

Executive Summary

Background

The Township of Wellesley (Township) is one of seven local municipalities in the Region of Waterloo (Region). The Wellesley Urban Area (Wellesley) is one of 11 settlement areas that comprise the Township of Wellesley. The Region is responsible for maintaining servicing within Wellesley's water and wastewater systems to provide capacity for the existing population and for new growth in the service area while meeting regulatory requirements. The Region undertook the Wellesley Water and Wastewater Master Plan (WWWMP) to address anticipated water and wastewater treatment needs to 2051, and in doing so, to improve the reliability and resiliency of Wellesley's water and wastewater assets. The WWWMP has incorporated recent population forecasts, condition assessments, and relevant concurrent upgrades and projects.

The goals of the WWWMP include assessing existing and future scenario infrastructure capacity, identifying required infrastructure upgrades and improvements, and systematically developing a prioritized implementation plan that is endorsed by the Region and project stakeholders. The proposed recommendations meet the Region's social and environmental stewardship standards and the regulatory requirements for infrastructure upgrades and improvements while providing technical and cost-effective solutions that meet both energy management and resiliency objectives.

Existing Water System Conditions

The purpose of this section is to describe the existing conditions within Wellesley's Water system.

Wellesley Water Treatment Plant

Water demand data was analyzed from 2018 to 2022. The existing average per capita demand, maximum day demand (MDD) factor, and peak hour demand (PHD) factor were determined to be 179 L/c/day, 1.69, and 2.28, respectively. The demands were used to assess the existing capacity of the Wellesley WTP. The rated capacity of the Wellesley WTP is 3,006 m³/d, however the maximum water taking allowed by the Permit to take Water (PTTW) is 1,503 m³/d. Therefore, the overall WTP capacity is limited by the well taking capacity. Current plant usage consists of an average day demand (ADD) of 668 m³/d, MDD of 1,128 m³/d, PHD of 1,522 m³/d, representing a usage of 44 percent, 75 percent, and 101 percent of overall capacity, respectively. The Wellesley WTP has sufficient capacity for the current ADD and MDD but does not meet the current PHD.

Raw and treated water quality data collected at the Wellesley WTP between 2002 and 2022 was utilized to assess the water quality. Overall, treated water arsenic and fluoride levels are below the regulatory limits, and iron, manganese, and strontium are within acceptable guideline objectives.

Wellesley Water Distribution System

The Region's existing water distribution model for Wellesley was used to evaluate system pressures. The preferred design pressure ranges for average day and maximum day are 350 kPa (50 psi) to 550 kPa (80 psi). The preferred minimum hour and peak hour pressure ranges are 275 kPa and 700 kPa. No distribution system pressure constraints were identified under non-emergency flow conditions.

The basis for fire flows for various building types were developed and reviewed with the local fire department to confirm these estimates were sufficient for their needs as part of the engagement activities for this Master Plan. The fire flow requirements by building types, can be summarized as follows:

- Fire Flow (Industrial/Commercial/Institutional): 175 L/s – Duration: 2.13 hours
- Residential Fire Flow: minimum 75 L/s
- Preferred Residential Fire Flow: minimum preferred 125 L/s

ICI fire flow constraints exist within the distribution system under existing conditions, and two locations at dead-end streets have insufficient residential fire flow capacity. However, the current fire-fighting practice includes reliance on tanker trucks to supplement flows from the distribution system, as required.

Treated water storage is provided at the Wellesley WTP by a three-celled reservoir with a total usable volume of 902.3 m³ (Cell A: 188.5 m³; Cell B: 279.8 m³; Cell C: 434.0 m³). The main purpose of this water reservoir is to provide a standby volume of water for firefighting and an additional volume for emergency conditions. In addition, the reservoir will also provide the required volume for primary disinfection.

Water treatment plant treated water volumes and water billing volumes were compared to determine the distribution system losses, which is defined as unaccounted for water. The calculated annual distribution system losses are approximately 18 percent, which falls within a typical range of 10-20 percent. However, opportunities may exist to improve the efficiency of the distribution system.

Existing Wastewater System Conditions

The purpose of this section is to describe the exiting conditions within Wellesley's Wastewater system.

Wellesley Wastewater Collection System

Flow monitoring within Wellesley's collection system was completed between March and June 2023 to understand existing sewer capacity conditions. The flow monitoring data was then used to calibrate a sanitary hydraulic model for Wellesley's wastewater collection system.

The level of service used as criteria to identify collection system constraints included no surcharging during dry weather periods and wet-weather events up to the 5-year design storm, and hydraulic freeboard greater than 1.8 m during wet weather events greater than the 5-year design storm.

The hydraulic model results were compared against the level of service criteria to identify existing capacity constraints within Wellesley's wastewater collection system during dry weather flow (DWF), the 5-year design storm, and the 25-year design storm. During DWF, the hydraulic model indicated the level of service criteria were met (i.e., no surcharging). During the 5-year design storm, surcharging was simulated in several locations including along the Firella Creek Trunk Sewer. During the 25-year design storm, further surcharging was identified and areas with freeboard greater than 1.8 m were identified.

Wellesley Wastewater Treatment Plant

Historical flow data were reviewed from 2019 to 2021. On a hydraulic basis, the plant has been operating at approximately 75 to 80 percent of the design average daily flow (ADF) capacity of 1,100 m³/d. Typical per capita flow rates vary from 225 to 450 L/cap/d, with an average per capita flow rate of 239 L/cap/d. The daily flow was less than the design peak day flow (PDF) factor of 3.5 approximately 99.7% of the time. Thus, the design PDF factor was exceeded for a total of one day per year. The instantaneous flow was less than the design peak instantaneous flow (PIF) factor of 4.0 approximately 99.6% of the time. Thus, the

design PIF factor was exceeded for a theoretical total of 35 hours per year. The high peak flows are the result of inflow and infiltration (I/I) in the wastewater conveyance system. Data indicates that recorded peak flows can reach up to ten times the annual average flow rate.

Historical raw wastewater concentration data from 2019 to 2021 were analyzed to established current plant loadings. Weekly sampling results were available for biochemical oxygen demand (BOD₅), carbonaceous biochemical oxygen demand (cBOD₅), total suspended solids (TSS), total Kjeldahl nitrogen (TKN), total ammonia nitrogen (TAN), and total phosphorus (TP). The raw wastewater per capita load rates are lower than typical observed values. The lower per capita loads would to be attributed to the domestic discharges without significant industrial discharges in the sewershed. Future load projections should account for the possibility of development in the sewershed. For planning purposes, higher per capita load rates in line with typical ranges are recommended. The design per capita values, summarized in Table ES-1, are within typical ranges cited by Metcalf & Eddy (Metcalf & Eddy, 2013).

