Municipality of Chatham-Kent Public Utilities Commission

Northeast Chatham-Kent Water Distribution System Municipal Class Environmental Assessment

Schedule B

60654246

March 2023

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AECOM: 2015-04-13

Authors

Report Prepared By:

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Paul Adams, Environmental Planner

Report Reviewed By:

Insert electronic signature

Karl Grueneis, Senior Environmental Planner

Report Approved By:

Insert electronic signature

Antony Aruldoss, P.Eng
Project Manager

Prepared for:

Municipality of Chatham-Kent Public Utilities Commission

Prepared by:

Paul Adams

Environmental Planner

AECOM Canada Ltd.
410 – 250 York Street, Citi Plaza
London, ON N6A 6K2
Canada

T: 519.673.0510
F: 519.673.5975
www.aecom.com

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1. Introduction

1.1 Project Background

The Chatham-Kent Public Utilities Commission (CK PUC) through their consultant AECOM Canada Ltd. has completed a Municipal Class Environmental Assessment (MCEA) for the Northeast Chatham-Kent Water Distribution System (NE WDS). The Study evaluated a range of water servicing strategies to provide sustainable water to Northeast Chatham-Kent to accommodate long-term future demands while also providing reliable municipal water to the Delaware Nation Community.

The CK PUC NE WDS's water servicing strategy is classified as a Schedule B project (as is extending a water distribution system where some components are outside of an existing right of way) in the Municipal Engineers Association (MEA) process (October 2000, as amended in 2015), where project activities are subject to Phases 1 and 2 of the environmental assessment process of the MCEA. The study included:

- Development of Problem and Opportunity Statement;
- Identification and evaluation of alternative solutions;
- An assessment of the effects on the environment, including natural, social, economic and engineering aspects associated with the preferred alternative;
- Identification of measures required to mitigate and potential adverse effects; and
- Public, regulatory and approval agencies and Indigenous Community consultation.

Findings, results and recommendations along with public, agency, stakeholder and Indigenous community consultation have been documented in this Project File Report.

1.2 Study Purpose and Objectives

The purpose of this MCEA Study is to provide a comprehensive and environmentally sound planning process, which is open to public and Indigenous Communities participation, to select the preferred water servicing strategy for the NE WDS. The objectives of this Study include:

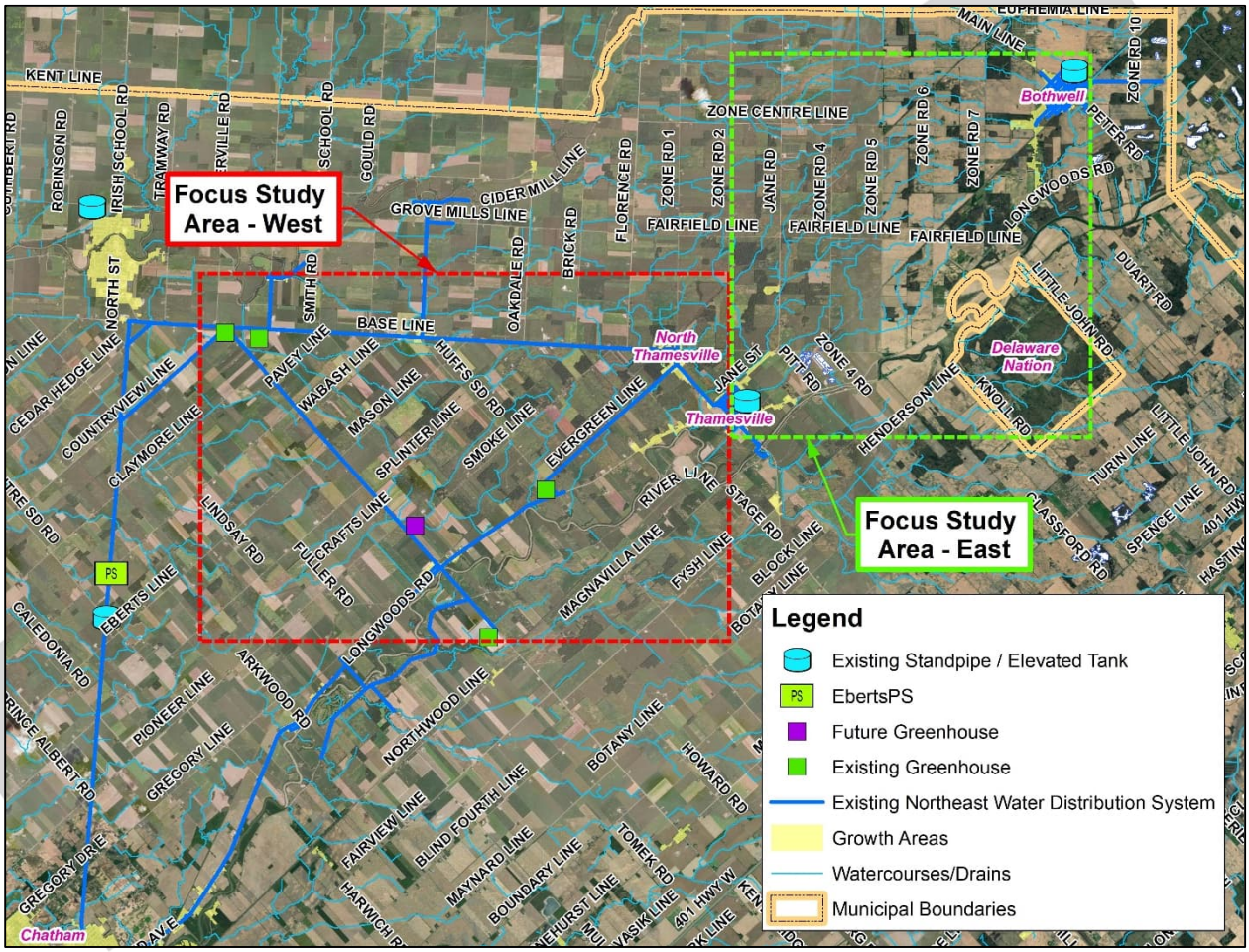
- Identify water servicing needs for the area;
- Protect the environment, as defined by the Environmental Assessment Act (EA Act), through the wise management of resources;
- Consult with affected and interested agencies, Indigenous Communities, key stakeholders, affected landowners, and the public;
- Identify a range of alternative solutions that incorporate concerns raised during the planning process;
- Identify measures needed to mitigate impacts associated with the recommended solutions; and

- Prepare a Project File Report that documents all consultation inputs and complies with the requirements of the MCEA process for Schedule B undertakings.

1.3 Study Area

The water servicing analysis for the Northeast Water Distribution System required the study area to be divided into 2 specific focus study areas, East and West as shown in Figure 1-1: Study Areas. This analysis considered the location of existing and future growth areas including greenhouse development and potential servicing of individual properties in addition to providing reliable potable water to Delaware Nation.

Figure 1-1: Study Areas



1.4 Project Team Organization

This MCEA Schedule B study was undertaken by the CK PUC using consulting services provided by AECOM Canada Ltd. The CK PUC and Consultant project managers are listed below.

Ali Akl, M.Eng., P.Eng
Project Engineer
Chatham-Kent PUC
325 Grand Avenue East
Chatham, ON
N7L 1W9
alia@chatham-kent.ca
Tel: 226.312.2023 ext. 4347

Antony Aruldoss M.A.Sc., P.Eng
Project Manager
AECOM Canada Ltd.
105 Commerce Valley Drive
Markham, ON
L3T 7W3
Antony.aruldoss@aecom.com
Tel: 905.213.6468

2. Municipal Class Environmental Assessment

2.1 Overview

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

In Ontario, infrastructure projects such as implementing a water servicing strategy for the CK NE WDS are subject to the MCEA process and must follow a series of steps as outlined in the MCEA guide. The MCEA consists of five phases as summarized below:

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

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

2.1.1 Planning Project Schedules

The Class EA defines four types of projects and the processes required for each (referred to as Schedule A, A+, B, or C). The selection of the appropriate schedule is dependent on the anticipated level of environmental impact, and for some projects, the anticipated construction costs. Projects are categorized according to their environmental significance and their effects on the surrounding environment. Planning methodologies are described within the Class EA and are different according to Class type, such as the following:

Schedule A: Projects are limited in scale, have minimal adverse environmental effects and include a number of municipal maintenance and operational activities. These projects are pre-approved and may proceed to implementation without following the full Class EA planning process.

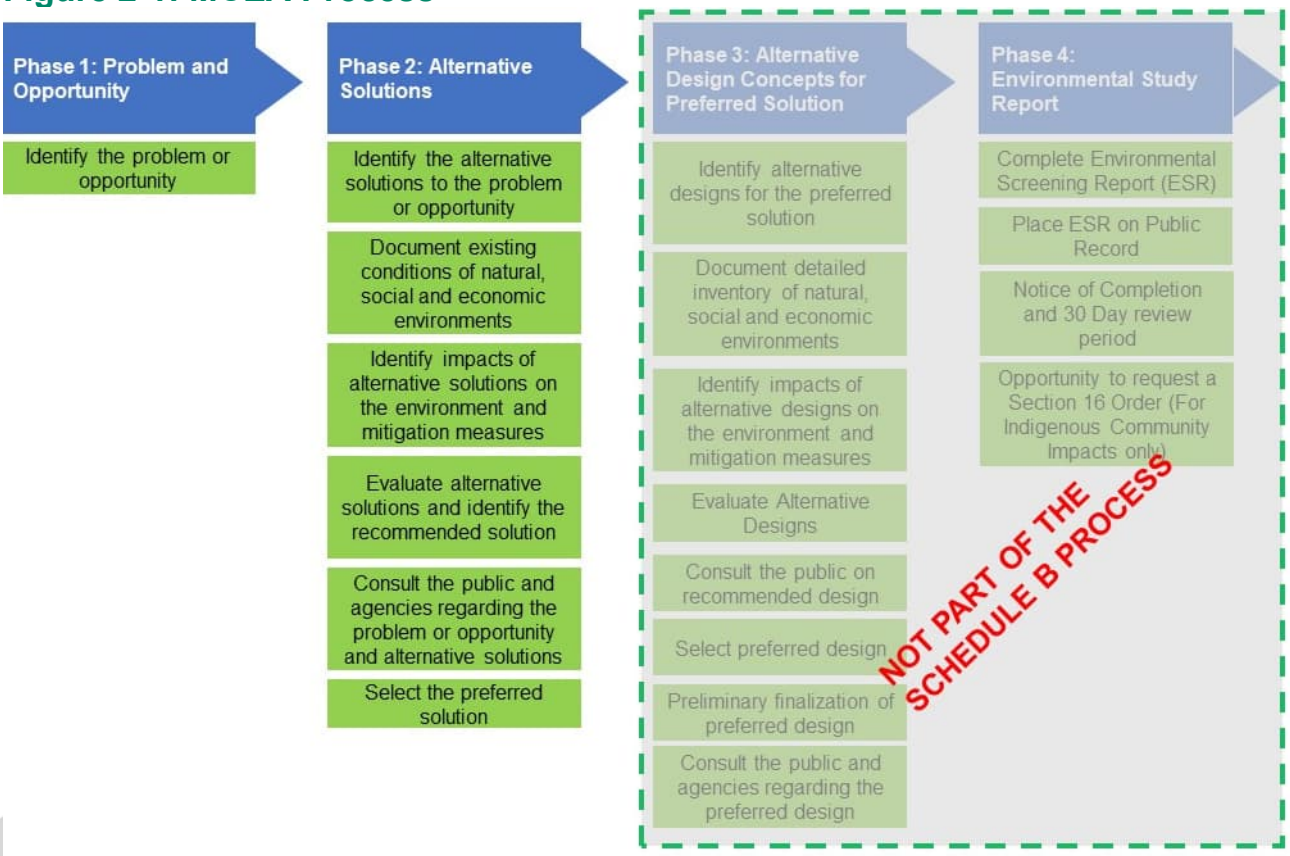
Schedule A+: The purpose of Schedule A+ is to ensure some type of public notification for certain projects that are pre-approved under the Class EA. It is appropriate to inform the public of municipal infrastructure project(s) being constructed or implemented in their area; however, there would be no ability for the public to request a Part II Order (discussed in section 2.2).

Schedule B: These projects have the potential for some adverse environmental effects. The proponent is required to undertake a screening process (Phases 1 and 2), involving mandatory contact with directly affected public, Indigenous Communities and with relevant review agencies to ensure they are aware of the project and that their concerns are addressed. If there are no outstanding concerns, then the proponent may proceed to implementation. At the end of Phase 2, a Project File Report documenting the planning process followed through Phases 1 and 2 shall be finalized and made available for public and agency review. However, if a concern is raised related to aboriginal and treaty rights which cannot be resolved, a Section 16 Order may be requested and considered by the Minister of the Environment, Conservation and Parks (MECP). Alternatively, the proponent may elect voluntarily to plan the project as a Schedule C undertaking. (refer to section 2.2).

Schedule C: Such projects have the potential for significant adverse environmental effects and must proceed under the full planning and documentation (Phases 1 to 4) procedures specified in the Class EA document. Schedule C projects require that an Environmental Screening Report (ESR) be prepared and filed for review by the public and review agencies. Similar to Schedule B, Indigenous Communities have the opportunity to submit a Section 16 Order request to the Minister of Environment, Conservation and Parks. Review agencies, stakeholders and the public may also raise concerns to the Minister (refer to section 2.2).

Based on a review of the MEA document, this project triggers a Schedule 'B' planning process and as such, Phases 1 and 2 of the Municipal MCEA planning process must be completed. This Project File Report has been prepared and will be made available for a minimum 30-day review period. **Figure 2-1** illustrates the process followed for the Northeast Chatham-Kent Water Distribution System MCEA.

Figure 2-1: MCEA Process



2.2 Public Review of this Report

This Project File Report comprises the documentation for this Schedule 'B' MCEA study. Placement of this report for public review completes the planning stage of the project.

This Project File is available for public review and comment for a period of 30 calendar days starting on **xx 2022** and ending on **xx, 2022**. A public notice (Notice of Completion) was published to announce commencement of the review period. To facilitate public review of this document, copies are available at the following online location:

https://www.letstalkchatham-kent.ca/north-east-ne-chatham-kent-water-distribution-system-municipal-class-ea-mcea

Interested persons may provide written comments to our project team by xx, 2022. All comments and concerns should be sent directly to the Project Managers:

Ali Akl, M.Eng,. P.Eng
Project Engineer
Chatham-Kent PUC
325 Grand Avenue East
Chatham, ON
N7L 1W9
alia@chatham-kent.ca
Tel: 226.312.2023 ext 4347

Antony Aruldoss M.A.Sc., P.Eng
Project Manager
AECOM Canada Ltd.
105 Commerce Valley Drive
Markham, ON
L3T 7W3
Antony.aruldoss@aecom.com
Tel: 905.213.6468

In addition, a request may be made to the Ministry of the Environment, Conservation and Parks for an order requiring a higher level of study (i.e. requiring an individual/ comprehensive EA approval before being able to proceed), or that conditions be imposed (e.g. require further studies), only on the grounds that the requested order may prevent, mitigate or remedy adverse impacts on constitutionally protected Aboriginal and treaty rights. This is called a Section 16 Order request.

For all other concerns, an additional 30-day window has been considered for the Ministry to decide if the Minister should take any action. During the additional 30 days the Minister will review the requested concerns and project documents in detail, decide if the project will be elevated (Section 16 Request granted) or if It will be approved with conditions.

Requests should specify what kind of order is being requested (request for conditions or a request for an individual/comprehensive environmental assessment), how an order may prevent, mitigate or remedy potential adverse impacts on Aboriginal and treaty rights, and any information in support of the statements in the request. This will ensure that the ministry is able to efficiently begin reviewing the request.

After reviewing the Section 16 Order request and project documents in detail, the Minister may make one of the following decisions:

- Deny the request;

- Deny the request with conditions;
- Refer the matter to mediation; or
- Issue a Section 16 Order whereby the proponent will be required to prepare a Terms of Reference and an Individual EA for the undertaking.

The request should be sent in writing or by email to:

Minister of the Environment, Conservation and Parks
Ministry of Environment, Conservation and Parks
777 Bay Street, 5th Floor
Toronto ON M7A 2J3
minister.mecp@ontario.ca

and

Director, Environmental Assessment Branch
Ministry of Environment, Conservation and Parks
135 St. Clair Ave. W, 1st Floor
Toronto ON, M4V 1P5
EABDirector@ontario.ca

Requests should also be copied to the Chatham-Kent Public Utilities Commission by mail or by e-mail. Please visit the ministry's website for more information on requests for orders under section 16 of the Environmental Assessment Act at:

https://www.ontario.ca/page/class-environmental-assessments-part-ii-order

All personal information included in your request – such as name, address, telephone number and property location – is collected, under the authority of section 30 of the Environmental Assessment Act and maintained for the purpose of creating a record that is available to the general public. As this information is collected for the purpose of a public record, the protection of personal information provided in the Freedom of Information and Protection of Privacy Act (FIPPA) does not apply (s.37). Personal information you submit will become part of a public record that is available to the general public unless you request that your personal information remain confidential.

3. Consultation

3.1 Consultation and Communication Program

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

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

The MCEA process requires two points of mandatory contact for Schedule 'B' projects which are:

- The first point of mandatory contact is made at the end of Phase 2 when the proponent has identified a problem statement, and developed, assessed, and evaluated alternative solutions to the problem based on the social, natural, and economic environments that could be impacted by the project. This initial contact is issued to invite the public and stakeholders to comment on the potential impacts and local sensitivities.
- The second point of mandatory contact is when the Project File report is complete. The Project File report documents the entire planning process through Phases 1 and 2. A proponent is required to place the Project File on the public record for at least 30 calendar days which provides the public and stakeholders the opportunity to review and make submissions to the MECP.

For this study an extra point of contact was made at the beginning of Phase 2 to introduce the project and provide a background summary of the need for this study.

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

3.2 Public Consultation

Table 3-1: Public Consultation Notices

Notice	Publication Date
Notice of Commencement **Appendix A.1**	August 3rd, 10th 2021
Notice of PIC #1 **Appendix A.2**	November 17th / 24tt ,2021
Notice of PIC #2 **Appendix A.3**	July 13th / 20th, 2022
Notice of Completion **Appendix A.4**	XX

3.2.1 Public Information Centre #1

The first Public Information Centre (PIC) was an online presentation that went live on November 30th, 2021 and remained accessible for the remainder of the project. The purpose of the PIC was to introduce the project, share background study findings and gather comments on the following:

- Problem and Opportunity Statement;
- Existing conditions;
- The Class EA process;
- The identification of servicing strategies to address the Problem and Opportunity Statement;
- Evaluation criteria; and
- Next steps of the study.

Following a two (2) week review period there were no comments or concerns regarding the presented servicing strategies.

3.2.2 Public Information Centre #2

The second PIC was an online presentation that went live on July 20th, 2022 and remained accessible for the remainder of the project. The purpose of the PIC was to share study findings to date and gather comments on the following:

- The evaluation of alternatives;
- The recommended servicing alternatives for the east and west focused study areas; and
- Next steps.

Following a two (2) week review period there were 4 comments received regarding the servicing strategies. **Table 3-2** summarized the comments raised at PIC #2.

Table 3-2: Public Comments from PIC #2

Comment / Issue	Response
This is an important project that needs to get done.	Noted
Nice, we need more of this. Good work CK engineering.	Noted
Nice, Good work Ck engineering. We need more of this.	Noted
Sounds like you've got some big projects happening in the area. I'd like to stay informed	Noted

3.3 Agency Consultation

All relevant regulatory agencies and authorities were contacted at the project initiation stage through correspondence notifying them of the study commencement and requesting their comments. All of these agencies were included in the project mailing list, which was updated regularly to ensure accuracy. They were also notified of the PICs and the Notice of Completion. The following section provides a summary of correspondence received from external agencies. Agency correspondence can be found in **Appendix A.5.**

Table 3-3: Agency Comments

Agency	Comment	Response
Ministry of Environment Conservation and Parks (MECP) September 16, 2021	MECP provided information on the following: Requirements for duty to consult with Indigenous Communities.	This Study has undertaken the necessary requirements to fulfil the Duty to Consult. See **Section 3.4** for details of Indigenous consultation.
Ministry of Heritage, Sport, Tourism and Culture, Industries (MHTCSI) December 2021	MHTCSI provided an outline of the MCEA requirements as they relate to archaeological resources and built heritage and cultural heritage landscapes.	This Study has undertaken the necessary studies to fulfil the requirements of MHTCSI.

3.4 Indigenous Community Consultation

All Indigenous Communities outlined in the MECP Notice of Commencement correspondence have been contacted via a Notice of Commencement/Project Introduction/Invitation to consult. These Indigenous Communities were also sent the Notice of PICs and the Notice of Completion. The following communities were contacted throughout the course of this study.

- Aamjiwnaang First Nation;
- Bkejwanong (Walpole Island);
- Caldwell First Nation;
- Chippewas of Kettle and Stony Point;
- Chippewas of the Thames First Nation;
- Eelunaapeewii Lahkeewiit (Delaware Nation or Moravian of the Thames); and
- Munsee-Delaware Nation.

Delaware Nation is a community with interest in this project as they have a desire to connect to the CK PUC system and receive potable water, instead of using their existing groundwater system which can have reliability issues during dry weather periods. As a result, additional sharing of information and consultation between CK PUC, AECOM and Delaware Nation occurred through the planning process. **Table 3-4** outlines the consultation dates with Delaware Nation.

Table 3-4: Delaware Nation Consultation

Date	Meeting Purpose and Discussion Items
December 9th, 2021	Pre-PIC #1 Project Status Meeting. CK PUC request for information (Delaware Nation water demand and existing system information)
March 3rd, 2022	Pre-PIC #2 Meeting, Project Progress Meeting.
July 11th, 2022	Discussion regarding the status of Delaware Nation Water Supply and work to date, Review of PIC #2 and the location of Proposed Watermain Stub/connection. Discussion of future funding applications.

No comments or concerns were received from the other Indigenous Communities listed above.

4. Project Need and Justification

4.1 Project Need and Justification

Phase 1 of the five-phase MCEA planning process requires the proponent of an undertaking (i.e., the CK PUC) to first document factors leading to the conclusion that an improvement is needed and develop a clear statement of the identified problems or opportunities to be investigated. As such, the Problem and Opportunity Statement is the principal starting point in the undertaking of a MCEA and becomes the central theme and integrating element of the project. It also assists in setting the scope of the project.

The MCEA Problem and Opportunity Statement is as follows:

Problem:

- Water is supplied to the Northeast part of Chatham-Kent by the Chatham Water Treatment Plant. The distribution system in the Northeast does not have the capacity for future growth outside of its current service area;
- There has been increasing demand/inquiries from potential greenhouse developers and farmers for increased water supplies to the Northeast region;
- Delaware Nation has looked at options of receiving municipal water from CK PUC;
- Low pressures in this region make expanding the water system difficult to accomplish;
- The existing Thamesville standpipe is aging and nearing the end of its service life, requiring a rehabilitation or replacement in the near future; and
- The capacity of the existing Thamesville standpipe is sufficient to meet the future demands and provide adequate levels to meet the minimum pressures for Thamesville. However, the elevation / top water levels must be increased to provide adequate pressures to Kent-Bridge within the Focus Area – West.

Opportunity – The MCEA process provides the CK PUC the opportunity to:

- Develop and assess a range of water servicing strategies to provide sustainable water supply to Northeast Chatham-Kent to accommodate near and long-term future growth demands while also providing municipal water to the Delaware Nation Community;
- Obtain additional revenue from new customers which will assist with the capital and operating costs thus enabling to CK PUC to provide a safe and sustainable water supply to customers;
- Develop a capital works plan that will support future infrastructure planning and budgeting; and

- Consult the public, Indigenous Communities, agencies and solicit feedback to select the best strategy for the future.

5. Existing Conditions

5.1 CK PUC Northeast Water Distribution System

The NE CK WDS has water supplied by the Chatham Water Treatment plant and encompasses the area between the following communities:

- Eberts, Dresden, Kent Bridge and Thamesville: currently supplied by the Chatham WDS with Existing Dresden Elevated Tank (High Water Level (HWL) = 228 m and Low Water Level (LWL) = 219 m) and Existing Thamesville Stand Pipe (HWL = 222 m and LWL = 213 m) providing water storage and maintaining system pressure for the water system.
- Bothwell: currently serviced from the Tri-County water supply system through the connection from the Municipality of Southwest Middlesex with the Existing Bothwell Elevated Tank (HWL = 249m and LWL = 239m) providing water storage and maintaining system pressure for the water system.

There is increasing demand from potential greenhouse developers and farmers in the area for water supply. The current system does not have the capacity to expand.

The Delaware Nation is currently serviced with an existing groundwater well based water supply system.

Refer to **Figure 5-1** for the existing system map.

Figure 5-1: Northeast Water Distribution System

5.2 Socio-Economic Environment

5.2.1 Existing Land Use

Existing land uses within the area are varied and include residential, industrial uses, commercial properties, green space, natural heritage system, but mostly dominated by agricultural uses.

5.2.2 Future Land Use

Future growth is guided by the Municipality of Chatham-Kent Official Plan. While growth can be expected in the study areas, the existing land uses will remain mostly the same, with the expectation of growth in the greenhouse sector.

5.3 Cultural Environment

5.3.1 Archaeology

A Stage 1 Archaeological Assessment (**PIF Number - P438-0269-2021**) was conducted within the study area boundaries, and it was determined that the potential for the recovery of pre- and post-contact First Nation and 19th century Euro-Canadian

archaeological resources is high. Based on these findings, a Stage 2 archaeological assessment is recommended for all areas of potentially disturbed land within the study area limits. Areas where archaeological potential has been removed include areas determined to have been subject to extensive land alterations that have significantly compromised the recovery of archaeological materials. This includes constructed roadways building footprints, and areas previously assessed and cleared of archaeological concerns.

See **Appendix B** for the Stage 1 Archaeological Assessment.

