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Long Term Water Storage

Municipal Class Environmental Assessment
Project File

Corporation of the City of London
Water Engineering Division
300 Dufferin Avenue
London, ON, N6A 4L9

Project number: 60569302

March 26 2019

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Revision	Revision date	Details	Authorized	Name	Position
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2 nd Submission	March 26 2019		JHH	John Haasen	Project Manager

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# Hard Copies	PDF Required	Association / Company Name
0	Yes	City of London

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- C.2 Conceptual Cost Estimate

Glossary

ADD	Average Daily Demand
COTTFN	Chippewa of the Thames First Nation
CWA	Clean Water Act
DWWP	Drinking Water Works Permit
EA	Environmental Assessment
EAA	Environmental Assessment Act
EAWSS	Elgin Area Water Supply System
EIS	Environmental Impact Study
EMPS	Elgin-Middlesex Reservoir and Pump Station
HVA	Highly Vulnerable Aquifers
IPZ	Intake Protection Zones
LACH	London Advisory Committee on Heritage
LHWSS	Lake Huron Water Supply System
mASL	Meters Above Sea level
MBCA	Migratory Bird Convention Act
mbgs	Meters Below Ground Surface
MCEA	Ontario Municipal Class Environmental Assessment
MDD	Maximum Daily Demand
MDWL	Municipal Drinking Water Licence
MECP	Ministry of Environment and Conservation and Parks
MNRF	Ontario Ministry of Natural Resources & Forestry
MOCEE	Ontario Ministry of Environment and Climate Change
MTCS	Ontario Ministry of Tourism, Culture & Sport
NRW	Non-revenue Water
OBC	Ontario Building Code
OFC	Ontario Fire Code
OP	Official Plan
O.Reg.	Ontario Regulation
PIC	Public Information Centre
PPS	Provincial Policy Statement
PTTW	Permit To Take Water
SAR	Species at Risk
SC	Special Concern
SCC	Species of Conservation Concern
SERPS	Southeast Reservoir and Pump Station
SGRA	Significant Groundwater Recharge Area
SPP	Source Protection Plan
SWP	Source Water Protection
UGB	Urban Growth Boundary
UTRCA	Upper Thames River Conservation Authority
WHMIS	Workplace Hazardous Material Information System
WHPA	Wellhead Protection Areas

1. Introduction

The City of London (the City) retained AECOM Canada Ltd. to complete a Municipal Class Environmental Assessment (MCEA) study to determine Long Term Water Storage needs for the City of London's Water Supply and distribution system. Additional water storage is needed to address future growth demands, potential disruptions or reductions in water supply during emergency situations and to meet Ministry of Environment and Conservation and Parks (MECP) fire balancing and daily peak demand criteria needs. This report documents the planning process followed and the work completed for this project. This study also considered the decommissioning of existing water supply and/or storage facilities within the City.

The study included:

- public and agency consultation;
- the identification and evaluation of alternative storage solutions focused on water storage facility siting/expansion;
- an assessment of the effects associated with any alternative and/or the preferred solution;
- the identification of measures required to mitigate any potential adverse effects; and
- the preparation of a design concept for the preferred solution.

The findings and results, along with a record of review agency and stakeholder consultation have been documented in this Project File and made available for a 30-day public and agency review period.

1.1 Study Purpose and Objectives

The purpose of this MCEA study is to provide a comprehensive and environmentally sound planning process, which is open to public participation, to select preferred Long-Term Water Storage improvements for the City's water supply and distribution system. The objectives of this study include:

- Provide an opportunity to identify Long Term Water Storage improvements;
- Protect the environment, as defined in the Environmental Assessment Act (EAA), through the wise management of resources;
- Consult with affected and interested agencies, Indigenous communities, key stakeholders, and the public;
- Identify a range of alternative solutions that incorporate concerns raised during the planning process;
- Identify the measures needed to mitigate impacts associated with the recommended solution;
- Prepare a design concept for the recommended solution; and,
- Prepare a Project File that documents all consultation input and complies with the requirements of the MCEA process for Schedule 'B' undertakings.

1.2 Study Area

The Study Area is the City of London's water supply and distribution system as shown in **Figure 1-1**. The City of London presently has terminal water storage (drinking water supply and emergency response) from the Arva Reservoir and Pump Station, the Springbank Reservoir Complex, the Southeast Reservoir and Pump Station and the Elgin-Middlesex Reservoir and Pump Station. These water storage facilities provide potable water to City residents and business through the City's low and high-level pressure zones.

City of London Long Term Water Storage Environmental Assessment Schedule 'B'

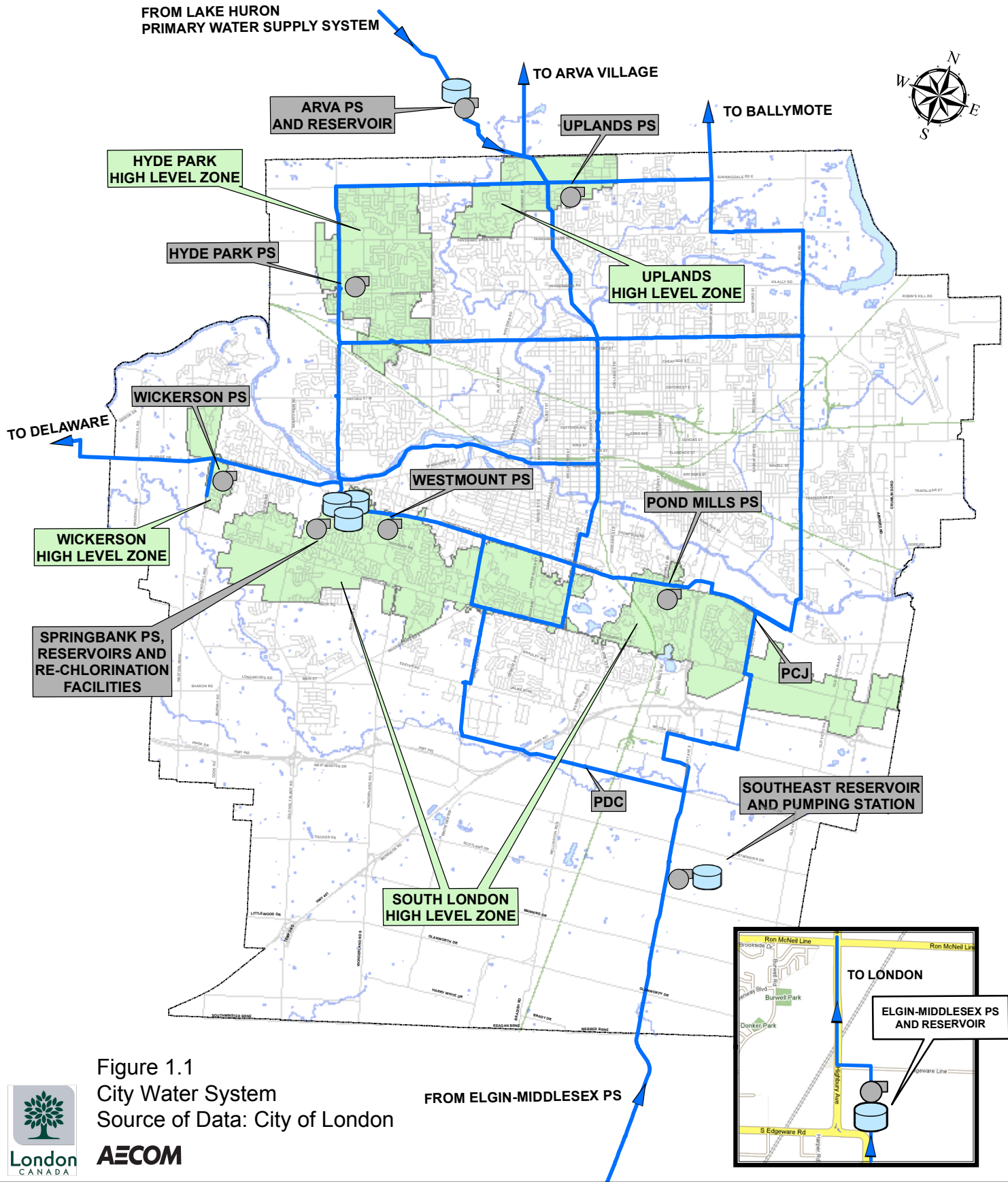


Figure 1.1
City Water System
Source of Data: City of London



AECOM

1.3 Study Team Organization

AECOM Canada Ltd. was retained by the City of London to complete this MCEA study. This study addresses all aspects of the environment, a full range of technical issues, and the requirements of the MCEA process. The Project Team consisted of staff from the City and AECOM. Key members of the project team included the following individuals as listed in **Table 1-1**.

Table 1-1: Study Team

Proponent	Consultant
City of London	AECOM
Pat Lupton, P.Eng - Project Manager Water Engineering	John Haasen, PMP, CET - Project Manager Senior Vice President
Aaron Rozentals, Division Manager – Water Engineering Michelle Morris, Engineer – Water Engineering	Nancy Martin, Environmental Planner Neil Awde, Project Engineer John Pucchio, Structural Engineer

2. Planning Process

2.1 Municipal Class Environmental Assessment Planning Process

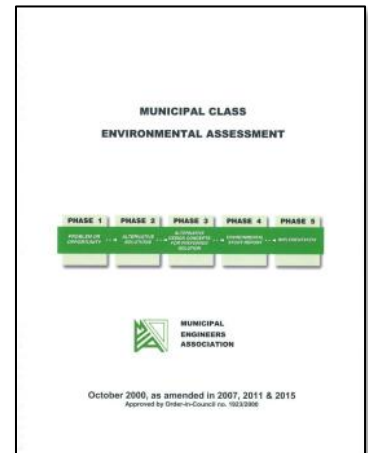
All municipalities in Ontario, including the City of London, are subject to the provisions of the *EAA* and its requirements to prepare an Environmental Assessment for applicable public works projects. The Ontario MCEA document (October 2000, as amended in 2007, 2011 and 2015) provides municipalities with a five-phase planning procedure, approved under the *EAA*, to plan and undertake all municipal sewage, water, stormwater management and transportation projects that occur frequently, are usually limited in scale and have a predictable range of environmental impacts and applicable mitigation measures.

In Ontario, infrastructure projects such as improvements to the City's water storage system are subject to the MCEA process and must follow a series of steps as outlined in the MCEA guide. The MCEA consists of five phases as summarized below:

- **Phase 1 – Problem or Opportunity:** Identify the problems or opportunities to be addressed and the needs and justification;
- **Phase 2 – Alternative Solutions:** Identify alternative solutions to the problems or opportunities by taking into consideration the existing environment, and establish the preferred solution taking into account public and agency review and input;
- **Phase 3 – Alternative Design Concepts for the Preferred Solution:** Examine alternative methods of implementing the preferred solution based upon the existing environment, public and agency input, anticipated environmental effects and methods of minimizing negative effects and maximizing positive effects;
- **Phase 4 – Environmental Study Report:** Document in an ESR, a summary of the rationale, planning, design and consultation processes for the project as established through Phases 1 to 3 above and make such documentation available for scrutiny by review agencies and the public; and
- **Phase 5 – Implementation:** Complete contract drawings and documents, proceed to construction and operation, and monitor construction for adherence to environmental provisions and commitments. Also, where special conditions dictate, monitor the operation of the completed facilities.

The MCEA process ensures that all projects are carried out with effectiveness, efficiency and fairness. This process serves as a mechanism for understanding economic, social and environmental concerns while implementing improvements to municipal infrastructure.

Based on a review of the MCEA document, this project involves establishing new or expanding water storage facilities which triggers a Schedule 'B' planning process and as such, Phases 1 and 2 of the Municipal MCEA planning process must be completed. This Project File has been prepared and will be made available for a minimum 30-day review period. **Figure 2-1** illustrates the process followed for the Long Term Water Storage MCEA.



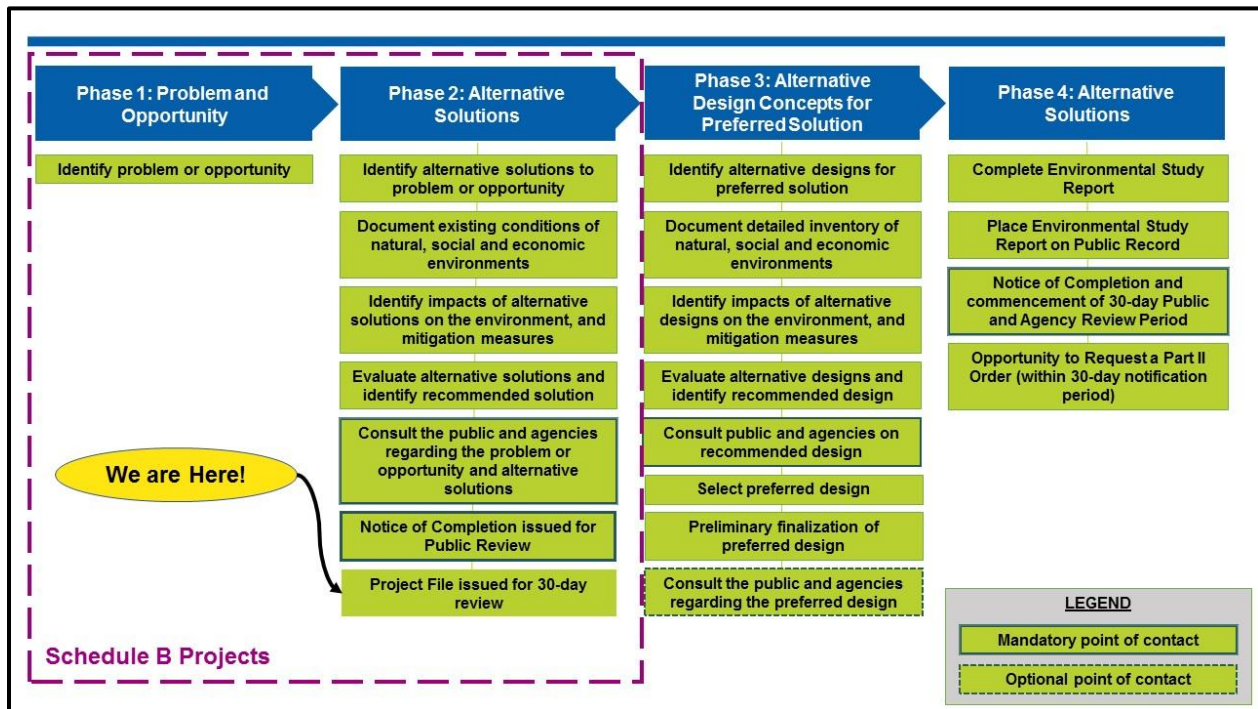


Figure 2-1: MCEA Planning Process

2.2 MCEA Documentation and Filing

This Project File comprises the documentation for this Schedule B Municipal Class EA study. Placement of the Project File for public review completes the planning stage of the study.

