7th Avenue Water Tower Replacement

Schedule ‘B’ Municipal Class EA

Prepared For:

Town of Hanover

APRIL 2024

CREATING QUALITY SOLUTIONS TOGETHER

Ainley GROUP

7TH AVENUE WATER TOWER REPLACEMENT
SCHEDULE 'B' MUNICIPAL CLASS EA

PROJECT NO. 122051

Prepared For:

Town of Hanover

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VERIFICATION & APPROVAL

Rev.	Prepared By (Name / Affiliation)	Date	Revision (Name / Affiliation)	Date
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2.	Mike Ainley, P.Eng., PMP / Ainley Group	21-Mar-2024	Town of Hanover	08-Apr-2024
3.				

The above noted individuals have reviewed and commented on this document and are satisfied that the authors have addressed concerns raised.

Executive Summary

The Town of Hanover retained the Ainley Group to complete a Schedule 'B' Class Environmental Assessment (EA) to consider storage options and sites for a new water storage tank that will enhance potable water delivery to the community as well as accommodate future growth. Based on a municipal service needs assessment completed in 2021, the Town is anticipating major growth north of the Saugeen River, identified as Special Policy Area (SPA)1, and some growth on the south limit of the Town (SPA 2 and SPA 3).

The Study Area includes all areas to be considered in the Class EA and is defined by the Town of Hanover boundary.

Class EA Process

The Class EA was approved under Ontario's Environmental Assessment Act and identifies the process by which municipal infrastructure projects are to be planned. The process identifies an approved procedure that classifies projects in terms of schedules based on varying environmental impact.

- **Exempt** – minimal adverse environmental impact; consider public notification
- **Eligible for Screening to Exempt** – may have minimal adverse environmental impact; requires completing an Archaeological Screening Process (ASP) to determine if exempt or Schedule B; consider additional public notification even if exempt
- **Schedule B** – potential for some adverse environmental effects, requires mandatory contact with public and review agencies
- **Schedule C** – potential for significant environmental effects, requires mandatory contact with public and review agencies, requires completion of Environmental Study Report (ESR)

Establishing new or expanding/replacing existing water storage facilities is defined as a Schedule B project under the Municipal Class Environmental Assessment document. A Schedule B project requires completion of Phases 1 & 2 of the Class EA process, which is generally comprised of the following tasks:

- Identify the problem/opportunity;
- Inventory the existing environment (physical, natural, social and economic);
- Develop alternative solutions to address the problem/opportunity;
- Evaluate proposed alternative solutions;
- Consult with the public, review agencies, relevant stakeholders;
- Select the Preferred Solution giving consideration to the evaluation and any feedback received through consultation;
- Establish mitigation measures to minimize potential environmental impacts;
- Document the process in a Project File Report (PFR);
- Issue a Notice of Completion followed by a 30-day review period; and
- Address and final comments and conclude the Class EA process.

The project team for the Class EA consisted of members of the Town of Hanover and Ainley Group, as well as the sub-consultants Cambium Indigenous Professional Services, Archaeological Services Inc. (ASI), and Englobe Corp. The project team met on a number of occasions to discuss the project's progress and develop content for the PICs.

Public, review agency, and Aboriginal community consultation is mandatory during the Schedule B planning process to allow for participation during the development and evaluation of the servicing alternatives. The public, review agencies, and Aboriginal communities were contacted with three notices throughout the Class EA process. The three notices were to inform the public of:

- Study Commencement – September 1, 2022
- Phase 2 PIC – November 30, 2023
- Study Completion – April 18, 2024

The comments and input received from the public, review agencies, and aboriginal communities were taken into consideration during the planning process.

Existing Conditions

The existing Hanover water storage infrastructure related to this project includes:

- The 7th Avenue water tower, located at the south end of Town near the Hanover and District Hospital, which is a 66-year-old (1957) multi-column water tower and has nominal capacity of 941 cubic meters, and
- The 14th Street water tower, which is a 30-year-old (1993) composite water tower and has nominal capacity of 3,507 cubic meters.

The Town has experienced significant system deficiencies when the 3,507 m^3 14th Street water tower is out of service due to maintenance. No similar deficiencies have occurred when the smaller 941m^3 7th Avenue water tower is out of service.

In addition, there is significant risk if an emergency such as a fire coincides with the 14th Street water tower being out of service.

Future Conditions

Given the anticipated growth in the Town of Hanover, it is important to ensure that the new water storage tank on or near 7th Avenue has the ability to service the growth areas. In addition, the Town of Hanover applied for Investing in Canada Infrastructure Program (ICIP) Green Stream Funding in 2021 for the replacement of the 7th Avenue water tower project, confirming the need to replace the existing 7th Avenue water tower with a water tower similar in size to the 14th Street water tower.

Problem/Opportunity Identification

The problem/opportunity statement that has been developed for the replacement of the 7th Avenue Water Tower is as follows:

> "Identify and develop a preferred solution for a new water tower to replace the existing 7th Avenue Water Tower to improve water demand supply security and service new growth in the Town of Hanover."

Storage Requirement

To understand the infrastructure that will be necessary during full build out conditions within the Town of Hanover, additional storage calculations were completed. Based on a combination of Ministry Guidelines and industrial fire flow requirements the total amount of required storage was calculated. The following is a breakdown of existing storage and the additional storage calculated for ultimate growth based on the worst-case industrial fire flow requirements (Exceldor) per their insurers:

Infrastructure / Storage Requirement	Capacity
7th Avenue Elevated Tank	941 m^3
14th Street Elevated Tank	3,507 m^3
Total Existing Storage	4,448 m^3
Full Build Out Storage Requirement	8,275 m^3
Additional Storage Required	4,768 m^3

The proposed size of the 7th Avenue replacement water tower when governed by the requirement to fully accommodate Exceldor's fire flow is 4,768 m^3; however:

- If the Exceldor facility had a sprinkler system the total storage required would be reduced to 5,698 m^3 (vs 8,275 m^3 un-sprinklered) and the new water tower could be reduced to 3,507 m^3
- A 3,507 m^3 water tower is sufficient to accommodate Exceldor's fire flow for 3 hours (rather than 4 hours per their requirements).

It was determined that, in lieu of the additional cost for a 35% larger tank, storage requirements including fire flow for 3 hours for Exceldor can be provided from 7,014 m^3 total storage (existing 3,507 m^3 14th Street elevated water tower plus new 3,507 m^3 water tower to replace the 7th Avenue water tower). Pumper trucks can provide fire flow for the subsequent hour, if required.

Site Selection

The following site characteristics were identified:

- Preliminary site size
  - The water storage will need 0.25 – 0.5 ha
- Potential area
  - Three areas were identified as potential sites
  - A short list of two feasible sites were subsequently identified
    - Site 1 – 95 7th Avenue just north of the cemetery
    - Site 2 – 66 14th Avenue (vacant land south of Public Works Yard)
- A site assessment was completed to determine if Site 1 or Site 2 was preferred for the new water tower location.
  - The assessment identified Site 1 as the preferred site for this project.
  - The assessment also identified possible impacts, which allowed mitigation measures to be developed.

Alternative Water Tower Designs

Four elevated water tower designs were initially listed, of which two made it to the short list. The following elevated water tower design alternatives were examined and evaluated to determine the best option for the 3,507 m^3 storage.

- Alternative 1 – Composite elevated water storage
- Alternative 2 – Bolted glass lined elevated water storage

Alternative 1 was identified as the preferred elevated storage alternative.

Preferred Solution

The preferred solution identified was provision of a 3,507 m^3 composite elevated water storage tank at 95 7th Avenue just north of the cemetery.

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1 Introduction

1.1 Background

Water storage for the Town of Hanover is currently provided by the 7th Avenue and 14th Street water towers. The 7th Avenue water tower, located at the south end of Town near the Hanover and District Hospital, is a 66-year-old (1957) multi-column water tower and has nominal capacity of 941 cubic meters. The 14th Street water tower is a 30-year-old (1993) composite water tower and has nominal capacity of 3,507 cubic meters. The towers are approximately 38 m and 36 m high respectively and the ground level at both towers is approximately 289.0 m. The water towers are shown in Figure 1.

Figure 1: Hanover 7th Avenue and 14th Street Water Towers

7th Avenue Water Tower

14th Street Water Tower

The operating level band of the 7th Avenue water tower is limited and a significant portion of the tank volume is at an elevation that can not provide sufficient fire protection while maintaining 140 kPa minimum system pressure. In addition, the water tower fills and empties from the floor of the tank when out of normal operating range, resulting in very low free chlorine residual. Per the 2017 inspection report (Landmark), the exterior coating of this tank will need to be removed and replaced within the next 3 to 5 years. Overcoating is not feasible. The tank interior is in poor condition with localized corrosion cells, created by the epoxy coating becoming porous with age and allowing water transfer and osmotic blistering. The interior coating of this tank should be completely removed and relined within 1 to 3 years.

Exceldor Foods (poultry processing facility in the Town) utilizes approximately 30-35% of the Town's water and their current water demand does not allow the Town to take the 14th Street water tower off-line for service unless they are on a shutdown; resulting in maintenance concerns associated with the 14th Street water tower.

In 2021, the Town completed a municipal service needs assessment for the Town's Special Policy Areas (SPAs) within the current municipal boundary. The assessment confirmed the need to replace the 7th Avenue water tower with one of equivalent capacity to the 14th Street

water tower. A new water tower on or near the existing 7th Avenue site similar in size to the 14th Street water tower will provide increased access to potable water to the existing residents and ensure sufficient pressure and fire flow at all times. In addition, the new water tower will provide the Town with improved security of water supply to maintain pressures and supply Exceldor Foods under emergency/break conditions (or if either tank needed to be taken offline for a short period for maintenance purposes).

Based on the municipal service needs assessment, the Town is anticipating major growth north of the Saugeen River (SPA 1) and some growth on the south limit of the Town (SPA 2 and SPA 3); as such, it is important to ensure that the new water storage tank on or near 7th Avenue has the ability to service the growth areas. In addition, the Town of Hanover applied for Investing in Canada Infrastructure Program (ICIP) Green Stream Funding in 2021 for the replacement of the 7th Avenue water tower project, confirming the need to replace the existing 7th Avenue water tower with a water tower similar in size to the 14th Street water tower. This application recently received approval for federal and provincial funding; therefore, it is anticipated that the construction for the water tower shall commence by October 2024 and be substantially complete (commissioned) by October 30, 2026.