5.3.2 Built Heritage

A desktop Cultural Heritage Screening Memorandum was completed to identify municipally, provincially, and federally recognized properties as well as to identify cultural heritage resources or properties with and or adjacent to the Study Area in order to evaluate potential impacts that new water services may have on cultural heritage.

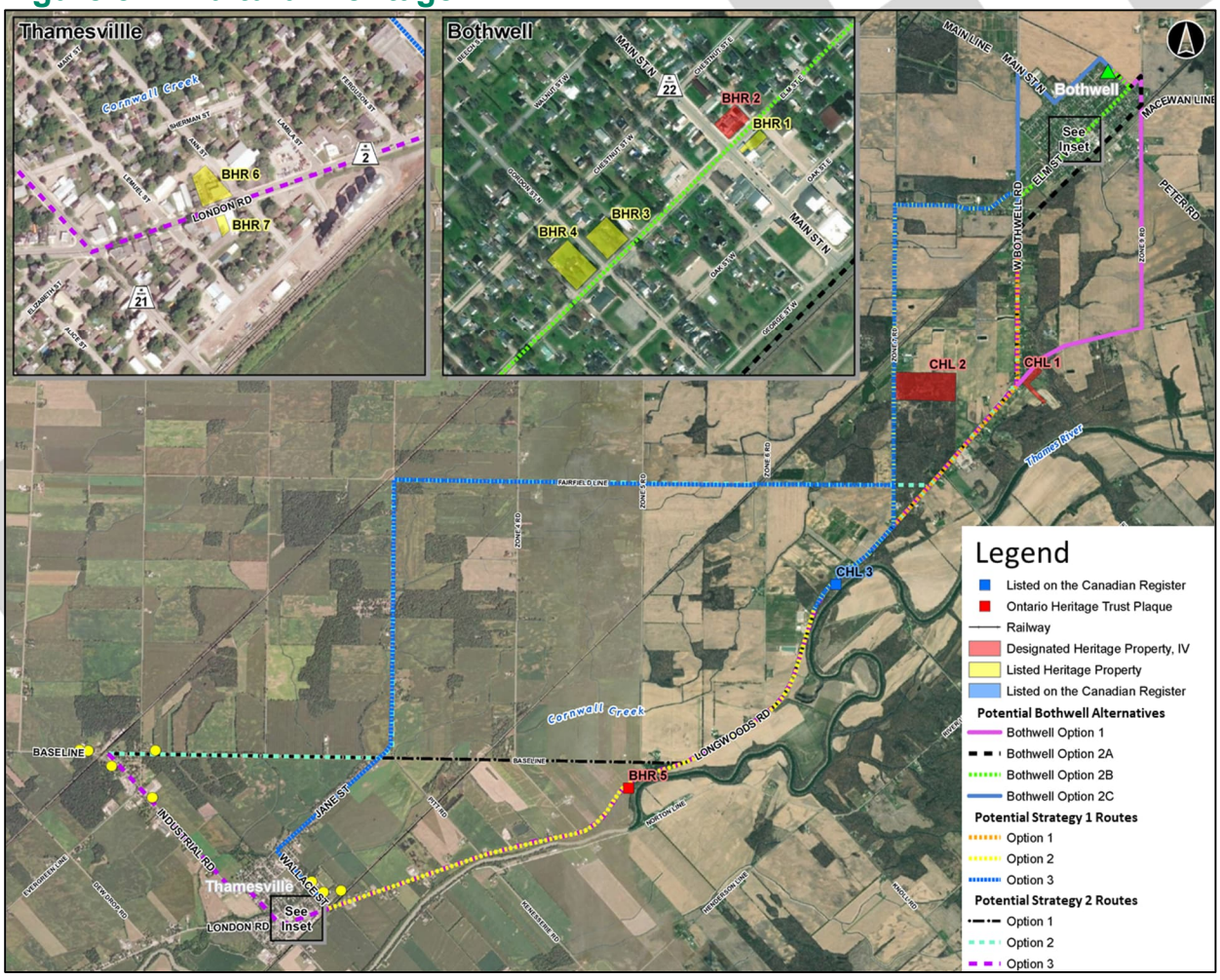
Based on the results of the screening memorandum, it was determined that there were no Built Heritage Resources (BHR) or Cultural Heritage Landscapes (CHL) within the study area and 10 known BHRs and CHLs adjacent to the Study Area as identified on **Figure 5-2** and descriptions found in **Table 5-1.**

Table 5-1: Known BHRs and CHLs Within or Adjacent to the Study Area

Feature ID	Address/Location	Property Description	Heritage Recognition
BHR 1	288 Main Street	Originally the home to one of Chatham-Kent 's best dry good stores	Listed Heritage Property
BHR 2	320 Main Street North	Bothwell Town Hall	Designated Heritage Property, IV
BHR 3	190 Elm West Street	Italianate Mansion	Listed Heritage Property
BHR 4	325 Gordon Street	House belonged to Joseph McGill, an oil entrepreneur	Designated Heritage Property, IV
BHR 5	14249-14431 Longwoods Road	Monument and Plaque commemorating the Battle of the Thames	Ontario Heritage Trust Plaque
BHR 6	62 London Road	The Tecumseh House, Circa 1899	Listed Heritage Property

Feature ID	Address/Location	Property Description	Heritage Recognition
BHR 7	67 London Road	Commercial building, Circa 1870	Listed Heritage Property
CHL 1	15258 Longwoods Road	The Bothwell cemetery	Designated, Part IV
CHL 2	29785 Zone 7 Road	Bothwell Zone Oil Museum	Designated Heritage Property, IV
CHL 3	14878 Longwoods Road	Fairfield on the Thames National Historic Site of Canada	Listed on the Canadian Register

Figure 5-2: Cultural Heritage



See **Appendix B** for the Cultural Heritage Memorandum**.**

5.4 Natural Environment

Based on aerial imagery and the site visit by AECOM ecologists the majority of the Study Areas are dominated by agriculture fields yielding corn. Natural areas are scattered through the East and West Focus Study Area routes and are largely presented as small, forested communities. These vegetation communities may provide nesting habitat for breeding birds protected under the Migratory Birds Convention Act and therefore construction timing restrictions may apply such as no vegetation removal between April 1 and August 30.

A variety of communities within each of the alternative routes provides potential significant wildlife habitat including, raptor wintering area, bat maternity colonies, reptile hibernaculum, old growth forest, other rare vegetation communities, bald eagle and osprey nesting, foraging and perching habitat, woodland raptor nesting habitat, turtle nesting areas, seeps and springs, amphibian breeding habitat (woodland), amphibian-breeding habitat (wetlands), woodland area sensitive bird-breeding habitat, terrestrial crayfish and special concern and rare wildlife species. These areas should be confirmed by a qualified biologist during detailed design. If development is proposed within or immediately adjacent to these Significant Wildlife Habitat features, specific mitigation measures to avoid or minimize negative effects on these features as result of the development will be required.

Although the majority of the flora and fauna identified through the background review are common, tolerant of disturbances and widespread throughout Ontario, a total of 30 Species at Risk on the East Focus Study Area routes, 20 Species at Risk on the West Focus Study Area routes and four Species at Risk on the Booster Pumping Station Sitting Area locations were identified to potentially occur within the Study Areas based on available suitable habitat. Species-specific surveys targeting these species are recommended once the preferred alternative is identified along with further consultation with the Ministry of the Environment, Conservation and Parks. If any Species at Risk is identified during these surveys, Ministry of the Environment, Conservation and Parks should be consulted with to determine appropriate mitigation and avoidance measures as well as any permitting requirements.

All proposed routes cross waterbodies that directly support fish and contain fish habitat. In-water work may be required for each route depending on the crossing methodology employed. Mitigation measures will be implemented to avoid or minimize the potential for harm to fish, or harmful alteration, disruption or destruction of fish habitat. Where such harm cannot be avoided, an Authorization from Fisheries Canada (DFO) under the Fisheries Act may be needed. Trenchless crossing methods are recommended for detail design.

Designated natural areas include Provincially Significant Wetlands, Locally Significant Wetlands, Areas of Natural and Scientific Interests, significant wildlife habitat and significant woodlands that receive protection under the Provincial Policy Statement and other legislation and may be identified by the planning authorities (e.g., province, municipality, conservation authority). Several designated natural areas were identified through the background information review.

Two provincially significant wetlands were identified within the East Focus Study Area, including the Thamesville Conservation Club Wetland Complex and the Skunk's Misery Wetland Complex.

Significant woodlands are present throughout both the East and West Focus Study Areas, and within 120 metres of all east and west alternative watermain routes.

The Natural Environment Inventory Report is provided in **Appendix B.2.**

6. Provincial and Municipal Planning Context

6.1 Provincial Policy Statement

The 2020 Provincial Policy Statement[1] (PPS) provides policy direction on matters of provincial interest related to land use planning and development. As a key part of Ontario's policy-led planning system, the PPS sets the policy foundation for regulating the development and use of land. It provides for appropriate development while protecting resources of provincial interest, public health and safety, and the quality of the natural environment.

Key policies relevant to this project include the following:

- 1.6: Infrastructure and Public Service Facilities;
- 1.8: Energy Conservation, Air Quality and Climate Change;
- 2.1: Wise Use and Management of Resources, Natural Heritage;
- 2.2: Wise Use and Management of Resources, Water; and
- 2.6: Wise Use and Management of Resources, Cultural Heritage and Archaeology.

Relevance to Study: Investment in water servicing infrastructure within the Study Area for a project of this nature, will have regard for the range of planning objectives of the PPS. In addition, project design will consider and address impacts involving natural heritage, cultural heritage, water resources and climate change.

6.2 Municipality of Chatham-Kent Official Plan

The Municipality of Chatham-Kent Official Plan outlines the general policies for future land use and planning goals, that guides future development. This Class EA has regard for and complies with the following relevant policies:

Section 2.4.8 Water Servicing

Section 4.3-4.4 Natural Heritage

Section 5.3 Heritage Resource Policies

Section 7.1.2 Growth Management

Relevance to the Study: This MCEA has been conducted with regard to the policies of the Chatham-Kent Official Plan.

1 *Provincial Policy Statement. Ontario Ministry of Municipal Affairs and Housing, 2020.*

6.3 Climate Change

The Ministry's guide "Consideration of Climate Change in Environmental Assessments in Ontario" was finalized in October 2017 and, therefore, the MECP requires that all MCEAs consider this within the scope of the project. Two approaches for consideration and addressing climate change in project planning include:

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

Relevance to the Study: Climate change impacts were considered when evaluating all alternatives from a construction, energy use, and extreme weather events perspective.

6.4 Source Water Protection

Section A.2.10.6 of the MCEA document directs proponents, including the Municipality of Chatham-Kent to consider Source Water Protection (SWP) in the context of the *Clean Water Act* (CWA). Projects proposed within a SWP vulnerable area are required to consider policies in the applicable Source Protection Plan (SPP), including their impact with respect to the project. A watershed based SPP contains policies to reduce existing and future threats to drinking water in order to safeguard human health through addressing activities that have the potential to impact municipal drinking water systems.

The Thames - Sydenham & Region Drinking Water Source Protection Plan is the relevant SPP for this project and contains policies that address current and potential threats to municipal drinking water supply.

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

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

Relevance to Study: The relevance of the policies of the SPP has been considered in this study. There are no IPZs or WHPA's within or adjacent to the Study Area, however,

the Study Area is within and adjacent to SGRA and HVA's. These factors were considered during the evaluation of alternatives. Some of the locations considered for evaluation are within Source water Protection Areas. Potential contamination for fuel storage and fueling vehicles during construction and runoff from the proposed new roadway were considered during the evaluation. Although these are designated as a vulnerable area, there are no significant, moderate or low drinking water quality threats associated with this project and runoff from the road will be directed away from the vulnerable areas.

6.5 Lower Thames Valley Conservation Authority Policies

The study areas are located within the Lower Thames Valley Conservation Authority (LTVCA) jurisdiction.

Ontario Regulation 152/06 is the local regulation for the LTVCA watershed. This regulation fulfils the general purpose of ensuring public safety and preventing property damage and social disruption, due to natural hazards such as flooding and erosion within regulated areas.

Relevance to Study: The preferred servicing strategy may require a permit from LTVCA.

6.6 CK PUC Water/Wastewater Master Plan Update

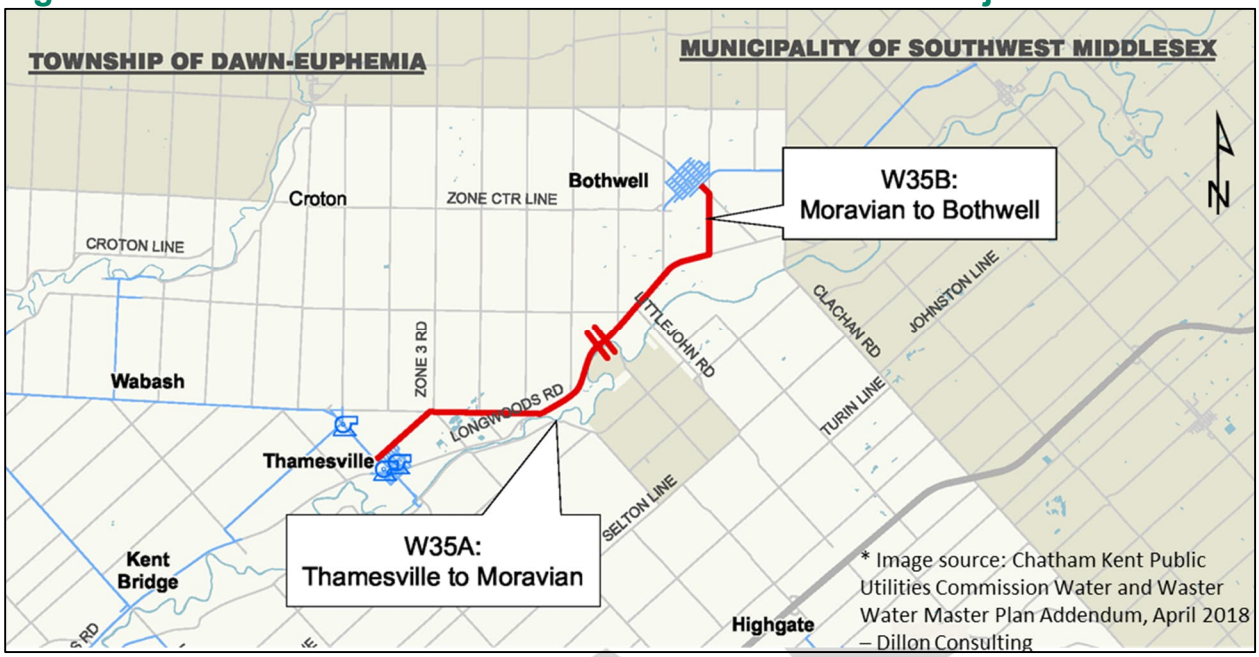
The 2018 CK PUC Water and Wastewater Master Plan update identified water servicing projects to meet the current and future needs of Chatham-Kent . The Master Plan recommended the following Northeast Water Distributions System Projects.

- Project W35A- Thamesville to Moraviantown (Delaware Nation) Watermain
- Project W35B – Moraviantown (Delaware Nation) to Bothwell Watermain

Refer to **Figure 6-1**.

Relevance to the Study: The water masterplan was completed at a broad level and this Schedule B MCEA is required to review and confirm the water servicing requirements and to find the best routes/alignments for the recommended projects including pumping and storage requirements.

Figure 6-1: 2018 Water/Wastewater Master Plan NEWDS Projects



7. East of Thamesville Focused Study Area Servicing Strategies

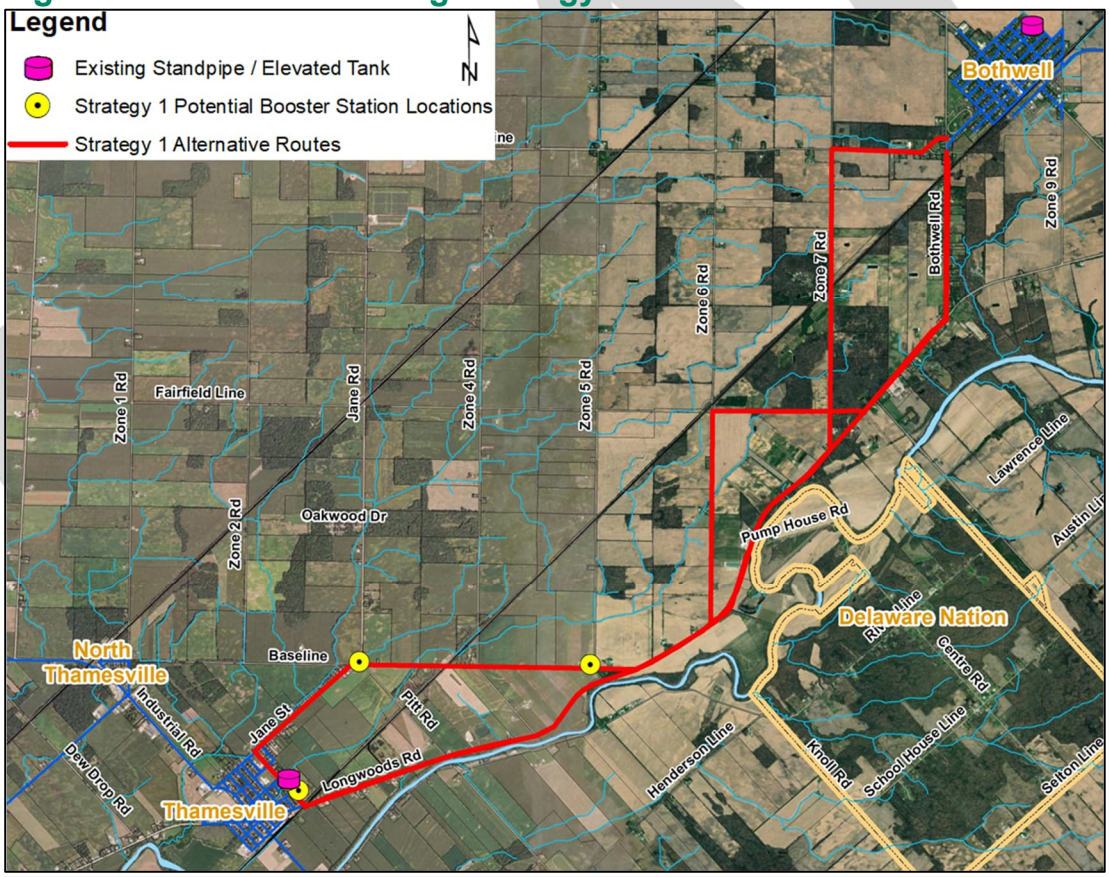
7.1 Identification of the East Side Servicing Strategies

There are two servicing strategies being considered to address the Problem and Opportunity Statement identified in **Section 4** of this report for the east side of Thamesville focused study area. Each servicing strategy involves multiple watermain routing alternatives to be evaluated.

Servicing Strategy 1:

This strategy involves the construction of a new booster pumping station in the Thamesville area and using the existing 2.3ML Standpipe located in the east end of Thamesville (Ferguson Park). This strategy also explores the requirement to rehabilitate or replace (in the same location) the existing standpipe in the near future. **Figure 7-1** shows all of the potential routing alternatives and Booster Pump Station locations for Strategy 1.

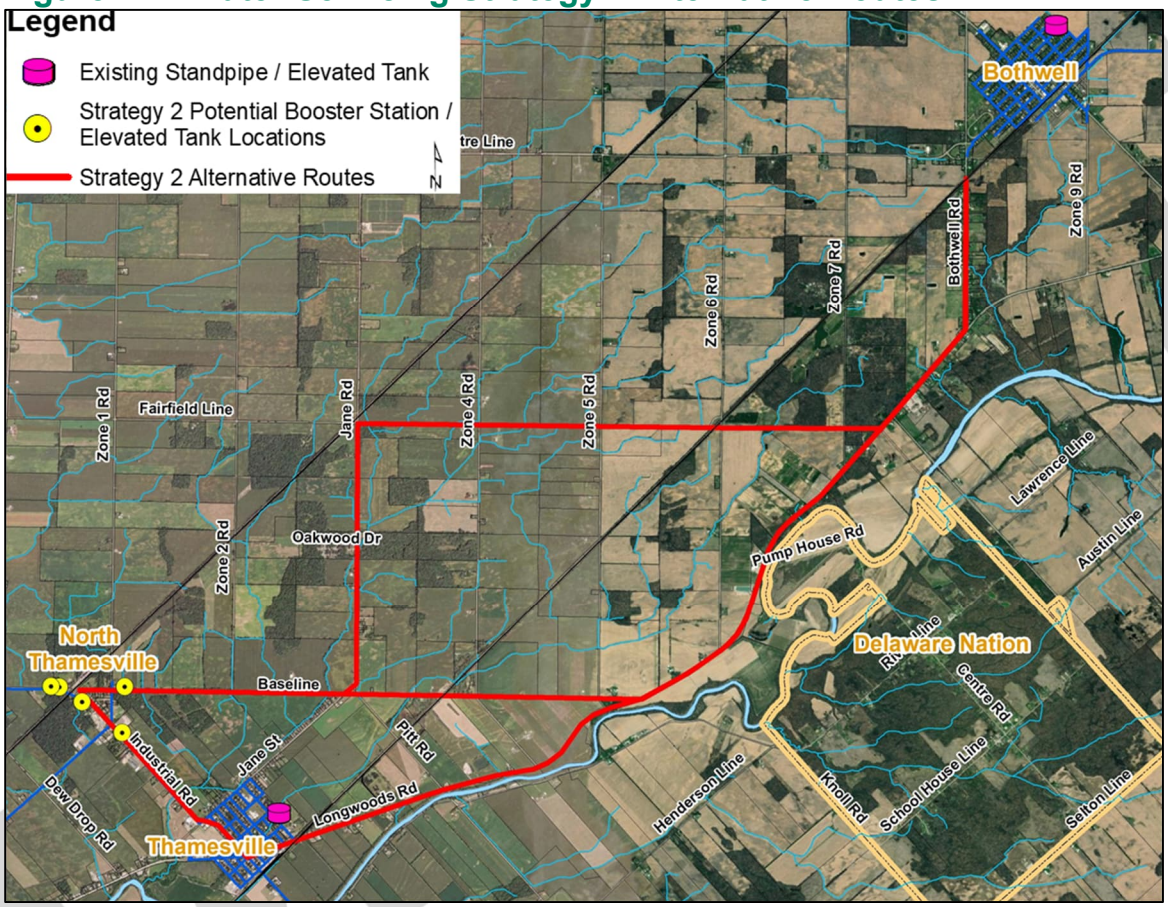
Figure 7-1: Water Servicing Strategy 1 Alternative Routes



Servicing Strategy 2:

This strategy involves the construction of a new booster pumping station and 2.3ML elevated tank in the North Thamesville to replace the existing standpipe in Thamesville. **Figure 7-2** shows all of the potential routing alternatives and Booster Pump station locations for Strategy 2.

Figure 7-2: Water Servicing Strategy 2 Alternative Routes



7.2 Screening of East Side Focused Study Area Servicing Strategies

To choose the preferred servicing strategy the following set of screening criteria was used:

- Hydraulic performance;
- Ability to provide water servicing to future greenhouses west of Thamesville;
- Land acquisition requirements; and
- Opportunity to provide water to new customers.

After screening against the above criteria, it was determined that Servicing Strategy 1 is preferred. The reasons are:

- Provides the best water pressure;
- Does not require a new location for an elevated tank with higher top water level than the existing Thamesville standpipe;
- Provides increased fire protection for Thamesville;
- Provides potential service connections to properties that front the future watermain; and
- Has the opportunity to provide increased water supply west of Thamesville to service future and proposed developments including greenhouses.

8. Identification of East Side Focused Study Area – Alternative Watermain Routes

8.1 Alternative Watermain Routes

There are three (3) potential routes that the watermain can follow to provide water servicing the east side of Thamesville focus area. Refer to **Figures 8-1 to 8-3** for each routing alternative.

- **Alternative Route E1** – Follows Longwoods Road from Thamesville to West Bothwell Road;
- **Alternative Route E2** – Follows Longwoods Road from Thamesville to Zone Road 7 and then east to West Bothwell Road;
- **Alternative Route E3** – Follows Jane Street from Thamesville to Baseline and east to Longwoods Road. The route then follows Zone Road 6 to Fairfield Line and east to Longwoods road. From there the watermain extends northeast to West Bothwell Road.