This Project File is available for public review and comment for a period of 30 calendar days starting on **Date** and ending on **Date**. A public notice (Notice of Completion) was published to notify the public and stakeholders about the 30-day public review period. To facilitate public review of this document, copies are available at the following locations during regular business hours and on the City’s website:

<p>City of London City Hall 300 Dufferin Avenue, London City Clerk 3rd Floor</p>	<p>London Public Library Central Branch 251 Dundas Street, London</p>
<p>City of London www.london.ca/residents/Environment/EAs/Pages/LongTermWaterStorageOptions.aspx</p>	

If you have any outstanding issues or concerns with this project during the 30-day review period, please address them to the Pat Lupton and John Haasen, with the subject line “Long Term Water Storage MCEA Notice of Study Completion” and efforts will be made to seek a mutually acceptable resolution.

<p>Pat Lupton - Project Manager Corporation of the City of London 300 Dufferin Avenue London ON, N6A 4L9 519.661.CITY (2489) x. 5613 plupton@london.ca</p>	<p>John Haasen - Senior Vice President AECOM Canada Ltd. 250 York Street, Suite 401 London ON, N6A 6K2 519.963.5889 john.haasen@aecom.com</p>
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If concerns regarding the project cannot be resolved in discussion with the City of London, a person or party may request that the MECP make an order for the project to comply with Part II of the EAA (referred to as a Part II Order), which addresses individual environmental assessments. A Part II Order Request Form must be used to request a Part II Order. The Part II Order Request Form is available online on the Forms Repository Website <http://www.forms.ssb.gov.on.ca> by searching “Part II Order” or “012-2206E” (the form number).

The completed form, including any additional information, must be sent to the addresses below, with a copy to the City.

Minister Rod Phillips
Ministry of Environment, Conservation and Parks
 77 Wellesley Street West, 11th Floor
 Toronto, ON
 M7A 2T5
minister.mecp@ontario.ca

AND

Director, Environmental Assessment and Permissions Branch
Ministry of Environment, Conservation and Parks
 135 St. Clair Avenue West, 1st Floor
 Toronto, ON
 M4V 1P5
enviropemissions@ontario.ca

If no Part II Order requests are received by **Date**, the City may proceed with preliminary/detailed design and construction of the recommended works as presented in this report.

Information will be collected in accordance with the *Municipal Freedom of Information and Protection of Privacy Act*. All comments, apart from personal information, will become part of the public record.

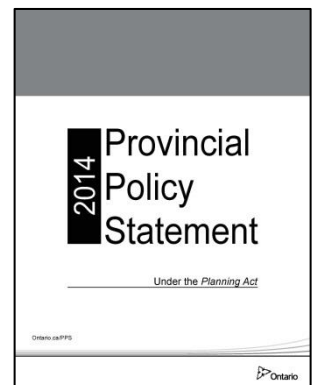
2.3 Planning Studies and Policy Context

2.3.1 Provincial Policy Statement

The 2014 Provincial Policy Statement¹ (PPS) provides policy direction on matters of provincial interest related to land use planning and development. As a key part of Ontario’s policy-led planning system, the PPS sets the policy foundation for regulating the development and use of land. It provides for appropriate development while protecting resources of provincial interest, public health and safety, and the quality of the natural environment.

Key policies relevant to this project include the following:

- 1.6: Infrastructure and Public Service Facilities;
- 2.1: Natural Environment
- 2.2.2: Water
- 2.6: Cultural Heritage and Archaeology



Relevance to Study: Investment in water servicing infrastructure within the study area, such as this project, will have regard for a range of planning objectives of the PPS. In addition, project design will consider and address impacts to natural heritage resources.

¹ *Provincial Policy Statement. Ontario Ministry of Municipal Affairs and Housing, 2014.*

2.3.2 Climate Change

The Ministry of Environment, Conservation and Parks requires that all MCEAs consider climate change as identified in the “Consideration of Climate Change in Environmental Assessments in Ontario” guide (2017). Within this guide, two approaches for consideration and addressing climate change in project planning are identified and include:

- Reducing a project’s effect on climate change (climate change mitigation).
- Increasing the project’s and local ecosystem’s resilience to climate change (climate change adaptation).

Relevance to Study: Improvements via water storage facilities and related infrastructure increases overall water system reliability and response in emergencies. Improvements via water storage facilities in relation to climate change have been considered and incorporated into the planning alternatives for this study. Further climate change mitigation is included in **Section 9.1**.

2.3.3 Source Water Protection

Section A.2.10.6 of the MCEA document directs proponents, including the City of London to consider Source Water Protection (SWP) in the context of the *Clean Water Act* (CWA). Projects proposed within a SWP `vulnerable area are required to consider policies in the applicable Source Protection Plan (SPP), including their impact with respect to the project. A watershed-based SPP contains policies to reduce existing and future threats to drinking water in order to safeguard human health through addressing activities that have the potential to impact municipal drinking water systems. The Thames - Sydenham & Region Drinking Water Source Protection Plan is the relevant SPP for this project and contains policies that address current and potential threats to municipal drinking water supply.

There are four types of vulnerable areas covered by the SPP:

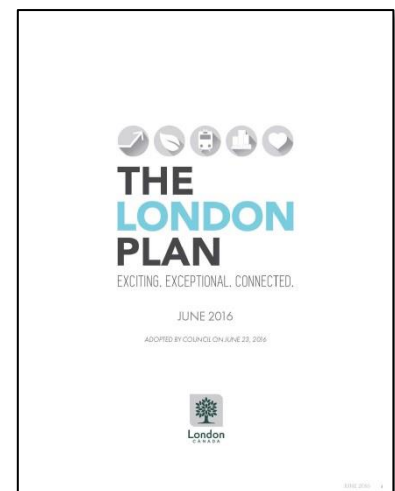
1. Intake protection zones (IPZs) – An IPZ is the area around a surface body of water where water is drawn in and conveyed for municipal drinking water.
2. Highly vulnerable aquifers (HVAs) – Aquifers are underground layers of water that supply wells. HVAs are susceptible to contamination due to their proximity to the ground surface or where the types of materials in the ground around it are highly permeable.
3. Significant groundwater recharge areas (SGRAs) - SGRAs are characterized as having porous soils (e.g. sand or gravel), which allow for water to easily seep into the ground and flow to an aquifer.
4. Wellhead protection areas (WHPAs) – WHPAs are areas of land around a municipal well where land use activities have the greatest potential to affect the quality of water flowing into the well.

Relevance to Study: The relevance of the policies of the SPP have been considered in this study. The locations considered for evaluation are within SGRAs where the vulnerability score is low. Although it is designated as a vulnerable area, there are no significant, moderate or low drinking water quality threats associated with this project. Potential contamination for fuel storage and fuelling vehicles during construction is low. See **Section 9.3** for construction mitigation measures.

2.3.4 The London Plan

The London Plan (2016) is the policy direction document for the City that contains policies approved by Council to provide direction for the allocation of land use, provision of services and facilities, and policies to control the use of land, having regard for social, economic, and environmental matters. The Plan identifies the following:

- The London Plan supports the requirements of the MECP to provide safe drinking water.
- The City will ensure water servicing is available to service long term growth and upgrade the water system to address intensification



- The City is committed to meeting and exceeding service requirements for water supply for fire protection
- Water supply will be provided to avoid shortages

Relevance to Study: This MCEA has been conducted with regard to the water servicing policies of the London Plan and all necessary design standards for the City and the Province.

2.3.5 Strategic Plan

The City of London Strategic Plan (2015-2019) sets out tangible actions and auditable projects/programs that will be coupled with the multi-year budget to bring about a higher quality of life in the City. The strategies for Building a Sustainable City set out the City's mandate to manage and improve servicing infrastructure through water and waste water business plans and to build new infrastructure as London expands.

Relevance to Study: Expanding the capacity of the current water storage system aligns with the Strategic Plan to improve water servicing infrastructure within the City.

2.3.6 Upper Thames River Conservation Authority Policies

Portions of the study area are within the Upper Thames River Conservation Authority (UTRCA) regulated area. Regulated areas are established where development could be subject to flooding, erosion or dynamic beaches, or where interference with wetlands and alterations to shorelines and watercourses might have an adverse effect on those environmental features. Any proposed development, interference or alteration within a Regulated Area would require a permit from the UTRCA under the *Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*, Ontario Regulation (O.Reg.) 157/06.

Relevance to the Study: If construction is required within regulated areas, permitting will be required prior to project construction.

3. Consultation

The involvement of the community – residents, agencies, stakeholders, Indigenous communities, and those who may be potentially affected by a project – is an integral part of the MCEA process. The purpose of a consultation process is to provide an opportunity for stakeholder groups and the public to gain an understanding of the study process; contribute to the process for the development and selection of alternatives/design concepts; and provide feedback and advice at important stages in the MCEA process. Specifically, the objectives of the consultation efforts are to:

- Generate awareness of the project and provide opportunities for involvement throughout the planning process; and,
- Facilitate constructive input from public and agency stakeholders at key points in the MCEA process, prior to decision-making.

A summary of the consultation activities undertaken for this study is provided in this section.

3.1 Public Consultation

Public notices were issued throughout the course of the study to notify agencies, local stakeholders, Indigenous communities and the public of the status of the project, provide notification of the Public Information Centres (PICs), and to invite feedback on the project.

At the beginning of the study, a Notice of Study Commencement and PIC #1 was mailed to the public and review agencies. The notice presented an overview of the project and details of how to participate in the study. Notices for PICs and Study Completion were also distributed as part of this study. A list of public notices that were issued as part of the study are provided in **Table 3-1**.

All notices were listed on the City's website (www.london.ca/residents/Environment/EAs/Pages/LongTermWaterStorageOptions.aspx).

Table 3-1: Public Consultation Notices

Notice	Newspaper Publication Dates
Notice of Commencement/PIC #1 Appendix A.1	The Londoner June 7/14, 2018
Notice of PIC #2 Appendix A.2	The Londoner November 15/22, 2018
Notice of Completion* Appendix A.3	The Londoner March 23/30, 2019

* Prior to issuing the Notice of Completion, the project file was issued to the Civic Works Committee and Council for approval (May 14, 2019).

3.1.1 Public Information Centre #1

The first PIC was held on June 20, 2018 at City Hall, 300 Dufferin Avenue, London, from 5:00 pm to 7:00 pm. The PIC was structured as a drop-in centre with a sign in sheet, display boards, background reports, maps, and comment sheets. The purpose of PIC #1 was to share study findings and gather comments on the following:

- Problem and Opportunity Statement;
- Existing conditions;
- Identification of a long list of alternatives to address the Problem and Opportunity Statement;

- Evaluation of the long list of alternatives to determine the short listed alternatives; and,
- Next steps.

Representatives from the project team, including City staff and the AECOM consulting team, were available to discuss the project with participants. Six people attended PIC #1.

Based on comments received at PIC #1, the following points summarize the key issues from the public perspective:

- Participants were generally in favour of the recommended planning alternative to provide additional water storage.
- Residents were not supportive of some of the potential locations considered as these could have negative impacts on existing land uses (dairy operation, condo development).

See **Appendix A.1** for PIC #1 notices and materials.

3.1.2 Public Information Centre #2

The second PIC was held on November 28, 2018 at City Hall, 300 Dufferin Avenue, London, from 5:00 pm to 7:00 pm. It was structured as a drop in centre. The purpose of PIC #2 was to share study findings to date and gather comments on the following:

- Evaluation of short listed alternatives;
- Recommended alternative including associated design;
- Mitigation measures; and,
- Next steps.

Representatives from the project team, including City staff and the AECOM team, were available to discuss the project with participants. Three members of the public attended PIC #2.

No issues and comments were raised by the public at PIC #2: See **Appendix A.2** for PIC #2 notices and materials.

3.1.3 Notice of Completion

A public Notice of Completion was published in the *Londoner* on **Date** to notify the public and stakeholders about the 30-day public review period. To facilitate public review of this document, copies are available at London City Hall and the London Public Library – Central Branch during regular business hours and on the City's website. See Section 2.2 for more information and location addresses.

See **Appendix A.3** for the Notice of Completion.

3.1.4 Agency Consultation

All relevant agencies and authorities were contacted at the project initiation stage through correspondence notifying them of the study commencement and requesting their comments. All of these agencies were included in the project mailing list, which was updated regularly to ensure accuracy. They were also notified of the PICs and the Notice of Completion. The following section provides a summary of the correspondence with external agencies. Agency correspondence can be found in **Appendix A.4**. **Table 3-2** identifies the comments received from agencies as part of this project.

Table 3-2: Agency Comments

Agency/Department	Comment	Response
Ministry of Tourism, Culture and Sport (MTCS) (June 21, 2018)	<ul style="list-style-type: none"> • MTCS provided an outline of the MCEA requirements as they relate to archaeological resources, built heritage and cultural heritage landscapes. 	Submission and acceptance of a Stage 1 archaeological assessment is needed prior to construction.