1.2 Class Environmental Assessment Process

The 2023 Municipal Class Environmental Assessment document as published by the Municipal Engineers Association outlines a planning process for municipalities to follow so as to complete infrastructure projects in an environmentally responsible manner and in accordance with the *Environmental Assessment Act* (*EA Act*). The Municipal Class Environmental Assessment process identifies an approved procedure that classifies projects in terms of schedules based on varying environmental impact.

- **Exempt** – minimal adverse environmental impact; consider public notification
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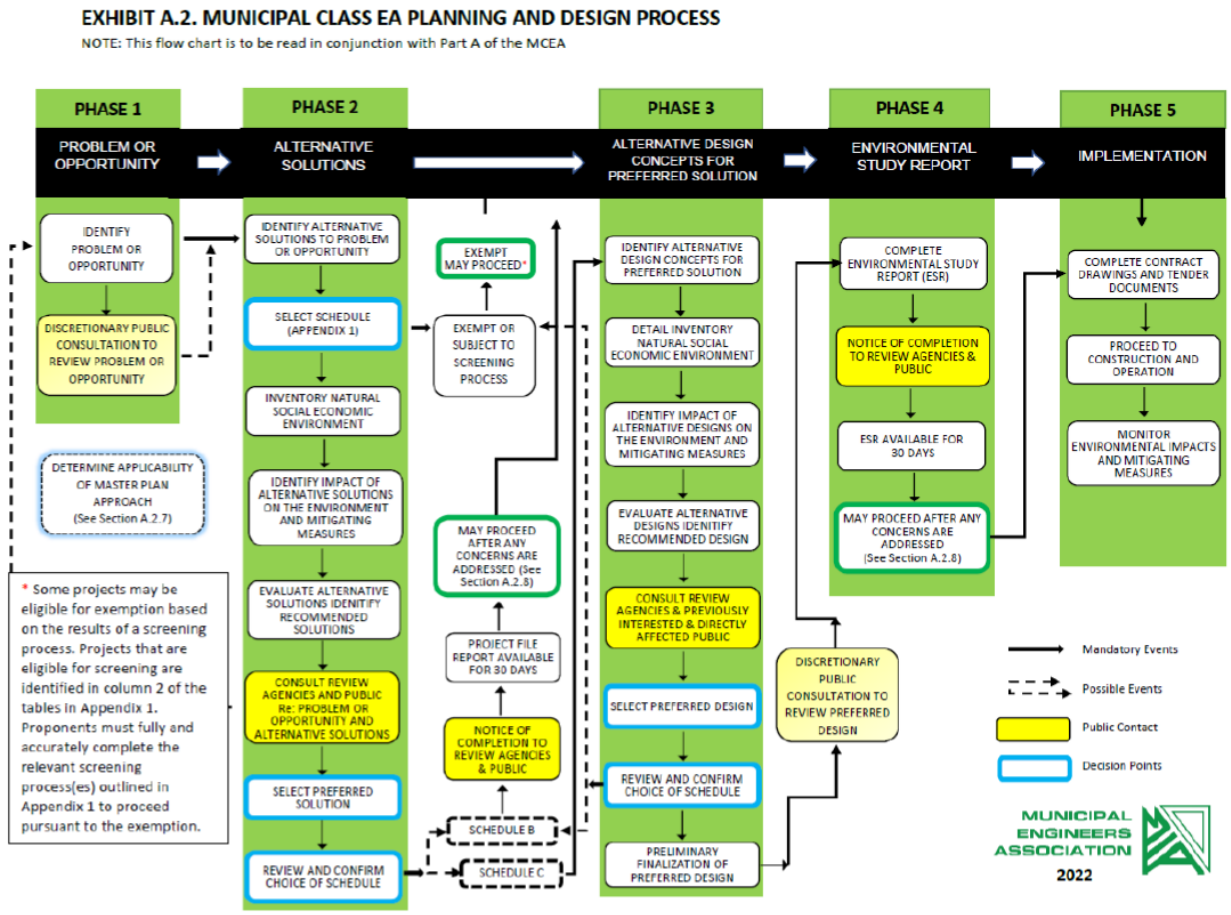
Figure 2 illustrates the Municipal Class EA planning and design process.

Figure 2: Municipal Class Environmental Assessment Flow Chart



Establishing new or expanding/replacing existing water storage facilities is defined as a Schedule B project under the Municipal Class Environmental Assessment document. A Schedule B project requires completion of Phases 1 & 2 of the Class EA process as illustrated in Figure 2, which generally comprises the following tasks:

- Identify the problem/opportunity;
- Inventory the existing environment (physical, natural, social and economic);
- Develop alternative solutions to address the problem/opportunity;
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- Consult with the public, review agencies, relevant stakeholders;
- Select the Preferred Solution giving consideration to the evaluation and any feedback received through consultation;
- Establish mitigation measures to minimize potential environmental impacts;
- Document the process in a Project File Report (PFR);
- Issue a Notice of Completion followed by a 30-day review period; and

- Address and final comments and conclude the Class EA process.

Consultation is a key component of the Class EA process as it allows members of the public, Indigenous communities, and review agencies opportunity to provide relevant information and feedback for consideration.

1.3 Objective of This Report

The objective of this report is to document the Class EA, Schedule B, planning process. This report identifies the deficiencies affecting the project study area; the Problem/Opportunity Statement to be addressed; and the existing conditions based on review of background documents and desk-top research. This information was used to identify the alternative solutions to be considered as well as criteria to evaluate these alternatives in Phase 2 of the Class EA process to demonstrate the decision-making process leading to the selection of the preferred solution. Decision-making criteria includes impacts on technical environment, natural environment, cultural and social environment and economic environment.

1.4 Previous Reports

Throughout this assessment background documents were reviewed to gain further knowledge on the existing conditions and make use of previous studies and assessment that have been conducted. A list of the reviewed background documents is contained herein.

- Official Plan of the Town of Hanover (2014)
- Drinking Water Works Permit 085-201 Issue No. 3 (2016)
- 7th Avenue Water Tower Inspection (Landmark, 2021)
- Uncommitted Reserve Hydraulic Capacity (as of December 21, 2022)
- Official Plan of the County of Grey (2019)
- Grey County Growth Management Strategy Growth Forecasts to 2046 (Hemson, 2021)
- Town of Hanover Potential Growth Areas Memorandum (Meridian, 2021)
- Town of Hanover Local Growth Strategy Review Municipal Servicing Needs Assessment, Potential Expansion Areas, Technical Memorandum (GM BluePlan/Meridian, 2021)
- Town of Hanover Local Growth Strategy Review Municipal Servicing Needs Assessment, Special Policy Areas, Technical Memorandum (GM BluePlan/Meridian, 2021)
- Investing in Canada Infrastructure Program Application with Supporting Documentation (2021)

Copies of the following documents referenced in this Project File Document are provided in **Appendix A**:

- Grey County Growth Management Strategy Growth Forecasts to 2046 (Hemson, 2021)
- Town of Hanover Local Growth Strategy Review Municipal Servicing Needs Assessment, Potential Expansion Areas, Technical Memorandum (GM BluePlan/Meridian, 2021)
- Town of Hanover Local Growth Strategy Review Municipal Servicing Needs Assessment, Special Policy Areas, Technical Memorandum (GM BluePlan/Meridian, 2021)

1.5 Project Team

The project team involved in the completion of this Schedule 'B' Class EA includes the following:

Proponent:	Town of Hanover
Prime Consultant:	Ainley Group
Sub-Consultants:	Cambium Indigenous Professional Services, Archaeological Services Inc, Englobe Corp.

2 Planning Policy and This Class EA

This section provides a brief discussion of various land use planning policies and principles to illustrate the consistency of this project in relation to provincial, regional and municipal planning goals.

2.1 Provincial Policy Statement (2020)

The *Provincial Policy Statement (2020)* provides policy direction relating to land use planning and development in Ontario. Section 3 of the *Planning Act* stipulates that all decisions affecting planning matters are to be consistent with the *Provincial Policy Statement (PPS)*. Policies applicable to this project include the following:

- Section 1.1.1e) "Healthy, livable and safe communities are sustained by promoting the integration of land use planning, growth management, transit-supportive development, intensification and infrastructure planning to achieve cost-effective development patterns, optimization of transit investments, and standards to minimize land consumption and servicing costs."
- Section 1.6.1 "Infrastructure and public service facilities shall be provided in an efficient manner that prepares for the impacts of a changing climate while accommodating projected needs."
- Section 1.6.6.2 "Municipal sewage services and municipal water services are the preferred form of servicing for settlement areas to support protection of the environment and minimize potential risks to human health and safety. Within settlement areas with existing municipal sewage services and municipal water services, intensification and redevelopment shall be promoted wherever feasible to optimize the use of the services."
- Section 2.1.1 "Natural features and areas shall be protected for the long term."
- Section 2.6.1 "Significant built heritage resources and significant cultural heritage landscapes shall be conserved."

As the current project is following a Municipal Class Environmental Assessment process consideration is being given to the potential to impact the physical, natural, social, and economic environment prior to selection of the preferred solution. Various studies have been completed to obtain a better understanding of the existing conditions of the study area so that impacts can be properly assessed and appropriate mitigation developed.

2.2 Safe Drinking Water Act (2002)

The *Safe Drinking Water Act, 2002* (SDWA) and the *Drinking Water System Regulation* (O. Reg. 170/03 as amended) regulate the treatment and distribution of drinking water matters, including the control and regulation of drinking water systems. Requirements for all the water systems within treatment and testing processes are specified under *the Drinking Water Systems Regulation (O. Reg. 170/03 as amended).*

2.3 Clean Water Act (2006)

The purpose of the *Clean Water Act ,2006 (CWA)* is to provide protection of municipal drinking water at the source and to safeguard human health and the environment. It aims to protect existing drinking and future drinking water sources. The CWA and its regulations ensure that municipal drinking water supplies such as the groundwater wells and the surface water intake at the Hanover water treatment plant are protected through the development of watershed-based source protection plans. The source protection plans identify vulnerable areas within each municipality and provide policies to address existing and future risks to municipal drinking water sources.

