Carlisle Water Storage Study

Project File Report

Final

December 10, 2024

Prepared for:

RVA

Hamilton

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December 10, 2024

City of Hamilton
Hamilton Water Division, Public Works Department
100 King Street W., Hamilton, ON L8P 1A2
Email: justin.wilson@hamilton.ca

Attention: Justin Wilson, MSc
Project Manager

Dear Mr. Wilson:

Re: Carlisle Water Storage Study
Project File Report

Please find enclosed the final Project File Report for the Carlisle Water Storage Study, completed by R.V. Anderson Associates Limited.

If you have any questions, please do not hesitate to contact the undersigned by email or at 905-685-5049 ext. 4211.

Yours very truly,

R.V. Anderson Associates Limited
Andrew McGregor, MCIP, RPP
Senior Planner, EA & Approvals

Carlisle Water Storage Study

Project File Report

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City of Hamilton

In Association With:

RVA 215933

December 10, 2024

CARLISLE WATER STORAGE STUDY

PROJECT FILE REPORT

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EXECUTIVE SUMMARY

The City of Hamilton (City) retained R.V. Anderson Associates Limited (RVA) to complete a Schedule 'B' Municipal Class Environmental Assessment (EA) and Conceptual Design (Study) for a water storage facility in the Carlisle Rural Settlement Area and its immediate vicinity. The EA was later reclassified to be 'Exempt' based on guidance within the Municipal Class EA process. The Study Area is show in Figure ES 1 below.

Figure ES 1 Study Area

The objective of this Project File Report (PFR) is to document the results of the Class EA process pertaining to the identification, evaluation and recommendation of the preferred location and design concepts for the new elevated water storage tank. This PFR also documents the reclassification of this Schedule 'B' EA study to 'Exempt' as per the 2023 amendment to the Municipal Class Environmental Assessment process (MCEA).

The Carlisle water distribution system has historically experienced high per capita water demands during the summer, exceeding Ministry of Environment, Conservation and Parks (MECP) Design Guideline standards. A long-term comprehensive water conservation program was undertaken between 2015 and 2019 and it was determined that conservation measures alone could not eliminate the need for additional water storage. Given the existing storage deficit in Carlisle and the forecasted growth for the Carlisle Rural Settlement Area, additional water storage will be required. As such, the Problem and Opportunity Statement has been identified as:

Additional water storage infrastructure is required within the Community of Carlisle to address the community's water storage capacity needs now, and in the future.

This Class EA will identify and evaluate:

- *potential **sites** for the required water storage infrastructure, and*
- *various **types** of water storage facilities.*

A total of eight (8) alternative locations were identified for the new water storage system. This long-list of locations were then assessed based on screening criteria developed by the Project Team and in consideration of comments received from technical agencies, key partners, and the public. Through this screening process, two (2) alternative locations were shortlisted for further evaluation. After a detailed evaluation of the shortlisted alternative locations, the preferred location was determined to be Tower Park, where the existing elevated tank is currently located.

A total of nine (9) alternative water storage system improvements were considered. The alternatives consisted of Do Nothing (required to be evaluated as per the Class EA process), an elevated tank, a standpipe, an in-ground water reservoir, and an above ground reservoir. Each water storage system could either replace or be in addition to the existing elevated tank. After evaluating all the alternatives, it was determined that a new, slightly larger, elevated tank to replace the existing elevated tank was the preferred water storage system solution.

Key impacts associated with the implementation of the proposed design concept and general mitigation measures required have been identified. In addition to the mitigation measures identified in the report, additional work will be required to be completed prior to construction. During detailed design, findings from the Class EA will be confirmed through additional investigations, planning, and consultation with the key partners and technical agencies.

1.0 INTRODUCTION

1.1 Purpose of the Study

The City of Hamilton (City) retained R.V. Anderson Associates Limited (RVA) to complete a Schedule 'B' Municipal Class Environmental Assessment (MCEA) and Conceptual Design (Study) of a water storage facility in the Carlisle Rural Settlement Area (Carlisle RSA) and its immediate vicinity. The EA was later reclassified to be 'Exempt' based on guidance within the MCEA process (MCEA 2023).

Several studies, including Master Plans and Class EAs have been previously initiated with respect to water supply and storage in the Carlisle RSA. The original Master Plan completed in 2004 identified two distinct but related problems or objectives for the Carlisle RSA which included:

1. The existing water system has insufficient storage capacity to meet the existing estimated Maximum Day Demand. A solution is required to balance supply and demand. This problem statement forms the basis of this Class EA.
2. Long-term planning, including supply, treatment, pumping, storage, and distribution, is needed for the Carlisle water system to meet the future Maximum Day Demands that includes full buildout of the Carlisle Drinking Water System. This problem statement responds to the basis of the Master Plan.

The objective of this Project File Report (PFR) is to document the results of the Class EA planning process pertaining to the identification, evaluation and recommendation of the preferred location and design concepts for the new elevated water storage tank. This PFR also documents the reclassification of this Schedule 'B' EA study to 'Exempt' as per the 2023 amendment to the MCEA process (MCEA 2023). Additionally, communication and consultation efforts with the public, government agencies, Indigenous communities and other interested partners are documented in the report.

1.2 Study Area

Carlisle RSA is located east of Highway 6, north of Waterdown, approximately 20 kilometres (km) northeast of downtown Hamilton. Carlisle is in the former Township of Flamborough which, along with the Towns of Ancaster and Dundas, the Township of Glanbrook and the cities of Hamilton and Stoney Creek were amalgamated to form the new City of Hamilton on January 1, 2001.

The study area includes the Carlisle RSA and its immediate vicinity, see Figure 1.1 below.

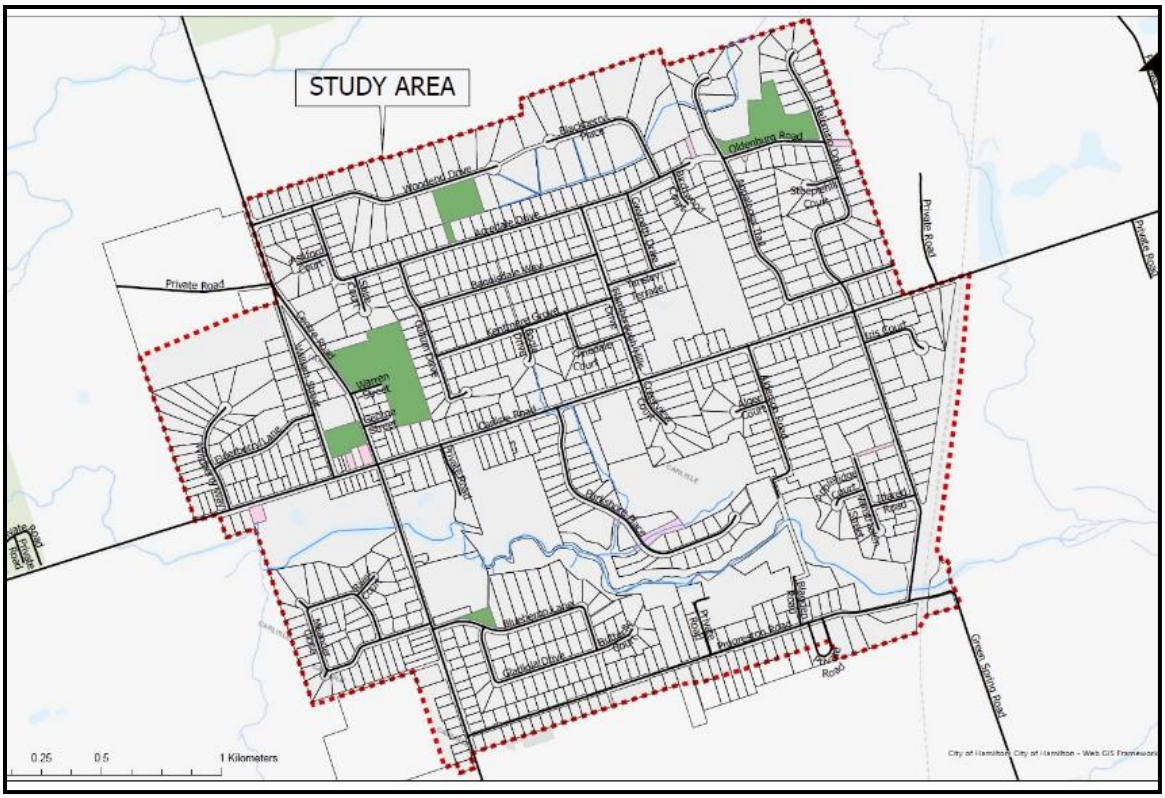

Figure 1.1 Study Area

1.3 Project Team

The Study was carried out by a consulting team led by R.V. Anderson Associates Limited (RVA) on behalf of the City of Hamilton. The study team is outlined below:

City of Hamilton:

- Justin Wilson – Project Manger, Watershed Management
- Carmen Vega – Senior Project Manager, Watershed Management

Consulting Team:

- R.V. Anderson Associates Limited – Lead Consultant, Planning, Natural Heritage, Technical Design, Water Distribution System Modelling, Conceptual Design
- Palmer Inc. – Hydrogeological Assessment and Source Water Protection, Geotechnical Investigation, Phase 1 Environmental Site Assessment
- Parslow Heritage Consultancy Inc. – Archaeological & Cultural Heritage Assessment
- Glenn Pothier – Public Engagement Facilitator

1.4 Overview of Municipal Class EA Planning Process

This Study was initiated in accordance with the requirements of MCEA Schedule 'B', which is an approved process under the *Environmental Assessment Act*. Figure 1.2 illustrates the framework for the Class EA process which is a legislated planning process comprising of up to five phases with mandatory points of public contact. The focus of the framework is a comprehensive and transparent decision-making process.

The Class EA is broken down into phases, as follows:

- Phase 1 – Identify problem or opportunity;
- Phase 2 – Identify alternative solutions, evaluate, and select the preferred solution;
- Phase 3 – Identify alternative design concepts, evaluate, and select the preferred design concepts;
- Phase 4 – Complete the Environmental Study Report (ESR) and place it on the public record; and
- Phase 5 – Project implementation, which is to undertake the contract drawings and tender documents for the project and proceed to construction and operation of the project.

This Schedule 'B' study requires the completion of Phases 1 and 2 of the MCEA process, with the final deliverable comprising the documentation of the planning process as provided in this Report. The Project will then proceed to Phase 5.

1.4.1 Reclassification of EA to 'Exempt' Status

Based on the preferred solution selected at the completion of Phase 2, it was determined that the Study should be downgraded from Schedule 'B' to 'Exempt' from the MCEA process as per the 2023 MCEA guidance document (MCEA 2023). The preferred solution does not require the acquisition of additional property and has minimal impact on the natural and socio-economic environment which renders the project exempt according to Appendix 1 – Table B: Municipal Water and Wastewater Projects and section 6a (MCEA 2023).

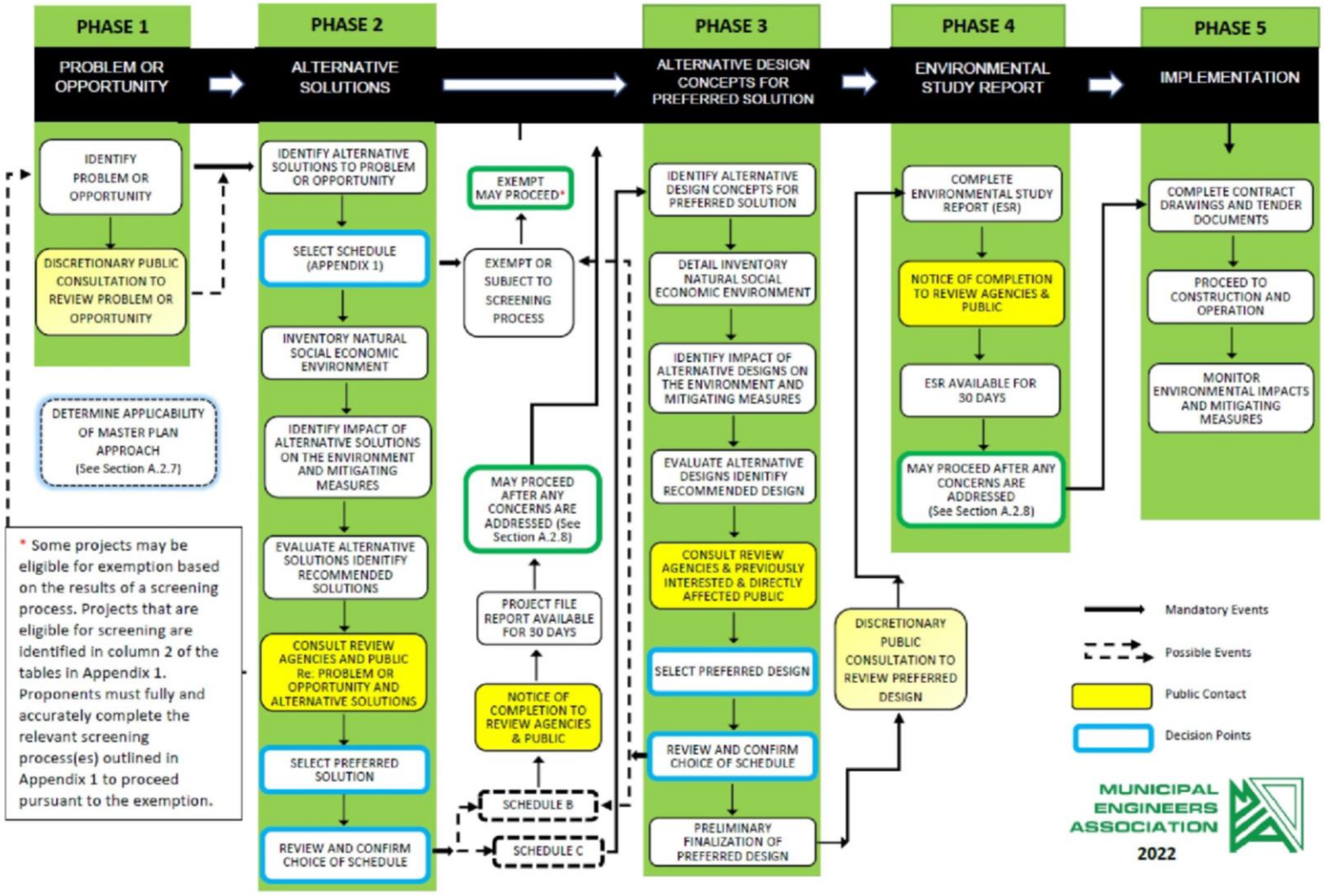

Figure 1.2 Municipal Class Environmental Assessment Process (Municipal Engineers Association, 2022)

2.0 EXISTING CONDITIONS

2.1 Planning and Policy Context

The following provincial and municipal policies and planning documents were taken into consideration in this Study:

2.1.1 Provincial Planning Documents

2.1.1.1 PROVINCIAL POLICY STATEMENT (2020)

The Provincial Policy Statement, 2020 (PPS, Ministry of Municipal Affairs and Housing (MMAH), 2020) sets the policy direction for regulating development and land use planning in the province. Both provincial and local land use planning decisions build on the PPS and its relevant policies. The policy works with land use planning systems to support the government's goals to increase housing, support jobs, and reduce red tape.