Table ES-1. Historical Per Capita Loads and Planning Design Basis

Parameter	2019 – 2021 Per Capita Load, g/cap/d	Typical Per Capita Load, g/cap/d ^[a]	Planning Design Basis, g/cap/d
BOD ₅	38	50 – 120	50
TSS	55	60 – 150	60
TKN	9	9 – 18	15
TP	1.2	1.5 – 4.5	1.5

^[a] Adapted from Metcalf & Eddy (2013)

Historical sludge generation data from 2019 to 2021 were analyzed from plant operations data. Waste Activated Sludge (WAS) generated at the Wellesley WWTP is stored in an aerated holding tank prior to haulage to the Waterloo WWTP for further processing. The sludge holding tank is periodically decanted to headworks. The typical per capita sludge generation rate for extended aeration plants with chemical phosphorous removal is 50 to 55 g/cap/d per MECP guidelines (MOE, 2008). The sludge generation rate as calculated based on plant data is significantly lower than typical values. As such, a process model was developed to estimate per capita sludge generation rates for use in planning. Overall, the solids holding tank provides less than the recommended 5-day storage volume. However, this conclusion should be confirmed during future design stages using data from the recently installed WAS flow meters at the plant.

Future Conditions

This section describes future conditions of the Water and Wastewater systems within the Township of Wellesley.

Community Growth Projections

The residential population projections were used to estimate future flows and water demand to determine the future need for Wellesley's water and wastewater infrastructure and to identify when the recommendations should be implemented to service anticipated growth. The population projections were developed by the Region in 5-year increments to the planning horizon of 2051, as shown in Table ES-2. The population within the Study Area is anticipated to increase by 1,887 people, from 3,730 to 5,617.

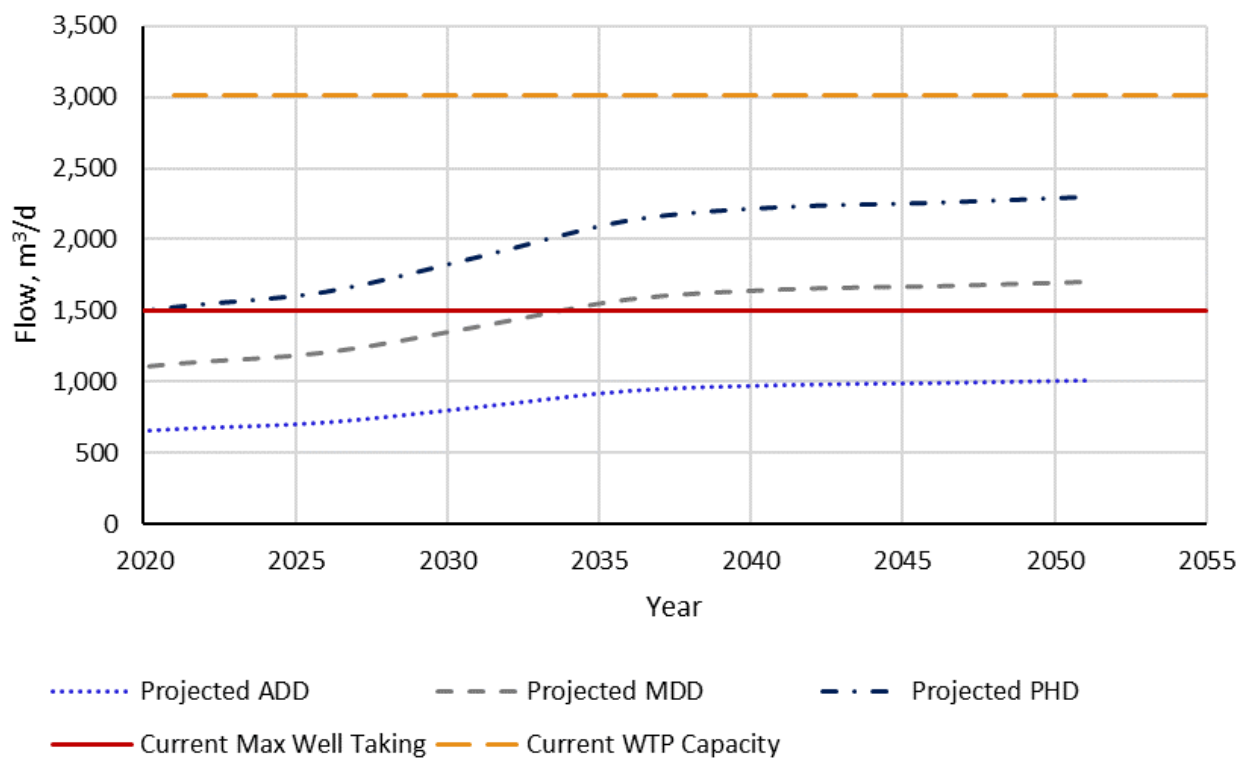
Table ES-2. Village of Wellesley Population Projections

Population	Year
2021	3,730
2026	3,992
2031	4,587
2036	5,218
2041	5,443
2046	5,518
2051	5,617

Water Treatment and Distribution

Water demand projections are presented in Figure ES-1.

Figure ES-1. Water Demand Projections



Wastewater Collection System

A future conditions scenario representing the year 2051 was created in the sanitary hydraulic model. The future hydraulic model results were compared against the level of service criteria to identify future capacity needs within Wellesley's wastewater collection system during DWF, the 5-year design storm, and the 25-year design storm. For the future scenario, the level of service criteria were not met during the 5-year design storm and 25-year design storm.

Wastewater Treatment

Wastewater flow projections through 2051 are presented in Table ES-3.

Table ES-3. Wellesley WWTP Service Area Population and Flow Projections

Parameter	Value	Basis
Design Year	2051	-
Population	5,617	-
AADF, m ³ /d	1,345	239 L/cap/d
PDF, m ³ /d	4,700	3.5 peaking factor
PHF/PIF, m ³ /d	5,370	4.0 peaking factor

Influent loading projections through 2051 are presented in Table ES-4.

