Carleton Place Water & Wastewater Master Plan – Phase 2 Report

Final

May 30, 2022

Prepared for:

Town of Carleton Place

Prepared by:

Stantec Consulting Ltd.

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Executive Summary

The Town of Carleton Place's water & wastewater infrastructure will require expansions to accommodate planned growth to 2041. A Municipal Class Environmental Assessment (MCEA) is being undertaken to identify problems & opportunities, identify alternative solutions, define implementation plans and implement the solutions.

Based on a review of alternatives, the preferred alternatives were:

- To expand the existing water treatment plant (WTP) on the existing site at John St.
- To add water storage at the WTP site as part of the expansion
- To upgrade watermains in the water distribution system (WDS)
- To expand the existing wastewater treatment plant (WWTP) on the existing site off Patterson Cres. and partially into the neighbouring property (Town's household hazardous waste and compost depot).

The sanitary collection system was also investigated. However, it is recommended that the existing system modelling tools first be further developed through a flow monitoring program prior to using them for the detailed planning of solutions.

Consultation from the onset of and throughout the process was led to allow an exchange of ideas with stakeholders and the public, and broaden the information base for better decision-making, per the MCEA process.

Implementation plans are presented in this Master Plan for the WTP expansion, WDS upgrades and WWTP expansion, including phasing and planning level costing.

This Master Plan will be posted to the project website, and a Notice of Completion for Schedule A and A+ projects will be published. Schedule C projects will be further investigated in future phases of the EA.

1 Introduction

1.1 Background

Stantec Consulting was retained by the Town of Carleton Place (The Town) to undertake a Municipal Class Environmental Assessment (MCEA) and prepare a Master Plan for the expansion of the Town's Water Treatment Plant (WTP) and Wastewater Treatment Plant (WWTP) and to assess the need for the potential addition of a new water storage reservoir. The Master Planning assignment will evaluate the Town's water and wastewater infrastructure needs over 5-year, 10-year and 20-year horizons. In addition to the treatment facility expansions and the water reservoir, the assessment will investigate current and future needs of the potable water distribution and wastewater collection systems.

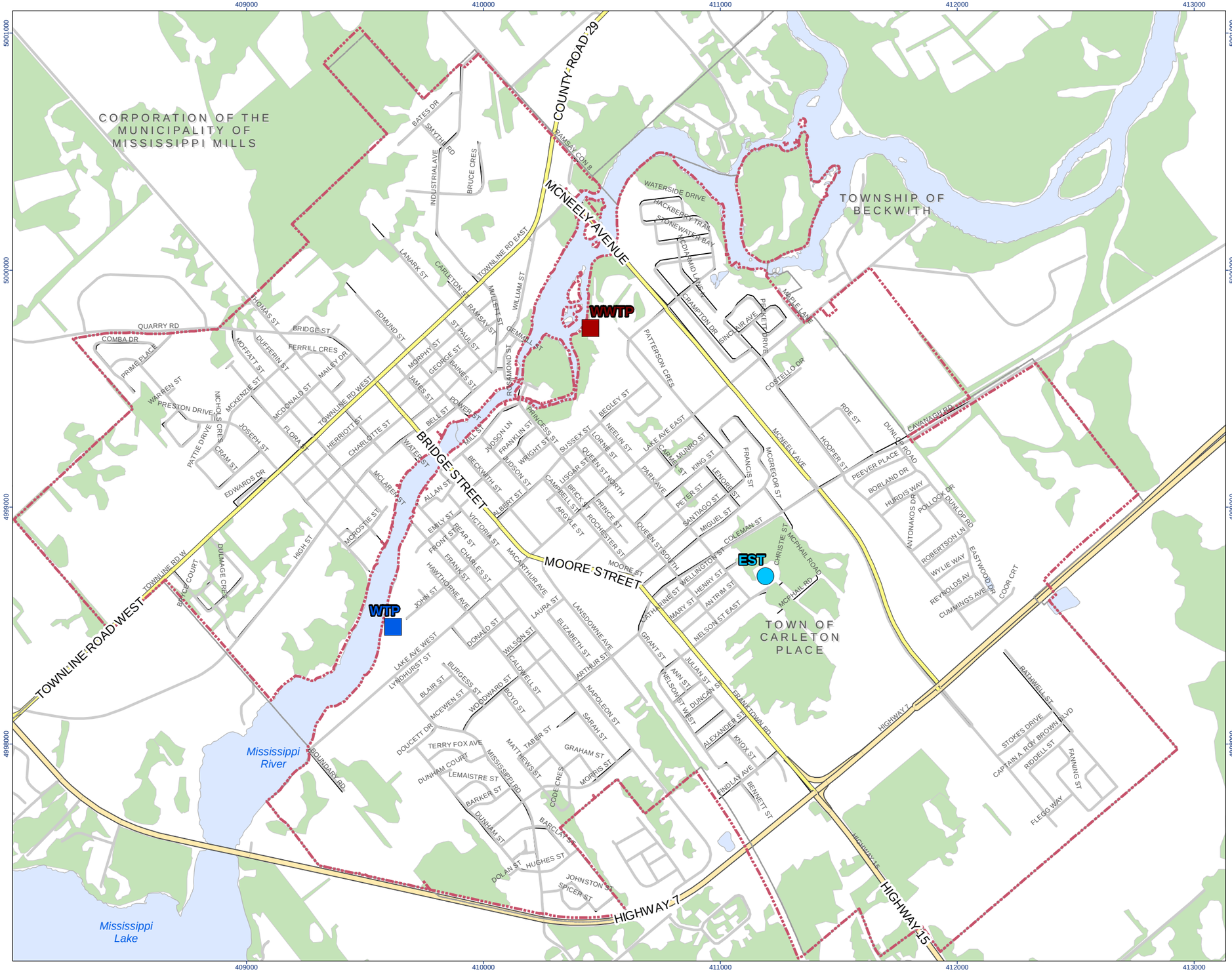
The purpose of this report is to present the preferred solutions of the Master Plan, along with an implementation strategy for each solution. Alternative solutions were previously presented and evaluated in an **Alternatives Evaluation Technical Memo** (TM), provided in **Appendix B**. These alternatives were developed as potential solutions to address the problems and opportunities identified in the **Phase 1 Report** (provided in **Appendix A.1**). The assessment of problems and opportunities under existing and growth conditions are based on criteria established in the **Phase 1 Report** (**Appendix A.1**).

Once finalized, the Master Plan will be posted to the project website (https://carletonplace.ca/water-and-wastewater-master-plan.php), and a Notice of Completion for Schedule A and A+ projects will be published. Schedule C projects will be further investigated in future phases of the EA. This Master Plan will provide a basis for any Schedule B projects to be pursued by the Town of Carleton Place under a separate EA as needed.

1.2 Study Area

The Town of Carleton Place is situated in Lanark County, west of the City of Ottawa, accessible via Highways 7 and 15. Based on the Census of 2021, the Town had a population of 12,517 inhabitants and occupied an area of 9.94 km^2. The Town has experienced fast population growth, and this represents a 17.6% increase from the 2016 population.

The Mississippi River runs through the center of the Town and serves as the source of water for the municipal drinking water system and as the receiving stream for treated sewage effluent. The Mississippi River is also used for recreational purposes around the Town. The Town limits and major water & wastewater infrastructure are shown in **Figure 1.1**.



Legend

- Town Limits
- Highway
- Major Road
- Minor Road
- Waterbody
- Wooded Area

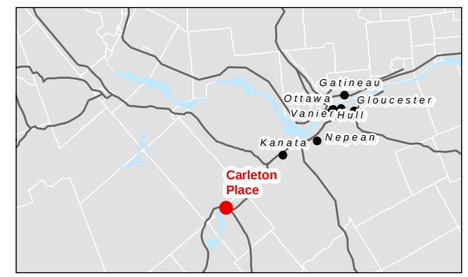
N

0 0.5 Kilometers

(At original document size of 11x17)
1:16,500

Notes

1. Coordinate System: NAD 1983 UTM Zone 18N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.
3. Data Source: Background shapefiles from the Town of Carleton Place
4. Abbreviations: EST = Elevated Storage Tank; WM = Watermain(s); WDS = Water Distribution System; WTP = Water Treatment Plant; WWTP = Wastewater Treatment Plant



Project Location

Carleton Place, ON

Prepared by CR on 2022-03-09

Client/Project

Town of Carleton Place
Carleton Place W&WW Master Plan
Phase 2 Report

163401646 REVA

Figure No.

1-1

Title

Town of Carleton Place Limits & Major Water/Wastewater Infrastructure

Background Studies and Official Plan

Stantec reviewed relevant studies, assessments and reports completed in recent years, prior to the current Master Plan, that provide background information on the Town's water and wastewater systems, and on the Town's population growth. The findings of these studies are summarized in the **Phase 1 Report** (provided in **Appendix A.1**), as well as in the **Alternatives TM** (provided in **Appendix B**).

Notably, the 2019 Town of Carleton Place Official Plan (OP) sets out the policies and land use designations that are to be used by the Town to guide development until the year 2032.

The OP sets out the population growth projections for the Town. The OP outlines policies regarding land use, designating areas for development. This Master Plan is prepared with consideration given to the objectives of the OP.

2 Class Environmental Assessment Process & Master Planning

2.1 Overview

The MCEA provides a consistent method of identifying and assessing technical and environmental impacts and concerns before improvements or additions to municipal infrastructure are undertaken. Planning in this way provides reassurance that potential impacts from all municipal projects are addressed and mitigated, prior to implementation.

The MCEA document defines four schedules under which projects may be planned and the associated processes required for each. The four types of projects are referred to as schedules and projects can be classed as either Schedule A, A+, B or C, depending on the anticipated level of environmental impact, and for some projects, the anticipated construction costs.

Schedule A projects are minor operational and/or maintenance activities and may go ahead without further assessment once Phase 1 of the Class EA process is complete (i.e., the problem is reviewed, and a solution is confirmed).

Schedule A+ projects are limited in scale, have minimal adverse environmental impacts, and require no documentation. However, the public is to be advised of the project prior to implementation.

Schedule B projects must proceed through the first two phases of the process. Proponents must identify and assess alternative solutions to the problem, inventory impacts, and select a preferred solution. They must also contact relevant agencies and affected members of the public. Provided that no significant impacts are found, and no requests are received to elevate the project to Schedule C or undertake the project as an Individual EA, the project may proceed to detailed design (Phase 5).

Schedule C projects require more detailed study, public consultation and documentation, as they may have more significant impacts. Projects categorized as Schedule C must proceed through the first four phases of assessment. Schedule C projects may potentially result in adverse impact(s), and as such, a public consultation program is needed to ensure that stakeholders and local residents within the study area are provided with the opportunity to provide meaningful input.

The schedule in which a project applies determines the planning and design phases that must be followed. The five phases are as follows:

- Phase 1: Identification of problem or opportunity
- Phase 2: Identification of alternative solutions
- Phase 3: Definition of alternative methods to implement the preferred solution
- Phase 4: Publication of an Environmental Study Report
- Phase 5: Implementation of the solution

This study was initiated and conducted in accordance with Approach #2 of the Master Planning Process, as outlined in Appendix 4 of the MCEA document. As such, this study will address Phases 1 and 2 of the MCEA process. Since further environmental investigations are required for specific projects, this Water and Wastewater Master Plan (W&W MP) report serves to form the basis for the recommended Schedule B and C water and wastewater projects identified.

Consultation is a key element of EA planning and is required during different phases to ensure public participation. **Figure 2.1** summarizes the different schedules and phases of the Class EA process, and **Figure 2.2** provides details on the activities within each phase of the process.

By incorporating the principles of the Class EA, Master Plans can support the requirements of EAs. The Town of Carleton Place will look to satisfy the EA requirements (Schedule B) for a potential new water reservoir, should it be found as the preferred alternative, and publish Environmental Study Reports to satisfy the EA requirements (Schedule C) for the water and wastewater treatment plant expansions.

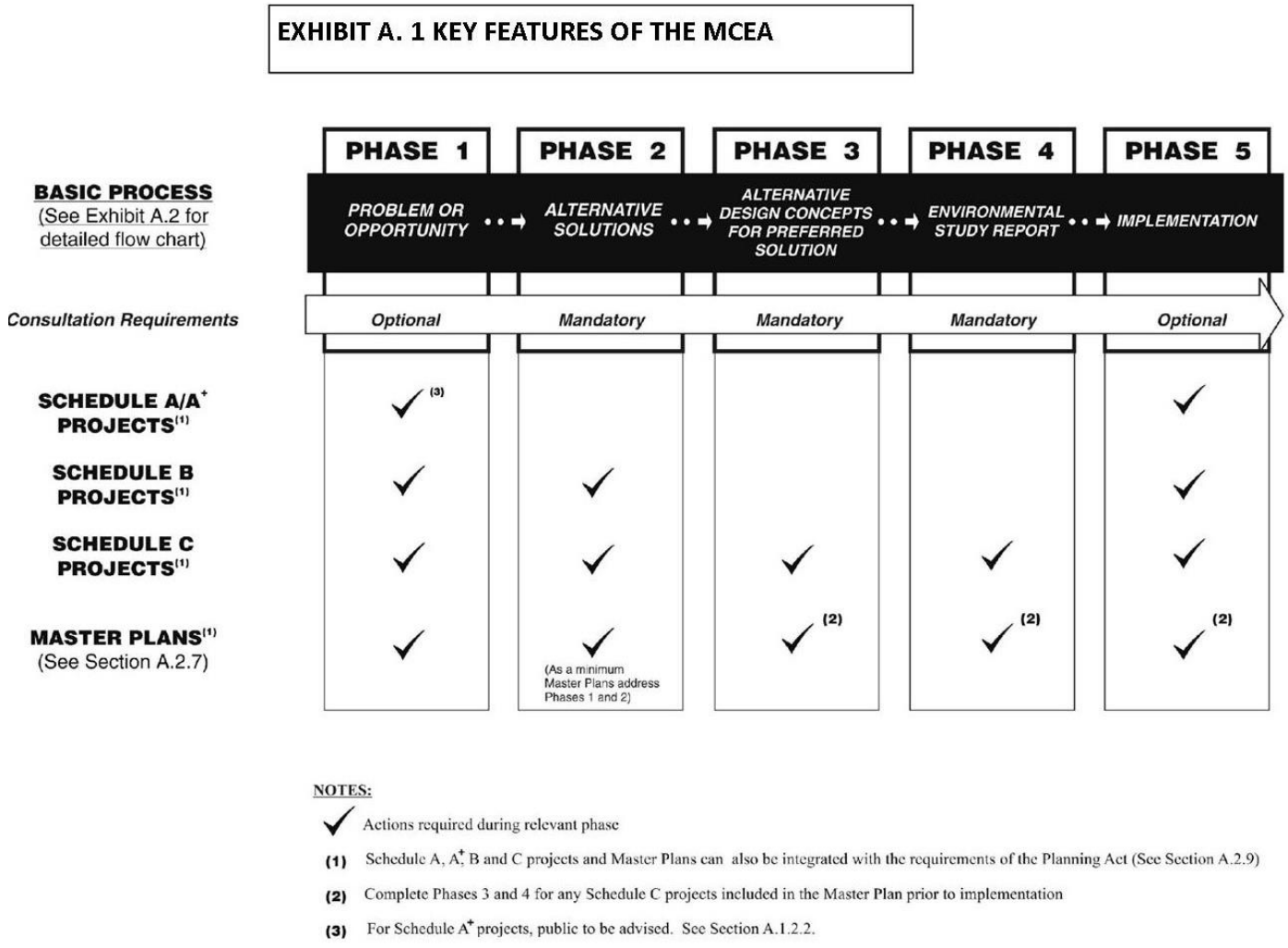


Figure 2.1: Summary of the Municipal Class EA Process (Source: Municipal Engineers Association, 2021)