This Study aligns with the PPS Section 1.6 Infrastructure and Public Service Facilities as it addresses forecasted water demands and storage needs of the Carlisle community. Prior to the initiation of this Study, the City also undertook water conservation and water use efficiency efforts, aligning with policy 1.6.6.1 c) of the PPS.

2.1.1.2 MINISTRY OF ENVIRONMENT, CONSERVATION AND PARKS' DESIGN GUIDELINES FOR DRINKING WATER SYSTEMS (2008)

The Ministry of Environment, Conservations and Parks' Design Guidelines for Drinking Water Systems (2008) are intended to support engineers responsible for designing drinking-water systems, and ministry engineers responsible for reviewing and approving the designs of such systems.

This Study incorporated these design guidelines when determining water storage requirements based on population.

2.1.2 Local Planning Documents

2.1.2.1 CARLISLE WATER SUPPLY MASTER PLAN AND CLASS ENVIRONMENTAL ASSESSMENT (2004)

The purpose of the 2004 Carlisle Water Supply Master Plan and Environmental Assessment was to develop a strategy for the provision of municipal water, inclusive of supply, treatment, pumping, storage, and distribution to accommodate planned growth via infill

development within the Carlisle RSA (approximately to the year 2023), in accordance with the Ministry of Environment Regulations and Guidelines and City of Hamilton Standards.

The 2004 Master Plan and EA identified two distinct but related problems for Carlisle:

1. The existing water system has insufficient storage capacity to meet the existing estimated Maximum Day Demand (MDD). A solution is required to balance supply and demand.
2. Long-term plan, including supply, treatment, pumping, storage and distribution, is needed for the Carlisle water system to mee future MDDs that includes the full buildout of the Carlisle Drinking Water System.

These related problems formed the need and justification to initiate this Study.

2.2 Existing Water Supply System

Carlisle is serviced primarily (73% of households) through four (4) communal groundwater production wells (FDC01, FDC02, FDC03R, AND FDC05) which have a total capacity of 4,303 m^3/d or 49.8 L/s, with the remainder being serviced by private wells (27% of households). Carlisle's firm capacity is currently 2,143 m^3/d or 24.8 L/s. This assumes a worst-case scenario where the largest well has been taken out of service, in accordance with the Ten States Recommended Standards for Water Works Guidelines (2003).

Water storage is provided by one (1) elevated tank with a total volume capacity of 1,400 m^3, with a Top Water Level (TWL) of 323.0 m and a Low Water Level (LWL) of 315.5 m, providing municipal water supply to approximately 1,930 residents in Carlisle.

2.3 Water Demands and Storage Needs

2.3.1 Water Demands

The Carlisle water distribution system has historically experienced high per capita water demands during the summer, exceeding Ministry of Environment, Conservation and Parks (MECP) Design Guideline (2008) as noted in the RFP. In the summer of 2002, the well production system was unable to meet peak demands. This event resulted in a mandatory total outdoor watering ban at that time. Further bans and restrictions such as alternative watering days have since been imposed and continue to be in place as required.

A water conservation program was initiated in the spring and summer of 2004 to address water supply and demand. In 2013, an MCEA was initiated to evaluate options for improving water service delivery through infrastructure solutions, however the Study was terminated in

2014 due to community concerns over new water storage infrastructure in the community. This resulted in another long-term comprehensive water conservation program undertaken between 2015 and 2019 to determine whether conservation could eliminate the need for additional water storage. The collective goal was to reduce municipal water consumption in Carlisle to under 1,170 m3 per day in order to align with the existing water tower storage capabilities within the community, as noted in the RFP. The water conservation program (2015-2019) included several water conservation measures and public education. The number of days over the 1,170m^3/day target ranged from 25 to 87 days per year between 2015 and 2019. In 2022, the Maximum Day Demands (MDD) for Carlisle was 2,648 m^3/day (31 L/s). Despite the community's efforts, conservation measures alone were not able to meet Carlisle's water needs.

The community requires additional storage capacity to meet municipal and provincial guidelines for fire flow, increasing demand, and the gradual transfer of the remainder of existing private well supply users to the municipal system.

The existing servicing population is 1,930 and the future service population is expected to increase to 2,947 by 2051. This increase would include 969 people switching over from private wells to the municipal water supply system and 48 people from new development on existing undeveloped lots for future buildouts.

The Per Capita Consumption and Maximum Day Factor were based on billing records from 2011 to 2013, previously completed Storage Memo by WSP (2015) from 2009 to 2013, City records from 2015 to 2019, and the City's Drinking Water Report from 2019 to 2022.

Based on historical data (2015-2022), the calculated MDD water demand is 2,363 m^3/day. Storage requirements to service the current Carlisle RSA population is 2,089 m^3, however the existing elevated tank's storage capacity is 1,400 m^3, resulting in a 689 m^3 deficit below Provincial requirements. Based on the above population projections, the future MDD water demand is expected to increase to 4,226 m^3/day. Upon calculations described in the Well Capacity Needs Report in Appendix 1, the total storage required to service the future projected population of the Carlisle RSA is 2,671 m^3. This would result in a storage deficit of 1,271 m^3 with the existing elevated tank.To sufficiently meet the water demand under maximum day existing and future conditions, Carlisle RSA requires a firm capacity of about 4,303 m^3/d, meaning additional well capacity of 2,160 m^3/d (25 L/s) is required to meet existing and future water demands. The water capacity requirement can be addressed via a new well next to the largest well. This new well would be active and allow the system to operate without impacts to the supply capacity when the largest well is out of service.

2.3.1.1 WELL CAPACITY NEEDS

A *Well Capacity and Storage Requirements Assessment* was completed by RVA in July 2023 (**Appendix 1**), to determine the initial calculations of the required well supply and capacity for the Carlisle RSA. These calculations would be based on population projections and water consumption data obtained from the City.

The following summary and conclusions were provided based on RVA's assessment of the Carlisle RSA's additional capacity and storage requirements:

1. Population densities of 3.05 persons per unit (PPU) and 3.41 PPU were selected to calculate Carlisle RSA's current (developed land parcels) and future (undeveloped land parcels) population, respectively, based on historical population data sources collected from the Statistics Canada Census between the years 2011 and 2021 and the Development Charges Background Study.
2. The estimated current population within the area based on City records is 1,930 people [(610 single-detached units x 3.05 PPU) + (40 apartment units x 1.74 PPU)], which is the highest estimated population from the data sources available so it can be considered as a conservative estimate.
3. Based on Carlisle RSA's existing population and the three components of the future projected population, the total future population to be serviced within the RSA is 2,947 people.
4. Using the above population estimates, the average day demand per capita (365 L/cap/day), and the resulting MDD peaking factor (3.4), the future (2051 ultimate build-out) average day and MDD are 1,243 m^3/d and 4,226 m^3/d, respectively.
5. Carlisle RSA currently has a total available storage volume of 1,400 m^3. Considering this, the required additional storage to meet the existing water demands (both domestic and fire flows) under current maximum day demand conditions was estimated to be 689 m^3, while the additional storage volume needed to meet future demands under maximum day demand conditions was estimated to be 1,271 m^{3i}.
6. In order to sufficiently meet the water demands under maximum day existing and future demand conditions, an additional supply capacity of 2,160 m^3/d (25 L/s) is recommended for redundancy to improve the firm capacity and supply flow rate to 4,303 m^3/d (49.8 L/s).

The full Well Capacity and Storage Requirements Assessment is provided in **Appendix 1.**

2.3.1.2 REDUNDANT WELL

Redundant Well FDC03RR located at the largest Carlisle well site, within 14 m of well FDC03R, was constructed in 2023 to provide a redundant source of water for the Carlisle community to be used as a backup to the existing water supply well (FDC03R).

A Carlisle Redundant Well (FDC03RR) Construction and Testing Report was prepared on June 5, 2024, by Palmer to summarize the results of well construction, aquifer assessment, Groundwater Under Direct Influence (GUDI) assessment and groundwater quality assessment for the newly constructed Redundant Well FDC03RR located at 84 Acredale Drive, Carlisle, Hamilton, ON.

After construction of the well, a comprehensive sampling program was undertaken, and concluded the following:

- The groundwater from FDC03RR does not have a significant surface water source, and groundwater quality has not been significantly impacted by contamination associated with surface water;
- The raw groundwater from FDC03RR meets Ontario Drinking Water Standards (ODWQS) standards except that it exceeds the reporting criteria of sodium; and
- The existing supply well, FDC03R, was designated as a GUDI well in Halton Region Source Protection Plan. The redundant well, FDC03RR, is only 14 m from the FDC03R and has almost the same depth. Chemical analysis results show that these two wells have similar water quality. Therefore, FDC03RR should have the same level of GUDI as FDC03R, and the existing treatment of Carlisle Drinking Water System should be adequate for treating water from FDC03RR.

Based on construction records, the well and aquifer performance assessment and the comprehensive groundwater quality assessment, it is concluded that the FDC03RR is suitable to be used as a redundant production well.

Based on the assessment of FDC03RR, the following is recommended:

- Caliper logging, image logging, video inspection, flow distribution profiling, etc. should be considered before commissioning of the well to characterize the open bedrock zone and to confirm the construction quality of the well structure. These results would serve as baseline conditions of the well;
- FDC03RR is about 14 m away from existing supply well FDC03R, and is surrounded by the WHPA-E of FDC03R which is a GUDI well based on the 2017 Technical Rules under the Clean Water Act. Based on the results of raw water sampling program as presented above, no significant impact from contaminants associated with surface

water was identified, and the GUDI status of FDC03RR and FDC03R should be re-evaluated as part of WHPA update. The re-evaluation should be based on further investigation, monitoring and modelling; and

- After the re-evaluation of GUDI, if FDC03RR and FDC03R are not found to be GUDI wells, the groundwater monitoring program can be scaled back, and monitoring frequency can be reduced.

A pump test was also conducted for this newly constructed redundant well. The well capacity was also confirmed during testing and specific well capacity ranges from 14.5 to 21.4 m^3/hr/m (348 to 513.6 m^3/day/m). Results of this test are referenced and appended within the Redundant Well Report.

The full Redundant Well Report is provided in Appendix 2.

2.3.2 Water Storage Needs

In 2013, existing storage requirements for the Carlisle Water Supply System were assessed using the MECP Design Guidelines (2008) which include fire, emergency, and equalization storage. These calculations suggested that additional well capacity will not be required if well FDC03R was used at 90% capacity over the long term, assuming complete build-out and gradual transfer of all private well users (27% of households) to the municipal system. However, additional storage capacity is still required to satisfy the long-term needs of the community.

While additional water supply can be resolved through an adjacent redundant well, Carlisle has an existing storage deficit of 689 m^3 compared to Provincial guidelines. By 2051, additional population forecast to be serviced by the municipal supply will further increase the total storage deficit to 1,271 nm^3 below Provincial water storage guidelines.

Treated water storage calculations were completed based on the MECP Design Guidelines for Drinking Water Systems (2008) and consider:

- Fire Storage – calculated using the City of Hamilton's Target Available Fire Flows for Different Land Uses
- Equalization Storage –25% of maximum daily water demand.
- Emergency Storage – calculated based on 25% of the required fire storage + equalization storage.

Current water storage needs are 2,098 m^3/day and total storage needs after the future buildout of the Carlisle RSA community will increase to 2,671 m^3/day. Due to this need for

more storage, this Class EA was initiated to identify long-term water storage solutions for the Carlisle RSA community.

3.0 PHASE 1: PROBLEM AND OPPORTUNITY

Based on Phase 1 requirements of the MCEA process for a Schedule 'B' project, a "Problem and Opportunity Statement" was prepared to identify in detail the various problems and opportunities to be addressed by the study. In essence, the Problem Statement outlines the need and justification for the overall project and establishes the general parameters, or scope, of the study.

Given the existing storage deficit in Carlisle and the forecasted growth for the Carlisle RSA, additional water storage is required. As such, the Problem and Opportunity Statement has been identified as:

Additional water storage infrastructure is required within the Community of Carlisle to address the community's water storage capacity needs now, and in the future.

This Class EA will identify and evaluate:

- *potential* ***sites*** *for the required water storage infrastructure, and*
- *various* ***types*** *of water storage facilities.*

4.0 PHASE 2: ALTERNATIVE SOLUTIONS (PART 1)

4.1 Identification of Alternative Locations – Long-list

The following is a summary of the long list of alternative locations identified as part of this EA study. The long list of alternatives was identified based on initial screening for potential suitability and screened against pass or fail criteria to confirm feasibility before proceeding to a detailed evaluation for a shortlist of alternative sites. For an alternative to proceed, it had to pass all three criteria.

Figure 4.1 Long-List of Alternative Water Storage Site Locations

4.1.1 Area 1: Existing Elevated Tank Site (Tower Park)

Tower Park is located on City owned property at 40, 42, and 46 Woodend Drive and is already connected to the existing water supply system. Tower Park can be easily accessed from Acredale Drive or through a new access from Woodend Drive. It is located in a community park in between residential homes and can accommodate an above-ground or below-ground water storage facility. This site could see the construction of a new facility to replace the existing tower or accommodate an additional facility to provide the required storage.

4.1.2 Area 2: William Street

This location is on privately owned property, 1535 Centre Road, which is one (1) of three (3) privately owned properties on this long list of alternative site locations. 1535 Centre Road is not connected to the existing water supply system and a 350 m watermain extension from Elderberry Lane would be required. Access to the water storage facility could be provided from William Street, which is a dead-end street. This site could see the construction of a new facility to replace the existing tower in Tower Park or to accommodate an additional

facility to meet the required storage needs. However, this area is located adjacent to Wetland Hazard Lands, which would require additional permitting from Halton Conservation and is near rural residential homes.

4.1.3 Area 3: Baseball Diamonds

The baseball diamonds are City-owned property located at 1496 Centre Road. It is already connected to the existing water supply system and the site can be accessed from the Arena Parking Lot. This site location is within the Carlisle Community Centre Park, adjacent to the baseball diamond and playground. This site could see the construction of a new facility to replace the existing tower in Tower Park or to accommodate an additional facility to meet the required storage needs.

4.1.4 Area 4: Tennis Court

Within the same park as Area 3 and again located at 1496 Centre Road, is another potential location for a water storage facility. This location which is further to the east in the park and adjacent to the tennis court is connected to the existing water supply system and can be accessed from the Arena Parking Lot. The Tennis Court can also be accessed from George Street. This site could see the construction of a new facility to replace the existing tower in Tower Park or to accommodate an additional facility to meet the required storage needs.

4.1.5 Area 5: South of Carlisle Road

This alternative location is on privately-owned property at 302 Carlisle Road. The property is connected to the existing water supply system. This location would require additional property to be accessed from Parkshore Place. This location is partially within the Floodplain Hazard, Meander Belt Hazard, and Stable Top of Bank Hazard, resulting in some approvals necessary from the Halton Conservation Authority as well as the purchase of private property. This site could see the construction of a new facility to replace the existing tower in Tower Park or to accommodate an additional facility to meet the required storage needs.