		Submission and acceptance of a Stage 2 archaeological assessment (if required) is needed prior to construction.
MECP (June 8, 2018)	<ul style="list-style-type: none"> MECP indicated the MCEA should consider SWP and climate change. 	SWP is addressed in Section 2.3.3 . Climate change is discussed in Section 2.3.2 and in Section 9.1 .
City of London Development and Compliance (June 21, 2018)	<ul style="list-style-type: none"> This City department is responsible for implementing the Industrial Land Development (ILD) strategy. Locating water storage infrastructure within City owned land serviced and zoned for future industrial development is not supported by current City policy and mandate. 	This information was considered in the evaluation of siting alternatives.
City of London London Advisory Committee on Heritage (June 27, 2018)	<ul style="list-style-type: none"> The London Advisory Committee on Heritage (LACH) indicated that a Stage 1 Archaeological Assessment and Cultural Heritage Screening Report be undertaken as part of the MCEA process. 	The assessments have been undertaken. See Section 5.4 of this report.
City of London Environment and Parks Planning (June 21, 2018)	<ul style="list-style-type: none"> Parks Planning does not support the potential elimination of recreational facilities, parkland and/or natural heritage features such as woodlands. 	This information was considered in the evaluation of siting alternatives.

3.2 Indigenous Consultation

The City of London is committed to proactively identifying and addressing potential impacts of the Long Term Water Storage MCEA on the interests and rights of interested Indigenous communities within proximity to the City. Consultation with Indigenous communities is important for the project to identify and address specific cultural and heritage interests, as well as potential impacts to established or asserted Indigenous or treaty rights or Land Claims that Indigenous communities may have within the area. Consultation activities were conducted in accordance with the guidelines provided in the MCEA (MEA, 2000) and the Code of Practice – Consultation in Ontario’s Environmental Assessment Process (MECP, 2014).

The duty to consult with Indigenous communities is triggered when a proponent contemplates decisions or actions that may adversely impact asserted or established Indigenous or Treaty rights. Although ultimate legal responsibility to meet the duty to consult requirements lies with the Crown, the City undertakes a procedural aspect of the Crown’s duty. As part of this procedural responsibility, the City will notify the Director of the Environmental Approvals Branch if the project has the potential to adversely affect an Indigenous or Treaty right. This procedural aspect would be solely to provide information regarding the proposal and to gather information about the potential impacts of the asserted project on potential or established Aboriginal or Treaty rights.

The City initiated consultation with Indigenous communities that have previously engaged in London infrastructure planning / development projects and are anticipated to have interest in the project, and other recognized Indigenous communities and organizations. A list of communities and groups that were included in correspondence for this project is provided below. All Indigenous correspondence is included in **Appendix A.5**.

- Aamjiwnaang
- Alderville First Nation
- Assembly of First Nations
- Associated Iroquois and Allied Indians
- Aundeck-Omni-Kaning
- Hiawatha First Nation
- Iroquois Caucus
- London District Chiefs Council
- M'Chigeeng First Nation
- Metis Nation of Ontario

- Beausoleil
- Bkejwanong Territory (Walpole Island) First Nation
- Caldwell First Nation
- Chiefs of Ontario
- Chippewas of Georgina Island
- Chippewas of Kettle and Stony Point
- Chippewas of Nawash First Nation
- Chippewas of Rama First Nation
- Chippewas of the Thames First Nation
- Curve Lake
- Delaware Nation (Moravian of the Thames)
- Mississaugas of Scugog Island First Nation
- Mississaugas of the Credit
- Mohawks of Akwesasne
- Mohawks of the Bay of Quinte
- Munsee-Delaware Nation
- Oneida Nation of the Thames
- Saugeen First Nation
- Sheguiandah First Nation
- Six Nations of the Grand River Territory
- Union of Ontario Indians
- Zhiibaahaasing First Nation

Correspondence was received from the following Indigenous communities:

- Mohawk Council of Akwesasne (June 7, 2018) advised that the study is outside of their area of interest.
- Rama First Nation (June 12, 2018) advised that project information has been forwarded to Rama First Nation Council and to Karry Sandy McKenzie, Coordinator/Negotiator for Williams Treaties First Nation Process.
- Chippewas of the Thames First Nation (COTTfN) (July 5, 2018) indicated the study falls within the London Township Treaty (1796) area, the Big Bear Creek Additions to Reserve (ATR) land selection area and the COTTfN Traditional territory. The project was identified as being of moderate concern to the community and further information was requested.
 - AECOM and the City of London provided background studies to COTTfN and met with representatives on December 11, 2018 to discuss the project further. Additional information was provided as a result of this meeting.

4. Phase 1: Project Need and Justification

Phase 1 of the Class EA planning process requires the proponent of an undertaking (the City) to document factors leading to the conclusion that the improvement or change is needed, and to develop a clear statement of the identified problems or opportunities to be addressed. The Problem and Opportunity Statement is the principle starting point in the undertaking of a Class EA study and becomes the central theme and integrating element of the project. It also assists in setting the scope of the project.

Project Need and Justification

In developing the Problem and Opportunity Statement for the City's Long Term Water Storage Class EA, the following was considered.

- The City of London's water system provides safe drinking water to residents, businesses and industry within the City limits.
- The City is supplied with water from two lake-based sources, the Lake Huron Regional Water Supply System and the Elgin Area Water Supply System (Lake Erie).
- The City operates several water storage facilities including the Southeast Reservoir and Pump Station, and the Springbank Reservoir complex, which has three storage reservoirs that can gravity feed the entire City.
- The City benefits from storage facilities operated as part of the Lake Huron and Elgin Area Water Supply System at the Arva Reservoir and the Elgin Middlesex Reservoir.
- Springbank Reservoir #2 has both an aging membrane liner and ongoing issue with its floating cover and requires continued maintenance and repair. The reservoir is reaching the end of its service life and the City would like to consider retiring the facility when it reaches the end of its life expectancy anticipated in 2022. As a result, comparable reservoir capacity (45 million litres (ML)) will need to be replaced or better located within the City's water system.
- Additional water storage (100ML) is necessary to meet future growth needs to 2054 and beyond.
- The Arva Reservoir and Pump Station can pump water from the Lake Huron Water Supply System to the entire City. The City of London operates the Arva Pump Station and the Elgin Middlesex Pump Station. However, the water supply rate and pressure is reduced compared to normal operating condition in an emergency. There is a need to have adequate standby power to operate the Arva distribution pumps to the City and be able to utilize the full volume of water in storage at the Arva Reservoir.
- The City must also consider the potential of a disruption or reduction in water supply during emergency situations in planning for the storage needs of the City's water system, as well as MECP fire balancing and daily peak demand attenuation.
- The London Plan identifies policies that require the City to 'provide and maintain water storage facilities, pump stations and the City's watermain distribution system with sufficient capacity to provide for existing and planned development to an acceptable standard and at the lowest cost possible'.
- The PPS promotes the expansion of any service in a coordinated, efficient and cost-effective manner to accommodate projected needs, and requires that planning for infrastructure and public services 'be integrated with the planning for growth so that these are available to meet current and projected needs'.

Problem and Opportunity Statement

Based on the needs and justifications outlined above, the Problem and Opportunity Statement is as follows:

The City of London and the Regional Water Supply Systems provide water storage and distribution from the Arva, Elgin-Middlesex, Southeast and Springbank reservoirs. From these sources, water is provided for drinking water, daily household use, business and industrial needs and fire protection. Water can also be provided during water disruptions or if pressures within the City's water system are reduced. However, the existing water system is not able to provide flows at a supply rate and pressure necessary to meet peak demand, fire and/or emergency needs based on future growth. Additionally, Springbank Reservoir 2 is subject to ongoing maintenance associated with this aging facility and is nearing the end of its service life.

To address the Problem and Opportunity Statement, the City initiated this MCEA process to evaluate alternative solutions and address these issues and determine a preferred solution for future water storage that will contribute to the overall City water system daily operation and emergency needs, and meet future growth.

5. Existing Conditions

5.1 Technical Environment

5.1.1 Existing Water Supply System

The City of London is supplied with water from two lake-based sources. The Lake Huron Water Supply System (LHWSS) provides approximately 85% of the supply to London, and the Elgin Area Water Supply System (EAWSS) provides the remaining water. The City's overall water system includes 8 pump stations, 4 reservoirs (reservoirs at the Springbank Reservoir Complex and reservoir at the Southeast Pump Station and reservoir), over 1,570 km of water mains, 12,800 valves and 9000 hydrants (see **Figure 1-1**). Water storage reservoirs are located at the Arva Reservoir and Pump Station, Springbank Reservoir Complex (consisting of Reservoirs 1, 2 and 3), Southeast Reservoir and Pump Station and the Elgin-Middlesex Reservoir and Pump Station. The Arva Reservoir is owned and operated by the LHWSS, and the Elgin-Middlesex Reservoir and Pump Station is owned and operated by the EAWSS and function as part of the larger London water system through cooperative agreements.

Most of the City's low-pressure system is fed by the Arva Pump Station and Springbank reservoirs. System pressures are maintained from the Arva Pump Station to the City's low-level system, to fill the Springbank reservoirs and feed the City's high-pressure systems.

The Springbank Reservoirs 1, 2 and 3 are elevated ground storage reservoirs that feed the City on a gravity basis for day to day and emergency conditions. Springbank Reservoirs 1 and 3 are single chamber concrete cast in place covered reservoirs. These were constructed in 1970 and 1964 respectively.

Springbank Reservoir 2 was originally constructed around 1920 as an open reservoir. A membrane liner and floating cover were added in 1977. Both the liner and floating cover have been refurbished and then replaced since 1977, with the cover being replaced multiple times. Springbank Reservoir 2 is regularly taken out of service over the winter months each year to extend the life expectancy of the floating cover. The floating cover has a life expectancy of approximately 10 years. The most recent refurbishment of the floating cover was in 2012. The liner over the existing concrete structure which forms the bottom of the reservoir was last replaced in 2000. It was noted at that time that the concrete base structure was severely deteriorated in many locations.

There have been a number of incidents of operational concerns with Springbank Reservoir 2. The cover has been damaged by members of the public who have jumped the fence to retrieve soccer balls. The cover has been damaged by members of the public throwing objects into the fenced in area. The floating cover also collects precipitation which must be pumped off regularly to prevent potential contamination hazards for the potable water in the reservoir and to avoid risk to members of the public who have occasionally breached the fence and to City staff.

The Springbank Reservoir 2 is nearing the end of its life expectancy, and the current budget forecast includes funds for constructing a new reservoir to replace Springbank Reservoir 2 in approximately 2023.

The Arva Pump Station and Reservoir was constructed around 1965. Currently the pump station facility has a small standby generator with only enough capacity to operate building facilities during a power outage. Currently water can be pumped from the Lake Huron Water Supply System bypassing the Arva Pump Station in an emergency. But this supplies water at a reduced rate and operating pressure as compared to normal operating conditions. The need to have adequate standby power to operate the Arva Pump Station in an emergency and be able to utilize the full volume of water in storage at the Arva Reservoirs is also being considered during this Municipal Class Environmental Assessment process.

The Southeast Reservoir and Pump Station (SERPS) was placed into service in 2018. Located in south London at 5200 Highbury Avenue, south of Highway 401, the SERPS provides 113 ML of reservoir storage capacity and 123 ML per day of pumping capacity for primarily the industrial area in southeast London. The potable water that is conveyed to the facility is from the Elgin Area Water Treatment Plant which takes water from Lake Erie. The station also

contains a pressure reducing valve to reduce the water pressure to the reservoir from the watermain on Highbury Avenue as well as a gas chlorination system to boost the chlorine residual for the incoming and outgoing water as necessary. This reservoir was set on higher ground to lower its profile and features open space with a naturalized woodlot area and management facility to maximize functionality of the space. As the Elgin Area Water Treatment Plant expands, more of South London can be serviced by the Southeast Reservoir and Pump Station in the future. Currently the City of London has an agreement to take 22.7 ML of water per day from this system.

The Elgin-Middlesex Reservoir and Pump Station (EMPS) is located north of Highway 3, east of the City of St. Thomas. Owned and operated by the EAWSS, its primary components are two 27.3 ML reservoir cells, booster pumping equipment and a surge suppression system. High lift pumps supply water to the City of London to the SERPS through a 1050 mm diameter concrete transmission main: The City of St. Thomas, Central Elgin, Malahide Township, Southwold Township and the Town of Aylmer are serviced through dedicated pumping systems, stations and transmission mains from the pump station also. This pump station pumps to the SERPS which will eventually serve all of south London once increased water supply from the Elgin Area Water Supply System is expanded to service future growth. The pumps at EMPS supply water only to the Southeast Reservoir, which in turn will provide system pressure and supply to south London. The EMPS also pumps directly into the City of London water system under emergency conditions.

A summary of the City's existing water storage is shown in **Table 5-1** below. Details are provided in the Evaluation of Long Term Storage Requirement Report (August 2017) included in **Appendix B.1**.

Table 5-1: Existing Water Storage Summary

Description	Location	Total Storage Capacity	Useable Storage Capacity ⁽¹⁾
Arva Reservoir (operated as part of LHWSS)	North west	109.0 ML	76.4 ML
Springbank Total	Central	209.2 ML	132.9 ML
	Springbank Reservoir 1	81.8 ML/52.0 ML	
	Springbank Reservoir 2	45.6 ML/28.9 ML	
	Springbank Reservoir 3	81.8 ML/52.0 ML	
Southeast Reservoir and Pump Station	South east	113 ML	83.3 ML
Elgin – Middlesex Reservoir (operated as part of EAWSS)	South east	27.0 ML	19.2 ML
TOTAL (pre 2022) (includes Springbank 2)		458.2 ML	311.7 ML
TOTAL (post 2022) (excludes Springbank 2)		412.6 ML	282.8 ML

- (1) Due to pumping capability, free board at top of reservoir, percent full at the time of need, and the pump intake elevation at bottom of the reservoir.

The City's water system currently has a 91 ML storage deficit as outlined in **Table 6-2** in **Section 6.1.1**. This is projected to grow to 203 ML by 2054. Details are provided in the Evaluation of Long Term Storage Requirements included in **Appendix B1**.