2.4 Town of Hanover Official Plan (2014)

At the municipal level, provincial policy is implemented through the Town of Hanover Official Plan (OP).

The purpose of the OP is to provide a long-term strategy for managing growth and development within the Town of Hanover within the planning horizon of the County of Grey Official Plan. The goals, objectives and policies contained in the OP are intended to guide the decisions of the public authorities and private interests in order to maintain livable and attractive communities.

No public work shall be undertaken and no By-law shall be passed for any purpose that does not conform to this OP.

Municipal servicing policies are identified based on the goal of providing adequate and sufficient systems of water supply and sanitary sewerage disposal to all areas of development in the municipality through extensions and/or improvements to the existing piped systems in accordance with availability of uncommitted capacity.

2.5 Climate Change (2017)

The MECP document entitled "Considering Climate Change in the Environmental Assessment Process" (2017) provides guidance relating to the Ministry's expectations for considering climate change during the environmental assessment process. The Guide is now a part of the Environmental Assessment Program's Guides and Codes of Practice. The environmental assessment of proposed undertakings is to consider how a project might impact climate change and how climate change may impact a project.

3 Phase 1 – Problem or Opportunity

3.1 Problem/Opportunity Statement

The purpose of Phase 1 of the Class EA process is to develop a problem/opportunity statement that clearly identifies the issue, challenge, or opportunity that is being reviewed and addressed.

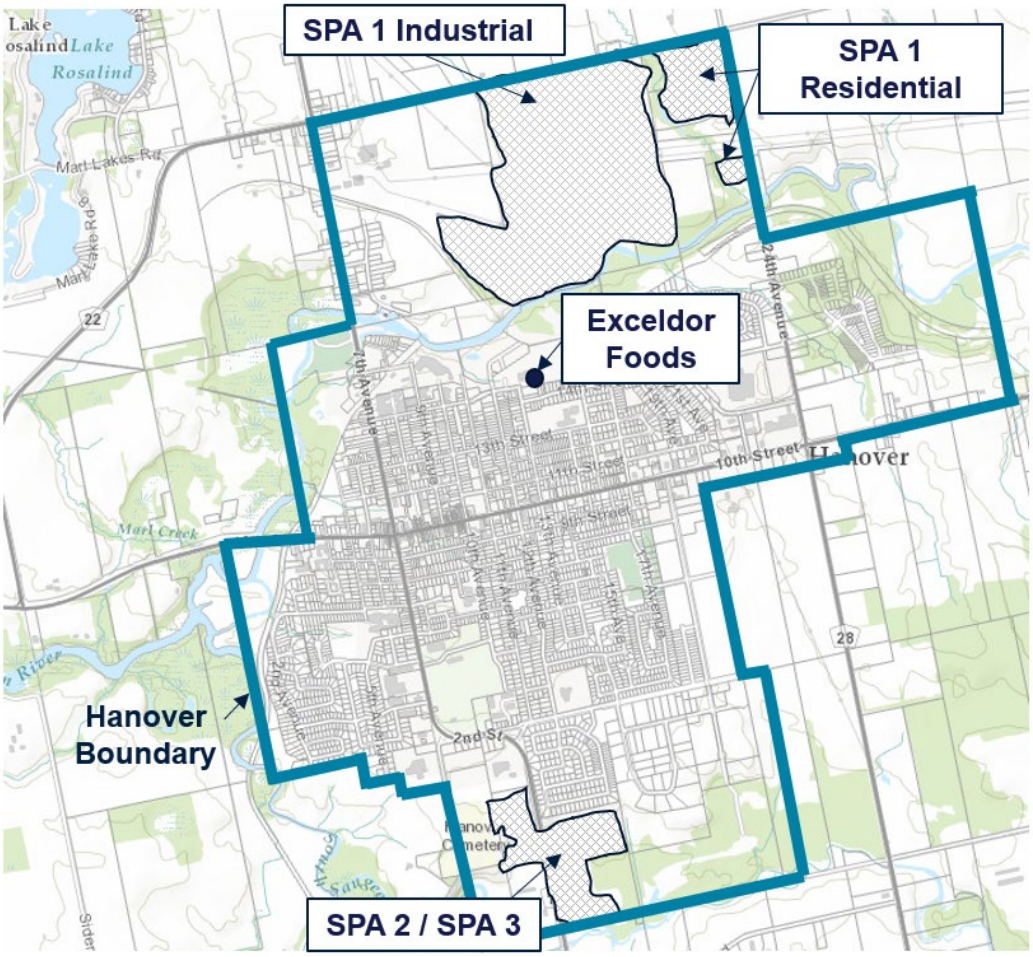
The problem/opportunity statement that has been developed for the replacement of the 7th Avenue Water Tower is as follows:

> "Identify and develop a preferred solution for a new water tower to replace the existing 7th Avenue Water Tower to improve water demand supply security and service new growth in the Town of Hanover."

3.2 Study Area

The Town of Hanover is located in the southwestern part of the County of Grey, bordering the County of Bruce. Hanover is west of Durham and east of Walkerton on Grey/Bruce Road 4. With a population of 8,450 (County of Grey Growth Management Strategy, Growth Forecasts to 2046, July 14, 2021) Hanover is a dominant urban commercial centre for the immediate, surrounding area where 40,000 people live within a 30-minute drive. The Town's business sector comprises 500 predominantly small and medium business enterprises which provide retail, financial, heath, educational and recreational and entertainment services. The existing water tower to be replaced is found at 140 7th Avenue towards the south end of the Town. The existing land use within the study area is urban.

Figure 3: Study Area



Background map source: Grey County Online GIS

3.3 Existing Water System Infrastructure

3.3.1 Existing Water Supply and Treatment System

The Town of Hanover Drinking Water System obtains raw water from two well supplies - groundwater under the direct influence of surface water (GUDI) and Ruhl Lake (surface water source) - with a common 15,405 m^3/d treatment facility located at 36 Airport Road consisting of chemically assisted filtration, primary disinfection using UV disinfection and secondary disinfection using chlorination, and high lift pumping to the distribution system. Upgrades are needed at the plant to reliably achieve the full approved capacity due to existing well pump capacity limitations and seasonal Ruhl Lake turbidity issues, as well as a lack of UV reactor redundancy. The effective capacity without these upgrades is approximately 8,700 m^3/d; however, the Town will complete the work as operational upgrades and therefore planning for growth can proceed based on a plant capacity of 15,405 m^3/d.

The water supply works are operated and maintained by the Town.

3.3.2 Existing Water Distribution System

The water distribution system consists of approximately 55 km of watermains comprised of approximately 880 individual pipes ranging in size from 100mm to 400mm. Over 30% of the watermains are more than 50 years old and approximately 30% of the pipes are cast iron or asbestos cement.

3.3.3 Existing Water Storage

Existing water storage is provided by two elevated storage tanks:

- 941 m^3 elevated storage tank at 140 7th Avenue
- 3,507 m^3 elevated storage tank at 710 14th Street

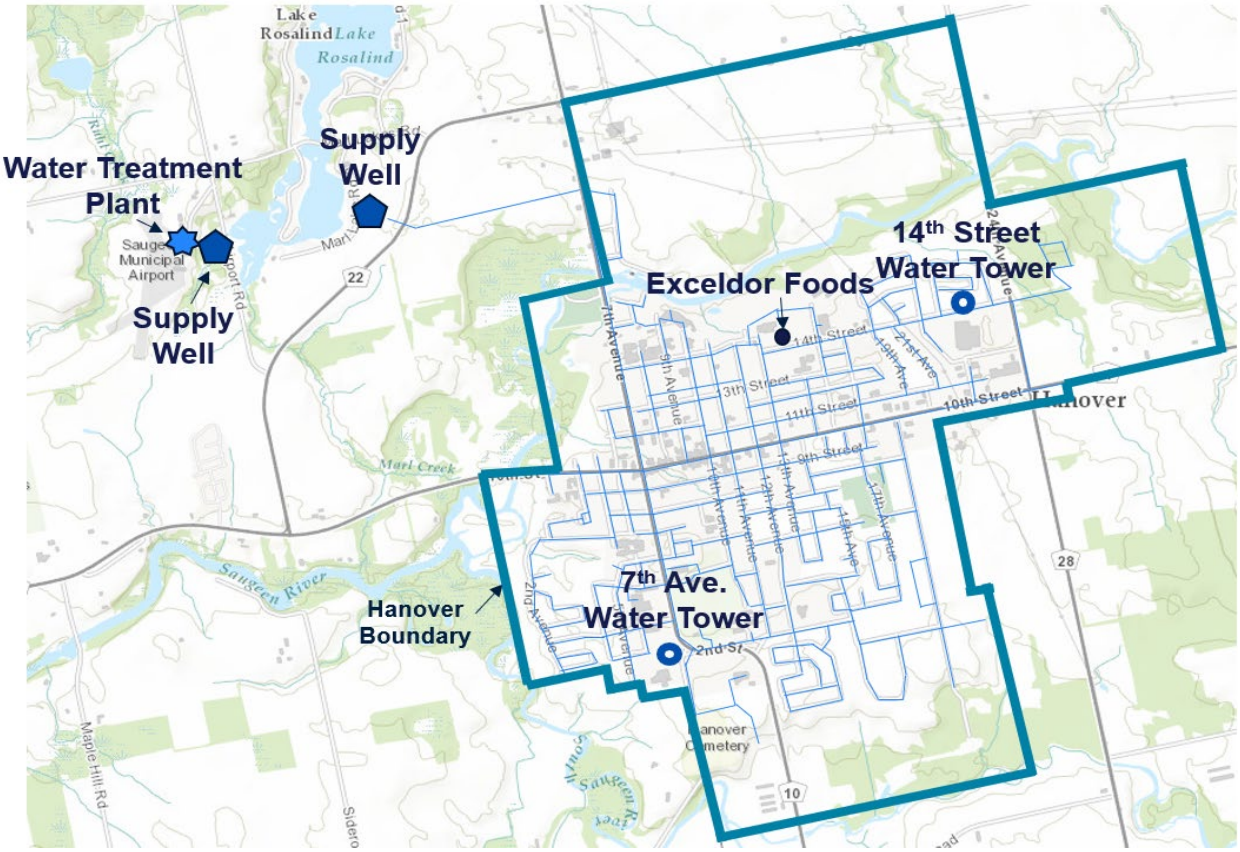
Under MECP guidelines, system pressures must be maintained at greater than 140 kPa (20 psi) to prevent a boil water advisory. Under current normal conditions, system operating pressures drop to less than 140 kPa in some locations when the tanks are still 45% full, bringing the maximum usable combined volume of the two tanks under normal operating conditions to 2,425 m^3. The situation is exacerbated even further under current fire flow conditions, where system pressures drop to less than 140 kPa when the tanks are still 60% full, bringing the usable combined volume of the two tanks under this condition to 1,795 m^3.