4.1.6 Area 6: Centre Road

At the southern limits of Carlisle RSA, this alternative location is on privately-owned property with no municipal address. Centre Road is not connected to the existing water supply system, thus requiring a 175 m watermain extensions. This location would also require additional property to be acquired for access from Centre Road. This location is between residential homes and agricultural lands; therefore, an Agricultural Impact Assessment could be required. This site could see the construction of a new facility to replace the

existing tower in Tower Park or to accommodate an additional facility to meet the required storage needs.

4.1.7 Area 7: Oldenburg Road

This alternative location is on City-owned property at 6 Oldenburg Road. This property is connected to the existing water supply system and can be accessed from Oldenburg Road or Palimino Drive. This location is adjacent to a forested area and may require removal of some trees to create access to the facility. This site could see the construction of a new facility to replace the existing tower in Tower Park or to accommodate an additional facility to meet the required storage needs.

4.1.8 Area 8: Carlisle Memorial Park

Carlisle Memorial Park is on City-owned property at 1487 Centre Road. This property is connected to the existing water supply system and can be accessed from William Street to the west or Centre Road to the east. The potential location is in Carlisle Memorial Park, adjacent to a baseball diamond and playground. This site could see the construction of a new facility to replace the existing tower in Tower Park or to accommodate an additional facility to meet the required storage needs.

4.2 Screening Criteria for Long List of Alternative Locations

The long list of alternatives was screened against pass or fail criteria to confirm feasibility before proceeding to a detailed evaluation of a shortlist of alternative sites. For an alternative to proceed, it must pass all three (3) criteria.

Table 4.1 Screening Criteria for Long-List to Shortlist of Alternative Locations

Criteria	Considerations
Is it feasible and reasonable?	• Is the alternative technically feasible and reasonable? • Can the alternative be constructed for a reasonable cost? • Are the ecological, social, or other impacts anticipated to be unreasonably high relative to other alternatives? • Does the alternative provide a long-term solution?
Does it address the identified problem / need?	• Does the alternative address the considerations listed in the Problem and Opportunity Statement? • Does the alternative support planned growth to 2051?

	• Can the alternative offer resiliency to potential future changes to regulatory, climatic, and raw water quality conditions?
Does it meet applicable planning policies?	• Does the alternative meet local, regional, and provincial planning policies?

4.3 Screening of Alternative Locations – Long-list

Table 4.2 below presents a summary of the screening of the long list of alternatives against the evaluation criteria. Further details of the screening criteria and evaluation of this long-list is provided in the Screening of Long-list of Alternative Locations Technical Memorandum in Appendix 4.

Table 4.2 Screening of Long List of Alternative Water Storage Locations

Alternative	Is it feasible and reasonable?	Does it address the identified problem/need?	Does it meet applicable planning policies?	Carry to Short List
Area 1: Tower Park	Yes	Yes	Yes	Yes
Area 2: William Street	Yes	Yes	Yes	Yes
Area 3: Baseball Diamonds	No	Yes	No	No
Area 4: Tennis Court	No	Yes	No	No
Area 5: South of Carlisle Road	No	Yes	Yes	No
Area 6: Centre Road	No	Yes	Yes	No
Area 7: Oldenburg Road	No	Yes	Yes	No
Area 8: Carlisle Memorial Park	No	Yes	Yes	No

4.3.1 Identification of Shortlisted Alternative Locations

Based on the evaluation of the long list of alternatives above, the following two locations were recommended to be carried forward for further assessment:

- Area 1: Tower Park (40, 42, 46 Woodend Drive)
- Area 2: William Street (1535 Centre Road)

4.4 Supporting Technical Studies

The environmental investigations summarized below were conducted for the shortlist of potential water storage facility locations. These investigations included: a Geotechnical and Hydrogeological Assessment, a Natural Environment Assessment, an Archaeological Assessment; a Cultural Heritage Assessment; and a Phase 1 Environmental Site Assessment. These studies were completed to inventory the technical requirements and natural and cultural environments. Results of this detailed inventory were used to develop evaluation criteria and evaluate the shortlisted alternatives for the water storage location and the alternative water storage system options.

4.4.1 Hydraulic Modelling Analysis

RVA completed the watermain hydraulic modelling of Carlisle RSA's water distribution system that was used to assist in shortlisting the location options mentioned above for the additional water storage facility. The purpose of this analysis was to determine the capability of the existing municipal water distribution system to meet required water demands under existing and future conditions including the effectiveness of the proposed upgrades to the system.

The following conclusions and recommendations were provided based on the watermain hydraulic analysis of the Carlisle RSA's water distribution system:

1. All simulated pressures are within the acceptable range under existing (2022) and future (2051) demand conditions per the City of Hamilton's design criteria and standards for water distribution systems. To service all the residential units and provide more redundancy within the Carlisle RSA, additional watermains could be installed as follows:
    - Ø300 mm watermain loop connection along Carlisle Road from Centre Road to Parkshore Place (approximately 177 m).
    - Ø150 mm watermain loop connection along Progreston Road from Centre Road to Idared Road (approximately 574 m).

- Ø150 mm watermain loop connection east of Tansley Terrace going south to Carlisle Road (approximately 133 m).

2. Based on the resulting pressure spectrum from the hydraulic modeling, the northern part of the RSA near the intersection of Palomino Drive and Steeplehill Court has relatively low pressures, ranging from 365 to 379 kPa, compared to other areas. It should be noted that these pressures are still within the acceptable range. This area of the RSA has the highest elevations within the entire community. FDC03R, which has the largest supply well within Carlisle, is currently operating at 41 Hz which is equivalent to a total discharge flow capacity of 14 L/s. This pump station has a total allowable capacity of 25 L/s; therefore, if needed, the pump can operate at a higher frequency up to its fully allowable capacity to improve the pressures within this area.
3. Under existing (2022) and future (2051) MDD plus Fire Flow (MDD+FF) conditions, the fire flow requirement was not met in one location on Carlisle Road between Parkshore Place and Flamborough Hills Drive This location has a required fire flow of 150 L/s where an existing retirement home is situated including two available parcels that could be developed. The fire flow deficiency can be addressed by extending the 300 mm Ø watermain along Carlisle Road and looping the system to improve the flows at this location and to satisfy the fire flow requirement. The remaining junctions were able to satisfy each respective fire flow requirement ranging from 50 L/s to 75 L/s. In addition, the system was able to maintain a minimum required pressure of 140 kPa (20 psi) under these conditions within the distribution system. It should be noted that the local fire department is aware of the pressure deficiencies within Carlisle and the department plans accordingly when attending a fire in this area.
4. The additional storage required to meet all the future projected demands and system requirements per the MECP Design Guidelines for Drinking Water Systems (2008) was estimated to be 1,271 m^3. Although the results of the hydraulic modeling demonstrated that the system could provide the required pressures and flows with the existing water tower and some additional watermain loops in the system, the steady-state model only analyzes the performance of the system and it does not take into account other factors such as fire, equalization, and emergency storage requirements for an emergency situation. Therefore, this additional storage is calculated outside the model.
5. A significant increase in fire flow availability of about 22% can be expected at the highest elevation in the system along Steeplehill Court if the proposed new tank is installed at the Oldenburg Road location (Area 7) compared to the existing Carlisle Tower Park location. Furthermore, the results of the hydraulic modeling show that the Oldenburg Road location is a more suitable location for the new elevated tank since it is

closer to the low-pressure area from the resulting pressure spectrum of Carlisle RSA compared to the existing location of the water tower with higher pressures and flows within the water distribution network.

The full Hydraulic Modelling Technical Memorandum is provided in Appendix 3. Hydrant testing results obtained for the hydraulic modelling report is provided in Appendix 3-1.

4.4.2 Geotechnical and Hydrogeological Assessment

4.4.2.1 GROUNDWATER

Based on observations during drilling the redundant well, FDC03RR, as well as the well log for the sentry well (CM-03-03S/D) located to the east of Areas 1 and 2, the groundwater table in the area close to the two areas should range from 4.0 to 6.0 meters below groundwater surface (mbgs), however a shallower water table may occur seasonally.

4.4.2.2 SOURCE WATER PROTECTION

The two Areas are situated in the Halton Region Source Protection Area and are subject to the Source Protection Plan of Halton-Hamilton Source Protection Region. The Source Water Protection Plan identifies four main regulatory factors under the Clean Water Act (2006) relating to local hydrogeology to consider: Significant Groundwater Recharge Areas (SGRAs), Highly Vulnerable Aquifers (HVAs), and Wellhead Protection Areas (WHPAs), and Intake Protection Zones (IPZs).

Based on the provincial dataset, Tower Park is located within a SGRA and a WHPA-A with a score of 10. WHPA-A indicates that Tower Park is located within 100 m from the existing supply wells, and a score of 10 indicates that surficial contaminants at Tower Park have a higher risk to migrate into the well screen of the nearby supply well(s). Scoring can range between 2 (lowest vulnerability) to 10 (highest vulnerability). The east part of William Street is located within a SGRA.

4.4.2.3 GEOTECHNICAL AND HYDROGEOLOGICAL INVESTIGATION RESULTS

A desktop geotechnical and hydrogeological assessment was completed on March 18, 2024, by Palmer Environmental Consulting Group Inc. (Palmer) to provide a preliminary characterization of regional setting and subsurface conditions for Areas 1 and 2 and to assess the expected soil mechanic properties, assess potential groundwater issues, identify data gaps and to make recommendations for additional, site-specific work, if required.

The results of the geotechnical and hydrogeological assessment shows that soil mechanical properties and groundwater conditions at both Area 1: Tower Park and Area 2: William

Street are considered generally suitable for the proposed water storage facility and appurtenance structures. Significant geotechnical and hydrogeological constraints are not anticipated. Geotechnically, both Tower Park and William Street will be appropriate for the proposed development. Hydrogeologically, Tower Park is moderately preferred to William Street as groundwater levels under Tower Park are predicted to be deeper, and the possibility of a construction dewatering requirement is lower.

The above assessment and discussion were based on desktop studies only and should be verified or confirmed with further investigations, including site-specific field investigations. The following are the recommended steps to be undertaken during detailed design:

- Geotechnical and hydrogeological drilling should be conducted for the area selected. The drilling should extend to dense to very dense soils or bedrock expected at approximately 30 m depth. The drilling program should include at least three (3) boreholes outside but adjacent to the footprint of the storge tank. Standard Penetration Testing, soil sampling and lab testing, and classification should be completed. Groundwater monitoring wells should be installed in all boreholes to measure stabilized groundwater levels;
- At least one borehole for each appurtenance structure should be drilled to a depth of 6 m and completed as a groundwater monitoring well. Standard Penetration Testing, soil sampling and lab testing, and classification should be completed; and
- To facilitate soil management during excavation as required by O.Reg. 406/19 On-Site and Excess Soil Management, an Assessment of Past Uses is recommended during later design stages.

The full Desktop Geotechnical and Hydrogeological Investigation Report is provided in Appendix 5.

4.4.3 Natural Environment

A Natural Environment Assessment Report was completed by RVA on March 8, 2024, to document background review and field investigations for Species at Risk (SAR) and highlight significant or sensitive natural heritage features that should be considered during the facility siting and design. This technical report analyzed four (4) Study Areas for the water storage facility siting – Area 1: Tower Park, Area 2: William Street, Area 3: Baseball Diamonds, and Area 4: Tennis Court.

Results of the background review concluded that several SAR are found or potentially found within the vicinity of the Study Areas. There were also significant natural heritage features identified adjacent to the Study Areas including Woodlands, Unevaluated Wetlands, and

Locally Significant Wetlands (LSW). A portion of the Study Areas is also within the regulation limit of Conservation Halton.

The full Natural Heritage Report is provided in **Appendix 6.**

4.4.3.1 VEGETATION

The Study Areas are within a landscape that is primarily estate residential land use interspersed with remnant natural features through the greater Carlisle RSA. The surrounding area is a mixture of agricultural areas, estate residential, and large tracts of wooded natural features. Three (3) of the Study Areas (Areas 1, 3, and 4) are predominantly located within community parks within which the dominant vegetation community is best described as Parkland with a floral composition dominated by common, maintained grass and lawn weed species. Within Study Areas 1 and 3, additional natural/successional communities were identified. Study Area 1 is bounded by a Dry-Fresh Deciduous Forest Ecosite along the northeastern boundary and includes a Mineral Cultural Woodland near the southwestern boundary. A Mineral Cultural Woodland is also present along the northwestern boundary of Study Area 3.

Study Area 2 is located along the eastern edge of Carlisle centered on a formerly cultivated agricultural field. The field is now fallowed and is described as a Mineral Cultural Meadow with a Mineral Cultural Woodland present along the property frontage. To the south, Conservation Halton classifies a tree community as a Mixed Swamp (SWM), a component of the Locally Significant Carlisle Wetland Complex and a tributary of Bronte Creek. No additional natural/successional vegetation communities were identified within the Study Areas; however, several hedgerows and small pocket woodlands, likely classified as Mineral Cultural Woodlands (CUW1) and comprised of a combination of native and non-native tree and shrub species, are identified adjacent to the Study Areas. These features were not investigated in detail and community observations were made strictly from the edges of the Study Area locations.

4.4.3.2 WILDLIFE AND WILDLIFE HABITATS

Due to the rural nature of the Study Area, it is anticipated that most wildlife species in the area are limited to those that tolerate some degree of habitat fragmentation and cultural landscapes. Due to the timing of the survey, birds recorded have been assumed to be breeding locally.

Eight (8) birds were identified during field investigations:

- American Crow
- Field Sparrow

- American Goldfinch
- American Robin
- Blue Jay
- Northern Cardinal
- Northern Flicker
- Song Sparrow

No provincially rare vegetation communities were observed during site investigations nor were any candidate or confirmed point-source areas of wildlife concentration/specialized habitats, such as terrestrial reptile hibernacula, turtle nesting areas, or terrestrial crayfish burrows. All trees greater than 10 cm diameter at breast height including healthy or dead/decaying individuals, may provide Significant Wildlife Habitat (SWH) for bat maternity colonies, as well as habitat for at-risk bats.

No fish or wildlife habitats of significance were confirmed within the Study Area during site investigations. While not mapped as provincially significant, a wooded community classified as FOD4 (Dry-Fresh Deciduous Forest) was identified adjacent to Area 1: Tower Park that is comprised of native woodland species (Wild Sarsaparilla, White Baneberry, etc.) and mature trees. Given the natural composition and age of the woodland, it is our opinion that this feature merits additional discussion with respect to potential project constraints and impacts.

Candidate SWHs with potential to occur within the Study Area (i.e. were not confirmed, but could not be ruled out following field investigations) consist of:

- Candidate SAR Bat maternity roosting habitat (treed communities)
- William Street is within a Mineral Cultural Meadow (CUM1-1) habitat that has the potential to support open-habitat/grassland breeding birds, including rare and SAR.