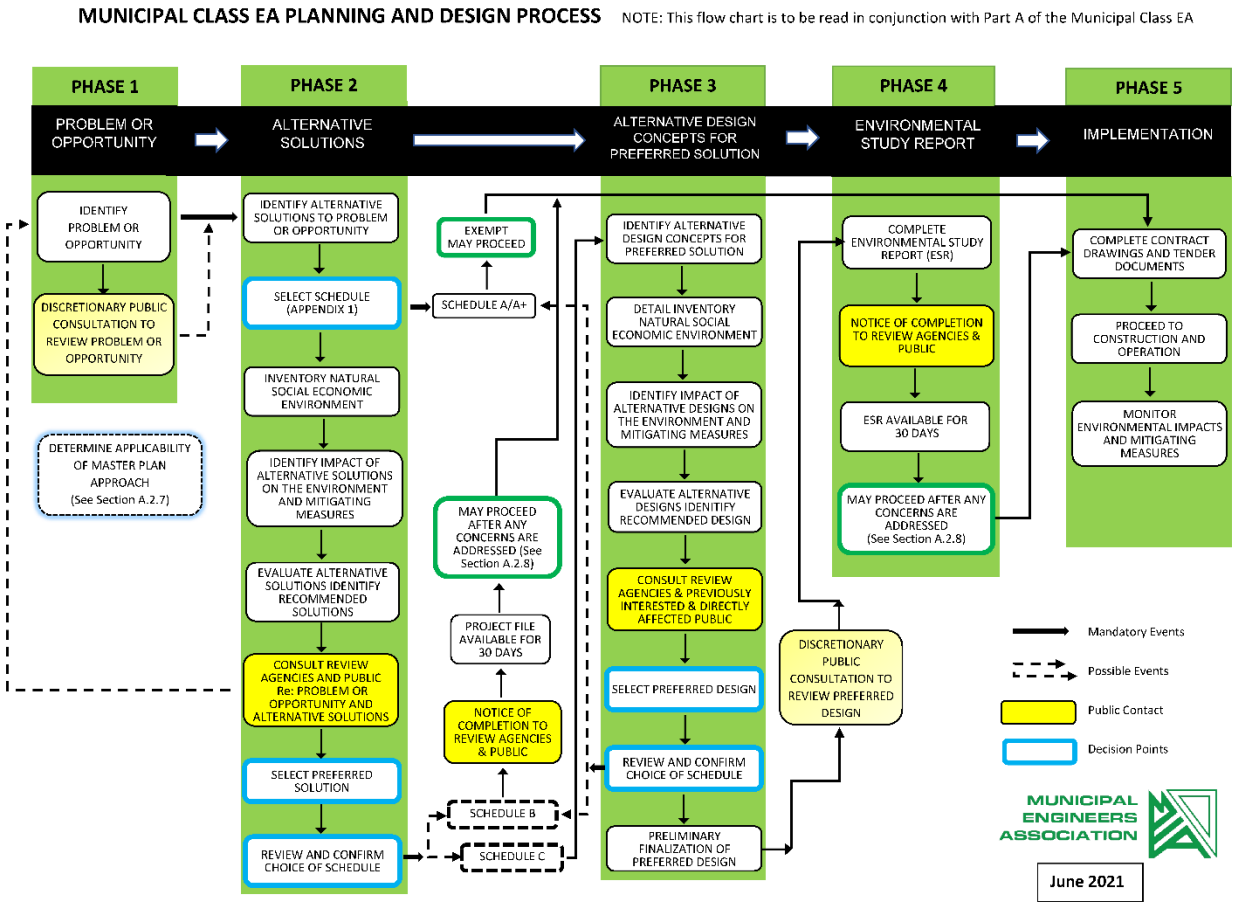


Figure 2.2: Municipal Class EA Planning and Design Process (Source: Municipal Engineers Association, 2021)

2.2 Consultation and Communication

Consultation from the onset of and throughout the process is a key component of the EA planning process. An effective consultation program can foster meaningful dialogue between the project planners and stakeholders, allowing an exchange of ideas and broadening of the information base for better decision-making.

2.2.1 Study Website

A separate study webpage was established on the Town's existing website. Study background information, notifications, updates, and links to online consultation were provided on the dedicated webpage, as it became available. The consultation material published on the study webpage is also provided in **Appendix F**. Through the study webpage, users were invited to contact study team members through their email account. The dedicated website is: https://carletonplace.ca/water-and-wastewater-master-plan.php

2.2.2 Study Contact List

A comprehensive study contact list consisting of government agencies, Town staff, utilities, emergency service providers, Indigenous Nations, Indigenous Organizations, local organizations and special interest groups and members of the public who expressed interest in the study was developed at the onset of the study. This list was updated as the study progressed. The latest version of this contact list is provided in **Appendix F.1**.

2.2.3 Notice of Study Commencement

The purpose of the Notice of Study Commencement was to inform the public and external agencies about the study and to seek initial input in relation to the study. The notice briefly outlined the objective of the study, the Class EA process, study area location map and contact information for project team representatives.

The Notice of Study Commencement was communicated via the local newspaper, the Carleton Place Canadian Gazette on June 3, 2021, and was also posted on the Town's website. Additionally, a copy of the notice was mailed and emailed to the contact mailing list.

A copy of this notice is provided in **Appendix** Error! Reference source not found. of this d ocument.

Nine (9) comments were received as a result of issuing the Notice of Study Commencement. The comments and responses are summarized in **Table 2.1** below.

Table 2.1: Summary of Notice of Study Commencement Comments and Responses

Comments Received	Response
Request to be added to mailing list	Added
Response from the Ministry of the Environment, Conservation and Parks (MECP) recommending a pre-consultation meeting, and outlining considerations for the Class EA Process, the MECP Technical Review and consultation with Indigenous Nations	Pre-consultation meeting with the MECP held on December 16th, 2021 (see **Section 2.2.4.2**).
Response from the Mississippi Valley Conservation Authority (MVCA) expressing concerns for the consideration of climate change in the Master Plan, and specifically the impact of drought on water levels.	Pre-consultation meeting with the MVCA held on July 5th, 2021 (see **Section 2.2.4.1**). Low flow water levels considered in an ongoing updated assimilative capacity study and water availability study. Climate change resilience considered throughout the Master Plan (see **Sections 3.4, 5.1.2, 1.1.1** and **5.3.2**).
Response from the Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI) to develop a Cultural Heritage Report Existing Conditions and Preliminary Impact Assessment (CHRECPIA)	Response letter sent on July 12th, 2021, outlining activities which will consider potential cultural heritage resources, including a Cultural Heritage Assessment (see **Section 3.3.1**) and screening for archaeological potential (see **Section 3.3.2**).
Suggestion to consider the implementation of water metering for cost-effectiveness	Response sent on June 4th, 2021 summarizing a cost-benefit analysis on the impact of implementing metering on water consumption. Cost-effectiveness considered throughout the Master Plan as part of the Planning Alternatives (see **Section 4**) and Implementation Plan (see **Section 5**).

2.2.4 Pre-Consultation Agency Meetings

Following the publication of the Notice of Study Commencement, pre-consultation meetings were held with the Mississippi Valley Conservation Authority (MVCA) and with the Ontario Ministry of the Environment, Conservation and Parks (MECP). The MVCA and MECP were also consulted throughout subsequent steps of the study.

2.2.4.1 Pre-Consultation Meeting with the MVCA (July 5th, 2021)

Following the Notice of Study Commencement, the MVCA shared comments and questions on the consideration of climate change in the Town's Class EA process. A pre-consultation meeting was held with the MVCA on July 5th, 2021. The study team

gave a brief presentation providing an overview of the Master Plan project, followed by a discussion of the MVCA's questions and comments regarding the uncertainty in historical streamflow data and potential drought conditions, and their impacts on the calculation of treatment objectives. The MVCA suggested that the Mississippi River low flow indicators be re-calculated using an extended flow data set including more recent dry years as an input to the ongoing assimilative capacity study (as requested by the MECP, see next section on pre-consultation meeting with the MECP). The MVCA also shared data on the Carleton Place Dam (rating curve), which will be used in or inform additional studies (assimilative capacity study and water taking study, which will be finalized in Phase 3 of this project). The meeting with the MVCA also helped identify climate change considerations, which helped inform potential resilience measures in the evaluation, selection and development of the preferred alternatives.

2.2.4.2 Pre-Consultation Meeting with the MECP (December 16th, 2021)

The study team organized a pre-consultation meeting with the MECP on December 16th, 2021, to review regulatory requirements which might impact the study. The study team gave a presentation providing an overview of the Master Plan project, during which the MECP's questions and comments were discussed. Following this meeting, the study team is updating the Mississippi River assimilative capacity study and preparing a water taking study, which will be finalized in Phase 3 of this project.

2.2.5 Notice of Online Public Information Centre (PIC) 1

The purpose of the Notice of Online Public Information Centre (PIC) 1 was to announce the period of time in which the Online PIC 1 would be available for public review and comment, to inform readers about the purpose, format and how to access the PIC materials, and provide the study team's contact information.

The Notice of Online PIC 1 for this study was issued via mail and/or email to agencies, interested persons and/or groups, and Indigenous Nations on February 3rd, 2022. The notice was also posted in the *Carleton Place/Almonte Canadian Gazette* on January 27th, 2022 and February 3rd, 2022.

A copy of this notice is provided in **Appendix F.4** of this document.

2.2.6 PIC 1

A PIC was held to share information and solicit feedback from the public, agencies, Indigenous Nations and other stakeholders on the study background, MCEA process, existing conditions, future deficiencies and opportunities, evaluation of alternative solutions, recommended water and wastewater infrastructure solutions and next steps in the study process. Considering COVID-19 and physical distancing requirements,

PIC 1 was held on an online platform on the study website using the Articulate Storyline platform. This platform included a prerecorded presentation which shared the study materials on a set of slides, along with a transcript, which was available both audibly and visually next to each slide. This format allowed participants to read/listen to the presented information, as well as pause the presentation, or skip ahead to the section that interests them most.

PIC 1 was held on the study website from February 10th, 2022 to February 24th, 2022. All participants were encouraged to provide their feedback directly to the listed study contacts by February 24, 2022. In total, 5 emails were received during the Online PIC 1 review period and the common response themes are summarized in **Table 2.2.**

Table 2.2: Summary of Online PIC 1 Comments and Responses

Topic	Comments Received	Response
General Feedback	Request to be added to contact list/to update contact information	Contact added/updated
	Request to submit a Request for Review (RFR) to the Fisheries and Oceans Canada once design details are available	Need to submit a RFR added to list of Permits & Approvals (see **Section 5.4**).
Water Treatment Plant (WTP)	Concern regarding potential property and traffic impacts to Carleton Place High School.	Response provided, indicating that the roadway around the WTP will be restored after construction is completed. Impacts of construction on traffic will be addressed at the detailed design stage.
	Suggestion to consider incorporating water conservation measures in tandem with the expansion of the WTP to reduce impacts to the watershed.	Provided clarification that water conservation measures will continue to be implemented by the Town.
	Concern regarding potential impacts to the watershed and aquatic environment as a result of the increase of water taking from the Mississippi River and resiliency to future droughts and climate change.	The impact of increased water-taking will be addressed in an ongoing water availability study. Climate change resilience considered throughout the Master Plan (see **Sections 3.4, 5.1.2, 1.1.1** and **5.3.2**). A RFR will be submitted to Fisheries and Oceans Canada once a detailed design is prepared.
	Inquiry regarding the consideration of renewable energy sources to power the WTP.	The use of renewable energy sources to power the WTP can be investigated as part of the detailed design.

Topic	Comments Received	Response
	Concern for potential impacts to individual trees and commitment for replacement.	Responded that the Town can ensure that additional trees are planted to compensate for any trees lost in the expansions.
Water Storage	Suggestion to implement water conservation measures to reduce the amount of water storage required.	Clarified that water conservation measures alone will not provide the necessary capacity for future growth. Specified that water conservation measures will continue to be implemented by the Town.
	Inquiry regarding the future use of the existing Nelson St Water Storage Tower.	Responded that the Nelson St water storage tower will remain in operation, but has limited capacity to be expanded and would not meet the criteria for redundancy.
Water Distribution System (WDS) & Sanitary Collection System	Inquiry regarding upgrading/adding watermain and sewers (including at specific locations on Cavanagh Rd, Coleman St and the Trans Canada Trail)	Clarified that deficiencies in the WDS and sanitary collection system would in part be addressed by the WTP & WWTP upgrades. Remaining deficiencies are expected to be addressed by Schedule A/A+ projects, which are pre-approved; Schedule A+ projects will require notification prior to implementation. Sanitary sewer upgrades will be investigated once flow monitoring has been completed (see **Section 4.2.2**). Watermain upgrades are identified in **Section 5.2**.
Wastewater Treatment Plant (WWTP)	Concern regarding impacts to air quality as a result of the expansion of the WWTP near adjacent residential dwellings.	Acknowledged the potential for odours near WWTP. Odour control will be investigated during detailed design.
	Suggestion to implement inflow/infiltration reduction measures in tandem with the WWTP expansion to reduce the required expansion size and operating costs.	Clarified that inflow/infiltration reduction measures alone will not provide the necessary capacity for future growth. Specified that infiltration reduction measures (pipe rehabilitation/lining activities) will continue to be implemented by the Town. Indicated that a flow monitoring program may be implemented in the future to identify locations of excess I/I.