Table ES-4. Wellesley WWTP Influent Load Projections

Parameter	Value
Design Year	2051
Population	5,617
Average BOD ₅ Load, kg/d	281
Average TSS Load, kg/d	337
Average TKN Load, kg/d	84
Average TP Load, kg/d	78.4

Summary of Future Needs

The following is a summary of the future needs within Wellesley's water and wastewater systems:

- **Water Treatment.** The future water treatment needs include the following:
 - Well Capacity – The current well taking capacity is expected to be exceeded by the projected MDD by 2034, therefore a plan for obtaining a minimum of 196 m³/d (2.3 L/s) additional well capacity must be initiated around 2025.
 - Future Disinfection and Water Pumping & Storage Needs – Currently, additional pumping capacity, additional CT volume, and additional treated water storage, are identified to be required within the planning horizon (to 2051).
 - The Wellesley WTP treated water is currently in compliance with all regulatory limits in Ontario. However, should strontium become regulated within the planning horizon, alternative approaches for treatment will need to be considered. The capability to address naturally elevated strontium and fluoride concentrations was considered as a value-added factor in the WWWMP alternatives evaluation. We recommend the Region continue to monitor the regulatory landscape in the coming years and take the appropriate measures as recommended by the province.
- **Water Distribution.** Modelling was completed to identify constraints in the Wellesley Urban Area water distribution system throughout the planning horizon. ICI fire flow constraints were identified but can continue to be mitigated by maintaining the implementation of the current fire-fighting practice which

includes supplying additional fire flows via tanker trucks. Residential fire flow requirements (at 75 L/s) are met with the exception of two locations at dead-end streets under existing and future conditions.

- **Wastewater Treatment.** Process capacity constraints include influent pumping, screening, secondary treatment, tertiary treatment, chemical dosing, ozone disinfection, and sludge storage. Of note, the Region is in the process of upgrading the disinfection system from ozone disinfection to UV disinfection, and it is anticipated that the UV design will provide sufficient capacity for growth to 2051.
- **Wastewater Collections.** Future constraints occur during wet weather flow within the Firella Creek Trunk Sewer, the WWTP Influent PS, and various local sewers. It should be noted that the WWTP Influent PS constraint was also identified as a constraint under the wastewater treatment category of future needs.

Problem and Opportunity Statement

The Region of Waterloo is undertaking a Water and Wastewater Master Plan for the Village of Wellesley to address anticipated water and wastewater treatment needs, and including water distribution and wastewater collection needs, over the next 30 years. Because the population of the Village of Wellesley is expected to increase over the next 30 years, it is critical that the water and wastewater infrastructure can meet the anticipated future treatment, distribution and collection system servicing requirements. This Water and Wastewater Master Plan represents an opportunity to review the existing service levels and identify projects that are required to be implemented to meet the future needs.

Environmental Assessment Process

This section describes the steps of a Class Environmental Assessment and the decision-making framework behind certain steps in the process.

Overview of Study Approach

The Class EA process is a decision-making framework that effectively meets the requirements of the *EA Act* and is comprised of the following five phases.

1. Identify the problem or opportunity
2. Identify alternative solutions and establish a preferred solution
3. Examine alternative methods of implementing the preferred solution that will minimize negative effects and maximize positive effects
4. Prepare the project file
5. Implement the preferred solution

The Master Plan will follow MCEA Approach #2 for completing a Master Plan, which involves the preparation of the WWWWMP at the end of Phases 1 and 2 of the MCEA process, while including sufficient supportive studies and investigations required to proceed to Phases 3 through 5. Approach #2 includes public and external agency consultation and an evaluation of alternative solutions.

Decision-Making Process

The alternatives were evaluated based on relative benefit/impact on criteria from the following categories: Environmental, Social, Technical and Financial. Alternatives were assigned a score according to a performance scale ranging from very well aligned with criteria to low alignment with criteria. Following the alternative scoring, each criteria category was weighted equally to calculate an overall scoring for each alternative. A sensitivity analysis using the category weightings was also completed to determine the impact different category weightings have on the evaluation outcome and ultimately assess the robustness of the alternative.

The detailed evaluation criteria included the following:

- Environmental
 - Protects environmental features
 - Protects wildlife and species at risk
 - Protects groundwater, streams and river
 - Minimizes climate change impacts
- Social
 - Minimizes impacts to residents related to noise, odour, traffic, and aesthetics
 - Minimizes impacts to businesses
 - Manages and minimizes construction impacts
 - Conserves built heritage and/or cultural heritage landscapes
 - Conserves archaeological resources
 - Protects health and safety
- Technical
 - Provides reliable service
 - Meets existing and future needs
 - Aligns with existing and planned infrastructure
 - Aligns with existing and future land use
 - Aligns with approval and permitting process
 - Manages and minimizes construction risks
 - Ability to adapt to climate change
- Financial
 - Requires low lifecycle costs

Well Capacity Alternatives Evaluation

The short-listed alternatives to address well capacity needs include the following:

1. Do Nothing (kept as a baseline) – Maintain existing well supply.
2. Increase Existing Well Supply – Explore additional water taking from existing production wells.
3. Supplement Existing Wells with New Well Supply – Maintain existing well supply and supplement with a new well that is pumped to the WTP. This alternative is split into the following sub-alternatives:
 - a. Alternative 3A: the new well is to be constructed within the urban boundary, with the watermain connection crossing through the downtown section of the Village.

- b. Alternative 3B: the new well is to be constructed at a new site located outside the urban boundary near the south-east end of the Village with a watermain connection that would not cross through the downtown section of the Village.
4. Supplement Existing Wellesley Water System with External Supply – Maintain existing well supply and provide additional treated water supply from another drinking water system such as the Integrated Urban Supply (IUS).

Alternative 2: Increase Existing Well Supply is the preliminary preferred alternative to address future well capacity constraints, based on the detailed evaluation scoring and sensitivity analysis. This alternative is preferred, however, subject to further hydrogeological study. There is uncertainty, regarding the ability to acquire approvals for increasing the existing well supply because the potential impact to groundwater quantity and quality from increasing the water taking rate has not yet been studied adequately.

Alternative 3B: Supplement Existing with New Well Supply (Outside Urban Boundary) ranked very similarly to Alternative 2 and is recommended to be considered as a preferred alternative should the hydrogeological study on Alternative 2 provide negative results. Therefore, the recommended preliminary preferred alternative that can be taken forward for further study and selection includes both Alternative 2: Increase Existing Well Supply, and Alternative 3B: Supplement Existing with New Well Supply (Outside Urban Boundary).

Water Distribution and Storage Alternatives Evaluation

The short-listed alternatives identified to address the future disinfection, water pumping, and storage needs include the following:

