Project File

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Lake Huron Primary Water Supply System

Lake Huron Water Treatment Plant Disinfection and Storage Upgrades Schedule B Class Environmental Assessment

October 2022

Jacobs

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Acronyms and Abbreviations

Abbreviation	Definition
ABCA	Ausable Bayfield Conservation Authority
CT	concentration-time
EA	Environmental Assessment
LHPWSS	Lake Huron Primary Water Supply System
MEA	Municipal Engineers Association
MECP	Ontario Ministry of Environment, Conservation and Parks
MHSTCI	Ontario Ministry of Heritage, Sport, Tourism and Culture Industries
ML	megalitre(s)
ML/d	megalitre(s) per day
PIC	public information centre
RWS	Regional Water Supply
study	Schedule B Municipal Class Environmental Assessment
UV	ultraviolet
WTP	water treatment plant

1. Introduction

The Lake Huron Primary Water Supply System (LHPWSS) owns the 340 megalitre-per-day (ML/d) Lake Huron Water Treatment Plant (WTP). The WTP supplies treated water to reservoirs and secondary transmission systems within eight municipalities via a (partially twinned) 1,200-millimetre-diameter primary transmission main. The Lake Huron WTP is in need of improved disinfection and increased water storage, to meet future water demands.

The Lake Huron WTP is in the Municipality of South Huron, Ontario, east of Bluewater Highway and west of Lake Huron (Figure 2-1). The Lake Huron WTP services the following LHPWSS member municipalities:

- City of London
- Municipality of Bluewater
- Municipality of Lambton Shores
- Township of Lucan-Biddulph
- Municipality of Middlesex Centre
- Municipality of North Middlesex
- Municipality of South Huron
- Municipality of Strathroy-Caradoc.

1.1 Problem and Opportunity Statement

A recent update to the LHPWSS *Master Water Plan* (Jacobs 2020) identified the need to improve disinfection and increase water storage at the Lake Huron WTP, to meet water demands to the year 2038. As such, the following Problem and Opportunity Statement has been defined for this project:

"A Schedule B Municipal Class Environmental Assessment (EA) (the study) is being completed to confirm the recommendation for additional storage at the Lake Huron WTP site, and refine requirements for enhanced disinfection to provide operational flexibility to implement energy management and other strategies."

The study presents an opportunity to develop alternative solutions, assess their technical viability, and conduct a comprehensive evaluation to select a preferred alternative within the Schedule B Municipal Class EA framework. The study is being carried out in accordance with the planning and design process for Schedule B projects under the *EA Act, 1990* as outlined in the Municipal Engineers Association's (MEA's) *Municipal Class EA* document (MEA 2000, as amended in 2007, 2011, 2015, and 2019).

1.2 Background

Constructed in 1967 and 1976, the original components of the LHPWSS were owned and managed by the Province of Ontario (via the Ontario Water Resources Commission). In 1998, the Ontario Ministry of Environment (now the Ontario Ministry of Environment, Conservation and Parks [MECP]) transferred ownership of the water system and associated lands from the Province to the benefiting municipalities via the *Municipal Water and Sewage Systems Transfer Act, 1997*, establishing the LHPWSS Board of Management. The City of London provides administrative and management services on behalf of the Board of Management. The Board of Management

comprises members appointed by each of the benefiting municipalities, and is supported by staff from the City of London's Regional Water Supply (RWS) Division.

The 1998 Transfer Order outlined management requirements for the LHPWSS. These included the requirement to update a Master Water Plan every five years to identify capital works and operational changes to address future water supply needs over a long term planning horizon. A Master Water Plan was completed in 2001 and has been updated with base years of 2003, 2008 (report completed in 2010), 2014 (report completed in 2015), and 2018 (report completed in 2020).

1.3 Project Team

The LHPWSS retained CH2M HILL Canada Limited (now Jacobs) to complete the Class EA requirements for this project. The Project Team includes Jacobs staff, as well as members of the City of London's RWS Division who managed the project on behalf of the LHPWSS. Golder Associates was retained to complete a cultural and heritage desktop assessment, as well as a Stage 1 archaeological assessment.

1.4 Project Objectives

The Project Team identified two main categories of objectives to address the problem and opportunity statement, and to identify and evaluate alternative solutions for the project:

1. Disinfection Objectives
    a. Improve disinfection under cold water conditions
    b. Decrease reliance on chlorine for disinfection (in the pre-treatment process at the plant and in transmission pipeline)
2. Storage Objectives
    a. Provide additional water storage to meet future water demand needs
    b. Provide storage to support an operating strategy for energy management
    c. Improve hydraulic conditions for high-lift pumps

1.5 Regulatory Framework

This section describes the regulatory framework Jacobs used to meet the project objectives.

1.5.1 Environmental Assessment Act

The objective of Ontario's *EA Act* R.S.O. 1990, c. E. 18, is to consider the possible effects of projects early in the planning process, when concerns may be most easily resolved, and to select a preferred alternative with the fewest identified impacts.

The *EA Act* requires the study, documentation, and examination of the environmental effects that could result from projects or activities.

The *EA Act* defines "environment" very broadly as follows:

- Air, land, or water
- Plant and animal life, including human life

- Social, economic, and cultural conditions that influence the lives of humans or a community
- Buildings, structure machines, or other devices or items made by humans
- Solid, liquid, gas, odour, heat, sound, vibration, or radiation resulting directly or indirectly from human activities
- Any part or combination of the foregoing, and the interrelationships between any two or more of them, in or of Ontario

When applying the requirements of the EA Act to projects, two types of EA planning and approval processes are identified:

1. Individual EAs (Part II of the *EA Act*): Projects have terms of reference and individual EAs, which are carried out and submitted to the MECP for review and approval.
2. Class EAs: Projects are approved subject to compliance with an approved Class EA process. A proponent will comply with the requirements of the *EA Act,* provided the appropriate Class EA approval process is followed.

Environmental Assessment Process

Ontario municipalities are subject to the provisions of the *EA Act* and its requirements to prepare a Class EA for applicable public works projects. The Class EA planning process includes the following key processes:

- Consultation early and throughout the process
- Reasonable range of alternatives
- Consideration of effects on the environment and ways to avoid or reduce impacts
- Systematic evaluation of alternatives
- Clear documentation
- Traceable decision making

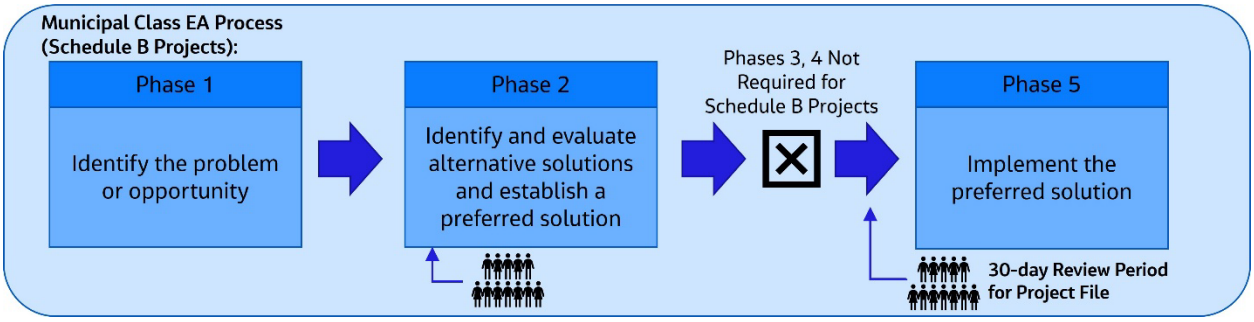
The Class EA process is a decision-making framework that effectively meets the requirements of the *EA Act,* and is composed of the following phases.

1. Identify the problem or opportunity.
2. Identify alternative solutions and establish a preferred solution.
3. Examine alternative methods to implement the preferred solution, while minimizing negative effects and maximizing positive effects.
4. Prepare an Environmental Study Report
5. Implement the preferred solution.

This study was completed as a Schedule B Class EA, completing Phases 1 and 2 which is formally documented in this Project File, and will then move on to Phase 5 of the Municipal Engineer's Class EA process (Figure 1-1). The Project File will be posted for a 30-day public comment period.

Schedule B projects have the potential for some adverse environmental effects and must proceed through the first two phases of the process. The proponent must undertake a screening process that involves mandatory contact with directly affected public, First Nations, and relevant review agencies. The purpose of this contact is to confirm the affected parties are aware of the project and their concerns have been addressed. If there are no outstanding issues or concerns, the proponent may proceed to implementation. Schedule B projects generally include improvements and minor expansions to existing facilities.

Figure 1-1. MEA Process (Schedule B Projects)



Before Phase 5 (Implementation), a Notice of Study Completion will be distributed when the Project File is posted for the 30-day public comment period. The notice will notify the public and First Nations communities the study is complete, invite them to review the Project File and provide comments to the Project Team. The Notice of Completion also outlines the process for requesting a higher level of study (i.e., individual or comprehensive EA), or that conditions be imposed, only on the grounds that the requested order may prevent, mitigate or remedy adverse effects on constitutionally protected Indigenous and treaty rights. Requests on other grounds will not be considered.

This Project File was prepared in accordance with Section A.4.1 of the Municipal Class EA guidance provided by the MEA (MEA 2000, as amended in 2007, 2011, 2015, and 2019).

1.5.2 Provincial

Provincial Policy Statement

The Provincial Policy Statement came into effect May 1, 2020, under section 3 of the *Planning Act*. The purpose of the Provincial Policy Statement is to provide direction on matters of provincial interest related to land use planning and development, and to set the foundation for policy regarding the regulation of land development and use (Province of Ontario 2020). The Provincial Policy Statement "*supports a comprehensive, integrated, and long-term approach to planning, and recognizes linkages among policy areas*." Municipal official plans (described in this

section) are considered the most important "vehicle" for the implementation of the Provincial Policy Statement. The following policies apply to this project (Province of Ontario 2020):

- "Section 1.1.1: Healthy, liveable, and safe communities are sustained by promoting development and land use patterns that conserve biodiversity and prepare for regional and local impacts of climate change.
- Section 1.2.1: A coordinated, integrated, and comprehensive approach should be used when dealing with planning matters within municipalities, including managing natural heritage, water, agricultural, mineral, cultural heritage, and archaeological resources.
- Section 1.2.2: Planning authorities shall engage with Indigenous communities and coordinate on land use planning matters.
- Section 1.6.6.1: Planning for sewage and water services shall: accommodate forecasted growth in a manner that promotes the efficient use and optimization of existing municipal sewage services; ensure that these systems can be sustained by water resources and prepare for the impacts of climate change; and promote water conservation and water use efficiency.
- Section 1.6.6.7: Planning for stormwater management will: be integrated with planning for sewage and water services; minimize or prevent increases in contaminant loads; minimize erosion or changes in water balance; prepare for climate change impacts; and promote stormwater management best practices."

Conservation Authority

The western portions of the WTP property are within the Ausable Bayfield Conservation Authority (ABCA) Regulated Area (ABCA 2020). As a result, any proposed site alternation within or near the Regulated Area is subject to review by ABCA as a part of the site plan approval process. Refer to Appendix A for more details on the regulated area, including figures showing the boundaries of the regulated area.

Additional

In Ontario, the regulatory framework related to the supply of safe drinking water from municipal drinking water systems includes the following components:

- Source water protection, via the *Clean Water Act* and associated regulations
- Control and regulation of drinking water systems and drinking water testing, via the *Safe Drinking Water Act* and its regulations
- Water conservation, sustainability, and innovation, via the *Water Opportunities and Water Conservation Act* and its regulations

1.5.3 Municipal

The study is located predominately within the Port Blake Planning Area of the Municipality of South Huron. The overall Lake Huron WTP as well as Port Blake Park is owned by LHPWSS. There is lease agreement in place between LHPWSS and the Municipality of South Huron for Port Blake Park. Consequently, Jacobs will include the following policies and aspects from the South Huron Official Plan, first adopted by County in July of 2003 and last updated in June of 2020 in the development of design alternatives:

The study area contains land that is designated as Community Facilities and Natural Environment (Schedule H) (South Huron 2020):

- Policy 5.3(6). "Any development proposed in or near Natural Environment areas must consider its need and demonstrate that, through project design and mitigation of impacts, there will be no unaddressed negative impacts on the natural features or the ecological functions for which the area is identified, and show how the natural environment will be enhanced and increased."
- Policy 5.4.2.1. "As planning applications, land use change and development are undertaken in the Intake Protection Zones, the Municipality, residents and developers will work with the Ausable Bayfield – Maitland Valley Source Protection Planning Authority to be vigilant and mitigate potential threats to surface water quality."
- Policy 7.10.5.2. "Pursuant to Section 41(2) of the Planning Act, any lands within the designated Community Facility, Agriculture, Natural Environment and Floodplain within the Port Blake Planning Area are hereby established as areas within which Council may pass by-laws designating the site of any proposed development as a site plan control area."
- Port Blake Park (located immediately south of the Lake Huron WTP) is a designated Community Facility although the land continues to be owned by the LHPWSS.
- "Natural Environment facility uses within the Port Blake Planning Area shall proceed according to the Natural Environment policies" of Section 5.4 in the Official Plan.
- Policy 8.4.2(4). "Where possible, public service facilities will be co-located on land already designated Community Facility outside of settlement areas in order to minimize the impact on the surrounding agricultural land uses."