Topic	Comments Received	Response
	Inquiry regarding the consideration of renewable energy sources to power the WWTP.	The use of renewable energy sources to power the WWTP can be considered as part of the detailed design. Specifically, biogas re-use at the WWTP may be investigated depending on the treatment technologies selected.
	Concern regarding the potential for contaminated runoff into the Mississippi River.	Clarified that stormwater is not directed to the WWTP. All new subdivisions have storm sewers to pick up storm water runoff and facilities to provide the necessary treatment before discharge to the receiving stream. As part of the Central Bridge reconstruction project, a large oil/grit separator is being installed to prevent contaminants from the Bridge Street catchment area north of the river from discharging into the river.

Copies of the information presented as part of Online PIC 1 and the feedback received are available within the Online PIC 1 Summary Report provided in **Appendix F.4**.

2.2.7 Draft Master Plan Report

The Draft Master Plan Report will be submitted to the Town staff for comments before a Final Draft is prepared and presented to Town Council and the Committee of the Whole (COW).

2.2.8 Notice of Study Completion / Final Master Plan Report

The Notice of Study Completion will be placed in the local newspaper (*Carleton Place Canadian Gazette*) when the Master Plan report is made available for public review. The Notice will also be made available on the project website and distributed via mail and email to agencies, key stakeholders, Indigenous Nations and the public on the study mailing list. This notice will briefly outline the Recommended Solutions and note the Master Plan will be posted to the project website for a 30-day public review period. Comments received throughout the 30-day review period will be addressed and records from the 30-day review period will be included in the Environmental Study Report (ESR).

Those who wish to review the Master Plan report will be encouraged to do so and submit comments to the project contacts provided by a specified date.

3 Existing Conditions

This section provides an overview of the existing conditions in the Town of Carleton Place, considering different environmental factors, as recommended in the MCEA Manual (*Section C.3.1*).

3.1 Natural Environment

3.1.1 Mississippi River

The Mississippi River is 200 km in length, flows northeastwards through the center of the Town and is a tributary of the Ottawa River. The Mississippi Lake is located upstream (southwest) of the Town. The Mississippi River watershed encompasses an area of 3,750 km^2 and comprises various natural environment features including wetlands and woodlands. Within the developed and undeveloped areas of the Town there are several creeks and parklands that present both opportunities and constraints to future developments, and need to be considered in the different components of this EA.

Furthermore, given the proximity of existing facilities to the river, the location of floodplains needs to be considered throughout the planning and design phases of this EA. Mitigation measures will need to be developed accordingly. Conversely, another key objective of this Master Plan is to limit the impact that any proposed infrastructure may have on the surrounding natural environment.

Water levels in Mississippi Lake are controlled by the Carleton Place Dam, which is owned and operated by the MVCA. The dam is not intended for hydro-electric production, but rather, it maintains recreational levels in Mississippi Lake and provides some flood control benefits for Mississippi Lake and downstream municipalities (MNRF 2020). Operation of the Carleton Place Dam is important for maintaining water levels in Mississippi Lake during low flow conditions. Additionally, the Carleton Place Dam is operated to reduce shoreline damage and maintain stable ice levels in Mississippi Lake.

As the Town's WTP draws water from the Mississippi River, a water availability assessment is ongoing to assess the impact of projected increased water taking needed to accommodate future growth on the river's water levels, which is identified in **Phase 1 Report** (provided in **Appendix A.1**). The findings of the water availability assessment will be presented in Phase 3 of this project.

3.1.2 Species at Risk Screening

A species at risk (SAR) screening was conducted on the WTP site, WWTP site and on the Town-owned lot on Bates Dr. representing a potential site for additional water storage. The SAR screening for the three sites included a desktop review of potential SAR occurrences and/or habitat accompanied by a single site visit. Natural heritage features and potentially suitable habitat for species at risk were observed and/or identified as occurring within the Study Areas of the WTP and WWTP (e.g., Blanding's turtle) as well as the Bates Dr. site (e.g., wood thrush). Additionally, the mature trees within the boundaries of the WTP site potentially provide maternity roost habitat for SAR bats.

The **Species at Risk Screening Report** is provided in **Appendix D**.

3.2 Social & Economic Environment

3.2.1 Population & Households

According to the 2021 federal census, the population in Carleton Place was 12,517 persons, a 17.6% increase from the 2016 population. This is double the growth rate experienced by the Town in the previous 5 years (+8.5% from 2011 to 2016). In 2021, there were a total of 5,340 private dwellings reported in the federal census, representing an increase of 21% since 2016.

Growth projections over multiple planning horizons were developed as the basis of the Master Plan. This study addresses the following horizons:

- Baseline year 2021
- Short term, or 5-year planning horizon, in the year 2026
- Medium term, or 10-year planning horizon, in the year 2031
- Long term, or 20-year planning horizon, in the year 2041

The **Design Basis Memo** (**Appendix A.2**) provides detailed information on how population and area growth projections were developed for this Master Plan. The resulting growth projections, geospatial distribution and phasing of development for the Town of Carleton Place are presented in the **Design Basis Memo** (**Appendix A.2**).

The 2021 federal census results were not available during the development of the **Design Basis Memo (Appendix A.2)**. As such, the baseline (2021) population used as the basis of the Master Plan overestimates the reported population by ~1,000 persons. However, for long-term planning purposes, this allows for a conservative estimate of future population, providing the Town with additional capacity should the current population growth rate be maintained in the future.

Table 3.1: Town of Carleton Place Growth Projections (2021-2041)

	Baseline (2021)	2026	2031	2041
Total Number of Units	5,623	7,186	8,535	10,581
Total ICI Area (ha)	35.0	42.2	48.7	57.4
Total Land Area (ha) (2)	591.0	650.0	700.0	850.0
Total Population (3)	13,500	17,000	20,500	25,000

Notes:

(1) Refer to **Design Basis Memo** (**Appendix A.2**) for detailed projection methodology.
(2) Total land area rounded to nearest 50 ha.
(3) Total population rounded to nearest 500.

3.2.2 Economic Environment

Along with population, employment and institutional, commercial and industrial (ICI) areas are also projected to grow. The Town's major economic sectors include the manufacturing industry, the health industry and retail trade (Corporation of the Town of Carleton Place 2022, The Labour Market Group of Renfrew & Lanark 2017).

A component of this Master Plan will be to ensure that future ICI sites supporting the economic development growth with the Town can be appropriately serviced with municipal water and wastewater services.

3.3 Cultural Environment

3.3.1 Cultural Heritage

The MCEA require consideration of cultural environment heritage, including built heritage resources, throughout the EA process. The MCEA Manual suggests that cultural heritage resources that retain heritage attributes should be identified early in the EA process and avoided where possible. Where avoidance is not possible, potential effects to these attributes should be identified and minimized. Adverse impacts should be mitigated according to provincial and municipal guidelines. It is suggested that this happen early in the process so that potential impacts to significant features can be included in an understanding of Project impacts and plans established to mitigate these impacts.

Per the letter received from the Ministry of Heritage, Sport, Tourism, and Culture Industries (MHSTCI), a *Cultural Heritage Report of Existing Conditions and Preliminary Impact Assessment* (CHRECPIA) was prepared. The purpose of the CHRECPIA was to identify the presence of built heritage resources and cultural heritage landscapes within the study area, understand the potential impacts of the project on these resources and prepare mitigation strategies to minimize these impacts.

A site visit was conducted by a Cultural Heritage Specialist with Stantec, on March 2, 2022. During the survey, the Study Area was surveyed for previously identified or potential built heritage resources or cultural heritage landscapes. Where identified, these were photographed, the characteristics noted while in the field, and their locations recorded.

In general, buildings and structures of more than 40 years of age were screened during the survey for their potential to satisfy O. Reg. 9/06 criteria and the MHSTCI Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes (MHSTCI 2016). Only properties containing buildings or structures determined to have potential to satisfy O. Reg. 9/06 were evaluated. The use of the 40-year threshold is generally accepted by both the federal and provincial authorities as a preliminary screening measure for cultural heritage interest or value. This practice does not imply that all buildings and structures more than 40 years of age are inherently of significant heritage value, nor does it exclude exceptional examples constructed within the past 40 years of being of significant cultural heritage value.

The Carleton Place WTP located at 199 John Street is a two-storey Edwardian style industrial building built in 1914 and is listed on the Town's municipal heritage register. An addition on the south elevation of the original building was built in 1983. The building is made of buff brick and includes carved stone at the cornice and at the top of each column. The west elevation consists of three bays separated by four columns. The side bays include a 20-pane window at the lower level and a 4-pane window at the upper level. The windows have stone sills. The central bay includes a single wooden door that provides access into the building, as well as a cast iron light fixture and a sign that reads "CARLETON PLACE WATER WORKS 1914". The east elevation is the same as the west elevation but has a double door in place of a single door in the central bay. The north elevation consists of five bays separated by six columns. The four easternmost bays contain a 20-pane window at the lower level and a 4-pane window at the upper level, while the westernmost has a wooden access door and a 4-pane window at the second level. The south elevation has a one-storey annex that is used for chlorine storage. The annex uses the same design language as the main WTP building but includes a double width loading door with an arched brick voussoir on its south elevation. The remaining annex elevations include 20-pane windows, access doors and the connection to the contemporary addition. The contemporary addition to the WTP

was built in 1983 and is a Brutalist inspired extension. The interior of the WTP has been extensively modified.

The Carleton Place WWTP is an infrastructure complex located at 122 Patterson Crescent. The complex consists of three above ground buildings that are all connected through a series of underground tunnels. The original WWTP was built in 1914 and there was a major overhaul of the entire complex that was completed in 1993. The new design of the facility does not retain any of the design elements of the historic structure of the site. Therefore, the property cannot be considered rare, unique, representative or an early example of a style, type, expression, material or construction method.

Given that the Bates Drive site is a plot of land that has been cleared of trees, it is not important in defining, maintaining or supporting the character of an area nor is it physically, functionally, visually or historically linked to its surroundings. The site could not be considered to be a landmark.

A copy of the **CHRECPIA** is provided in **Appendix E**.

3.3.2 Archaeology

A Stage 1 Archaeological Assessment (AA) was conducted in accordance with Section 1.3.2 and Section 7.7.4 of the Ministry of Heritage, Sport, Tourism and Culture Industries' (MHSTCI) 2011 *Standards and Guidelines for Consultant Archaeologists* to determine the potential for the presence of known and/or potential archaeological resources within the study area. This was based on a review of relevant background information and multiple site visits to different properties conducted on September 9th, 2021. The properties visited were the existing WTP site, the existing WWTP site, and the Town's potential future water reservoir site on Bates Dr.

A review of soil texture and topography provided an indication of past settlements. The background information of the study area indicates that its geology mainly consists of shallow soil over limestone, with shallow tracts of clay near the Town, and bogs in the region as well. Soils within the study area comprise loam, which are generally used for pasture and agriculture. The background information of the study area demonstrated that the study area retained potential for the recovery of pre- and post-contact Indigenous and Euro-Canadian archaeological resources. Two archaeological sites were identified within one kilometer of the study areas, consisting of Euro-Canadian residential sites.

Construction drawings of the WTP and WWTP were reviewed and demonstrated previous ground disturbances at the time of construction. During the site visits, signs of previous grading activities and landscaping activities were identified. As such, it was determined that the existing WTP site, the existing WWTP site and the Town's potential

future water reservoir site on Bates Dr. do not retain potential for the recovery of archaeological resources.

A copy of the **Stage 1 AA Report** is provided within **Appendix C**.

3.4 Climate Change

The 2014 Provincial Policy Statement issued under the *Planning* Act advises of the need to consider climate change adaptation and mitigation. The MECP provides further guidance on considering climate change adaptation and mitigation in the environmental assessment process (Considering climate change in the environmental assessment process | ontario.ca; *MECP Guidance on Considering Climate Change*). With climate change leading to highly variable conditions, adaptation measures may be required in the future to ensure the infrastructure's resiliency and mitigate the impact of extreme weather events. Climate change and the potential impact to infrastructure is highly uncertain. This uncertainty should be considered in engineering planning and design initiatives.

As recommended in the *MECP Guidance on Considering Climate Change*, the **Phase 1 Report** (**Appendix A.1**) presents the historical means, trends and projected trends in average total precipitation and average mean temperature for the study area, and potential impacts to the different components of this EA are identified. The *Resiliency Plan – Water Treatment Plant* (J.L. Richards, 2018) and the *Resiliency Plan – Wastewater Treatment Plant* (J.L. Richards, 2018) relate to climate change and water infrastructure resiliency for the Town of Carleton Place. Both studies concluded that some of the infrastructure required to accommodate population growth could also contribute to enhancing the facilities' resiliency to climate change. Measures to enhance the treatment facilities' resiliency were also presented. These studies are provided in **Appendix A.4**.

For the Town of Carleton Place, notable historical weather events include the very wet spring of 2017 and 2019 (stressing the WWTP) and the very dry summer of 2016 (stressing the WTP). With climate change, high and low extreme water levels are more likely to occur. Low water levels can pose issues with water-taking quantity and quality at the WTP, and with the assimilative capacity of the WWTP effluent receiving stream. High water levels can create risks of flooding at the WTP and WWTP sites and could also pose issues with the WWTP gravity outfall (requiring pumping of effluent). Climate change resilience was considered as part of the preferred alternatives for the WTP (**Section 1.1.1**) and WWTP (**Section 5.3.2**). Climate change was furthermore considered as part of the ongoing water availability assessment.

The *MECP Guidance on Considering Climate Change* also highlights the importance of considering and understanding the potential impacts that a project may have on climate change. This can be done qualitatively and includes reviewing measures that could contribute to climate change mitigation.

As recommended in the *MECP Guidance on Considering Climate Change*, potential climate adaptation and mitigation measures were considered in the evaluation of alternatives, and are outlined in the **Alternatives TM** (**Appendix B**) as well as in each component's implementation plan (**Section 5**).

4 Planning Alternatives

4.1 Potable Water System

4.1.1 Water Treatment Plant (WTP)

Existing and future (growth) constraints were identified in the **Phase 1 Report** (**Appendix A.1**). The following alternatives to address these constraints were proposed and evaluated for the WTP. These alternatives align with recommended alternatives in the MCEA Manual (*Section C.2.1*.3). Detailed descriptions are provided in the **Alternatives TM** (**Appendix B**):

- Alternative A: Do Nothing
- Alternative B: Water Conservation Measures
- Alternative C: Expand Existing WTP On-Site
- Alternative D: Build an Additional WTP (Off-Site)
- Alternative E: Municipal Groundwater Well

The detailed evaluation of each alternative is presented in the **Alternatives TM** (**Appendix B**). Based on this evaluation, the preferred alternative is **Alternative C**, to expand the WTP on-site.