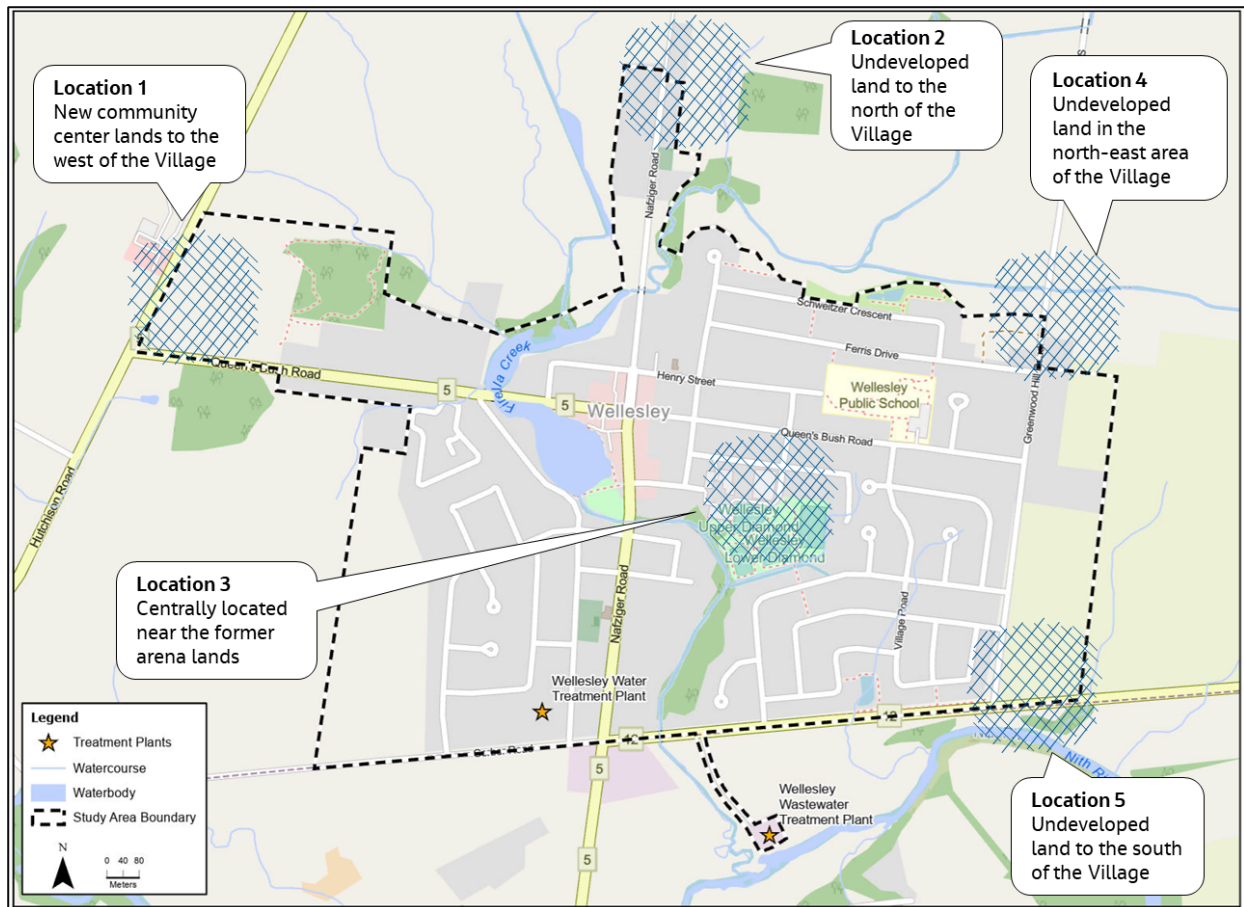
1. Do Nothing (kept as a baseline) – Maintain existing reservoir and pump station with the pump station as the sole source of supply for domestic and emergency use.
2. New Storage Off-Site – Maintain existing reservoir for disinfection. Construct floating storage, such as an elevated tank, to provide additional storage for emergency use (i.e., fire demand). Maintain existing pump station for domestic use.

Only Alternative 2: New Storage Off-Site, will meet the future needs. Evaluation was completed for the floating storage location alternatives. A list of potential locations for the floating storage was developed, including the general locations indicated in Figure ES-2 and below:

1. Bill Gies Recreation Centre lands to the west of the Village
2. Undeveloped land to the north of the Village
3. Centrally located near the former arena lands
4. Undeveloped land in the north-east area of the Village
5. Developed land to the south of the Village

Based on the detailed evaluation results, Location 1 was selected as the preferred location.

Figure ES-2. Floating Storage Alternative Locations



The alternatives for addressing fire flow are consistent with the alternatives for future disinfection and water storage needs. The total Fire flow available (FFA) is limited by the practical capacity of the existing water distribution system. It is understood that, within the planning horizon, any additional fire flow needed beyond the distribution system capacity limits can be provided through the fire department's own supply and delivered via tanker trucks, consistent with the current practice. However, when the anticipated future development within Wellesley is undertaken, there may be additional requirements for improvements to the water distribution system that would provide additional value in regard to servicing. The following watermain upgrades are recommended, based on modelling results carried out under the WWMP, to be further investigated for implementation as additional planning information is made available to the Region in regard to the anticipated future development:

- **Residential Fire Flow Needs.** The needs for residential fire flow were identified where FFA is less than 75 L/s. These correspond to watermain dead-ends ranging in size from 50 mm to 100 mm in diameter (Pond View Drive dead-end and Village Place). These dead-end watermains should be upgraded to a size of 150 mm in diameter. By doing so, the FFA increases to 110 L/s, according to the modelling results.
- **ICI Fire Flow Needs.** The needs for ICI fire flow were identified where FFA is less than 175 L/s. It is recommended that the 200 mm diameter watermain on Queen's Bush Road from David Street (approximately 510 m in length) be upgraded to 250 mm diameter to adequately service the proposed water tower near to the Bill Gies Recreation Centre located at Queen's Bush Road and Hutchison Road.

The proposed water tower provides enough FFA to meet the requirements for the Bill Gies Recreation Centre due to its close proximity. However, to meet the fire flow required for the other ICI locations evaluated, upgrading the 200 mm diameter watermain on Queen's Bush Road from Nafziger Road to the Bill Gies Recreation Centre (approximately 900 m in length) to 300 mm diameter is required.

- Based on the additional planning information that is made available to the Region in regard to the anticipated future development, other watermain upgrades that may provide additional distribution needs should also be further investigated for implementation through additional hydraulic modelling.

Wastewater Collections and Conveyance Alternatives Evaluation

Alternatives were grouped into alternatives to address the Firella Creek Trunk Sewer needs (Group A), and alternatives to address the local sewer needs (Group B).

The short-listed alternatives to address the Firella Creek Trunk Sewer needs (Group A Wastewater Collections Alternatives) include the following:

1. **Group A -Alternative 1.** Do nothing and maintain status quo (included as a means of comparison).
2. **Group A -Alternative 2.** Implement I/I reduction measures, WTP backwash mitigation measures, offline storage locations to equalize flows along the Firella Creek Trunk Sewers.
3. **Group A -Alternative 3.** Implement I/I reduction measures, WTP backwash mitigation measures, upsize or twin Firella Creek Trunk Sewer.

Alternative 3: Implement I/I reduction measures, WTP backwash mitigation measures, upsize or twin Firella Creek Trunk Sewer, is the preferred Group A alternative.