2. Description of the Environment

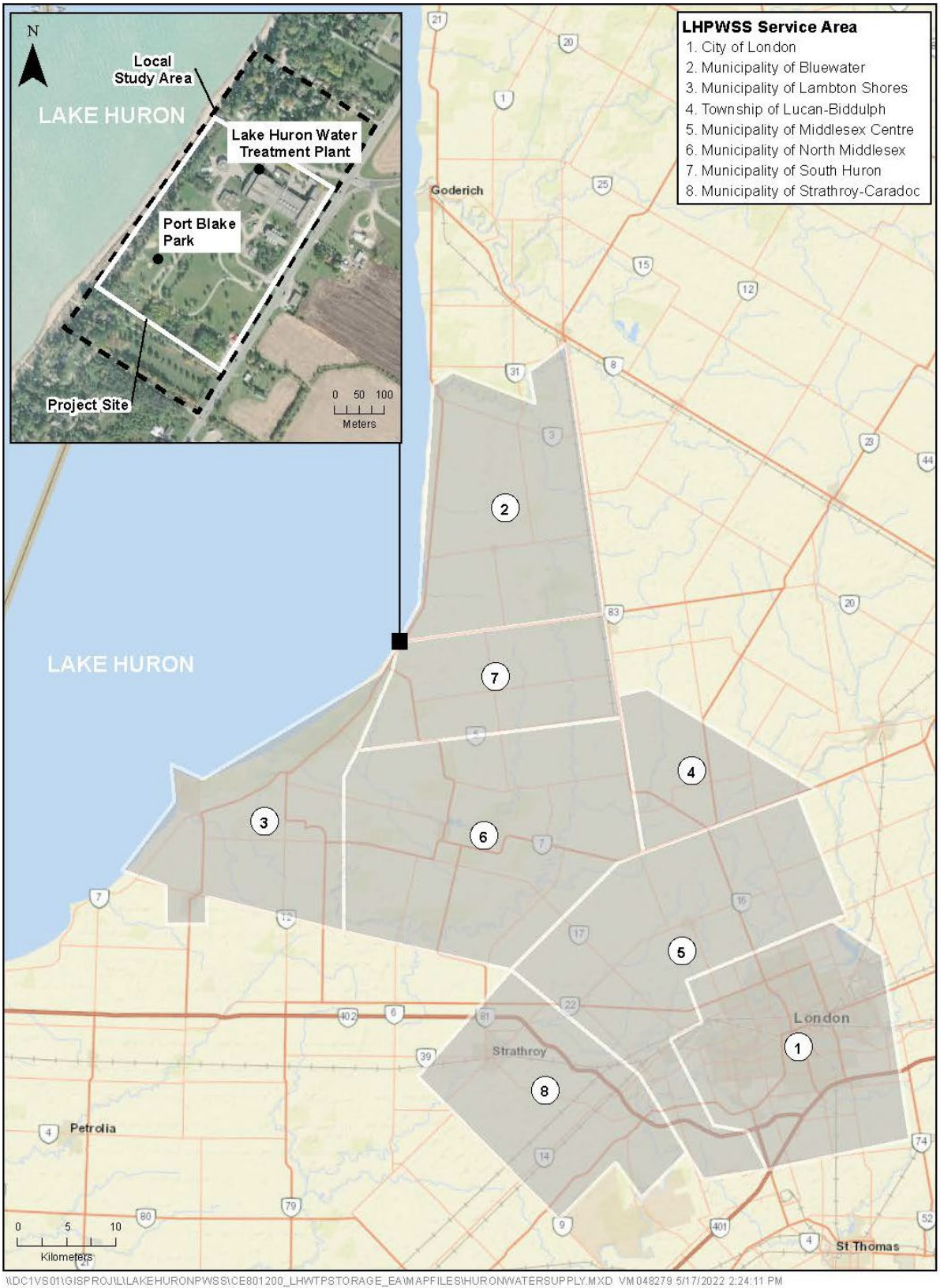
2.1 Study Area

The study area (Figure 2-1) includes a project site, local study area, and regional study area (LHPWSS Service Area) that can reasonably be assumed to experience direct and indirect environmental and socioeconomic effects based on the construction and operations of the preferred alternative. Figure 2-1 shows the project site, as well as local and regional study areas.

- The project site is focused on the Lake Huron WTP property, which is bound by residential and private property on three sides, and by the Lake Huron shoreline on the remaining side. The project site includes lands that may be directly disturbed while the preferred alternative is constructed. The study area description therefore generally focuses on the project site, understanding that impacts may extend into the local study area.
- The local study area extends from the project site and includes Highlands Drive to the north, Bluewater Highway to the east, Gravelle Street to the south, and the shoreline of Lake Huron to the west.
- The regional study area encompasses the LHPWSS Service Area, which includes the following municipalities:
  - The City of London
  - The Municipality of Bluewater
  - The Municipality of Lambton Shores
  - The Township of Lucan-Biddulph
  - The Municipality of Middlesex Centre
  - The Municipality of North Middlesex
  - The Municipality of South Huron
  - The Municipality of Strathroy-Caradoc

The study area includes utility, agricultural, residential, and natural areas. It is dominated primarily by utility and residential conditions, including open grassed areas, road networks, and disturbed areas associated with the Lake Huron WTP.

Figure 2-1. Project Study Areas



2.2 Previous Studies

The following previous studies provide key background information for this Class EA:

- *Energy Audit and Pump Optimization Study* (AECOM 2015) – A study was completed to review the energy and pump efficiencies in the LHPWSS system. The study issued some recommendations to improve energy use at the Lake Huron WTP, via upgrades to the high-lift pumps and changes to pump operation.
- *Lake Huron WTP Disinfection Review* (AECOM 2018a) – A study of the primary disinfection process determined that operational interventions or permanent upgrades to the disinfection process would be required to meet the disinfection requirements under cold water conditions when operating at more than 200 ML/d. Because the WTP has a capacity of 340 ML/d, it identified the need to mitigate the disinfection deficiencies. Note, the WTP has not operated at more than 200 ML/d during cold water conditions in the past 5 years (based on 2015 to 2020 flow data).
- *LHPWSS 2018 Master Water Plan Update* (Jacobs 2020) – A storage capacity assessment was completed as part of this master plan update. The assessment identified the need for additional storage to meet the regional equalization and emergency storage needs, to be able to supply member municipalities in case of a planned or unplanned plant shutdown.
- *LHPWSS Pumping and Storage Optimization* (AECOM 2018b) – A study identified operational restrictions and deficiencies for the Lake Huron WTP relating to the operations of the existing high-lift pumps. It identified that insufficient volume in the existing clear wells to offset the ramp-up requirements of the plant processes, to provide stable operations under certain high-lift pump operating conditions that support energy management.
- *Lake Huron Water Treatment Plant [Concentration-time] CT Calculation at Worst Scenario* (AECOM 2018c) – A study identified that the WTP's disinfection performance is limited by the north clear well, which is the smaller of the WTP's two clear wells. Access to the volume in the clear wells for water storage purposes is therefore constrained by the level that must be maintained in the clear wells for disinfection purposes.

2.3 Natural Environment

2.3.1 Physical Environment

Topography at the project site is generally level, gently sloping west toward Lake Huron. The project site is underlain by the sand plain physiographic type, which is the result of water-laid alluvial and beach deposits (NDMNRF 2020a).

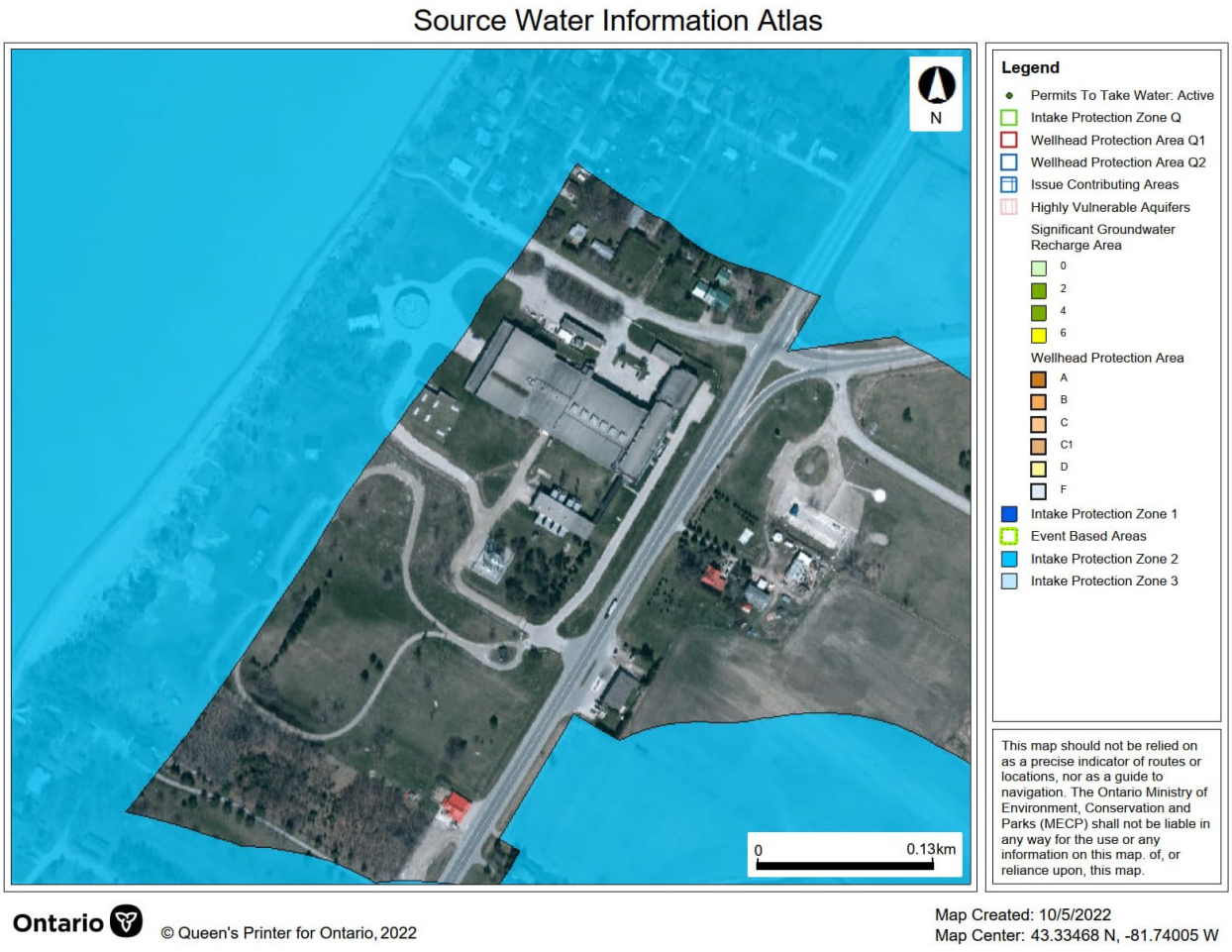
2.3.2 Vegetation and Wetlands

Based on a desktop review, the study area is dominated by the Lake Huron WTP, open fields, cultural woodlands, and disturbed areas. Larger swaths of forest and riparian ecotones are noted within the southern and northern extremities of the study area and are associated with agricultural drains. Based on a desktop review, there are no wetlands located on or within 120 m of the project site (NDMNRF 2020b).

2.3.3 Water Quality and Quantity

According to the MECP Source Protection Information Atlas (MECP 2021), the project site is partially located within the Ausable Bayfield Source Protection Area and Intake Protection Zone 2 (Figure 2-2), and has a surface water vulnerability score of 4 meaning there are no activities (except Dense Non-Aqueous Phase Liquids) that are considered a significant drinking water threat. As such, restrictive policies such as Prohibition and Risk Management Plans are not applicable to this area (Ausable Bayfield Maitland Valley Drinking Water Source Protection Committee 2019). The project site does not encounter a wellhead protection area, issue contributing area, significant groundwater recharge area, highly vulnerable aquifer, or event-based area (MECP 2021). No negative effects to source water vulnerable areas are anticipated.

Figure 2-2. Intake Protection Zone 2 within Project Site



According to ABCA (2022), the 100-year flood level at the project site is 177.9 metres.

2.3.4 Aquatic Habitat

The project site fronts onto Lake Huron and includes two municipal drains within the southern and northern limits of the site. The drains are known as Turnbull Drain and Fahner Drain, and they are hydrologically connected to Lake Huron within the Ausable Bayfield Conservation Authority area (ABCA 2020).

Potential plant upgrades to address the project objectives (disinfection and storage) are not anticipated to change the current discharge effluent quality or quantity, and will not require physical modifications in or around water, including Lake Huron.

2.3.5 Wildlife and Wildlife Habitat

The Study Area includes various ecological zones, including open and disturbed areas that may provide potential wildlife corridors to Lake Huron, forested areas, and agricultural drains that may contain riparian areas. The combination of these features could provide suitable habitat for numerous fauna species. Appendix A provides information on the background screening and species at risk wildlife that have been confirmed to occur within or near the Project site.

2.3.6 Species at Risk

The project site provides habitat for wildlife species at risk, including birds, reptiles, insects, and bats. There are five vegetation species at risk with the potential to occur within the project site, based on a desktop background review and consultation with MECP. No species at risk (SAR), rare or sensitive wildlife or vegetation species were identified at the site during the field survey (Appendix A-2). Fish SAR are known to occur in Lake Huron; however, an interaction with aquatic species at risk is not anticipated. Appendix A provides a detailed list of species and associated listings. Section 5.4 outlines the environmental impacts and mitigation measures associated with the preferred solution.

2.3.7 Air Quality

Air quality in the local study area is generally considered to be good. The Air Quality Health Index that fluctuates between 1 (lowest risk) and 4 on a 10+ scale throughout the year, with the most variability and higher scores in the summer months (MECP 2010).

Air quality in and around the local study area is influenced by vehicle and equipment traffic on roads and highways, and general human activity in the area.

2.3.8 Acoustic Environment

Noise in and around the project site is mainly from the ongoing operations of the existing WTP, traffic on surrounding roads, industrial or farming activity, park use, and general human activity in the area.

2.4 Social Environment

2.4.1 Land and Resource Use

Port Blake Park is a day use park, adjacent to the Lake Huron WTP and within the project site and study area. Port Blake Park is operated seasonally by the Municipality of South Huron, through a

lease agreement with LHPWSS, from the May holiday weekend to the end of September. The project site is surrounded by residential use to the south and immediate north, agricultural use to the east, and a public beach to the west. Businesses surrounding the project include a gas station, vehicle sales and service, and stores (such as a hardware store). Bluewater Highway and provincial Highway 83 meet at the northeastern corner of the WTP site.

2.4.2 Social Demographics

The *2018 LHPWSS Master Water Plan Update* (Jacobs 2020) identified capital works and operational changes to address future water supply needs over a 20-year planning horizon to the year 2038, using population and water demand projections with 2018 as the base year. Population forecasts presented in the LHPWSS Master Water Plan Update were based on anticipated growth rates (developed from 2011 and 2016 census data, provincial growth projections, and municipal data), as well as information about potential new connections to the LHPWSS or new large industrial, commercial, and institutional customers as identified through consultation during the 2018 Master Water Plan Update (Jacobs 2020). Table 2-1 summarizes the serviced population forecasts for the LHPWSS through to 2038, assuming the medium-growth scenario.

Table 2-1. LHPWSS Projected Serviced Population (Medium-growth Scenario [a])

Region Serviced	2018 Baseline	2023	2028	2033	2038
LHPWSS Serviced Population	389,827	408,174	427,276	447,359	468,476

Source: LHPWSS Master Water Plan (2020)

[a] The Master Plan's medium-growth scenario was determined from the average of the census and municipality growth rates. Where municipality growth rates were not provided, the medium annual growth rate was based on the average of the census and county (provincial projections) growth rates. The medium annual growth rates were carried forward to develop the water demands used for the Master Plan projections.