4.1.2 Water Storage

Existing and future (growth) constraints were identified in the **Phase 1 Report** (**Appendix A.1**). The following alternatives to address these constraints were proposed and evaluated for water storage. These alternatives align with recommended alternatives in the MCEA Manual (*Section C.2.1*.3). Detailed descriptions are provided in the **Alternatives TM** (**Appendix B**):

- Alternative A: Do Nothing
- Alternative B: Expand WTP Clearwell
- Alternative C: Add New Storage Off-Site

The detailed evaluation of each alternative is presented in the **Alternatives TM** (**Appendix A.1**). Based on this evaluation, the preferred alternative is **Alternative B**, to add storage at the WTP site. As such, the detailed implementation plan for additional storage will be outlined as part of the WTP expansion plan.

4.1.3 Potable Water Distribution System (WDS)

Existing and future (growth) constraints were identified in the **Phase 1 Report** (**Appendix A.1**). The following alternatives to address these constraints were proposed for the water distribution system throughout the Town. These alternatives align with recommended alternatives in the MCEA Manual (*Section C.2.1.*3). Detailed descriptions are provided in the **Alternatives TM** (**Appendix B**):

- Alternative A: Do Nothing
- Alternative B: Upgrade Watermains without Adding New Fire Flow Storage
- Alternative C: Add Secondary Fire Flow Storage

The selection of the preferred alternative depended on the alternative selected for the WTP and the water storage. As described in the **Alternatives TM** (**Appendix B**), it was decided that for the 20-year planning horizon, new fire flow storage would not be added. As such, the preferred alternative is **Alternative B**, to upgrade watermains without adding new fire flow storage. Watermain upgrades will be recommended in this report.

4.2 Wastewater System

4.2.1 Wastewater Treatment Plant (WWTP)

Existing and future (growth) constraints were identified in the **Phase 1 Report** (**Appendix A.1**). The following alternatives to address these constraints were proposed and evaluated for the WWTP. These alternatives align with recommended alternatives in the MCEA Manual (*Section C.2.2.*3). Detailed descriptions are provided in the **Alternatives TM** (**Appendix B**):

- Alternative A: Do Nothing
- Alternative B: Inflow & Infiltration Reduction Measures
- Alternative C: Expand Existing WWTP
- Alternative D: Build an Additional WWTP

The detailed evaluation of each alternative is presented in the **Alternatives TM** (**Appendix B**). Based on this evaluation, the preferred alternative is **Alternative C**, to expand the WWTP on-site and partially into the neighbouring property (Town's household hazardous waste and compost depot).

4.2.2 Sanitary Collection System

Existing and future (growth) constraints in the sanitary trunk collection system were initially identified in the **Phase 1 Report** (**Appendix A.1**).Based on the **Phase 1 Report** recommendations, a PCSWMM model was developed and an updated analysis was completed, which considers the hydraulic grade lines (HGL) throughout the trunk sanitary network and includes the considerations for basement and surface flooding. This analysis is presented in **Technical Memorandum #1 - Sanitary Trunk Model Update & Phase 1 Report Addendum** (**Appendix A.3**). This developed PCSWMM model was used to assess and identify possible deficiencies within the system based on system constraints, as well as areas where more information is required.

While there is greater confidence in the updated model than in the previous sanitary sewer design spreadsheets (SSDSs), the flows generated in the model used design guideline values, and as such may not be representative of the actual flows or their distributions observed within the system. Once flow monitoring data has been used to verify flows within the sanitary collection system, solutions can be evaluated. Sanitary collection system upgrades will need to consider the WWTP expansion and may include some of the following options [also outlined in the MCEA Manual (*Section C.2.2.*3)]:

- Conveyance upgrades, including:
  - Increasing pipe diameters to improve pipe flow capacity;
  - Adjusting pipe slopes to improve pipe flow capacity; and
  - Laying deeper pipes to reduce HGL issues;
- I/I reduction (e.g. identifying areas with high I/I, relining older pipes);
- Installation of backwater valves at individual properties' service lines, to reduce the risk of basement flooding if the HGLs are within basement level; and
- Storage within the sanitary collection system in order to control downstream flows to the WWTP in the collection system.

Furthermore, the impacts of climate change and extreme weather events on the sanitary collection system include:

- Increased peak inflow during wet weather event with increased precipitation
- Insufficient flushing velocity with decreased precipitation
- Odour issues from sewers due to convective air circulation as a result of temperature increase
- Increased melt contribution to wet weather flows with temperature increase
- Impact of freeze-thaw cycles on sewers
- Severe storms leading to power outages at pumping stations

These impacts should be explored using the hydraulic model (once updated), and resilience measures should be considered in the development of solutions, which could include (in addition to the solutions listed previously):

- Additional sewer flushing;
- Condition assessment of sewers prone to impacts of freeze-thaw;
- Backup power sources at pumping stations (where currently not available); and,
- Pumping station overflows (where currently not available)

Opportunities for climate change mitigation (GHG emissions reduction) and energy savings include:

- Upgrading pumping station pumps (and motors) to increase their efficiency (or selecting new high-efficiency pumps and motors)
- Reduce incoming sewage to pumping stations with pipe rehabilitation projects and other I/I reduction measures

These opportunities should be further considered during the detailed planning and design of solutions developed using an updated hydraulic model.

Although no detailed implementation plan will be developed for the sanitary collection system as part of this Master Plan, the following steps are recommended to further improve the confidence in the model and yield a tool that can be used to develop alternative solutions to resolve confirmed system constraints:

- Implement a flow monitoring program to collect flow and rain data for the Town, which should then be used to calibrate the model. Updated populations and ICI distributions, and calibrated per capita rates, diurnal patterns, baseflows (or Ground Water Infiltration (GWI) rates), and wet weather I/I rates can be determined and used to improve the Town's understanding of their sanitary system (i.e., leaky areas, variation in flow distributions, etc.);
- Obtain additional data at the WWTP including wet well levels during large events to improve the confidence in the boundary conditions applied; and,
- Include the local system pipes in the model. This is not required to develop solutions for the trunk system, however this would allow the model to identify local constraints or areas at risk that are currently unknown. Flow monitoring can also be used to help understand the characteristics of flows within local systems throughout the Town.

5 Implementation Plan

5.1 Water Treatment Plant (WTP)

The preferred alternative based on the evaluation performed in the **Alternatives TM** (**Appendix B**) maintains the existing WTP site footprint and involves expanding treatment processes, from the existing plant capacity (10,000 m^3/d – limited by the low lift pumps) to the capacity required to meet the planned growth (20,700 m^3/d). A high-level review of the required process expansion footprints indicates that the 2041 demand could be met by expanding the existing facility on the current property, as shown in **Figure 5.2**. For a limited portion of processes, this could be achieved by expanding individual processes within the existing building footprint, by increasing hydraulic loading (on a $m^3/m^2/h$ basis) within maximum acceptable capacity as recommended by Ministry of the Environment, Conservation and Parks (MECP) Design Guidelines. For most processes, new structures will be required to be constructed on site. Expansion will meet firm capacity requirement, so the plant will develop rated capacity even with the largest unit of a given process being out of service, for maintenance or repair purpose.

The current site, while relatively small, is expected to be capable of accommodating all the new construction to meet the target rated capacity. The existing raw water intake can support the higher water demand, but the new low lift pumps would require a larger and deeper basin than the current one. The new basin is proposed to be set below the new chemical feed building. The new standby power generator capable to meet future plant needs will be set beside the chemical room, within an acoustical attenuation weatherproof enclosure. Additional clearwell cells and increased high lift pump capacity will also be required. The original 1914 building has cultural heritage value or interest and will be preserved in any expansion of the site. This building may continue to be used for reduced chemical storage, maintenance activities and administrative purposes.

The proposed expansion of the ACTIFLO and gravity filter processes may consist of one of the following options:

- Option 1:
  - Addition of two (2) ACTIFLO tanks, and
  - Addition of three (3) steel tank gravity filters.
- Option 2:
  - Addition of two (2) ACTIFLO tanks, and
  - Addition of two (2) concrete tank gravity filters.

- Option 3:
  - Addition of two (2) ACTIFLO tanks,
  - Addition of two (2) concrete tank gravity filters, and
  - Replacement of steel filters with concrete filters.

These sub-options will be evaluated in subsequent stages of the EA process. Once the existing ACTIFLO basins and/or circular steel tank filters reach the end of their service life, there may still be enough land on site to replace those with new facilities before decommissioning; however, this would limit future WTP expansions on the existing site beyond the 20-year planning horizon. An expansion area adjacent to the existing WTP or a new plant would need to be identified and secured for the next required WTP capacity increase. Further expansion may be practical into the open park space to the East of the existing Canoe Club building.

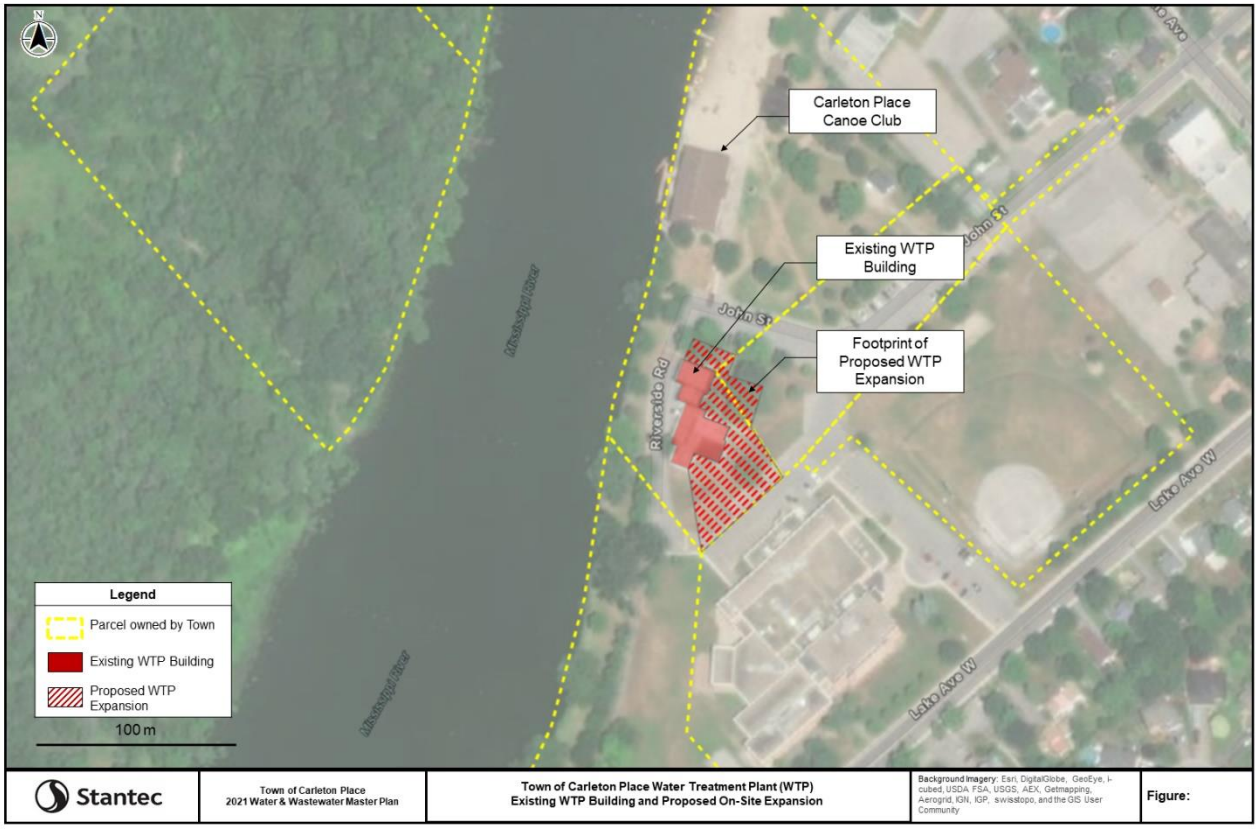


Figure 5.1: Potential Footprint of On-Site WTP Expansion

The following table details the required capacity increases for each unit process to meet the projected year 2041 maximum day water demand. A cost estimate and timing for the required upgrades is further outlined in **Section 5.1.1**.

Table 5.1: Unit Process Capacity Increases for WTP Expansion

Process	Existing Capacity (1)	Proposed Maximum Day Demand Process Capacity Increase	Maximum Day Capacity Required to meet 2041 Population Water Demands (2)
Low Lift Pumping	10,000 m^3/d	10,700 m^3/d	20,700 m^3/d
Water Storage Tank (Clearwells)	2,960 m^3	1,590 m^3	4,550 m^3
		1,530 m^3	6,080 m^3
Chemical Feed Systems, Power Supply, Generator, SCADA, site piping and other civil works	-	-	-
Gravity Filters, Backwash Tank, & Backwash Equalization Tank	13,400 m^3/d (limited by the gravity filters)	7,300 m^3/d	16,000 m^3/d
			20,700 m^3/d
ACTIFLO Basins	12,000 m^3/d	8,700 m^3/d	20,700 m^3/d
High Lift Pumping	16,800 m^3/d	14,700 m^3/d	31,500 m^3/d

Table Notes:

(1) Assuming all units in operation

(2) With largest unit out of service (i.e. firm capacity)

5.1.1 Cost Estimate & Timing – WTP Upgrades

The proposed WTP upgrades are provided below by process area and include an opinion of probable cost (Class 4 estimate (-30% to +50%) in $CAD 2022) and timing for the upgrades.