In addition, MECP guidelines recommend that system pressures under normal operations be maintained at 350 – 480 kPa (50 – 70 psi). Currently the system operates within the 310 – 515 kPa range (45 – 75 psi), which is generally within the recommended range; however, the tanks must be approximately 75% full to maintain this condition, bringing the usable combined volume to 1,125 m^3.

The water distribution system and storage reservoirs are operated and maintained by the Town.

The existing water system infrastructure is illustrated in Figure 4.

Figure 4: Existing Water System Infrastructure



Background map source: Grey County Online GIS

3.4 Growth Projections

Growth forecasts for Hanover as provided in the July 14, 2021 County of Grey Growth Management Strategy Update (Hemson), are shown in Table 1.

Growth forecasts for Hanover as provided in the July 14, 2021 County of Grey Growth Management Strategy Update (Hemson), are shown in Table 1.

Table 1: Town of Hanover Growth Projections

Projection Type		Quantity
Population	2021 Population	8,450
	2046 Population	11,870
	2021-2046 Population Growth	**3,420 (~1.5% per year)**
Household Units	2021 Households	3,650
	2046 Households	5,350
	2021 – 2046 Household Growth	**1,700 (~68 per year)**
Employment Forecast	2021 Jobs	5,120
	2046 Jobs	6,590
	2021 – 2046 Job Growth	**1,470**

The May 2021 Local Growth Strategy Review, Municipal Servicing Needs Assessment, Special Policy Areas, Technical Memorandum (GM BluePlan/Meridian) provided a high-level persons per unit (PPU) estimate of 2.0 to 3.0. Based on the growth projections in Hemson's Growth Management Strategy Update, the PPU for Hanover is estimated at 2.2 to 2.3. A PPU of 2.25 is assumed for all calculations in this report. This is an average PPU for all types of units (single/ semi, row and apartment as well as seasonal).

The actual 2021 population as provided by the Statistics Canada census was 7,967 and as documented in the July 26, 2023 Progress Meeting minutes (see **Appendix B**) the Town stipulated that the 2021 census population be used rather than the Hemson 2021 forecast of 8,450. Using the 2021 census population and assuming the growth rate as given in the Hemson report results in a forecast 2046 population of 7,967 + 3,420 = 11,387. Similarly, the 2021 census indicated there were 3,445 households in Hanover and this has been used rather than the original Hemson forecast. This results in a 2046 forecast of 3,445 + 1,700 = 5,145 households. These updated numbers are summarized in the table below.

Table 2: Growth Projections using Statistics Canada 2021 Data

Projection Type		Quantity
Population	2021 Population	7,967
	2046 Population	11,387
	2021-2046 Population Growth	**3,420 (~1.5% per year)**
Household Units	2021 Households	3,445
	2046 Households	5,145
	2021-2046 Household Growth	**1,700 (~68 per year)**

1. These values are assuming full build-out, which include Potential Expansion Areas outside of the Town of Hanover boundaries i.e., outside of the Study Area

3.4.1 Intensification of Existing Built-up Area

Of the 1,700 new household units from 2021 to 2046, 15% (255) are intended to be developed through intensification of the existing built-up area.

3.4.2 Special Policy Areas

The Town has designated three Special Policy Areas within its current boundaries for residential and non-residential growth. A fourth SPA area (SP4) will be designated Electrical Utilities (Hydro Electric Transmission Facilities) land, which are not developable.

Special Policy Areas 1, 2 and 3 are shown in Figure 3 and include:

- Special Area 1 (north of Saugeen River) — Industrial – 83 ha; Residential – 14.3 ha
- Special Areas 2 and 3 (at the south limit of Town): — Industrial – 10.1 ha; Residential – 7.3 ha

An industrial target density of 12 jobs/ha is assumed as outlined in the Town of Hanover Employment Land Needs, 2021 to 2046. Therefore, the Special Policy Areas can accommodate:

- Special Area 1: 996 jobs
- Special Areas 2 and 3: 121 jobs

The jobs within the Study Area (existing Town boundaries) will increase by 1,117 from the current 5,120 to 6,237 by 2046. The water storage needs of these jobs, i.e., 93.1 ha of industrial lands, must be accommodated by the 14th Street water tower and replacement 7th Avenue water storage facility.

A residential target density of 25 units per hectare is assumed as outlined in the Town's Official Plan Amendment (OPA) 3. Therefore, the Special Policy Areas can accommodate:

- Special Area 1: 358 residential units
- Special Areas 2 and 3: 182 residential units

Including intensification of the existing built-up area, the residential units within the Study Area (existing Town boundaries) will increase by 795 from the current 3,445 units to 4,240 by 2046. It is this number of households (4,240) that will be used going forward for calculations in this report. The water storage needs of these household units must also be accommodated by the 14th Street water tower and replacement 7th Avenue water storage facility.

3.4.3 Potential Expansion Areas

The existing Town boundaries cannot accommodate all the Town's growth to 2046. Based on Table 2, there will be a shortfall of 353 jobs (equivalent to 29.4 ha of industrial land) and 905 residential units (36.2 ha of residential land).

The May 2021 Local Growth Strategy Review, Municipal Servicing Needs Assessment, Potential Expansion Areas, Technical Memorandum (GM BluePlan/Meridian) provided a high-level review of Potential Expansion Areas outside the Town boundaries and identified 474 ha of developable land in four Potential Expansion Areas, sufficient to accommodate growth in Hanover well beyond the 2046 planning horizon. The report concluded that "ultimate buildout of Potential Expansion Area 1 or Potential Expansion Areas 2 and/or 3 will require significant water, wastewater and roads infrastructure upgrades". However, servicing of Potential Expansion Area 4 was identified as generally able to be accomplished with connections to the existing system.

Potential Expansion Area 4 is located to the south and west of Hanover and directly to the south of the Hanover & District Hospital. Both 2nd Avenue and 5th Avenue end at the northern boundary of Area 4. The western boundary of Area 4 is the Hanover Community Trail. A significant portion of Area 4 is within a floodplain and only the tableland portion is potentially available for development. The net land area potentially available for development is about 13 hectares. The Meridian Planning Memo indicated that "given the small size and location of Area 4, it is assumed that it would be used for residential purposes only" and they estimated the population that could be accommodated within this area to be 634.

The scope of this Project File document is confined to the Study Area (existing Town boundaries) and therefore the existing and future household units and industrial areas contained therein. Water system requirements including storage for the Potential Expansion Areas will be accommodated by future additional infrastructure as needed. It is recognized that development of Potential Expansion Area 4 is likely to occur before the full build-out timeframe and thus will be serviced by the new 7th Avenue water tower. The only difference this will make is that the amount of storage allocated for fire storage will be somewhat reduced but, as discussed in Section 3.6, there are alternate ways of accommodating this scenario.

3.5 Future Water Demand

Water supply and treatment rated capacity is based on maximum day demand (MDD), i.e., the highest demand in a single day. The 2017 – 2021 water treatment plant records show the following annual MDDs:

Table 3: Hanover WTP MDD

Year	MDD (m^3/d)
2017	5,655
2018	6,668
2019	5,675
2020	6,437
2021	6,890

The highest 5-year MDD of 6,890 m^3/d was recorded in 2021. As this does not appear to be an anomaly (similar MDDs were recorded in 2018 and 2020) 6,890 m^3/d is taken as the existing MDD.

The MDD is a combination of both the residential MDD plus industrial MDD. The main industrial user is Exceldor Foods, which has a 95,000 sq ft facility where they produce Butterball branded turkeys and turkey products. Exceldor Foods only operates 5 days per week and thus demands are much lower on weekends when Exceldor is not in operation.

The split between residential and industrial MDDs can be calculated by using the 5-year average daily demand (ADD) for Exceldor Foods and the ADD for residential users, to which the derived Maximum Day Factor is applied. Details as to these calculations can be found in **Appendix C**.

The resulting MDD in the Study Area (within Town boundaries) in 2046 is estimated to be 10,120 m^3/d. A summary of current (2021) and future (2046) demands are shown in Table 4.

Table 4: Hanover Design Demands

Type	2021	2046
Residential	3,915 m^3/d	4,817 m^3/d
Industrial	2,975 m^3/d	5,303 m^3/d
MDD	**6,890 m^3/d**	**10,120 m^3/d**

3.6 Future Demand on Water System (Supply & Treatment, Distribution & Storage)

3.6.1 Water Supply and Treatment

The water treatment plant rated capacity of 15,405 m^3/d significantly exceeds the estimated 2046 demands in the Study area; therefore, no expansion of the plant is required to service the Study Area.

3.6.2 Water Distribution

The May 2021 Local Growth Strategy Review, Municipal Servicing Needs Assessment, Special Policy Areas, Technical Memorandum (GM BluePlan/Meridian) provided the following high-level assessment of water distribution system extensions to service the Special Policy Areas:

- Special Policy Area 1 servicing via a 350mm transmission/trunk main extension of the existing 7th Avenue watermain to County Road 28 (north) and a 300mm transmission/trunk on 24th Avenue/County Road 28 (east) from 14th Street to County Road 28 (north), connected by transmission main on County Road 28 (north) to provide looping.
- Special Policy Areas 2 and 3 servicing via connections to the existing 150mm watermain north of the cemetery and/or the existing 250mm watermain through the 14th Avenue Industrial Area.

The Town plans to undertake a Master Servicing Plan (MSP) to more fully develop servicing and connection options.

The MSP analysis will also identify constraints and bottlenecks within the existing watermain network and recommend upgrades to improve pressures, including replacement of aging pipes. Ground elevations throughout the existing service area range from 270m to 290m and system pressures under normal operating conditions range from 310 – 515 kPA. Ground elevations in Special Policy Area 1 range from 275m to 285m and from 267m to 275m in Special Policy Areas 2 & 3, generally close to the existing area range; therefore, system pressures under normal operating conditions will be similar (slightly less due to increased flows).