2.4.3 Infrastructure and Services

Jacobs reviewed the Ontario Oil, Gas and Salt Resources Library (2022) for known data on existing infrastructure. There are two water wells located at the project site, one commercial and one observation well. There are no petroleum wells or pipelines on the project site.

There are two aboveground, 115-kilovolt electricity poles on the project site, which are owned and managed by Hydro One. The poles and associated transmission lines are south of the WTP. These lines are part of the existing electrical transmission system that provides power to the Lake Huron WTP. They feed the plant via an electrical substation located on the existing Lake Huron WTP property (and is owned by LHPWSS). Consultation with Hydro One has informed the siting of infrastructure within the project site.

2.4.4 Cultural and Heritage Resources

Based on the criteria outlined in the Ontario Ministry of Heritage, Sport, Tourism and Culture Industries' (MHSTCI's) *Standards and Guidelines for Consultant Archaeologists* (2011), the project site was determined to have archaeological potential for both pre-contact Indigenous and historical period sites (Golder 2021a). The project site was systematically inspected to confirm whether features of archaeological potential were present. Areas of manicured lawn and

forested areas were found to retain archaeological potential and should be subject to a Stage 2 Archaeological Assessment before their development (refer to Section 5). Because there are complete and extensive previous disturbances, and areas with a ground slope greater than 20 degrees, the rest of the project site does not retain archaeological potential; therefore, no further archaeological work is recommended in these areas (Golder 2021a). Refer to the PIC Summary located in Appendix D for a figure summarizing the areas within the project site that were found to have archaeological potential and those that were not.

The background research and desktop analysis of the study area were based on the MHSTCI *Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes* (2016) checklist. Based on the checklist, there are no properties within the project site with the potential to meet the Ontario Regulation 9/06 *Criteria for Determining Cultural Heritage Value or Interest* (MHSTI 2006). Refer to Appendix B for more information. No further cultural heritage studies are recommended (Golder 2021b).

2.5 Economic Environment

Major economic sectors within the Study Area include tourism, forestry, and natural attractions. Residential participation in the Arts, Entertainment and Recreation, and Accommodation and Food Services sectors is higher than provincial average. The area sees an influx of tourism (campers, cottagers) in the summer months, which increases local business traffic and sales. Major agriculture sections include soybeans, wheat, corn, potatoes, and cattle (Municipality of Lambton Shores 2022).

The study may influence the local economy through the procurement of goods and services throughout the implementation phase. The study's evaluation of potential solutions has included costs associated with the construction of the potential upgrades and the operations and maintenance of the WTP.

2.6 Technical Environment

The Lake Huron WTP produces drinking water to supply the LHPWSS. Drinking water is conveyed via a partially twinned 1,200-millimetre-diameter (partially twinned) primary transmission main to the McGillivray, Exeter-Hensall, and Arva Reservoirs. Secondary transmission systems (Exeter-Hensall, Strathroy, and Komoka – Mount Brydges) connected via the primary transmission main are also part of the LHPWSS. The primary and secondary transmission systems service the following municipalities (Figure 2-1)

- City of London
- Municipality of Bluewater
- Municipality of Lambton Shores
- Township of Lucan-Biddulph
- Municipality of Middlesex Centre
- Municipality of North Middlesex
- Municipality of South Huron
- Municipality of Strathroy-Caradoc

The original components of the LHPWSS, the Lake Huron WTP, the primary transmission pipeline, and the Arva Terminal Reservoir (located north of London, Ontario) were constructed in 1967. The McGillivray Reservoir and Pumping Station were added in 1976. Many upgrades have been completed at the Lake Huron WTP, and sections of the primary transmission pipeline were twinned in 1996 and 2014. The secondary transmission systems, pumping stations, and the and Exeter-Hensall Reservoir were constructed in the 2000s.

2.6.1 Primary Disinfection and Plant Storage Requirements

The Lake Huron WTP is classified as a conventional filtration plant, and has a rated capacity of 340 ML/d. The plant draws water from Lake Huron (referred to as "raw water") and employs a combination of the following processes to produce treated water:

- Pre-chlorination
- Screening
- Powdered activated carbon addition (seasonally and as required)
- Coagulation
- Flocculation
- Sedimentation
- Dual-media filtration
- Post-chlorination
- pH adjustment using sodium hydroxide

Chlorine gas is used for disinfection at the WTP. The plant has two treatment trains (the North Treatment train and the South Treatment train). Each is rated for 170 ML/d (half of the plant's capacity) and can be operated independently and taken offline, as needed, for maintenance. It is noted that while the rated capacity of the entire plant is 340 ML/d, the plant has historically been producing water at a rate lower than this. In 2020, the average daily treated water flow was 124 ML/d and the maximum daily flow was 203 ML/d.

As Section 2.2 discussed, Jacobs reviewed several previous studies at the commencement of the EA to assess the existing primary disinfection and plant storage conditions, and to identify the requirements for the Lake Huron WTP.

These reviews identified that disinfection upgrades and expansion of storage at the Lake Huron WTP would provide the following opportunities to improve its performance:

- Provide enhanced disinfection (either through ultraviolet [UV] treatment, additional clear well volume, or alternative disinfection methods) to allow for the full use of plant capacity under all operating conditions. (Treatment by UV is a disinfection process in which pathogens such as viruses and bacteria are inactivated or "disinfected" by shining ultraviolet light into the water as it passes through.)
- Relieve the restriction that currently exists for the high-lift pumps, which is due to limited available net positive suction head relative to the required net positive suction head.
- Provide additional buffering volume to mitigate impacts on the WTP's performance stability during pumping regime changes, to manage energy consumption.

The *2018 LHPWSS Master Water Plan Update* (Jacobs 2020) identified the addition of 40 ML of storage for planning purposes – this recommended volume was carried forward from the 2018 Pumping and Storage Optimization Study (AECOM 2018b) which was based on a rule of thumb

for operational buffering volume for conventional plants (i.e., 15-20% of plant capacity). The 2018 Master Plan therefore recommended the plant operations undergo further hydraulic assessments (via this EA study) to refine and confirm the optimal storage volume.

2.6.2 Water Demand-Based Storage Review

As part of the *2018 LHPWSS Master Water Plan Update* (Jacobs 2020), Jacobs completed a high-level storage capacity assessment to quantify water storage deficiencies for the LHPWSS regional system. The LHPWSS's existing storage facilities include the Arva Terminal Reservoir (109.2 megalitres [ML]), the McGillivray Reservoir (18.2 ML, which is used to boost water from the Lake Huron WTP to the Arva Terminal Reservoir during high-demand periods), and the Exeter-Hensall Reservoir (8.0 ML). The *2018 LHPWSS Master Water Plan Update* identified that in case of a plant shutdown, the LHPWSS would not be able to supply water to customers that are partially or fully serviced from points in the primary transmission system upstream of existing LHPWSS storage facilities. Consequently, the Master Water Plan Update recommended adding storage at the Lake Huron WTP and estimated the volume for which was estimated based on available information and conservative assumptions (Jacobs 2020).

A more detailed storage analysis was completed as part of this EA to refine the storage volume required to meet these regional water supply needs. This assessment was informed by data obtained from the LHPWSS transmission system hydraulic model (which was not available for the *2018 LHPWSS Master Water Plan Update*) and from Master Plan Update questionnaires completed by four member municipalities (Bluewater, Lambton Shores, North Middlesex, and South Huron) that are partially or fully serviced from points in the primary transmission line upstream of existing LHPWSS storage facilities (specifically, the McGillivray Reservoir and the Exeter-Hensall Reservoir). The remainder of the LHPWSS member municipalities are serviced from a point in the transmission system that is downstream of other LHPWSS reservoirs and were therefore not included in the assessment because they would be serviced by existing reservoirs in case of a plant shutdown.

The storage volume needed for the new Lake Huron WTP reservoir was calculated using MECP guidelines for sizing storage facilities not providing fire protection, as well the 2038 projected water demands (medium-growth scenario) from the *2018 LHPWSS Master Water Plan Update* (Jacobs 2020). Based on the storage analysis completed as part of this EA, the volume needed in the reservoir for regional supply needs is 7 ML. Appendix C2 (Technical Memorandum No. 2) provides details on the calculation of required storage volume.

2.6.3 Buffering and Operational Volume Based Storage Review

As part of this EA project, a hydraulic model of the Lake Huron WTP was developed using Jacobs' Replica™ modelling software. The purpose of the model was to dynamically simulate the existing conditions and determine the volume needed for buffering purposes to allow for high-lift pump operations under defined energy management scenarios. The hydraulic model was also used to simulate the short-listed alternatives to determine their impacts on plant hydraulics. Through the modelling exercises, it was identified that additional buffering and operational volume is not required at the plant under any of the modelled scenarios, if the low-lift pumps are operated appropriately in coordination with the recently replaced high-lift pumps.

2.7 Climate Change and Adaption

The MECP's *Consideration of Climate Change in Environmental Assessment in Ontario* (2017) document was reviewed to include climate change in the preparation and documentation of EA materials. Per Table 1 of that document, and based on the EA scope (that is, a Schedule B Class EA), Jacobs considered the following four potential significant environmental effects in the selection of alternatives, review of alternatives, and implementation methods for this study:

1. Encouragement for green infrastructure (natural and human-made elements that provide ecological and hydrological functions and processes)
2. Consideration for energy conservation and efficiency (storage for energy-efficient plant operating strategy, and effective UV disinfection operating strategy)
3. Inclusion of potential climate change mitigation and/or adaptation measures related to the implementation of the preferred alternative (infrastructure to withstand severe weather events)

The infrastructure that will be implemented as a result of the study will address the first two points through the consideration for green infrastructure and energy efficiency strategies,. Potential climate change adaptation and/or mitigation measures need to consider the risks associated with the study area.

A climate change risk analysis (RWS 2021) concluded that the LHPWSS is susceptible to a variety of climate change risks:

- Increases in water temperatures leading to water quality issues (taste, odour, and colour); increases in harmful algae blooms; increases in zebra and quagga mussel populations; increases in the corrosion of water pipes; and increases in the frequency and intensity of extreme weather events such as floods, hurricanes, and droughts
- Fluctuating water levels increasing the risk of shoreline erosion; damage to infrastructure, such as the intake and low-lift pumping station; and changes to raw water quality (increases in nutrients and pollutants from lower lake levels)
- Extreme weather events, such as heavy rainfall, floods, droughts, hurricanes, storm surges, and ice storms potentially causing power outages, damage to infrastructure, changes to raw water quality (due to increased runoff carrying sediment, nutrients, pollutants, and other materials), and changes in water demand due to heat waves and droughts
- Exacerbated shoreline erosion by extreme weather events, and changes in water level, wind, wave action, and runoff; shoreline erosion may damage infrastructure and impact raw water quality (increased sediment containing nutrients and pollutants)
- Changes to raw water quality (such as increased turbidity, temperature, pH, nutrient, and pollutant concentrations) that may occur due to these climate change impacts and that can cause increased algae blooms, create disruptions to WTP operations (increased difficulty to treat water, increased chemical use, increased pump wear), impact the ability to meet drinking water quality standards, and increase the cost of treatment

Existing control measures to mitigate climate change risks (for example, water monitoring, chemical dosage changes when required, adjustable flow rates, filters) will be further considered and assessed during subsequent detailed design of any proposed infrastructure.

3. Consultation and Engagement

A variety of strategies and tools were used to encourage widespread, accessible participation in the public consultation program for the project. Through the public consultation program, LHPWSS followed a consultation process that meets the Municipal Class EA requirements including:

- Is meaningful to those involved
- Facilitates open and transparent dialogue, resulting in defensible and traceable decision-making
- Provides opportunities for early public, relevant agencies, and Indigenous Communities/First Nations and stakeholder involvement
- Helps promote public learning regarding RWS water treatment objectives, water supply, infrastructure, and asset-renewal strategies

The MECP's *Code of Practice: Consultation in Ontario's Environmental Assessment Process* (2016) and *Environmental Assessments: Consulting Indigenous Communities* (2013) was also used to form the public consultation program.

The study included the following stakeholders:

- Review agencies
- Members of the public
- Indigenous communities
- LHPWSS member municipalities
- LHPWSS Board of Management
- Others who may be affected or interested in the project (for example, residents or businesses)

Jacobs identified relevant stakeholders based on the following sections of the Municipal Class EA guidelines:

- Section A.3, Consultation, outlines the types of stakeholders to be contacted in all cases (for example, MECP), as well as additional federal, provincial, and municipal ministries and agencies to be contacted, as appropriate.
- Appendix 3-1, Screening Criteria, provides guidelines for establishing contact with appropriate review agencies for situations where varying environmental impacts are identified. Jacobs reviewed the criteria to identify the appropriate review agency and contacts before initiating the consultation.

3.1 Project Mailing List

The project mailing list was prepared based on relevant stakeholders identified during the *2018 LHPWSS Master Water Plan Update,* and expanded to include additional stakeholders and review agencies, per MEA guidance. The project-specific mailing list was maintained and updated throughout the project. Personal information provided by members of the public is not included.

Appendix D provides the project mailing list, as well as a consultation log of meetings and correspondence/surveys received relating to this Class EA study.

3.2 Engagement with Indigenous Communities

Indigenous communities, including First Nations and Métis communities, are important stakeholders and were consulted based on interests and potential impacts on established or asserted rights.

Proponent-led consultation can satisfy the Crown's duty to consult, which MECP confirmed at the onset of the project, while providing a list of Indigenous communities identified as potentially affected by the proposed work. The list of Indigenous communities to be consulted was also based on one or more of the following considerations:

- Established relationships with LHPWSS
- Information related to historical occupation, current land claims, and land-related negotiations
- Reserves near the project area
- Results of archaeological assessments
- A review of treaties
- Information about Indigenous communities available from online sources (such as the Ontario Ministry of Indigenous Affairs, Indigenous and Northern Affairs Canada, Chiefs of Ontario, and Métis Nation of Ontario websites)

The following Indigenous communities were notified of the project and received all Class EA notices:

- Chippewas of Kettle and Stony Point
- Munsee-Delaware Nation
- Oneida Nation of the Thames
- Chippewas of the Thames First Nation
- Aamjiwnaang First Nation
- Bkejwanong Territory (Walpole Island)
- Caldwell First Nation

When this report was prepared, the Project Team has not been made aware of any issues or concerns, raised by the above Indigenous communities, regarding the project.

3.3 Agency Consultation

Agency consultation is an integral part of the study's success. Jacobs notified the following agencies of the study:

- MECP
- MHSTCI
- NDMNRF (Guelph and Aylmer districts)
- Ontario Ministry of Transportation
- Ontario Ministry of Indigenous Affairs
- Environment and Climate Change Canada
- ABCA
- Local public health units.