Table 5.2: Cost Estimate & Timing for WTP Upgrades

Process System	Opinion of Probable Construction Cost (2022 $CAN)	Proposed Upgrades or Notes
2023 – 2025: Increase WTP capacity to 20,700 m^3/d to support population growth up to 2041		
Power Supply, Generator & SCADA	$1,700,000	• Upgrading the plant's standby power system, including replacing the water-cooled diesel generator with an air-cooled diesel or natural gas generator within a sound attenuating, weatherproof enclosure, having rated capacity sufficient to meet the 2041 standby power needs • Upgrading the plant's SCADA system
Low Lift Pump & Chemical Feed Building	$2,640,000	• Installing a new Chemical Feed and Low Lift Pumping Building adjacent to the existing Low Lift Pumping Building • Replace low lift pumps and install in new building • Upgraded chemical feed systems to resolve 30-day chemical storage issue • Replacing the gaseous chlorine feed system with a sodium hypochlorite solution feed system • Relocating the fluoride feed system to the existing gaseous chlorine feed room • Demolishing the lime feeder • Implementing a carry water-based sand transfer system in the existing chemical storage room, to carry ACTIFLO sand to the ACTIFLO basins
Clearwell Expansion	$2,550,000	• Expanding the clearwells to meet chlorine contact and additional emergency storage requirements to meet 2041 projected water demand
High Lift Pump Upgrades	$600,000	• Replacing high lift pumps to meet 2041 peak hour demand flow rate • Upgrading the HVAC system in the High Lift Pump Room.
Site Piping and Other Civil Works	$250,000	• Includes connecting the raw water intake pipe to the new Low Lift Pumping Building
Gravity Filters, Backwash Tank, Backwash Equalization Tank	$4,140,000	• Installing new gravity filters (two (2) new concrete gravity filters have been assumed for preliminary costing) • Installing new backwash equalization tank and new backwash pumps • Installing a duplex low lift pump system to transfer a portion of the current ACTIFLO basin clarified water to the new gravity filters
ACTIFLO Basins with Chemical Feed System Upgrades	$1,760,000	• Install two (2) new ACTIFLO basins and extend chemical feed systems to new basins
Sub-Total	**$13,640,000**	
Contingency, Engineering, & Additional General Contract Costs (1)	**$5,720,000**	• Includes contingency (20%), engineering (10% - includes design and contract administration), additional general contract costs that are significant factors of construction contracts, including mobilization/demobilization/bonds/insurance (2%), and contract contingency/cash allowance (10%). Contractor's overhead and profit is assumed to be included in items above.
Grand Total	**$19,370,000**	

5.1.2 Climate Change Considerations - WTP

The Phase 1 Report also discusses climate change projections and potential impacts to each system. The impacts of climate change and extreme weather events on the WTP include:

- Increased runoff's impact on source water quality due to increased precipitation;
- Flooding during higher river flows due to increased precipitation;
- Low flows impact on water intake and water quality due to decreased precipitation/prolonged droughts;
- Increase in water demand linked to temperature increases;
- Water quality issues linked to temperature increases;
- Formation of frazil ice at intake structure during low water levels; and
- Severe storms interrupting deliveries or leading to power outages.

To address potential climate change impacts and increase resilience to climate change, different measures could be integrated in the preferred alternative to expand the existing WTP. Opportunities for climate change adaptation include:

- Adaptation to flooding risks
  - Build new process structures and buildings above the floodplain limit, with a buffer to accommodate future floods,
  - Relocating equipment away from flood-prone areas, and
  - Verify and update emergency measures for flooding;
- Adaptation to increased precipitation and impact on source water quality
  - Design processes to increase chemical dosing and other operational parameters in case of degraded source water quality,
  - Adapt chemical supply planning based on modified usage, and
  - Consider changes in proportion of process wastewater;
- Adaptation to low water levels due to drought
  - Design low-lift pumps and basin considering potential low water levels,
  - Keep existing raw water intake at current location, which is the deepest point in the River upstream of the dam, minimizing the risk of frazil ice formation; and
  - Implement water conservation measures in the Town to restrict water usage during periods of drought.
- Adaptation to degraded source quality due to drought
  - Design processes which can handle increased solids loading;
- Adaptation to increased potable water demand with increased temperatures

  - Integrate process water usage efficiency in design, and
  - Encourage water conservation in the Town; and
- Adaptation to impacts of severe storms
  - Design storing capacity to provide additional reserve and minimize impacts of delayed deliveries on plant operation, and
  - Size backup power generators for critical plant processes.

Opportunities for climate change mitigation (GHG emissions reduction) and energy savings are considered in the evaluations and include:

- Upgrading pumps and other processes to increase their efficiency (or selecting new high-efficiency pumps and motors);
- Optimizing pump operation and other processes to reduce energy consumption and process water usage;
- Upgrading backup generator with energy efficient model; and
- Using renewable energy sources.

The impacts and associated mitigation measures for the above noted Schedule C project will be determined during Phase 3 and 4 of the EA and listed in the ESR.

5.2 Potable Water Distribution System (WDS)

The following presents potential upgrades to the water distribution system to address existing constraints and meet growth needs. The potential watermain upgrades consider the implementation of upgrades at the WTP, as described previously. Watermain upgrades were also identified based on planned or recommended road upgrades, as provided by the Town. The serviceability of future growth areas outside the existing water distribution network was also evaluated.

Potential watermain upgrades or additional interconnections were identified. The recommended infrastructure upgrades are summarized in **Table 5.3** and illustrated in **Figure 5.2**. As the water distribution system evolves, it is recommended that an up-to-date version of the hydraulic model which is representative of the system be used during detailed stages of planning and design of each proposed upgrade, to confirm the sizing and assess the performance each watermain upgrade, prior to implementing these modifications. Potential changes in the water distribution system which may impact the hydraulic analysis include increased demands with population growth, watermain upgrades, elevated storage tank maintenance (tank offline) and upgrades of high-lift pumps at the WTP.

For each proposed upgrade, the approval status was also identified in **Table 5.3**. The EA schedule types presented are based on the general description of the project described in the MCEA Manual. Existing piping upgrades and new piping installations within an existing utility corridor or road allowance are expected to be Schedule A or Schedule A+ projects. Per the MCEA Manual, Schedule A and A+ projects are pre-approved as part of this EA; Schedule A+ projects will require notification of the public prior to implementation. New piping installation outside an existing road allowance or utility corridor (or right-of-way, ROW) are expected to be Schedule B projects, which are not approved as part of this EA, and will need to undergo a separate EA process if required at the time of implementation.

The estimated time to plan, design, tender and construct is dependent on various factors including the complexity of the work, the approvals process, the length of the construction season, the ability to secure land and the availability of contractors. The estimated time to complete additional EA processes is also provided in **Table 5.3**; this estimated time does not include required time for design, tender and construction, which would range between 1 and 2 years, depending on the watermain upgrades. The estimated costs (including 30% contingency) for each watermain upgrade is also provided.

The proposed watermain upgrades were categorized in 4 different types of upgrades:

A) **Backbone watermain interconnections required within new development areas**: these watermain interconnections would be implemented to address growth as part of the future development projects. The proposed timing of these interconnections is based on the phasing of the developments presented in the **Design Basis Memo** (**Appendix A.2**), however it should be re-confirmed once planning for the development areas begins. These watermain interconnections will not be approved as part of this ongoing EA; their approval falls under the purview of the Planning Act. The construction of these backbone watermain interconnections should be funded by developers.

B) **Upgrades to existing distribution system watermains to improve conveyance to future development areas**: these watermain upgrades would be implemented to address growth when future development areas are built. The proposed timing of these upgrades is based on the phasing of the developments presented in the **Design Basis Memo** (**Appendix A.2**) or on known planned road infrastructure upgrades, however it should be re-confirmed once planning for the development areas and/or road reconstruction begins. The costs for these watermain upgrades could be factored into development charges or funded by specific developments they service.

- Project B-1 consists of replacing the existing watermain on Bates Dr with a larger watermain (B-1a) and extending the watermain to form a loop with Project A-2 in conjunction with the planned Bates Dr westerly extension road project (B-1b). While replacing the existing watermain is a

Schedule A/A+ project (and is hence pre-approved), the watermain extension will only be a Schedule A/A+ project once the Bates Dr extension is built. The watermain could be included as part of the road extension project.

- Projects B-2 to B-11 consist of existing watermain replacement or are located within existing roadways, and are thus Schedule A/A+ projects, which are pre-approved.

Cost-sharing opportunities should be explored once planning for the development areas begins.

C) **Upgrades to existing distribution system watermains to improve system performance**: these watermain upgrades are recommended to address existing water distribution system deficiencies, as identified in **Phase 1** (**Appendix A.1**). These upgrades are recommended to provide the Town with a stronger and more reliable backbone network, and to improve fire flow conveyance across the system. Where feasible, these watermain upgrades were recommended based on known or recommended road upgrade projects, however timing should be re-confirmed once planning for road upgrade begins. These projects would require municipal funding.

- Project C-1 is recommended once a municipal roadway connecting Franktown Rd and McNeely Ave is built. This project is currently not pre-approved, however, once the roadway is built, it will be a Schedule A/A+ project (and would then be pre-approved). This project is recommended but is not required to address existing water distribution system deficiencies.
- Project C-4 is recommended to provide watermain looping and thus improve fire flow conveyance in this part of the system, whereby fire flows are below the target threshold of 60 L/s (see **Phase 1** (**Appendix A.1**)). This project would be routed along the existing utility corridor connecting Johnston St to Hughes St. This project would be a Schedule A+ project, and is pre-approved, while requiring consultation of residents prior to implementation.
- Project C-6 is recommended to reinforce the backbone watermain network and complete the connectivity of 300 mm diameter watermains in the system. This project would be routed along an existing right-of-way on Boyd St, connecting Taber St and Arthur St. As ROW is currently undeveloped, it would a Schedule B project, not approved under this EA and requiring its own EA process once implementation is decided. Alternatively, should the adjacent lands be developed and require that this ROW also be developed, the approval of this project would fall under the purview of the Planning Act. This project is recommended but is not required to address existing water distribution system deficiencies.

D) **Condition assessment and rehabilitation program for older watermains**: older watermains are recommended for condition assessment as they are reaching the end of their lifespan and may eventually need to be replaced or rehabilitated. The proposed timing for replacement or rehabilitation of these watermains is based on the age of the watermains or the timing of other projects they may be associated with. Timing and funding should be re-confirmed following condition assessment and based on future developments (i.e. if there are benefits to upsizing the watermains during replacement to improve conveyance to a future development area).

- Projects D-1, D-5 and D-6 are recommended for existing watermains on Town property or in the existing right-of-way (project D-1 could potentially also be associated with the redevelopment of Strategic Property 26 on Emily St, see project D-4). These projects would be Schedule A/A+ projects and are pre-approved.
- Projects D-2 and D-3 are recommended for existing watermains leaving the WTP. These projects would be Schedule A/A+ projects and are pre-approved. For costing purposes, they are not included in the WTP expansion costs (see **Section 5.1.1**), however their timing may be aligned with the WTP expansion.
- Project D-4 is recommended for the existing watermains on the Strategic Property 26 on Emily St. The existing watermain is currently under a building. The Town has indicated that, once the property is redeveloped, the watermain may be abandoned in favour of a new watermain in the existing right-of-way (ROW). This will need to be re-evaluated as part of the redevelopment of the site. This project is recommended but is not required to address existing water distribution system deficiencies. This project would be a Schedule A/A+ project and would be pre-approved. Project D-1 may also be implemented as part of this site redevelopment.

A 5th watermain upgrade category (Category E) is also shown in **Figure 5.2**. These are approved or recent watermain upgrades or new watermains implemented by private developers or by the Town. They are shown as they provide additional looping to the backbone watermain network, however they are not further considered as part of costing within this Master Plan.

The system was tested under year-2041 peak hour demand, considering the upgrades proposed herein (WM upgrades and WTP HLP upgrade). Pressures in this scenario improved from a range of 38 to 68 psi (no upgrades) to a range of 47 to 74 psi. A fire flow analysis was also completed with all infrastructure revisions implemented. This analysis showed an overall improvement in the available fire flow with the implementation of all upgrades and the WTP HLP upgrade, reducing the number of nodes with fire flows ≤ 60 L/s. Fire flows in the areas around Industrial Ave (north of the Mississippi River) and in the southwestern quadrant of Town also improve.