Figure 8-1: Alternative Route E1

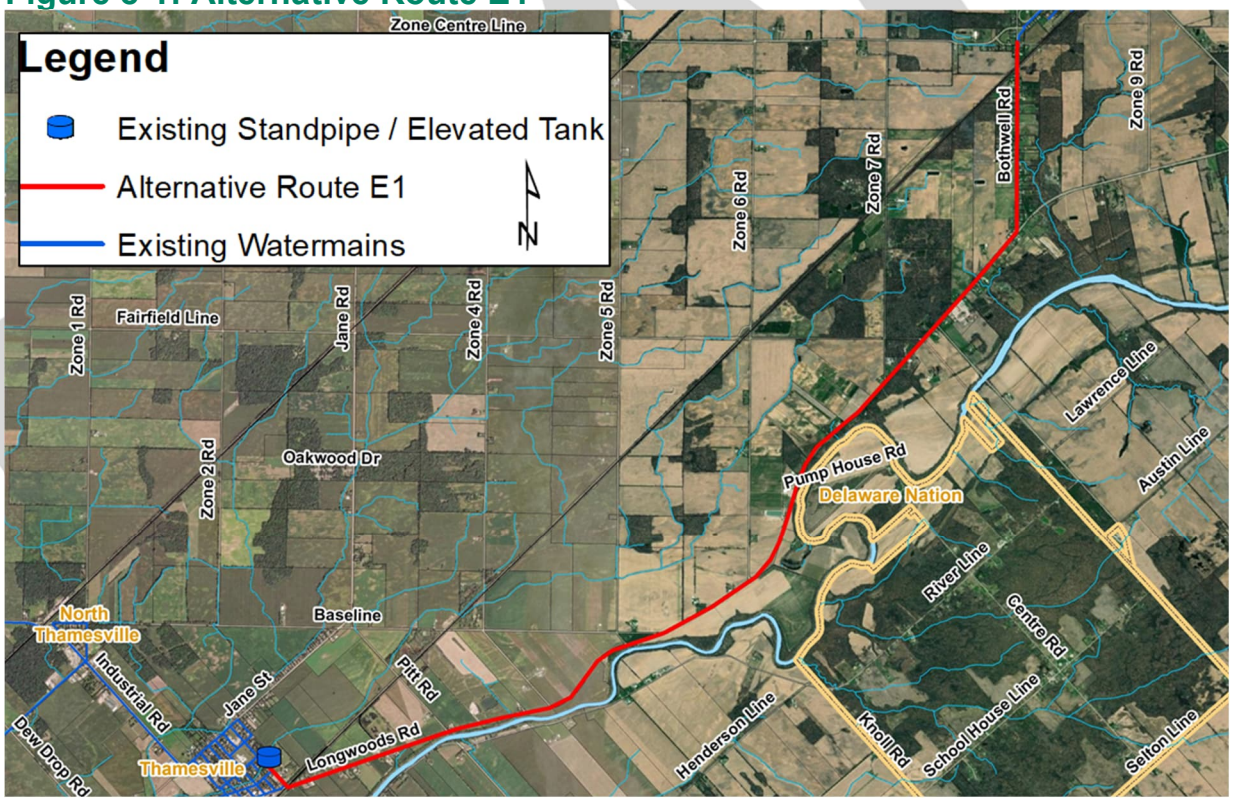
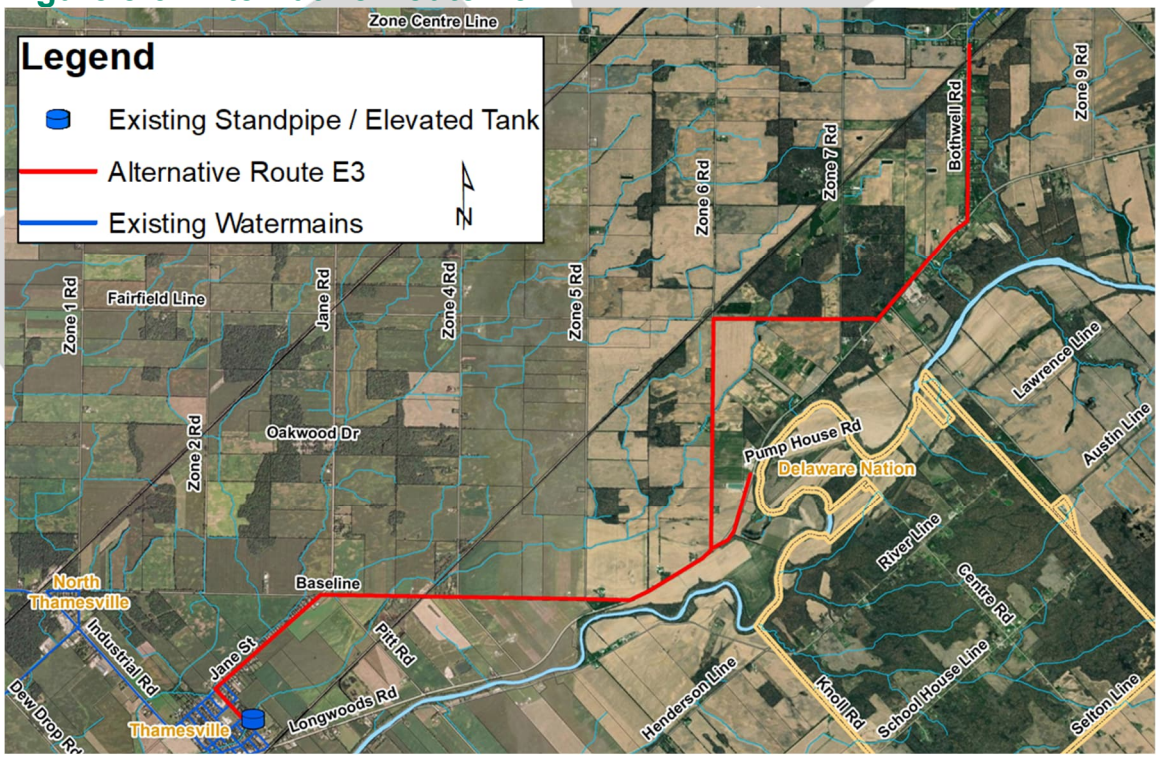


Figure 8-2: Alternative Route E2

Figure 8-3: Alternative Route E3



8.2 Evaluation Criteria

In order to evaluate the routing alternatives for the East side of Thamesville focused study area, a set of criteria were chosen which are categorized as follows in **Table 8-1.**

Table 8-1: Evaluation Criteria

Environmental Factor	Criteria
Land Use	Conformance with approved local, county and provincial plans and Policies. Potential effects on existing and approved / planned land uses.
Technical	Ability to meet long-term water servicing requirements including flow, pressure and fire flow for the servicing area. Constructability
Natural Environment	Potential effects of terrestrial species and habitat Potential effects on aquatic species and habitat Potential effects on Species at Risk (SAR) Potential effects on surface water and groundwater Potential to encounter soil and water contamination Potential for project to impact climate change and for climate to impact the project
Socio-Economic	Potential effects (noise, vibration, dust, access to property) related to residences, agricultural, businesses and traveling public during construction and operation
Cultural Environment	Potential effects on archaeological resources Potential effects to built heritage resources and cultural heritage landscapes
Cost	Cost of construction Cost of operations / maintenance.

8.3 Evaluation of East Side Focussed Study Area Watermain Routes

A detailed qualitative assessment of each watermain routing alternative was completed based on the previously described evaluation components and criteria. In this evaluation approach, trade-offs consider the advantages and disadvantages of each option to address the problem and opportunity statement with the least environmental effects and the most technical benefits which forms the rationale for the identification of the preferred watermain routing alternative.

Each evaluation category was evaluated based on the following scoring system. Low impact is considered a preferred solution compared to moderate or high impact.

8.3.1 Preferred East Side Focussed Study Area Watermain Route

Based on the criteria and methodology applied as part of the evaluation process, the preferred alternative is **Alternative E3**. This route avoids the Thames Riverbank erosion and stability issues on the west end of Longwoods Road while still providing a connection point to the Delaware Nation community. This route also provides approximately 96 potential new water connections to existing properties. A full evaluation matrix for the East Side Focused Study Area Watermain Routes is provided in **Table 8-2**.

Table 8-2 – Evaluation of Intersection Improvements Design Concepts

Category	Criteria	Alternative Route E1	Alternative Route E2	Alternative Route E3
Socio Economic	**Land Use**	Low Impacts as work will stay within the limits of the existing right of way.	Low Impacts as work will stay within the limits of the existing right of way.	Low Impacts as work will stay within the limits of the existing right of way.
	Noise, Dust, Vibration, and access to property during construction.	Low to moderate Impacts as much of the route is rural causing disruption to a limited number of properties.	Low to moderate Impacts as much of the route is rural causing disruption to a limited number of properties.	Low to moderate Impacts as much of the route is rural causing disruption to a limited number of properties.
Technical	**Ability to meet long term water servicing requirements.**	Low to Moderate Impact. Provides potential water connections to approximately 90 properties.	Moderate Impact/Least Preferred. Provides potential water connections to approximately 80 properties.	Low Impact/Most Preferred. Provides potential water connections to approximately 98 properties.
	Constructability	High Impact. Route follows sections of the Thames Riverbank erosion and stability areas. More complex design requirements may be required.	High Impact. Route follows sections of the Thames Riverbank erosion and stability areas. More complex design requirements may be required.	Least Impact. Avoids the Thames Riverbank erosion and stability areas, protecting the watermain. Less complex design requirements.
Natural Heritage	**Impacts to Aquatic Environment**	Moderate Impact. No water crossings but runs adjacent to the Thames River at multiple locations along the route.	Moderate to High Impact. Two water crossings and runs adjacent to the Thames River at multiple locations along the route.	Moderate Impact. Two minor water crossings and avoids the Thames River.
	Impacts to Terrestrial Environment	Low Impact. Entire Route is within the existing right of way with limited impacts to Terrestrial Environment.	Low Impact. Entire Route is within the existing right of way with limited impacts to Terrestrial Environment.	Low Impact. Entire Route is within the existing right of way with limited impacts to Terrestrial Environment.
	Impacts to Species at Risk	Low Impact. No impacts to SAR.	Low Impact. No impacts to SAR.	Low Impact. No impacts to SAR.
	Source Water Protection	Low Impact. Route is within an HVA and SGRA. There are no significant, moderate or low drinking water quality threats.	Low Impact. Route is within an HVA and SGRA. There are no significant, moderate or low drinking water quality threats.	Low Impact. Route is within an HVA and SGRA. There are no significant, moderate or low drinking water quality threats.
	Climate Change	Low Impact. Watermain will be equally impacted by climate change trends such as extreme precipitation and heat	Low Impact. Watermain will be equally impacted by climate change trends such as extreme precipitation and heat	Low Impact. Watermain will be equally impacted by climate change trends such as extreme precipitation and heat
		No carbon sequestration capacity reduction due little or no vegetation removal	No carbon sequestration capacity reduction due little or no vegetation removal	No carbon sequestration capacity reduction due little or no vegetation removal
		Low Impact. Equal impacts for all routes.	Low Impact. Equal impacts for all routes.	Low Impact. Equal impacts for all routes.

Table 8-2 – Evaluation of Intersection Improvements Design Concepts

Category	Criteria	Alternative Route E1	Alternative Route E2	Alternative Route E3
	Potential to encounter soil and water contamination			
Cultural	**Potential effects on archaeological resources**	Low Impacts to archaeological resources.	Low Impacts to archaeological resources.	Low Impacts to archaeological resources.
	Potential effects to built heritage resources and cultural heritage landscapes	Low Impacts to cultural heritage resources and landscapes.	Low Impacts to cultural heritage resources and landscapes.	Low Impacts to cultural heritage resources and landscapes.
Economic and Financial	**Capital Costs (Design, Construction)**	High Capital costs. .	High Capital Costs.	High Capital Costs.
	Land Acquisition Costs	No Land acquisitions.	No Land acquisitions.	No Land acquisitions.
	Cost of Operations / maintenance	High Impact due to potential issues with bank stability along the Thames River and a need to replace/relocate should the riverbank undermine the watermain.	High Impact due to potential issues with bank stability along the Thames River and a need to replace/relocate should the riverbank undermine the watermain.	Low to Moderate impact.
		NOT RECOMMENDED	**NOT RECOMMENDED**	**RECOMMENDED**

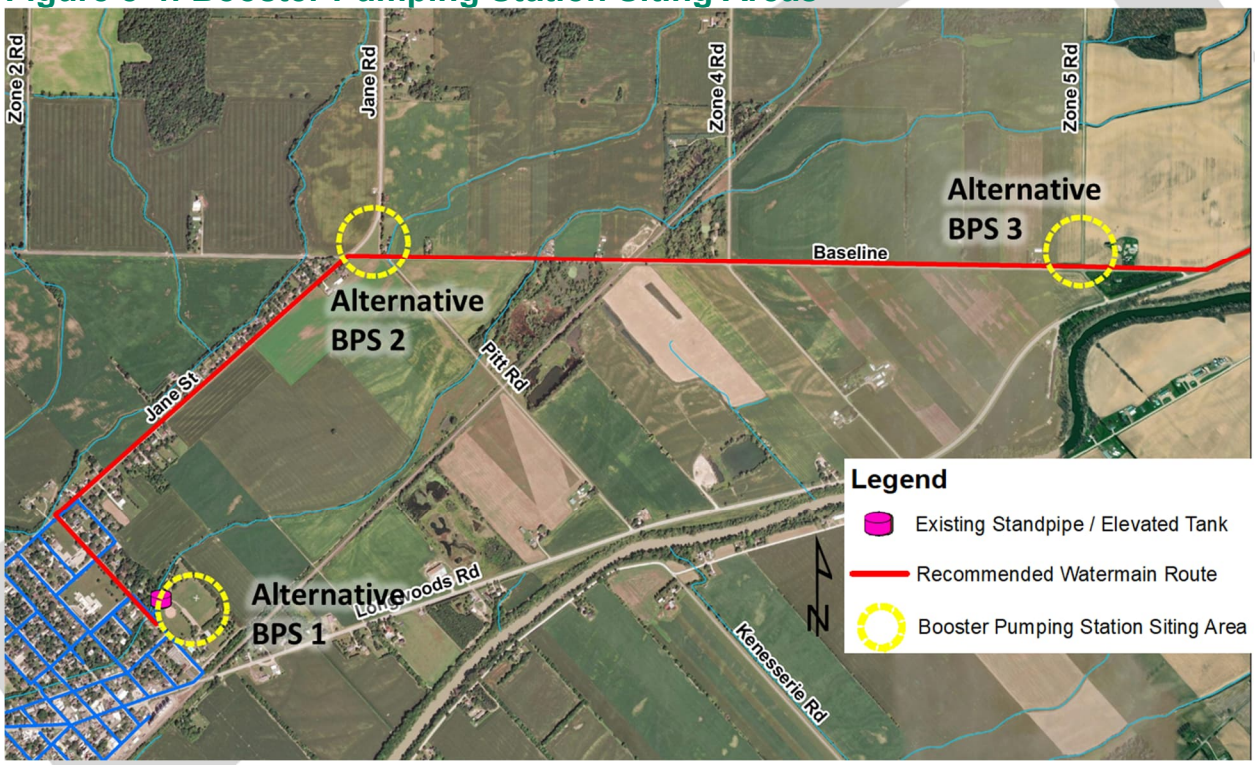
8.4 Identification of Booster Pumping Station Siting Areas

To provide adequate water pressure for the recommended watermain route and the northeast Chatham-Kent water distributions system, a new booster pumping station (BPS) is required. Three (3) potential locations for this booster pumping station were identified as follows:

- Alternative **BPS 1** – Located in Ferguson Park near the existing elevated tank;
- Alternative **BPS 2** – Located at the intersection of Jane Street and Baseline; and
- Alternative **BPS 3** – Located at the intersection of Zone Road 5 and Baseline.

Figure 8-4 illustrates the Booster Pumping Station Siting Areas.

Figure 8-4: Booster Pumping Station Siting Areas



8.4.1 Booster Pumping Station Siting Area Screening

The following siting guidelines were established to choose the preferred siting area for the booster pumping station:

- Strategically located at a suitable distance away from existing Thamesville Standpipe for optimizing the available pressure for existing and future customers; and
- Potential to use publicly owned land;

- Minimum site size 40mX40m (includes temporary construction working area).
- Good road access and proximity to Hydro; and
- Avoidance of displacing sensitive land uses such as residential properties, and significant natural heritage features.

After screening against the above criteria, it was determined that Alternative **BPS 3** was the preferred siting area. This location has adequate space to construct and operate a booster pumping station, does not disrupt or remove usable space from Ferguson Park, allows for more efficient system operation including less energy usage and avoids the need for a pressure reducing valve.

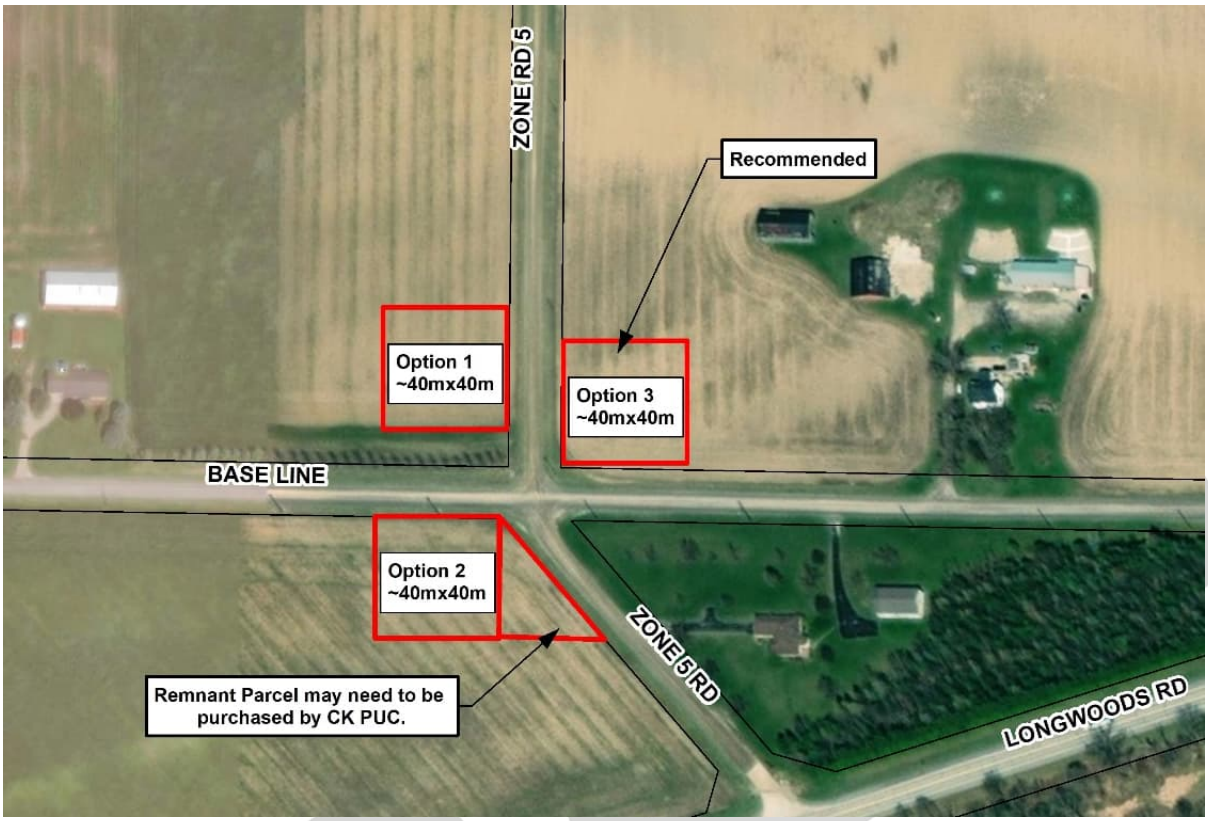
8.5 BPS 3 Siting Options and Screening

Three potential siting options were identified for the BPS3 siting area considering the previously described siting guidelines.

- **Option 1** – Located at the Northwest corner of Zone 5 Road and Baseline;
- **Option 2** – Located at the Southwest corner of Zone 5 Road and Baseline; and
- **Option 3** – Located at the Northeast corner of Zone 5 Road and Baseline.

Figure 8-5 illustrates the BPS 3 Siting Options.

Figure 8-5: Booster Pumping Station Siting Locations



After screening against the criteria outlined in **Section 8.4.1**, it was determined that **Option 3**, located at the northeast corner of Zone 5 Road and Baseline is the recommended location. This location avoids creating a small remnant area that would need to be purchased, is a large land parcel resulting in a large amount of viable remaining land for agricultural uses and is adjacent to existing hydro poles to supply power to the booster station. In addition to the above rationale for selecting Option 3 as the preferred site, this was the only location of the three with a willing host for the booster pumping station.

9. Identification of West Side Focused Study Area Alternative Watermain Routes

9.1 Alternative Watermain Routes

The Northeast Chatham-Kent area is experiencing growth in greenhouse development. To provide adequate water servicing to these proposed and future greenhouses new watermains need to be installed west of Thamesville. There are three (3) potential routes that the watermain can follow to provide water servicing to the west side of Thamesville focus area. Refer to **Figures 9-1 to 9-3** for each routing alternative.

- **Alternative Route W1** – Provides 2 new watermain connections to the existing watermain on Kent Bridge Road. A southerly east-west watermain following Longwoods Road connecting to Kent Bridge Road watermain and a northerly east-west watermain that follows Industrial Road to Baseline which then follows Wabash Line connecting to Kent Bridge Road watermain;
- **Alternative Route W2** – Provides 2 watermains connections to the existing watermain on Kent Bridge Road. A southern east-west watermain follows Evergreen Road to Huffs Side Road and then follows Huffs Side Road south to Longwoods Road connecting to Kent Bridge Road watermain. A northerly east-west watermain follows Industrial Road to Baseline which then follows Wabash Line connecting to Kent Bridge Road watermain;
- **Alternative Route W3** – Provides a watermain along Longwoods Road to Huff Sideroad. The watermain follows Huff Sideroad to Baseline then follows Wabash Line and connects to Kent Bridge Road watermain. Another watermain follows Smoke Line and connects to the existing Kent Bridge Road watermain.

Figure 9-1: Alternative Route W1

Figure 9-2: Alternative Route W2

Figure 9-3: Alternative Route W3

9.1.1 West Side Focused Study Area Alternative Watermain Route Screening

The west side service area is identified based on current and planned greenhouse development in relation to existing water distribution network and routing alignment opportunities. Available routing options area focused on existing road right of ways such as Longwoods Road, Huff Side Road, Baseline, Wabash Line, Evergreen Line, Smoke Line and Kent Bridge Road.

As such, the following siting guidelines were established to choose the recommended watermain routes for servicing the west side of Thamesville:

- Avoid routes where an existing watermain is in place;
- The proposed watermain shall be strategically located in the centre of the water distribution network and have the ability to service future greenhouse development that is not already in the planning stages; and
- Opportunity to improve level of service and security of supply in the event of an existing watermain break.

Based on the above siting guidelines and considerations the recommended route for the west side of Thamesville Focused Study Area **is Alternative W3**. The reasons are:

- is the shortest route and therefore the least expensive;
- is on roads that do not currently have watermains on them creating a preferred system redundancy; and
- can provide servicing to future greenhouses that are not already in the planning stage.

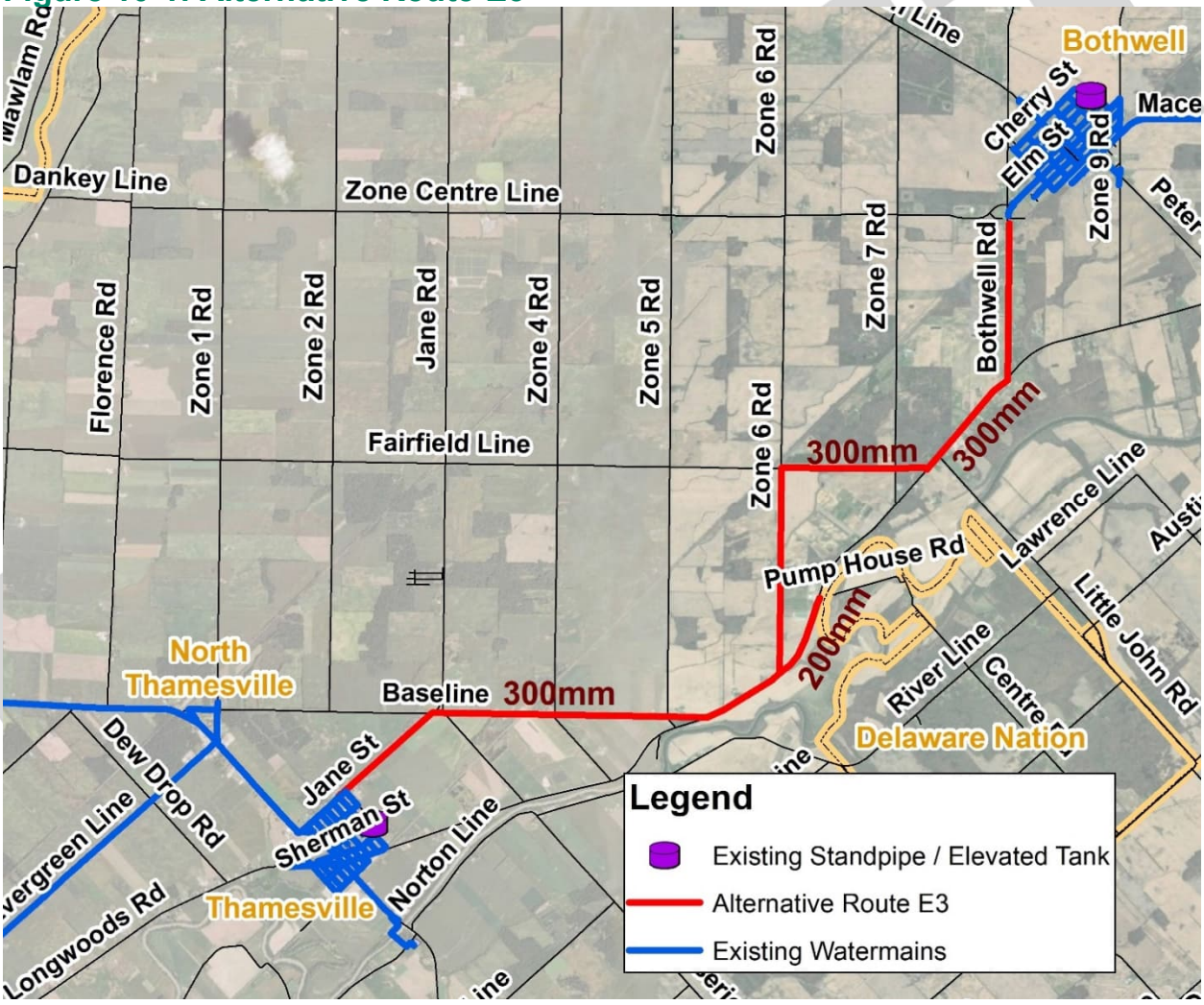
This alternative also provides potential new water connections to approximately 100 properties.