The MECP and ABCA have been actively involved in the study. Additional review agencies remain informed of study progress and results. Refer to Appendix D for additional information.

The Municipality of South Huron was also consulted regarding this project due to the study area's location in this municipality. Any major alterations to the Lake Huron WTP site would be subject to site plan approval through the Municipality of South Huron.

3.4 Notice of Commencement

The Notice of Study Commencement was issued on February 1, 2021. This outlined a clear purpose for the study, inviting the public to be added to the mailing list, and provided contact information and the website address for further information.

3.5 Public Information Centre

One Public Information Centre (PIC) took place for the project. The PIC opened May 27, 2022 and closed June 10, 2022. It was held virtually in a recorded video presentation format that was viewable and open for public comments during the PIC period via a survey on Microsoft Forms. Twelve users watched the video between May 27, 2022 and June 10, 2022. The video and PIC presentation boards are available on the LHPWSS website.

Thirty-six slides were presented as part of the PIC; these summarizes the background, objectives, alternative solutions, and evaluation; and identified the preferred solution, as well as the additional or supplemental studies required. The associated recorded presentation video is approximately 34 minutes in length and describes the PIC presentation slides and content.

The PIC survey was designed to facilitate feedback from the public, specifically those who viewed or listened to the PIC content. As mentioned, the survey was closed to participants on June 10, 2022. Two survey responses were received. There are no outstanding issues or concerns, to date.

Appendix D includes the PIC presentation slides.

3.6 Notice of Completion

A Notice of Study Completion will be distributed when the Project File is posted for the 30-day public comment period. The Notice of Study Completion will notify the public that the study is complete, invite them to review the Project File posted to the project website. The Notice of Completion also outlines the process for requesting a higher level of study (i.e., individual or comprehensive EA), or that conditions be imposed, only on the grounds that the requested order may prevent, mitigate or remedy adverse effects on constitutionally protected Indigenous and treaty rights. Requests on other grounds will not be considered.

3.7 Comment Tracking

Issue tracking began with the distribution of the Notice of Commencement. Contact information for RWS and key Jacobs staff was included with the Notice of Commencement, in case stakeholders wanted to contact the Project Team.

Comments and concerns were responded to in a timely manner either by a member of RWS or Jacobs staff, depending on the content of the inquiry. General feedback that does not pose a specific question or request a response has not been responded to individually, but is included in the overall issue tracker in Appendix D.

4. Alternative Solutions

4.1 Identification of Alternative Solutions

The identification and evaluation of alternative solutions was undertaken to systematically assess viable disinfection and storage alternatives, considering environmental, social, technical, and economic criteria, and following the Phase 2 Class EA process.

An important step in the Class EA process is the identification of alternatives that will address the identified problems or opportunities. The Municipal Class EA document (MEA 2000, as amended) provides the following guidance on the identification of alternative solutions:

> *"feasible alternative ways of solving an identified problem (deficiency) or addressing an opportunity, from which a preferred solution is selected."*

The process of identifying and evaluating alternative solutions followed these key steps:

1. Select the most effective combination of alternatives based on environmental considerations (a blend of technical, environmental, economic, and public feasibility, while considering the applicable Class EA requirements).
2. Quantify benefits, capital, monitoring, and operations and maintenance costs, and liabilities that can be quantified in present-day-dollar terms.
3. Qualitatively describe other benefits, costs, and liabilities.
4. Combine these factors to compare and rank the alternatives and identify a preferred solution.

Per the Municipal Class EA guidance, the systematic evaluation of alternatives is based on consultation with review agencies and the public. The consultation takes place to confirm relevant project-specific or technical information gained during the planning process will assist the proponent in arriving at the best decision.

There are several interconnected factors with the potential to impact the overall disinfection or storage solutions (or both). Appendix C2 lists these considerations, which were used to guide the alternative development.

4.2 Long List of Alternative Solutions

This section describes the process used to develop the long list of alternatives to address the project objectives and overall problem and opportunity statement (Section 1.1).

The process begins with an evaluation of broad strategies to address the project objectives, followed by the identification of viable alternatives to implement the available strategies. The following strategies have been considered:

- Do nothing
- Limit growth
- Modify operational practices or expand maintenance program, or both
- Reduce water demand
- Expand or upgrade existing water system

Limiting growth and reducing water demand are not viable strategies because the *LHPWSS 2018 Master Water Plan* (Jacobs 2020) projects that growth will occur within the planning horizon, which will in turn increase the water production demand for the Lake Huron WTP. Additionally, these solutions are not viable in terms of achieving the project objectives of redundancy and operational flexibility. Modifying and improving operational practices or expanding maintenance programs are a good practice, however, they do not solely meet project objectives of redundancy and operational flexibility, and therefore is also not considered a viable solution. As such, these three non-infrastructure solutions (Limit Growth, Modify Operational Practices or Expand Maintenance Programs, or Reduce Water Demand) are not included as part of the long list of alternatives.

With the Do Nothing strategy, plant capacity would continue to be limited during cold water conditions because of disinfection constraints (unless operational practice modifications are implemented), and no additional storage would be available to provide buffering volume for operational flexibility. The Do Nothing strategy is not considered a viable solution, but was maintained in the long list of alternatives for the Lake Huron WTP EA as a baseline alternative for comparison purposes.

Expanding or upgrading the existing water system was identified as the only strategy that provides the opportunity to achieve the disinfection and storage study objectives. This section outlines viable means to implement this strategy.

4.2.1 Alternative Solutions to Improve Disinfection

The following upgrade concepts were identified to address the disinfection objectives for this project:

1. Do Nothing
2. Control Flow Rate through North and South Treatment Trains
3. Modify Existing Clear Wells
4. Provide Additional Clear Well Volume
5. Implement UV Disinfection
6. Implement Ozonation

4.2.2 Alternative Solutions to Improve Storage

The following upgrade concepts were identified to address the storage objectives:

1. Do Nothing
2. Reservoir to Meet Water Demand-based Requirements, Provide Buffering and Operational Volume, and Provide Additional Disinfection Volume to Meet Objectives

For each specific alternative, the volume of the proposed new reservoir varies. The general approach to determine the overall total volume needed in the reservoir component for each alternative was to determine the volume required for the following three components:

1. Volume for water demand-based storage to supply LHPWSS customers in case of a planned or unplanned plant production shutdown, as determined through a refined water demand-based storage assessment (refer to Section 2.6.2).

2. Volume for buffering and operational purposes, specifically to implement energy management strategies (later confirmed not to be needed via the dynamic hydraulic modelling of the WTP; refer to Section 2.6.3.)
3. Volume for disinfection purposes to meet the project's two disinfection objectives (providing adequate disinfection under cold water conditions and reducing reliance on the transmission pipeline and pre-treatment for achieving CT requirements), as determined via process calculations using the plant's CT calculator (refer to Appendix C2 for more information)

4.3 Combined Long List of Alternatives

The disinfection and storage upgrade concepts presented in Sections 4.2.1 and 4.2.2 were combined and expanded into multiple alternative solutions, which are presented and described in Table 4-1.

Table 4-1. Summary of Long List of Alternatives

Number	Alternative	Alternative Description
1	Do Nothing	▪ Baseline non-infrastructure solution considered as part of the Class EA ▪ No physical infrastructure changes are made but operational changes are implemented ▪ Does not meet project objectives as disinfection and storage needs would continue to be limited by the existing treatment plant arrangement and processes
2	Control Flow to North Clear Well, and New Reservoir	▪ Change in operating strategy to control the flow through the two treatment trains at the plant, to reduce capacity restrictions due to disinfection currently imposed by the smaller north clear well ▪ Construction of a new reservoir for storage needs
3.1	Increase Existing Clear Well Baffling Factor, and New Reservoir	▪ Construction of additional baffle walls and hydraulic control structures within the clear wells to improve primary disinfection ▪ Construction of a new reservoir for storage needs
3.2	Overflow Weir at Clear well Effluent, and New Reservoir	▪ Construction of overflow weirs at the effluent of the clear wells to maintain a minimum water level within the clear wells and provide improved disinfection ▪ Construction of a new reservoir for storage needs
3.3	Operate North and South Clear wells in Series, and New Reservoir	▪ Modification of the existing clear wells so the north and south clear wells operate in series to improve disinfection ▪ Construction of a new reservoir for storage needs
4.1	Add Second Cell at North Clear well, and New Reservoir	▪ Construction of a second cell at the north clear well to expand the overall clear well volume and thereby improving disinfection ▪ Construction of a new reservoir for additional storage needs

Number	Alternative	Alternative Description
4.2	New Reservoir to Meet Disinfection and Storage Needs	▪ Construction of a new reservoir to meet all disinfection and storage requirements, as defined by the objectives for this study ▪ Comprises the largest reservoir volume of all the alternatives
5.1	UV Disinfection at Filter Influent Channels, and New Reservoir	▪ Installation of UV disinfection reactors within the two filter influent channels at the plant to improve disinfection ▪ Construction of a new reservoir for storage needs
5.2	UV Disinfection at Each Filter Effluent, and New Reservoir	▪ Installation of a UV disinfection reactor on the effluent piping of each of the 12 filters at the plant to improve disinfection ▪ Construction of a new reservoir for storage needs
5.3	UV Disinfection at New Reservoir[a]	▪ Construction of a new reservoir for storage needs ▪ Construction of a new UV building adjacent to the new reservoir, which will house UV reactors to treat water entering the reservoir to improve disinfection
5.4	UV Disinfection at HLP Discharge, and New Reservoir	▪ Installation of UV reactors on the high-lift pumping discharge pipe of the treatment plant ▪ Construction of a new reservoir for storage needs

[a] Alternative solution was previously named "UV Disinfection at Each Clear Well;" however, this was modified to "UV Disinfection at New Reservoir" based on a technical decision by the Project Team to achieve the same process with fewer constructability concerns.

Refer to Appendix C1 for more information on each alternative included in the long-list of alternatives.

4.4 Alternative Screening

A high-level screening was conducted to determine the short list of alternatives for the study. This screening assessment served to identify viable alternative solutions to address the disinfection and storage objectives. Workshop Number 1 was held on March 9, 2021. LHPWSS and Jacobs staff attended to collaboratively review screening criteria, and to complete the screening exercise. This section presents the criteria used to screen the alternatives, as well as the resulting short list of alternatives.

In consultation with LHPWSS, five screening criteria (Table 4-2) were selected to screen the long list of alternatives. The criteria were implemented using a pass or fail approach, with alternatives being evaluated as either "meets" or "does not meet" each criterion.

Table 4-2. Screening Criteria

Criterion	Criteria Description
Criterion 1: Meet All Objectives	Does the alternative meet all disinfection and storage objectives?
Criterion 2: Operational Flexibility	Relative to baseline condition, does the alternative increase or decrease operational flexibility?
Criterion 3: Constructability	Is it feasible to construct and implement the alternative while maintaining plant capacity requirements?
Criterion 4: Impacts to Existing Treatment Process	Does the alternative result in impacts to existing treatment processes such that additional upgrades (not directly related to the project objectives) would be required at the plant?
Criterion 5: Park/Plant Access	Does the alternative substantially impact park or plant access with no practical mitigation measures available?

The process of screening the long list of alternatives is documented in Appendix C1.

The following alternatives were screened out of the list based on the following rationale:

- Alternative 1 (Do Nothing) was screened out because it does not meet all the project objectives. Nonetheless, the Do Nothing alternative was carried through to the short list as a point to compare the other short-listed alternatives, as part of the Class EA evaluation process.
- Alternative 2 was screened out because it does not meet all the project objectives and it decreases plant operational flexibility relative to the baseline condition, due to flow restrictions through the north treatment train.
- Alternative 3.3 was screened out because operating the clear wells in series removes the WTP's flexibility to operate the trains independently, and because of the constructability issues associated with connecting the clear wells.
- Alternative 4.1 was screened out because the construction of a second cell on the North Clear well would substantially impact plant operations and access on the northern side of the plant. Practical measures would not be available to mitigate this plant access issue, because the southern side of the plant would be occupied by reservoir construction.
- Alternative 5.4 was screened out because the current UV equipment is incompatible with the high pressures noted, and plant operational flexibility would be substantially impacted because of increased headloss or management of discharge or transient pressures (or both).
- Alternatives 6.1 and 6.2 were screened out because the introduction of ozonation would require significant changes to the treatment process, including reconstructing the filters to support biological filtration. Alternative 6.2 also presents constructability issues with connecting the ozone contact tank to the existing system.

The resulting short list includes five alternatives (plus the Do Nothing alternative), as presented in Table 4-3. Alternatives 3.1 and 3.2 were combined into a single alternative, reflecting flow regime changes to the clear wells, as determined during Workshop Number 1.

Table 4-3. Short List of Alternatives

Long List Alternative Number	Updated Alternative Number for Short List	Alternative Description
1	1	Do Nothing
3.1 + 3.2	2	Modify Flow Through Existing Clear Wells by Increasing Baffle Factor and Installing Overflow Weirs at Clear Well Effluent, and New Reservoir
4.2	3	New Large Reservoir to Meet All Disinfection and Storage Needs
5.1	4.1	UV Disinfection at Settled Water Conduits, and New Reservoir
5.2	4.2	UV Disinfection at Each Filter Effluent, and New Reservoir
5.3	4.3	New Reservoir with UV Disinfection

4.5 Short List of Alternatives

This section establishes the design concepts and the technical considerations for each short-listed alternative. The design concepts were developed to establish a basis for a comparative evaluation as part of the Class EA study, to identify a preferred alternative solution. The design concept for the preferred alternative will be further developed during Phase 5 of the EA process (Implementation) via preliminary design. Refer to Appendix C2 (Technical Memorandum No. 2) for more details on the information presented in this section, including information about developing storage needs for each alternative.

4.5.1 Alternative 1: Do Nothing

Do Nothing is the baseline alternative considered as part of the Class EA process in which no physical infrastructure changes are made. Chlorine-based disinfection and storage needs would continue to be limited by the existing WTP arrangement and processes. To meet the project's disinfection objectives, however, operational changes would be needed to the existing plant operations (such as increasing chlorine use), and are assumed for this EA. This alternative does not address the project's storage objectives, and therefore does not meet the project's overall problem and opportunity statement.

This alternative has zero capital costs because no new infrastructure is being added. However, it will result in increased operations and maintenance costs due to the operational changes that are needed to improve disinfection (that is, increases in chlorine usage at certain times of the year). This increased usage, over a span of 20 years, is estimated to cost approximately $844,000 more than current expenditures.