The short-listed alternatives to address the local sewer needs (Group B Wastewater Collections Alternatives) include the following:

1. **Group B -Alternative 1.** Do nothing and maintain status quo (included as a means of comparison).
2. **Group B -Alternative 2.** Implement I/I reduction measures, pipe capacity increases as necessary for local sewers.
3. **Group B -Alternative 3.** Implement I/I reduction measures, new trunk/sub-trunk sewers to collect flows from future developments on the east and west extents of the study area, pipe capacity increases as necessary for local sewers.

Alternative 2: Implement I/I reduction measures, pipe capacity increases as necessary for local sewers is the preferred Group B alternative. The I/I reduction component should be further explored prior to implementing the recommended infrastructure upgrades associated with Alternative 2. Reducing I/I could substantially decrease the number of recommended local sewer upgrades with the Study Area. After I/I implementation strategies are investigated and implemented, the wet weather flow and sewer constraints within Wellesley's wastewater collection system should be reassessed.

Wastewater Treatment Alternatives Evaluation

This section summarizes the short-listed alternatives for select wastewater treatment processes.

Influent Pumping

The short-listed alternatives to address influent pumping needs include:

- Alternative 1: Do Nothing
- Alternative 2: Replace existing duty/standby pumps with larger capacity pumps and construction of equalization tank.
- Alternative 3: Construct a new pump station and construct an equalization tank.

The influent pump station alternatives were considered in conjunction with the determination of the preferred Firella Creek Sanitary Trunk Sewer because of the impact of the trunk sewer alternatives on the peak flow rates received at the WWTP.

Alternative 3: New Pump Station/ Equalization Tank is recommended for influent pumping. The equalization tank will provide storage for flows in excess of the future peak hourly flow capacity considering a peaking factor of 4.0 (i.e., flows in excess of 5,370 m³/d) during wet weather events. This concept will be considered when developing concepts for downstream processes (i.e., secondary treatment and tertiary treatment) that are impacted by peak flows.

Headworks

The short-listed alternatives to address the needs for headworks include:

- Alternative 1: Do Nothing
- Alternative 2: Replace existing screen and retrofit channel to increase capacity
- Alternative 3: Construct a new headworks facility

Alternative 2: Existing Screen Replacement is recommended for the screening facility upgrade.

Secondary Treatment

The short-listed alternatives to address the needs for secondary treatment include:

- Alternative 1: Do Nothing
- Alternative 2: New Secondary Treatment Plant Construction
- Alternative 3: Implement an alternative process intensification technology into Plants 1 and 2 (Densification with AGS or MABR)
- Alternative 4: Implement wet weather management technology

Secondary treatment needs are impacted by peak flows. The preferred Influent Pumping alternative is Alternative 3: Construct a new pump station/equalization tank. The equalization tank would be part of the plant's wet weather management strategy and provide storage for flows in excess of the future peak hourly flow capacity considering a peaking factor of 4.0 (i.e., flows in excess of 5,370 m³/d) during wet weather events. The size of the equalization tank can be optimized and may be paired with wet weather management technology to handle excess flow, which will be confirmed as part of a Schedule C Class EA. Therefore, it is recommended that Alternative 4: Implement wet weather management technology be eliminated from further analysis under Secondary Treatment but be evaluated as part of an overall wet weather management strategy in conjunction with the equalization tank as part of a Schedule C Class EA.

A multi-step approach is recommended for secondary treatment with further evaluation as part of a Schedule C Class EA:

1. Complete additional process modelling and evaluation to confirm if process intensification is feasible to increase secondary treatment capacity at the Wellesley WWTP. If process intensification is confirmed as a feasible strategy, proceed with implementation within the necessary timeframe.
2. If process intensification is confirmed as not feasible through the evaluation completed within the Schedule C Class EA, proceed with a secondary treatment expansion.

Both Alternative 2: New Secondary Treatment Plant Construction and Alternative 3: Implement an alternative process intensification technology will be carried forward as potential preferred solutions as part of this Master Plan.

Sludge Storage

The short-listed alternatives to address the needs for sludge storage include:

- Alternative 1: Do Nothing
- Alternative 2: Replace existing storage tank with a new larger storage tank
- Alternative 3: Construct a second storage tank

Alternative 3: Construct a Second Storage Tank, is recommended for the Wellesley WWTP.

Tertiary Filtration

The short-listed alternatives to address the needs for tertiary treatment include:

- Alternative 1: Do nothing and use the redundant filter to handle flows exceeding 4,400 m³/d
- Alternative 2: Expand existing tertiary filtration process with additional filter

Alternative 2: Existing Tertiary Filtration Expansion, was selected as the preferred solution for tertiary filtration at the Wellesley WWTP.

Engagement

This section summarizes the consultation and engagement conducted through this Master Plan.

Engagement Plan and Approach

As part of the Wellesley WWMP, a Consultation and Engagement Plan was developed. The Consultation and Engagement Plan establishes a strategy to provide meaningful information about the project to the identified audiences, as well as provide engagement opportunities over the course of the Master Plan development.

The goal for consultation and engagement was to effectively inform the public, agencies, and other stakeholders about the Class Environmental Assessment process for Master Planning, as well as the study background and goals, and provide sufficient opportunities for two-way communication opportunities. Specific goals of the Consultation and Engagement Plan include:

- Providing accessible methods and opportunities for consultation and engagement
- Addressing comments, questions, and concerns so they can be considered within the study process

- Garnering support from members of the public, agencies, and other stakeholders that the process is fair, transparent, and defensible

Managing and incorporating input from the community was used to guide the Master Plan decision-making process and support the identification and development of informed water and wastewater infrastructure solutions.

A separate Indigenous Community Engagement Plan was developed as part of this Master Plan. The MECP has established guidelines for engagement with Indigenous communities through the environmental assessment process. Communities were contacted to identify interests in the Wellesley WWWWMP, to support the planning process, and to understand how potential impacts of a proposed alternative might be prevented or mitigated.

In a letter dated April 20, 2023, the MECP confirmed the following communities are anticipated to have a potential interest in the WWWWMP:

- Mississauga's of the Credit First Nation
- Six Nations of the Grand River

Meaningful engagement with Indigenous communities was an important component of this study. Notices were sent to the Mississauga's of the Credit First Nation, Six Nations of the Grand River, and HCCC. No responses to the notices were received. Record of the correspondence conducted with these parties can be found in Appendix A.