4.4.3.3 NATURAL HERITAGE CONSTRAINTS

Area 2: William Street is located within 50 m of one section of the Carlisle Wetland Complex Locally Significant Wetland (LSW). No areas defined as a high natural heritage constraint (e.g. provincial natural heritage areas, direct fish habitat, provincially significant wetlands, or habitats that have a high likelihood of supporting SAR) were identified within or adjacent to the remaining Study Areas (Area 1: Tower Park, Area 3: Baseball Diamonds, and Area 4: Tennis Court). Moderate natural heritage constraint areas include higher quality woodland habitats and those areas regulated by Conservation Halton under Ontario Regulation 162/06 for Development, Interference with Wetlands and alterations to Shorelines and Watercourses. The remaining land within the Study Areas and adjacent lands, consisting primarily of parkland habitat, Cultural Meadow, and residential lands, are presented as being a low natural heritage constraint.

4.4.4 Archaeological and Cultural Heritage Environment

4.4.4.1 ARCHAEOLOGICAL RESOURCES

A Stage 1 Archaeological Assessment (Stage 1 AA) was completed on March 7, 2024, by Parslow Heritage Inc. (PHC). Stage 1 AA consists of a review of geographic, land use and historical information for the property and the relevant surrounding area and contacting the Ministry of Citizenship and Multiculturalism (MCM) to find out whether, or not, there are any known archaeological sites on or near the property. Its purpose is to identify areas of archaeological potential and further archaeological assessment (e.g., Stage 2-4) as necessary.

The Carlisle Water Storage Facility Archaeological Assessment Study Area consists of the two shortlisted locations – Area 1: Tower Park and Area 2: William Street.

Although Area 1: Tower Park appears to have been partially disturbed, it is recommended to undergo a Stage 2 test pit survey at 5 m intervals to confirm the degree of disturbance and determine if any intact soils remain within the proposed study area. Area 2: William Street has not been disturbed and is recommended to undergo Stage 2 property survey through a combination of test pit survey and pedestrian survey. A test pit survey is completed by excavating a small test pit area and screening the test pit fill through a mesh, to uncover any artifacts. The test pits are also examined for stratigraphy, cultural features, and evidence of fill. Once the test pit survey is complete, the test pits are backfilled. A pedestrian survey is completed by plowing the Study Area and then conducting a visual sweep while walking to look for uncovered artifacts. Approximately 0.56 Ha (75.6% of the Study Area) is considered to be agricultural field, and as such should undergo Stage 2 assessment via Stage 2 pedestrian survey at 5 m intervals. Approximately 0.18 Ha (24.4% of the study area) is treed and cannot be ploughed. As such, it is recommended that these areas are subject to Stage 2 test pit survey at 5 m intervals.

The full Stage 1 Archaeological Assessment Report is provided in Appendix 7.

4.4.4.2 BUILT HERITAGE RESOURCES AND CULTURAL HERITAGE LANDSCAPES

A Cultural Heritage Assessment Report was completed on April 3, 2024, by PHC to identify existing conditions within the Study Area, as it relates to the two shortlisted water storage facility locations under consideration (Tower Park and William Street), provide an inventory of known and potential cultural heritage resources within or adjacent to the Areas, identify preliminary potential impacts to cultural heritage resources, and provide preliminary mitigation measures, as appropriate.

Assessment of the Study Areas did not result in the identification of any potential impacts to known or potential heritage resources in proximity to either location. It is acknowledged that Carlisle is identified by the City of Hamilton as an inventoried Cultural Heritage Landscape (CHL). As such, the following recommendations were made:

- As no known or potential cultural heritage resources were identified within or adjacent to Tower Park or William Street, no further cultural heritage assessment(s) are required (Cultural Heritage Evaluation Report [CHER], Heritage Impact Assessment [HIA]) and no mitigation options are presented for these locations.
- As Tower Park and William Street are located within an inventoried CHL within the City of Hamilton, post-construction landscaping and rehabilitation plans should be undertaken in a manner that is sympathetic to the overall setting of the community.
- Should further work require an expansion of the properties required for Tower Park and/or William Street, a qualified heritage consultant must be retained to assess potential impacts to known and/or potential heritage resources.

The full Cultural Heritage Assessment Report is provided in Appendix 8.

4.4.5 Phase 1 Environmental Site Assessment

A Phase 1 Environmental Site Assessment (ESA) was carried out by Palmer Inc. for the two (2) shortlisted locations considered and evaluated for implementing the water storage facility.

4.4.5.1 AREA 1: TOWER PARK

A Phase 1 ESA was carried out for Tower Park by Palmer Inc. for due diligence purposes.

The Area is an approximate 1.46 Ha, irregular shaped, parcel of land located on the south side of Woodend Drive in Carlisle, Hamilton, Ontario. Building structures on the Area include a 292.6 m² storage building and an 573 m^2 water tower. A children's playground is also present in the northeast portion of the Site. The exterior portion of Tower Park has an asphalt paved walkway running through the Area with grassed areas to the east and west of the buildings. Approximately 90% of the Area's exterior is covered with asphalt and/or grass and trees.

Results of the Phase 1 ESA provided the following conclusions:

- The following potential on-site sources of contamination were identified:
  - A potential on-site source of soil and groundwater contamination includes Sodium (Na), Chloride (Cl-), Electrical Conductivity (EC) and Sodium Adsorption

Ratio associated with the water treatment occurring at the site. However, based on the interior storage of the sodium hypochlorite solution with no reported spills and incidents, this potential source is considered to pose a low environmental concern at the site.

- No potential off-site sources of contamination were identified. Based on the age and use of the buildings, it is unlikely that designated substances were used during the construction.

In conclusion, no actual or potential sources of soil or groundwater contamination associated with the Area have been identified during our Phase 1 ESA. Therefore, no further investigations are currently warranted.

The full Phase 1 Environmental Site Assessment Report for Area 1: Tower Park is provided in Appendix 9-1.

4.4.5.2 AREA 2: WILLIAM STREET

A Phase 1 ESA was carried out for Area 2: William Street by Palmer Inc. for due diligence purposes. The municipal address for the entire parcel is 1535 Centre Road, Carlisle, Hamilton, ON.

The site is an approximate 0.65 Ha, rectangular shaped, parcel of land which is a portion of a larger block of land located on the south side of William Street in Carlisle, Hamilton, Ontario. No building structures are present on the Site. The site is currently an undeveloped, vacant parcel of land. The site consists of grassed areas and vegetation throughout. Approximately 100% of the site is covered with vegetation and/or grass.

The surrounding area was surveyed within a 250 m radius from the site and it was determined that the area is developed with residential and community land uses. In addition, there are no automotive repair garages, gasoline service stations, dry cleaning facilities, or industrial land uses within a 250 m radius of the site. Historically, the site has remained undeveloped since at least the 1950s.

Results of the Phase 1 ESA provided the following conclusions:

- No potential on-site or off-site sources of contamination were identified that require further investigation.
- The following potential off-site sources of contamination were identified and are considered to pose a low environmental concern to the site:
  - A potential off-site source of groundwater contamination includes Petroleum Hydrocarbons (PHCs), Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX)

associated with a historic fuel oil spill recorded for 1535 Centre Road in 2003. However, based on a review of historical aerial photographs, the buildings associated with this address where a fuel oil tank would have been present, are outside of the 250 m radius of the site and are inferred to be located hydraulically cross-gradient from the site. Therefore, this potential source is considered to pose a low environmental concern.

- A potential off-site source of groundwater contamination includes Polychlorinated Biphenyls (PCBs) associated with a historic transformer oil spill for 1535 Centre Road in 2009. However, based on Palmer's Site reconnaissance, no transformers were observed along Centre Road in the vicinity of 1535 Centre Road, and the buildings associated with this address where a transformer may be present, are outside of the 250 m radius of the site and are inferred to be located hydraulically cross-gradient from the site. Therefore, this potential source is considered to pose a low environmental concern.
- A potential off-site source of ground water contamination includes PHCs and BTEX associated with the generation of emulsified oils at the arena located at 1496 Centre Road. This record is considered to pose a low environmental concern to the site as this property is inferred to be located hydraulically cross-gradient from the site.

In conclusion, no actual sources of soil or groundwater contamination associated with the site have been identified during the Phase I ESA. The abovementioned potential off-site sources of contamination pose a low environmental concern to the site, if any. Therefore, no further investigations are currently warranted.

The full Phase 1 Environmental Site Assessment Report for Area 2: William Street is provided in Appendix 9-2.

5.0 PHASE 2: ALTERNATIVE SOLUTIONS (PART 2)

Under Phase 2 of the Class EA process, all reasonable solutions to the problem are identified and described, including the "Do Nothing" alternative. After general inventories of the technical, natural, social, cultural, and economic environments are prepared and potential environmental impacts are determined for each alternative, the net positive and negative effects are identified, and the alternatives are evaluated resulting in a recommended solution. The recommended solution is then presented to the public, partners, and agencies to solicit input into the selection of the "preferred solution".

5.1 Assessment Criteria

The Project Team considered criteria that represent the broad definition of the environment as described in the EA Act to comparatively evaluate the alternative water storage facility locations and system improvements. The general evaluation criteria used in evaluating the alternatives are outlined in the table below.

Criteria	Considerations
Technical	• Reliability • Connection to existing infrastructure (including pipe network) • Operational impact • Long-term solution • Approvals required to implement solution • Constructability and access • Hydraulic requirements
Social Environment	• Effects on neighbouring properties • Sensory impacts throughout construction (noise, dust, etc.) • Effects on the municipality, local businesses, etc. • Effects on Indigenous partnerships • Future growth as per the City's Official Plan
Natural Environment	• Effects on wildlife and vegetation • Effects on habitats and air quality • Effects on Source Water Protection • Climate change
Cultural Heritage / Archaeological	• Impacts areas with archaeological potential • Impacts cultural heritage resources
Relative Cost and Financial Risk	• Affordability • Relative magnitude of expense • Additional costs related to unknowns • Potential construction risks that could impact cost or other financial risks

5.2 Evaluation Methodology and Ranking System

The Project Team then comparatively ranked each alternative solution from least desirable to most desirable, for each of the criteria described above, to determine the preliminary

preferred solution(s). Figure 5.1 demonstrates the rating scale used in the evaluation of alternative locations and water storage systems described below.

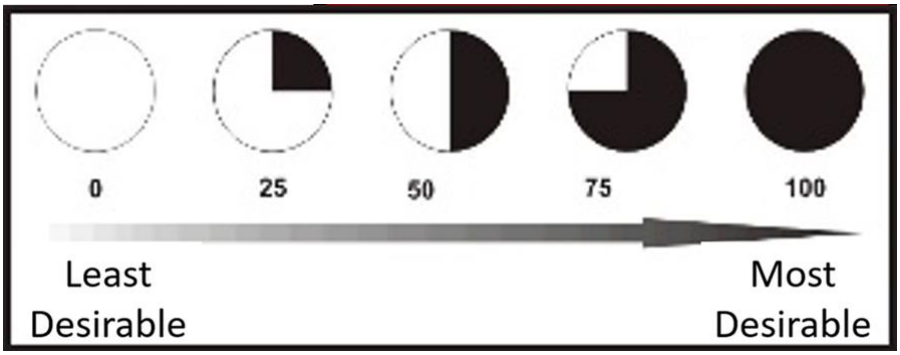

Figure 5.1 Alternatives Ranking Scale for Each Criterion

Figure 5.2 Ranking Scale for Overall Alternatives

5.3 Shortlisted Alternative Locations

The following sections describe and evaluate the shortlisted alternative locations for the water storage facility.

5.3.1 Identification of Shortlisted Alternative Locations

5.3.1.1 AREA 1: TOWER PARK (EXISTING ELEVATED TANK LOCATION)

As previously mentioned, Tower Park is located on City owned property off Woodend Drive and is already connected to the existing water supply system. Tower Park can be easily accessed from Acredale Drive or through a new access from Woodend Drive. It is located in a community park in between residential homes and can accommodate an above-ground or below-ground water storage facility. This site could support the construction of a new facility to replace the existing tower or accommodate an additional facility to provide the required storage.

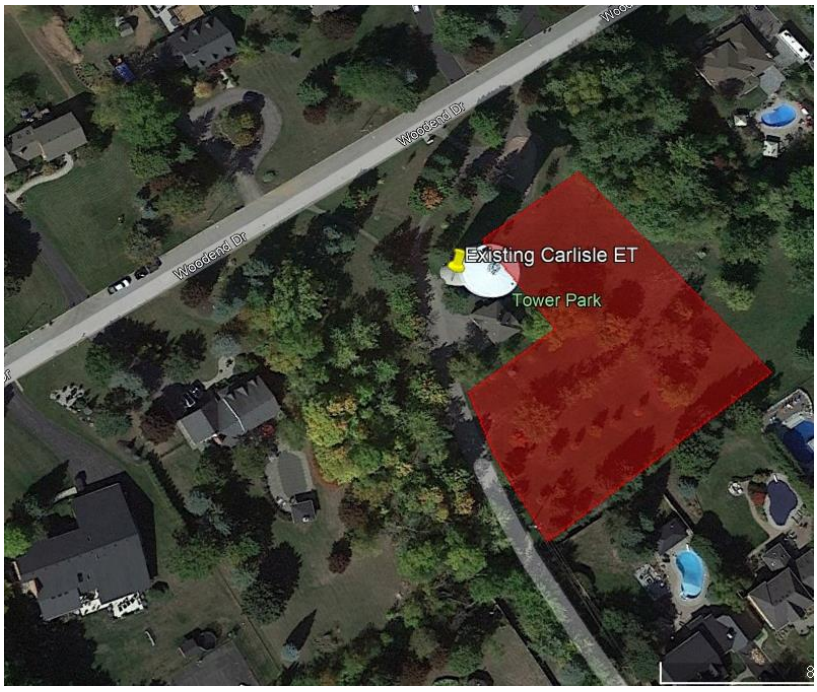

Figure 5.3 Area 1: Tower Park

5.3.1.2 AREA 2: WILLIAM STREET AT CENTRE ROAD

As previously mentioned, this location is on privately owned property, 1535 Centre Road. 1535 Centre Road is not connected to existing water supply system and a 350 m watermain extension from Elderberry Lane would be required. Access to the water storage facility could be provided from William Street, which is a dead-end street. This site could support the construction of a new facility to replace the existing tower at Tower Park or accommodate an additional facility to provide the required storage. However, this area is located adjacent to Wetland Hazard Lands between two residential homes.

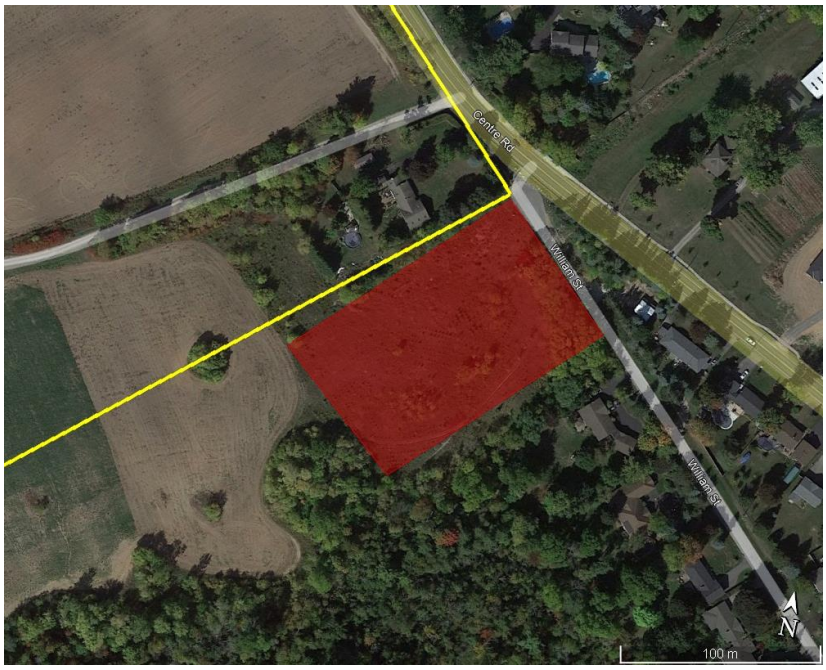

Figure 5.4 Area 2: William Street at Centre Road

5.3.2 Evaluation of Shortlisted Alternative Locations

Table 5.1 summarizes the evaluation of alternative site locations for implementing an improved water storage system. The evaluation was completed based on criteria presented in Section 5.1 and the evaluation methodology described in Section 5.2.