4.5.2 Alternative 2: Clear Well Upgrades and a New Reservoir for Additional Storage Needs

Alternative 2 involves modifying the flow through the existing clear wells to improve the disinfection contact time, by adding baffle walls and overflow effluent weirs in the existing clear wells. Alternative 2 also consists of a new reservoir, sized to meet additional storage and disinfection requirements for the plant. A reservoir with an approximate total volume of 11 ML is

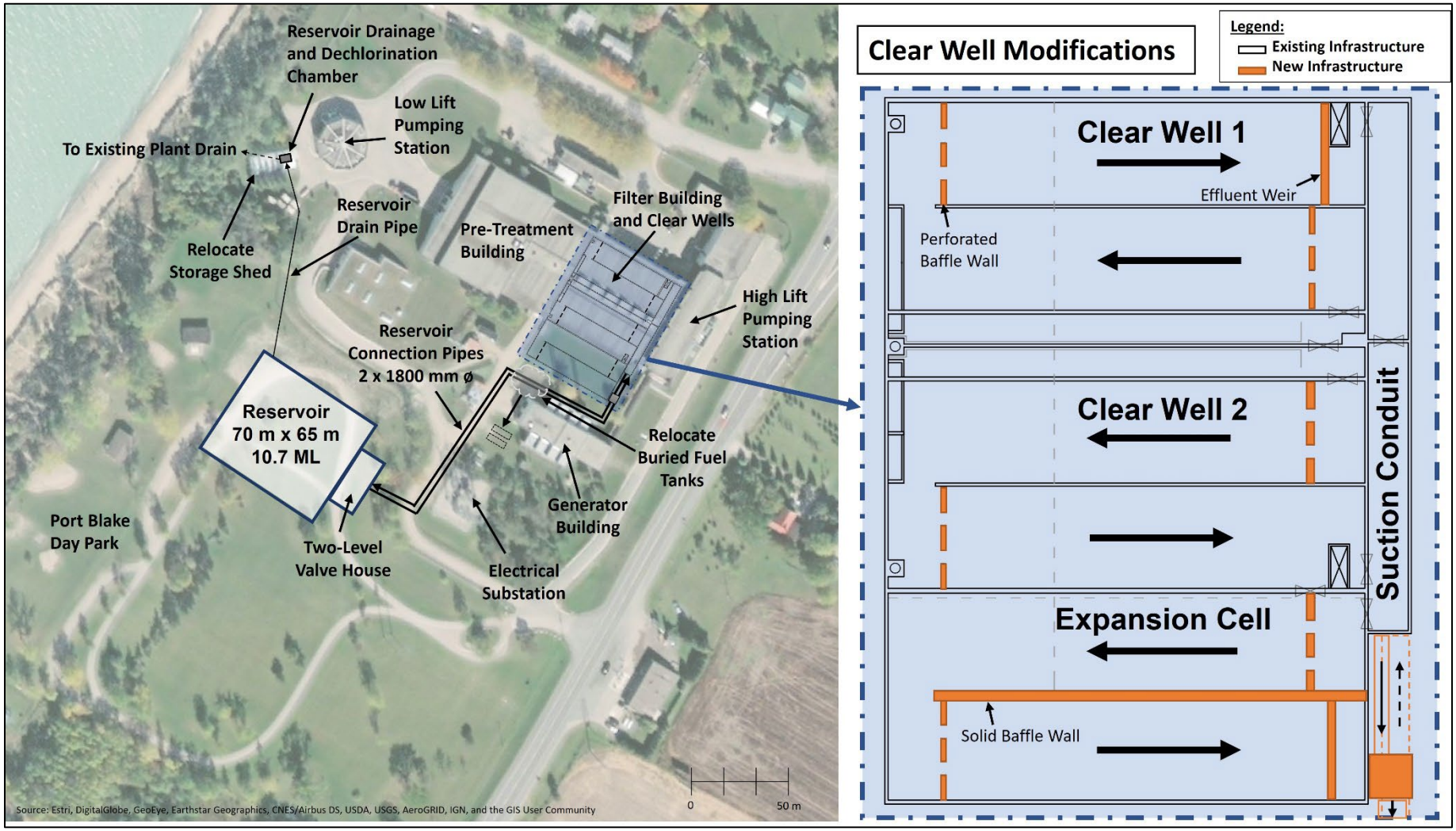
proposed, which includes the approximately 4-ML volume required for disinfection, as well as the 7-ML volume required for water demand-based storage needs. The location of the proposed reservoir is south of the existing WTP's Residue Management Facility within Port Blake Park (Figure 4-1).

The reservoir design concept includes the following components:

- A below grade, concrete, two-cell rectangular reservoir
- A reservoir footprint of approximately 4,500 square metres, and a depth of 4.5 metres
- A two-level, below grade valve house adjacent on the eastern side of the reservoir, which will house the influent and effluent piping to and from the existing WTP
- A 1800mm-diameter reservoir influent pipe that will connect to the clear wells at the existing WTP
- A 1800mm-diameter reservoir effluent pipe that will connect to the high lift pump suction conduits at the existing WTP
- A drainpipe from the reservoir will connect to the existing plant effluent drain at a new dechlorination chamber, in case of an emergency overflow event or scheduled reservoir maintenance. This applies to each short-listed alternative.

It is estimated that the capital cost for Alternative 2 is approximately $33 million dollars, and the total operations and maintenance costs over the span of a 20-year period are estimated to be $303,000 more than current expenditures.

Figure 4-1. Alternative 2



4.5.3 Alternative 3: New Reservoir

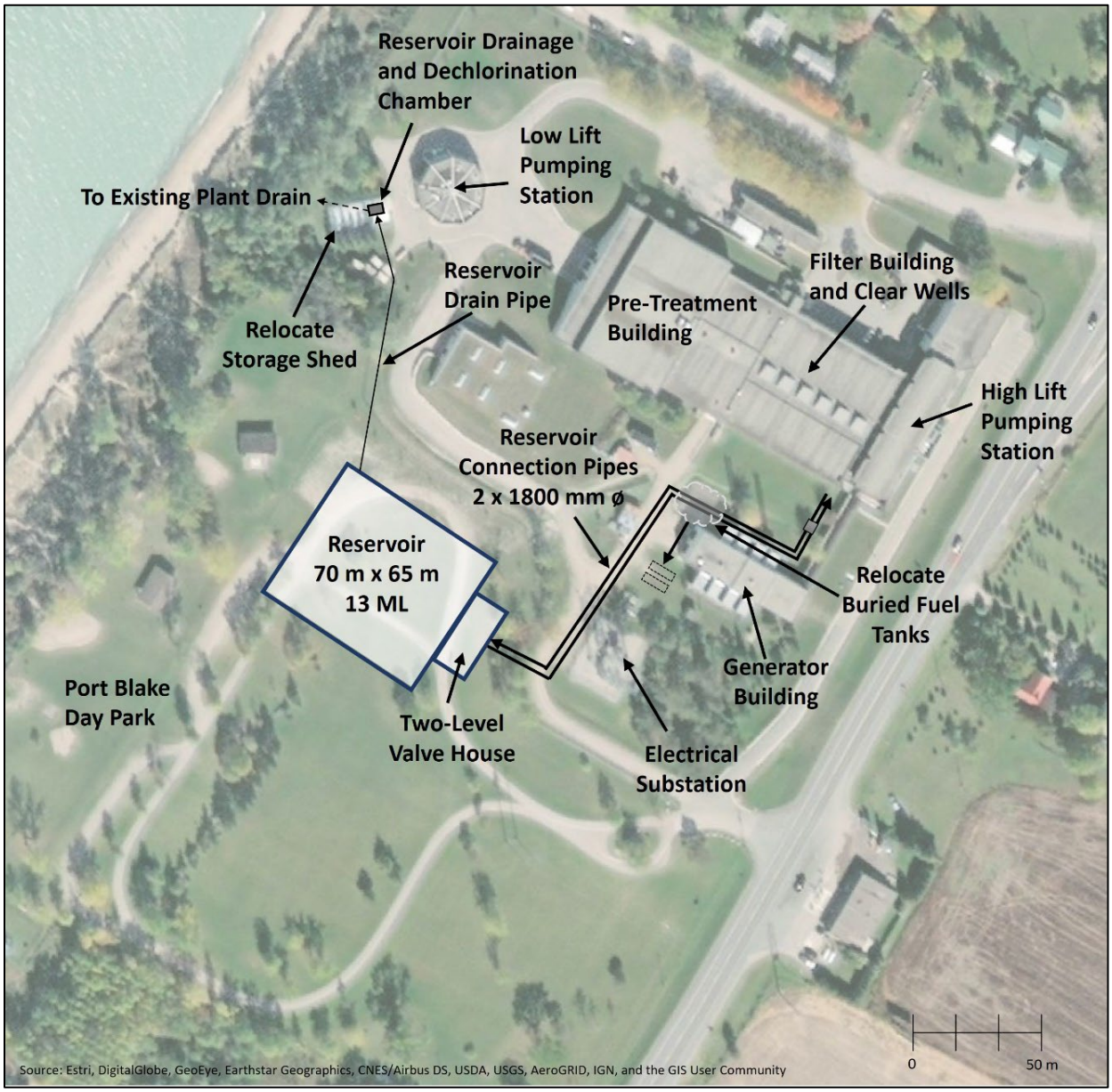
Alternative 3 consists of constructing a new reservoir to meet all requirements, which include the remaining disinfection needs (primary disinfection deficit through the existing treatment process), and water demand-based needs (equalization and emergency supply). This alternative therefore includes the largest reservoir volume of the alternatives. A reservoir with a total volume of 13 ML is proposed, which includes the 5.3-ML volume required for disinfection and the 7-ML volume required for water demand-based storage needs. The location for the proposed reservoir is south of the WTP (the same as for Alternative 2) (Figure 4-2).

The reservoir design concept includes the following components:

- A belowgrade, concrete, two-cell rectangular reservoir
- A reservoir footprint of approximately 4,500 square metres, and a depth of 5 metres
- A two-level, below grade valve house adjacent on the eastern side of the reservoir, which will house the influent and effluent piping to and from the existing WTP
- A 1800mm-diameter reservoir influent pipe that will connect to the clear wells at the existing WTP
- A 1800mm-diameter reservoir effluent pipe that will connect to the high lift pump suction conduits at the existing WTP

It is estimated that the capital cost for Alternative 3 is approximately $35 million dollars, and the total operations and maintenance costs over the span of a 20-year period are estimated to be $294,000 more than current expenditures

Figure 4-2. Alternative 3



4.5.4 Alternative 4.1: UV Disinfection at Settled Water Conduits and a New Reservoir for Additional Storage Needs

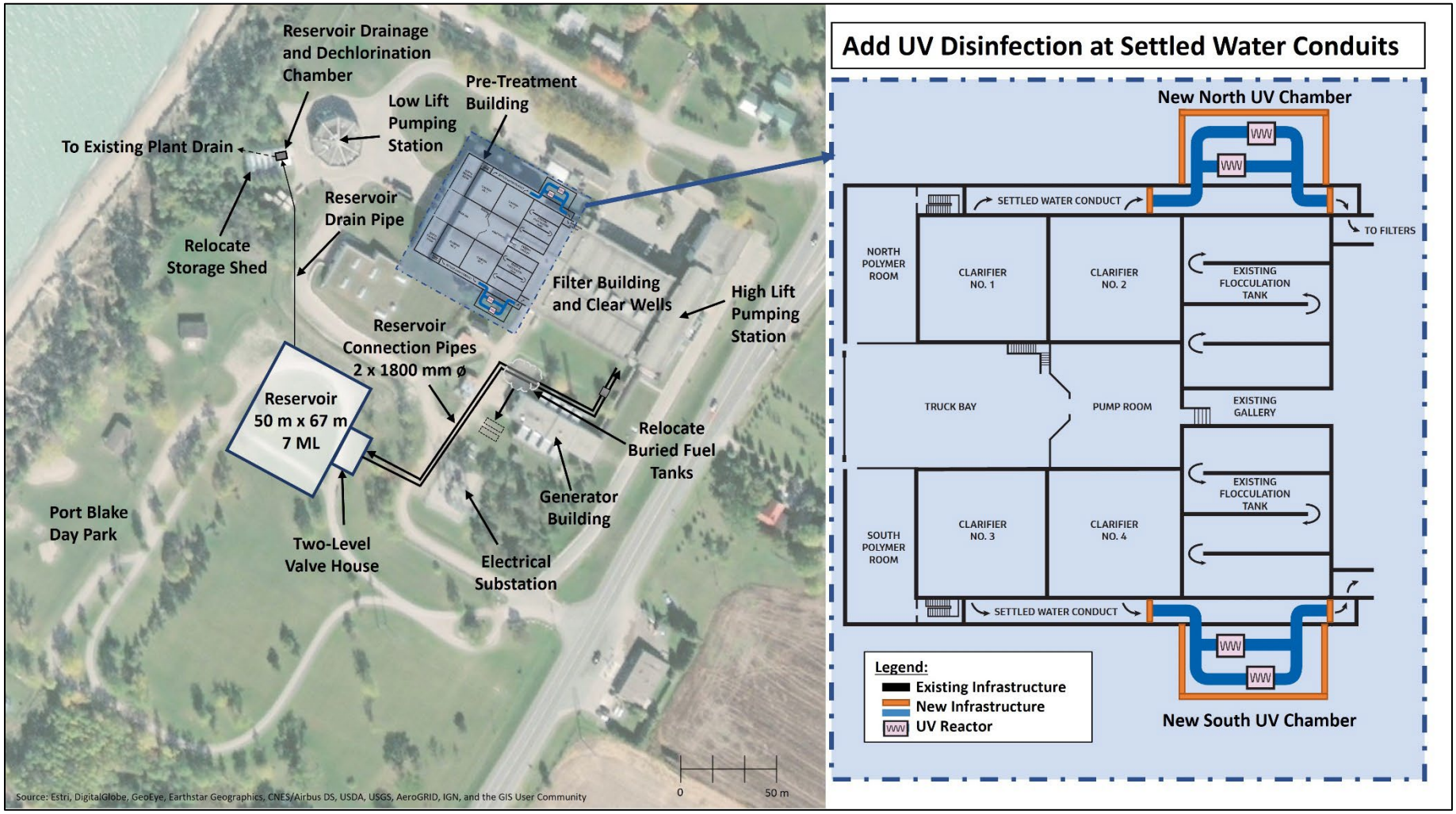
Alternative 4.1 consists of implementing UV disinfection to improve disinfection at the plant and reduce its reliance on chlorine-based disinfection and enhance multi-barrier treatment at the WTP. The concept includes adding two new buildings annexed to the existing pre-treatment building: one at each the northern and southern settled water conduits. Four low-pressure, high-output UV reactors will be installed to provide a dosage of 40 millijoules per square centimetre for the peak design flow of 340 ML/d, to treat water between the clarification and filtration processes at the plant.