3.6.3 Water Storage

The Ministry of Environment, Culture and Parks (MECP) guidelines recommend storage capacity based on the following formula:

Equation 1: Storage Capacity Formula

$$\text{Storage} = A + B + C$$

Where:

A = Fire Storage

B = Equalization Storage – 25% of MDD

C = Emergency Storage – 25% of (A + B)

3.6.3.1 Fire Storage

Fire protection is a municipal responsibility and there are several means for determining the requirements, including methods outlined in the Fire Underwriters Survey and Ontario Building Code. The municipality may also choose to forgo fire protection by way of the drinking-water distribution system altogether. Historically, small municipalities in Ontario have used the MECP guidelines to calculate fire flows for the residential population. Using this method and assuming a 2046 population of approximately 10,000, the fire flow would be 189 L/s for 3 hours, representing fire storage (A) of 2,041 m^3. Details of fire flow calculations and a copy of the MECP table used are provided in **Appendix C**.

It is important to also consider the fire flow requirements for commercial, institutional and industrial users such as schools, shopping plazas and processing plants like Exceldor Foods. These fire flow requirements could exceed the general fire flows calculated by population; and therefore, become governing. Since it is a large 95,000 sq ft facility without a sprinkler system, Exceldor Foods can be reasonably assumed to require greater fire flows than any new industry.

Two other existing industrial facilities were also considered – Edgewell Personal Care, as it appears to be larger than Exceldor in total area, and P&H Milling, which produces flour dust that can become combustible. It was ascertained that both of these facilities are fully sprinklered and thus their required fire flows will be substantially less than that of Exceldor. In general, depending on the particular method used, a sprinklered building's fire flow requirement is anywhere from 0.25 to 0.5 that of the same building without sprinklers.

The fire flow requirement for Exceldor Foods of 284 L/s for 4 hours results in a required fire storage (A) of 4,090 m^3. As this is greater than the 2,041 m^3 residential fire flow calculated by population and the MECP guidelines, the industrial fire flow becomes the defining requirement.

3.6.3.2 Total Storage

Using the MECP formula for storage capacity results in a total required storage (A+B+C) of 8,275 m^3.

The nominal capacity of the 14th Street water tower is 3,507 m^3. Replacing the 7th Avenue water tower with a 4,768 m^3 tower would theoretically provide sufficient storage for the Study Area. However, as previously noted in the Section 3.3.3 discussion on existing storage, system constraints effectively limit the usable volume to about 25% of the nominal capacity. Furthermore, the Town has experienced significant system deficiencies when the 3,507 m^3 14th Street water tower is out of service due to maintenance. There are no similar deficiencies when the smaller 941 m^3 7th Avenue water tower is out of service. In addition, there is significant risk if an emergency such as a fire coincides with the 14th Street water tower being out of service.

Therefore, the Town requires the storage that replaces the 7th Avenue water tower to be equal to or greater than the 3,507 m^3 storage in the 14th Street water tower.

Potential ways to address or partly address the pressure and usable volume issues and thereby allow the system to operate within the MECP's recommended design range include:

- Raising the height of the replacement tower; in combination with the additional storage to provide more effective usable volume in the replacement tower, this would mitigate the usable volume problem for the existing 14th Street water tower. An altitude valve would be required due to the different tower elevations.
- Providing one or more booster pumping stations within the system to increase pressures when needed, resulting in the creation of an additional pressure zone(s).

The scope of this study does not include distribution system improvements (e.g., watermain replacements/looping) or booster pumping stations. The storage tank requirements will be determined based on a static (no flow) condition such that MECP low- and high- pressure guidelines are optimized throughout the system at the static condition.

It is recommended that a water model analysis be conducted to identify and resolve any bottlenecks and constraints within the distribution system.

3.6.3.3 Alternate Scenarios for Fire Storage

Given that the Total Storage is so greatly impacted by fire flow and, in this case, the industrial fire flow as dictated by Exceldor's requirements, it is worth investigating alternative scenarios.

According to the National Fire Protection Association (NFPA), a sprinkler system would reduce Exceldor's fire storage requirements to 1,023 m^3, and then the residential fire storage requirement of 2,041 m^3 would be governing. This would result in a required Total Storage of 5,714 m^3 and the 3,507 m^3 minimum tank size would be sufficient.

Alternatively, should Exceldor be unable to install a sprinkler system, a simple reduction in their fire flow duration from the existing 4 hours down to 3 hours would again result in a 3,507 m^3 tank size to be sufficient. Given that there is a water source nearby, a practicable solution would be to supply fire flow from storage for 3 hours and then via pumper truck for the subsequent hour, if required. Calculation details for the two alternate scenarios can be found in **Appendix C**.

It should be noted that this is also the approach that would be taken should Potential Expansion Area 4 be developed, which would increase the total MDD. Any reduction in industrial fire flow that would ensue can be accommodated by reducing the fire flow duration and then make up the difference via use of pumper trucks, if required.

4 Phase 2 – Alternative Solutions

4.1 Long List of Alternative Solutions and Sites

4.1.1 Preliminary Screening Criteria

As part of Phase 2 of the Class EA process, several alternatives and alternative sites have been developed to address the problem/opportunity statement. A preliminary screening was conducted to eliminate alternatives that do not meet the basic criteria below.

- Screening Criteria No. 1 – Does the alternative meet the problem/opportunity statement?
- Screening Criteria No. 2 – Does the alternative meet the minimum technical requirements?
- Screening Criteria No. 3 - Can the alternative be implemented without facing significant impacts that mitigation measures could not address?

A long list of alternative solutions was considered to address the problem/opportunity statement, classified as:

- General Alternatives
- Water Storage Alternatives
- Site Alternatives

4.1.2 General Alternatives

The existing water storage facilities cannot reliably provide fire flows with adequate system pressure to the existing population (when the 14th Street water tower is out of service for maintenance) and there is insufficient storage capacity to allow future population growth to be accommodated. A list of alternatives was developed and evaluated based on established criteria. The following two general alternatives were also identified and evaluated:

- Do nothing
- Limit/manage growth

4.1.2.1 Do Nothing

The Project File Report must effectively deal with all aspects of the problem statement. The "Do Nothing" alternative does not provide any additional capacity to Hanover's water storage nor does it address the existing fire flow and system pressures deficit. The "Do Nothing" alternative was therefore considered not viable and was screened out of the detailed comparative assessment. It was nevertheless considered throughout the evaluation and reviewed as a benchmark to gauge the potential impacts of the other alternatives being considered.

4.1.2.2 Limit/Manage Growth

An objective of this Class EA is to enhance municipal services due to population growth and this alternative is in conflict this objective. Additionally, placing a limit on growth does nothing to address the existing fire flow and system pressure issues. For this reason, the "Limit/Manage Growth" alternative was screened out of the detailed comparative assessment.

4.1.3 Water Storage Alternatives

4.1.3.1 Identification of Water Storage Types

The two main types of municipal water storage include floating (elevated) and pumped storage. Pumped storage consists of a reservoir that can be located above ground, in-ground or partially in-ground and a pumping station. Common elevated tanks are elevated steel tanks, composite tanks and standpipes.

4.1.3.2 Pumped Water Storage

Pumped water storage consists of a concrete reservoir, which can be made up of multiple cells, and a pumping station. This type of storage allows for staged construction and is less visible to the public. All three types of pumping options allow for similar function however, in-ground water storage allows for the land to be used for additional purposes making it the ideal type of pumped storage.

Pumped storage is generally not as visibly imposing and can potentially be phased resulting in the deferral of some initial costs. However, there are high yearly hydro costs incurred due to necessary pumping. Also, the operational security/reliability of standby power (diesel or natural gas generator) is required. As such, noise and air emissions may be factors to be mitigated and overall operations and maintenance are more complex and costly. In addition, the land requirements are significantly greater. For these reasons this alternative was not short-listed for further evaluation.

4.1.3.3 Elevated Storage (Water Tower)

Elevated tanks provide water at or above the required system pressure. Elevated tanks generally have higher upfront capital costs; however, no pumping is necessary, reducing annual operation and maintenance costs.

There are several types of elevated storage:

- Spheroid
- Multi-column
- Composite
- Composite glass-lined

Figure 5: Types of Elevated Storage

Spheroid	Multi-Column	Composite	Composite Glass-Lined
			

4.1.3.3.1 Spheroid

Spheroid elevated storage consists of an elevated spherical water storage tank supported by a single circular support pedestal with a flared conical base. They have a relatively small base and the design allows for a reduced surface area when compared to other elevated storage options. However, their small support pedestal does not allow for interior access. In addition, the parameters under which spheroid water towers are generally more cost-effective are limited and therefore there are currently no local manufacturers of this type of elevated storage. Therefore, spheroid elevated storage has been eliminated a viable option.

4.1.3.4 Multi-Column

Multi-column elevated storage is a traditional design that has been used for over 100 years. It consists of an elevated water storage tank that is supported by a series of support columns and cross braces. This type of storage has no interior to the support braces resulting in exterior access to the tower, which most new designs have eliminated. While capital costs are still competitive for elevated storage less than 4,000 m^3, the aesthetics, safety issues associated with exterior access and extra maintenance requirements and costs involved with scheduled recoating of the steel support columns in addition to the steel reservoir make this option less desirable than the composite and composite glass-lined alternatives. Therefore, multi-column storage has been eliminated as a viable option.

4.1.3.5 Composite

Composite elevated water storage is a more modern design, comprised of an elevated water storage tank supported by a large diameter steel-reinforced concrete support tower that extends vertically from a steel-reinforced concrete foundation. This style of elevated storage is the most common and typically economical because the design utilizes the valuable strength characteristics of each material. Maintenance costs are also reduced when compared to other traditional types of storage because only the tank portion of the tower requires coating. This style of tank has a life expectancy of 80 years.

Composite elevated tanks require repainting of both the inside and outside of the tank on a 20 year basis. At 20 years and 60 years no paint removal is necessary. The coating is placed on top of the existing coating of the tank. At 40 years a full removal and recoating of the tank is

required. The costs of repainting are high; however with new technologies and coating materials the cost of repainting has been reduced in recent years. Some cost reduction techniques include using newer coatings that are easier to remove and non-scafolding techniques during recoating.