Relevant agencies and stakeholders were engaged at various stages of the Master Plan to provide their input and feedback to inform the project team in the planning process. The following agencies were engaged:

- Fisheries and Oceans Canada (DFO)
- Grand River Conservation Authority
- Ministry of Citizenship and Multiculturalism (MCM)
- Ontario Ministry of the Environment, Conservation and Parks (MECP)
- Ontario Ministry of Transportation (MTO)
- Ministry of Municipal Affairs and Housing (MMAH)
- Township of Wellesley

Engagement Activities

The following provides an overview of the engagement activities completed for this Master Plan:

- Project Notices:
 - Notice of Commencement
 - Notices of Public Consultation Centers (PCC)
 - Notice of Study Completion
 - Inserts that notified Wellesley residences of upcoming PCCs and the Notice of Study Completion were distributed to residences through utility bill distribution
- Public Consultation Centers (PCC)
 - PCC1 was held on April 19, 2023, at 7pm via Microsoft Teams Webinar. The presentation included an overview of the master planning process and the project Study Area, a summary of the Wellesley water and wastewater systems and next steps. A total of 13 people, including presenters, attended the PCC, and attendees were encouraged to complete a PCC survey.

- PCC2 was held on June 20, 2024, at 7pm via Microsoft Teams Webinar. The presentation included an overview of the master planning process, a summary of identified water and wastewater system constraints, short-listed water and wastewater system alternatives, and the evaluation criteria. A total of 12 people, including presenters, attended the PCC, and attendees were encouraged to complete a PCC survey.
- PCC3 was held on December 12, 2024, at 7pm via Microsoft Teams Webinar. The presentation included a review of the evaluation criteria and alternatives presented at PCC2 and shared the preliminary recommendations on the preferred alternatives for water supply and wastewater. A total of 14 people, including presenters, attended the PCC, and attendees were encouraged to complete a PCC survey.

How the Preferred Solution Incorporates Engagement Feedback

Incorporating feedback received at the PCC's into the WWWMP is an important and valued component of the master planning process. The points below summarize the feedback received and how the feedback was incorporated into the Wellesley WWWMP.

- **What were the proposed population changes and how those may impact infrastructure needs?** Considered future projected populations based on updated projections in April 2024 and this is reflected in alternatives in PCC3
- **Will development impact the quality of water?** The Region must monitor water quality on a regular basis and ensure it meets all Provincial water quality standards.
- **Concern is raised over central elevated tank location.** Noted. This was reflected in the evaluation under social category of criteria
- **Will this project address low water pressures?** The provision of off-site water storage will help stabilize pressures in Wellesley.
- **How does water efficiency change wastewater flows?** Less water usage has a direct relation to water entering the wastewater system; water efficiency would lead to decrease in wastewater flows.
- **Additional technical information on alternatives.** Alternative evaluation details are covered in PCC3 and further technical details will be provided in the Master Plan Report which will be posted early 2025.
- **Concern is raised over various bottle necks in the local sanitary sewer system, and how the expansion of the Firella Creek Trunk Sewer will impact these areas.** In addition to identifying alternatives for the Firella Creek Trunk Sewer, PCC3 presented alternatives to address the local pipe capacity needs. The evaluation results recommended managing local pipe capacity needs by implementing I/I reduction measures and other pipe capacity increases as necessary.
- **Project timelines and next steps?** Covered in PCC3

Recommendations

Table ES-5 summarizes the recommended water and wastewater system alternatives.

Table ES-5. Summary of Recommended Alternatives

System Type	Constraint Group	Preferred Alternative Description	Cost ^[a]	EA Schedule	Recommended Implementation Year ^[b]
Drinking Water	Well Capacity	Increase existing well supply or supplement existing with a new well (outside urban boundary)	\$5,320,000	Schedule C Class EA	Before 2034
Drinking Water	Future Disinfection, Water Pumping, and Storage	New storage off-site	\$12,803,000 & \$250k to \$400k for chlorine boosting (if needed)	Schedule B Class EA	Near-Term (within 5 years)
Drinking Water	Water Distribution	Watermain upgrades to accommodate fire flow needs	TBD ^[c]	Exempt	TBD ^[c]
Wastewater Collections	Group A – Firella Creek Trunk Sewer	Increase capacity of Firella Creek Trunk Sewer	\$5,421,000	Exempt	Near-Term (within 5 years)
Wastewater Collections	Group B – Local Sewer Constraints	Investigate and implement I/I reduction strategies	TBD ^[d]	TBD ^[d]	2025
Wastewater Collections	Group B – Local Sewer Constraints	Reassess local sewer constraints	TBD ^[d]	Exempt	Near-Term (within 5 years)
Wastewater Treatment	Not Applicable	Assimilative Capacity Study	\$150,000	Not Applicable	2025
Wastewater Treatment	Influent Pumping	New pump station and equalization tank	\$11,383,750	Schedule C Class EA	Near-term (within 5 years) ^[f]
Wastewater Treatment	Headworks	Replace existing bar screen	\$1,050,000	Schedule C Class EA	2032

Master Plan Report (DRAFT)

System Type	Constraint Group	Preferred Alternative Description	Cost ^[a]	EA Schedule	Recommended Implementation Year ^[b]
Wastewater Treatment	Secondary treatment	Construct new secondary treatment plant ^[g]	\$3,937,500	Schedule C Class EA	2032
Wastewater Treatment	Sludge Storage	Construct new storage tank	\$700,000	Exempt	2032
Wastewater Treatment	Tertiary Filtration	Expand existing filtration process	\$2,012,500	Schedule C Class EA	2036

Notes:

^[a] Land acquisition costs are not included in cost. Costs are in 2024 dollars.

^[b] Refer to TM5 in Appendix B for additional information and assumptions.

^[c] TBD = To be determined pending further investigation for implementation as additional planning information for anticipated future development is made available to the Region

^[d] TBD = To be determined pending I/I investigation results

^[e] Assimilative capacity study to be completed prior to Wellesley WWTP Schedule C EA

^[f] The equalization tank is required in the near-term to manage peak flows from the collection system that are conveyed to the Wellesley WWTP. The preferred equalization tank concept (sizing, hydraulics, etc.) will be determined during the future Schedule C Class EA and design. A new influent pumping station will be constructed as part of this contract with the same peak rated capacity as the Wellesley WWTP, with provisions for expansion when the remainder of the WWTP is expanded and following a Schedule C Class EA. The pumping station may include separate wet weather pumps to convey flows to the equalization tank, however, these will not impact the overall rated capacity of the pumping station (i.e., the flow rate that can be pumped through the Wellesley WWTP). The construction of the equalization tank is a Schedule B activity, but is recommended to be incorporated into the Wellesley WWTP Schedule C Class EA.

^[g] Secondary treatment expansion was carried forward for costing as a conservative approach. A pilot study is recommended to first be completed to determine the feasibility of process intensification, however these secondary treatment recommendations will be confirmed during the subsequent Schedule C EA. Refer to Section 8.2.4.3 for further details.