The alternative also includes adding a new 7-ML belowgrade reservoir, sized to meet only the water demand-based storage requirements, because the disinfection needs are addressed through the UV upgrade. The location for the proposed reservoir is south of the WTP (the same as for all short-listed alternatives) (Figure 4-3). The reservoir design concept includes the following components:

- A belowgrade, concrete, two-cell rectangular reservoir
- A reservoir footprint of approximately 3,350 square metres, and a depth of 4.7 metres
- A two-level, below grade valve house adjacent on the eastern side of the reservoir, which will house the influent and effluent piping to and from the existing WTP
- A 1800mm-diameter reservoir influent pipe that will connect to the clear wells at the existing WTP
- A 1800mm-diameter reservoir effluent pipe that will connect to the high lift pump suction conduits at the existing WTP

It is estimated that the capital cost for Alternative 4.1 is approximately $39 million dollars, and the total operations and maintenance costs over the span of a 20-year period are estimated to be $346,000 more than current expenditures

Figure 4-3. Alternative 4.1



4.5.5 Alternative 4.2: UV Disinfection at Each Filter Effluent and a New Reservoir for Additional Storage Needs

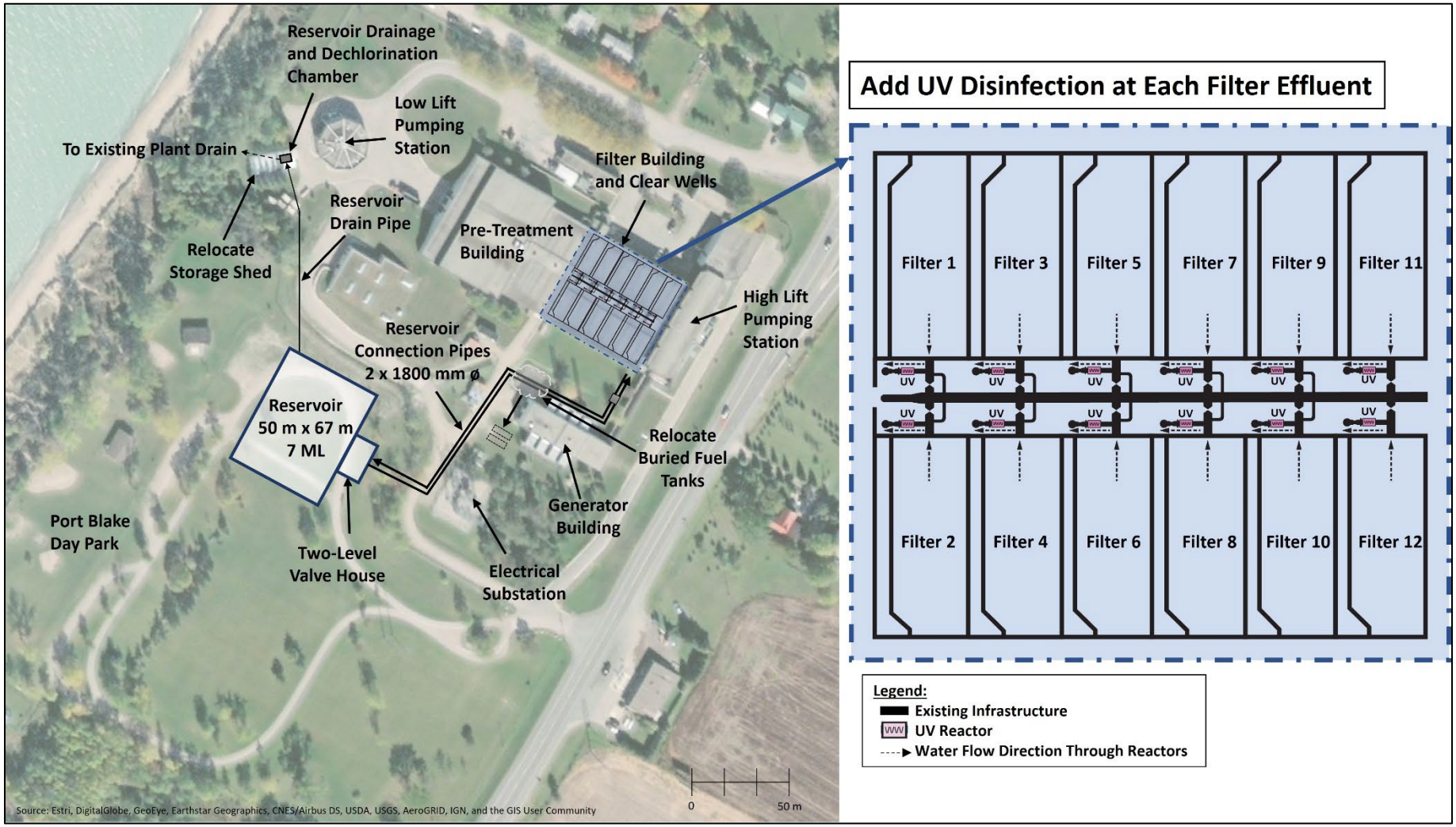
Alternative 4.2 is a variation of the concept to implement UV disinfection at the plant and enhance multi-barrier treatment at the WTP. Alternative 4.2, however, consists of implementing UV disinfection at the filter effluent piping. One medium-pressure UV reactor will be installed on the effluent piping of each filter at the plant, for a total of 12 UV reactors. The reactors will be installed to provide a dosage of 40 millijoules per square centimetre for the peak design flow of 340 ML/d.

The alternative also includes adding a new 7-ML belowgrade reservoir, sized only to meet the water demand-based storage requirements (the same as for Alternative 4.1). The location for the proposed reservoir is south of the WTP (Figure 4-4). The reservoir design concept is the same as it is for Alternative 4.1, which includes the following components:

- A belowgrade, concrete, two-cell rectangular reservoir
- A reservoir footprint of approximately 3,350 square metres, and a depth of 4.7 metres
- A two-level, below grade valve house adjacent on the eastern side of the reservoir, which will house the influent and effluent piping to and from the existing WTP
- A 1800mm-diameter reservoir influent pipe that will connect to the clear wells at the existing WTP
- A 1800mm-diameter reservoir effluent pipe that will connect to the high lift pump suction conduits at the existing WTP

It is estimated that the capital cost for Alternative 4.2 is approximately $28 million dollars, and the total operations and maintenance costs over the span of a 20-year period are estimated to be $420,000 more than current expenditures

Figure 4-4. Alternative 4.2



4.5.6 Alternative 4.3: UV Disinfection at New Reservoir

Alternative 4.3 is the last variation of the concept of implementing UV disinfection at the plant and enhance multi-barrier treatment at the WTP. Alternative 4.3 involves the implementation of a new reservoir, sized to meet the water demand-based needs (equalization and emergency supply), with UV disinfection before the water enters the new reservoir. A new UV building will be constructed adjacent to the new reservoir, and will house four low-pressure, high-output UV reactors that will be able to treat the water entering the reservoir at a dosage of 40 millijoules per square centimetre for the peak design flow of 340 ML/d. The new UV facility will be partially abovegrade and will consist of the following levels:

- Upper Level (Abovegrade): The upper level will be an abovegrade building that serves as an access point and service area to the facility, which houses the UV system power and control panels, as well as a platform overlooking the UV reactor trains at the middle level of the facility.
- Middle Level (Belowgrade): The middle level is the pipe gallery, and will house the reservoir influent piping and valving with the UV reactors and associated equipment.
- Lower Level (Belowgrade): The lowest level of the facility provides access to the effluent piping and valving for the treated water exiting the reservoir. This level will be below the floor slab of the UV pipe gallery, and will be accessible by removing the grating over the pipe trench.

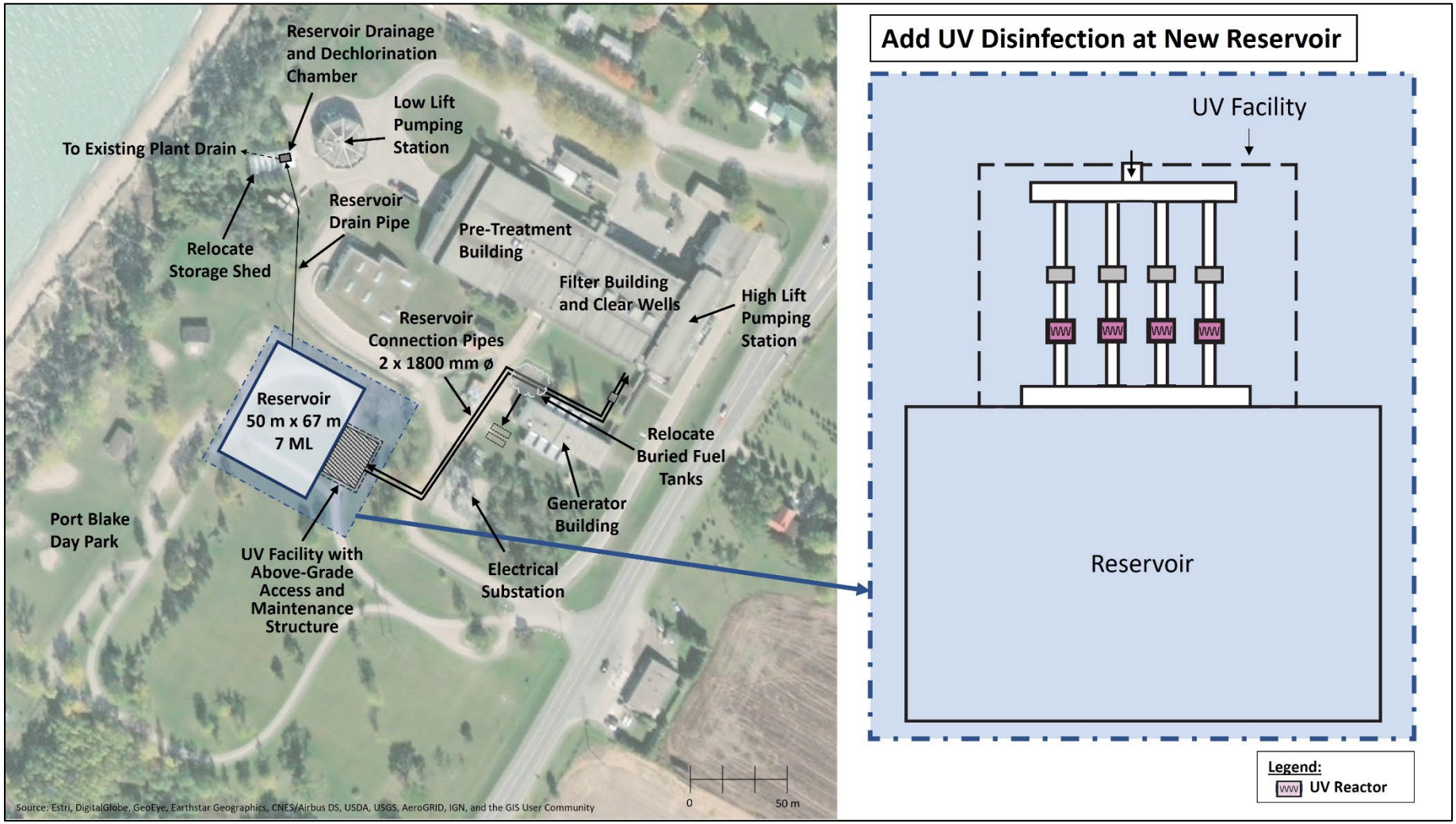
Similar to Alternatives 4.1 and 4.2, a reservoir with a volume of 7 ML is proposed to meet the water demand-based storage needs. The location for the proposed reservoir is south of the WTP at the same location and with the same footprint as for Alternatives 4.1 and 4.2, but would be constructed at a slightly lower depth than those concepts (Figure 4-5).

The reservoir design concept includes the following components:

- A belowgrade, concrete, two-cell rectangular reservoir
- A reservoir footprint of approximately 3,350 square metres, and a depth of 5 metres
- A 1800mm-diameter reservoir influent pipe that will connect to the clear wells at the existing WTP
- A 1800mm-diameter reservoir effluent pipe that will connect to the high lift pump suction conduits at the existing WTP

It is estimated that the capital cost for Alternative 4.3 is approximately $37 million dollars, and the total operations and maintenance costs over the span of a 20-year period are estimated to be $182,000 more than current expenditures

Figure 4-5. Alternative 4.3



4.6 Identification of the Preferred Solution

This section describes the evaluation framework and criteria that are used to compare the short-listed alternatives, to determine a preferred solution for the Lake Huron WTP.

4.6.1 Evaluation Framework and Criteria

Development Guidelines

The following guidelines are used in the development of evaluation criteria to achieve a robust representative evaluation of the short-listed alternatives. Evaluation criteria should include the following characteristics:

- **Mutually Exclusive and Collectively Exhaustive** – to avoid double-counting possible consequences and so important considerations are not neglected
- **Concise** – to focus the analysis on the objectives necessary to make a decision
- **Operational** – to confirm that the information necessary to measure objectives can be obtained with reasonable time and effort
- **Measurable** – to define objectives precisely and to specify the degree to which objectives may be achieved
- **Understandable** – to facilitate the communication of insights from the decision-making process

Evaluation Criteria

A set of evaluation criteria reflecting four overarching categories were established: Natural, Sociocultural, Technical, and Economic Environments (Table 4-4). These criteria are based on the triple-bottom-line approach described in the Class EA process and were established through consultation with LHPWSS, and considering the existing conditions of the local study area, the alternative solutions being considered, and the problem and opportunity statement. LHPWSS's Customer Level of Service (CLOS) objectives, as defined in the LHPWSS Asset Management Plan (Jacobs 2016), were also considered and incorporated into the criteria where possible.

Table 4-4. Evaluation Criteria

Natural Environment	Sociocultural Environment	Technical Environment	Economic Environment
▪ Aquatic Vegetation and Wildlife ▪ Terrestrial Vegetation and Wildlife ▪ Surface Water ▪ Groundwater ▪ Greenhouse Gas from Energy Usage[1] ▪ Chemical Usage [a]	▪ Archaeological Sites ▪ Cultural and Heritage Features ▪ Recreational Land Uses and Visual Landscape ▪ Impacts during Construction ▪ Long-term Community Impact	▪ Improvements to Primary Disinfection ▪ Impact on Disinfection Byproduct Formation ▪ Ease of Implementation ▪ Future Proofing ▪ Potential for System	▪ Capital Costs ▪ Lifecycle Costs (includes Operations and Maintenance Costs)

Natural Environment	Sociocultural Environment	Technical Environment	Economic Environment
▪ Soil and Geology	▪ Reduction in Service Interruptions [a] ▪ Planning Policy Compliance	Expandability for Redundancy ▪ Compatibility with WTP Hydraulic Grade Line ▪ Operational Flexibility ▪ Maintenance ▪ Permits and Approvals	

[a] Criterion is associated with LHPWSS Customer Level of Service objectives as defined in the LHPWSS Asset Management Plan (Jacobs 2016).