This was considered a viable option and was short-listed for further evaluation.

4.1.3.6 Composite Glass-Lined

The newest type of elevated storage that is being used for municipal potable water storage is a glass-lined bolted tank. This type of tank is composed of a bolted steel tank with factory applied glass-fused-to-steel coating. This type of construction has the least maintenance because it never requires repainting and requires minimal upkeep over its service life (replacement of cathode protection bars). If the tank does become damaged individual panels can be replaced which additionally reduces maintenance costs. This type of tank has a reduced construction time because the tank is constructed of factory-coated panels that do not require on site welding. A top-down construction approach of the tank allows for it to be constructed in remote and environmentally sensitive areas.

Glass-lined elevated water tanks are a newer form of construction. There are currently no specific standards developed for this style of elevated tank. A combination of standards is being used which may not completely cover all aspects of the product. Since these tanks are a newer form of construction the estimated life expectancy varies between different manufacturers and there is not a sufficient database to establish an industry-wide standard. In general research suggests that the bolted design reduces the life span of this type of elevated tank to approximately 40 years. At approximately 40 years, the glass lined panels can be replaced on the same pedestal which would result in a large cost to be incurred by the Town. This style of tank is also more susceptible to damage caused by seismic activity, wind and ice due to the bolted construction when compared to welded tanks. Glass lined bolted tanks are accessed from the outside which creates additional risks when compared to traditional composite tanks that are accessed through the interior of the pedestal. The structural design of a glass lined elevated tank does not allow for interior access.

Composite elevated glass lined tanks are similar to traditional composite elevated tanks with a steel-reinforced concrete support tower and foundation; however, instead of a traditional steel water storage tank; a glass-lined tank is used. Due to the materials used in this style of construction, glass lined elevated tank panels are less versatile than traditional welded panels, resulting in the need for a larger diameter pedestal. Most installations also require a "double-column" for support due to the wider base of the steel tank. At 2,500 m^3 capacity the glass lined tank starts losing efficiency and at this size a divergence in cost compared to the composite elevated tank begins to become significant.

This was considered a viable option and was short-listed for further evaluation.

4.1.3.7 Standpipe

The standpipe combines functions of both elevated and in-ground storage. The standpipe is a steel or concrete cylindrical storage option which is partially gravity fed. The water below the required system pressure is unusable without the addition of a pumping station. Since the introduction of concrete pedestals for elevated steel tanks, few standpipe designs have been seen as cost effective. The disadvantages of this option combine those of both in-ground and elevated storage.

Due to the vast disadvantages associated with this type of storage the standpipe was not considered a viable option.

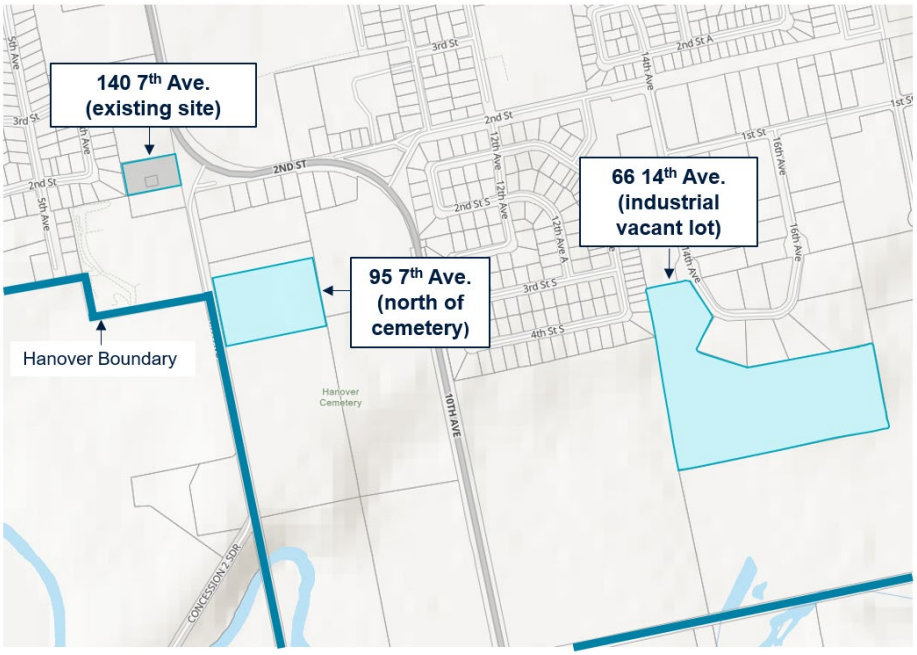
4.1.4 Site Alternatives

It is estimated that a minimum 0.5 ha site is required to accommodate an elevated water storage tank. Three alternative sites were identified for the potential construction of a new water tower to replace the 7th Avenue water tower:

- 140 7th Avenue - existing site
- 95 7th Avenue - adjacent to/north of cemetery
- 66 14th Avenue - industrial vacant lot

An overall plan showing each alternative site is provided in Figure 6.

Figure 6: Overall Plan of Alternative Sites



Background map source: Grey County Online GIS

4.1.4.1 140 7th Avenue (Existing Site)

The existing site is zoned as an Institutional property. Due to the limited site size (0.60 ha), constructing the new water elevated tank on the same site would first require the existing tower be taken out of service and demolished. This would remove a key component of an already stressed water system while the new tower is being constructed, further reducing the security and reliability of the water system in the short term. Although this is not an insurmountable challenge, there would be significant cost and schedule implications to proceed with this alternative.

Since there are alternative available sites of sufficient size without this constraint, this site was eliminated from further consideration.

4.1.4.2 95 7th Avenue (Adjacent to/North of Cemetery)

This site is close to the existing site and has ample room to construct a new water tower. The total property was 9.49 ha but this is reduced by a small portion sold to the new nursing home at the north end of the site and much of the remaining area being used for other purposes (i.e., the cemetery proper). It is estimated that approximately 2.7 ha is available upon which to situate the new water tower. Like the existing site, it is zoned as Future Development, Institutional property. The existing 7th Avenue water tower could remain in operation during construction of a new water tower on this site.

This site was considered a viable option and was short-listed for further evaluation.

4.1.4.3 66 14th Avenue (Vacant Land south of Public Works Yard)

This site is located further east of the existing site but still in the southerly area of the Town. It has sufficient room to construct a new water tower (8.4 ha). It is zoned as a Future Development, Restricted Industrial, Residential One/Three property. The existing 7th Avenue water tower could remain in operation during construction of a new water tower on this site. Although there is an existing trunk storm sewer to the east of the Public Works workshop that runs through the site there is still sufficient room for the water tower to be located in the southeast section of the lot. This site was considered a viable option and was short-listed for further evaluation.

4.2 Short List of Alternative Solutions and Sites

4.2.1 Short-Listed Alternative Solutions

The short-listed alternative solutions carried forward for further evaluation were:

- Alternative 1 – Composite Elevated Storage
- Alternative 2 – Composite Glass-Lined Elevated Storage

4.2.2 Short-Listed Alternative Sites

The short-listed alternative sites carried forward for further evaluation were:

- Site 1 – 95 7th Avenue (Adjacent to/North of Cemetery)
- Site 2 – 66 14th Avenue (Vacant Land south of Public Works Yard)

Copies of the Property Reports for these two sites can be found in **Appendix D.**

4.3 Evaluation of Alternative Elevated Tank Solutions

Both alternatives offer unique design characteristics able to provide the necessary storage. Alternative 1 provides the current most frequently implemented option while Alternative 2 provides a more recent product which potentially eliminates the need to periodically inspect and restore the protective coating.

4.3.1.1 Elevated Water Storage Alternatives Cost Comparison

Capital costs and operation and maintenance costs were estimated over an 80-year life span of both elevated storage tank alternatives. An 80-year life span was used in the analysis as it represents the longest lifespan of the two alternatives. Estimates are based on quotes provided by industry manufacturers of composite welded and glass lined tanks. Additional operation and

maintenance costs not included by the manufacturers were calculated based on similar, recently completed projects. A summary of the analysis is provided in Table 5 and the budgetary quotes are provided in **Appendix E**.

Table 5: Cost Comparison of Elevated Storage Alternatives

Population	Alternative 1 Composite	Alternative 2 Glass-Lined
Capital Cost[1, 2]	$8,350,000	>$10,000,000
Operation and Maintenance Costs	$1,050,000	$1,100,000
Major Maintenance Costs[2]	$4,800,000	$7,000,000
Total Cost (2023$)	**$14,200,000**	**>$18,100,000**

1. The capital cost includes just the cost of the water tower. Additional costs may result if additional features (not included in the price) are included with the water tower construction.
2. Costs were provided by Landmark Structures. The quotes provided are included in **Appendix E**.

The capital costs represent the upfront costs including tank construction and engineering costs. As previously noted in Section 4.1.3.6, the capital cost of the glass lined tank starts to increase dramatically over that of the composite tank once the size exceeds 2,500 m^3. In this particular case of a 3,507 m^3 tank, Landmark (the supplier) indicated that the tank itself for the glass lined option would be at least $1M greater than that of the composite tank. This does not include any engineering costs. After discussion with the Town of Hanover, it was agreed that the high-level cost estimate provided by Landmark for the glass-lined tank was sufficient for cost comparison purposes. As a result, the tank supplier did not continue with the development of a more detailed cost breakdown of the glass lined tank.

The annual operation and maintenance costs represent the yearly costs totalized over the next 80 years (i.e. $13,000 - $14,000 per year) including hydro, diesel generator operation, site maintenance, equipment maintenance, labour and trucks. Each of the elevated facilities will result in the same general operation and maintenance costs as the designs of each tank result in the same upkeep requirements. Major maintenance cost represents maintenance that is not completed yearly and includes repainting every 20 years for the welded composite tank or replacement of the glass lined panels every 40 years for the glass lined tanks.

4.3.1.2 Evaluation of Elevated Water Storage Alternatives

To assess the two alternatives a criteria assessment table was developed rating each alternative as best, moderate or worst for the various criteria. Numbers associated with each rating are: worst = 1, moderate = 2 and best = 3. The total value was obtained by summing all of the criteria ratings shown in Table 6. The criteria incorporate the advantages and disadvantages of each type of elevated storage as well as the costs associated with each of the alternatives.