10. Recommended Alternative Project Descriptions

10.1 East Side Focus Area Project Description

Alternative Route E3 was identified as the recommended watermain route to service future growth east of Thamesville. The recommended pipe diameter for the entire length of this route would be 300mm, all installed within existing road right of ways. This route provides approximately 96 potential new water connections to existing properties. Refer to **Figure 10-1**

Figure 10-1: Alternative Route E3

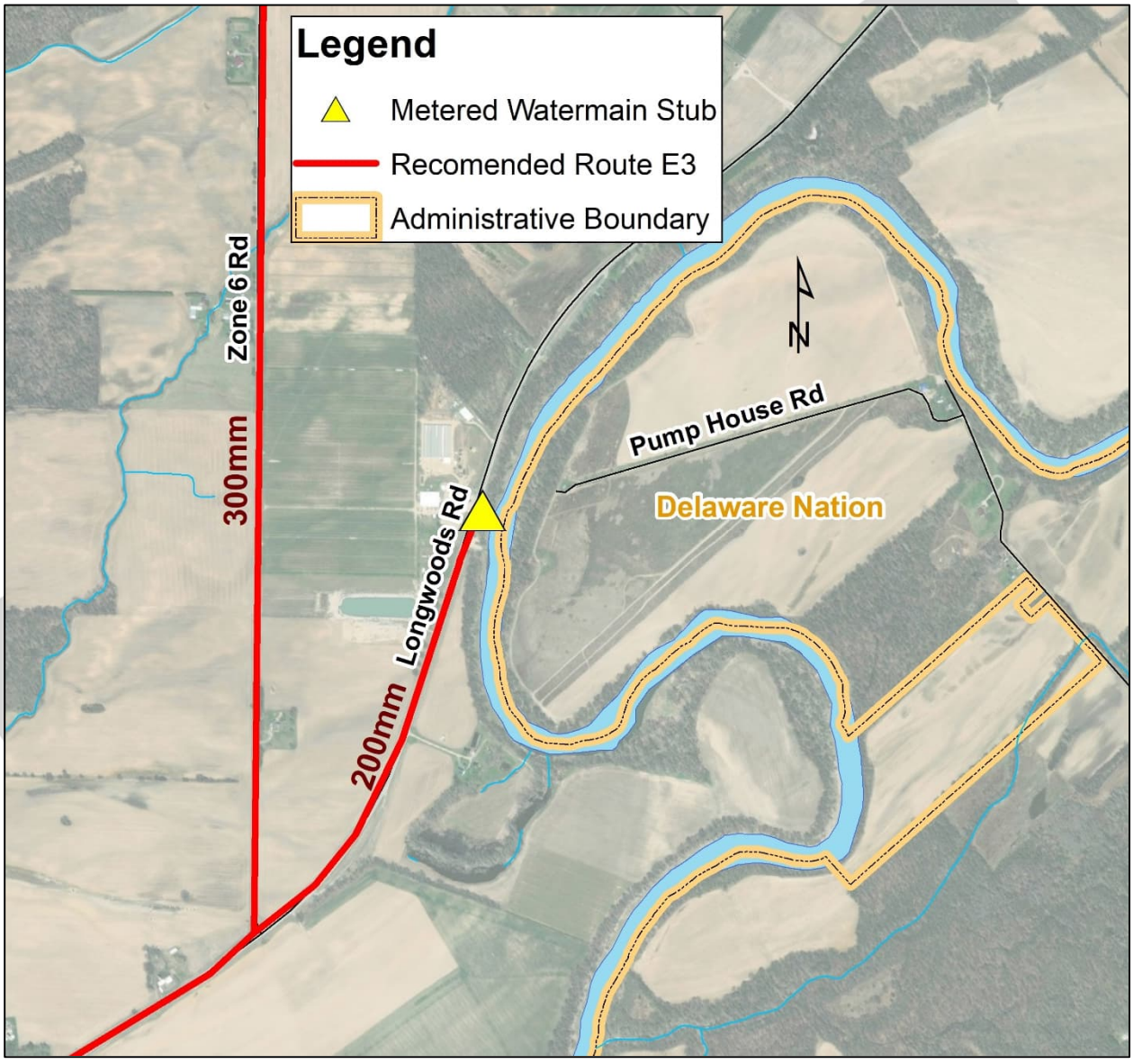


A 200mm watermain stub and water metre will be installed adjacent to Delaware Nation. Delaware Nation will complete their own engineering study to determine the tapping connection off the watermain installed by Chatham-Kent PUC. Refer to **Figure 10-2**.

In addition to the new 300mm watermain, a new Booster Pumping Station at the northeast corner of Zone 5 Road and Baseline will be constructed (**Figure 8-5**). This will require land acquisition/purchase from a private landowner.

The existing Thamesville Standpipe will be replaced with a new 2.3ML standpipe which will increase the top water levels and provide adequate pressures to Kent-Bridge. The Standpipe is in need of rehabilitation to increase its service lifecycle; however this replacement will provide a longer service life than rehabilitating the existing standpipe and will prove to be more cost-effective overtime.

Figure 10-2: Route E3 Project Description – Delaware Nation Connection



10.1.1 East Side Preliminary Cost Estimate

Table 10-1: East Side Preliminary Cost Estimate

Water Supply Scenario	Description	Total Cost
Initial Phase	Thamesville to 200mm Reducer	$7,200,000
	200mm Reducer to Delaware Nation Connection	$1,150,000
	Metered Connection/Chamber	$500,000
	New Booster Pump Station	$300,000
	Contingency and Engineering (30% and 15% above)	$5,332,5000
	Total Initial Phase	**$17,182,500**
Ultimate Scenario	200mm Reducer to Bothwell	$9,720,000
	Upgrade Booster Pump Station	$750,000
	Contingency and Engineering (30% and 15% above)	$4,711,500
Thamesville Standpipe	Replace 2.3ML Standpipe	**$5,000,000**
	Total Ultimate Scenario	**$20,181,500**

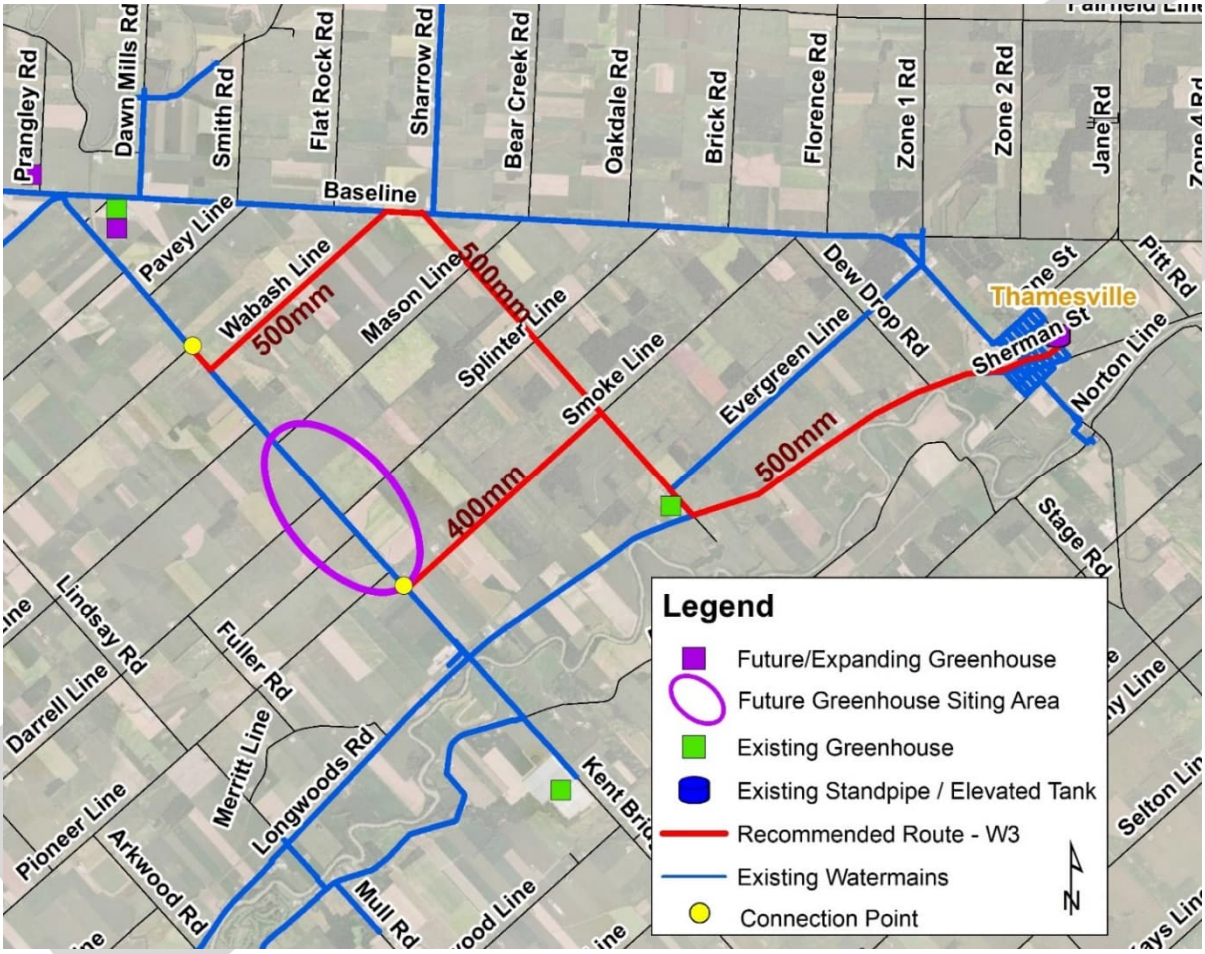
10.2 West Side Focus Area Project Description

Alternative Route W3 was identified as the recommended watermain route to service future growth west of Thamesville. The recommended pipe diameter for this route would be as follows:

- 500mm – Longwoods Road to Huff Side Road
- 500mm – Huff Side Road
- 400mm – Smoke Line

Figure 10-3 illustrates the proposed pipe diameters.

Figure 10-3: Alternative Route W3 Project Description



10.2.1 West Side Preliminary Cost Estimate

Table 10-2: West Side Preliminary Cost Estimate

Description	Total Cost
Longwoods Road to Wabash to Kent Bridge	$28,296,000

Description	Total Cost
Smoke Line	$5,110,000
Contingency and Engineering (30% and 15% above)	15,032,700
Total	**$48,438,700**

11. Permits and Approvals

11.1 Fisheries and Oceans Canada (DFO)

An assessment of harmful alteration, disruption or destruction to fish and fish habitat may be required for activities occurring near and/or below the high water mark of any fish bearing watercourse. In cases where harmful alteration, disruption or destruction cannot be avoided and/or mitigated or the scope of work cannot be covered under a Standard or Code of Practice, a Request for Review shall be submitted to DFO. If death of fish or harmful alteration, disruption or destruction to fish habitat is likely to result from project activities, an Authorization under the Fisheries Act will likely be required. Further assessment will be required at detailed design to determine DFO approval requirements.

11.2 Ministry of Environment Conservation and Parks

Authorization under the Endangered Species Act (ESA)may be required for Species as Risk if confirmed present and impacts to the individuals or habitat cannot be avoided. If the proposed activities cannot avoid impacting protected species and their habitats, then an application for authorization under the ESA will be required. If it is believed that the proposed activities are going to have an impact, then SAROntario.ca should be contacted to undergo a formal review under the ESA. Further assessment will be required at detailed design to determine if permitting under the ESA will be necessary.

11.2.1 MECP Endangered Species Act

Permitting under the ESA may be required if it is determined that there will be impacts to the natural areas located adjacent to the proposed routes. Further assessment will be required at detailed design to determine if permitting under the ESA will be necessary.

If the proposed activities cannot avoid impacting protected species and their habitats, then an application for authorization under the Endangered Species Act (ESA) will be required. If it is believed that the proposed activities are going to have an impact then SAROntario.ca should be contacted to undergo a formal review under the ESA.

11.2.2 MECP Amendment to Drinking Water License

An amendment to the CK PUC Drinking Water Works Permit will be required for all proposed works. This will be undertaken during detailed design.

11.3 Lower Thames Valley Conservation Authority (LTVCA)

In accordance with O.Reg 152/06, a Development Interference with Wetlands and Alteration to Watercourses and Shoreline Regulation permit (Section 28) will be required from LTVCA prior to construction within any regulated area. This will be confirmed at the detailed design stage.

11.4 Ministry of Heritage Sport Tourism and Culture Industries

Acceptance of the Stage 1 Archaeological Assessment will be necessary, and the completion of a Stage 2 Archaeological Assessment at detailed design will be required following acceptance by the ministry before construction begins on any undisturbed lands identified.

11.5 Ministry of Natural Resources (MNRF)

A Licence to Collect Fish for Scientific Purposes (LCFSP) permit will be required from MNRF to relocate fish from features providing fish habitat where an open-cut crossing method is proposed. This will be confirmed at the detailed design stage.

11.6 Municipality of Chatham-Kent Local Road Occupancy and Building Permits

Municipality of Chatham-Kent Public Works will be consulted during preliminary detailed design to confirm the need for Road Occupancy Permits to be issued for construction. A building permit will also be required for the new booster pumping station.

11.7 CN Rail

CN Rail will be consulted during preliminary detailed design to confirm scope and requirements for trenchless crossing of the tracks on Baseline.

12. Potential Impacts, Recommended Mitigation Measures and Commitments

12.1 Potential Impacts and Mitigation Measures

Based on the project descriptions in **Section 10**, it is recognized that watermain(s) and booster pumping station construction will result in some impact to the existing environment. In order to address the effects, the following approach was taken:

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

The following mitigation measures are recommended to ensure that any disturbances are managed by the best available methods. These measures will be further confirmed and developed during detailed design. **Table 12-1** provides assessments of the potential impacts associated with the project and the recommended mitigative measures required to reduce these effects.

Table 12-1: Impacts and Mitigation/Compensation or Enhancement

Potential Impact	Mitigation/Compensation or Enhancement Measure
Construction Near a Watercourse, Sediment and Erosion, Risk of Water Contamination, Effects on fish and fish habitat	Stock piled material will be stored at a safe distance (30m) from watercourses to ensure no deleterious substances enter the water. Spill prevention plan will be developed and adhered to. Refuelling will occur at least 30m away from the watercourse. All machinery and equipment will be in clean condition (free of fluid leaks).

Potential Impact	Mitigation/Compensation or Enhancement Measure
Open Cut water crossings (if required)	Avoid in water work during the appropriate timing restrictions for fish and mussel species. Minimize the time in-water by appropriately staging all equipment and materials to minimize disturbance to fish. Fish relocation should be completed immediately following the isolation of any wetted areas. Follow industry Best Management Practices for the placement of temporary fill within the watercourse.
Trenchless Water crossings (if required)	The drill path will be designed to an appropriate depth below the watercourse to minimize the risk of frac out and to a depth to reduce the risk of the line being exposed to scouring. Water crossings will be monitored for signs of surface migration of drilling mud during all phases of construction.
Sediment, Dust, and Erosion	Develop an Erosion and Sediment Plan during detailed design that would include installation of sediment and erosion control measures such as silt fencing and hay-bale check dams prior to construction activities. A non-chloride dust suppressant can be applied to areas of exposed soils to reduce or eliminate dust generation.
Excess Materials and waste	Construction activities involving the management of excess soil should be completed in accordance with O.Reg 406/19 and the MECP guidance document “rules for Soil Management and Excess Soil Quality Standards (2020) All construction waste must be disposed of in accordance with MECP requirements
Noise and Vibration	Construction operations to occur during day shift. Adhere to municipal noise by-laws, where possible. Use of low noise equipment during construction, where possible. Implement a vibration, noise and dust monitoring and response program along with limits.
Construction Equipment / Machinery Practices	Risk of impacts from construction machinery can be reduced or limited with machinery inspections and maintenance and by establishing areas away from natural heritage features that are dedicated to re-fuelling and storing machinery.

Potential Impact	Mitigation/Compensation or Enhancement Measure
	Refuelling should not occur within 30 m of a wetland, watercourse or drainage feature. Regular maintenance, cleaning and inspection of machinery. Adherence to the Clean Equipment Protocol for Industry (Halloran et al. 2013)
Construction Timing	Any vegetation clearing or significant species habitat clearing should occur outside of the breeding bird period (i.e. April 1 to August 31). If removal of vegetation is to occur during the breeding bird window, the area will be searched by a qualified ecologist for the presence of nesting birds to avoid contravening the Migratory Birds Convention Act. Clearing shall only be undertaken if the ecologist is satisfied that there are no breeding/nesting pairs within the affected area.
Disturbance to Wildlife	Restrict construction activities to daytime hours (sunrise to sunset). Restrict vegetation removal to periods before and after the bird nesting period of April 1st to August 31st.
Access to residences / businesses	Access to all residences and businesses should be maintained during construction. Traffic management plans will be part of detailed design.
Archaeology	Potential impacts to archaeological resources will be addressed through the completion of a Stage 2 archaeological assessment during the preliminary design phase. Delaware Nation will be notified prior to initiating the Stage 2 archaeological assessment to confirm their involvement in the assessment. If any archaeological and/or historical resources are discovered: Require contractor to halt work in the area of the discovery, until permitted to resume by the MHSTCI. Require contract administration to notify the MHSTCI (Archaeological Unit) of the discovery. If human remains are identified all work will halt until the proper authorities have been notified.

12.2 Climate Change

Climate change is now being integrated into infrastructure planning and design, as a way of building more resilient and robust systems. Incorporating sustainability and resiliency early on in the decision-making process provides a level of flexibility to allow for changes in ***future weather and climate uncertainty*** into the project design.

Climate change trends across Ontario show that temperatures are increasing across all seasons, precipitation patterns are changing, and extreme weather events are becoming more intense and frequent. Planning to account for these changes in historical averages, as well as shorter-term more extreme events, is challenging but essential.

12.2.1 Potential Construction Effects

The planning and design of new water infrastructure should take into consideration key factors and climate change trends, such as building to withstand extreme precipitation and extreme heat. These climate events will impact the physical infrastructure.

Impacts of climate change on water systems are already visible and include:

- Infrastructure damage due to flooding, winter storms and road washouts; and
- Increased potential for damage to infrastructure due to higher temperatures and freeze thaw cycles.

During construction, water infrastructure proposed should be as climate ready as possible. Potential effects to consider include the greenhouse gas (GHG) emissions associated with the construction period including the physical machinery and equipment, travel distance and time for construction workers to get to and from the site, and the sourcing of building materials as well as energy efficiency related to booster pumping station pumping.

12.3 MCEA Commitments

The above future permitting approvals and mitigation measures form EA commitments that will be subject to the design and construction phases.

12.4 Proposed Construction Monitoring

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

During detailed design, a surface water related monitoring program will be established, specified, and implemented before the construction initiation of any water crossing to establish baseline conditions and to track any changes to the environmental conditions during construction. The monitoring program and trenchless crossing plan will be shared with the Ministry of Environment Conservation and Parks once they are developed.

12.5 Post Construction Monitoring

Following construction, the new watermains and pumping station are not expected to result in any negative impacts. Post construction monitoring will be required following construction to ensure that any disturbances have been properly restored (e.g. grading, seeding and planting). Post construction monitoring details will be developed during detailed design.

13. Conclusions and Next Steps

The MCEA Project File Report outlines the process required to ensure that the proposed recommended solutions to the problem and opportunity statement meet the requirements of the *EAA*. The MCEA planning process has not identified any significant environmental concerns that cannot be addressed by incorporating established mitigation measures during construction.

The proposed projects resolve the problem and opportunity statement identified in this report. A preliminary evaluation of potential impacts has been included in the evaluation, which indicates minor and predictable impacts that can be addressed by recommended mitigation measures as presented in **Section 12**. The proposed mitigation measures will further be developed at the detailed design stage and will form commitments that will be adhered to by the Chatham-Kent Public Utilities Commission. Appropriate public notification and opportunity for comment was provided and no comments were received that could not adequately be addressed. Subject to receiving MCEA clearance following the 30-day review period, the CK PUC can start the detailed design and permitting-approvals phase and proceed to construction as outlined in this report.

Appendix A

A.1 Notice of Commencement

Chatham Kent Public Utilities Commission
Municipal Class Environmental Assessment
for the North-East Chatham-Kent
Water Distribution System

NOTICE OF STUDY COMMENCEMENT

The Study

The Chatham-Kent Public Utilities Commission (CK PUC) has initiated a Municipal Class Environmental Assessment (MCEA) study for the North-East (NE) Chatham-Kent Water Distribution System (WDS). The CK PUC is responsible for the treatment and delivery of safe drinking water and currently supplies water to a population of approximately 89,000 within the Municipality of Chatham-Kent.

This MCEA study will review and confirm municipal water servicing requirements and identify capital project upgrades required for the NE Chatham Kent WDS in order to provide sustainable municipal water and accommodate near and long term future growth demands. Specific to this study, the MCEA will look at siting new watermains, pumping and storage facilities in the Thamesville / Dresden / Bothwell area, in addition to supplying municipal water to the Delaware Nation at Moraviantown.

The Process

The MCEA study will be following the Schedule "B" planning process as per the Municipal Engineers Association's MCEA manual (October 2000, as amended in 2007, 2011 and 2015), which is approved under the Ontario Environmental Assessment Act. A Project File documenting the MCEA process will be available for public review at the end of the study.

How to Get Involved

Public input is essential to this study. The CK PUC invites anyone with an interest in the study to have an opportunity to provide feedback and help inform the decision-making process. Two Public Information Centres (PICs) will be held over the course of the study. The first PIC will be to introduce the study and present the NE Chatham-Kent WDS constraints and opportunities, potential solutions, and evaluation criteria. The second PIC will present the recommended municipal water servicing strategy, including associated capital projects. Advance notification will be provided prior to each PIC.

If you have comments, require further information or would like to be added to the study's mailing list to receive future notifications, please contact either:

Ali Akl, P.Eng
Project Engineer
Chatham-Kent Public Utilities Commission
Municipality of Chatham - Kent
325 Grand Ave East
Chatham, ON N7L 1W9
alia@chatham-kent.ca
(226)-312-2023 ext. 4347

Paul Adams, CPT
Environmental Planner
AECOM Canada Ltd.
250 York Street, Suite 410
London, Ontario N6A 6K2
Paul.Adams2@aecom.com
(519)-636-6448

This notice first issued on August 3rd, 2021

With the exception of personal information, all comments will become part of the public record of the Study. The Study is being conducted according to the requirements of the Municipal Class Environmental Assessment, which is a planning process approved under Ontario's Environmental Assessment Act.

Appendix A

A.2 PIC #1

Chatham Kent Public Utilities Commission
Municipal Class Environmental Assessment for the Northeast Chatham Kent Water Distribution System

NOTICE OF PUBLIC INFORMATION CENTRE #1

Background

The Chatham-Kent Public Utilities Commission (CK PUC) has initiated a Municipal Class Environmental Assessment (MCEA) study for the North-East (NE) Chatham Kent Water Distribution System (WDS). The CK PUC is responsible for the treatment and delivery of safe drinking water and currently supplies water to a population of approximately 89,000 within the Municipality of Chatham-Kent.

This MCEA study will review and confirm municipal water servicing requirements and identify capital project upgrades required for the NE Chatham Kent WDS in order to provide sustainable municipal water and accommodate near and long-term future growth demands. Specific to this study, the MCEA will look at siting new watermains, pumping and storage facilities in the Thamesville / Dresden / Bothwell area, in addition to supplying municipal water to the Delaware Nation at Moraviantown.

Public Information Centre #1

A Public Information Centre (PIC) will be held for the study to present the Problem and Opportunity Statement, background information collected, a review of the servicing strategies being evaluated and the project timeline.

In order to comply with social distancing requirements for COVID-19, the CK PUC will be holding an online PIC. This PIC will have materials available starting on November 30th, 2021 and will be available for the duration of the study. To access the PIC materials please visit the Chatham Kent 'Lets Talk' (https://www.letstalkchatham-kent.ca/) project page at the following address:

https://www.letstalkchatham-kent.ca/north-east-ne-chatham-kent-water-distribution-system-municipal-class-ea-mcea

How to Get Involved

Public input is essential to this study. The CK PUC invites anyone with an interest in the study to have an opportunity to provide feedback and help inform the decision-making process. A second PIC is scheduled for April 2022 and will present the recommended municipal water servicing strategy, including associated capital projects.

If you have comments, require further information or would like to be added to the study's mailing list to receive future notifications, please contact either:

Ali Akl, P.Eng
Project Engineer
Chatham-Kent Public Utilities Commission
Municipality of Chatham Kent
325 Grand Ave East
Chatham, ON N7L 1W9
alia@chatham-kent.ca
(226)-312-2023 ext. 4347

Paul Adams, CPT
Environmental Planner
AECOM Canada Ltd.
250 York Street, Suite 410
London, Ontario N6A 6K2
Paul.Adams2@aecom.com
(519)-636-6448

This notice first issued on November 17th, 2021

With the exception of personal information, all comments will become part of the public record of the Study. The Study is being conducted according to the requirements of the Municipal Class Environmental Assessment, which is a planning process approved under Ontario's Environmental Assessment Act.

WELCOME

Municipality of Chatham Kent
Public Utilities Commission

Chatham-Kent Public Utilities Commission

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Northeast Chatham-Kent Water Distribution Municipal Environmental Assessment
Online Public Information Centre #1(PIC#1)

Municipal Class Environmental Assessment
Schedule 'B'

This is an online PIC that is replacing a traditional face-to-face Public Information Centre due to COVID-19 restrictions.

This PIC will be made available on the Chatham Kent 'Lets Talk' Website for the entire duration of the project.

Comment Period for PIC#1 ends on December 15th, 2021.