For each criterion, each alternative was assigned a high, medium, or low score (the equivalent of 10, 5, or 0 points respectively). The score was established based on the alternative's level of impacts and benefits. Refer to Appendix C2 for more information on the scoring descriptors for each criterion.

The total score for each alternative is the sum of the scores from all 25 criteria, with equal weighting of each criterion.

4.6.2 Comparative Evaluation of Short-listed Alternatives

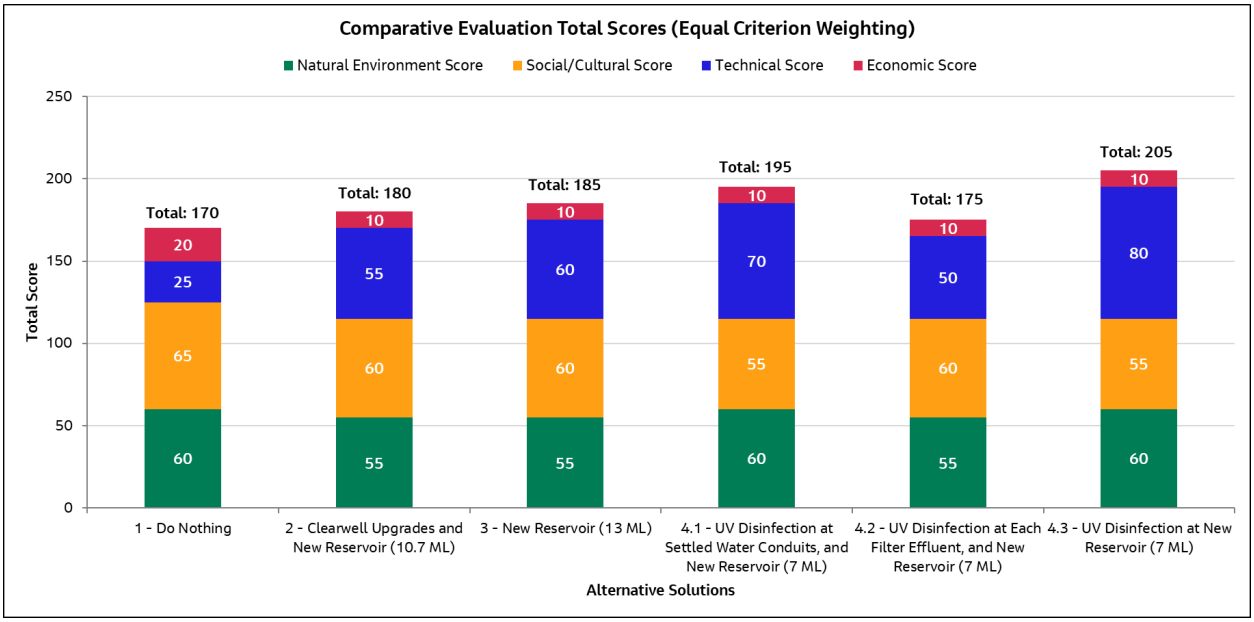
The short-listed alternatives were evaluated using the criteria and framework described in Section 4.6.1.2. Alternative 4.3 (UV Disinfection at New Reservoir) scored the highest and offers the most preferred solution, in terms of the evaluation criteria considered. Table 4-5 and Figure 4-6 summarize the comparative evaluation results. Appendix C2 outlines the detailed comparative evaluation with the scoring rationale.

Table 4-5. Comparative Evaluation Summary

Alternative Number	Alternative Description	Natural Environment Score	Sociocultural Score	Technical Score	Economic Score	Total Score	Rank
1	Do Nothing	60	65	25	20	170	6
2	Clear Well Upgrades and New Reservoir (11 ML)	55	60	55	10	180	4
3	New Reservoir (13 ML)	55	60	60	10	185	3
4.1	UV Disinfection at Settled Water Conduits, and New Reservoir (7 ML)	60	55	70	10	195	2

Alternative Number	Alternative Description	Natural Environment Score	Sociocultural Score	Technical Score	Economic Score	Total Score	Rank
4.2	UV Disinfection at Each Filter Effluent, and New Reservoir (7 ML)	55	60	50	10	175	5
4.3	UV Disinfection at New Reservoir (7 ML)	60	55	80	10	205	1

Figure 4-6. Comparative Evaluation Total Scores



4.6.3 Sensitivity Analysis

To confirm the robustness of the comparative evaluation, a sensitivity analysis using five scenarios was conducted. One sensitivity scenario involves each criteria category (Natural Environment, Sociocultural, Technical and Economic) being equally weighted; that is, a weighting of 25% was applied to each category. The other four sensitivity scenarios were computed, where the weighting is increased from 25% to 40% for each criteria category, and the remaining weighting (60%) is evenly distributed across the other three categories (that is, 20% weighing each category). To summarize, the sensitivity analysis scenarios were as follows:

- Scenario 1: Natural (25%), Sociocultural (25%), Technical (25%), Economic (25%)
- Scenario 2: Natural (40%), Sociocultural (20%), Technical (20%), Economic (20%)
- Scenario 3: Natural (20%), Sociocultural (40%), Technical (20%), Economic (20%)
- Scenario 4: Natural (20%), Sociocultural (20%), Technical (40%), Economic (20%)
- Scenario 5: Natural (20%), Sociocultural (20%), Technical (20%), Economic (40%)

Alternative 1 (Do Nothing), which is not a viable solution, scored highest in Scenarios 1, 2, 3, and 5. Alternative 4.3 (UV Disinfection at New Reservoir) scored second-highest after Alternative

1 in these sensitivity scenarios. Alternative 4.3 (UV Disinfection at New Reservoir) scored highest in Scenario 4. Refer to Appendix C2 for more information on the sensitivity analysis details and results.

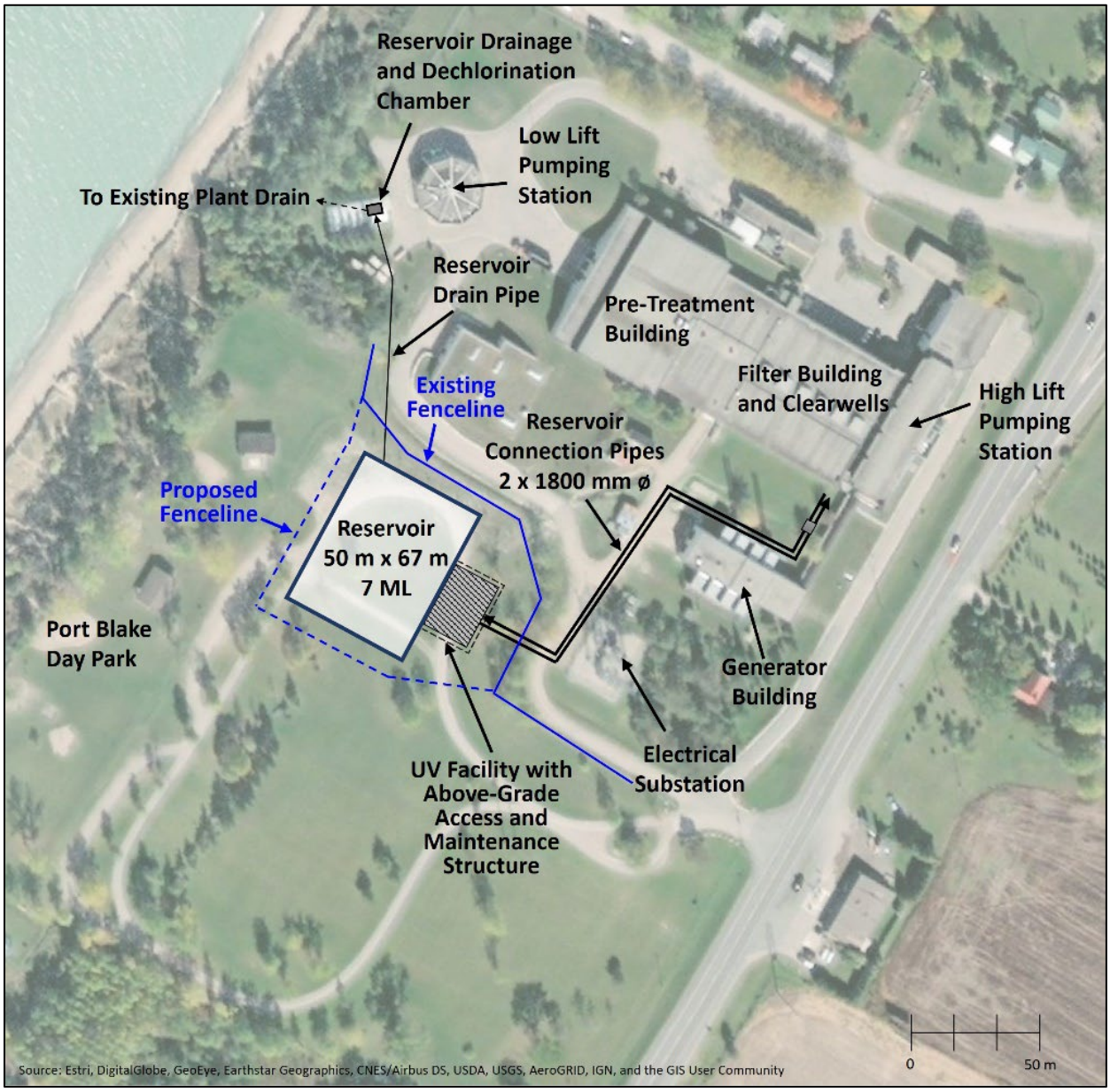
4.6.4 Preferred Solution

Based on the detailed comparative evaluation and sensitivity analysis, Alternative 4.3 (UV Disinfection at New Reservoir) was selected as the preferred alternative solution. This alternative provides the most benefits with the fewest impacts. In addition to meeting the project objectives, Alternative 4.3 will provide the following benefits:

- Provide the Lake Huron WTP with enhanced primary disinfection capabilities through a multi-barrier disinfection process, and therefore provide the ability to accommodate future more stringent primary disinfection regulatory requirements and changes in source water quality.
- Provide the plant with more storage to reduce the potential number of and impacts from planned or unplanned service interruptions to LHPWSS customers.
- Limit the construction to one area, reducing interference with plant operations compared to other short-listed alternatives (not including Alternatives 1 and 3).

The preferred solution, Alternative 4.3 – UV Disinfection at New Reservoir, is shown in Figure 4-7. As the location for the new reservoir and UV building will be located south of the WTP within Port Blake Park, a new fenceline will be installed. The approximate new fenceline is shown in Figure 4-7.

Figure 4-7. Preferred Alternative Solution (including Proposed New Fenceline)



5. Implementation Plan

5.1 Future Work

This Project File will be available for a 30-day public comment period. Pending feedback at the close of the review period and when the EA is complete, the next stage is for the preliminary design of the preferred solution to be completed, followed by the detailed design and then construction, as summarized in Table 5-1.

Table 5-1. Timeline of Technical Implementation of Preferred Solution

Phase/Step	Approximate Timing
EA Completion	Fall 2022
Preliminary Design	Fall 2022 to Spring 2023
Detailed Design	2023 to 2024
Anticipated Implementation (Start of Construction)	2024/2025

5.1.1 Preliminary Design Phase

A baseline natural feature field assessment was completed by Jacobs in June 2022 in support of the preliminary design phase. This assessment was carried out prior to the completion of the EA to capture the appropriate timing windows for wildlife and early growing season for terrestrial vegetation. It is noted that results from the field assessment were not considered in the evaluation of the alternatives, but are to inform future work by supplementing the desktop assessment by identifying natural features that may occur with the local study area associated with the preferred alternative. Key results from the field survey assessment are summarized as follows (refer to the full report in Appendix A2 for the complete results and more information):

- No SAR, rare and/or sensitive species were overhead or observed. At the time of the field assessment, impacts to SAR and/or SAR habitat is not predicted with the implementation of environmental mitigation.
- The preferred alternative occurs within cultural plantations, Industrial or Parkland features, with the exception of minor encroachment of the FOD4 forested dripline (due to the proposed alignment of the reservoir drain pipe). As the FOD4 community is considered a Natural Feature, which are considered sensitive and are afforded protection from various environmental regulators, it is recommended that the alignment is optimized to avoid impacts to the FOD4 forested area.
- Other than the FOD4 forested area, the proposed alternative does not occur within other Natural Features.
- If the reservoir drain pipe is shifted to avoid the sensitive area and with the implementation of mitigation methods, impacts to Natural Features is not predicted.

A Stage 2 Archaeological Assessment must be completed during the design phase. The Stage 2 Archeological Assessment (using the test-pit survey method) will need to be completed for the areas identified as having archaeological potential within the anticipated construction disturbance and laydown areas (Golder, 2022). Figure 5-1 demonstrates the approximate limits of these areas (green hatched line and cyan blue box), of which the yellow shaded regions within

those areas represent an approximate total area of 1.5 ha that will need to be surveyed as part of the Stage 2 assessment.

Figure 5-1. Areas for Stage 2 Archaeological Assessment (Adapted from Golder, 2021a)

5.1.2 Detailed Design Phase

The following studies may also take place during the detailed design phase:

- Topographic survey
- Geotechnical studies
- Hydrogeological assessment
- Tree inventory, protection, removal, and replacement plan
- Excess soil management plan
- Follow-up SAR survey

Based on consultation with ABCA following the completion of the baseline natural feature field assessment, an Environmental Impact Study (EIS) is not anticipated to be required for the project.

Consideration for additional engineering principles that may reduce the project's contribution to climate change will be given during the detailed design phase and is anticipated to include, at a minimum, energy-efficient buildings and equipment. Project-related infrastructure will be designed according to applicable codes and regulations and will be designed to withstand severe weather events and extreme temperatures that may be expected within the local geography in a changing climate.

5.2 Cost to Implement Preferred Solution

It is estimated the capital cost to implement the preferred solution, Alternative 4.3, is approximately $37 million dollars including engineering, construction, contingency, and inflation allowances. This includes the costs for a new reservoir, as well as the new UV building and associated equipment (Table 5-2). The total operations and maintenance costs for the preferred solution are estimated to be $182,000 over the span of a 20-year period. This includes costs associated with additional electricity usage, labour, and equipment replacement relative to current expenditures. In total, it is estimated that the preferred solution will have a lifecycle cost of $37.5 million dollars (Table 5-2). Refer to Appendix C2 for more information on the cost estimate for the preferred solution.