Table 6: Evaluation of Elevated Storage Alternatives

Population	Alternative 1 Composite	Alternative 2 Glass-Lined
Land Requirement	3	3
Construction Time	2	3
Maintenance	2	3
Aesthetics	3	1

Population	Alternative 1 Composite	Alternative 2 Glass-Lined
Opportunity to Create Landmark	3	2
Security of Supply	3	3
Water Quality 1	6	6
Access to Storage	6	2
Capital Cost 1	6	4
Long Term O&M/Lifecycle Cost	3	2
Normal O&M Cost	2	2
Total	**39**	**31**

From the evaluation completed Alternative 1 is the best alternative with the highest score of 39.

4.4 Evaluation of Alternative Sites

Similar to the alternative elevated storage evaluation process, to assess the two sites a criteria assessment table was developed rating each alternative as best, moderate or worst for the various criteria. Numbers associated with each rating are: worst = 1, moderate = 2 and best = 3. The total value was obtained by summing all of the criteria ratings shown in Table 7. The criteria incorporate the advantages and disadvantages of each site.

Per the *Municipal Class EA* process, the following key considerations shall be kept in mind when evaluating alternatives: land-use planning objectives, natural heritage features (or natural environment), social environment, cultural environment, indigenous communities, economic environment, and property impacts (or technical considerations).

It should be noted that for both of the sites (adjacent to cemetery, vacant lot south of public works yard) there was no appreciable difference when it came to the natural environment as no site contained any significant natural heritage features. For the rest of the criteria there was some noted difference between one or all of the sites and these are explored in greater depth.

The following Ministry of Citizenship and Multiculturism (MCM) checklists were completed for the two water tower site alternatives:

- Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes
- Criteria for Evaluating Archaeological Potential

The checklists identified that site 1 does exhibit potential for archaeological as well as built heritage resources or cultural heritage landscapes. A Stage 1 Archaeological Assessment and Cultural Heritage Report were indicated as necessary for site 1 but not for site 2. Copies of the four completed checklists can be found in **Appendix F**.

Additional details and supporting documentation regarding the evaluation of the two alternative sites can be found in **Appendix G**.

Table 7: Site Evaluation Criteria

Criteria	Sub-Criteria	Site 1 North of Cemetery	Site 2 South of Public Works
Land Use Planning	Existing Land Use	3	3
	Proposed/Potential Land Use	3	1
Natural Environment	Groundwater (Dewatering)	3	3
	Surface Water/Drainage	3	3
	Ground Stability	3	1
	Natural Habitat, Species Protection, Trees	3	3
Social Environment	Residential Impact	2	3
	Traffic Impact	2	3
	Visibility of Water Tower	2	2
Cultural Environment	Archaeological Impact	1	3
	Cultural Heritage Impact	1	3
	Supporting Town Policies	3	1
Technical Considerations	Site Servicing (Power, Water)	3	3
	Adequate Size	3	3
	Tank Hydraulics Performance	3	2
	Access to Site	3	3
Economic Considerations	Cost	3	3
	Commercial/Industrial Impact	3	2
	Total	**47**	**45**

From the evaluation completed Site 1 is the best alternative with the highest score of 47.

4.5 Recommended Solution and Site and Mitigating Measures

4.5.1 Recommended Solution and Site

The recommended solution is construction of a 3,507 m^3 elevated storage tank at site 1 as shown on Figure 6. The top water level in the tower will be approximately 37- 40 metres above the ground and will occupy a site footprint of approximately 50 m by 50 m. The exact height will be determined upon completion of the Town of Hanover water system modelling, which is currently in progress.

4.5.2 Site Assessments (Recommended Site)

Site specific assessments were completed to determine if the recommended site was viable for the proposed works.

4.5.2.1 Geotechnical Assessment

The purpose of the geotechnical investigation, completed by Englobe Corp., was to explore the subsurface conditions at Site 1 and, based on the information, provide an assessment of the conditions that would impact the following:

- Foundation design for elevated water tower
- Site seismic classification
- Soil design parameters
- Excavation and backfill
- Other constructability recommendations

To determine the subsurface conditions, field work was conducted and 4 boreholes were completed. The boreholes varied in depth from 15.7m to 32.6m depth below grade and ground water conditions were closely monitored. During the site visit standard penetration tests were carried out to assess the strength characteristics of the stratigraphy. The borehole locations were determined based off of the initial site layout and placed in locations of site structures, i.e., one borehole in the centre and the other three along the perimeter of the proposed water tower pedestal.

The geotechnical report, "Geotechnical Investigation – Water Tower Replacement 7th Avenue, Hanover, Ontario" (**Appendix H**), was completed by Englobe Corp. in January 2024 to summarize the results of the geotechnical investigation.

4.5.2.1.1 Stratigraphy

The following stratigraphy is based on the borehole findings and the results of geotechnical laboratory testing conducted on selected representative soil samples. In general, four main stratigraphic units were encountered at the borehole locations as follows:

- The topsoil layer underlain by an earth fill zone, extending to 1.5 m depth below grade, overlying
- Typically compact to dense silty sand deposit, extending to 9.1 m depth below grade, overlying
- Typically compact to dense upper silt deposit, extending to 16.8 m depth below grade, overlying
- Typically firm to very stiff, silty clay deposit, extending to 27.4 m depth below grade, overlying
- Dense to very dense lower silt deposit, extending to at least 32.6 m depth (the borehole termination depth of Borehole 1).

4.5.2.1.2 Surficial Layer

A 200 to 250 mm thick topsoil layer was encountered in all boreholes at ground surface.

4.5.2.1.3 Earth Fill Materials

Earth fill materials, consisting of silty sand, with trace amounts of gravel and clay and organics were encountered in each borehole beneath the topsoil and extended to 1.5 m depth below grade.

Standard Penetration Test results (N-values) obtained from earth fill zones ranged from 3 to 16 blows per 300 mm of penetration, indicating a very loose to compact relative density. The in-situ moisture contents of the earth fill samples ranged from 1 to 13 percent by mass, indicating a moist condition.

4.5.2.1.4 Recommendations

The following comments and recommendations were made with regards to developing the site:

- The existing earth fill soils are unsuitable for the support of the proposed water tower foundations. All foundations must be supported on the underlying competent undisturbed native silty sand deposit.
- Prior to pouring concrete for the footings, the footing subgrade must be cleaned of all deleterious materials such as softened, disturbed or caved materials, as well as any standing water.
- Conventional lightly loaded concrete floor slab should be placed on at least 150 mm of granular base (OPSS.MUNI 1004 19 mm clear stone) compacted to a dense state by vibration. The existing earth fill may remain to support the slab on grade provided they are approved by the geotechnical engineer at the time of construction.
- Subfloor drainage provisions are not required provided the finish floor level of the slab-on-grade is at least 200 mm above the outside design grade, and the site is graded to promote drainage away from the building.
- Depending on the construction methodology for the site servicing (trench boxes or open cut, and length of trench) and the time of year (high versus low ground water levels), there is the possibility that water taking of greater than 50,000 L/day may occur at this site. If that is the case, then a Construction Dewatering Assessment Report (CDAR) and from the MECP will be required.
- A CDAR takes up to 1 month to complete if monitoring wells are already installed on site. Once the CDAR is completed, it is uploaded to the Environmental Activity and Sector Registry, which registers the construction dewatering with the MECP. If the results of the CDAR indicate that greater than 400,000 L/day will be pumped, a Permit to Take Water (PTTW) application must be submitted to the MECP. A PTTW application can take up to an additional 3 months for the MECP to process upon completion of the CDAR.
- Additional information on excavation, ground water control, foundation design and installation is provided in the geotechnical report.

4.5.2.2 Archaeological and Cultural Heritage Assessments

4.5.2.2.1 Stage 1 Archaeological Assessment

A Stage 1 Archaeological Assessment was completed by Archaeological Services Inc. for the study area, which includes site 1, the Preferred Site. The assessment consisted of reviewing property geography, history, previous archaeological fieldwork and current land condition to determine the archaeological potential of the Study Area. The Stage 1 review identified elevated potential for the recovery of archaeologically significant materials within the study area. Archeological potential was determined because the study area is located in close proximity to historic transportation routes (7th Avenue) and the Hanover Cemetery. A Stage 2 Archaeological Assessment was identified as necessary for all undisturbed land in the footprint of the Preferred Site.

4.5.2.2.2 Stage 2 Archaeological Assessment

The Stage 2 Assessment consists of a more extensive review of background documents as well as a field assessment of the exact footprint of the water tower location. The field work will be

completed once the ground is dry enough to be excavated, which is expected to occur in either April or May, 2024. During the Stage 2 Assessment the archaeologist surveys the land to determine if there are any archaeological resources on the property.

The Stage 2 Assessment will determine if any further archaeological investigation is required. Before construction can take place, confirmation from the Archaeological Programs Unit (MTCS) will be required in writing to indicate that all archaeological licensing and technical review requirements have been met.

4.5.2.2.3 Cultural Heritage Report

ASI completed a Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment in January, 2024. The purpose of this report was to "present an inventory of known and potential built heritage resources (BHRs) and cultural heritage landscapes (CHLs), identify existing conditions of the project study area, provide a preliminary impact assessment, and propose appropriate mitigation measures".

The results of this study revealed there were no BHRs and there was one potential CHL – the Hanover Cemetery - in the study area. ASI's investigation found that the study area had a rural land use history dating back to the mid-nineteenth century although, as noted in the archaeological assessment, the area appears to have been largely undisturbed. Per ASI's assessment, there were no direct adverse impacts; only indirect impacts were identified. The main finding was the potential for indirect adverse impacts due to construction related vibration as the proposed work is within 50-metres of the monuments and headstones within the active portion of the cemetery and the chapel structure.

Proposed mitigation includes the following as provided by ASI:

- Construction activities and staging should be suitably planned and undertaken to avoid impacts to the identified CHL. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, issuing instructions to construction crews to avoid identified features, etc.
- Where feasible given other project constraints, the new water tower should be placed as far as possible from the cemetery.
- To address the potential for indirect impacts to CHL 1 due to construction related vibration, undertake a baseline vibration assessment during detail design to determine potential vibration impacts.
- The existing natural vegetative buffer could be enhanced through the addition of a berm or additional vegetation along the northern limits of the cemetery to significantly reduce views to the proposed tower from within the cemetery.