5.3.3 Preferred Location

The recommended location for the future water storage facility is Area 1: Tower Park, which is the location of the existing elevated water tank. This is the preferred location as there is existing driveway access and pipe network on the property. The property is owned by the City, which is generally preferable to purchasing private property as it reduces costs associated with acquiring land. Tower Park is located on higher ground and therefore meets the hydraulic (water pressure) requirements. Tower Park is located in an urban area on a disturbed site, thus reducing impacts to natural environment. Additionally, there are lower construction costs with this location in comparison to the Area 2: William Street at Centre Road.

Table 5.1 Evaluation of Shortlisted Water Storge Facility Locations

EVALUATION CRITERIA	Area 1: Tower Park		Area 2: William Street	
TECHNICAL	◕	• Higher ground elevation (acceptable hydraulic pressure) • Located in close proximity to supply wells	◕	• Lower ground elevation (acceptable hydraulic pressure) • Pipe extension required to connect to existing infrastructure
SOCIAL ENVIRONMENT	◕	• City owned (Location of Existing Elevated Tank) • Potential impact to playground during construction	◑	• Private Property • Open land with minimal adjacent residential properties
NATURAL ENVIRONMENT	◕	• Minimal vegetation and wildlife impact anticipated	◑	• Vegetation removal required • Located adjacent to wetland and within Conservation regulation
CULTURAL HERITAGE / ARHCAEOLOGICAL	●	• Less potential as land has been previously disturbed	◕	• Agricultural land has not been developed. • Potential for archaeological potential.
RELATIVE COST AND FINANCIAL RISK	◕	• Approx $6-$8M capital cost and similar maintenance cost to existing	◑	• Approx $7-$9M capital cost and similar maintenance cost to existing
Overall Ranking (based on score)	**1st**		**2nd**	
EVALUATION SUMMARY	**Recommended**		Not Recommended	

5.4 Water Storage System Improvement Options

The following sections identify and describe water storage system alternatives considered to improve Carlisle RSA's water storage and distribution system.

5.4.1 Identification of Alternative Water Storage Systems

5.4.1.1 ALTERNATIVE 1: DO NOTHING

This is the baseline scenario where the existing elevated tank would remain in place and a new water storage system would not be constructed. For this baseline scenario, water demands will not be met for the current population or the planned additional growth in the community. This alternative does not address the Problem and Opportunity Statement. This alternative is required to be evaluated as per the Class EA process requirements (MCEA 2023).

5.4.1.2 ALTERNATIVES 2 AND 3: ELEVATED TANK (REPLACE OR IN ADDITION TO EXISTING)

An elevated tank is a water storage facility supported by a tower at an elevation to provide storage and water pressure. This water storage system uses gravity to distribute water. The elevated tank could either replace (Alternative 2) or be in addition to the existing facility (Alternative 3). The new elevated tank would be approximately the same height (49 m) and slightly wider (20 m) than the existing elevated tank. The above-mentioned dimensions and illustration below assume construction of a new elevated tank to replace the existing.

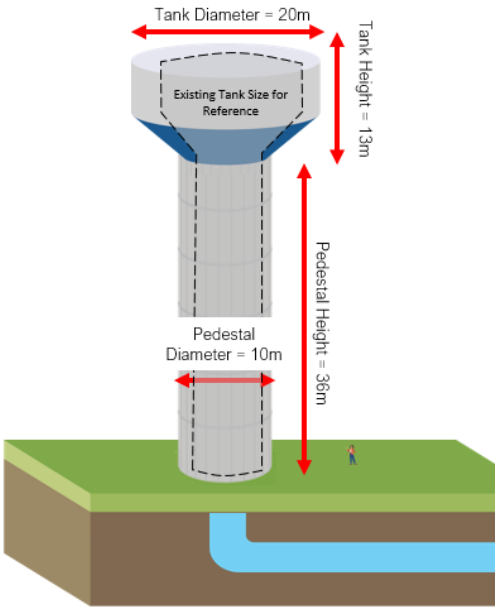

Figure 5.5 Alternative 2: New Elevated Tank to Replace Existing Tank

5.4.1.3 ALTERNATIVES 4 AND 5: STANDPIPE (REPLACE OR IN ADDITION TO EXISTING)

A standpipe is a tall tank for storing water, usually smaller in diameter compared to its height. A standpipe also uses gravity to distribute water. The standpipe could either replace (Alternative 4) or be in addition to the existing facility (Alternative 5). The new standpipe would be approximately 49 m in height and 17 m in width. The above-mentioned dimensions and illustration below assume construction of a new standpipe to replace the existing elevated tank.

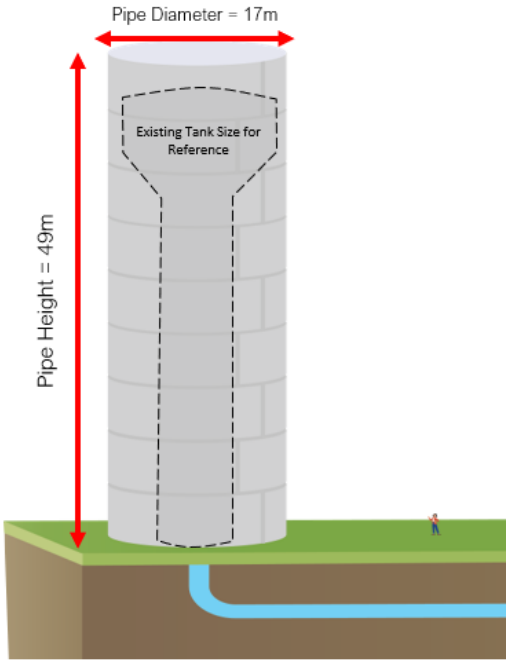

Figure 5.6 Alternative 4: New Standpipe to Replace Existing Elevated Tank

5.4.1.4 ALTERNATIVES 6 AND 7: IN-GROUND RESERVOIR (REPLACE OR IN ADDITION TO EXISTING)

An in-ground reservoir consists of an underground compartment used to accumulate water from an external water treatment unit and requires pumps to distribute water. Since this system required pumps, it may impact operational reliability and increases the electricity usage required to operate the pumps. This water storage system also requires a larger excavation. The in-ground reservoir could either replace (Alternative 6) or be in addition to the existing facility (Alternative 7). The size of the new underground reservoir would be approximately 20.5 m wide and 8.5 m tall with a pumping station approximately 8 m (width) by 8 m (height). The above-mentioned dimensions and illustration below assume construction of a new in-ground reservoir to replace the existing elevated tank.

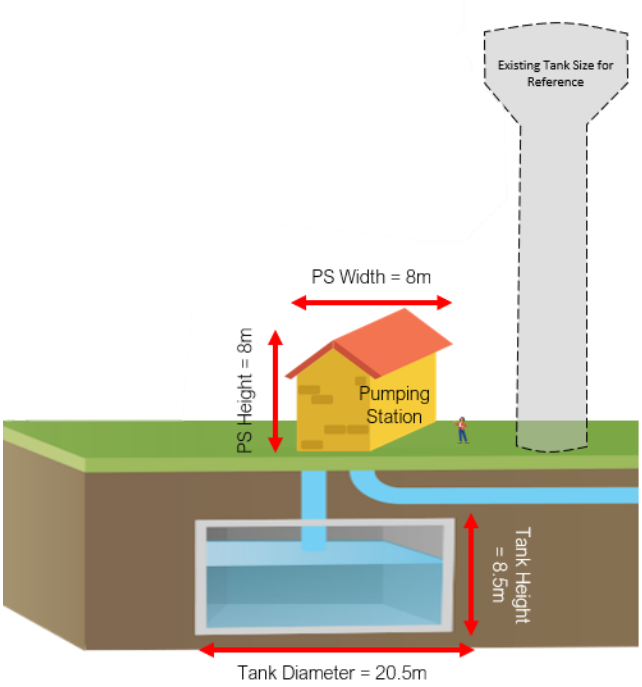

Figure 5.7 Alternative 6: In-Ground Reservoir to Replace Existing Elevated Tank

5.4.1.5 ALTERNATIVES 8 AND 9: ABOVE GROUND RESERVOIR (REPLACE OR IN ADDITION TO EXISTING)

An above ground reservoir consists of an above ground compartment used to accumulate water from an external water treatment unit and pumps to distribute the water. Since this water storage system requires pumps, it could impact operational reliability and increase the electricity usage to operate the pumps. The above ground reservoir requires a larger environmental footprint than the other alternatives listed above. The above ground reservoir could either replace (Alternative 8) or be in addition to the existing facility (Alternative 9).

The size of the new above ground reservoir would be similar to the in-ground reservoir, approximately 8.5 m tall and 20.5 m wide. The pump station would be approximately 8 m wide and 8 m tall. The above-mentioned dimensions and illustration below assume construction of a new above ground reservoir to replace the existing elevated tank.

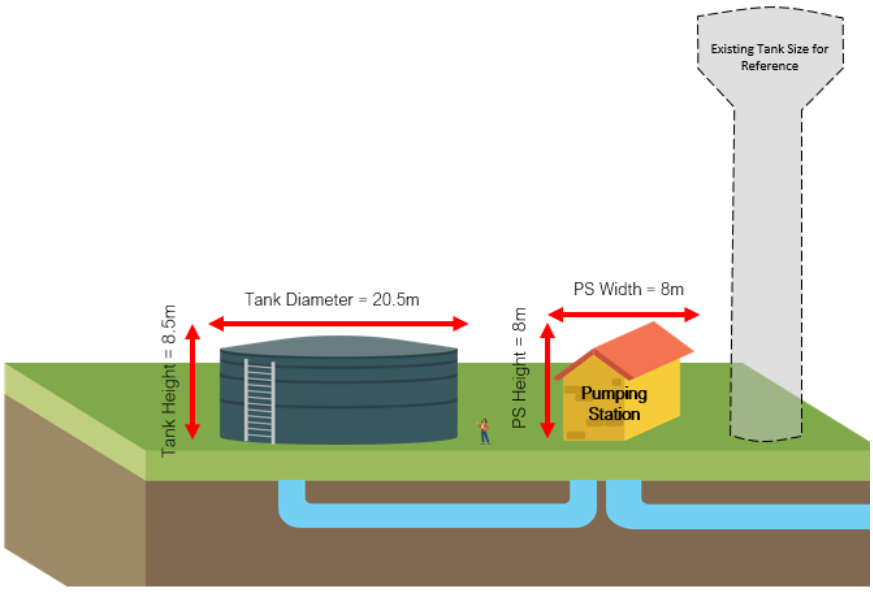

Figure 5.8 Alternative 8: Above Ground Reservoir to Replace Existing Elevated Tank

5.4.2 Evaluation of Alternative Water Storage Systems

Table 5.2 summarizes the evaluation of the nine (9) alternative water storage system solutions to address water demands and storage needs in the Carlisle RSA. The evaluation was completed based on criteria presented in Section 5.1 and the evaluation methodology described in Section 5.2.

5.4.3 Preferred Water Storage System

The preferred water storage system solution is Alternative 2: New Elevated Tank to Replace the Existing Elevated Tank. The new elevated tank will be slightly larger than the existing and will operate in a similar function (i.e., using gravity to distribute water). The new elevated tank will also have a similar environmental footprint to the existing tank. Once the new tank is constructed, the old tank could be replaced with green space.

The approximate capital costs for this solution are $9M to $11M. This solution will also have reduced operation and maintenance costs in comparison to other alternatives.