5.2 Land Use

The London Plan indicates 'robust' growth within the City over the next twenty years. Substantial growth is limited to within the Urban Growth Boundary (UGB) and is anticipated to occur through intensification primarily in the Built-Areas which the London Plan describes as substantially built out areas (as of 2006) of the City within the UGB. Intensification of residential development will be achieved through adaptive re-use, infill, severance and redevelopment at higher densities. Intensification of non-residential development, such as mixed-use, commercial, industrial and institutional areas, will also be encouraged.

A summary of land uses adjacent to the existing reservoirs is provided in **Table 5-2** below. A summary of existing conditions for potential reservoir sites (non-existing reservoir sites) is included in **Section 7.3**.

Table 5-2: Existing Land Uses

Location	Adjacent Land Uses
Arva Reservoir and Pump Station	agriculture
Springbank Reservoirs	residential, open space
Southeast Reservoir and Pump Station	agriculture
Elgin – Middlesex Reservoir and Pump Station	agriculture, industrial

5.3 Natural Environment Features

The City of London enjoys an abundance of Green Space Places including Natural Heritage Features and Areas, Natural and Human-made Hazard Lands, Natural Resources and Public Parkland. These areas are governed by the policies of the London Plan as a means of protecting and enhancing the natural environment within the City.

A preliminary background review was conducted for the existing reservoir sites to identify existing natural heritage features and is included in **Appendix B.2**. Species at Risk (SAR), Species of Conservation Concern (SOCC) and relevant London Plan maps outlining natural heritage land use designations were utilized to inform the review. Additionally, previous reports undertaken by AECOM within the study areas were also used. These include the following:

- Southeast Reservoir Subject Land Status Report (Earth Tech Canada Inc., 2004); and,
- Southeast Reservoir and Pump Station Environmental Impact Study (Earth Tech Inc., 2005).

A summary of natural environment features within and adjacent to the existing reservoirs is provided in **Table 5-3** below. A summary of existing conditions for potential reservoir sites (non-existing reservoir sites) is included in **Section 7.3**.

Table 5-3: Existing Natural Environment Features

Location	Natural Heritage Features (within or adjacent to the area)	Potential SAR/SOCC
Arva Reservoir and Pump Station	Natural heritage feature (woodland) is approximately 14 ha with 1.3 ha within the study area with 0 ha impacted.	Potential suitable habitat for 11 SAR/SOCC in woodland.
Springbank Reservoirs	Natural heritage feature (Significant Woodland) is approximately 9.8 ha of which 0.7 ha may be impacted. Potential impact to 35 - 80 trees.	Potential suitable habitat for 18 SAR/SOCC in woodland.
Southeast Reservoir and Pump Station	Natural heritage feature (Significant Woodland) is approximately 15 ha with 1.6 ha within the study area, 0 ha impacted.	Potential suitable habitat for 13 SAR/SOCC in woodland.

	A small portion of the Perl Drain is within the study area.	
Elgin and Middlesex Pump Station	EMPS is a feeder into SERPS, servicing southeast London. As a result the EMPS was not assessed as part of the Natural Environment review.	

5.4 Cultural Heritage and Archaeology

A preliminary background review was conducted to identify the potential for archaeological resources associated with each of the existing reservoirs. A review of the historical, environmental, and archaeological context of the land parcels has been provided below as well as a determination regarding the potential for the presence of archaeological resources for the proposed reservoir footprints. Data sources included recent historical maps, previous archaeological assessments, The Ministry of Tourism Culture and Sport's and Ontario Heritage Trust Databases and the City of London's heritage register mapping.

Additionally, a preliminary background review was conducted to determine if built heritage resources and/or cultural heritage landscapes are located in close proximity to the existing water supply facilities. Data sources included the City of London's Inventory of Heritage Properties, Ontario Heritage Trust's online inventory, the Canadian Register of Historic Places and the Directory of Federal Heritage Designations.

A summary of the cultural and archaeological resources and potential can be found below. Further details are found in **Appendix B.3** and **Appendix B.4**. A summary of cultural and archaeological resources for potential reservoir sites (non-existing reservoir sites) is included in **Section 7.3**.

Arva Reservoir and Pump Station

- Portions of the study area were determined to retain archaeological potential, specifically the woodlot in the northeast corner of the property. Given the proximity to the existing reservoir, the potential for the presence of archaeological resources within the proposed reservoir footprint is low to moderate.
- No cultural heritage resources are located in proximity to the facility.

Springbank Reservoirs 1 & 2

- Land within the east half of the site retains high potential for the recovery of archaeological resources.
- The west half no longer retains archaeological potential due to previous disturbance associated with the construction of the existing Springbank Reservoir.

Springbank Reservoir 3

- The majority of the land parcel to the south of Commissioners Road West no longer retains archaeological potential. Only a small corridor of manicured lawn extending from Commissioners Road West between existing private properties retains high archaeological potential.
- One Part IV designated property is located in proximity to the Springbank Reservoir.

Southeast Reservoir and Pump Station

- This site has features of archaeological potential, based on the results of the archaeological assessment however archaeological potential has been removed as a result of construction of the reservoir.
- Two Listed properties are in close proximity to SERPS. However, no impacts are anticipated. Further study may be required to evaluate potential impacts.

Elgin-Middlesex Reservoir and Pump Station

- No cultural heritage resources are located in proximity to the facility.

5.5 Geotechnical and Hydrogeological

A background review was conducted to document the historical geotechnical and hydrogeological data obtained from various field investigations previously completed. Reports completed in the vicinity of the proposed locations were referenced to establish location suitability. Further details are found in **Appendix B.5**. A summary of geotechnical and hydrogeological background information for potential reservoir sites (non-existing reservoir sites), is included in **Section 7** below.

Arva Reservoir and Pump Station

The subsurface condition at the Arva Reservoir and Pump Station generally consists of clayey silt till / clayey silt / silt. The hydraulic conductivity of the clayey silt till is considered to be relatively low. Groundwater elevations, as measured in open boreholes nearby this site, are in the range of 2.5 m to 4.2 meters below ground surface (mbgs) (281.6 to 279.6 meters Above Sea Level (mASL)). Based on change in soil colour and water content profile in the boreholes, the long-term groundwater elevation is estimated to be at approximately 281 mASL. The site is located to the northwest of Medway Creek. Ground surface topography slopes south-eastward toward Medway Creek, and thus, the groundwater flow direction is expected to be south-easterly toward Medway Creek, as well.

Springbank Reservoir Complex

The subsurface conditions at Springbank Reservoir Complex generally consist of sand and gravel. The hydraulic conductivity of the sand and gravel is considered to be relatively high. The only stabilized groundwater elevation was measured in borehole two (BH-2) at 7.6 mbgs. Ground surface elevation at the site is approximately 300 mASL, and thus the water table is at approximately 292 mASL. Historically, the groundwater elevation in the Byron Gravel Pit (to the west of the site) was approximately 240 mASL, and the North Thames River has a surface water elevation of approximately 228 mASL. Thus, the groundwater flow direction is toward the north and west of the site. No groundwater samples were collected for water quality analysis.

Southeast Reservoir and Pump Station

The subsurface at SERPS consists, in general, of silty clay till. The hydraulic conductivity of silty clayey till is considered to be relatively low. The stabilized groundwater elevation, as measured in Monitoring Wells, is in the range of 3.66 – 7.0 mbgs. From previous geotechnical investigations on the southern portion of the site, groundwater levels are near the existing ground surface at 0.0 – 3.9 mbgs. The site is located in the headwaters of Kettle Creek, which flows in a southerly direction toward Lake Erie. Thus, the groundwater flow direction is likely southward toward the Kettle Creek. No groundwater samples were collected for water quality analysis.

Elgin and Middlesex Reservoir and Pump Station

EMPS is a feeder into SERPS, servicing southeast London. As a result the EMPS was not assessed as part of the Geotechnical and Hydrogeological review.

6. Future Servicing Requirements

A preliminary background review was conducted to determine system design criteria, such as minimum pressures under emergency supply conditions as well as storage sizing criteria, in general and for future growth. Available storage estimates for storage capacity requirements for each design year and potential storage locations and configurations were also identified.

Previous reports reviewed by AECOM within the study area were also used and include:

- 2002 Water Supply Reliability Assessment, Final Report (Dillon, 2002);
- 2008 City of London Water Master Plan Update (City of London, 2008);
- 2014 City of London Water Master Plan Update (City of London, 2014);
- Elgin Area Primary Water Supply System – 2008 Water Master Plan Update (Delcan, 2014);
- Lake Huron Primary Water Supply System – 2008 Water Master Plan Update (Delcan, 2014); and,
- City of London InfoWater hydraulic model (AECOM, 2014).

A summary of the background review is provided below. Further details are provided in the Evaluation of Long Term Storage Requirements Report (**Appendix B.1**).

6.1 Design Criteria

In general, the City of London like other North America jurisdictions is required to meet minimum acceptable guidelines, policies and standards for potable water supply and water quality. In Ontario, a variety of level of service / design criteria are applied over discrete performance factors of the MECP, Ontario Fire Code (OFC), and Ontario Building Code (OBC).

Design Criteria for water storage was determined based on the following. Details of the criteria can be found in **Appendix B.1**.

- MECP requirements for fire storage, balancing storage and emergency storage;
 - Fire Storage – the volume of water required to fight a fire within a pressure zone based on a set fire demand for a specified period of time.
 - Equalization Storage – the volume of water required to meet peak demands that exceed the supply capacity of the water system.
 - Emergency Storage – surplus storage in addition to fire and equalization storage that is required in the case of emergencies such as watermain breaks or mechanical breakdowns.
- City of London demands, determined by existing and future growth demand factors, peaking factors and non-revenue water (peak demand occurs in the water system as the demand of various water users overlap in time);
- Emergency system supply;
- Available storage; and,
- Hydraulic Modelling.

6.1.1 London Demands

Existing and forecasted London demands used for the storage sizing calculations were reviewed, including existing and growth demand factors, peaking factors and non-revenue water (NRW). **Table 6-1** shows the winter average day demand based on the Evaluation of Long Term Water Storage Requirements Report in **Appendix B.1**.

Table 6-1: London Demand Forecasts for Storage Evaluation

Year	Winter Average Day Demand (ML/d)					Total
	Residential	Commercial	Institutional	Industrial	NRW	
Existing	80.0	20.8	5.0	9.4	13.5	128.6
2014	82.7	20.8	5.2	9.5	11.7	129.8
2019	87.2	20.8	5.5	9.8	12.2	135.6
2014	92.0	20.8	5.6	10.2	12.7	141.3
2029	96.5	20.9	5.8	10.6	13.2	147.0
2034	100.9	21.0	6.1	11.0	13.8	152.9

Based on the storage criteria listed above, City of London water storage requirements were estimated to the year 2054 based on an emergency condition of the LHWSS water being off-line for one maximum day (maximum daily demand (MDD)) followed by one average day (average daily demand (ADD)), for a duration of 48 hours. This determined that 100 ML of storage is recommended for the short term (assumed by 2023), with a provision for an additional future 100 ML by 2054, for a total of 200 ML, as shown by **Table 6-2**. This assumes that the existing Springbank Reservoir No. 2 would be decommissioned (more on decommissioning can be found in **Section 8.3.3**).

Table 6-2: Required Storage Capacity – 48 Hour Emergency

Year	Demands (ML/d) (1)		Emergency – MDD / ADD (2 days)						
	ADD winter	MDD	Required Storage (ML)	Elgin Supply Volume (ML)	Total Supply (ML)	Net Required Storage (ML)	Available Storage (ML)	Storage Surplus (deficit) (ML)	
	Existing	133.2	267.3	482.7	80.0	80.0	403	312	-91
0	2014	134.4	269.8	486.9	115.0	115.0	372	312	-60
5	2019	140.1	281.5	507.1	115.0	115.0	392	312	-80
10	2024	145.9	293.3	527.4	115.0	115.0	412	283	-130
15	2029	151.6	304.9	547.4	170.0	170.0	377	283	-95
20	2034	157.4	316.9	568.0	170.0	170.0	398	283	-115
25	2039	163.3	328.9	588.7	170.0	170.0	419	283	-136
30	2044	169.4	341.4	610.2	170.0	170.0	440	283	-157
35	2049	175.8	354.4	632.5	170.0	170.0	462	283	-180
40	2054	182.4	367.8	655.7	170.0	170.0	486	283	-203

6.2 Storage Configurations

A high amount of water storage within a water system provides a higher level of service as there is more water readily available in the event of an emergency (i.e., a pipeline break). Two types of water storage configurations can be applied to address current conditions and future needs.

Elevated ground storage reservoirs

- This is a 'floating' storage reservoir operation on a gravity basis (i.e., No pumping).
- This type of storage requires a substantial land area, situated at an appropriate elevation to supply a water service area with satisfactory pressures.
- This type of storage would supply water on a gravity basis and would automatically fill and draw, depending on supply pumping and system demands.
- Little or no energy losses are required for filling or drawing down the storage, other than any storage supply piping, if required.
- This type of storage is expandable, so storage cells can be staged for future years.
- Floating storage can more readily sustain pressures during a pumping interruption and minimize transient impacts.

Within the City of London, site opportunities that meet this elevation criterion are generally limited to the area within the vicinity of the existing Springbank Reservoirs and the northeast portion of the City.

Pumped Ground Storage

- This type of storage consists of a ground reservoir and a re-pump station
- This type of storage is expandable, so storage cells can be staged for future years.
- This type of storage is fairly common in flatter service areas.

This type of storage configuration would have operational issues with respect to filling and draining a facility within the same pressure zone. This requires coordination during filling or pumping via the Arva Pump Station or SERPS during supply or filling.

7. Phase 2: Alternative Solutions

7.1 Identification of Alternative Solutions

To address the Problem and Opportunity Statement provided in **Section 4**, on-site reservoir expansion and off-site locations were identified. **Table 7-1** provides a description of the on-site and off-site siting options.