Permits and Approvals

The following permits/approvals will be required before the construction of the preferred alternatives:

- Ontario Environmental Assessment Act Approval: Schedule B EA for the new elevated tank (satisfied through this Master Plan). Schedule C EA for the WWTP upgrades and new well (if required). The above requirements will need to be reviewed should any potential regulatory changes occur in the short-term. Consultation with the MECP is recommended.
- ECAs: Amendments to the Region's Consolidated Linear Infrastructure ECA and wastewater treatment plant ECA.
- PTTW Application Groundwater: Category 3 application to increase the water taking capacity, supported by a new hydrogeological assessment.
- Drinking Water Works Permit (DWWP) Amendment for the elevated tank and well.
- Municipal Drinking Water License (MDWL) Amendment for the elevated tank and well.
- PTTW if taking more than 50,000 litres of water per day from environment during construction.
- Receiving Water Quality Assessment (RWQA) prior to implementation of recommended projects.
- Endangered Species Act (ESA):
 - Follow timing windows for tree removals to avoid the maternal roosting period for species at risk (SAR) bats (May 1 and August 31). Recommend consultation with the MECP during design. Information Gathering Form must be completed to verify if a permit is required.
 - Consultation with MECP is recommended prior to removal of any protected SAR bat habitat within the study area. Consideration for SAR and SAR habitat is required for proposed construction within or nearby these areas as per the ESA as administered by the MECP. Further SAR screening is conducted by contacting the MECP's SAR Branch.
- Under the Fish and Wildlife Conservation Act, a License to Collect Fish for Scientific Purposes is required if fish relocation to outside the work area is required. A Wildlife Collector's Authorization will be required if wildlife must be relocated to outside of the work area.
- Under the Public Lands Act & Lakes and Rivers Improvements Act the project may require land tenure under the Public Lands Act. Consultation with the local MNR office may be required.
- GRCA: Permit for the Regulation of Development, Interference with Wetlands and Alteration to Shorelines and Watercourses (Ontario Regulation 150/06), erosion and sediment control plans.
- MCM: Stage 1 Archaeological Assessment and Cultural Heritage Report for new well supply.
- Environment and Climate Change Canada: Certain rules apply to migratory birds, which are protected under the federal Migratory Birds Convention Act. Environment Canada provides guidance regarding tree removal and construction timing windows.
- Fisheries and Oceans Canada (DFO): Review may be required if future work is proposed in-water, or near water, such as for the water crossings to upsize the sanitary sewers.
- Township of Wellesley: Municipal Consent for works with the Townships right-of-way, Municipal site plan approval for elevated tank, Municipal building permit for elevated tank, Road Work Permit for sanitary sewer upgrades, zoning by-law amendment for the elevated tank.

- **Utilities:** Utility infrastructure such as electrical, telephone, and gas must be confirmed during preliminary design. Review and approvals must be received.
- **Easements and Land Acquisition:** Land acquisition is anticipated for the recommended equalization tank at the WWTP, as well as the new elevated tank and well supply. Alternations to the WWTP buffer zone may also be required to satisfy MECP requirements. An expanded or revised easement may be required to implement the Firella Creek Trunk Sewer upgrades.
- **Approvals under the Electrical Safety Authority (ESA) and Technical Standards and Safety Act (TSSA)** may be required for the recommended WWTP upgrades.

Potential Impacts and Mitigation Measures

This section covers the potential impacts that may occur during the implementation of the preferred alternatives and recommended mitigation measures for such impacts.

Natural Environment

The following impacts and mitigation measures for the natural environment may apply during the implementation of the preferred alternatives:

- **Local Sanitary Sewer Upgrades:** Potential construction impacts to two waterbody crossings (one crossing south of Molesworth Street and one crossing west of Parkview Drive).
- **Firella Creek Trunk Sewer Upgrades:** Construction of the Firella Creek Trunk Sewer will be within the GRCA regulated area and mitigation measures will be required, including the implementation of sediment control plans. Potential impact to woodlots. One creek crossing will also be required.
- **Drinking Water Storage:** Location 1 does not overlap GRCA regulated areas, however there could be potential impacts to nearby woodlots.
- **Increasing Existing Well Supply:** Hydrogeological investigation to assess aquifer impacts.
- **New Well Supply Outside of Urban Boundary** (if required): A species at risk assessment and arborist surveys are to be completed during design. Desktop natural heritage review would be required as this alternative is located outside of the Study Area of this Master Plan.
- **Wastewater Treatment Plant Upgrades:** Property expansion will be required for the equalization tank, likely into neighboring agricultural lands. The equalization tank location and process equipment locations should be selected outside of the GRCA regulatory floodplain. An assimilative capacity assessment will be required prior to WWTP upgrades.
- **Wellhead Protection Area (WHPA):** One WHPA is located in the Study Area and is associated with WY1, WY5, and WY6, situated within the Wellesley WTP property. WHPA-A includes the area within the immediate vicinity of the Wellesley WTP. WHPA-B includes the approximate area from Gerber Road and Nafziger Road, extending northwest to west of Lawrence Street and south of Queens Bush Road. WHPA-C extends beyond WHPA-B to include areas northwest of Seigner Lane and Hutchinson Road in Wellesley Township. The following impacts to the WHPA are possible:
 - Sewage systems have a vulnerability score of 8 and 10 within WHPA-A and WHPA-B. Local sanitary sewer upgrades are not part of the recommendations in this WWWWMP, however, the Master Plan recommends I/I reduction to reduce wet weather flows in the sanitary collection system. Should any upgrades to local sewers that fall within WHPA-A and WHPA-B be initiated as an I/I option it should be remembered that potential risks to the impact zones include potential spills to the aquifer pertaining to

WY1, WY5, and WY6. This threat could occur during construction, operation, or sewer pipe deterioration or failure.

- The recommended elevated tank (Location 1) falls within WHPZ-C; however, is not considered a significant drinking water threat.
- The following mitigation measures are recommended:
 - The ECA should include terms and conditions to remove the drinking water threat. The ECA should also include a contingency plan in the case of a spill and within WHPA-A the ECA should include enhanced construction to reduce the likelihood of leaks.
 - Dewatering could also be minimized to reduce impacts on the aquifer. The proposed sewers will also be sized and constructed according to typical standards and codes to mitigate the occurrence of wastewater leakage into the aquifer.
- **Waterbody crossings:** Construction methods will be investigated in design. Construction of the recommended projects pose potential impacts to vegetation and tree removals, wildlife habitat removal, and aquatic habitats. Erosion and sedimentation plans will be developed and implemented to limit or eliminate the impact to the adjacent habitats and aquatic environment.
- A detailed natural environment monitoring study with field verification and an Environmental Impact Assessment is required. Mitigation measures are expected to include an Erosion and Sedimentation Plan, a Spills Management Plan, a Tree Impact and Preservation Plan, compliance with the Species Act and Migratory Birds Convention Act, and compliance with the Grand River Source Water Protection Plan.
- Selection of energy efficient equipment to mitigate the impacts due to increased energy consumption at the WWTP and WTP following implementation of the recommended alternatives.
- GHG emissions are anticipated to increase at the WWTP since the equalization tank basin is expected to be an open tank, thereby enabling the release of GHG. However, GHG emissions are expected to be minimal since the duration of storage of the peak flow would be one day or less.
- A desktop review geotechnical study was completed to provide a geotechnical feasibility screening for the preferred alternatives as well as constructability considerations. Geotechnical investigations will be required prior to project implementation. It should be noted that archaeological assessments need to be completed prior to geotechnical investigations.