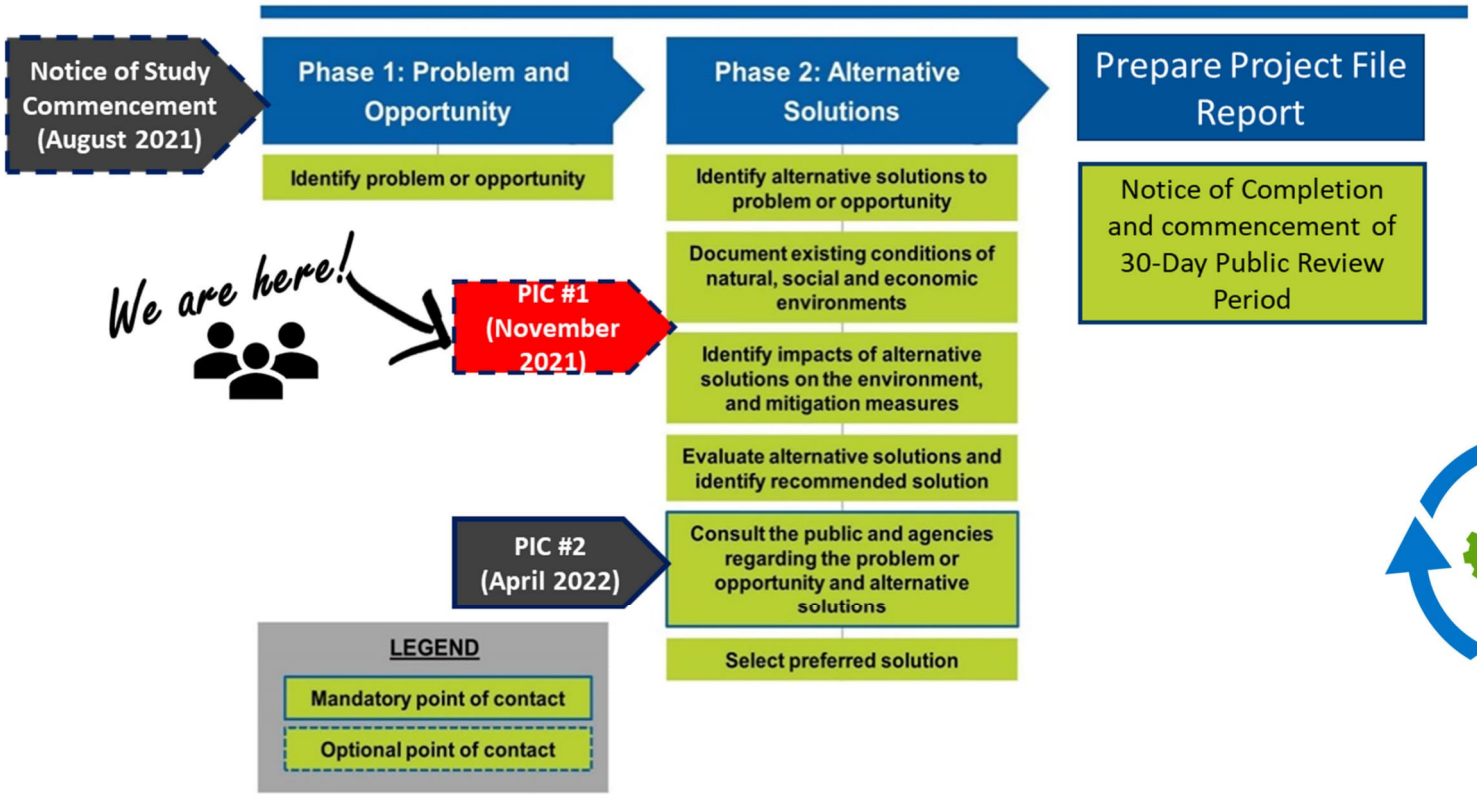
November 30th, 2021

Public Information Centre #1 (PIC#1) Purpose

- Introduce the Project.
- Present the Background Information Collected to date.
- Provide an Overview of the Municipal Class Environmental Assessment Process.
- Describe the Problem and Opportunity Statement.
- Describe the Servicing Strategies being evaluated to address the problem and opportunity statement.
- Present the Evaluation Criteria.
- Describe the next steps in the process.
- Solicit Public/Stakeholder/Agency Feedback

Municipal Class Environmental Assessment (MCEA) Process

- All municipalities in Ontario are required by the provisions of the *Environmental Assessment Act* (EAA) to follow the MCEA process.
- This project is following the MCEA Schedule B MCEA process, which follows Phases 1 and 2



Project Background

- The Chatham Kent Public Utilities Commission (CK PUC)) is responsible for the treatment and delivery of safe drinking water, as well as the collection and treatment of wastewater.
- The CK PUC provides municipal water and sewer services to a population of approximately 89,000 within the single tier Municipality of Chatham-Kent.

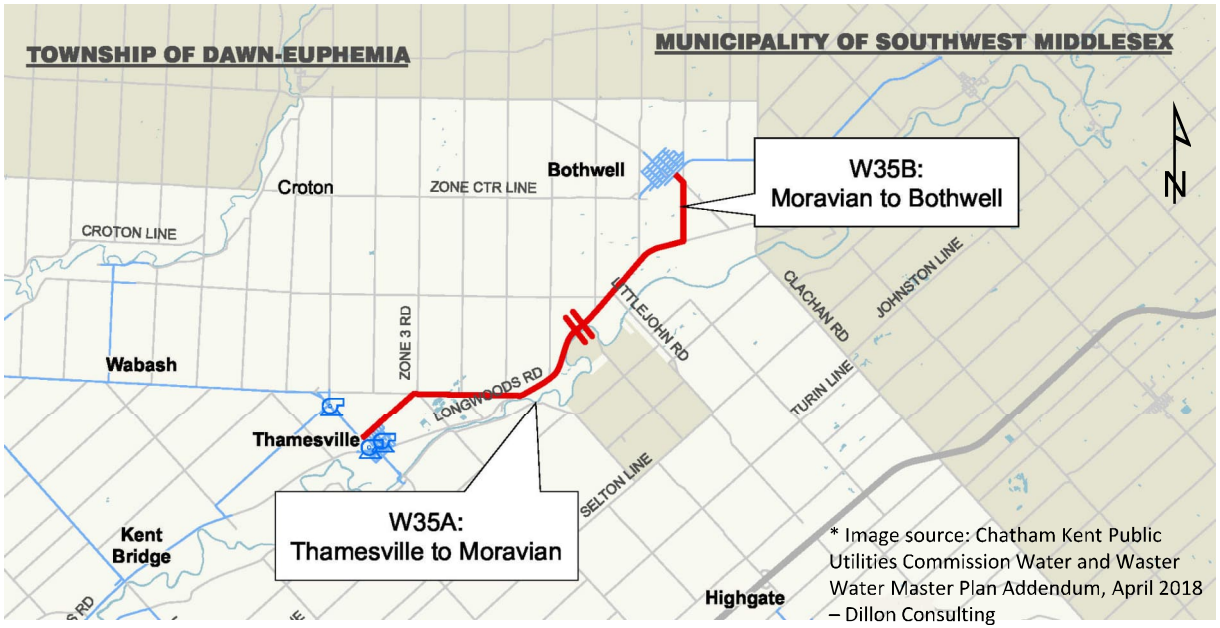
- The Community of Bothwell currently receives water from the Tri-County water supply system.
- For water servicing the CK PUC currently operates:
  - 5 water treatment plants with distribution systems
  - 1 stand alone water distribution system (Bothwell)
  - Approximately 1,710 km of water mains, 3,321 hydrants and 39,636 water customer connections
  - 10 elevated water tanks
  - 9 reservoirs

Project Background

In 2018 the CK PUC completed a Water/Wastewater Servicing Master Plan which identified water servicing projects to meet the current and future needs of Chatham Kent. The Master Plan Recommended the following Northeast Water Distribution System Projects:

- **Project W35A** – Thamesville to Moroaviantown Watermain:
  - Provide an 8.4 km, 250mm diameter watermain from Thamesville to Moravian of the Thames First Nation (Delaware First Nation)
- **Project W35B** – Moraviantown to Bothwell Watermain:
  - Provide a 7.6km, 250 mm diameter watermain from Delaware First Nation to Bothwell.

- In 2021, the CK PUC initiated the Northeast Chatham Kent Water Distribution System Municipal Class Environmental Assessment to review and confirm the water servicing requirements and to find the best routes/alignments for the recommended watermains and required pumping and storage facilities.
- These projects may change Bothwells water supply from the Tri-County System to the CK-PUC water supply system.



Problem and Opportunity Statement

The Problem and Opportunity Statement is the principal starting point of a MCEA and becomes the central theme and integrating element of the project. It also assists in setting the scope of the project.

Problem:

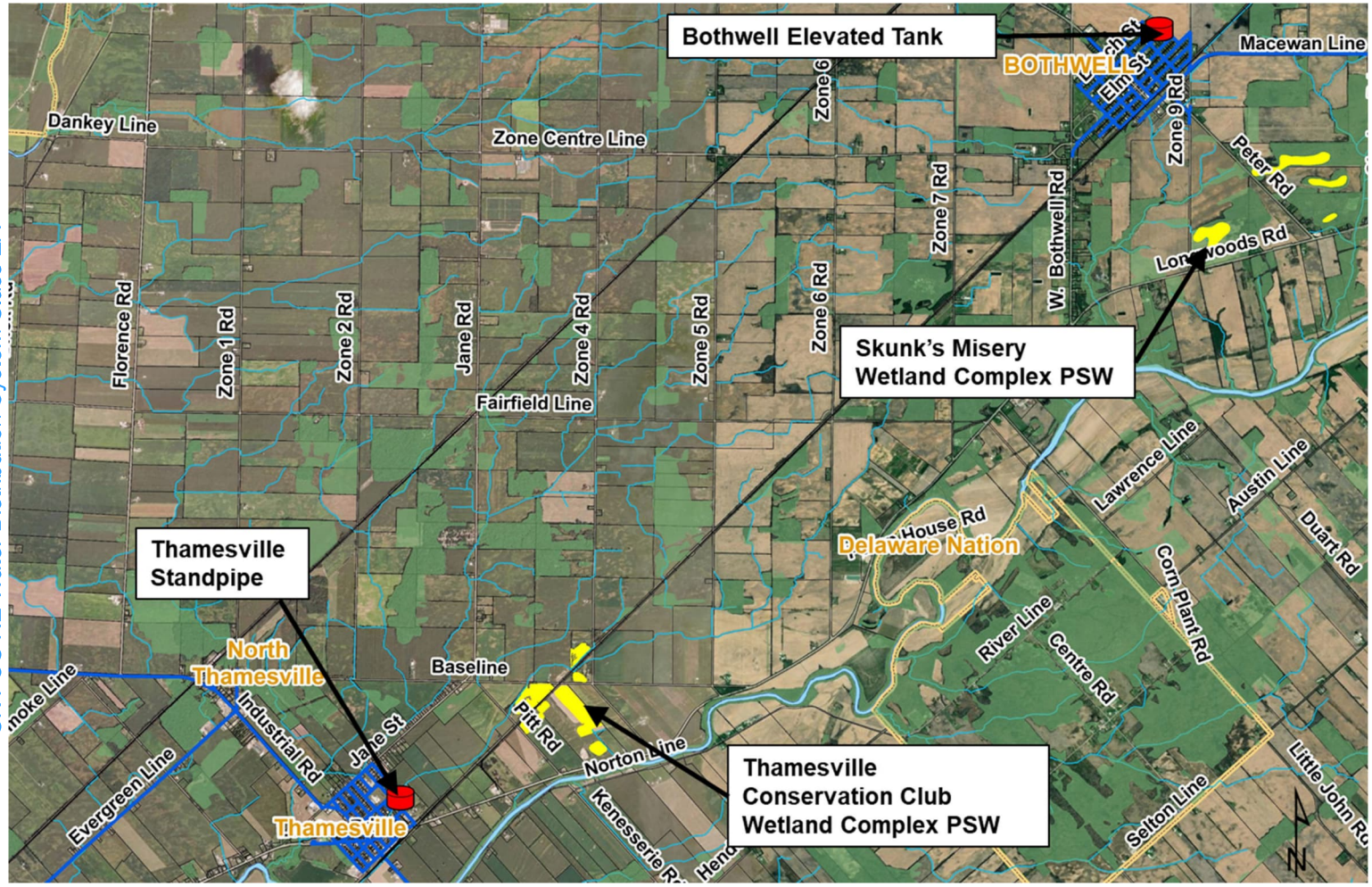
- Water is supplied to the Northeast part of Chatham Kent by the Chatham Water Treatment Plant. The distribution system in the Northeast dose not have the capacity for future growth outside of its current service area.
- There has been increasing demand/enquiries from potential greenhouse developers and farmers for increased water supplies to the Northeast region.
- Delaware Nation has looked at options of receiving municipal water from CK-PUC .
- Low pressures in this region make expanding the water system difficult to accomplish.
- The existing Thamesville standpipe is aging and nearing the end of its service life, requiring a rehabilitation or replacement in the near future.

Problem and Opportunity Statement

Opportunity – The MCEA process provides the CK PUC the opportunity to:

- Develop and assess a range of water servicing strategies to provide sustainable water to Northeast Chatham Kent to accommodate near and long-term future growth demands while also providing reliable municipal water to the Delaware Nation community.
- Additional revenue from new customers will assist with the capital and operating costs that will provide a safe water supply to customers.
- Develop a capital works plan that will support future infrastructure planning and budgeting.
- Consult the public, Indigenous Communities, agencies and solicit feedback to select the best strategy for the future.

Study Area and Existing Conditions

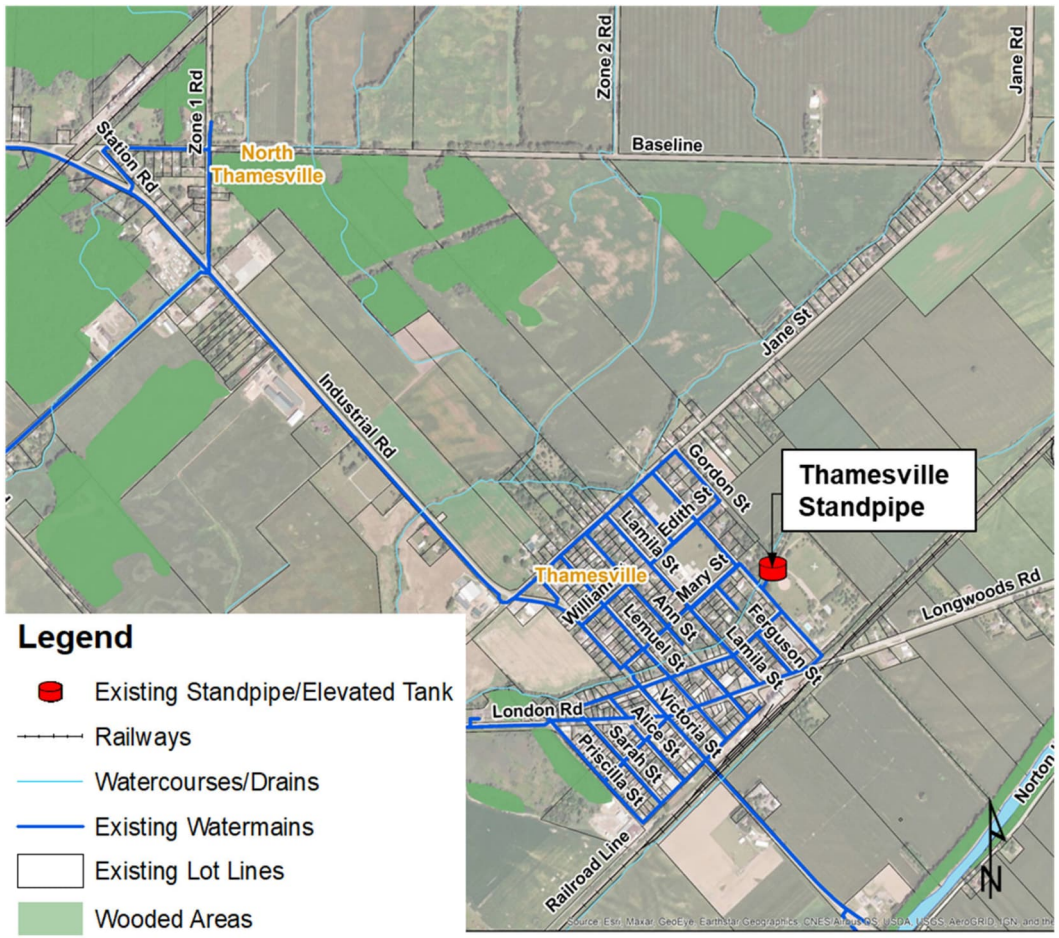


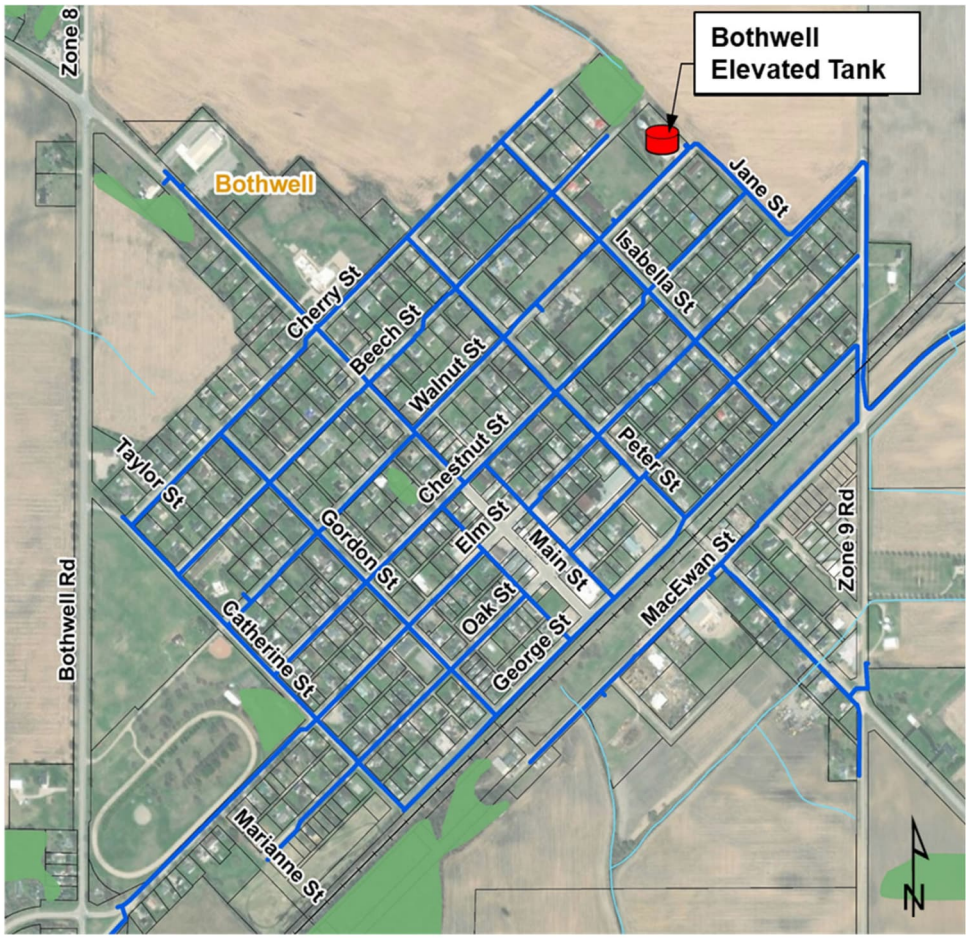
Legend

- Existing Standpipe/Elevated Tank
- Railways
- Watercourses/Drains
- Existing Watermains
- Existing Lot Lines
- Provincially Significant Wetland (PSW)
- Wooded Areas
- Municipal Boundaries

*See Board 9 for a Zoomed in view of Bothwell and Thamesville / North Thamesville

Study Area Overview and Existing Conditions





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CK PUC NE Water Distribution System Class EA

Overview of Existing Conditions

Natural Heritage

- Natural Heritage features within 120 m of the Study Area include the following:
  - Watercourses: Thames River and several drains.
  - Wetlands: Skunk's Misery Wetland Complex Provincially Significant Wetland (PSW) and Thamesville Conservation Club Wetland Complex PSW.
  - Several woodlands are also present.

- Candidate Significant Wildlife habitats identified based on desktop review within the Study Area include:
  - Seasonal Concentration Areas of Animals such as Bat Maternity Colonies and Turtle Wintering Areas.
  - Specialized Habitats of Wildlife considered Significant Wildlife Habitat (SWH) including but not limited to Turtle Nesting Areas and Amphibian Breeding Habitat (Woodland & Wetlands).
  - Habitats of Species of Special Concern (SOCC) including but not limited to Eastern Wood-Pewee, Wood Thrush and Snapping Turtle.
- Potentially suitable habitats for several Species at Risk were identified in the Study Area, including but not limited to Bat SAR (Eastern small-footed myotis, Little Brown Myotis, Northern Myotis and Tricolored bat), Bobolink, Eastern Meadowlark, Barn Swallow, Spiny Softshell and several fish (Black Redhorse, Eastern Sand Darter, Lake Sturgeon, Northern Madtom) and mussel SAR (Fawnsfoot, Kidneyshell, Rayed Bean, Round Pigtoe, Salamander Mussel, Threehorn Wartyback).


Eastern Meadowlark

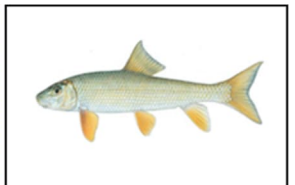

Barn Swallow


Bobolink


Spiny Softshell


Eastern Small-footed Myotis


Eastern Sand Darter


Black Redhorse

Overview of Existing Conditions

Archaeology

- A Stage 1 Archaeological Assessment is being completed to document the archaeological and land use history within the study area.
- The final Stage 1 Archaeological Assessment will provide recommendations regarding cultural heritage value or interest and mitigation strategies.
- 32 archaeological sites have been identified with 1km of the study area boundaries.
- Due to the study areas proximity to the Thames River and the review of historical context a Stage 2 Archaeological Assessment is recommended for all undisturbed areas within the study area where a watermain or pumping/storage facility will be located.

Cultural Heritage

- Cultural Heritage Resources will be identified through the process outlined in the Ministry of Heritage, Sport Tourism, and Cultural Industries (MHSTCI) Criteria for Evaluation Potential for Built Heritage Resources and Cultural Heritage Landscapes.
- A Cultural Heritage Report: Existing Conditions (CHR) may also be undertaken to identify municipally, provincially, and federally recognized properties, as well as to identify potential cultural heritage resources or properties within, or adjacent to the Project Construction Area(s), in order to evaluate the potential impacts that infrastructure may have on cultural heritage resources.

Alternative Water Servicing Strategies

There are two Serving Strategies being considered to address the Problem and Opportunity Statement. Each strategy involves multiple Routing Alternatives (Thamesville Area to Bothwell) to be evaluated:

Strategy 1 – New Thamesville Booster Pumping Station using the Existing 2.3 ML Standpipe Located in the East End of Thamesville in Ferguson Park

This option will also explore the requirement to rehabilitate or replace the existing standpipe in the near future.