Table 7-1: Water Storage Alternative Solutions

Water Storage Alternative Solutions	Description
On-Site Reservoir Expansion Options	Expand Arva Reservoir and Pump Station or Springbank Reservoir and/or Southeast Reservoir and pump station
Off-Site Reservoir Siting Options	Land that is currently vacant or open space. Land that meets the storage size and configuration requirements Site elevation (determines potential type of storage facility – pumped or floating)
Do Nothing	No improvements or changes would be undertaken to address current and future water storage requirements. Under the provisions of the MCEA, 'Do Nothing' is evaluated for the purposes of comparison. In this scenario, no additional storage would be provided. This option could prevent future growth and/or would result in inadequate water servicing (storage and pressure) to the service area. The 'Do Nothing' option does not address the Problem and Opportunity Statement and was therefore not carried forward through evaluation.

7.2 Evaluation of Long List of Alternatives

City of London water storage requirements were estimated to the year 2054 based on an emergency condition of the LHWSS water being off-line for one maximum day followed by one average day, for a duration of 48 hours. This determined that approximately 200 ML of additional storage would be required by the year 2054. This assumes that the existing Springbank Reservoir No. 2 would be decommissioned (more on decommissioning can be found in **Section 8.3.3**).

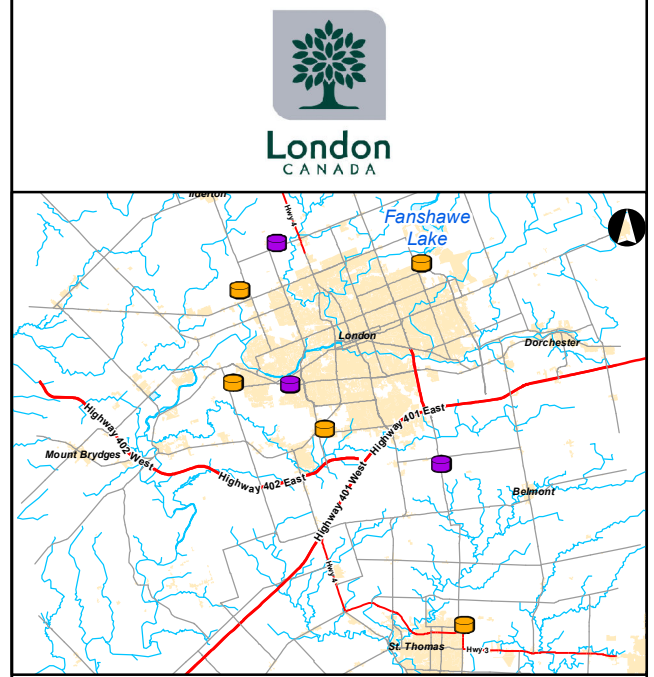
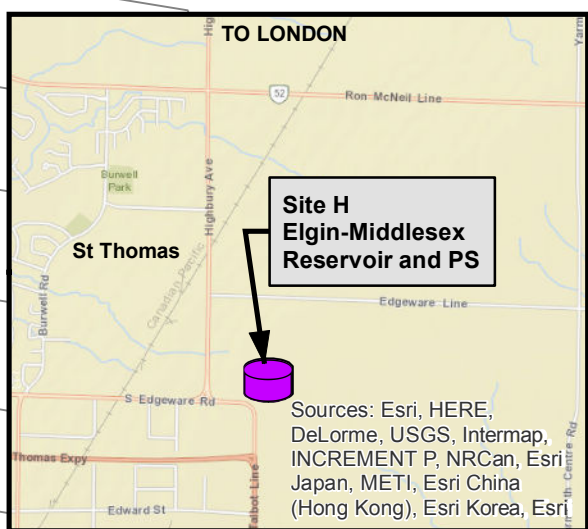
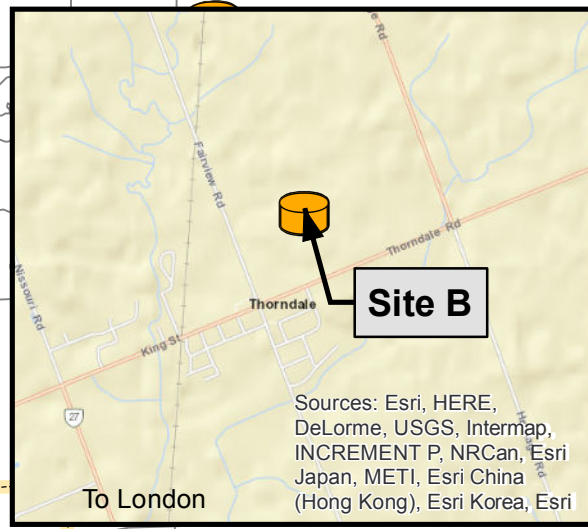
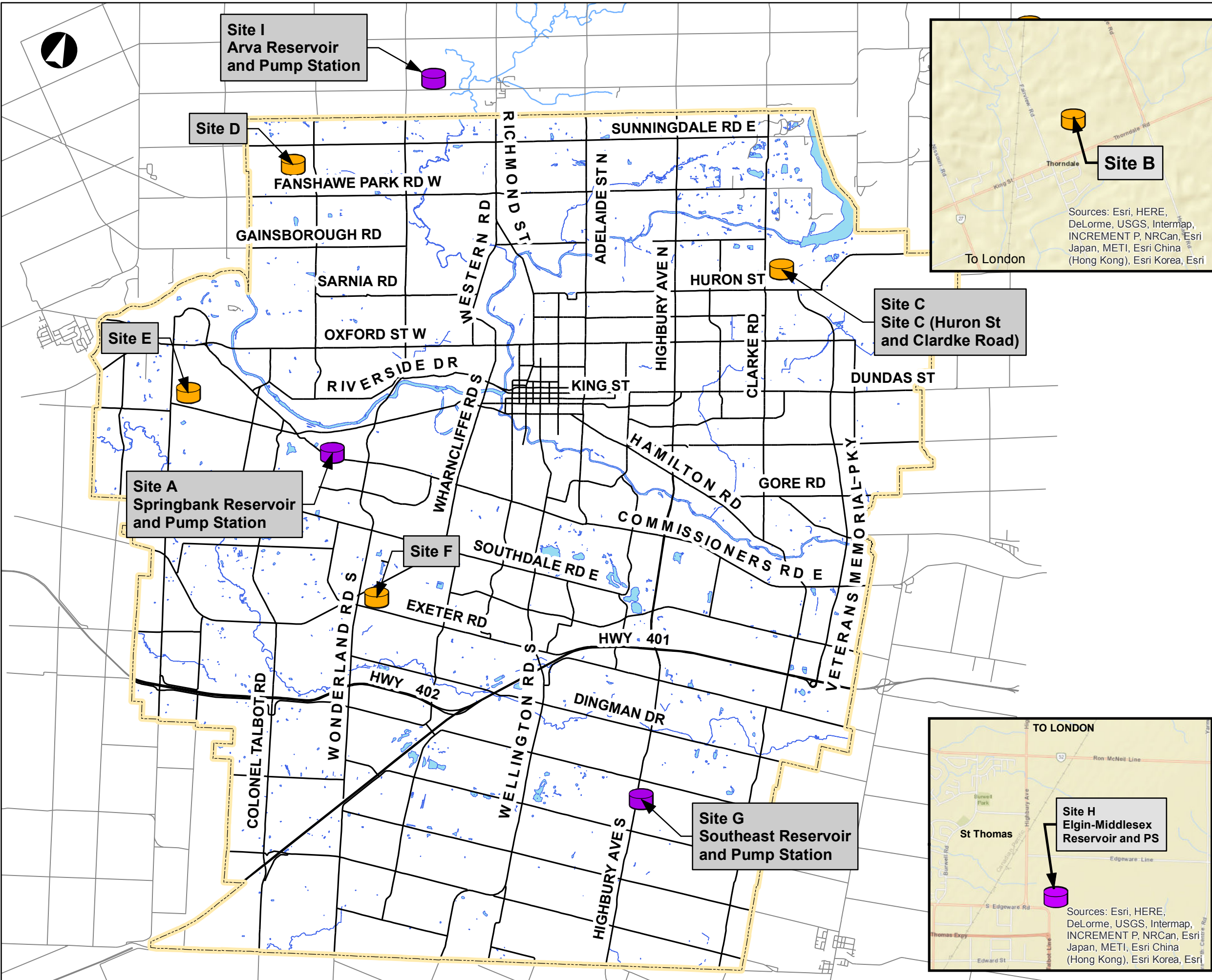
Required storage was assessed using hydraulic modelling for the year 2034, for which approximately 50% of the required additional storage for 2054 would be required, or 100 ML. Two types of storage were considered: floating storage, and pumped storage (see **Section 6.2**).

Feasible sites for floating storage would require operating elevations equivalent to the existing Springbank Reservoirs. There are limited opportunities for floating storage within the City's water system, primarily within the northeast portion of the City, outside of the municipal boundary.

Nine potential storage locations were identified based on high-level screening criteria:

- Property that is currently vacant land or open space;
- Property that meets the storage size and configuration requirements; and,
- Site evaluation (determine potential type of storage facility – pumped or floating).

Figure 7-1 shows the location of the nine long-listed candidate sites.



Legend

- Potential Site at an Existing Water Reservoir
- Potential Sites
- CityBoundary
- Roads
- Water

0 1,250 2,500 5,000
Meters

City of London
Long Term Water Storage
Environmental Assessment
Schedule 'B'

Long List of Candidate Locations

December 2018	1:100,000	Datum: NAD83 UTM17 Source: LIO 2016, City of London 2017
P#: 60565856	V#:	

AECOM

Figure 7.1

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The Long-List candidate sites were evaluated to determine their suitability based on the following criteria:

- **Socio-Economic:** property ownership, impacts to the existing and future use of the property, archaeology and cultural heritage;
- **Natural Environment:** aquatic, terrestrial, source water protection, climate change; and,
- **Technical Considerations:** hydraulics, energy, transients, operations, infrastructure requirements, ability to meet future growth needs.

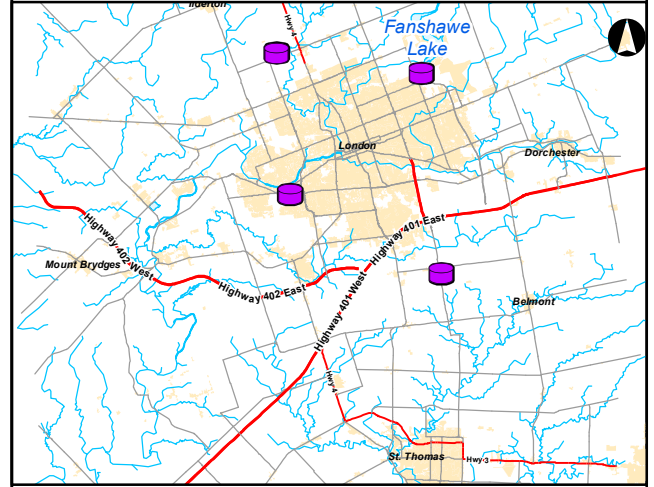
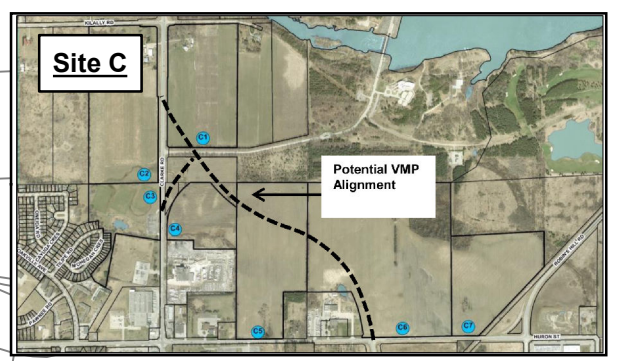
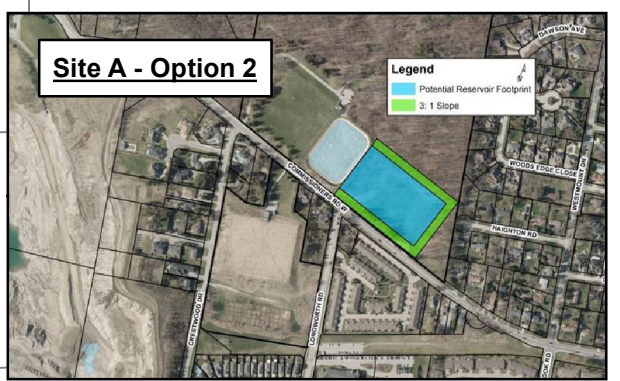
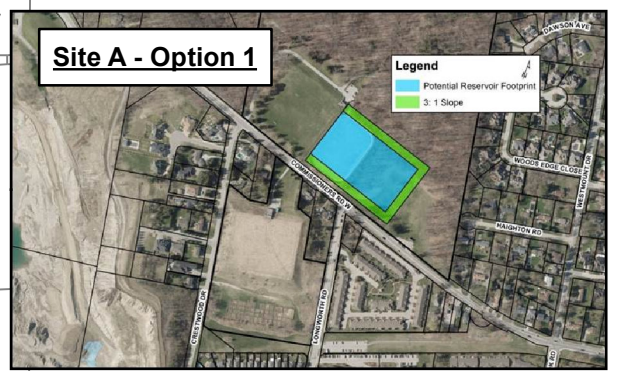
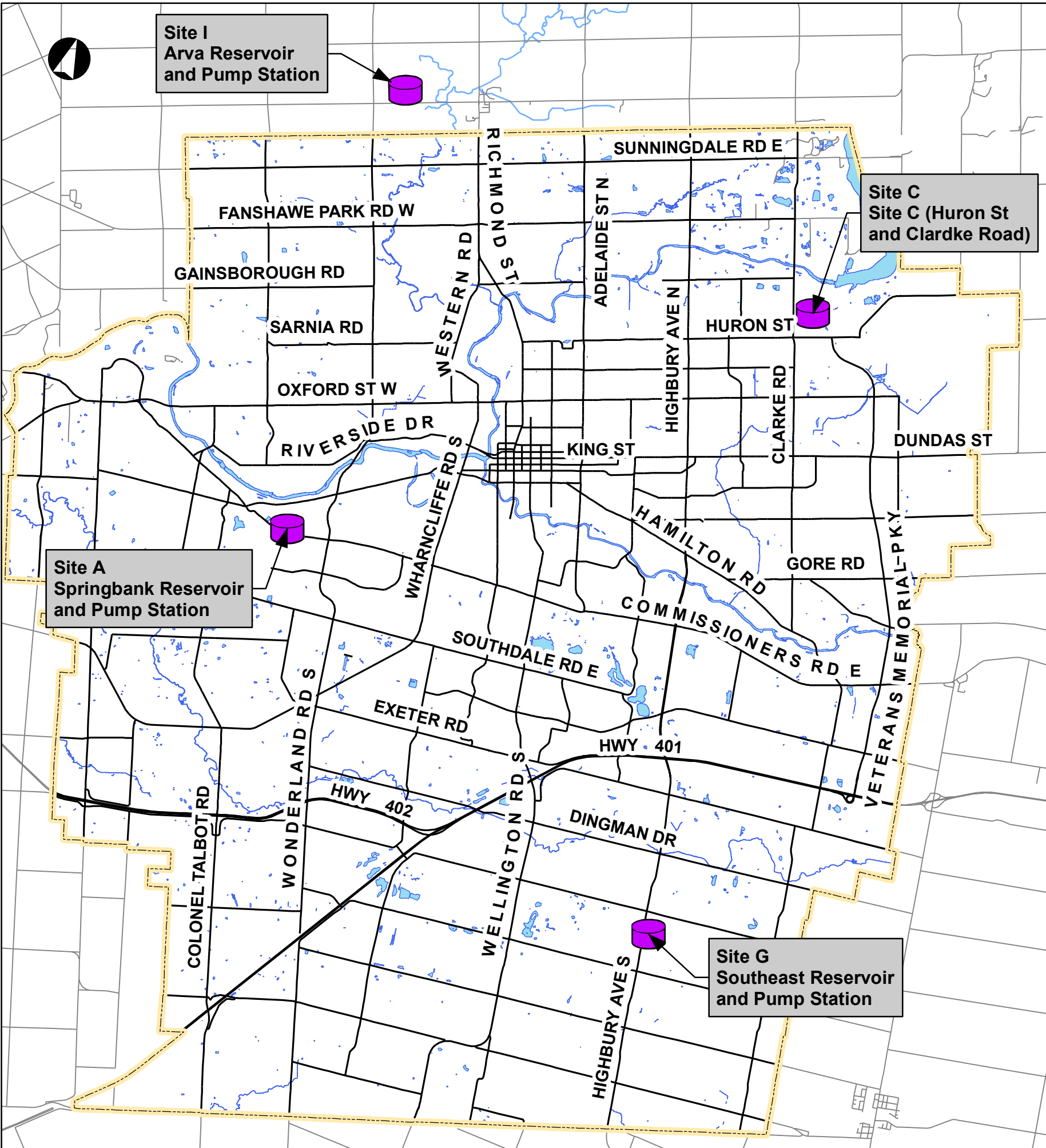
The evaluation of the nine sites is shown below in **Table 7-2**.