Table 5-2. Preferred Solution Lifecycle Cost Estimate

Cost Category	Component	Cost
Capital Investment	UV and Reservoir Valve Facility	$ 9,698,000
	Belowgrade Reservoir (7 ML)	$ 5,027,000
	Clear Well Outlet Modifications	$ 576,000
	Conveyance Piping to and from Reservoir (1,800-millimetre-diameter concrete pressure pipes)	$ 2,475,000
	Subtotal Project Costs (excluding markups)	$ 17,776,600
	Markups (contractor overhead, contingency, and others)	$ 19,543,000
	Total Capital Costs	**$ 37,318,000**
O&M Expenditures	Additional Electricity (Annual)	$ 48,400
	Additional Labour: Reservoir Inspection (Every 3 years)	$ 4,000
	Additional Labour: UV System Maintenance (Annual)	$ 5,000
	UV Lamp Replacement (Annual)	$ 24,700
	Chemical (Chlorine) Usage Credit[a]	($ 68,300)
	Total O&M Costs Over 20 Years, NPV	**$ 182,000**
	Total Life Cycle Cost	***$ 37,500,000***

[a] Calculated as a credit, because the implementation of UV will provide an opportunity to eliminate pre-chlorination (i.e. chlorination done at the Low Lift Pumping Station for the pre-treatment process ahead of filtration) at the plant year-round.

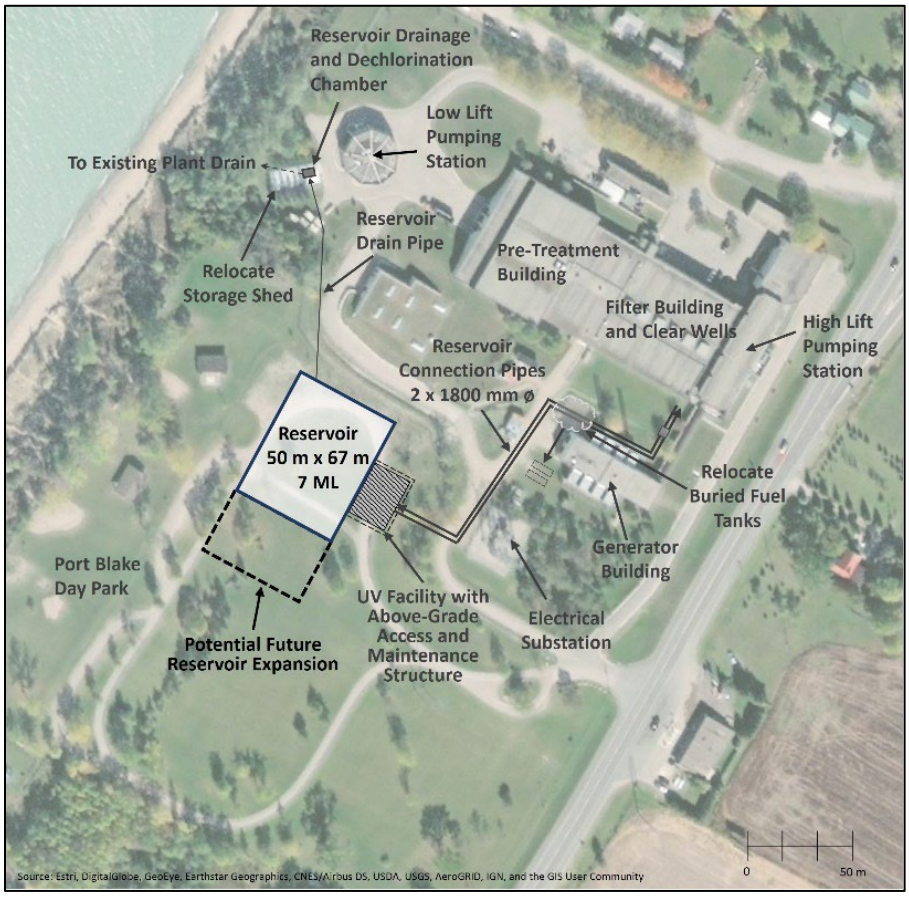
5.3 Future Reservoir and UV Expansion

One of the components of the preferred alternative solution includes the addition of a 7-ML belowgrade reservoir. The future expansion of the new reservoir should be considered during the design phase to accommodate uncertainties in this EA project, such as:

- Atypical population growth rates. The demand projections previously developed as part of the 2018 Master Water Plan Update (refer to Sections 2.4.2 and 2.6.2 for more information) were used to determine the storage volume required in this Class EA. Data from the 2020 census as well as recent projections by some of the member municipalities suggest increased population growth in some of the LHPWSS member municipalities (in comparison to previous years, possibly as a result of the trend of working from home and the housing market). This difference between the 2018 Master Water Plan projections and recent population trends may impact the design of the reservoir; this should be reviewed when the next Master Plan Update projections are available. Alternatively, the reservoir may need to be expanded before the end of planning cycle if the increased population growth trends continue beyond that assumed in available projections.
- Additional volume components. The reservoir was sized to meet water demand-based storage needs in case of a planned or unplanned WTP shutdown. The reservoir volume may be expanded to accommodate volume for other needs (outside of the objectives of the EA), such as volume for recovery of transmission main failures.

The location of the new reservoir considers the potential future need to expand the reservoir. Figure 5-2 demonstrates the tentative location of the future reservoir expansion, shown by a dashed line. The reservoir may be expanded by 50% based on the area reserved for the WTP expansion for one additional treatment train. Consideration of future potential reservoir expansion should be made during the sizing and design of the two reservoir connection pipes.

Figure 5-2. Potential Future Expansion of Reservoir for Preferred Alternative



The design of the UV facility should also consider the potential future reservoir expansion. The design should consider expandability in the case that the WTP needs to be expanded beyond its current rated capacity of 340 ML/d to meet the growing demand in the future.

5.4 Environment Impacts and Mitigation Measures

The implementation of the preferred solution will involve construction activities that may have impacts to the natural, socio-cultural, technical, and economic environments. Construction activities will include, but are not limited to, the following:

- Excavation within the park for the construction of the underground reservoir, adjacent partially underground UV building, and associated piping and infrastructure
- Dewatering to lower groundwater and permit construction in dry conditions
- Appropriate excess soil storage and management
- Sediment and erosion control
- Significant concrete work for the construction of the new reservoir and building
- Grading and landscaping, including vegetation and tree protection and restoration

During construction of the preferred alternative, measures will be established and implemented to mitigate impacts to the environments.

5.4.1 Natural Environment Impacts and Mitigation

Aquatic Environment

The preferred solution is not anticipated to cause physical disturbance to aquatic features and will not result in substantial long-term impact on the viability of aquatic habitats in terms of density and diversity of species, as residuals discharge from the plant will not change from existing operations.

A new dechlorination chamber at the outlet of the drainpipe from the reservoir is proposed to dechlorinate water before it flows into Lake Huron, in the case of an emergency overflow event or scheduled reservoir maintenance. This reduces the potential impacts of chlorinated water on the aquatic environment.

Vegetation

The preferred solution will result in a small portion of the grass-covered land in Port Blake Park to be permanently lost because of the new UV building. The new reservoir adjacent to the UV building will be completely below grade and the topsoil and grass will be replaced once it is constructed. Some trees will be removed (approximately 10-15) for the construction of the new reservoir and UV building. A Tree Protection, Removal, and Replacement Plan should be developed at the design stage. Tree replacement is anticipated to comply with the requirements of the local By-Laws. Construction activities will avoid natural vegetation to the extent possible, or an arborist survey and report will be required during the detailed design. Following construction, the site will be restored as soon as weather conditions permit.

Previously disturbed grass and vegetation areas may contain weeds or invasive species. Confirm that construction vehicles and equipment arrive at the project site clean and clear of vegetative debris so weeds are not introduced or spread.

At this time, impacts to vegetation SAR are not anticipated. Avoidance of natural features (e.g., forested communities) should be considered during the design stage. The site should be surveyed to inform construction planning and mitigation measures at the detailed design stage.

Wildlife and Wildlife Habitat

Construction activities may create sensory disturbance (noise, vibrations) for wildlife present within the surrounding habitat areas. If construction activities are scheduled to occur within the migratory bird nesting window, arrange for a qualified biologist to search the area before clearing or mowing activities take place. Vegetation clearing will be conducted before the general nesting period for migratory birds (April 1 to August 31) at the study area. Educational awareness to support monitoring and response plans will be required for construction staff. Staging areas and access will be sited away from natural features (see Appendix A-2). Future screening for SAR and associated field surveys should be completed at the detailed design stage.

Water Quality and Quantity

The preferred solution will have no change to surface water quality or quality, as there will be no changes to the existing plant intake nor discharge. The preferred solution, after being

constructed, is anticipated to have low potential for impacts to groundwater; the new reservoir will result in a minor change in surface permeability and infiltration of the ground.

During construction, appropriate dewatering and sediment control will be required to reduce impacts to water quantity and quality. During the construction, dewatering activities will be suspended if signs of erosion, flooding, or sediment loading occur.

Although a desktop review of available data indicated that no wells are present on the project site, if any unanticipated wells are encountered during the project, or if the proponent has questions regarding petroleum operations, the proponent should contact the Petroleum Operations Section at POSRecords@ontario.ca or 519-873-4634.

Soil and Physical Environment

During the construction of the preferred solution, erosion control measures should be implemented to protect the land surface, soil integrity, and water siltation:

- Revegetate areas disturbed during construction with a cover crop, where appropriate, to reduce wind and water erosion, as well as the speed of water runoff to Lake Huron.
- Monitor the project site conditions for signs of erosion and confirm erosion control measures are adequate and maintained during and after construction.
- Inspect all erosion and sediment control measures after a substantial rainfall or in consultation with ABCA.
- Remove mats, matting, or geotextiles, if applicable. Silt fences to remain in place, where warranted, to assist with controlling erosion until vegetation is re-established.
- Avoid disturbing the existing gully and ravine during construction. This includes disturbances resulting from reservoir excavation stockpiles. Maintain a setback buffer during construction and consider proximity to the gully and ravine when selecting proposed reservoir stockpile location.

A geotechnical investigation conducted in 2010 for a previous project at the Lake Huron WTP found the presence of contaminated soil from a borehole location within the vicinity of the proposed location for the new reservoir and UV building. The presence of petroleum hydrocarbons was detected (Trow 2010) at levels above the limit at the time (July 2011 criteria of 50 µg/g for F3 and F4 hydrocarbons). It is recommended that a geotechnical study is completed at the design stage, including a soil chemistry analysis, to confirm if and to what extent hydrocarbons or other contaminants are present. If present, contaminated soil and excess soil management are to be completed in accordance with O. Reg. 406/19.

5.4.2 Sociocultural Environment Impacts and Mitigation

Archaeological Features

The preferred solution will result in construction within a portion of the grassy areas of Port Blake Park, which were found to retain archaeological potential and require a Stage 2 Archaeological Assessment prior to construction (Golder 2021a). The Stage 2 Archaeological Assessment will be conducted prior to construction to confirm if there are and to what extent the area planned for the new reservoir and UV building possesses archaeological significance.

If a historical resource (for example, an archaeological artifact) is discovered or suspected during construction, work is to be stopped and cease alteration of the site immediately. A licensed consultant archaeologist is to be contacted to carry out archaeological field work, in compliance with Section 48(1) of the *Ontario Heritage Act*. If human remains are found during construction, stop work and contact the authorities (police, or Registrar of Cemeteries at the Ministry of Consumer Services).

Cultural and Heritage Features

The preferred solution will have no physical nor non-physical disturbance to known cultural or heritage features.

Recreational Land

The preferred solution will involve construction within a portion of Port Blake Park, south of the WTP's Residue Management Facility, which will result in a reduction in available park area. Consideration has been made to avoid areas of the park that may have more significance to park use, such as washrooms and picnic table areas. Construction fencing will clearly mark the boundaries between the park and construction areas. The preferred solution will not result in loss of beach access.

Traffic

The preferred solution is not anticipated to have any substantial effects to existing traffic levels as road closures along Highway 21 nor local roads are anticipated. However, equipment and vehicles will increase traffic in the area during construction. As necessary, a traffic management plan should be established for construction crews. The construction workforce should adhere to local speed limits, and carpooling should be encouraged to reduce the number of vehicles on and around the site. Implement dust suppression measures, as necessary, if construction is conducted in dry conditions.

Social Well-being

Construction activities may create sensory disturbance (noise, dust, odour) for people and domestic animals in the area, including residents and park users. Conduct construction activities in accordance with applicable municipal bylaws, such as the noise by-law.

5.5 Applicable Permits and Approvals

The following permits and approvals may be required to implement the preferred alternative:

- Amendments to Drinking Water Works Permits and Municipal Drinking Water License from MECP
- Stage 2 Archaeological assessment submitted to the MHSTCI
- Permit to Take Water (PTTW) from MECP or registration with the Environmental Activity Sector Registry (EASR) for construction dewatering activities - under the Ontario Water Resources Act, an EASR will be required for any water takings that exceed 50,000 litres per day, and a PTTW must be obtained for any water takings exceeding 400,000 litres per day.
- MECP Director Notification form prior to placing any new equipment in operation

- MECP Environmental Compliance Approval application for selected activities based on addition of UV disinfection, new sources of air emissions, noise etc.
- Municipal Noise Bylaw exemption from the Municipality of South Huron, as needed
- Site plan approval from the Municipality of South Huron
- Approval from ABCA as a part of site plan approval
- Building permit from the Municipality of South Huron
- Electrical Safety Authority approvals.

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Appendix A. Natural Features Technical Memoranda

Appendix A1 – Desktop Natural Features Assessment

Appendix A2 – Natural Features Field Assessment

Appendix A has been posted separately and is available on the Lake Huron Water Treatment Plant Disinfection & Storage Upgrades Class EA website.

Appendix B. Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes

Appendix B has been posted separately and is available on the Lake Huron Water Treatment Plant Disinfection & Storage Upgrades Class EA website.

Appendix C. Technical Memoranda

Appendix C1 – Long List of Alternatives and Alternative Screening

Appendix C2 – Short-Listed Alternative Evaluation and Preferred Solution

Appendix C has been posted separately and is available on the Lake Huron Water Treatment Plant Disinfection & Storage Upgrades Class EA website.

Appendix D. Consultation Record

- Mailing List
- Notice of Commencement/PIF
- PIC Summary
- Consultation Log and Minutes
- Comment Tracker

Appendix D has been posted separately and is available on the Lake Huron Water Treatment Plant Disinfection & Storage Upgrades Class EA website.