Social, Economic and Cultural Environment

The following impacts and mitigation measures for the social, economic, and cultural environments may apply during the implementation of the preferred alternatives:

- **Built Heritage Resources and Cultural Heritage Landscapes:** Archaeological Services Inc. (ASI) completed the Cultural Heritage Report for the project study area which consisted of the primary and secondary preferred elevated tank sites to the west and north-east areas of the Village, the Wellesley WWTP, and various underground sewer locations. The report includes an inventory of known and potential built heritage resources (BHRs) and cultural heritage landscapes (CHLs), summary of existing conditions of the study area, a preliminary impact assessment, and proposed mitigation measures.
 - Potential Elevated Tank Location 1 in the west area of the Village will not result in direct or indirect impacts to any BHRs or CHLs.
 - Wellesley WWTP: No direct or indirect impacts to any BHRs or CHLs are expected.

- I/I mitigation work or construction activities on the various underground sewer locations: Potential for indirect adverse impacts due to construction related vibration to five potential BHRs and six potential CHLs.
- The following mitigation measures were recommended:
 - Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to identified BHRs and CHLs. Avoidance measures may include erecting temporary fencing, establishing buffer zones, issuing instructions to construction crews to avoid identified BHRs and CHLs, and post construction rehabilitation with sympathetic plantings.
 - Where project works are anticipated to be directly adjacent to a designated or listed property, a resource-specific Heritage Impact Assessment (HIA) may be required per Schedule 9.5.1 of the Township's Official Plan. An HIA may be required for CHL 5 located along Henry Street. However, as no direct adverse impacts are anticipated, Heritage Planning at the Region should consider waiving the requirement for an HIA in favour of suitable avoidance and mitigation measures.
 - The Firella Creek trunk sewer should be designed in a manner that does not adversely impact B.H.R. 9 (Gerber Road Bridge). Should avoidance not be feasible and the bridge will be subject to direct adverse impacts, a Cultural Heritage Evaluation Report (C.H.E.R.) is recommended to determine if the bridge has cultural heritage value or interest, as per Ontario Regulation 9/06. If it is determined to have cultural heritage value or interest, a H.I.A. is recommended to assess and mitigate any impacts.
 - To address the potential for indirect impacts to B.H.R.s 1-10 and C.H.L.s 1-6 due to construction related vibration, undertake a baseline vibration assessment during detailed design to determine potential vibration impacts.
 - The Cultural Heritage Report should be submitted by the proponent to heritage staff at the Township, the Ministry of Citizenship and Multiculturalism, and any other relevant stakeholder with an interest in this project.
 - Should future work require an expansion of the study area then a qualified heritage consultant should be contacted to confirm the impacts of the proposed work on potential heritage resources.
 - All subsequent recommended technical cultural heritage studies should be completed by a qualified heritage professional with recent and relevant experience as early in detailed design as possible prior to any construction activities and submitted for review and comment to the Township, the Region, and the Ministry of Citizenship and Multiculturalism, and any other local heritage stakeholders that may have an interest in this project.
 - A Built Heritage Resources and Cultural Heritage Landscapes assessment has not been completed for a new well supply but will be required if it is determined that expanding the existing well capacity is not feasible and a new well supply outside of the urban boundary is required.
- **Archaeology:** A Stage 1 Archaeological Assessment and a subsequent report was completed by ASI. The background assessment determined that six previously registered archaeological sites were located in close proximity (within 1 km) of the Study Area. A Stage 1 Archaeological Assessment property inspection was conducted on November 1, 2024, to assess the archaeological potential along the preferred alternatives based on the geography, topography, and current conditions. The property inspection was visual and did not include excavation or collection of archaeological resources.

- The property inspection determined that the following preferred alternative exhibits archaeological potential:
 - WWTP Upgrades, including equalization tank: Archaeological potential – require Stage 2 archaeological assessment by test pit and pedestrian survey at 5m intervals.
- The areas exhibiting archaeological potential will require Stage 2 Archaeological Assessment prior to any construction activities or other proposed impacts, including geotechnical investigations.
- **Noise and Vibration:** Impacts associated with construction can be addressed by the following:
 - Working within Township of Wellesley noise bylaw
 - Working within the MECP's Environmental Noise Guideline - Stationary and Transportation Sources - Approval and Planning
 - Minimizing construction traffic in local residential streets
 - Larger pumps may increase noise at the WWTP. However, the impact is expected to be minimal given that the land use surrounding the WWTP is generally agricultural.
- **Odour:** Odour is not expected to increase substantially during construction. Odour generation potential at the WWTP may increase due to increased flows. However, the impact is expected to be minimal given that the land use surrounding the WWTP is generally agricultural. Providing a sludge storage tank with a jet aerator would provide sufficient mixing to minimize odour. Achieving minimum scouring velocity thresholds within the sanitary sewers will reduce the risk of odour generation within the sewers.
- **Aesthetics:** The elevated tank is a permanent infrastructure change that will alter the community aesthetics and viewshed. These impacts were considered in detailed evaluation to select a location that minimizes impacts to current residents and businesses. The Firella Creek Trunk Sewer will be underground and will not impact aesthetics. I/I mitigation methods within the local sewers are not anticipated to impact aesthetics. Upgrades at the WWTP are not anticipated to substantially impact the existing aesthetic landscape.
- **Water and Wastewater Servicing:** Temporary disruptions may occur for water and wastewater servicing during the construction of the elevated tank and I/I mitigation measures within local sanitary sewers. Mitigation measures for these disruptions are recommended to be developed during design, as applicable. Bypass pumping will be required during the Firella Creek Trunk Sewer Upgrades. A temporary interruption of the existing process operation, or reduced capacity, may occur at the WWTP during upgrades. Mitigation measures to limit disruption impacts and mitigate the risk of potential effluent quality impacts to the Nith River should be considered during design.
- **Health and Safety:** Development and construction activities may increase the type and volume of traffic (e.g., construction vehicles and equipment) or introduce additional hazards to the environment (e.g., material spill). Vehicles and equipment used during construction will follow traffic laws and multi-passenger vehicles will be used, when possible, to reduce traffic associated with construction activities. Increasing the existing well taking capacity may lead to elevated strontium and fluoride concentrations, which remains to be determined as a part of the hydrogeological study.

Statement of Limitations

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