Table 5.3: Proposed Watermain Upgrades

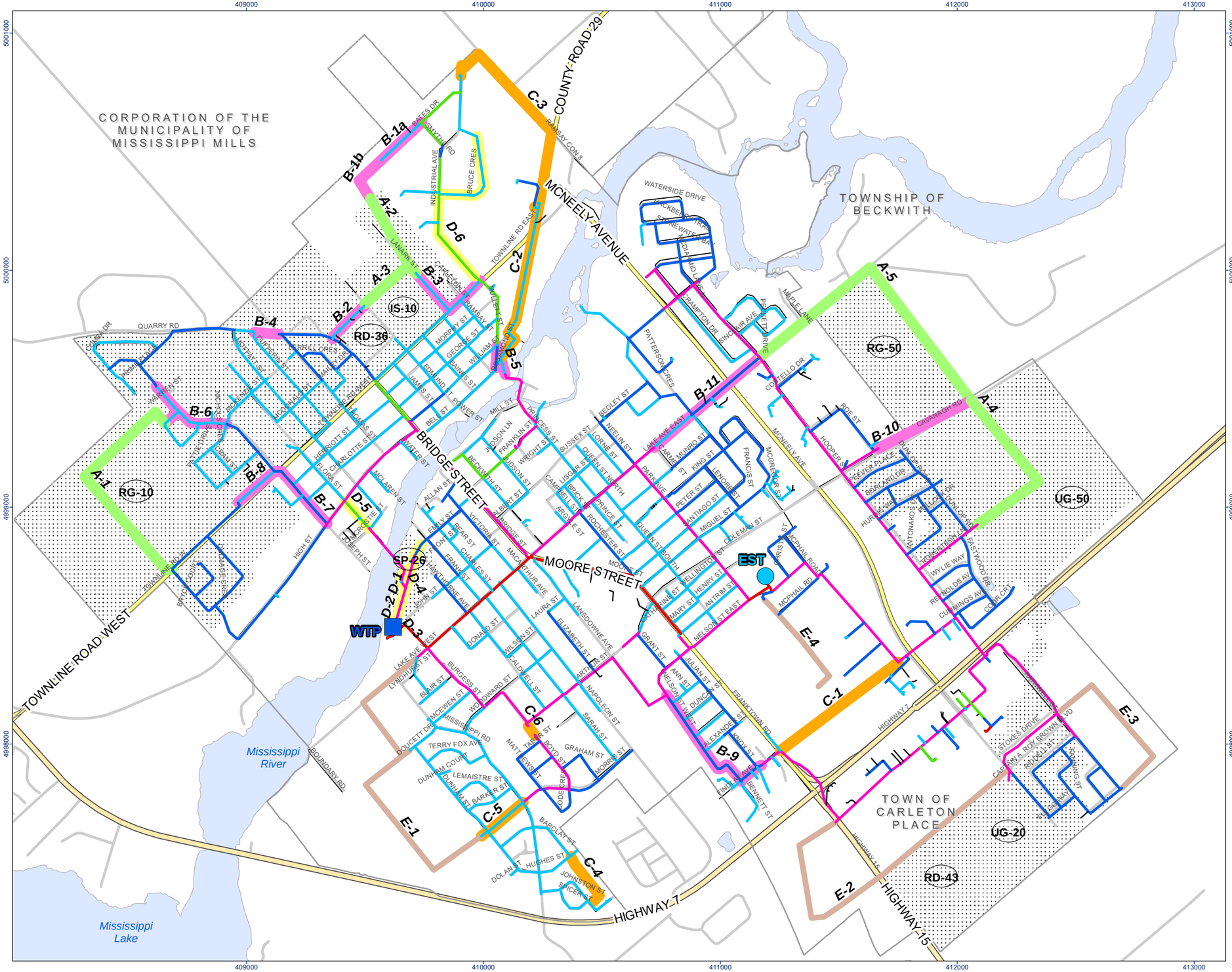
Upgrade ID	Street	From	To	Type of Upgrade	Total Length (m)	Proposed Diameter (mm)	Rationale	Year Recommended	Project Schedule & Approval Status	Estimated Time to Complete Studies for Approval[7]	Estimated Cost ($CAN), incl. 30% Contingency
A) Watermain interconnections which will be required as part of development areas' servicing[1]											
A-1	RG-10 Development	Townline Rd West	Preston Dr	New Pipe within Future Development Area	1,018[1]	200[2]	Development (RG-10)	2026[3] (or implementation of development)	Approval to be addressed by Planning Act *Not approved as part of this EA*	Dependent on development planning process	$794,000
A-2	RD-36 Development	Bates Dr	Lanark St	New Pipe within Future Development Area	324[1]	250[2]	Development (RD-36)	2026[3] (or implementation of development)	Approval to be addressed by Planning Act *Not approved as part of this EA*	Dependent on development planning process	$294,000
A-3	IS-10 Development	Edmund St	Lanark St	New Pipe within Future Development Area	292[1]	200[2]	Development (IS-10)	2031[3] (or implementation of development)	Approval to be addressed by Planning Act *Not approved as part of this EA*	Dependent on development planning process	$228,000
A-4	UG-50 Development	Robertson Ln	Cavanagh Rd/East Boundary	New Pipe within Future Development Area	759[1]	300[2]	Development (UG-50)	2026[3] (or implementation of development)	Approval to be addressed by Planning Act *Not approved as part of this EA*	Dependent on development planning process	$888,000
A-5	RG-50 Development	Lake Ave W/Peckett Dr	Cavanagh Rd/East Boundary	New Pipe within Future Development Area	1,297[1]	300[2]	Development (RG-50)	2026[3] (or implementation of development)	Approval to be addressed by Planning Act *Not approved as part of this EA*	Dependent on development planning process	$1,517,000
B) Upgrades to existing distribution system watermains to improve conveyance to future development areas											
B-1a	Bates Dr	Smythe Rd	Bates Dr Existing Dead-End	Existing Pipe Replacement	233	250	Development (IS-10, RD-36) & Road Upgrade	2026[3] (or implementation of development or year of road reconstruction)	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$212,000
B-1b	Bates Dr	Bates Dr Existing Dead-End	West Extension to RD-36 Development	Existing Pipe Extension within Future Roadway	219	250	Development (IS-10, RD-36) & Road Upgrade	2026[3] (or implementation of development or year of road reconstruction)	Schedule A/A+* if road is built *Not yet approved*	½ Year	$199,000
B-2	RD-36 Development Connection to Bridge St	Bridge St	Edmund St	Existing Pipe Replacement	193	200	Development (IS-10, RD-36)	2026[3](or implementation of development)[j]	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$151,000
B-3	Townline Rd East & Lanark St	Industrial Ave	IS-10 Development	Existing Pipe Replacement	393	200	Development (IS-10, RD-36)	2026[3] (or implementation of development)	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$307,000
B-4	Bridge St	Thomas St	Quarry Rd	New Pipe within Existing Roadway	106	200	Development (IS-10, RD-36, RG-10)	2026[3] (or implementation of development)	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$82,000
B-5	Mullett St	S of Rosamond St	William St	Existing Pipe Replacement	207	250	Development (IS-10, RD-36)	2026[3] (or implementation of development)	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$189,000
B-6	Joseph St & Preston Dr	McKenzie St	N of Warren St	Existing Pipe Replacement	442	200	Development (RG-10)	2026[3] (or implementation of development)	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$345,000
B-7	Joseph St & Preston Dr	High St	Townline Rd W	Existing Pipe Replacement	323	250	Development (RG-10)	2026[3] (or implementation of development)	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$294,000

Upgrade ID	Street	From	To	Type of Upgrade	Total Length (m)	Proposed Diameter (mm)	Rationale	Year Recommended	Project Schedule & Approval Status	Estimated Time to Complete Studies for Approval[7]	Estimated Cost ($CAN), incl. 30% Contingency
B-8	Townline Rd W	Joseph St	Edwards Dr	Existing Pipe Replacement	200	200	Development (RG-10)	2026[3] (or implementation of development)	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$156,000
B-9	Nelson St	N of Brown St	Findlay Ave, E of Knox St	Existing Pipe Replacement	626	300	Development (RD-43, UG-20) & Road Upgrade	2028[4] (or year of road reconstruction)	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$733,000
B-10	Cavanagh Rd	Roe St	East Boundary	New Pipe within Existing Roadway	443	300	Development (UG-50, RG-50) & Road Upgrade	2027[4] (or year of road reconstruction)	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$519,000
B-11	Lake Ave E	E of Neelin St	McNeely Ave	Existing Pipe Replacement	586	300	Development (UG-50, RG-50) & Road Upgrade	2030[3] (or implementation of development, or year of road reconstruction)	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$685,000
C) Upgrades to existing distribution system watermains to improve system performance											
C-1	Hwy 7 North Special Connection	Franktown Rd	McNeely Ave	New Pipe within Future Roadway	622	300	Long-Term Street Network Improvement	2041[4] (or year of road construction)	Schedule A/A+* if road is built *Not yet approved*	1 Year once road is built	$728,000
C-2	William St	Rosamond St	Townline Rd East	Existing Pipe Replacement	721	250	Improved Fire Flow Conveyance	Medium- to long-term to address existing deficiencies	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$657,000
C-3	Townline Rd East/Ramsay Concession 8	W of McNeely Ave	Industrial Ave	New Pipe within Existing Roadway	897	250	Potential Long-Term Road Project, Improved Fire Flow Conveyance & Watermain Backbone Network Improvements	Medium- to long-term to address existing deficiencies or year of road project implementation	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$816,000
C-4	Along stormwater management pond, within existing utility corridor	Johnston St	Hughes St	New Pipe within Existing ROW	271	150	Improved Fire Flow Conveyance	Medium- to long-term to address existing deficiencies	Schedule A+ *Pre-approved* *Will require consultation prior to implementation*	1 Year for consultation	$176,000
C-5	Morris St	Mississippi Rd	West of Dunham St (Bodnar Lands)	Existing Pipe Replacement	232	200	Watermain Backbone Network Improvements	2031[4] (or year of road construction)	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$181,000
C-6	Extend WM on Boyd St	-	-	New Pipe Outside of Existing Roadway or ROW	47	300	Watermain Backbone Network Improvements	Medium- to long-term to improve watermain backbone network	Schedule B or addressed by Planning Act[8] *Not approved as part of this EA and will require separate EA*	1 Year or dependent on development process	$56,000
D) Condition assessment and rehabilitation program for older watermains[6]											
D-1	Strategic Property 26 (SP-26; 115 Emily St)	SP-26	Mississippi River Crossing	Existing Pipe Condition Assessment & Relining	198	250	Watermain Age & Site Redevelopment	2026[3] (or implementation of site re-development)	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$82,000
D-2	WTP Feed	WTP	SP-26	Existing Pipe Condition Assessment & Relining	171	300	Watermain Age & WTP Upgrades	2025[5] (or year of WTP upgrades)	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$71,000

Upgrade ID	Street	From	To	Type of Upgrade	Total Length (m)	Proposed Diameter (mm)	Rationale	Year Recommended	Project Schedule & Approval Status	Estimated Time to Complete Studies for Approval[7]	Estimated Cost ($CAN), incl. 30% Contingency
D-3	WTP Process Water Pipe	-	-	Existing Pipe Condition Assessment & Relining	60	300	Watermain Age & WTP Upgrades	2025[5] (or year of WTP upgrades)	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$25,000
D-4	Strategic Property 26 (SP-26; 115 Emily St)	SP-26	Emily St	Existing Pipe Condition Assessment & Relining	83	300	Watermain Age & Site Redevelopment	2026[3] (or implementation of development)	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$34,000
D-5	Flora St	McRostie St	High St	Existing Pipe Condition Assessment & Relining	156	250	Watermain Age	End of watermain lifespan	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$65,000
D-6	Industrial Ave & Bruce Cres	Townline Rd East	Bruce Cres & Industrial Ave	Existing Pipe Condition Assessment & Relining	824	200	Watermain Age	End of watermain lifespan	Schedule A/A+ *Pre-approved*	½ Year if consultation required prior to implementation	$337,000

Notes

(1) Backbone watermain only; does not include complete servicing of development area.
(2) Watermain sizing to be confirmed during functional design of servicing for development area.
(3) Proposed timing based on phasing presented in the **Design Basis Memo** (**Appendix A.2**); timing to be confirmed based on development plans.
(4) Proposed timing based on planned road infrastructure upgrades.
(5) Proposed timing may be aligned with WTP upgrades.
(6) Cost for rehabilitation program only; cost for condition assessment is not included.
(7) Estimated time to complete studies for approval only; does not include estimated time for design, tender and construction (additional 1-2 years depending on project).
(8) If adjacent lands are developed and require that the ROW be developed, approval will fall under the purview of the Planning Act.



Stantec

Carleton PLACE

Legend

Watermain Diameter (D)

- < 150 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- ≥ 350 mm

Watermain Upgrade Type

- A - Backbone WM Connections Required in Development Area
- B - Upgrades WDS to Service Development Area
- C - Upgrades to WDS to Improve Service
- D - Condition Assessment & Rehabilitation of Older Pipes
- E - Approved/Recent WM Upgrades by Developers or Town
- Development

N

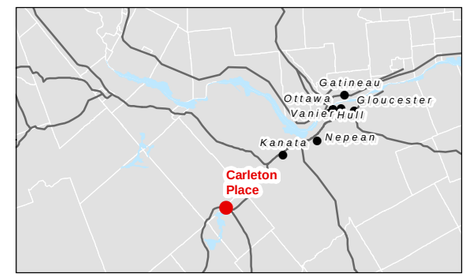
0 0.5 Kilometers

(At original document size of 11x17)

1:16,500

Notes

1. Coordinate System: NAD 1983 UTM Zone 18N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.
3. Data Source: *wm_mains.shp* from the Town of Carleton Place
4. Abbreviations: EST = Elevated Storage Tank; WM = Watermain(s); WDS = Water Distribution System; WTP = Water Treatment Plant



Project Location

Carleton Place, ON

Prepared by CR on 2022-03-09

Client/Project

Town of Carleton Place
Carleton Place W&WW Master Plan
Phase 2 Report

163401646 REVA

Figure No.

5.2

Title

Proposed Watermain Upgrades

5.2.1 Cost Estimate & Phasing - WDS

Table 5.4 summarizes the total costs (2022 dollars) for the proposed water distribution infrastructure upgrades. A contingency of 30% has been applied to all costs. Detailed costs for each watermain project are presented in **Table 5.3**. The preliminary timeline of the costs borne by the Town (as outlined in **Table 5.3**) is illustrated in **Figure 5.3**.

Table 5.4: Summary of Opinion of Probable Costs for Water Distribution Infrastructure Upgrades (2022 dollars)

Infrastructure Upgrade	Opinion of Probable Costs(1)	Funding Source
A) Watermain interconnections which will be required as part of development areas' servicing(2)	$3.7M	Developers
B) Upgrades to existing distribution system watermains to improve conveyance to future development areas	$3.9M	Town/Developers
C) Upgrades to existing distribution system watermains to improve system performance	$2.6M	Town
D) Condition assessment and rehabilitation program for older watermains (*cost of rehabilitation only*)	$0.6M	Town

Notes

(1) 2022 dollars; includes contingency of 30%.

(2) Approximate costing for backbone watermain; does not include complete servicing of entire development area.

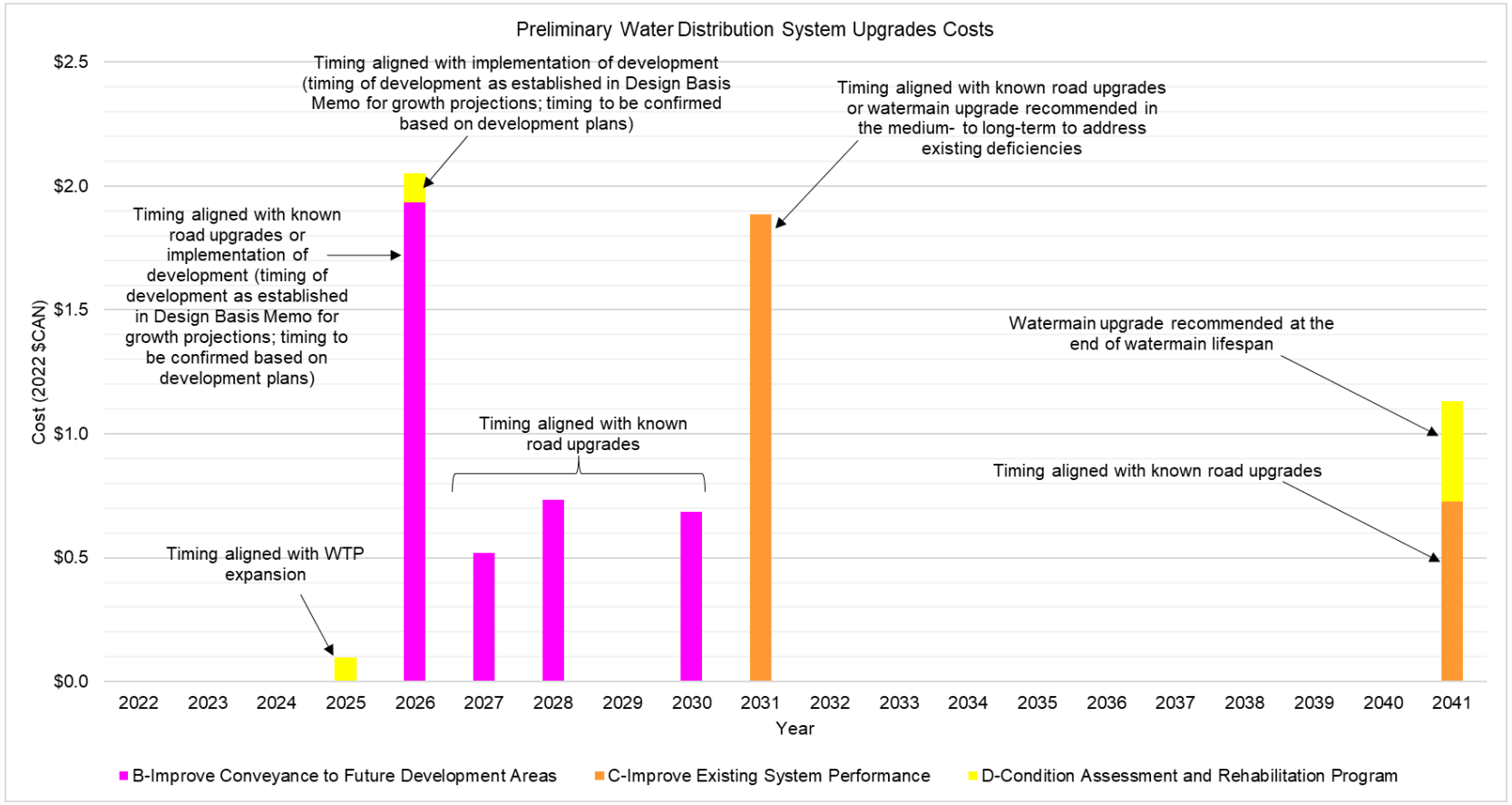


Figure 5.3: Preliminary Water Distribution System Upgrades Cost Timeline

5.2.2 Climate Change Considerations - WDS

Potential climate change impacts on the water distribution system were identified in the **Phase 1 Report** (**Appendix A.1**). The impacts of climate change and extreme weather events on the potable water distribution system include:

- Increase in water demand linked to temperature increases;
- Chlorine depletion due to temperature increases; and
- Impact of freeze-thaw cycles on watermains (e.g. watermain breaks).