Table 7-2: Evaluation of Long-List Candidate Locations





Criteria	Long-List Candidate Locations								
	Site A	Site B	Site C	Site D	Site E	Site F	Site G	Site H	Site I
Socio-Economic	Green	Yellow	Green	Purple	Purple	Purple	Green	Yellow	Green
Natural Environment	Yellow	Yellow	Yellow	Yellow	Purple	Purple	Green	Yellow	Green
Technical Considerations	Green	Yellow	Yellow	Purple	Purple	Purple	Green	Purple	Green
Short Listed	YES	NO	YES	NO	NO	NO	YES	NO	YES

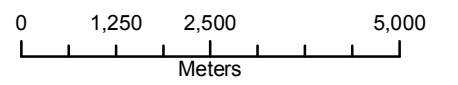
Legend	No Major Issues	Minor to Moderate Issues	Likely Significant Issues
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Following this preliminary screening, four sites were short listed for review in refined detail to determine their suitability to be carried forward. Within two of these locations (Site A and Site C), multiple sites were identified (**Figure 7-2**).



Legend
short_List

-  Short Listed Potential Sites
-  CityBoundary
-  Roads
-  Water



City of London
Long Term Water Storage
Environmental Assessment
Schedule 'B'

Short List of Candidate Sites

January 2019	1:100,000	Datum: NAD83 UTM17 Source: LIO 2016, City of London 2017
P#: 60565856	V#:	



Figure 7.2

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Map location: P:\05059302_Col. Water Storage Options EA\05059302_CAD_05\GIS\2025-029\GIS\Graphics\MXD\EA_Report_Figures\05059302 - Figure x - Short List of Alternative Solutions.mxd
Date saved: 1/16/2019 12:14:12 PM User Name: Adam.M

7.3 Site C Background Information

To fairly evaluate all short listed sites, background information was considered for Site C (Northeast System - Clarke Road and Huron Road Area) similar to that provided for the existing reservoir sites in **Section 5**. As part of this evaluation the North Huron Subject Land Status Report (AECOM, 2015) was considered. **Table 7-3** below provides a summary of the background information for the Site C options.

Further information is provided in associated **Appendices B.1 to B.5**.

Table 7-3: Site C Background Information

Land Use Residential, agricultural, industrial, institutional, parkland/open space

Natural Environment	Candidate sites are primarily agricultural, however, unevaluated wetlands and woodlands are present Potential impacts to ground and/or surface water. Potential suitable habitat for 20 SAR/SOCC	See Appendix B.2
Cultural Heritage and Archaeology	This site has features of archaeological potential, based on the results of the archaeological assessment including: Proximity to 13 previously identified archaeological sites Proximity to Thames River Early Euro-Canadian settlement and industry and early transportation route 3 Listed properties are within or in proximity to a potential reservoir location.	See Appendix B.3 & Appendix B.4
Geotechnical and Hydrogeological	Higher ground and/or surface water impacts subject to which of the 7 options is selected as the preferred.	See Appendix B.5
Technical	Best addresses systemic operation and peak/emergency response and hydraulic issues in north east London. Decreased transient protection with increased energy needs (highest of all the alternatives). Water system operation more complex with a 4th major reservoir and pump station. Maintains water quality but increases water turnover necessitating Arva pump station operational changes.	See Appendix B.1

7.4 Evaluation of Short Listed Storage Alternatives

A detailed qualitative assessment of each short listed alternative solution was completed based on the background information provided in **Sections 2 to 6**, using the evaluation criteria and indicators that address the broad definition of the environment as described in the *EAA* shown in **Table 7-4** below. The evaluation of approach used to consider the suitability and feasibility of alternative solutions for the study was a qualitative assessment. In this approach, trade-offs consider the advantages and disadvantages of each alternative to address the problem and opportunity

statement with the least environmental effects and the most technical benefits for relative comparison between alternatives. This formed the rationale used to identify the preferred alternative.

A comprehensive evaluation in a matrix format was used to present the evaluation of alternative solutions as shown in **Table 7-5**.

Table 7-4: : Evaluation Criteria

Category	Criteria	Indicator
Public Health	Long/short Term Impacts	<ul style="list-style-type: none"> Noise quality Air quality
Social and Cultural Evaluation	Property impacts and Acquisition	<ul style="list-style-type: none"> Need for Land Purchase in part or in whole
	Residential Land Use	<ul style="list-style-type: none"> Potential long or short-term impacts to surrounding neighbourhoods/land use due to project and/or construction
	Built and Cultural Heritage Resources	<ul style="list-style-type: none"> Potential impacts to built and cultural heritage resources
Natural Environment	Terrestrial	<ul style="list-style-type: none"> Potential Effects on flora, fauna and associated habitat Potential effects to SAR
	Aquatic	<ul style="list-style-type: none"> Number and nature of water crossings, including upgrade requirements Potential Effects on aquatic species and associated habitat
	Ground and Surface Water	<ul style="list-style-type: none"> Impacts to water quality
Technical	Hydraulics	<ul style="list-style-type: none"> Ability to service northeast London
	Energy Optimization	<ul style="list-style-type: none"> Optimizes Energy use and transient protection Need for booster pumping and backup power
	Operations Improvement	<ul style="list-style-type: none"> Ease of normal system operation, water turnover and quality
	Infrastructure	<ul style="list-style-type: none"> Use of existing infrastructure Distribution routing/ New Water System infrastructure
	Climate	<ul style="list-style-type: none"> Water supply source and system/ climate resilience
Economic and Financial	Operating Costs	<ul style="list-style-type: none"> Total project costs (design and construction) Operating and Maintenance Costs Land Costs

Table 7-5: Evaluation of Short Listed Storage Alternatives

Impact Criteria	Indicators	Reservoir Location				
		Site A Vicinity of Existing Springbank Reservoir and PS		Site C North East System: Clarke Road and Huron Road Area	Site G Existing Southeast Reservoir and PS	Site I Existing Arva Reservoir and PS
		A1	A2			
Public Health and Safety	Long/Short Term Impacts due to air and noise quality	-Little to no change from existing for long term. Some impacts due to construction given residential proximity	-Some change from existing for long term with impacts due to construction in closer proximity to residents.	-Some change from existing in long term and due to construction subject to which of 7 sites is chosen. -More significant for those options closer to existing residences.	-No change from existing in long term or due to construction in short term due to remote location.	-No change from existing in long term. -Some impacts due to construction in short term given proximity to some nearby residences.
Public Health and Safety Evaluation Summary						
Social and Cultural	Need for Land Purchase in part or in whole	-City owned land for purpose, currently used as open space.	-City owned land for purpose, but currently used as open space.	-Some City owned land with some sites having to be purchased. -Land Intended for industrial or residential development.	-City owned land ready for purpose.	-Outside of City boundary but is owned by the Regional Water System with London being the major user. (Potential to provide land at no or low cost if the decision is to have storage here to optimize the City's water supply). -Currently used as open space.
	Potential long or short term impacts to surrounding neighbourhoods/land use – due to project and/or construction.	-Impact to existing due to: loss of open space that can be replaced in part; reservoir closer to residences and higher slopes; Infrastructure work across Commissioners Road impacts roadway and the work onsite is closer to existing residences.	-Impact to existing due to: loss of open space; reservoir much closer to residences; and even higher slopes; Infrastructure work across Commissioners Road impacts roadway and the work onsite is much closer to existing residences.	-Impact to existing residents/businesses and land use (now and/or future), which could be mitigated to some extent based on which of 7 locations chosen. -Impacts to City's industrial land strategy by reducing available land. - New site requires extensive work on Clarke road for inlet/outlet, watermains, construction and permanent access.	-No impacts to surrounding land uses. -No impacts to existing residences/businesses. -Minimal construction impact given all works are setup for the site and it is well away from existing residents.	-Minor impacts to existing area and/or land use with nearest residence being greater than 300 m away from a potential expansion, which is a more than adequate buffer. -Minimal impact due to construction to nearby residences. Available site with no road works other than increased construction traffic.

Low Impact is considered preferred compared to moderate or high impact.

Legend						
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Impact Criteria	Indicators	Reservoir Location				
		Site A Vicinity of Existing Springbank Reservoir and PS		Site C North East System: Clarke Road and Huron Road Area	Site G Existing Southeast Reservoir and PS	Site I Existing Arva Reservoir and PS
		A1	A2			
	Potential impact to archaeological / heritage resources. (2)	<p>-Moderate impact – Stage 1 archaeological work completed, requires Stage 2 study. -CHER or HIA may be required to fully evaluate cultural heritage impacts.</p>	<p>-Moderate impact – Stage 1 archaeological work completed, requires Stage 2 study. -CHER or HIA may be required to fully evaluate cultural heritage impacts.</p>	<p>-Slight impact – Stage 1 archaeological work completed for the most part except for 2 sites. -Depending on the site chosen, CHER or HIA may be required to fully evaluate cultural heritage impacts.</p>	<p>-No impact. Stage 1 /2 archaeological work completed. -CHER or HIA may be required to fully evaluate cultural heritage impacts.</p>	<p>-Low to Moderate impact, archaeological potential with Stage 1/2 required. -No Cultural Heritage impacts.</p>
Social and Cultural Evaluation Summary						
Natural Environment (3)	Terrestrial – ecological impacts resulting from removal or damage to vegetation and trees (Species at Risk).	<p>- Woodland is a total of 9.77 hectares of which ~0.70 ha will be potential affected by proposed works. - Approximately 35 trees may be affected to extend the reservoir to the east into existing open space area.</p>	<p>- Woodland is a total of 9.77 hectares of which ~1.25 ha will be potential affected by proposed works. - Approximately 80 trees may be affected to extend the reservoir to the east into existing open space area. - More green space and natural areas impacted.</p>	<p>- Candidate sites primarily agricultural, however, unevaluated wetlands and woodlands are present. Any proposed facility should be kept away from wetlands/woodlots of significant value. If not, additional assessment and mitigation work is required. - Park impacts for 1 potential site.</p>	<p>- Natural Feature is approximately 15 hectares in size, with approximately 1.56 ha falling within the study area. Low amount of impact based on Natural Heritage review and that proposed works can be implemented without impacts to the wooded area already allowed for by previous assessments and work.</p>	<p>- Natural Feature is approximately 14 ha with 1.29 ha falling within the study area. Least amount of impact based on Natural Heritage review and that proposed work can be implemented without impacts to woodland areas; however, the boundary of the existing woodland would need to be confirmed through field investigations.</p>
	Impacts to Wildlife (Species at Risk)	<p>- Potential impacts to 18 SAR Of these, 15 (10 Endangered (END), 5 Threatened (THR)) are protected under the <i>Endangered Species Act</i> (2007). The other 3 species are listed as Species of Conservation Concern (SCC) and do not have any permitting implications.</p>	<p>- Potential impacts to 18 SAR Of these, 15 (10 END, 5 THR) are protected under the <i>Endangered Species Act</i> (2007). The other 3 species are listed as SCC and do not have any permitting implications.</p>	<p>- Potential impacts to 20 SAR Of these, 11 (5 END, 6 THR) are protected under the <i>Endangered Species Act</i> (2007); The other 9 species are considered SCC and do not have any permitting implications.</p>	<p>- Potential impacts to 13 SAR Of these, 8 (5 END, 3 THR) are protected under the <i>Endangered Species Act</i> (2007). The other 5 species are considered SCC and do not have any permitting implications. - Potential impacts are limited to 3 SAR cultural meadow species (3 THR) based on the proposed reservoir footprint. - Some impacts for 9 SAR were pre-assessed and mitigated during the Subject Land Status Report (Earth Tec, 2004).</p>	<p>- Potential impacts to 11 SAR Of these, 10 (5 END, 5 THR) are protected under the <i>Endangered Species Act</i> (2007). The other 1 species is considered SCC and does not have any permitting implications. - Potential impacts are limited to 5 SAR cultural meadow species (4 THR and 1 SCC) based on the proposed reservoir footprint.</p>

Low Impact is considered preferred compared to moderate or high impact.