Copies of subconsultant reports completed as part of archaeological and cultural heritage assessments can be found in **Appendix F.**

4.5.3 Summary of Impacts and Mitigation Measures

The environmental impacts and mitigation measures for the recommended solution are summarized in Table 8.

Table 8: Environmental Impact and Mitigation Measures

Criteria	Potential Impact	Mitigation
Land Use Planning		
Existing Land Use	The water tower will be located in land currently designated Restricted Industrial.	No mitigation required. The current land use zoning allows construction of a water tower
Proposed/Potential Land Use	There may be potential to rezone some of the existing property for another purpose; the water tower site will take up some of this land.	The site size will be limited to that necessary to construct, access and maintain the water tower.
Natural Environment		
Surface Water/ Drainage	Currently the property is developed with good drainage; no nearby water courses	Site will be reinstated to original grades around the water tower.
Groundwater	Potential for dewatering during construction	Geotechnical investigation to confirm dewatering requirement – see Section 4.6.1
Ground Stability	Potential for unstable subgrade to support water tower structure	Geotechnical investigation to confirm foundation requirements – see Section 4.6.1
Natural Heritage, Species Protection, Trees/Habitat	Potential for erosion on site during water tower construction	▪ Sediment and erosion control will be installed along the limits of the development during construction ▪ All disrupted areas will be stabilized with vegetation prior to the removal of the sediment fencing ▪ Undeveloped disturbed areas will be revegetated with native grasses combined with native soil mix
Social Environment		
Residential Impact	Will provide more reliable pressures to households.	No mitigation required
Traffic Impact	There will be little impact on traffic. Town operators will need to attend the tower for maintenance	Routine maintenance will be scheduled and coordinated for minimal traffic impact.
Visibility of Water Tower	The water tower will be a visible feature to residents.	The water tower will be designed to be an attractive landmark for both residents and visitors.
Archaeological and Cultural Heritage Environment		
Archaeological Impact	Potential for impact on archaeological features.	An Archaeological Screening Process (ASP) was completed to determine a Stage 1 archaeological assessment is required – see Section 4.6.2

Criteria	Potential Impact	Mitigation
Cultural Heritage Impact	Potential for impact on built heritage resources and cultural heritage landscapes.	Cultural Heritage Screening was completed to determine a cultural/heritage impact report is required – see Section 4.6.3
Supporting Town Policies	Will improve/expand capacity to accommodate growth which is required to optimize the use of public services and infrastructure.	Positive impact – no mitigation required
Technical Considerations		
Site Servicing (Power, Water)	The water tower will require power and connections to the water distribution system.	These utilities are nearby and readily available.
Adequate Size	Will not fully address storage requirements if undersized; potential water quality and staleness issues if too large.	The water tower will be sized for the design population based on a combination of existing demands and Ministry guidelines, and will be operated such that there is sufficient turnover to prevent staleness.
Tank Hydraulics Performance	▪ In conjunction with WTP pumping and water distribution improvements (larger watermain and/or looping), provides a long-term plan for reliable water supply including improved pressures and fire-fighting flows for existing and future developments. ▪ The water tower will be 37 - 40m high and can fill via a direct connection to the distribution while making the water supply to the service population more reliable.	The height and operating range will be set to ensure the pressures are optimal throughout the Town.
Access to Site	Access to the water tower site must be provided.	The site will be directly accessible.
Economic Considerations		
Cost	Cost to residents through taxes.	$3.67M Federal and Provincial funding has been secured.
Commercial/ Industrial Impact	The water tower will be located on the site adjacent to the existing cemetery.	The site is currently zoned for this purpose.

5 Climate Change

5.1 General

As per the MECP guidance document referenced in Section 2.5, the project's potential impacts to climate change and how climate change may impact the project were considered. Climate change concerns generally relate to the increased concentration of greenhouse gases in the atmosphere, which can result in a rise in the global mean surface temperature. Increased temperatures worldwide are creating changes in climate that is resulting in extreme weather events.

There are two approaches to address climate change. These include reducing a project's impact on climate change (climate change mitigation) and increasing the local ecosystem's resilience to climate change (climate change adaptation). This section of the report will discuss the aforementioned aspects in relation to this project utilizing a qualitative approach.

5.2 Potential for Project to Impact Climate Change

The proposed undertaking is considered to be a small-scale project with regard to the construction footprint. There will be a marginal increase in hydroelectric power requirements to operate equipment but the related impacts to climate change are considered to be minimal. In addition, chemicals (for re-chlorination, dichlorination) will require occasional truck deliveries to the site. However, the impact to climate change is, again, considered to be minimal.

5.3 Potential for Climate Change to Impact this Project

Climate change has the potential to result in increased storm events (number and intensity) that can lead to issues accessing the water tower for routine operation and maintenance and potentially increased risk of damage to the facility. Current standards take into consideration the impacts of climate change and the project will be designed and constructed to these standards.

6 Permits and Approvals

During detailed design permits and approvals will need to be acquired from the following agencies:

- **Ministry of Environment, Conservation and Parks:** A Permit to Take Water under the Ontario Water Resources Act (OWRA) may be required. A Permit to Take Water is required for any water takings that exceed 50,000 Litres per day, except for certain water taking activities that have been prescribed by the Water Taking Environmental Activity and Sector Registry (EASR) Regulation – O. Reg. 63/16. These prescribed water-taking activities require registration in the EASR instead of a Permit to Take Water. The geotechnical/ hydrogeological investigation (see Section 9.2) has confirmed that construction dewatering will be required.
- **Ministry of Environment, Conservation and Parks**: Following detailed design the Drinking Water Works Permit (DWWP) will need to be amended to include the water tower.
- **Town of Hanover**: A building permit and site plan approval will need to be acquired for construction of the project.

7 Stakeholder Consultation

Public, agency and Aboriginal consultation is mandatory for Schedule B projects under the Class EA process. For this project, public and agency participation was integrated into the development and evaluation of the servicing alternatives at different points in the planning process.

The stakeholders were contacted with three different notices throughout the Class EA process:

- Notice of Study Commencement on September 1, 2022;
- Notice of Phase 2 PIC on Nov. 30 and Dec. 7, 2023 (Phase 2 PIC held on Nov. 30, 2023); and
- Notice of Study Completion on April 18, 2024 advising of the study completion.

The review agencies that were included in the mailing list are shown in Table 9.

Table 9: List of Review Agencies Contacted During Class EA Process

Provincial and Federal Agencies	
Aboriginal Affairs and Northern Development	Ministry of Agriculture Food and Rural Affairs
Department of Fisheries & Oceans	Ministry of Environment, Conservation & Parks
Environmental and Climate Change Canada	Ministry of Municipal Affairs and Housing
Environmental Assessment and Permissions	Ministry of Natural Resources and Forestry
Ontario Provincial Police	Ministry of Transportation
Environmental Assessment Coordination – Environmental Unit; Lands and Trusts Services; Aboriginal Affairs and Northern Development Canada	Ministry of Tourism, Culture and Sports
Municipalities and Services	
County of Grey	Town of Hanover
County of Bruce	Hanover Police Service
Grey Sauble Conservation Authority	Hanover Fire Department
Saugeen Valley Conservation Authority	Grey Bruce Health Unit
Municipality of Brockton	
Local Organizations and Interest Groups	
Bluewater District School Board	Hanover Chamber of Commerce
Bluewater Grey Catholic District School Board	Canada Post
Utilities	
Bell Canada	Enbridge Gas
Rogers Cable Systems	Union Gas
Hydro One	Wightman Telecom
Eastlink	Westario Power
Indigenous Communities and Agencies	
Ministry of Indigenous Affairs & Reconciliation	Saugeen Ojibway Nation
Crown-Indigenous Relations & Northern Affairs Canada	Metis Nation of Ontario – Great Lakes Metis Council
Chippewas of Nawash Unceded First Nation	Great Lakes Metis Council
Saugeen First Nation	

7.1 Phase 1 Consultation

During Phase 1 stakeholders were notified of the commencement of the Class EA by an advertisement published in The Post on September 1, 2022. The review agencies and Aboriginal stakeholders were also subsequently mailed copies of the advertisement.

The Phase 1 notice of commencement advertisement, form letter to stakeholders and comments received are attached in **Appendix I**.

7.2 Phase 2 Consultation

A Phase 2 PIC was held on Nov. 30, 2023 to allow public and agency consultation during this phase of the Class EA process. It was held virtually and was available on the Town of Hanover website commencing Nov. 30, 2023. Hardcopies of the presentation were provided at the Town's office during regular business hours. To inform the public of this PIC a notice was published on the Town of Hanover website as well as in The Post on Nov. 30, 2023. The review agencies and Aboriginal stakeholders were also mailed copies of the advertisement.

The information provided at the Phase 2 PIC included a summary of the project background, an overview of the Class EA process, identification and evaluation of the project alternatives, and the recommended solutions. There were 49 views/attendees. The PIC provided stakeholders an opportunity to get questions and concerns answered and allowed the project team to further understand the community needs with respect to this project. The Phase 2 PIC advertisement and PIC presentation are attached in **Appendix J**.

Comments for this phase of the Class EA were received starting from Nov. 30 2023 until Jan. 5, 2024. All of the comments and responses were incorporated into the report. A summary of the comments and responses, along with copies of the full comment sheets and responses, are attached in **Appendix J**.

7.3 Study Completion Consultation

To inform the public of the study completion, a notice was published in The Post on April 18, 2024. The Notice was also mailed to residents that previously indicated they would like to stay informed throughout the project. The review agencies and Aboriginal communities contacted for this project were also mailed the notice to inform them about the study completion.

Following the notification of the study completion the Project File document was made available to the public for a 30-day review period. During the review period the public, review agencies and Aboriginal communities are encouraged to review the document and advise with the study team of any outstanding issues. Copies of the Notice of Study Completion, along with comments received and responses, are attached in **Appendix K**.

8 Selection of Preferred Solution

Following the selection of the Recommended Solution and subsequent feedback from the public, review agencies and Aboriginal communities, the Recommended Solution was confirmed as the Preferred Solution.