Water Servicing Strategy 1 - New Thamesville Booster Pumping Station and Existing Standpipe Located in the East End of Thamesville in Ferguson Park

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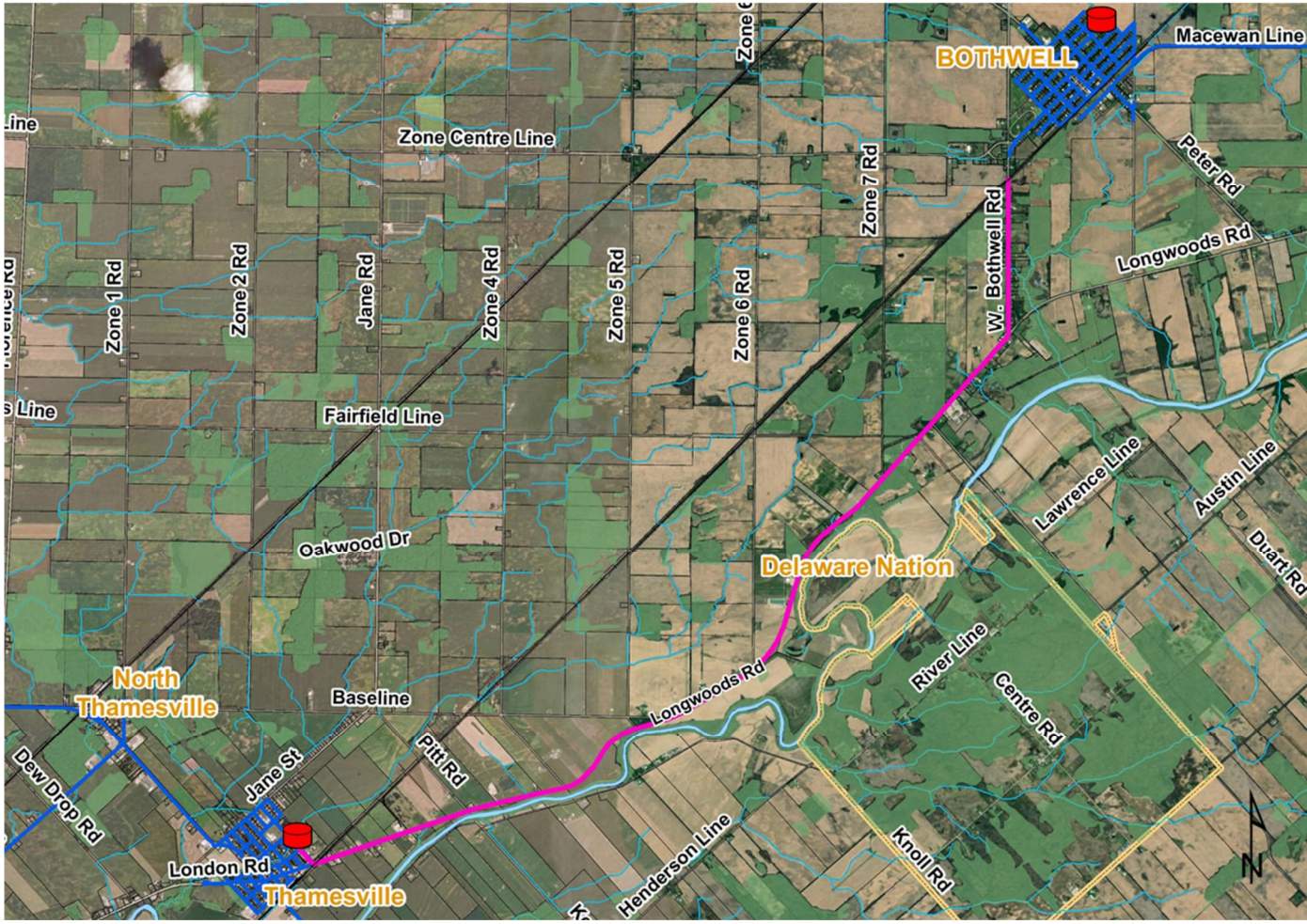
Alternative Route 1 – Longwoods Road to West Bothwell Road

- Approximate Watermain Length = 11km
- Approximately 95 Properties for potential new water connection



Legend

- Existing Standpipe / Elevated Tank
- Railways
- Watercourses/Drains
- Existing Watermains
- Strategy 1 Alternative Route 1
- Existing Lot Lines
- Municipal Boundaries

Water Servicing Strategy 1 - New Thamesville Booster Pumping Station and Existing Standpipe Located in the East End of Thamesville in Ferguson Park

Chatham-Kent Public Utilities Commission

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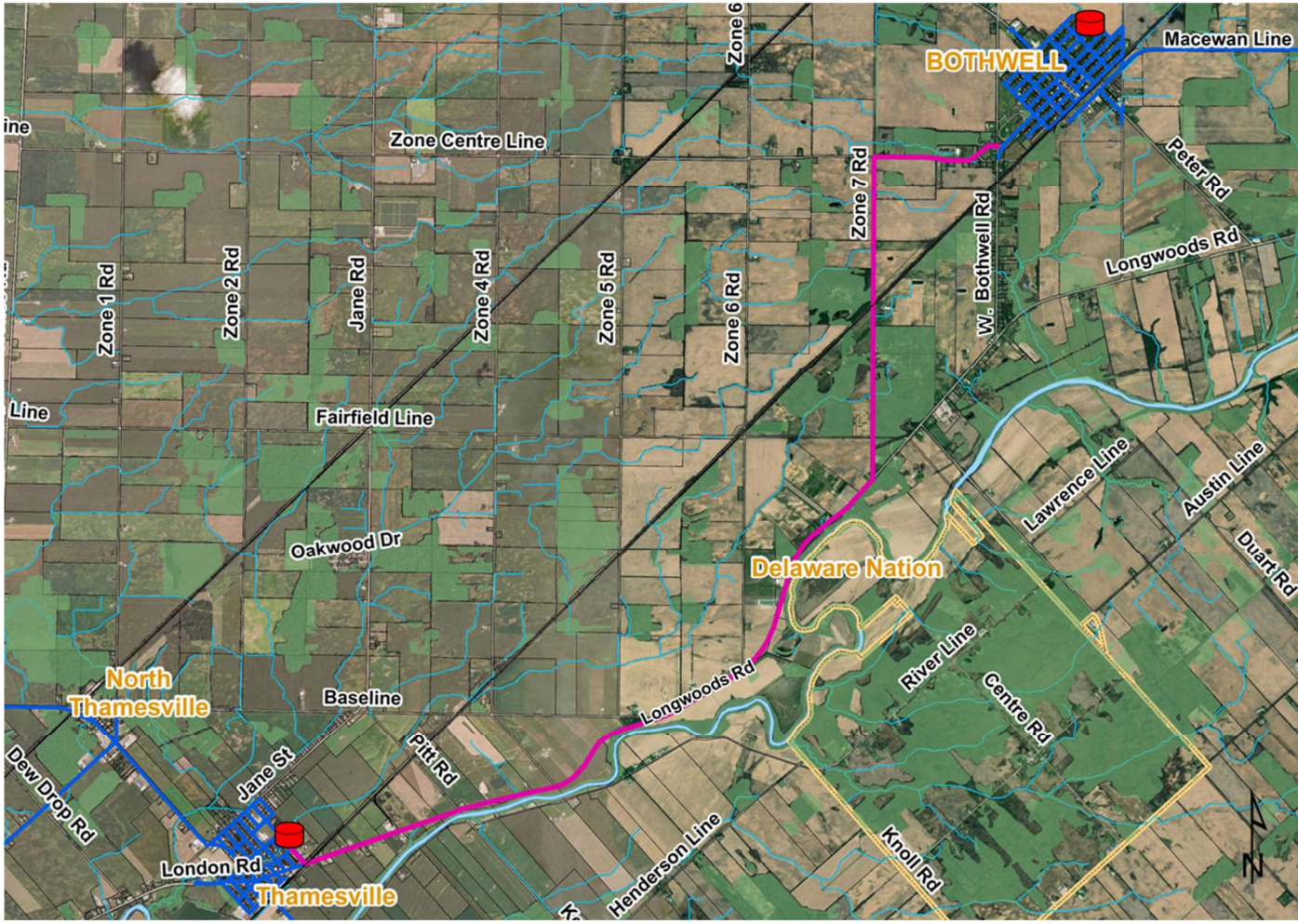
Alternative Route 2 – Longwoods Road to 7 Zone Road

- Approximate Watermain Length = 13km
- Approximately 80 Properties for potential new water connection

Legend

- Existing Standpipe / Elevated Tank
- Railways
- Watercourses/Drains
- Existing Watermains
- Strategy 1 Alternative Route 2
- Existing Lot Lines
- Municipal Boundaries



Water Servicing Strategy 1 - New Thamesville Booster Pumping Station and Existing Standpipe Located in the East End of Thamesville in Ferguson Park

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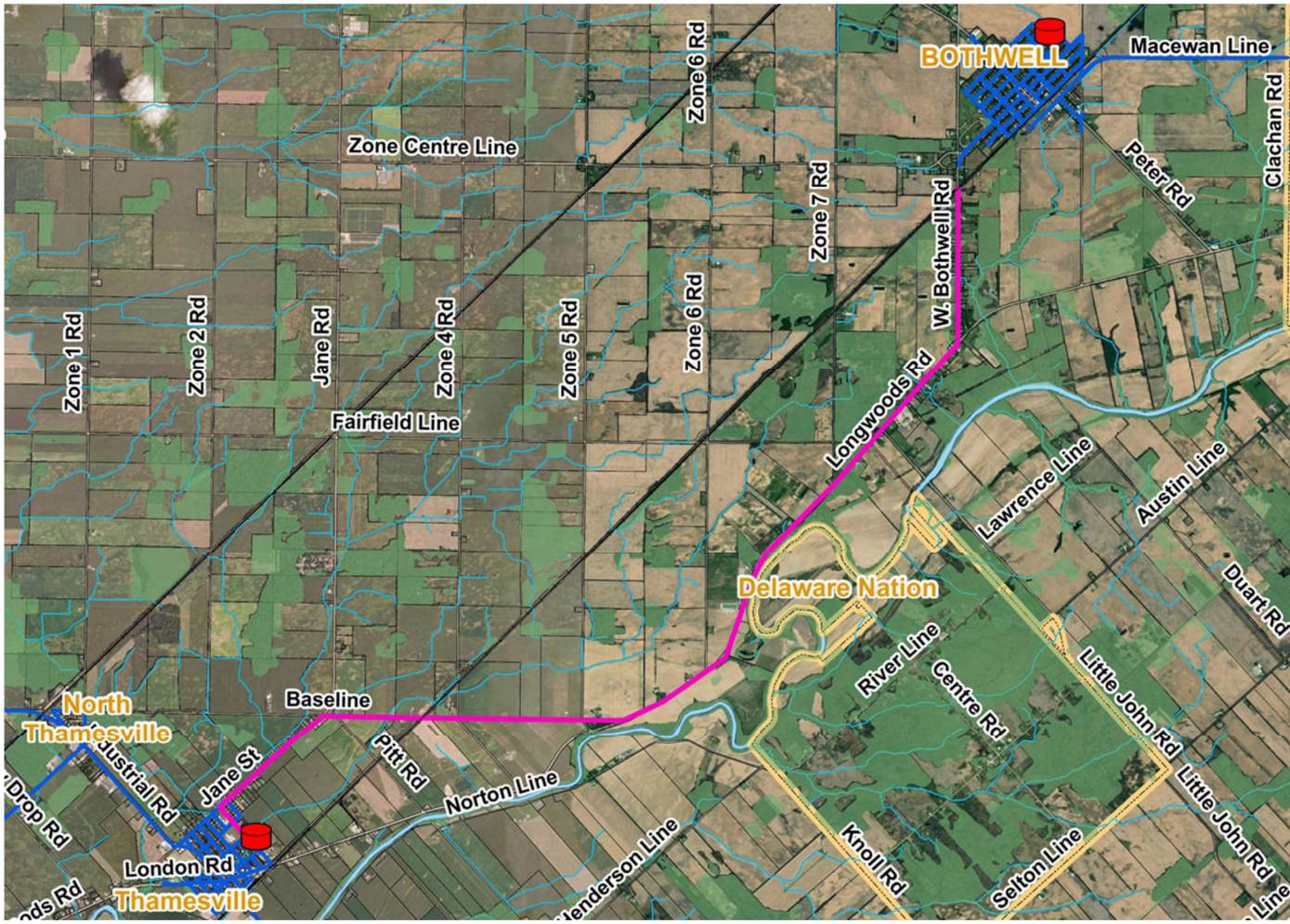
Alternative Route 3 – Jane Street to Baseline to Longwoods Road to West Bothwell Road

- Approximate Watermain Length = 13km
- Approximately 95 Properties for potential new water connection



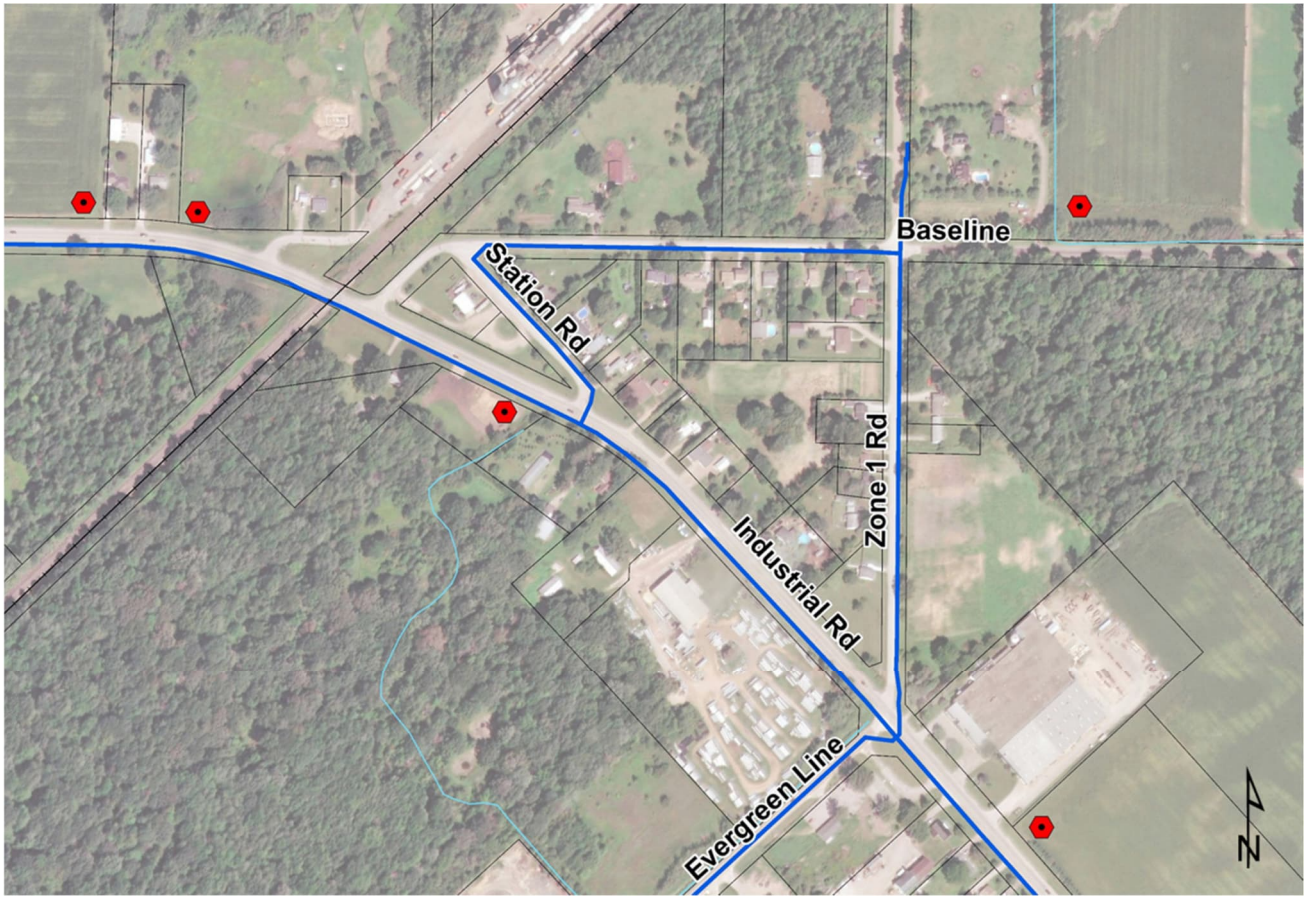
Legend

- Existing Standpipe / Elevated Tank
- Railways
- Watercourses/Drains
- Existing Watermains
- Strategy 1 Alternative Route 3
- Existing Lot Lines
- Municipal Boundaries

Alternative Water Servicing Strategies

There are two Serving Strategies being considered to address the Problem and Opportunity Statement. Each strategy involves multiple Routing Alternatives (Thamesville Area to Bothwell) to be evaluated:

Strategy 2 – New North Thamesville Booster Pumping Station and a New 2.3ML Elevated Tank



Water Servicing Strategy 2 - New North Thamesville

Booster Pumping Station and Elevated Tank

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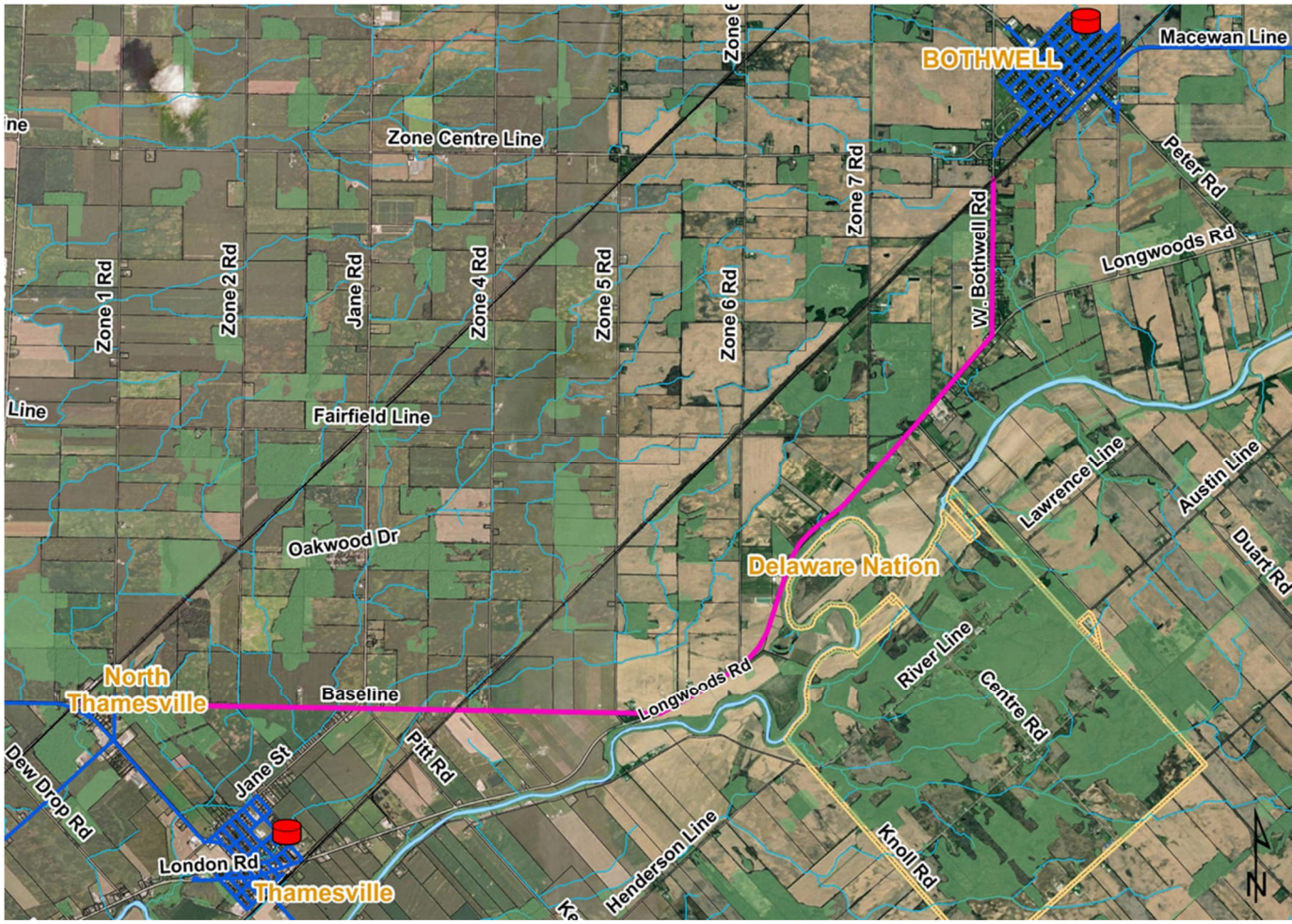
Alternative Route 1 – Base Line Road to Longwoods Road to West Bothwell Road

- Approximate Watermain Length = 14km
- Approximately 90 Properties for potential new water connection



Legend

- Existing Standpipe / Elevated Tank
- Railways
- Watercourses/Drains
- Existing Watermains
- Strategy 2 Alternative Route 1
- Existing Lot Lines
- Municipal Boundaries

Water Servicing Strategy 2 - New North Thamesville

Booster Pumping Station and Elevated Tank

Chatham-Kent Public Utilities Commission

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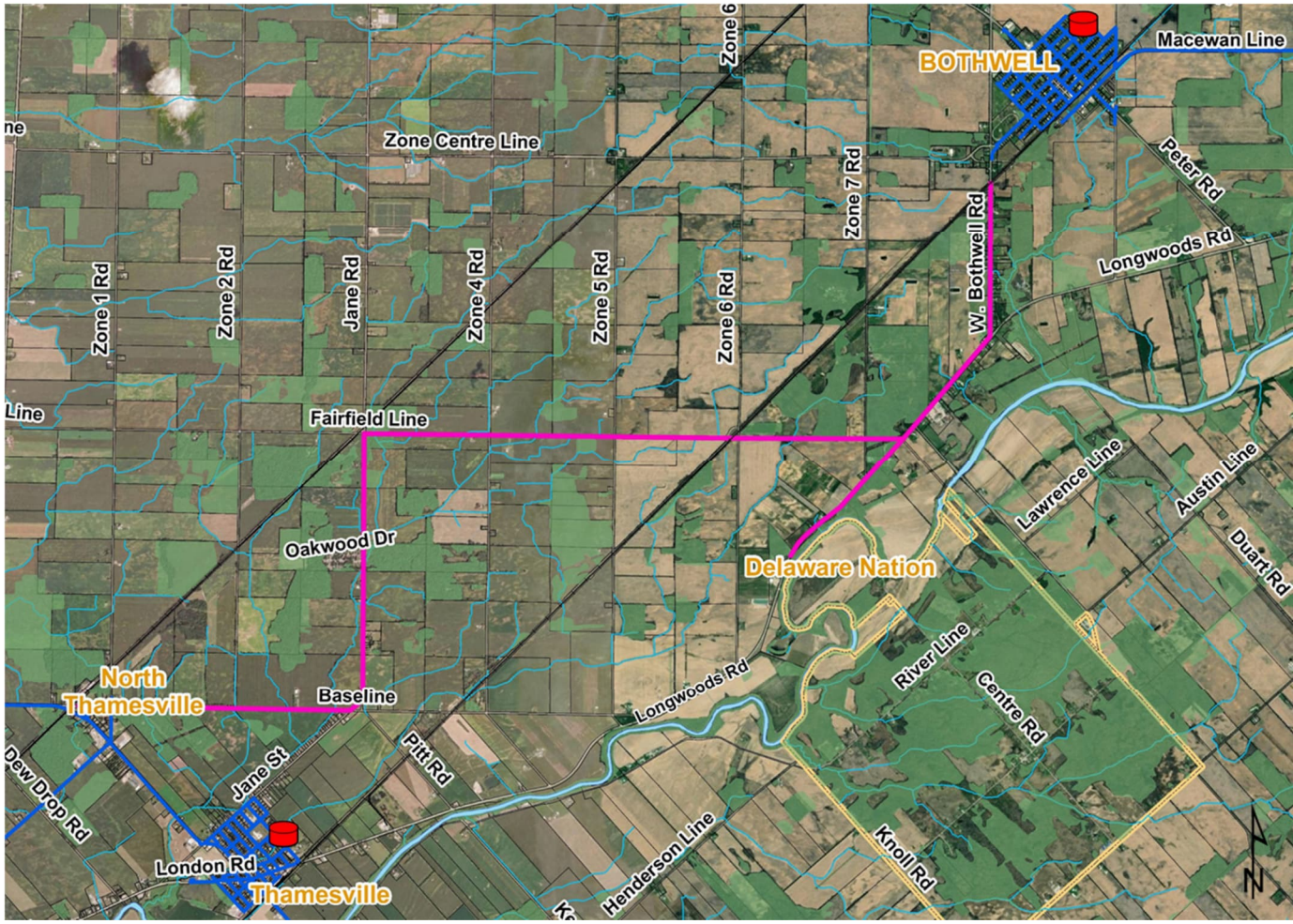
Alternative Route 2 – Base Line Road to Jane Road to Longwoods Road to West Bothwell Road

- Approximate Watermain Length = 17km
- Approximately 110 Properties for potential new water connection

Legend

- Existing Standpipe / Elevated Tank
- Railways
- Watercourses/Drains
- Existing Watermains
- Strategy 2 Alternative Route 2
- Existing Lot Lines
- Municipal Boundaries



Water Servicing Strategy 2 - New North Thamesville

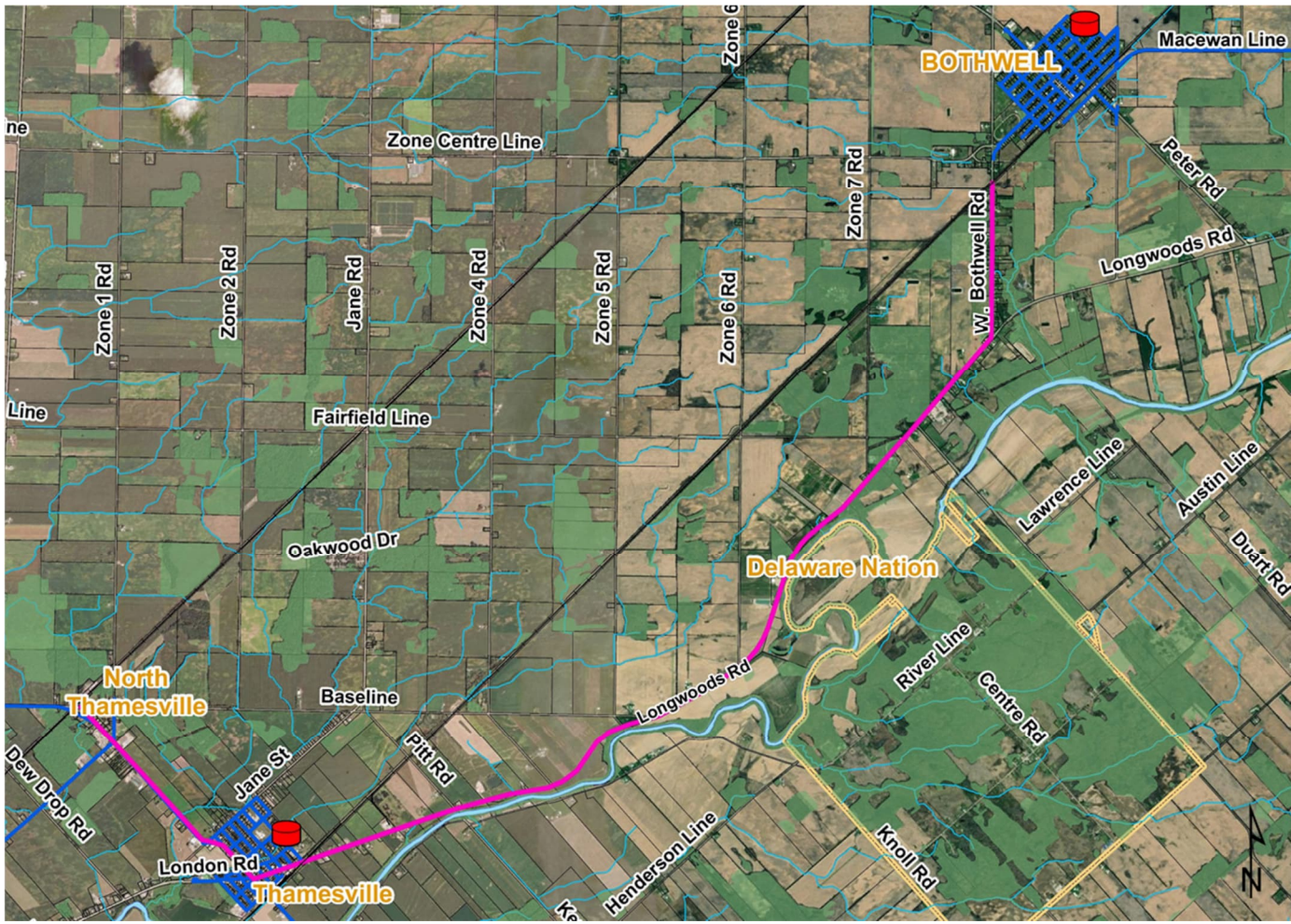
Booster Pumping Station and Elevated Tank

Chatham-Kent Public Utilities Commission

aecom.com

Alternative Route 3 – Industrial Road to Longwoods Road to West Bothwell Road

- Approximate Watermain Length = 17km
- Approximately 110 Properties for potential new water connection



Legend

- Existing Standpipe / Elevated Tank
- Railways
- Watercourses/Drains
- Existing Watermains
- Strategy 2 Alternative Route 3
- Existing Lot Lines
- Municipal Boundaries