Legend	Low Impact	Low to Moderate Impact	Moderate Impact	Moderate to High Impact	High Impact	Most Preferred
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Impact Criteria	Indicators	Reservoir Location				
		Site A Vicinity of Existing Springbank Reservoir and PS		Site C North East System: Clarke Road and Huron Road Area	Site G Existing Southeast Reservoir and PS	Site I Existing Arva Reservoir and PS
		A1	A2			
	Aquatic – ecological impacts resulting from construction in or near water with potential to harm aquatic species (watermain crossings, Species at Risk).	- No watercourses were observed within 100 m of the proposed reservoir. There are no anticipated impacts to SAR; however, potential impacts cannot be determined without further study.	- No watercourses were observed within 100 m of the proposed reservoir. There are no anticipated impacts to SAR; however, potential impacts cannot be determined without further study.	- 1 SAR species (THR) was flagged by NHIC during the background review; however, suitable aquatic habitat was not identified during aquatic surveys in within the Site C study area (AECOM, 2015). The Thames River is located approximately 100 metres north of the study area and contains SAR. - Impacts cannot be determined without further study. A moderate impact will be assumed until proposed reservoir footprints are established.	- A small portion of Perl Drain was identified in the southwest corner of the study area and therefore also falls within the KCCA's Regulation Limit. Aquatic SAR were not identified in the 2004 report (Earth Tec, 2004). There are no anticipated impacts to SAR. - Impacts cannot be determined without further study, however they are less likely given the proposed location of the reservoir.	- 1 SAR species was identified during the NHIC background review; however, DFO mapping did not flag any aquatic SAR species. There are no anticipated impacts to SAR species. - Impacts cannot be determined without further study; however, they are less likely given the proposed location of the reservoir.
	Impacts to ground/surface water quality (1)	- Minimal ground or surface water impacts but should be confirmed given soil type / groundwater conditions in the area.	- Minimal ground or surface water impacts but should be confirmed given soil type / groundwater conditions in the area.	-Higher ground and/or surface water impacts subject to the preferred site location of the 7 options.	-No groundwater/surface water quality impacts. Already addressed as part of initial facility construction and allowance for expansion.	-Minimal ground or surface water impacts anticipated. Subject to onsite confirmation at later project stages. -Water ponds onsite/adjacent to site due to poor drainage currently being addressed by adjacent landowners.
Natural Environment Summary						

Low Impact is considered preferred compared to moderate or high impact.

Legend						
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Impact Criteria	Indicators	Reservoir Location				
		Site A Vicinity of Existing Springbank Reservoir and PS		Site C North East System: Clarke Road and Huron Road Area	Site G Existing Southeast Reservoir and PS	Site I Existing Arva Reservoir and PS
		A1	A2			
Technical Considerations (4)	Ability to service northeast London (Hydraulics)	Does not improve operation and pressure under peak/emergency response in NE London but maintains water supply above minimum MOEC pressures.	Does not improve operation and pressure under peak/emergency response in NE London but maintains water supply above minimum MOEC pressures.	-Best addresses systemic operation and peak/emergency response and hydraulic issues in NE London.	-Does not improve operation and peak/emergency response in NE London.	-Addresses system operation and peak/emergency response hydraulics issues in NE London for the most part.
	Optimizes Energy use and transient protection	No improvement or detriment to transient protection under peak/emergency conditions. Much reduced energy costs due to gravity feed and somewhat improved operations with the Arva PS.	No improvement or detriment to transient protection under peak/emergency conditions. Much reduced energy costs due to gravity feed and somewhat improved operations with the Arva PS.	-Decreased transient protection with increased energy needs (highest of all the alternatives)	-No improvement or detriment to transient protection or increase in energy costs but pumping intensive.	-No improvements or detriment to transient protection but pumping intensive. Energy costs can be optimized at PS with storage in place.
	Operational Improvement (ease of normal system operation, water turnover and quality)	No significant improvement or detriment to existing operations. Longer water residence time necessitating operational changes at the Arva PS. Gravity based operation.	No significant improvement or detriment to existing operations. Longer water residence time necessitating operational changes at the Arva PS. Gravity based operation.	-Water system operation more complex with a 4 th major reservoir and PS. Maintains water quality but increases water turnover necessitating Arva PS operational changes.	-No significant improvement or detriment to existing operations. New storage not fully utilized and reliant on Elgin water supply expansion. Additional pumping capacity required.	-No significant improvement or detriment to existing City water operations, with improved potential for Regional Water Supply for filling. Maximizes new reservoir volume use with pumping capacity optimized.
	Use of existing infrastructure	Replaces existing 50ML being retired. An additional 50ML can be constructed on available land and connected to the existing reservoir with some height and slope issues.	Replaces existing 50ML being retired. An additional 50ML can be constructed on available land and connected to the existing reservoir with greater height, proximity and slope issues.	-New greenfield, land to be purchased and revised land use for City owned. -Does not maximize use of existing infrastructure.	-Existing infrastructure already in place as facility is designed for 113 ML expansion. Additional pumping capacity required.	-Connecting to existing reservoir on existing land for purpose.
	Need for booster pumping and backup power.	No PS or backup power required (gravity system).	-No PS or backup power required (gravity system).	-Yes, a new PS and backup power is required.	-No new PS or backup power is required but additional pumping capacity is needed.	-No new PS or pumping capacity is required, but emergency backup power is needed to access full reservoir capacity.

Low Impact is considered preferred compared to moderate or high impact.

Legend	Low Impact 	Low to Moderate Impact 	Moderate Impact 	Moderate to High Impact 	High Impact 	Most Preferred
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Impact Criteria	Indicators	Reservoir Location				
		Site A Vicinity of Existing Springbank Reservoir and PS		Site C North East System: Clarke Road and Huron Road Area	Site G Existing Southeast Reservoir and PS	Site I Existing Arva Reservoir and PS
		A1	A2			
Distribution routing / New Water System infrastructure						
		-Interconnection to existing PS and Reservoirs only.	-Interconnection to existing PS and Reservoirs only.	-New infrastructure and connections required to the Clarke Road watermain.	-No new infrastructure required.	-Interconnection to existing PS and Reservoir only.
		Lake Huron supply, gravity based servicing to all of London under all conditions. Lowest climate impacts.	Lake Huron supply, gravity based servicing to all of London under all conditions. Lowest climate impacts.	Lake Huron supply for NE London only. New infrastructure and pumping required with backup power for emergency operations. Increased climate impacts.	Lake Erie supply for SE London, with infrastructure and backup power in place for pumped operations. Current storage necessitates additional supply from Lake Erie. Greatest impact to climate.	Lake Huron supply with pump based operations to the entire City. Backup power required for improved emergency operations to that currently available, with some climate impacts.
Water Supply Source and System/Climate Resilience						
Technical Considerations Evaluation Summary						
Economic and Financial	Capital and Land Costs	Lowest capital cost with no land cost.	- 3 rd Lowest capital cost but with no land cost.	-2 nd Highest capital and land costs of all alternatives.	-Lowest capital cost of all alternatives with no land costs. -However, necessitates Elgin Water system expansion at highest cost.	-2 nd lowest capital cost with no or low land cost and some potential capital cost that could be mitigated with Regional Water Supply.
	Operating Costs	-Lowest operating cost.	-Lowest operating cost.	-Highest operating cost.	-3 rd lowest operating cost.	-2 nd lowest operating.
Economic and Financial Evaluation Summary						
Overall Summary / Recommendation						

Low Impact is considered preferred compared to moderate or high impact.

Legend						
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7.5 Preferred Water Storage Alternative Solution

Based on the comparative evaluation, the preferred water storage solution is **Site A1: Springbank Expansion**. Site A1 was selected as it results in the least amount of impacts overall and for Technical and Economic aspects and second lowest for Health and Safety and Social/Cultural aspects. Although natural environment aspects are greater, than 2 of the other alternatives, these can be mitigated for the terrestrial and wildlife aspects of significance. Refer to **Section 9** for further details on mitigation measures. Additionally, the preferred alternative has reasonable approvals certainty, straightforward construction, and capital/operating costs are lower than expanding the existing Arva Reservoir.



Figure 7-3 : Site A1 : Springbank Expansion

8. Project Description

8.1 Description of Recommended Solution

The proposed solution is to construct a 100 ML in-ground storage reservoir at the existing Springbank Reservoir Site (Option A1) by 2024 to replace the existing 45 ML of storage to be retired and meet storage deficit/growth projections at that point in time.

8.1.1 Conceptual Design Components (to be provided later)

8.1.2 Transmission upgrades (to be provided later)

8.2 Project Schedule

Environmental Impact Study (EIS): 2019

Preliminary Detailed Design: 2020/2021

Permits/Approvals: 2021

Construction: 2023-2024

It should be noted that the Municipality will implement the recommended solution pending completion of the EA study, further regulatory and/or budget approvals, and co-ordination with other planned infrastructure projects in the area.

8.2.1 Estimated Capital Costs (to be provided later)

Table 8-1: Estimated Capital Costs

Component	Assumption
Reservoir Approximate Cost: \$30 M	Two 50 ML cells 0.6 m cover (top soil and seed) Structural SCADA Electrical/ mechanical works Driveway and parking Site buffering/landscaping
Additional Construction Outside of Reservoir Approximate Cost: \$ 0.5 M	Watermain Restoration
Approximate Cost: \$4.5 M	Contingency \$2.0 - 2.5 M Design & Construction Administration \$2.0 – 2.5 M

Total Cost \$35 M	
Approximate Cost \$2.5 M	Arva Generator

8.3 Additional Project Components

8.3.1 Future Storage Requirements

A further 100 ML of additional storage capacity is to be implemented at the existing Arva Reservoir Site by 2044 to meet storage deficit/growth projections at to that point in time.

Additional Storage capacity to be implemented at the existing Southeast Reservoir Site once the Elgin Water Supply System treatment and supply capacity is expanded to meet future growth needs in addition to or as part of the further 100 ML of additional storage capacity recommended at the Arva Reservoir Site.

8.3.2 Backup Power at Arva Pump Station

Backup Power or standby power systems are needed to ensure pumping can maintain service in the event that primary power supplies fail.

Currently, no backup power supply exists for the Arva pump station. In the event of an emergency and/or to service under day to day or peak water need conditions, water supply and minimal pressure would be provided by the Lake Huron Water Supply System to the City of London water system by opening by pass valves at the Arva pump station. As part of this study AECOM assessed: (Results and recommendation to be provided later)

- The provision of a standby generator set in a new or existing structure to provide backup power to the Arva pump station.

This would allow the Arva PS to meet the City's day to day, peak or emergency needs.

O.Reg. 524/98 Environmental Compliance Approvals defines standby power systems as: *“standby power system” means any apparatus, mechanism, equipment or other thing, and any related fuel tanks and piping, that include one or more generator units and that is intended to be used only for the provision of electrical power during power outages or involuntary power reductions”.*

The Arva pump station was constructed prior to the initiation of the EAA, however, the implementation of this project would have required approval under the Act. As such, it is determined that the installation of standby power equipment located in a new building or structure is considered a Schedule A Class EA undertaking. Should the standby power equipment be installed in an existing building the undertaking would be considered a Schedule A+ Class EA. Schedule A+ projects require that the public be notified of the work prior to construction or decommissioning occurring.

8.3.3 Water Reservoir/Facility Decommissioning

Water reservoir or facility decommissioning occurs when a facility is taken out of service or when an 'offline' facility is being physically removed.

As part of this study, the City is considering decommissioning three water facilities to better optimize the overall water system for the City. Each of these facilities have been or will be considered no longer necessary for operational purposes. See Table 8-2 and Figure 8-1 below.

Table 8-2: Water Reservoir/Facility Decommissioning

Location	Date of Construction	Anticipated End of Service Life	Replacement
Springbank Reservoir #2	1920	2022	Replace capacity with new reservoir recommended
McCormick Reservoir	1959	Not in Service	No replacement necessary
White Oak Filter Plant	1959	Not in Service	No replacement of treatment or reservoir capacity is proposed. Future bulk water facility and chamber for new pressure zone proposed here.

The Municipal Engineers Association Municipal Class EA document defines decommissioning as: *“taking out of operation, abandonment, removal, demolition or disposal of a road, sewage, stormwater management or water facility for which approval under the Environmental Assessment Act would have been necessary for its establishment and includes, sale, lease, or other transfer of the facility for purposes of taking out of operation, abandonment, removal, demolition or disposal”*.

Each of the above facilities were constructed prior to the initiation of the Environmental Assessment Act, however, the implementation of each of these projects would have required approval under the Act. As such, it is determined that the decommissioning of each of these facilities is considered a Schedule A+ Class EA undertaking.

Schedule A+ projects require that the public be notified of the work prior to construction or decommissioning occurring.