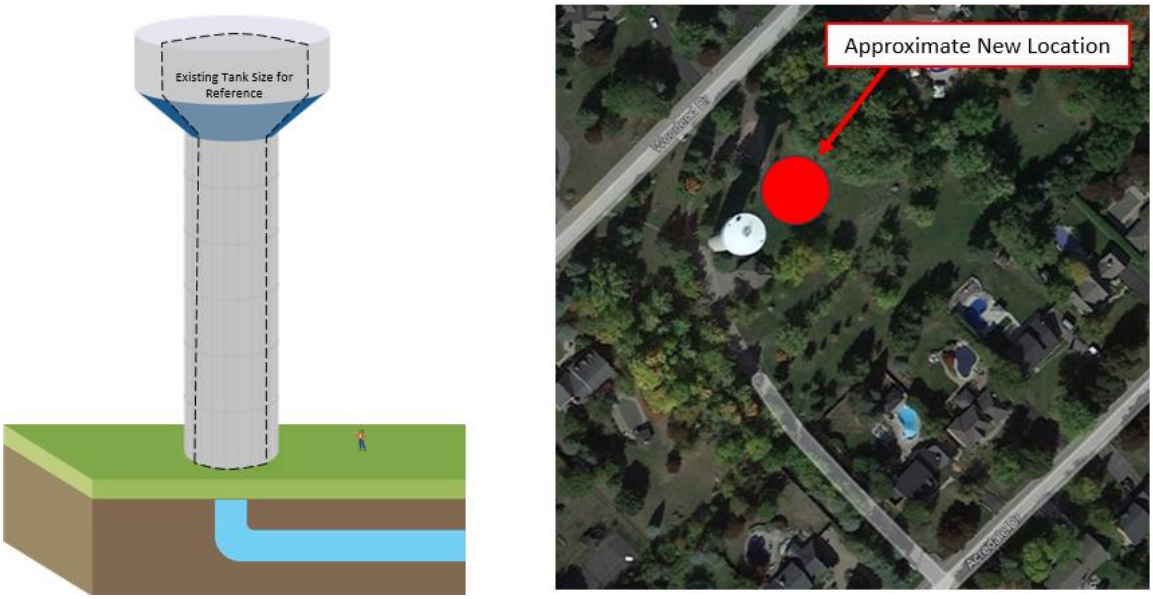

Figure 5.9 Preferred Water Storage System and Location

Table 5.2 Evaluation of Water Storage System Alternatives

EVALUATION CRITERIA	1. Do Nothing	2. Elevated Tank to Replace Existing Elevated Tank	3. Second Elevated Tank with Existing Elevated Tank	4. Standpipe to Replace Existing Elevated Tank	5. Standpipe with Existing Elevated Tank	6. Below Grade Reservoir to Replace Existing Elevated Tank	7. Below Grade Reservoir with Existing Elevated Tank	8. Above Grade Reservoir to Replace Existing Elevated Tank	9. Above Grade Reservoir with Existing Elevated Tank
TECHNICAL	○ • Does not provide required storage capacity • Is not a feasible Long Term solution	● • Slightly larger Elevated Tank than existing • Similar operation and functionality as existing elevated tank • Long Term solution	◕ • Two Tanks in one Community • Additional connections to connect tanks and allow for redundancy • Additional maintenance and operation • Long Term solution	◕ • Different design than existing • Slightly larger than the existing • Minor operational changes • Potential for water quality issues • Long Term solution	◕ • Two Tanks in one Community • Additional connections to connect tanks and allow for redundancy • Additional maintenance and operation with two tanks • Potential for water quality issues • Long Term solution	◑ • Buried below grade • Increased energy usage for pumps • Potential for impact to security of supply • Long Term solution	◑ • Two storage facilities in one Community • Additional maintenance and operation with two tanks • Buried below grade • Increased energy usage for pumps • Potential for impact to security of supply • Long Term solution	◑ • Different appearance than the existing • Increased energy usage for pumps • Potential for impact to security of supply • Long Term solution	◑ • Two storage facilities in one Community • Additional maintenance and operation with two tanks • Increased energy usage for pumps • Potential for impact to security of supply • Long Term solution
SOCIAL ENVIRONMENT	● • No Impacts	◕ • Casts shadow on adjacent properties • Higher aesthetic impact	◑ • Casts larger shadow on adjacent properties • Higher aesthetic impact	◕ • Casts shadow on adjacent properties • Higher aesthetic impact	◑ • Casts larger shadow on adjacent properties • Higher aesthetic impact	● • Minimal Visual Impact • Mostly all below grade	◕ • Minimal visual impact for new infrastructure • New infrastructure mostly all below grade	◕ • Increased visual impact • New infrastructure has a lower shadow	◑ • Increased visual impact • New infrastructure has a lower shadow
NATURAL ENVIRONMENT	● • No Impacts	● • Similar environmental footprint as existing • Existing infrastructure could be replaced with green space	◑ • Larger environmental impact with two structures	● • Similar environment footprint as existing • Existing infrastructure could be replaced with green space	◑ • Larger environmental impact with two structures	● • Larger environmental footprint • Green space could be located on top of structure	◕ • Larger environmental impact with two structures	◕ • Larger environmental footprint • Existing infrastructure could be replaced with green space	◑ • Larger environmental impact with two structures
CULTURAL HERITAGE / ARHCAEOLOGICAL	● • No Impacts	◕ • Lower potential for negative impact due to smaller footprint	◕ • Lower potential for negative impact due to smaller footprint	◕ • Lower potential for negative impact due to smaller footprint	◕ • Lower potential for negative impact due to smaller footprint	◑ • Higher potential for negative impact due to larger footprint	◑ • Higher potential for negative impact due to larger footprint	◑ • Higher potential for negative impact due to larger footprint	◑ • Higher potential for negative impact due to larger footprint
RELATIVE COST AND FINANCIAL RISK	◕ • No capital costs but increased maintenance costs for aging infrastructure	◕ • $5-$7M capital cost and standard maintenance costs	◑ • $4-$6M capital cost and increased maintenance costs for two structures, including one aging infrastructure	◕ • $4-$6M capital cost and increased maintenance costs to circulate water	◑ •$3-$5M capital cost and increased maintenance costs for two structures, including one aging infrastructure	◑ • $7-$9M capital costs • Large excavation required leading to potential unknowns • Higher maintenance costs	◑ • $5-$7M capital costs • Large excavation required leading to potential unknowns • Higher maintenance costs for two structures, including aging infrastructure	◕ • $4-$6M capital cost and increased maintenance costs	◑ • $3-$5M capital costs • Higher maintenance costs for two structures, including aging infrastructure
Overall Ranking (based on total score)	9th	1st	3rd	2nd	5th	4th	7th	6th	8th
EVALUATION SUMMARY	Not Recommended	**Recommended**	Not Recommended	Not Recommended	Not Recommended	Not Recommended	Not Recommended	Not Recommended	Not Recommended

6.0 RECOMMENDED SOLUTION AND CONCEPTUAL DESIGN

6.1 Reclassification of EA Study to 'Exempt' for the Recommended Solution

Since the preferred solution is to construct a larger elevated tank to replace the existing elevated tank at the same location (i.e. Tower Park), it was determined that the Study should be downgraded from Schedule 'B' to 'Exempt' from the MCEA process as per the 2023 amendment (MCEA 2023) because the preferred solution does not require any land acquisition and has minimal impact on the natural and socio-economic environment.

6.2 Conceptual Design

The following sections summarize key elements of the conceptual design of the new elevated tank. The Conceptual Design Drawings and full Conceptual Design Report are provided in Appendix 11.

6.2.1 Design Criteria

Two factors were taken into consideration when developing design criteria for the new elevated tank: 1) population projections and 2) water demand and pressures. As previously discussed, the total future population to be serviced within the Carlisle RSA is 2,947 people. The future population was used to calculate the future MDD water demands.

The following criteria were used for water consumption calculations:

- Per Capita Consumption: 422 L/cap/d
- Maximum Day Factor: 3.4
- Projected Service Population: 2,947 people
- The MECP's acceptable pressure ranges between 275 to 700 kPa (40 to 100 psi) for the local service area.

6.2.2 Key Elevations

The proposed conceptual design of the new elevated tank has the following key elevations:

- Ground Level (Finished Grade): 273 m above sea level (ASL).
- Low Water Level (LWL): 313 m ASL. Existing elevated tank LWL was 315.500 m per the existing Record Drawings.
- Bottom of Equalization Band: approximately at 319 m ASL

- High Water Level (HWL): 323 m ASL. Same HWL as the existing elevated tank per the existing Record Drawings.

The new elevated tank will not be taller than the existing tank, however, it will be wider.

6.2.3 Tank Sizing

According to MECP guidelines, it is recommended that the water supply provide sufficient storage for equalization of peak hours, firefighting, and emergency conditions. More specifically, the water storage volume for a community should be calculated using the following formula:

Total Treated Water Storage Requirement = A + B + C
Where: A = Fire Storage;
B = Equalization Storage (25% of maximum day demand); and
C = Emergency Storage (25% of A + B)

Fire Storage (A) is calculated based on theoretical fire flows over an estimated duration that the fire would require water. Equalization Storage (B) is calculated as 25% of the maximum day demand. This storage allows for fluctuation in water demand throughout the day. Emergency Storage (C) is calculated as 25% of the Fire Storage (A) and Equalization Storage (B). This storage accounts for unexpected issues that may arise in the water system, such as watermain break or equipment failure.

The required fire flow for the Carlilse RSA of 150 L/s for 2 hours was used to calculate the required fire storage volume. The future maximum day demand for the new ET service area was calculated to be 4.226 million litres per day (MLD). The following calculations show the overall daily storage volume required based on MECP guidelines.

A = 150 L/s x 2 hour = 1.080 ML
B = 25% x 4.226 ML = 1.057 ML
C = 25% (1.080 ML + 1.057 ML) = 0.534 ML
TOTAL = A + B + C = 2.671 ML

6.2.4 Tank Material

There are currently two types of panel material for elevated tanks (e.g. Composite Welded Steel and Composite Bolted Glass-Line Steel). Both are composite (concrete pedestal with steel storage tank) type, and both are design-build type structures. Both styles of panel materials are suitable for this project. Traditional welded steel elevated tanks have been constructed up to 9,000 m^3 in Ontario, and bolted steel elevated tanks can be constructed

to volumes up to approximately 3,700 m^3. Therefore, the style of elevated tank can be selected during preliminary design based on the City's preference. The City's Water Outstation Design Manual specifies all-welded steel reservoir that conforms to AWWA standard D107.

The major drawback of composite welded steel tank construction is that the steel tank portion needs to be painted internally and externally, and the paint needs to be maintained and re-applied typically every 15 to 20 years. The costs to refurbish an elevated tank have risen significantly, mainly due to the need for environmental controls, to prevent dispersion of dust and overspray. The recoating process would typically take the facility out of service for 6 months and the work must be performed within a certain temperature range.

Although glass-lined bolted steel tanks have higher capital costs upfront, the major advantage is that they do not need to be field-painted, and therefore the glass-lined panels do not require paint re-application throughout it's life-cycle, significantly saving on maintenance costs. The estimated lifespan of a glass-lined panel tank is 50 years.

6.3 Geotechnical Recommendations

The following provides a summary of geotechnical recommendations to be considered during design and construction.

6.3.1 Foundation Considerations

Based on the structural forms of the proposed development and the site stratigraphy, spread footings are expected to be feasible for the elevated storage tank. The spread footing for the elevated storage tank may take forms of reinforced concrete raft foundation and reinforced concrete ring. The spread footing for supporting appurtenances may be conventional strip footing.

It should be noted that the spread footings have to be founded in native soil. The depth of fill will be determined through site-specific borehole drilling completed during later design stages. Bearing capacity of foundation soil should be determined through borehole drilling and in-situ testing such as Standard Penetration Test and soil classification as part of a geotechnical drilling program.

For a preliminary foundation design, 70 to 100 KPa bearing capacity of soil under the sites for spread footings can be considered subjected to confirmation by geotechnical inspection that the soil must be native ice-contact deposits and over 1.5 m deep. The foundation should be founded on firm native mineral soil and with a depth of more than 1.2 m to be below the front line. In case the thickness of fill is greater than 1.2 m, the fill should be

excavated and removed. The space should be backfilled with lean concrete to grade. Lean concrete should be designed to have a compressive strength over 5.0 MPa.

6.3.2 Excavations and Groundwater Control

The majority of excavation will go through sand and gravel. Based on the density of soil and classification as observed during drilling the redundant well, a light to medium duty backhoe excavator should be adequate to execute the excavation.

Excavation sequence, cutting slope forms and support system should be implemented in accordance with Regulation 213/91 under the Ontario Occupational Health and Safety Act (OHSA) and Ontario Building Code.

Excavation may extend to deeper than 1.2 mbgs, and there must be workers working in the trench to build the foundation. Therefore, a supporting system has to be considered if the cutting slope is not to be flattened to one vertical to one horizontal (1:1 slope or 45-degree natural slope). Excavation should be closely inspected by a qualified geotechnical staff. If the exposed soil condition is different from the findings from boreholes, the excavation process and shoring system might have to be modified. Excavated soil should be stockpiled at least 3 m away from the cutting wall crest if space is available.

It is recommended to complete excavation in the dry season, if possible, to limit exposure to the elements. Limit the exposure of necessary slopes of any unsupported excavation. Tarps may be required during extended periods of rainfall to prevent erosion and soaking of the slope.

Excess soil should be disposed of according to Ontario Regulation 406/19 under the Ontario Environmental Protection Act and associated guidelines.

As mentioned above, the groundwater table under the two sites should be deeper than 3.0 m. If the excavation depth does not extend deeper than 3.0 m, groundwater seepage into the excavation pit is not anticipated. However, considering the coarse grain size of the overburden soil, perched groundwater seepage during precipitation is anticipated. In case the groundwater is encountered at shallower depth, construction dewatering will have to be considered. Hydrogeological assessment will be recommended during detailed design to confirm if construction dewatering is needed.

6.4 Preliminary Cost Estimates

A Cost Estimate for the conceptual design was prepared and summarized in Table 6.1 with inclusion of a Class D estimating contingency (30%). This estimate was developed based

on past industry experience and supplier costs, considering 2024 pricing. This estimate should be revisited and updated at least annually, and further refined during detailed design.

Table 6.1 Conceptual Cost Estimate for Construction

Item	Scope	Total Cost
1	Site Work for ET Pre and Post Tank site work including landscaping and paving (connection to redundant well FDC03RR not included)	$1,100,000
2	Elevated Tank with Logo 2.4 m deep raft slab, concrete pedestal, steel tank, coatings, piping, ladders, platforms, antenna support structure	$6,000,000
3	Process Recirculation, chemical system	$225,000
4	Mechanical HVAC and plumbing	$200,000
5	Electrical and Controls	$875,000
6	Third Party Testing – Coatings	$30,000
	Construction Subtotal	**$8,430,000**
	Class D Cost Estimate Contingency (30%)	$2,529,000
	Total Construction excluding HST	**$10,959,000**

Table 6.2 summarizes the cost estimates for some of the operational and maintenance (O&M) activities. The list of O&M costs presented is not meant to be exhaustive as there could be other costs required, such as equipment breakdown and replacement.

Table 6.2 Conceptual Cost Estimate for O&M

Item	Scope	Total Cost	Frequency
C1	Estimated Annual Power Cost	$3,000	Every Year
C2	Estimated Annual Chemical Cost	$2,000	Every Year
C3	Fall-Arrest System Inspection	$2,000	Every Year
C4	Overcoating of Tank Interior and Exterior	$650,000	Every 10-15 Years
C5	Tank Interior and Exterior Re-Coating	$1,000,000	Every 20-30 Years
C6	Tank Inspection (Remotely Operated Vehicle)	$5,000	Every 5 Years
C7	Tank Pressure Washing – Interior Only	$25,000	Every 5 Years

7.0 ANTICIPATED IMPACTS, MITIGATION MEASURES, AND MONITORING

7.1 Climate Change

As part of the Class EA planning process, the Provincial Guide for Considering Climate Change in the Environmental Assessment Process (2017) was reviewed. The guide sets out MECP's guidelines and expectations for consideration of climate change for the Class EA process. The project was reviewed to identify the potential impacts of climate change, the effects of climate change on the project, and identify mitigation measures to minimize the effects.

For the water storage facility, climate change mitigation and adaptation were considered during the selection of the preferred solution and shall factor into its design and construction as follows:

- Best practices for climate change will be considered during the design to mitigate the impact of the new elevated tank, and associated infrastructure. For example, energy reducing features would be incorporated into the design (e.g. energy efficient lighting systems).
- Best practices for structural building requirements to accommodate extreme weather will be incorporated to the elevated tank design (e.g. wind and snow load on elevated tank).
- The construction timing windows will be scheduled to mitigate the negative impacts on local vegetation, and native species.
- The location selected minimizes the overall impact to the environment in terms of the infrastructure required to connect the systems – minimal extension length for new watermains required and elevated tank can use existing watermains.
- Climate change is not anticipated to have a large effect on the operation, decommissioning, or post-closure of the tank. The preferred location of the elevated tank is at a point of high elevation in the community, which would reduce the risk of flooding, etc. from local water bodies. A stormwater management plan could be developed during detailed design to account for changes in severity of storms.
- The water storage system selected (elevated tank) is a gravity-based system that can continue to serve the Carlisle RSA community for a long period of time without needing additional pumps. This reduces electricity requirements for the new elevated tank.

7.2 Natural Environment Impacts

This project must consider SAR protected under the ESA, birds protected under the Migratory Birds Convention Act (MBCA 1994), and species protected under the Fish and Wildlife Act, all of which require consideration. Overall, there are limited natural heritage concerns with this project, and those that do exist relate to incidental impacts that may occur during construction.