Connection to Bothwell Elevated Tank

Chatham-Kent Public Utilities Commission

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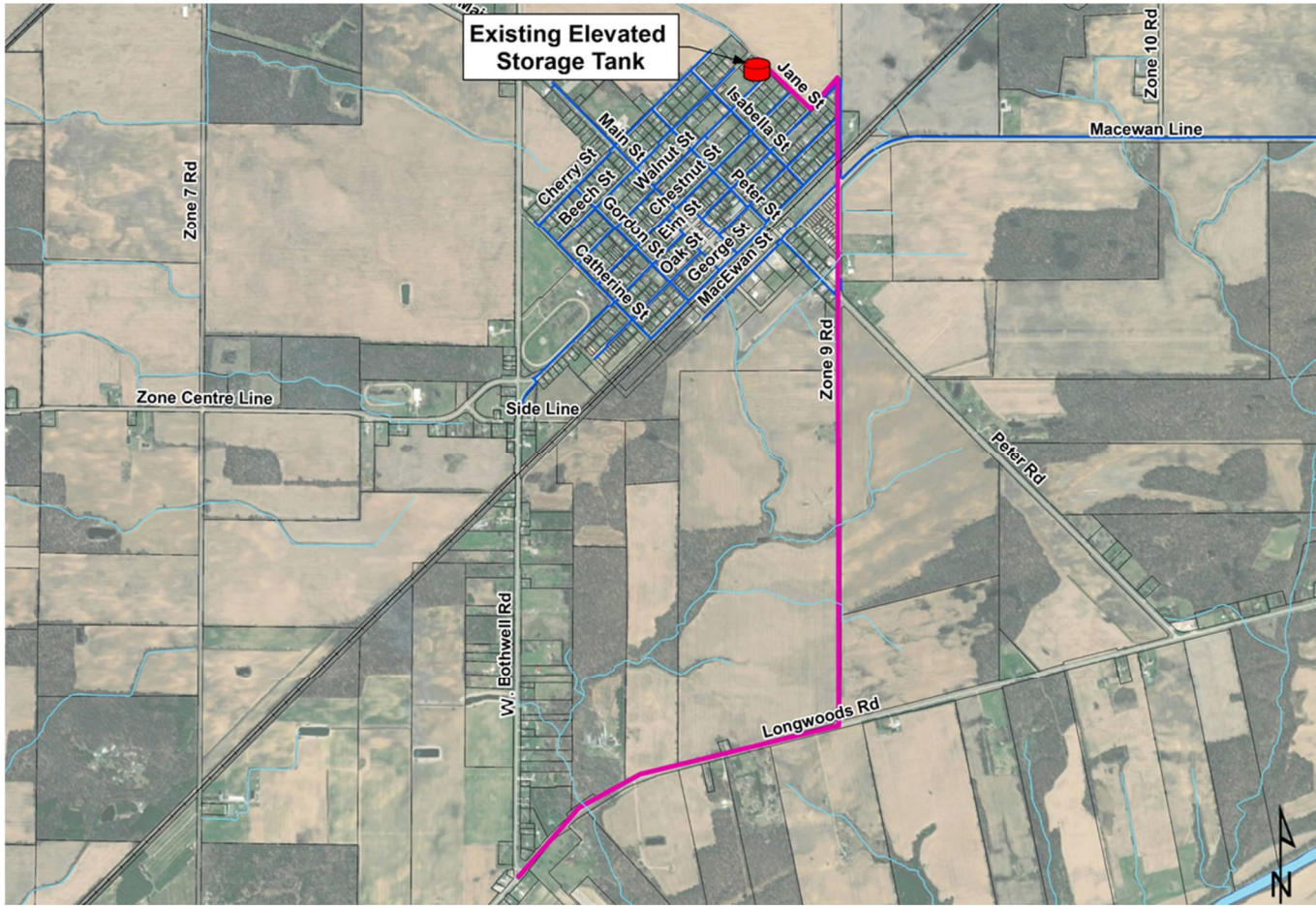
Once the preferred Servicing Strategy has been identified and selected the final connection route to the Bothwell Standpipe must be considered. There are four alterative routes being evaluated.

Bothwell Connection Route 1 – Watermain continues along Longwoods Road to 9 Zone Road north to the elevated tank on Jane Street.

- Approximate Watermain Length = 5km
- Approximately 5 Properties for potential new water connection

Legend

- Existing Elevated Tank
- Watercourses/Drains
- Railways
- Existing Watermains
- Bothwell Connection Alternative Route 1



Connection to Bothwell Elevated Tank

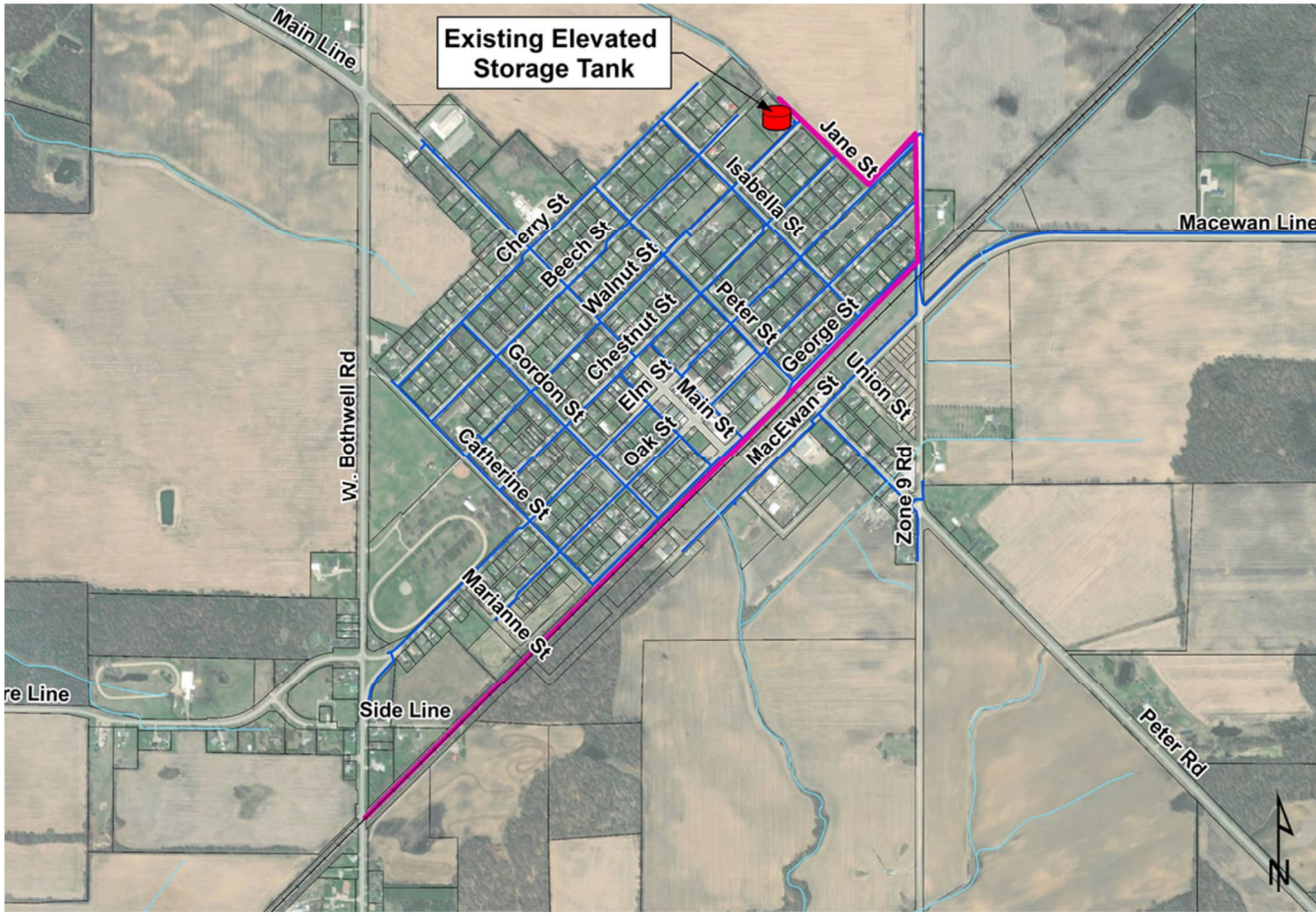
Once the preferred Servicing Strategy has been identified and selected the final connection route to the Bothwell Standpipe must be considered. There are four alterative routes being evaluated.

Bothwell Connection Route 2a – Watermain Follows railway tracks from West Bothwell Road to 9 Zone Road north to the elevated tank on Jane Street.

- Approximate Watermain Length = 3km
- Approximately 4 Properties for potential new water connection

Legend

- Existing Elevated Tank
- Watercourses/Drains
- Railways
- Existing Watermains
- Bothwell Connection Alternative Route 2a



Connection to Bothwell Elevated Tank

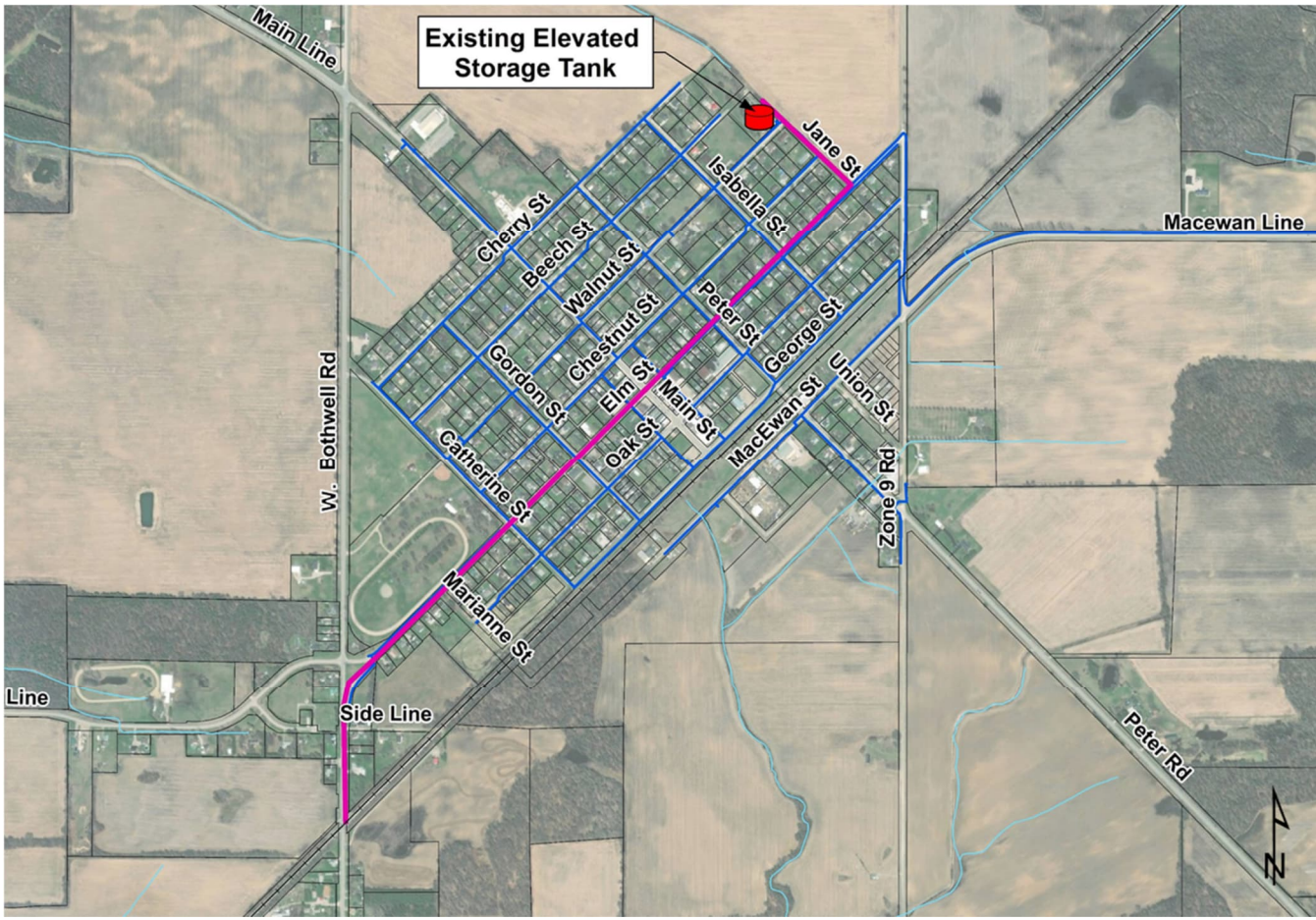
Once the preferred Servicing Strategy has been identified and selected the final connection route to the Bothwell Standpipe must be considered. There are four alterative routes being evaluated.

Bothwell Connection Route 2b – Watermain continues along West Bothwell Road to Elm Street. Follows Elm Street to 9 Zone Road north to the elevated tank on Jane Street.

- Approximate Watermain Length = 3km
- Approximately 3 Properties for potential new water connection

Legend

- Existing Elevated Tank
- Watercourses/Drains
- Railways
- Existing Watermains
- Bothwell Connection Alternative Route 2b



Connection to Bothwell Elevated Tank

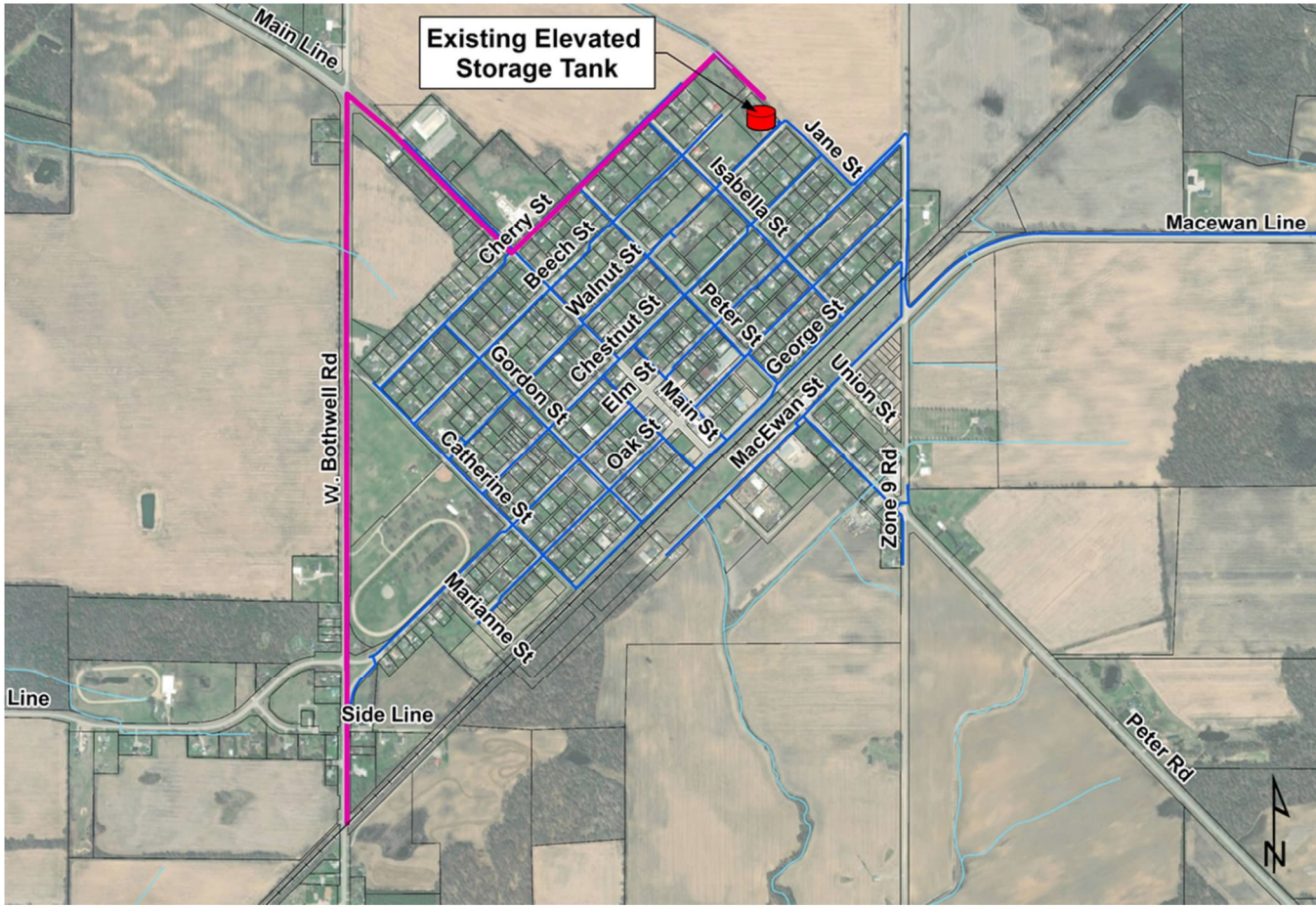
Chatham-Kent Public Utilities Commission

aecom.com

Once the preferred Servicing Strategy has been identified and selected the final connection route to the Bothwell Standpipe must be considered. There are four alterative routes being evaluated.

Bothwell Connection Route 2c – Watermain continues along West Bothwell Road to Main Street. Follows Main Street to Cherry Street to the elevated tank on Jane Street.

- Approximate Watermain Length = 3km
- Approximately 7 Properties for potential new water connection



Legend

- Existing Elevated Tank
- Watercourses/Drains
- Railways
- Existing Watermains
- Bothwell Connection Alternative Route 2c

Evaluation of Alternatives

To identify the preferred alternatives for the watermain routes and booster pump station/water storage locations from the Thamesville area to Bothwell, the alternatives will be assessed against the criteria shown below to determine which alternative has the least environmental impact:

Environmental Factor		Criteria
	**Land Use**	Conformance with approved local, county and provincial plans and policies
		Potential effects on existing and approved / planned land uses
	**Technical**	Constructability and minimum utility conflicts
		Ability to meet long-term water servicing requirements including flow, pressure and fire flow for the servicing area
	**Natural Environment**	Potential effects on terrestrial species and habitat
		Potential effects on aquatic species and habitat
		Potential effects on Species at Risk (SAR) and SAR habitat
		Potential effects on surface water and groundwater
		Potential to encounter soil and water contamination
		Potential for project to impact climate change and for climate change to impact the project
	**Socio-Economic**	Potential effects (noise, vibration, dust, access to property) related to disruption to residences, agricultural, businesses and travelling public during construction and operation
		Degree of property acquisition / easement requirements
	**Cultural Environment**	Potential effects on archaeological resources
		Potential effects to built heritage resources and cultural heritage landscapes
	**Cost**	Cost of construction (including potential property acquisition)
		Cost of operations / maintenance

Next Steps

- Comments received from this Public Information Centre will be collected, reviewed and considered in the evaluation of alternatives by the project team and become part of the public record.
- Evaluation of Alternative Solutions using the criteria described on Board 23
- Public Information Centre #2 – Scheduled for June 2022
  - Present the evaluation of alternatives and the recommended solution
  - Present the final steps of the MCEA process
  - Solicit feedback from the Public / Stakeholders and Agencies
- An EA Project File report will be prepared and made available for public review online for 30 days. – August 2022
- If no issues are raised within the 30-day review period, the Municipality can proceed to detailed design, approvals and construction once funding is in place.
- Any issues that cant be resolved within the 30 day review period will be reviewed by the Ministry of the Environment Conservation and Parks (MECP) who will decide appropriate course of action as required.
- Detailed design including any identified property acquisition negotiations and permitting would be completed, and construction can begin for the recommended solutions.

For More Information

Visit the Project Website

- www.letstalkchatham-kent.ca
- https://www.letstalkchatham-kent.ca/north-east-ne-chatham-kent-water-distribution-system-municipal-class-ea-mcea

Contact the Project Team

- Contact us with additional comments or questions at any time.
- Send comments in using the comment sheet found on the project website.

We appreciate the time you have taken to learn more about the project and value your input to this study and encourage you to stay connected.

Ali Akl, M.Eng., P.Eng
Project Engineer
Chatham-Kent PUC
Tel: 226-312-2023 ext. 4347
Email : alia@chatham-kent.ca

Paul Adams, CPT
Environmental Planner,
AECOM Canada Ltd.
250 York Street, Suite 410
London ON, N6A 6K2
Tel: 519-636-6448
Email: paul.adams2@aecom.com

Appendix A

A.3 PIC #2

Chatham Kent Public Utilities Commission
Municipal Class Environmental Assessment for the
Northeast Chatham Kent Water Distribution System

NOTICE OF PUBLIC INFORMATION CENTRE #2

Background

The Chatham-Kent Public Utilities Commission (CK PUC) has initiated a Municipal Class Environmental Assessment (MCEA) study for the North-East (NE) Chatham Kent Water Distribution System (WDS). The CK PUC is responsible for the treatment and delivery of safe drinking water and currently supplies water to a population of approximately 89,000 within the Municipality of Chatham-Kent.

This MCEA study will review and confirm municipal water servicing requirements and identify capital project upgrades required for the NE Chatham Kent WDS in order to provide sustainable municipal water and accommodate near and long-term future growth demands. Specific to this study, the MCEA will look at siting new watermains, pumping and storage facilities in the Thamesville / Dresden / Bothwell area, in addition to supplying municipal water to the Delaware Nation at Moraviantown.

Public Information Centre #2

A second Public Information Centre (PIC) will be held for the study to present the Problem and Opportunity Statement, a review of the servicing strategies being evaluated, the recommended strategies and the project timeline.

The PIC format is a recorded presentation and will be available starting on July 20th, 2022. To access the PIC please visit the Chatham Kent 'Lets Talk' (https://www.letstalkchatham-kent.ca/) project page at the following address:

https://www.letstalkchatham-kent.ca/north-east-ne-chatham-kent-water-distribution-system-municipal-class-ea-mcea

How to Get Involved

Public input is essential to this study. The CK PUC invites anyone with an interest in the study to have an opportunity to provide feedback and help inform the decision-making process.

If you have comments, require further information or would like to be added to the study's mailing list to receive future notifications, please contact either:

Ali Akl, P.Eng
Project Engineer
Chatham-Kent Public Utilities Commission
Municipality of Chatham Kent
325 Grand Ave East
Chatham, ON N7L 1W9
alia@chatham-kent.ca
(226)-312-2023 ext. 4347

Paul Adams, CPT
Environmental Planner
AECOM Canada Ltd.
250 York Street, Suite 410
London, Ontario N6A 6K2
Paul.Adams2@aecom.com
(519)-636-6448

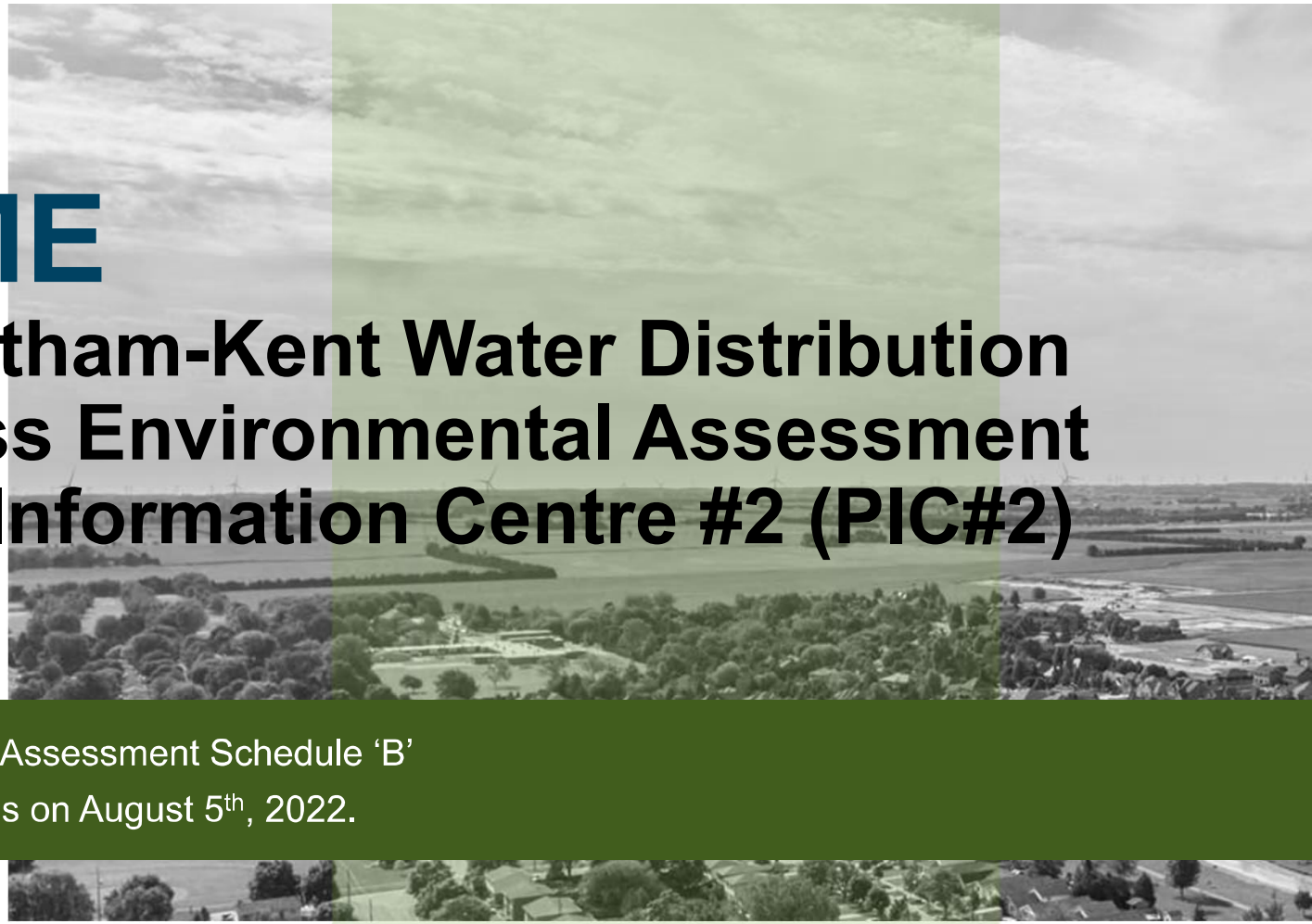
This notice first issued on July 13th, 2022

With the exception of personal information, all comments will become part of the public record of the Study. The Study is being conducted according to the requirements of the Municipal Class Environmental Assessment, which is a planning process approved under Ontario's Environmental Assessment Act.