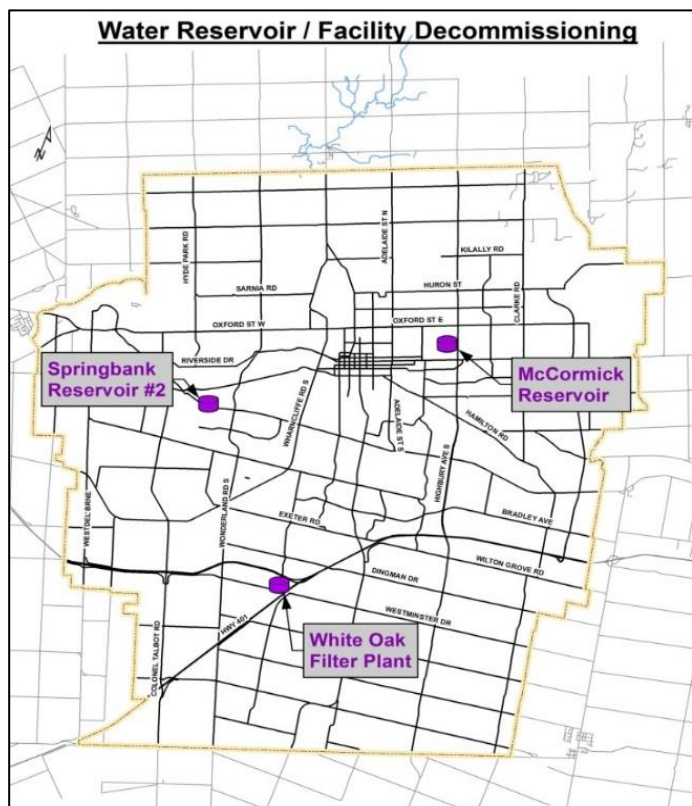


Figure 8-1: Water Reservoir/Facility Decommissioning

8.4 Permits and Approvals

8.4.1 Ministry of Environment, Conservation and Parks Pre-Application Consultation

The MECP approvals may include an Amendment Alteration to the existing City of London Drinking Water Works Permit (DWWP), A Municipal Drinking Water Licence (MDWL) amendment, A Permit To Take Water (PTTW) may also be required should there be groundwater taking of more than 50,000 litres per day. Based on the anticipated scope of construction, the need for a PTTW is not anticipated but should be reviewed further at the time of detailed design to confirm exact requirements.

8.4.2 Ministry of Environment Conservation and Parks – Natural Environment

Approvals required under the Endangered Species Act will be confirmed with the MECP at detailed design. However, as input into this study, a SAR Screening was completed which identified the potential for 18 SAR within proximity of the study area. Through aerial interpretation, suitable habitat for 15 SAR was identified within the woodland and adjacent to the proposed location of the reservoir. Through application of appropriate mitigation measures, it is not anticipated for this species to be affected.

8.4.3 Ministry of Tourism, Culture and Sport

A background study was undertaken to inform the evaluation of the alternatives. A Stage 1 Archaeological assessment was conducted for the recommended solution, and a Stage 2 Archaeological Assessment for all lands determined to retain archaeological potential that will be used for construction or that will be subject to ground disturbance. The Stage 1 and Stage 2 archaeological assessments will be conducted to meet the requirements of the Ontario Ministry of Tourism, Culture and Sport's (MTCS) *Standards and Guidelines for Consultant Archaeologists* (Ontario Government, 2011).

COTTFN monitors will be invited to participate in Stage 2 field activities if required. The cost of which will be the responsibility of the City.

8.4.4 City of London

Approvals and bylaw amendments will be required from various City of London departments prior to and during construction.

(1) Parks Planning

The City will be undertaking an EIS in 2019. The EIS will be completed in accordance with the requirements of the City of London's Official Plan, the London Plan (2016), the City of London Environmental Management Guidelines (2007) and with the Provincial Policy Statement (2014). All relevant federal and provincial legislation and policies will be incorporated. Upon completion of the EIS, Parks Planning and UTRCA will provide review.

Adaptive management measures and three years of post-construction monitoring for the trees planted during the restoration phase will be required following construction. Tree replacement will be required in all cases where plantings fail to establish, or substantial vigor is lost. Species selection may change according to site conditions and the success of initial restoration plantings, following the guidance of the City of London Parks Planning.

(2) Site Plan Approval

In accordance with Section 41 of the Planning Act, the City's Site Plan Approval process and the Site Plan Approval Reference Manual, Site Plan Approval will be required. Site Plan consultation will take place in conjunction with the preliminary design of the project being undertaken in 2019, which will identify the requirements to be met for Site Plan Application. The Site Plan Application should be completed during detailed design, currently anticipated to take place between 2021 and 2022.

(3) Drinking Water Works Permit

Drinking Water Work Permit Amendments and Licence Amendments will be required to progress the project as per The Reservoir Guide for Applying Drinking Water Works Permit Amendments, Licence Amendments. In accordance with the *Safe Drinking Water Act, 2002*, the City of London issued Drinking Water Works Permits (DWWP) where works are required that alter the residential drinking water system. Under Section 5.3 of the City of London's DWWP, a generator can only be added for emergency use. The provision of a standby generator set in a new or existing structure to provide backup power to the Arva pump station is proposed to meet the City's emergency needs, in conjunction with this project. A DWWP alteration will be required during detailed design, currently anticipated to take place between 2021 and 2022. Abandonment of Springbank Reservoir 2 will require a DWWP alteration. Construction of a new reservoir will require a DWWP amendment.

8.5 Utilities

Circulations to utilities will be completed during detailed design. Any utility conflicts will be addressed during this phase of the project.

9. Recommended Mitigation Measures

9.1 Mitigation Measures

Impacts related to construction of the new reservoir and related watermain connection will be limited to the duration and location of construction. Based on the preferred reservoir siting option and proposed construction techniques, construction is expected to have minimal environmental effects. By incorporating proper best management practices and construction techniques, adverse construction related effects can be minimized. To address the effects, the following approach should be taken.

- **Avoidance:** The first priority is to prevent the occurrence of negative effects (i.e., adverse environmental effects) associated with the implementation of an alternative;
- **Mitigation:** Where adverse environmental effects cannot be avoided, it will be necessary to develop the appropriate mitigation measures to eliminate or reduce to some degree, the negative effects associated with implementing the alternative; and
- **Enhancement/Compensation:** In situations where appropriate mitigation measures are not available, or significant net adverse effects will remain following the application of mitigation, enhancement or compensation measures may be required to counterbalance the negative effect through replacement in kind, or provision of a substitute or reimbursement.

The following mitigation measures are recommended for the preferred alternative to ensure that any disturbances are managed by the best available methods. These measures will be further confirmed and developed during detailed design. **Table 9-1** provides detailed assessments of the potential impacts associated with the project and the recommended mitigative measures required to reduce these effects.

Table 9-1: Proposed Mitigation Measures

Potential Impacts	Mitigation Measures
Socio-Economic	
Impacts to Residents/Adjacent Properties	<p>Access to existing open space amenities, residential and businesses, are to be maintained (where possible) during construction.</p> <p>City/Contractor to provide advanced notice to affected property owners prior to construction, including estimated construction timing and duration and project contact information if additional information is needed.</p>
Loss or disruption to archaeological resources.	<p>If any archaeological and/or historical resources are discovered:</p> <ul style="list-style-type: none"> • Require contractor to halt work in the area of the discovery, until permitted to resume by the MTCS. • Require contract administration to notify the MTCS (Archaeological Unit) of the discovery. • If human remains are identified all work will halt until the proper authorities have been notified.
Natural Environment	
Tree and Vegetation Removal	An Environmental Impact Study (EIS) be prepared that includes an Environmental Management Plan and Tree Preservation

	<p>Plan. Plans should be adhered to prior to and during construction.</p> <p>Trees to be retained shall be clearly marked.</p> <p>Restore disturbed areas/habitat to natural or better conditions.</p> <p>COTTEN monitors will be invited to participate in EIS field studies. The cost of which will be the responsibility of the City.</p>
<p>Breeding Birds and Vegetation Removals</p>	<p>Removal of vegetation within the Study Area can occur between the months of September to April, which is outside of the typical breeding bird period (April 1st to August 31st) within southern Ontario to avoid contravening the <i>Migratory Bird Convention Act</i>.</p>
<p>Construction Mitigation – Noise Disturbance to Resident Wildlife</p>	<p>Construction is restricted to periods before and after breeding period, subject to review.</p> <p>Limit construction activity to a period after 7 am and before 7 pm daily.</p>
<p>Wildlife Protection and Handling</p>	<p>During the detailed design phase, a more detailed wildlife observation protocol is necessary to ensure that appropriate wildlife mitigation measures are adhered to. Standard protocols include:</p> <ul style="list-style-type: none"> • A qualified ecologist/biologist or ecologists should conduct a survey of the project work area and areas immediately adjacent to the work areas. Where SCC species are found, appropriate transplanting (for vegetation species) and relocation (for reptiles and amphibians) will be undertaken by a qualified professional. Should any of the species be observed within the construction area, a Transplant and Relocation Plan should be prepared and implemented prior to construction; • Any required SCC relocation must be conducted by a qualified SCC Specialist who has obtained the appropriate approvals from the relevant regulator; and, • Consideration should be given to the London Invasive Plant Species Strategy, including the Clean Equipment Protocol during construction activities.
<p>Controlled Construction Vehicle Access</p>	<p>Construction vehicle access should be limited to areas outside of the drip-line of the tree being protected to prevent soil compaction and/or the initiation of soil erosion events. Construction vehicle re-fueling stations should be centralized away from vegetation communities and watercourses. Vehicle washing should be prohibited in areas adjacent to vegetation communities and watercourses.</p> <p>Construction vehicle access should be limited to existing roadways and construction paths, away from the identified vegetation communities.</p>
<p>Sediment and Erosion Control Fencing</p>	<p>Mitigation measures are recommended to be used for erosion and sediment control to prohibit sediment from entering the identified vegetation communities during construction. The primary principles associated with sedimentation and erosion</p>

	<p>protection measures are to:</p> <ul style="list-style-type: none"> • minimize the duration of soil exposure; • retain existing vegetation, where feasible; • encourage re-vegetation; • divert runoff away from exposed soils; • keep runoff velocities low; and, • trap sediment as close to the source as possible. <p>Details of the type and placement of sediment and erosion control to be used will be outlined in an Erosion and Sediment Control Plan to be drafted during detailed design.</p>
<p>Damage to Rooting Zones during removals</p>	<p>During grading and construction in areas immediately adjacent to identified vegetation communities and planted trees, roots may be damaged by machinery and soils may be compacted, thereby affecting the trees' ability to grow and absorb nutrients and water. To address root damage, it will be necessary to prune roots of adjacent trees during grading and excavation. To avoid compaction of soils, root zones around trees within natural heritage features will need to be fenced. Most areas will be avoided by restricting construction to areas outside the features.</p>
<p>Dust Suppressant Treatment</p>	<p>Dust suppressants during dry periods should be applied to those areas which generate large amounts of dust.</p> <p>Restrict earth movement immediately adjacent to woodlands during periods of high dust generation.</p>
<p>Construction Vehicle Re-fueling Stations</p>	<p>Re-fueling stations should be located within a centralized location on-site, a minimum of 30 m from vegetation communities, and watercourses.</p> <p>Re-fueling stations should be constructed in a manner to prevent soil and/or surface and groundwater contamination from any leaks or spills.</p> <p>An emergency response kit should be made available at each re-fueling station in case of a spill.</p> <p>All on-site crew members operating construction vehicles should be appropriately trained in handling a potential spill and have Workplace Hazardous Materials Information System (WHMIS) training.</p> <p>All chemical transfer/maintenance should be conducted within the refueling station areas.</p>
<p>Potential inadvertent spill of hazardous materials during construction</p>	<p>All oils, lubricants, fuels and chemicals are to be stored in secure areas.</p>
<p>Climate Change</p>	<p>Loss of trees (reduced carbon storage) related to construction in built up areas– address by tree replacement (minimum 3:1 ratio (or City standard). A seed mix comprised of native species is recommended to be used (as per City standard), where feasible.</p>

	<p>Post construction monitoring will be required to ensure that all disturbances within the construction area, private property and trees/vegetation, have been properly restored. Restoration measures, including tree replacement, will be confirmed during the detailed design phase.</p>
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9.2 Proposed Construction Monitoring

Contract tender documents will address mitigation in an explicit manner to ensure that compliance is maintained. The provision of an experienced field representative to review construction will ensure that the project follows contract specifications and does not unnecessarily impact vegetation, the community or aquatic environment.

Specific mitigation measures, timing windows, invasive species management including consideration of the London Invasive Plant Management Strategy and the Clean Equipment Protocol are required during the subsequent EIS phase of the project.

9.3 Post Construction Monitoring

Post construction monitoring will be required following construction to ensure that any disturbances have been properly restored (e.g. grading, seeding and planting).

Adaptive management measures and three years of post-construction monitoring for the trees planted during the restoration phase will be required following construction. Tree replacement will be required in all cases where plantings fail to establish, or substantial vigor is lost. Species selection may change according to site conditions and the success of initial restoration plantings, following the guidance of the City of London Parks Planning.

10. Conclusions and Recommendations

This MCEA covers the process required to ensure the proposed study and recommended works meet the requirements of the EAA. This MCEA planning process requires initial screening for a project of this type and this initial screening has not identified any significant concerns that cannot be addressed by incorporating established mitigation measures during construction.

The preferred siting option (Site A1) as described in **Section 8**, illustrated on **Figure 8-1** resolves the problems identified in this report and indicates only minor and predictable impacts, which are addressed by the recommended mitigation measures presented in **Section 9**.

Considering the above, it is recommended that:

1. Following MCEA documentation filing and clearance, the preferred reservoir siting Option (Site A1) proceed to preliminary/detailed design including approvals as per **Section 8**; and,
2. Mitigation measures identified in **Section 9** be expanded upon during preliminary/detailed design and implemented as part of construction.