The conceptual design for the proposed Carlisle Water Storage area should take into consideration the natural heritage features and functions noted above to confirm compliance with policies as well ecological sustainability through appropriate stewardship. It is recommended that appropriate mitigation measures to protect the identified natural heritage components be incorporated into an Environmental Management Plan (EMP) at detailed design, including discussion of site preparation (e.g. vegetation clearing) and construction timing windows, Erosion and Sediment Controls (ESCs), and contractor education.

7.3 Socio-Economic Impacts

7.3.1 Aesthetics and Community Impacts

Temporary visual, noise, and traffic impacts are anticipated during construction in residential areas and long-term visual impacts of the new elevated tank are anticipated. Long-term visual impacts are anticipated to be similar to the existing elevated tank as the new elevated tank is a similar size and shape and approximately in the same location.

Mitigation measures for aesthetics and community impacts for the new elevated tank and associated infrastructure will include:

- Design for landscaping using native vegetation where possible to provide natural habitat for wildlife and aesthetics.
- Long-term, the appearance of the new elevated tank should be maintained. The design for the coating system should consider longevity to minimize aesthetic impacts and frequency of recoating. Routine maintenance of the elevated tank long term is recommended to be completed to help maintain the appearance.
- Construction operations shall abide by local noise by-laws, including sticking to working time periods.
- Access for emergency response vehicles and personnel shall always be maintained along with public access to private residences and businesses.

- Construction specifications will limit all but emergency construction to normal daytime hours and will require environmental controls to limit runoff from sites, as well as noise and vibration impacts.

7.4 Surface Water and Groundwater Protection

This section outlines potential impacts and recommended mitigation measures for surface water and groundwater protection based on the results of the desktop geotechnical and hydrogeological study undertaken by Palmer Inc. as described in Section 4.4.2.

The full Desktop Geotechnical and Hydrogeological Investigation Report is available in Appendix 5.

7.4.1 Dewatering Requirements

As previously mentioned in Section 4.4.2, Tower Park is located within a WHPA-A, and a Significant Groundwater Recharge Area (SGRA). It is also located in the Carlisle Well Field and contains existing supply wells.

Groundwater levels are anticipated to be deeper than 3.0 m. If the excavation does not extend deeper than 3.0 m, construction dewatering for groundwater seepage should be minimal. If no construction dewatering for control of groundwater seepage is required, other related issues such as a Permit To Take Water (PTTW), an Environmental Activity and Sector Registry (EASR), impacts to natural heritage and interference with other water users, and dewatering-induced soil settlement would not be expected to occur.

A large quantity of transient groundwater seepage during precipitation events is anticipated. The contractor should have a sump pump with adequate capacity in place if the excavation occurs during the wet season to deal with potential perched, transient groundwater seepage and stormwater accumulation. Depending on the excavation depth and the rate of groundwater ingress, active dewatering methods such as well points or eductors may be required. Any construction dewatering in excess of 50,000 L/day is required to be registered on the MECP EASR system. Any construction dewatering in excess of 400,000 L/day requires a Category 3 PTTW from the MECP.

7.4.2 Groundwater and Surface Water

Based on the above preliminary characterization of site subsurface conditions, the hydrogeological conditions are considered to be suitable for shallow subsurface construction of the proposed storage facility and appurtenances. No significant groundwater constraints were identified through the desktop assessment for Tower Park.

A site-specific hydrogeological field program is recommended during later design stages to confirm water table depth, soil permeability and the interpretation of the low potential for adverse effects.

7.4.3 Source Water Protection

The following are recommendations for the prevention of potential contamination caused by construction activities within a WHPA and SGRA:

- Appropriate awareness training of field staff on the vulnerability of the existing supply wells;
- Spill management plan has to be formulated to meet construction requirements and pass the review of the Risk Management Officer (RMO) of the City of Hamilton;
- The construction area should be fenced and marked with clear signage for protection of existing supply wells; and
- The City's staff should inspect the construction site periodically for the purpose of onsite contamination prevention.

7.5 Archaeological and Cultural Heritage Resources

Section 7.5 describes impacts to the cultural heritage component of the environment. Cultural heritage resources include archaeological resources, built heritage resources, and cultural heritage landscapes.

7.5.1 Impacts to Archaeological Resources

Based on the results of the Stage 1 AA described in Section 4.4.4.1, it is recommended that Area 1 (Tower Park) undergo a Stage 2 test pit survey at 5 m intervals to confirm the degree of disturbance and determine if any intact soils remain within the proposed study area. Soils naturally exist in stratified layers, with the surface layers representing more recent deposits, and then increasing in age as depth increases. These layers have the potential to contain archaeological deposits and the layers help identify the ages of the deposits. Intact soil refers to areas in which the natural soils have not been disturbed or removed (by activities such as grading, filling, construction, etc.) and therefore have the potential to contain archaeological deposits within their original soil layer context.

Approximately 0.56 Ha (75.6% of the Study Area) is considered to be agricultural field, and as such should undergo Stage 2 assessment via Stage 2 pedestrian survey at 5 m intervals. Approximately 0.18 Ha (24.4% of the study area) is treed and cannot be ploughed. As

such, it is recommended that these areas are subject to Stage 2 test pit survey at 5 m intervals.

Stage 2 (and any further recommended archaeological assessment) will be completed as soon as possible during detailed design and prior to any ground disturbing activities. The archaeological assessment report will be submitted by the licensed archaeologist to the MCM for review in accordance with the Ontario Heritage Act.

Recommendations from the Stage 1 AA and details from any subsequent recommended assessments (e.g., Stage 2, 3, 4) will be incorporated into the detailed design.

The full Stage 1 Archaeological Assessment Report is provided in Appendix 7.

7.5.2 Impacts to Built Heritage Resources and Cultural Heritage Landscapes

As described in Section 4.4.4.2, no cultural heritage resources were identified within the Study Area. Therefore, there are no potential impacts to known or potential heritage resources identified in proximity to either location.

However, it is acknowledged that Carlisle is identified by the City of Hamilton as an inventoried Cultural Heritage Landscape (CHL). As such, the following recommendations are made:

- As no known or potential cultural heritage resources were identified within or adjacent to Tower Park, no further cultural heritage assessment(s) are required (Cultural Heritage Evaluation Report [CHER], Heritage Impact Assessment [HIA]) and no mitigation options are presented for these locations.
- As Tower Park is located within an inventoried CHL within the City of Hamilton, post-construction landscaping and rehabilitation plans should be undertaken in a manner that is sympathetic to the overall setting of the community.
- Should further work require an expansion of the property required for Tower Park, a qualified heritage consultant must be retained to assess potential impacts to known and/or potential heritage resources.

The full Cultural Heritage Assessment Report is available in Appendix 8.

7.6 Construction Impacts and Mitigation Measures

7.6.1 Construction Dust, Noise, Vibration, and Traffic

During construction, the following identified potential impacts and mitigation measures will be considered:

- Noise and vibration from construction activities and machinery. Increased noise and vibration will be mitigated by planning the working hours following local noise bylaws, and construction machinery and heavy vehicles will be in compliance with source sound limits with local bylaws.
- The City will consider the possibility of restricting any lane or road closures hours during peak travel times (e.g., rush hour) for adjacent roadways, to minimize impact on traffic overall.
- Residential areas are located adjacent to the construction area. The Contractors will be made aware of this and are to exercise caution for all construction vehicle movements in the area.
- It is recommended that best management practices be followed during construction to mitigate diesel emissions from the truck and equipment operations, including:
    - Proper maintenance and operation of engines and exhaust systems of fuel-burning equipment and the use of newer machinery that meets more stringent air emissions standards or retrofit older diesel engines with abatement technologies.
- Loads on haul trucks are to be covered.
- Burning of waste materials will be prohibited.

7.6.2 Contaminated Soils

Based on the results of the Phase 1 ESA for Area 1: Tower Park as described in Section 4.4.5.1, a potential on-site source of soil and groundwater contamination includes Sodium (Na), Chloride (Cl-), Electrical Conductivity (EC) and Sodium Adsorption Ratio associated with the water treatment occurring at the site.

However, based on the interior storage of the sodium hypochlorite solution with no reported spills and incidents, this potential source is considered to pose a low environmental concern at the site. Therefore, no mitigation measures or further investigations for contaminated soils are required at this time.

7.6.3 Excess Materials Management

Considerations for excess soil management include:

- Excavated soil quantities that will not be reused will be calculated during detailed design. An Excess Soil Management Plan is recommended to be developed and incorporated in the Contract Specifications, if required. This will address issues such

as identification, assessment, excavation conveyance, treatment, staging, and disposal of contaminated soils, if required.

- Construction activities involving the management of excess soils (if applicable) will be completed in accordance with O.Reg. 406/19 under the Ontario Environmental Protection Act and MECP's guidelines.
- Excess construction soil will be properly stored, reused and/or disposed of.
- Waste generated on-site will also be disposed of in accordance with MECP's requirements.

7.7 Monitoring

It is recommended that the City and its representatives develop a monitoring program to ensure all mitigation measures are being implemented as required. Input from review agencies, including the Conservation Authority and MECP may be beneficial to the program. The Contractor performing these works would be ultimately responsible for implementing all required mitigation measures. The monitoring program should include, but not be limited to, the following:

- Reviewing proposed construction methods and temporary facilities with respect to their ability to implement the stated mitigation measures.
- Abiding by the terms of any permits or approvals for works.
- Liaising with area property owners to ensure compliance with noise restrictions, working hours, and accommodation of vehicular and pedestrian traffic.

8.0 PUBLIC AND PARTNERS CONSULTATION

Public consultation is a key feature of EA planning projects. Input received from the public and partner groups, potentially affected Indigenous communities, provincial ministries, technical agencies, and authorities help generate meaningful dialogue between project planners and the public.

Various Indigenous communities, government agencies, authorities, and interest groups were informed of the Class EA Study Commencement, Public Information Centres (PICs), and Notice of Study Completion, through local newspaper notices and direct mailings (paper & electronic). Notices were distributed to property owners in the study area, as well.

A complete list of technical agencies, special interest groups, and Indigenous communities that were contacted as part of the study is provided in Appendix 10-2 of this report.

8.1 Consultation with Key Partners, Interest Groups, & Technical Agencies

The following table summarizes comments received from technical agencies throughout the course of this Study.

Table 8.1 Comments Received from Technical Agencies

Agency / Group	Comments Summary	Date Received	Response and Consideration of Comments in Class EA
Ministry of Environment, Conservation and Parks (MECP)	In response to the Notice of Commencement and PIC #1, the MECP responded with the following comments: MECP delegated the procedural aspects of rights-based Indigenous consultation to the proponent and provided a list of Indigenous communities to consult with. A draft copy of the Study report should be sent directly to Joan Del Villar C prior to the filing of the final report, allowing 30 days for the ministry's technical reviewers to provide comments. MECP's Areas of Interest in Relation to the study: Planning and Policy; Source Water Protection; Climate Change; Air Quality, Dust and Noise; Ecosystem Protection and Restoration; Species at Risk; Surface Water; Groundwater; Excess Materials Management; Contaminated Sites; Servicing, Utilities and Facilities; Mitigation and Monitoring; and Consultation. The MECP also provided a *Client's Guide to Preliminary Screening for Species at Risk*.	October 13, 2023	The Project Team engaged with Indigenous Communities throughout the study (see Section 8.2). Since this Study was reclassified to 'Exempt' under the Class EA process, this draft report will not be sent to MECP for review, nor will the report be filed for 30 day public review in accordance with the EA Act (S. 16). The Project Team documented the following MECP Areas of Interest in this report: Planning and Policy, Source Water Protection, Climate Change, Noise, Ecosystem Protection, Species at Risk, Surface Water, Groundwater, Servicing, Utilities, Facilities, Mitigation, Monitoring, and Consultation.
Ministry of Citizenship and Multiculturalism (MCM)	In response to the Notice of Commencement and PIC #1, the MCM responded with the following comments: • If the EA project area exhibits archaeological potential, then an archaeological assessment (AA) shall be undertaken by an archaeologist licenced under the Ontario Heritage Act (OHA), who is responsible for submitting the report directly to MCM for review. • If there is potential for built heritage resources and/or cultural heritage landscapes within the project area, then a Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment should be undertaken for the entire study area during the planning phase and will be summarized in the EA Report.	January 8, 2024	A Stage 1 Archaeological Assessment and a Cultural Heritage Report were completed as part of this EA study. Results of these assessments are described in Section 4.4.4.
	In response to the Notice of Public Information Centre #2, MCM asked for a status update on the cultural heritage study and Stage 1 AA.	May 13, 2024	The Project Team confirmed both studies were completed and they were then submitted to the ministry for review. The Stage 1 AA report was approved by MCM and entered into the Ontario Public Register of Archaeological Reports on June 26, 2024.
Conservation Halton	In response to the Notice of Commencement and PIC #1, Conservation Halton provided the following comments: • Areas 2, 5, and 7 contain wetlands that are regulated by Conservation Halton. • In addition to the above, Area 5 may also be impacted by Bronte Creek flooding and erosion hazards. If this area is considered as an alternative, delineation of these hazards may be required depending on the details of what is proposed.	July 11, 2023	Conservation Halton's comments were documented within this report and taken into consideration when screening the long list of alternative locations. Areas 5 and 7 were not carried forward onto the shortlist. Area 2 was shortlisted, but ultimately not selected as the preferred location.
Enbridge Gas	The Project Team contacted Enbridge to confirm their existing infrastructure in one of the alternative locations (451 Carlisle Road). Enbridge responded stating they currently have 4 large diameter gas mains in the area and that any works on their right of way will need to be evaluated (such as grade changes, driveways, drainage works, or utility installations) which if causing adverse effects to Enbridge facilities. Enbridge requested further information before comment/decisions cam be made; grade changes, driveways, drainage works, or utility installations.	November 28, 2023	The Project Team documented these comments within this report. 451 Carlisle Road was not selected as a potential location for the water storage facility.
Hydro One	In response to the Notice of Commencement and PIC #1, Hydro One confirmed that there are no existing Hydro One Transmission assets in the subject areas.	June 19, 2023	Hydro One's response was noted and documented within this report.

	In response to the Notice of PIC #2, Hydro One confirmed that there are no existing Hydro One Transmission assets in the subject area.	May 7, 2024	Hydro One's response was noted and documented within this report.
City of Hamilton – Landscape Architectural Services (LAS)	The City's LAS provided the following comments and questions as part of their review of the draft PFR: • The report indicates that there will be a similar building footprint, however it's difficult to understand the impacts to the park based on the information provided. We would be interested in better understanding what setbacks from natural features are required. • Natural Heritage report indicates there is some value to the natural feature located in the northeast corner of the park, immediately adjacent to the proposed tower location. How will this impact the overall design of the space? • If driveway access will be required and how extensive will this be (width and alignment). • If any existing infrastructure will be removed (such as roads). • If there will be impacts to the existing playground structures. • If the new tower location does impact existing park amenities, do the capital costs associated with this option include those associated with design and replacement of features as necessary?	September 9, 2024	The Project Team provided the following responses: • Typically, a 5-10 m buffer is maintained around the ET for future maintenance. Minimal to no impact to the natural areas is anticipated. The total impact on the natural areas (trees, grass, etc.) will be reviewed during detailed design. • The intention is to avoid disturbing the forested area to the northeast of the property. The ET is proposed to be located within the grassed area outside of the forested area. A topographic survey is recommended to be completed during preliminary design to identify all disturbed areas. • The existing driveway is proposed to be utilized. An extension of the driveway will be required from the existing tower to the new tower. The width of the driveway will be similar to the existing. A parking area/turn around area for vehicles is proposed on drawing G101. Final alignment and details of the driveway will be finalized during detailed design. • The existing ET is proposed to be removed following successful commissioning of the new ET. The existing road and well house are to remain. • No impacts to the playground are anticipated. Short term shutdowns may be required depending on crane and vehicle access locations. Construction fence will delineate space between public areas (playground, etc.) and the construction area. • No fees were included to relocate or replace park features.