To address potential climate change impacts and increase resilience to climate change, different measures could be integrated in the potable water distribution system. Opportunities for climate change adaptation include:

- Adaptation to increased water demand
  - Encourage water conservation in the Town
- Adaptation to increased chlorine depletion
  - Plan for increased chlorine needs
  - Identify locations for rechlorination throughout the water distribution system
- Adaptation to freeze-thaw cycles
  - Identify watermains prone to the impacts of freeze-thaw (e.g. watermain break locations), perform a condition assessment on those watermains and identify rehabilitation needs.

Opportunities for climate change mitigation (GHG emissions reduction) and energy savings include:

- Replacing infrastructure which generate high head losses (e.g., valves, leaky watermains)
- Water efficiency efforts.

Best Management Practices will be used to mitigate impacts associated with pre-approved Schedule A and A+ projects and determined during Detail Design.

5.3 Wastewater Treatment Plant (WWTP)

The preferred alternative based on the evaluation performed in the **Alternatives TM** (**Appendix B**) consists of expanding the WWTP within the existing site footprint and on the neighbouring household hazardous waste and compost yard site to the east (also owned by the Town, see **Figure 5.4**). This option seeks to maintain use of the existing processes, where practical, while still providing the necessary treatment capacity to accommodate future growth.

It is expected that upgrades to the WWTP may involve a combination of the following:

- Constructing a new or expanded headworks building including raw sewage pumping station.
- Repurposing the existing phys/chem clarifiers as primary clarifiers.
- Increasing the aeration tank volume and area.
- Addition of a new secondary clarifier area.
- Converting the secondary digester into a parallel primary digester.
- New dewatering building.
- New mechanical WAS thickening process.
- New filtration and UV disinfection process equipment and building.

Alternatively, a complete retrofit of the plant into a non-conventional treatment train (such as membrane bioreactor) may be considered during conceptual design.

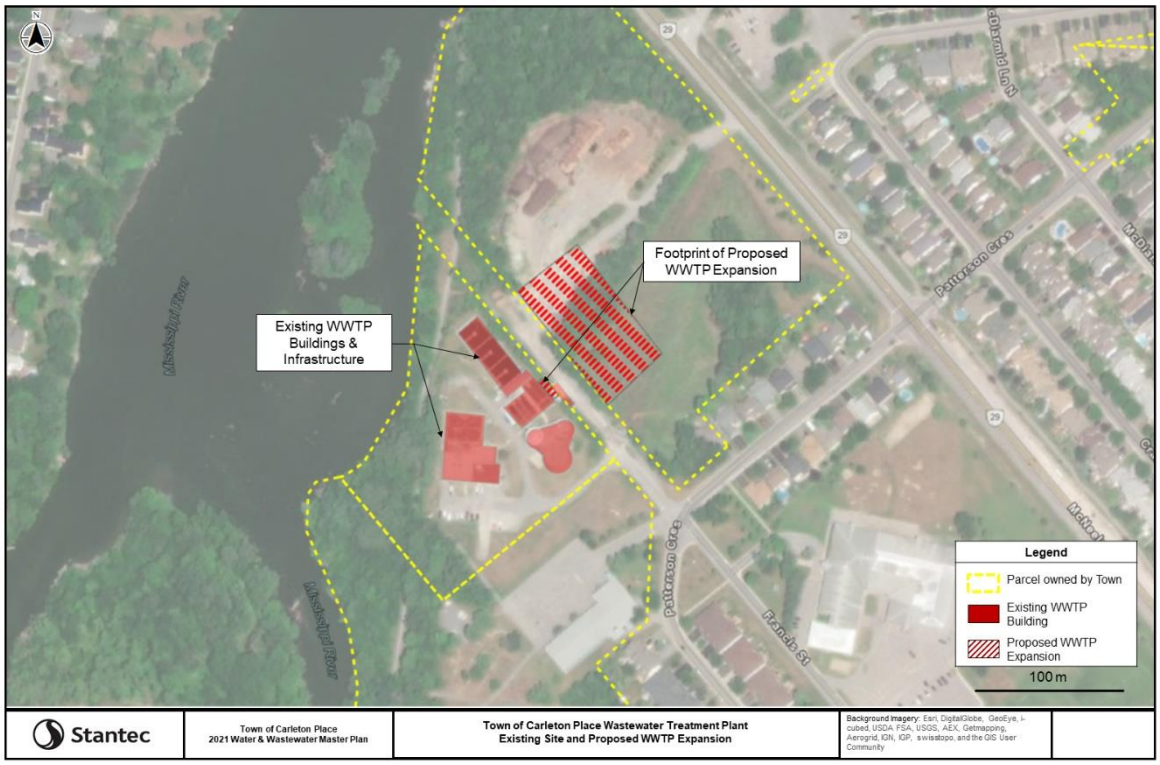


Figure 5.4: Potential Footprint of WWTP Expansion

The design basis for expanding the WWTP, including design flows, design loads, effluent limits, and perceived challenges/constraints, was defined in the following reports preceding this Phase 2 Report:

- Design Basis Memo (**Appendix A.2**) – analyzed existing conditions of the plant, and
- Phase 1 Report (**Appendix A.1**) – presented future flow and load projections.

As the Town's WWTP discharges into the Mississippi River, an assimilative capacity study will be completed in Phase 3 of this project to determine the appropriate effluent limits and mixing zone for the facility. These proposed limits will be reviewed by key stakeholders, including the MECP, prior to being used for the design of the WWTP's treatment process upgrades.

The key design basis findings that are anticipated to impact the proposed WWTP expansion include:

1. <u>More stringent effluent limits</u> – The anticipated future effluent limits for total phosphorus (TP) will require tertiary filtration to be implemented with the WWTP expansion. In addition, the anticipated future winter total ammonia nitrogen (TAN) limits will require a continuously nitrifying sludge mass and impose a de-rating of

the existing activated sludge process (ASP), thus requiring additional secondary treatment capacity for the plant expansion.

2. Higher design flows – The projected 2041 peak hour flow of 42.5 MLD will require significant capacity increases for raw sewage pumping, screening, and grit removal processes.
3. Higher design loads – The influent design loads are anticipated to increase proportionally with service population and combined with the need for continuous nitrification, will require significant increase in aeration tank and secondary clarifier capacities.

A Facility Optimization Program (FOP) Report (OCWA, 2021-08-25) was prepared to assess the current capacity of existing WWTP unit processes relative to existing effluent treatment needs. Information on the current unit process capacities from the FOP was used in combination with Stantec's preliminary process calculations to estimate future unit process size requirements to meet the design basis needs (**Table 5.5**).

Table 5.5 Unit Process Capacity Increases for WWTP Expansion

Process	FOP Capacity Analysis (OCWA, 2021)	Required Capacity by 2041	Plant Capacity Increase
Raw Sewage Pumping	26 MLD firm capacity (2+1 pumps)	42.5 MLD (firm capacity)	Additional 16.5 MLD firm pumping capacity
Screening	26 MLD (one screen)	42.5 MLD	Additional 16.5 MLD screening capacity
Grit Removal	10 MLD firm capacity (1+1 vortex units)	42.5 MLD	Additional 22.5 MLD grit removal capacity
Primary Clarifiers (PC)	15 MLD annual average flow equivalent (with all 5 units operating)	Existing capacity may be sufficient if chemically enhanced primary treatment (CEPT) is implemented or add one PC of equal size to existing	Implement CEPT with existing PC capacity or add one PC.
Aeration Tanks (AT)	7.9 MLD annual average flow equivalent, without winter nitrification	Existing AT, operated for winter nitrification will be de-rated to approximately 6.4 MLD	Additional 4.3 MLD annual average equivalent capacity
Secondary Clarifiers (SC)	7.9 MLD annual average flow equivalent, without winter nitrification	Existing SC, operated for winter nitrification will be de-rated to approximately 6.4 MLD	Additional 4.3 MLD annual average equivalent capacity
Tertiary Filtration	Not applicable	42.5 MLD filtration capacity	42.5 MLD filtration capacity

Process	FOP Capacity Analysis (OCWA, 2021)	Required Capacity by 2041	Plant Capacity Increase
UV Disinfection	5.5 MLD firm capacity (1+1 UV units)	42.5 MLD (firm capacity)	Additional 37 MLD firm capacity
Anaerobic Digestion	4.8 MLD annual average equivalent	At capacity with current flows/loading of approximately 6.5 MLD	Additional 4.8 MLD average equivalent primary digester capacity.
Sludge Storage / dewatering	7.9 MLD annual average equivalent	Additional storage volume and/or dewatering recommended to decrease sludge hauling fees	Option to either increase on-site storage volume and/or implement dewatering
WAS thickening	Not applicable	Recommended for improved solids management.	Recommended for improved solids management.

5.3.1 Cost Estimate & Timing - WWTP Upgrades

Table 5.6 provides the preliminary opinion of probable cost for the preferred alternative solution to expand the WWTP. The example expansion option description and Class 4 level (-30% - +50%) opinion of probable cost provided is intended to be iterated on in Phase 3 of the EA as several WWTP expansion options will be developed and evaluated.

The preliminary opinion of probable cost for the WWTP expansion is based on a conventional activated sludge treatment train with the following assumptions:

- All future flows to the plant to be directed through a common pumping station, new headworks with screens and vortex grit tanks and existing PCs for peak flows up to 42.5 MLD.
- Primary effluent flows will be split between the existing secondary treatment (ATs + SCs) process and a new parallel secondary treatment process constructed to the north of the existing site on adjacent lands. The existing secondary treatment process will be de-rated (initially estimated at 6.4 MLD annual average flow) to provide for continuous nitrification. The new secondary treatment process will be sized to accommodate the balance of flows of approximately 4.3 MLD annual average flow and provide a full treatment plant capacity of 10.6 MLD in combination with the existing de-rated plant. The peak flow of 42.5 MLD will be split according to the same flow split ratio between new and existing plants.

- Secondary effluent from the existing and new SCs will be hydraulically combined and treated through a new building located north on adjacent lands containing a filter process and UV disinfection sized for 42.5 MLD peak flow. Disinfected final effluent will tie into the existing outfall structure. It is assumed that sufficient hydraulic gradient exists to place filters and UV without supplemental pumping.
- Solids handling upgrades include: converting the existing secondary digester to primary digester operation, installing a new dewatering process, and installing a new WAS thickening process.

There may be an opportunity to defer capital expenditures to a later construction phase for WAS thickening process, dewatering process, phasing new train aeration tank and/or secondary clarifier, which will be explored in further detail in Phase 3.

Table 5.6 Construction Cost Opinion for Example WWTP Expansion

WPCP Process Area	Opinion of Probable Cost (1)	Notes
Raw Sewage Pumping Station	$1M	Costing assumes larger firm pump capacity required based on projected PHF of 42.5 MLD, as well as forcemain modifications to connect to the new Headworks building.
Headworks	$5M	Costing includes complete replacement and upsizing of the screening and grit removal equipment to meet PHF of 42.5 MLD. In addition, cost assumes that a new Headworks building will be constructed offline to house this equipment and mitigate to impacts to operations during construction.
Primary Clarifiers & Yard Piping	$2M	Costs included re-routing existing piping to the physical/chemical clarifiers for use in the biological treatment process. This also includes general yard piping not accounted for elsewhere.
Aeration Tanks	$5M	Costing assumes that new aeration tank with additional capacity would be required based on the requirement for continuous nitrification. In addition, the costs include blower upgrades and a new blower building (to account for separate aeration zones) and installation of fine bubble diffusers in the existing aeration tanks to address existing operational issues.
Secondary Clarifiers	$4M	Costing assumed that a new secondary clarifier may be required to expand plant capacity by approximately 4.3 MLD.
Tertiary Treatment (Filtration and UV Disinfection)	$3.8M	Costing assumes that filter and UV equipment must be sized to meet projected PHF of 42.5 MLD and more stringent effluent limits for TP and E.Coli removal.
Anaerobic Digestion Upgrades	$1M	Costing assumes the conversion of the secondary digester to a primary digester.
Dewatering	$3.5M	Costing assumes new dewatering building required to house dewatering process equipment.
WAS Thickening	$3M	WAS Thickening was identified as an upgrade required in the next 20 years to improve solids management at the plant.
Chemical Storage Building	$0.5M	Requirement to upgrade the Chemical Storage Building with the implementation of filtration for tertiary treatment.
Electrical Supply, Standby Generator Replacement, and Boiler Upgrades	$1.5M	Costs to size the new generator to meet the increased electrical demand from Headworks/Tertiary Treatment equipment required to meet projected PHF of 42.5 MLD

WPCP Process Area	Opinion of Probable Cost (1)	Notes
Outfall	$0.25M	Potential need to upgrade the plant outfall to meet the future peak flow requirements to be assessed in future design stages.
Sub-Total	**$30.55M**	
Contingency, Engineering, & Additional General Contract Costs (2)	$12.82M	
Grand Total	**$43.4M**	

Table Notes:

(1) This opinion of probable cost is based on the design basis information, the assumed scope of work, and using tendered prices from similar scopes of project work for the preferred Alternative C - Carleton Place WPCP Expansion assuming the existing activated sludge process will be upgraded conventionally. Alternative options for upgrading the existing plant will also be considered in Phase 3. The estimate is considered approximately Class 4 estimate ranging from -30% ($30.8M) to +50% ($65.1M) given the level of detail and excludes: taxes, permits, inflation beyond 2022, and contaminated soils.

(2) Includes contingency (20%), engineering (10% - includes design and contract administration), additional general contract costs that are significant factors of construction contracts, including mobilization/demobilization/bonds/insurance (2%), and contract contingency/cash allowance (10%). Contractor's overhead and profit is assumed to be included in items above.

5.3.2 Climate Change Considerations - WWTP

The impacts of climate change and extreme weather events on the WWTP include:

- Increased peak inflow during wet weather event with increased precipitation or severe storms;
- Increased peak inflow during spring melt due to higher temperatures and greater snow loads;
- Flooding during higher river flows due to increased precipitation;
- Lower river flows and reduced assimilative capacity due to decreased precipitation/prolonged droughts;
- Impact of temperature increase on aeration system;
- Odour generation with temperature increase;
- Wet weather treatment of snowmelt with temperature increase; and
- Severe storms interrupting deliveries or leading to power outages.

To address potential climate change impacts and increase resilience to climate change, different measures could be integrated in the selected alternative. Opportunities for climate change adaptation include:

- Adaptation to flooding risks
  - Build new process structures and buildings above the floodplain limit, with a buffer to accommodate future floods,
  - Relocating equipment away from flood-prone areas, and
  - Verify and update emergency measures for flooding;
- Adaptation to increased peak flow to WWTP due to increased precipitation (and/or snow melt)
  - Design processes to accommodate potential upgrades of pumps and other equipment without major infrastructure upgrades if peak flows increase,
  - Incorporate partial plant bypass to maintain some level of treatment during peaks rather than full bypass, and
  - Consider upgrades within the sanitary collection system to reduce peak inflows to the WWTP;
- Adaptation to reduced assimilation capacity due to drought
  - Design processes to adjust treatment, considering potential reduced assimilation capacity;
- Adaptation to odour issues and other impacts to outdoor WWTP processes with increased temperatures

  - Consider higher oxygen demand and lower oxygen transfer capacity in design of aeration basins; and
- Adaptation to impacts of severe storms
  - Design storing capacity to provide additional reserve and minimize impacts of delayed deliveries on plant operation,
  - Size backup power generators for critical plant processes, and
  - Consider co-generation of energy.

  Opportunities for climate change mitigation (GHG emissions reduction) and energy savings include:
- Upgrading pumps (and motors) to increase their efficiency (or selecting new high-efficiency pumps and motors);
- Reduce incoming sewage with I/I reduction and water conservation measures;
- Continue capture of gases from digesters and use flare to convert CH4 to CO2; and
- Consider co-generation of heat and energy once plant reaches a size that is practical for implementation.

Mitigation measures associated with impacts resulting from Schedule B projects will be determined during the EA. The impacts and associated mitigation measures for Schedule C projects will be determined during Phase 3 and 4 of the EA and listed in the ESR.

5.4 Permits and Approvals

The following permits and approvals should be considered during future design stages of the WWTP and WTP Upgrades when the scope of the projects has been further refined.

Table 5.7: Potential Permit and Approval Requirements

Agency	Description of Permit / Approval
Fisheries and Oceans Canada	• Any proposed modifications to the WTP water intake and the WWTP outfall may result in impacts to the aquatic environment of the Mississippi River and should be assessed through a Fisheries Act self-screening. A project review (RFR) or Fisheries Act Authorization (FAA) may apply if impacts to fish and aquatic habitat cannot be avoided or mitigated during design and construction.
Ontario Ministry of Environment, Conservation and Parks	• An updated Environmental Compliance Approval for the WWTP will be required if the plant capacity is increased. • An updated Drinking Water Works Permit and Permit to Take Water (PTTW) will be required for the WTP if the plant capacity is increased. • New standby power generators are expected to be less than 700 kW and therefore will be Environmental Activity and Sector Registry (EASR) eligible activities.

Agency	Description of Permit / Approval
	• A temporary PTTW or EASR may be required during construction activities if dewatering activities are required. • Relocation permits, for wildlife or fish, may be required if removals are needed during construction and timing window restrictions cannot be accommodated. • Permit or other authorization may be required to conduct an activity that could permanently impact an endangered or threatened plant or animal or its habitat through an Information Gathering Form (IGF).
Ministry of Tourism, Culture and Sport	• Archaeological and Cultural Heritage assessments, including fieldwork and reporting, are required to comply with the Ministry's 2011 Standards and Guidelines for Consultant Archaeologists. Additional surveys are required for Schedule B projects.
Mississippi Valley Conservation Authority (MVCA)	• Planned construction or alterations of land (e.g. excavate or fill) near a wetland, watercourse, or along a shoreline, may require a permit from MVCA. Permits are issued in accordance with the provincial *Conservation Authorities Act* and Ontario Regulation 153/06: *Mississippi Valley Conservation Authority: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*.
Town of Carleton Place	• A Building Permit may be required to receive approval for new building construction from the Town's Building Department. • Should any trees require removal, their removal will comply with applicable municipal by-laws.
Electrical Safety Authority	• All electrical installations, repairs, replacements or alterations in Ontario need to be done in compliance with the Ontario Electrical Safety Code, and all necessary Notifications ("permits") must be taken out. This creates a permanent record of the work and triggers a review process by the Electrical Safety Authority.
Local Utilities	• Utility clearance from local utilities, as required.

5.5 Summary of Implementation Plan

A preliminary implementation plan has been developed (**Figure 5.5**) to propose a method for the Town to phase upgrades to water and wastewater infrastructure over the 20-year planning horizon. The opinions for probable cost for the required WTP and WWTP Upgrades will be further refined in Phase 3 of the EA process; however, this high-level implementation plan will assist the Town's efforts in planning for upcoming upgrades. WDS upgrades are presented as total costs; the breakdown per upgrade category is provided in **Section 5.2.1**.

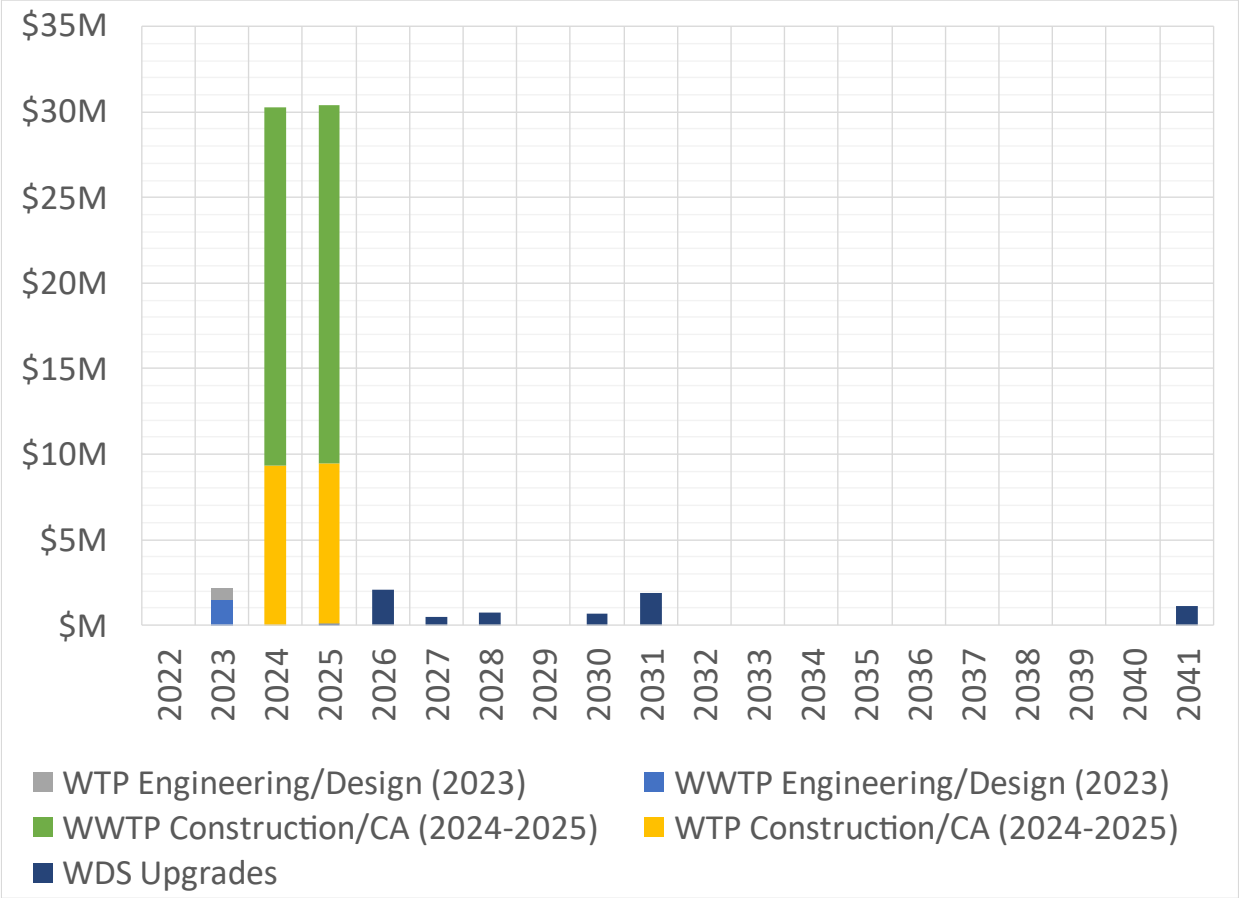


Figure 5.5: Preliminary Implementation Plan

6 Conclusions and Next Steps

This report presents the preferred solutions of the Town of Carleton Place's Master Plan, in support of the Municipal Class Environmental Assessment for the expansion of the Town's Water Treatment Plant (WTP) and Wastewater Treatment Plant (WWTP) and for current and future needs of the potable water distribution and wastewater collection systems. An implementation strategy was developed for each solution.

Once finalized, this Master Plan will be posted to the project website, and a Notice of Completion for Schedule A and A+ projects identified for the potable water distribution system will be published. Schedule C projects (WTP and WWTP expansions) will be further investigated in Phase 3 and 4 of the EA, whereby further consultation (PIS 2) and opportunity to review the Environmental Study Report will occur.

7 References

Background Information:

- The Labour Market Group of Renfrew & Lanark. 2017. "Economy Overview Carleton Place." https://carletonplace.ca/photos/custom/Economy-Overview-CP-2018.pdf.
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- Mississippi Valley Conservation Authority (MVCA). 2015. Climate Change Implications for Small Waterpower Facilities – A Watershed Perspective. Natural Resources Canada Project – AP223. December 2015.
- Ministry of Natural Resources and Forestry (MNRF). 2020. Mississippi River. Water Management Plan. Final Report. Amended October 2020.

Development Planning Studies:

- Development Charges By-law and Background Study (Watson & Associates, December 2020).
- Preliminary Findings on Residential Supply vs Demand and three (3) growth scenarios for the Town of Carleton Place letter (J.L. Richards, March 2021).
- Council Report for Comprehensive Review (Town of Carleton Place / J.L. Richards, March 2021).

Water Treatment Plant:

- Carleton Place Drinking Water System (OCWA, 2017).
- Carleton Place Drinking Water System (OCWA, 2018).
- Carleton Place Drinking Water System (OCWA, 2019).
- Carleton Place Drinking Water System (OCWA, 2020).
- Permit to Take Water No. 1310-9UHPPW (MECC, March 13, 2015).
- Drinking Water Works Permit Number 172-201, Issue Number 3 (MECP, February 26, 2021).
- Drinking Water Works License Number 172-101, Issue Number 3 (MECP, February 26, 2021).
- Addendum to the August 2011 Water Treatment Plant Capacity Expansion Master Plan (J.L. Richards. 2018).
- Resiliency Plan – Water Treatment Plant (J.L. Richards, 2018).
- Water Treatment Plant Expansion Master Plan (J.L. Richards, 2018)

- Water Treatment Plant Capacity Expansion Master Plan (Stantec Consulting Ltd., 2011).

Wastewater Treatment Plant:

- Carleton Place Drinking Water System (OCWA, 2017).
- Carleton Place Drinking Water System (OCWA, 2018).
- Carleton Place Drinking Water System (OCWA, 2019).
- Carleton Place Drinking Water System (OCWA, 2020).
- Receiving Water Assessment Review for Carleton Place Water Pollution Control Plant Discharge to Mississippi River (Stantec Consulting Ltd., May 2009).
- Water Pollution Control Plant Capacity Expansion Master Plan (Stantec Consulting Ltd., August 2011).
- Facility Optimization Report for the Carleton Place Water Pollution Control Plant draft memo (OCWA, April 2020).
- Carleton Place Water Pollution Control Pant Certificate of Approval Number 5001-7FZT4A, (MOE, October 3, 2008.
- Addendum to the August 2011 Water Pollution Control Treatment Plant Capacity Expansion Master Plan (J.L. Richards, 2018).
- Resiliency Plan – Wastewater Treatment Plant (J.L. Richards, 2018).
- Wastewater Treatment Plant Expansion Assessment (J.L. Richards, 2018).

Sanitary Sewer System:

- Trunk Sanitary Sewers – Hydraulic Capacity Investigation memo (J.L. Richards, March 2014).
- Update to Wastewater Trunk Sanitary Sewer Model memo (J.L. Richards, March 2021).
- Condition Assessment of Pumping Stations (J.L. Richards, 2018).
- Asset Management Plan (Town of Carleton Place, 2017).

Water Distribution System:

- Hydraulic Water Model Investigation Future Development memo, (J.L. Richards, September 2013).
- Potable Water Storage Study (J.L. Richards, November 2018).
- Town of Carleton Place 2021 WaterCAD Model Update (J.L. Richards, March 2021).
- Asset Management Plan (Town of Carleton Place, 2017).