8.2 Consultation with Indigenous Communities

Various Indigenous communities were notified of the study, to identify any potential issues or concerns regarding possible impacts to Aboriginal and Treaty Rights, or any other interests or questions that the community may have regarding this Study. The following Indigenous communities were notified of the Study:

- Haudenosaunee Development Institute / Confederacy Chiefs Council
- Huron-Wendat Nation
- Metis Nation of Ontario
- Mississaugas of the Credit First Nation
- Six Nations of the Grand River

Table 8.2 below provides a summary of communications between the Project Team and Indigenous communities. The complete list of Indigenous communities engaged is provided in Appendix 10-2, while copies of the correspondence and notifications sent are provided in Appendix 10-6.

Table 8.2 Consultation Log of Communications with Indigenous Communities

Indigenous Community / Organization	Date of Communication Issued	Notification Sent to Community / Organization	Comments Received	Date Comments Received	Response to Comments Received
Haudenosaunee Development Institute (HDI) / Confederacy Chiefs Council	June 1, 2023	Notice of Study Commencement and PIC #1	Email from HDI requesting one recipient of the email to be removed from the email list in future email correspondences	November 9, 2023	Acknowledged the removal of the recipient. No other responses were received from HDI that pertained to the project information from any of these initial attempts or follow-up emails and phone calls
	September 19-20, 2023	Notification of Stage 1 AA study commencement	No comments received.	-	-
	April 11, 2024	Notice of PIC #2	No comments received.	-	-
	December 10, 2024	Notice of Study Completion and Reclassification	-	-	-
Huron Wendat Nation	June 1, 2023	Notice of Study Commencement and PIC #1	No comments received.	-	-
	September 19, 2023	Notification of Stage 1 AA study commencement	Please keep us updated about Stage 1 archaeological assessment. We are in a very busy time and we won't be able to provide input in the project in the short term.	September 29, 2023	Project Team acknowledged the Nation's email and sent a Stage 1 AA report on March 8, 2024.
	March 8, 2024	Stage 1 AA Report for Review	The Nation found the Stage 1 AA results satisfactory and expressed interest in being involved in Stage 2 AA field work. The Nation provided two comments regarding the Historical context section of the report.	May 14, 2024	The Project Team addressed the Nation's comments in the final Stage 1 AA report. The Nation will be engaged during Stage 2 AA field work.
	April 11, 2024	Notice of PIC #2	No comments received.	-	-
	December 10, 2024	Notice of Study Completion and Reclassification	-	-	-
Six Nations of the Grand River	June 1, 2023	Notice of Study Commencement and PIC #1	The Nation expressed interest in reviewing the Stage 1 AA report.	June 8, 2023	The Project Team detailed that the Stage 1 AA would be sent when available.
	March 8, 2024	Notification of Stage 1 AA Study Agreement for Review	The Nation provided an agreement and cost for their review of the Stage 1 AA report.	March 13, 2023	The Project Team signed the agreement with a few revisions and sent it to the Nation on March 13, 2024. However, the Nation did not acknowledge receipt of the revised agreement or sign back. Multiple reminders were sent.
	April 3, 2024	Stage 1 AA Report Review Agreement Follow up	No comments received.	-	No response was received regarding the agreement, therefore the Stage 1 AA report was **not** sent to the Nation for review.
	April 11, 2024	Notice of PIC #2	No comments received.	-	-

	December 10, 2024	Notice of Study Completion and Reclassification	-	-	-
Mississaugas of the Credit First Nation	June 1, 2023	Notice of Study Commencement and PIC #1	The Nation confirmed their interest in reviewing the Stage 1 AA report and participating in Stage 2 AA field work.	June 1, 2023	City acknowledged interest of the Nation and on March 5, 2024, the City received agreement for the review of Stage 1 AA. The Project Team shared the Stage 1 AA report to the Nation for review on March 8, 2024.
	March 8, 2024	Stage 1 AA Report for Review	April 3, 2024, received response from the Stage 1 AA indicating that the Nation had no questions or concerns.	April 3, 2024	City thanked the Nation for the response and indicated that the City would inform of any planned Stage 2 AA field work
	April 11, 2024	Notice of PIC #2	No comments received.	-	-
	December 10, 2024	Notice of Study Completion and Reclassification	-	-	-
Metis Nation of Ontario	June 1, 2023	Notice of Study Commencement and PIC #1	No comments received.	-	No response was received from the Nation from any of these initial attempts or from follow-up emails and phone calls.
	September 19-20, 2023	Notification of Stage 1 AA Report for Review	No comments received.		
	April 11, 2024	Notice of PIC #2	No comments received.	-	-
	December 10, 2024	Notice of Study Completion and Reclassification	-	-	-

8.3 Consultation with Residents and General Public

Residents within Carlisle's RSA received direct mailings of all notices, while other members of the general public were invited to participate in the Study through the City's project website. Key opportunities for residents and general public to provide input to the study included two virtual Public Information Centres (PICs), two online information packages, and online comment forms on the project website as described below.

8.3.1 Public Information Centre #1

Notification

The Notice of Study Commencement and Public Information Centre (PIC) #1 was published on June 1 and 8, 2023, in the Flamborough Review and mailed to residents in the Study Area. Technical agencies and Indigenous communities were sent the notice via email. The notice was also published to the City's project website at https://engage.hamilton.ca/carlislewaterstorage.

The notice advised that the City was undertaking a study to consider infrastructure options to address Carlisle's long-term water demands and storage needs and that the project was a Schedule 'B' Class EA, with the first PIC was being held on June 14, 2023, starting at 6:00pm through a Virtual Public Meeting format hosted on Microsoft Teams, which included a formal presentation and a question-and-answer period. A copy of the Notice of Study Commencement and PIC #1, technical agency and study contact list, and associated communication records are provided in Appendix 10-1.

Meeting Format & Participation

The purpose of the first PIC was to provide an overview of the Study, including the problem and opportunities to be addressed, existing conditions within the study area, as well as a preliminary long list of alternatives to address Carlisle water requirements for discussion. Residents were invited to call-in to the meeting or participate in the meeting through a link posted to the project webpage. At the end of the presentation, residents were encouraged to submit their questions using the Microsoft Teams Chat function, or by using the "Raise Your Hand" feature, to ask a question directly to the project team. Based on the Microsoft Teams Meeting Attendance Report, a total of 35 individuals attended the PIC, which included members of the Project Team.

Feedback

Following the PIC, presentation materials, including a recording of the presentation, were made available on the project webpage starting June 13, 2023. RVA also prepared a Fact

Sheet and FAQs answering key questions regarding the Study, which were posted to the project website. Comments regarding PIC #1 and the Study were received until June 29, 2023, via a survey published on the City's engagement platform at https://engage.hamilton.ca/carlislewaterstorage and additional comments were received via email. A total of two (2) survey submissions were received and two (2) individuals submitted comments and questions via email. A summary of this feedback is provided in the table below and correspondence records are provided in Appendix 10-7.

Table 8.3 Summary of Comments Received From PIC #1

Medium	Date Comments Received	Summary of Comments	Response to / Consideration of Comments
Online Survey	June 18, 2023	Respondent noted that aesthetics, natural environment impacts, impacts to community uses, impacts to private property, and overall cost were all very important factors when choosing a site for the water storage facility.	Comments were taken into consideration when screening and evaluating the long list of alternative locations.
Online Survey	June 29, 2023	Respondent noted that aesthetics was the most important factor when considering a site for the water storage facility. Resident noted that although there were watering bans requested in Summer 2019, there were few residents abiding by this ban. Resident asked if the Study Area could be expanded to consider Courtcliffe Park and the neighbouring private farmland.	Comments were taken into consideration when screening and evaluating the long list of alternative locations.
Email	June 15, 2023	Individual noted that the PIC #1 presentation quoted 48 as the project number of new residents. Individual asked which areas in Carlisle are planned for development and requested a map of the	The Project Team email the individual a plan showing the areas currently planned for development for future residential development.

		area undergoing development.	
Email	June 26, 2023	An individual followed up a phone call conversation with an email asking information on how many of the 14 lots are allocated to their property.	The Project Team responded noting that there are 9 proposed units for their parcel of land. The Project Team provided and aerial image indicating where development will occur.

8.3.2 Public Information Centre #2

Notification

The Noice of PIC #2 was published in the Hamilton Spectator and mailed to residents in the Study Area. Technical agencies and Indigenous communities were sent the notice via email. The notice was also published to the City's project website at https://engage.hamilton.ca/carlislewaterstorage.

The notice advised that the second PIC was being held on April 25, 2024, starting at 6:00pm through a Virtual Public Meeting format hosted on Microsoft Teams, which included a formal presentation and a question-and-answer period. A copy of the Notice of PIC #2 is provided in Appendix 10-1.

Meeting Format & Participation

The purpose of the second PIC was to present the shortlisted water storage facility locations and infrastructure options, evaluation criteria, and the recommended solution. Residents were invited to call-in to the meeting or participate in the meeting through a link posted to the project webpage. At the end of the presentation, residents were encouraged to submit their questions using the Microsoft Teams Chat function, or by using the "Raise Your Hand" feature, to ask a question directly to the project team. Based on the Microsoft Teams Meeting Attendance Report, a total of 31 individuals attended the PIC, which included members of the Project Team.

Feedback

Following the PIC, presentation materials, including a recording of the presentation, were made available on the project webpage starting April 29, 2024. Comments regarding PIC #1 and the Study were received until May 13, 2024, via a survey published on the City's engagement platform at https://engage.hamilton.ca/carlislewaterstorage and additional

comments were received via email. A total of two (2) survey submissions were received and one (1) individual submitted comments via email. A resident also contacted the Project Team via phone. A summary of this feedback is provided in the table below and correspondence records are provided in Appendix 10-7.

Table 8.4 Summary of Comments Received From PIC #2

Medium	Date Comments Received	Summary of Comments	Response to / Consideration of Comments
Online Survey	April 30, 2024	Resident suggested that the community's name, Carlisle, be displayed on the new elevated tank as it was a disappointment to the community's residents when the tank was refurbished previously, and the community's name was not proudly displayed. The resident appreciated the Project Team's thorough evaluation and recommended solution.	Comments will be taken into consideration during detailed design of the new elevated tank.
Online Survey	May 1, 2024	Resident would like to ensure that if the playground needs to be relocated to accommodate the new elevated tank, then it should be relocated to another location within Tower Park. Resident noted that this is the only playground within the community.	The playground does not need to be relocated for the new elevated tank and will remain in its current location in Tower Park.
Email	April 29, 2024	A resident asked to be put on the project's mailing list.	Resident was added to the Study Contact List.
Phone	April 24, 2024	Resident was disappointed in the virtual presentation format as they have no access to a computer.	The Project Team sent the resident a hard copy of the PIC #2 information materials on May 2, 2024.

8.3.3 Project Website and Online Engagement

In addition to the formal consultation described above, contact information of the Project Manager, including email, telephone and mailing address were available to the public on the City's project website, and was included in all public notices distributed. This provided an ongoing opportunity for members of the public to submit their questions, concerns, and/or comments regarding the study to the project team at any time during the study. It should be noted that no additional comments or feedback was received from the public outside of the PICs and their associated comment periods.

9.0 ADDITIONAL WORK AND APPROVALS

9.1 Permits and Approvals

The proposed works for this project will require approvals and permits from various agencies and municipal departments. Consultation meetings and design submissions will need to be coordinated as required during the final design and construction.

The following permits and/or approvals are anticipated to be required at this time:

Table 9.1 Permits and Approvals

Agency	Approval	Description
MECP	Drinking Water Works Permit (DWWP)	Amendment of existing DWWP to include the new ET and associated infrastructure.
MECP	Permit to Take Water (PTTW)	Permit required for dewatering activities during constriction.
MECP	Species at Risk (SAR) Permit	In the event impacts cannot be mitigated from affecting SARs.
Conservation Halton	Work Permit	To review technical reports and plans, such as Site Plan Control, Stormwater Management Plan, Grading and Drainage, etc.
City of Hamilton	Building and Demolition Permits	To construct the new ET and demolish the existing ET associated infrastructure for both.
City of Hamilton	Site Plan Approval	To construct the new ET and associated infrastructure.
Transport Canada	Aeronautical Assessment for Obstruction Evaluation Form	Confirm the lighting requirements of the tank.

Nav Canada	-	Proposal to inform them of the location and height of the new ET.
Hamilton Community Enterprises (HCE) Telecom	-	Fiber optic internet connection to communicate with SCADA to be provided by HCE Telecom.
Electrical Safety Authority (ESA)	-	Approval of electrical installations during construction.
Utilities	-	Review existing utilities and coordination installation of new utility connections.

9.2 Detailed Design Commitments

The following activities are anticipated to be completed during detailed design prior to any ground-disturbing activities and construction:

- A Stage 2 Archaeological Assessment will be conducted for Tower Park via a test pit survey at 5 m intervals to confirm the degree of disturbance and determine if any intact soils remain within the preferred water storage facility location.
- Geotechnical and hydrogeological investigation activities:
  - A site-specific hydrogeological field program is recommended during later design stages to confirm water table depth, soil permeability and to further determine if there is a potential for adverse effects;
  - Geotechnical and hydrogeological drilling should be conducted for the site selected. The drilling should extend to dense to very dense soils or bedrock expected at approximately 30 m depth. The drilling program should include at least three (3) boreholes outside but adjacent to the footprint of the storge tank. Standard Penetration Testing, soil sampling and lab testing, and classification should be completed. Groundwater monitoring wells should be installed in all boreholes to measure stabilized groundwater levels;
  - At least one borehole for each appurtenance structure should be drilled to a depth of 6 m and completed as a groundwater monitoring well. Standard Penetration Testing, soil sampling and lab testing and classification should be completed; and
  - To facilitate soil management during excavation as required by O.Reg. 406/19 On-Site and Excess Soil Management, an Assessment of Past Uses is recommended during later design stages.
- Confirm need and requirements to accommodate antenna (similar to existing) on the proposed tower, including safety measures.

- Confirm detailed locations of all utilities and gas lines.
- Develop construction staging and demolition plans.
- Prepare detailed cost estimates, including removal of existing ET.
- Complete topographic survey of proposed elevated property.
- Develop construction staging and layout areas to limit impacts around the existing ET, Well House, playground, and green space.

9.3 Distribution of Notice of Completion and Exemption from Class EA

As noted previously, it was determined that this Study is now be exempt from the Class EA process based on the preferred solution selected. As such, a Notice of Completion and Exemption from Class EA Process is anticipated to be issued in Fall 2024.