Municipality of Chatham Kent
Public Utilities Commission

WELCOME

Northeast Chatham-Kent Water Distribution Municipal Class Environmental Assessment Online Public Information Centre #2 (PIC#2)



Municipal Class Environmental Assessment Schedule 'B'
Comment Period for PIC#2 ends on August 5th, 2022.

July 20th, 2022

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Public Information Centre #2 (PIC#2) Purpose

- **The purpose of this online PIC is to:**
- Present the evaluation and selection of the recommended preferred Water Distribution System Servicing Strategy used to address the problem and opportunity statement.
- Present the preliminary recommended alternatives.
- Describe the next steps in the process.
- Solicit public/stakeholder/agency feedback.

Problem and Opportunity Statement - Recap

- The Problem and Opportunity Statement is the principal starting point of a MCEA and becomes the central theme and integrating element of the project. It also assists in setting the scope of the project.

Problem:

- Water is supplied to the Northeast part of Chatham Kent by the Chatham Water Treatment Plant. The distribution system in the Northeast dose not have the capacity for future growth outside of its current service area.
- There has been increasing demand/inquiries from potential greenhouse developers and farmers for increased water supplies to the Northeast region.
- Delaware Nation has looked at options of receiving municipal water from CK-PUC .
- Low pressures in this region make expanding the water system difficult to accomplish.
- The existing Thamesville standpipe is aging and nearing the end of its service life, requiring a rehabilitation or replacement in the near future.

Opportunity – The MCEA process provides the CK PUC the opportunity to:

- Develop and assess a range of water servicing strategies to provide sustainable water supply to Northeast Chatham Kent to accommodate near and long-term future growth demands while also providing municipal water to the Delaware Nation community.
- Additional revenue from new customers will assist with the capital and operating costs that will provide a safe water supply to customers.
- Develop a capital works plan that will support future infrastructure planning and budgeting.
- Consult the public, Indigenous Communities, agencies and solicit feedback to select the best strategy for the future.

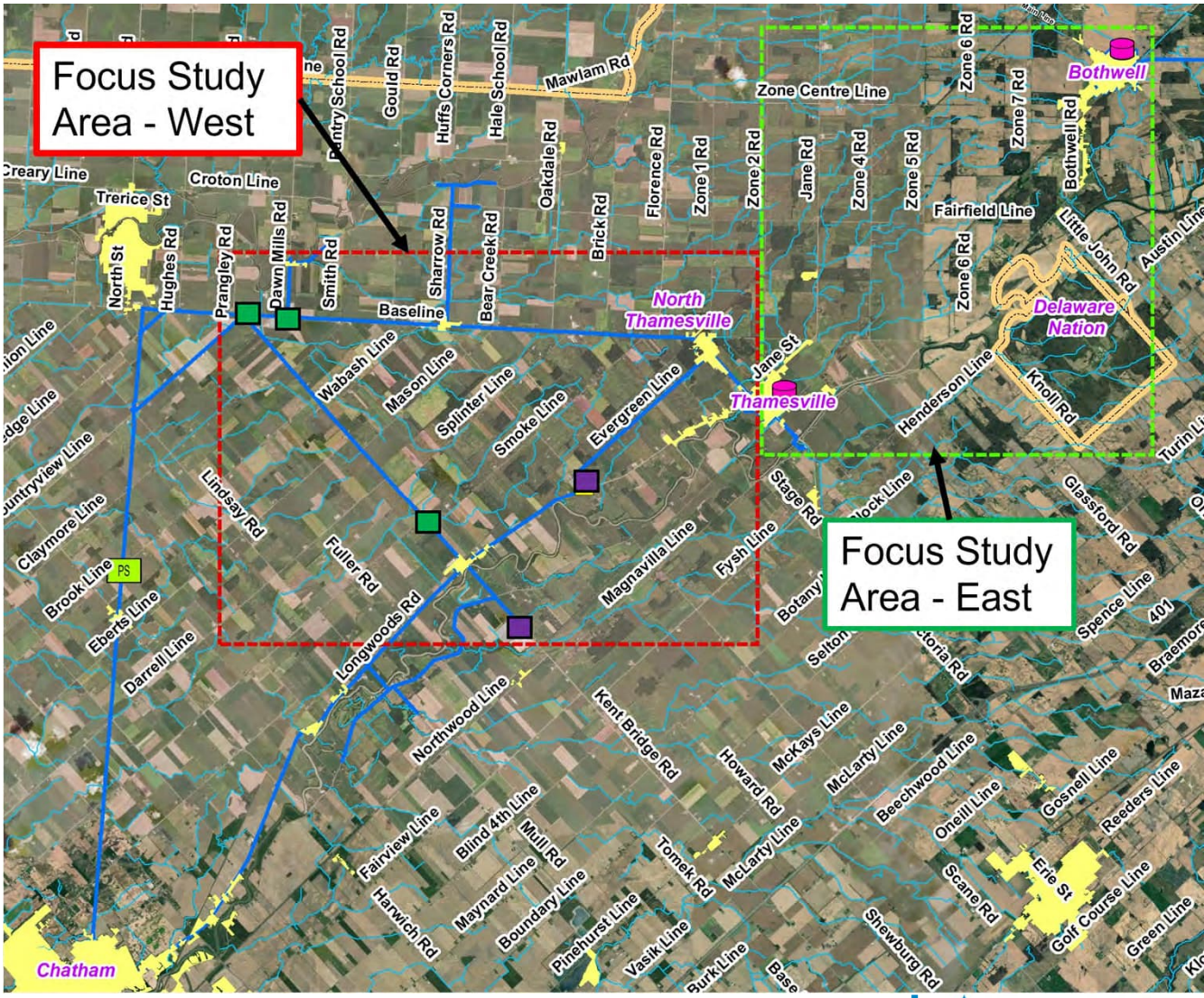
Study Area Limits

Focus Study Areas:

- West of Thamesville
- East of Thamesville

Legend

- Eberts PS
- Future Greenhouse
- Existing Greenhouse
- Existing Standpipe / Elevated Tank
- Northeast Water Distribution System
- Watercourses/Drains
- Growth Areas
- Municipal Boundaries



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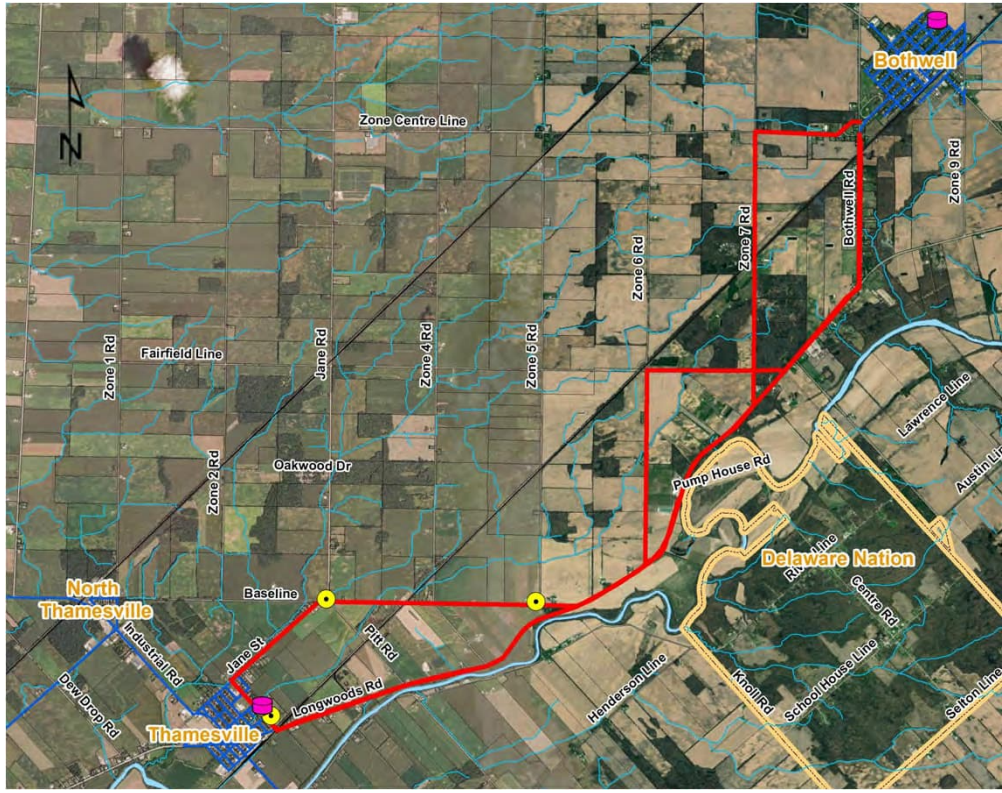
East Side of Thamesville

Alternative Water Servicing Strategies Focus Study Area - East

Strategy 1 – New Thamesville Area Booster Pumping Station. Replace or Rehabilitate the existing 2.3 ML Standpipe Located in the East End of Thamesville in Ferguson Park.

Legend

- Existing Standpipe / Elevated Tank
- Strategy 1 Potential Booster Station Locations
- Strategy 1 Alternative Routes



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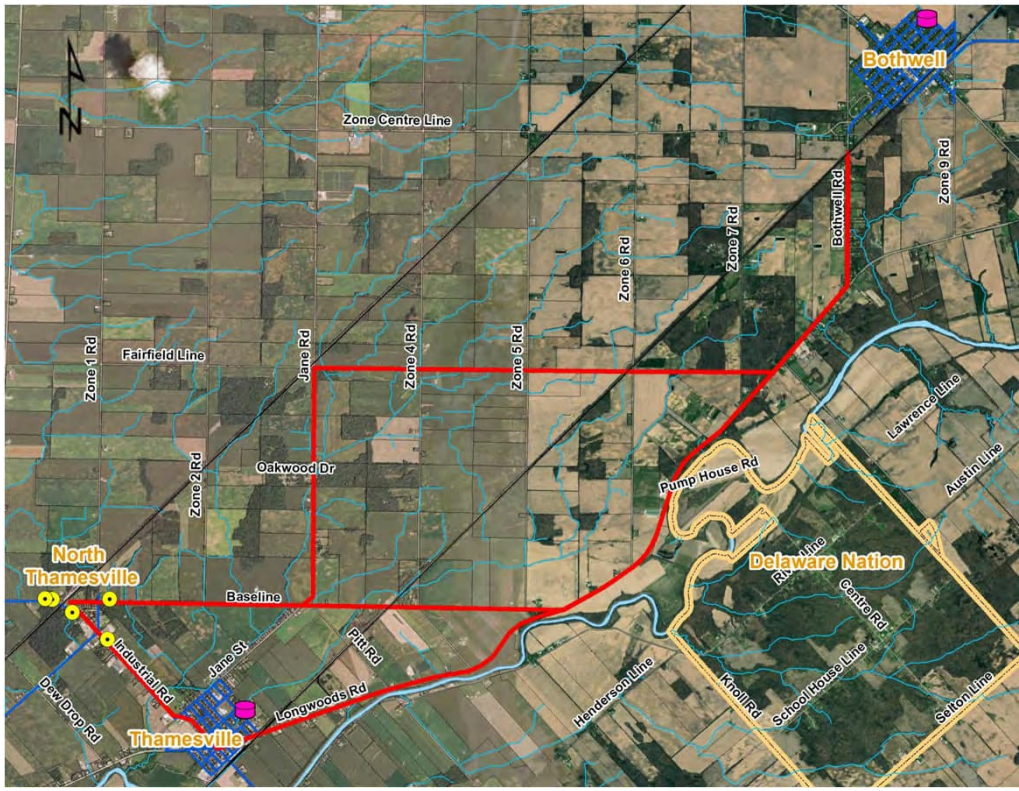
Alternative Water Servicing Strategies Focus Study Area - East

Strategy 2 – New North Thamesville Booster Pumping Station and a New 2.3ML Elevated Tank

Legend

- Existing Standpipe / Elevated Tank
- Strategy 2 Potential Booster Station / Elevated Tank Locations
- Strategy 2 Alternative Routes



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Recommended Water Servicing Strategy Focus Study Area - East

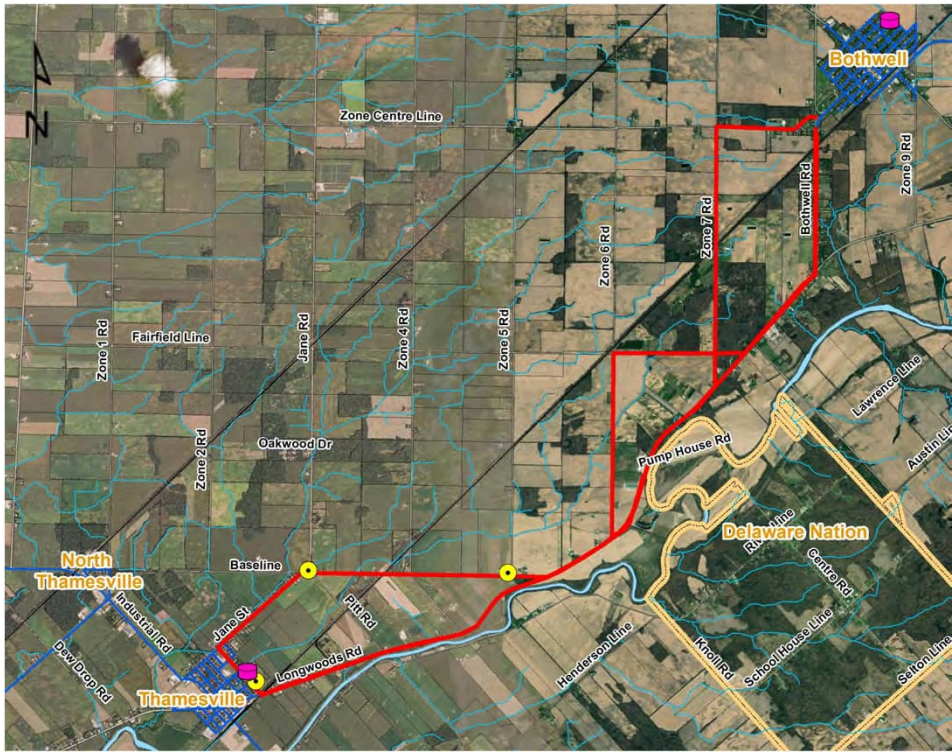
Strategy 1 – New Thamesville Area Booster Pumping Station. Replace or Repair the existing 2.3 ML Standpipe Located in the East End of Thamesville in Ferguson Park.

Rationale:

- Better Hydraulic performance
- Provides an opportunity to provide water servicing to future greenhouses to the west of Thamesville
- No new location required for the standpipe
- Allows improved fire protection for Thamesville
- Allows opportunity to provide water to more customers

Legend

- Existing Standpipe / Elevated Tank
- Strategy 1 Potential Booster Station Locations
- Strategy 1 Alternative Routes



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Alternative Routes for Recommended Strategy: Focus Study Area - East

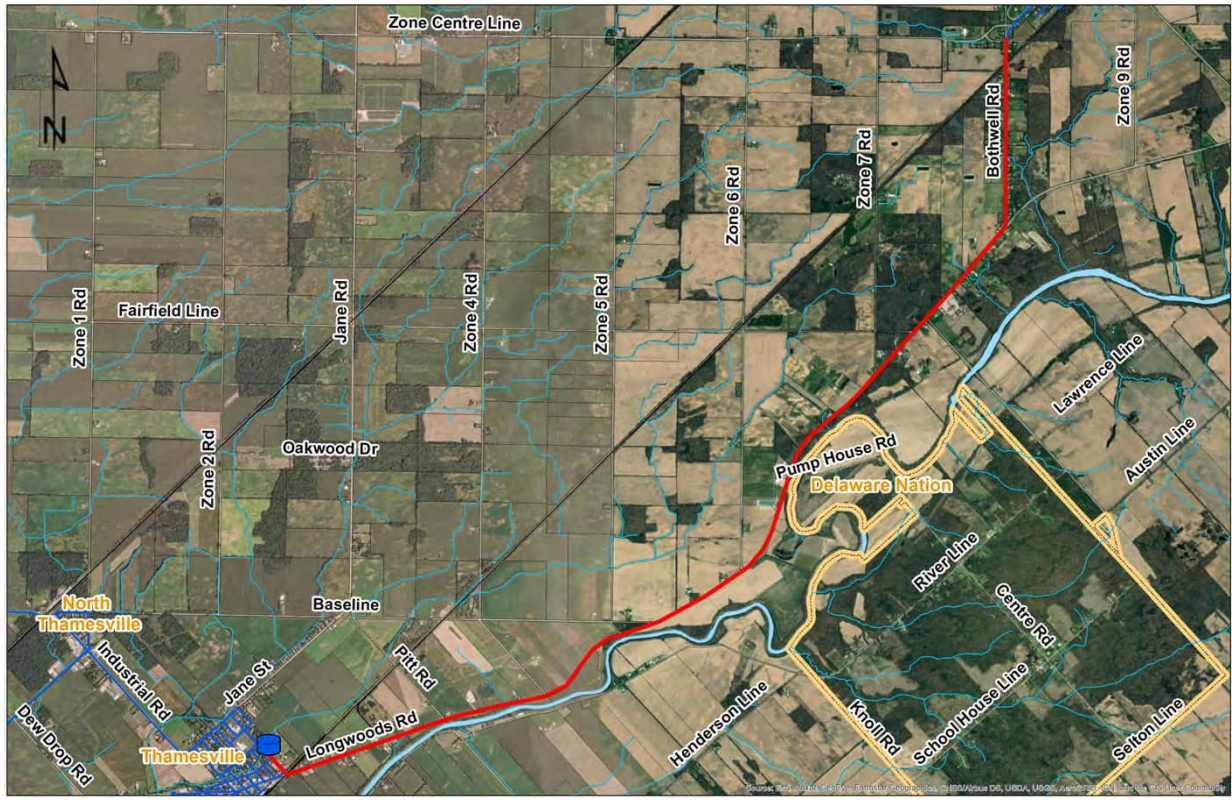
Alternative Route E1

- Approximate watermain length = 11km
- Approximately 95 properties for potential new water connection

Legend

Existing Standpipe / Elevated Tank

Strategy 1 Alternative Route 1



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Alternative Routes: Focus Study Area - East

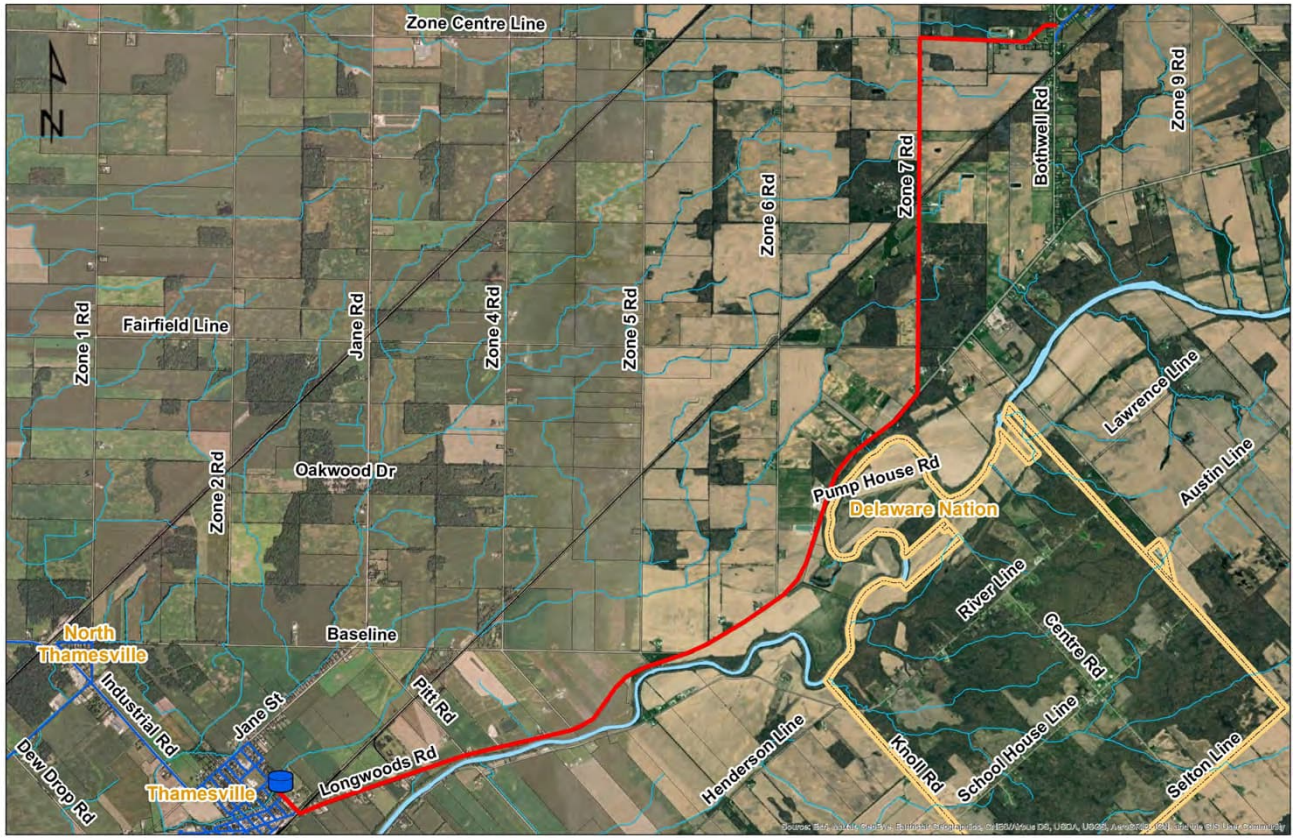
Alternative Route E2

- Approximate watermain length = 13km
- Approximately 80 properties for potential new water connection

Legend

Existing Standpipe / Elevated Tank

Strategy 1 Alternative Route 2



Alternative Routes: Focus Study Area - East

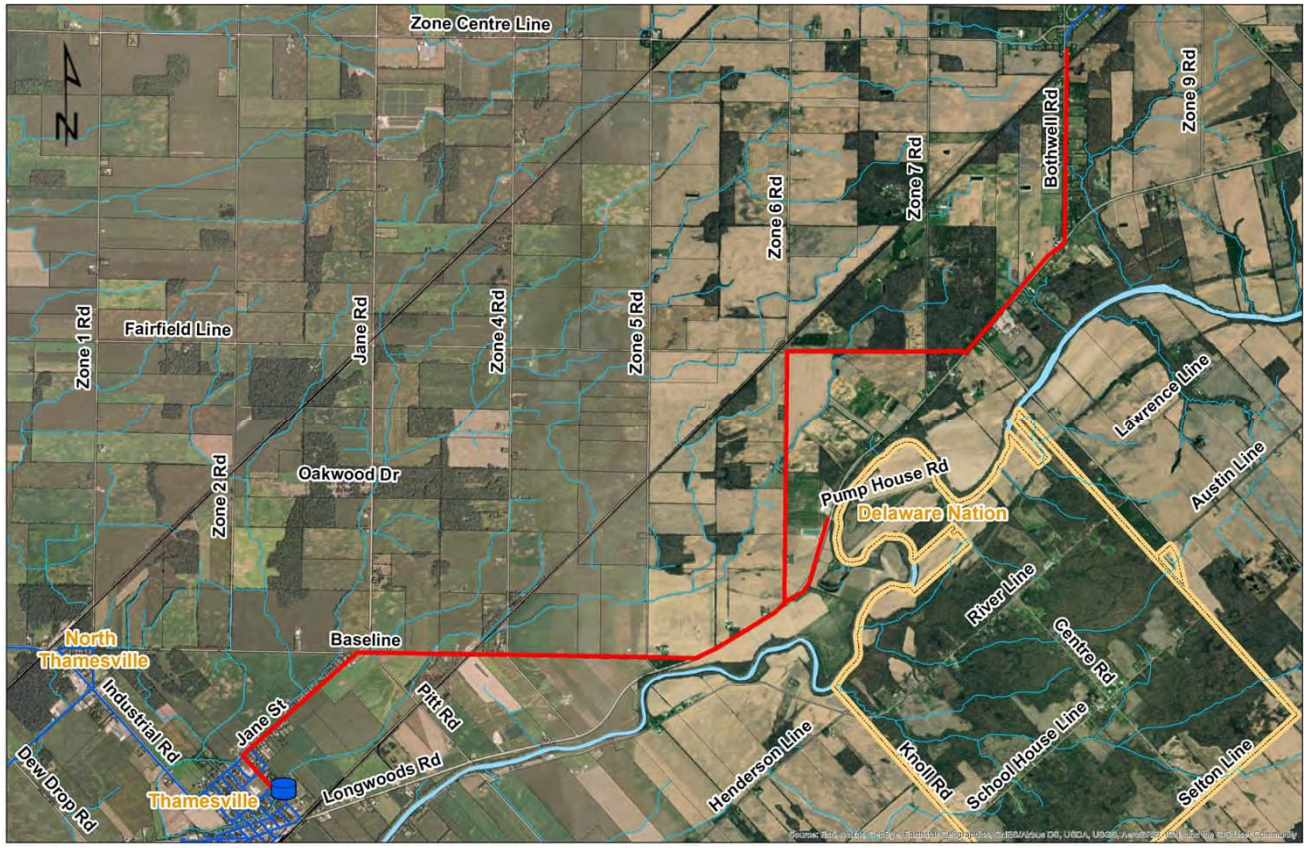
Alternative Route E3

- Approximate watermain length = 14km
- Approximately 98 properties for potential new water connection

Legend

Existing Standpipe / Elevated Tank

Strategy 1 Alternative Route3



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Recommended Route: Focus Study Area - East

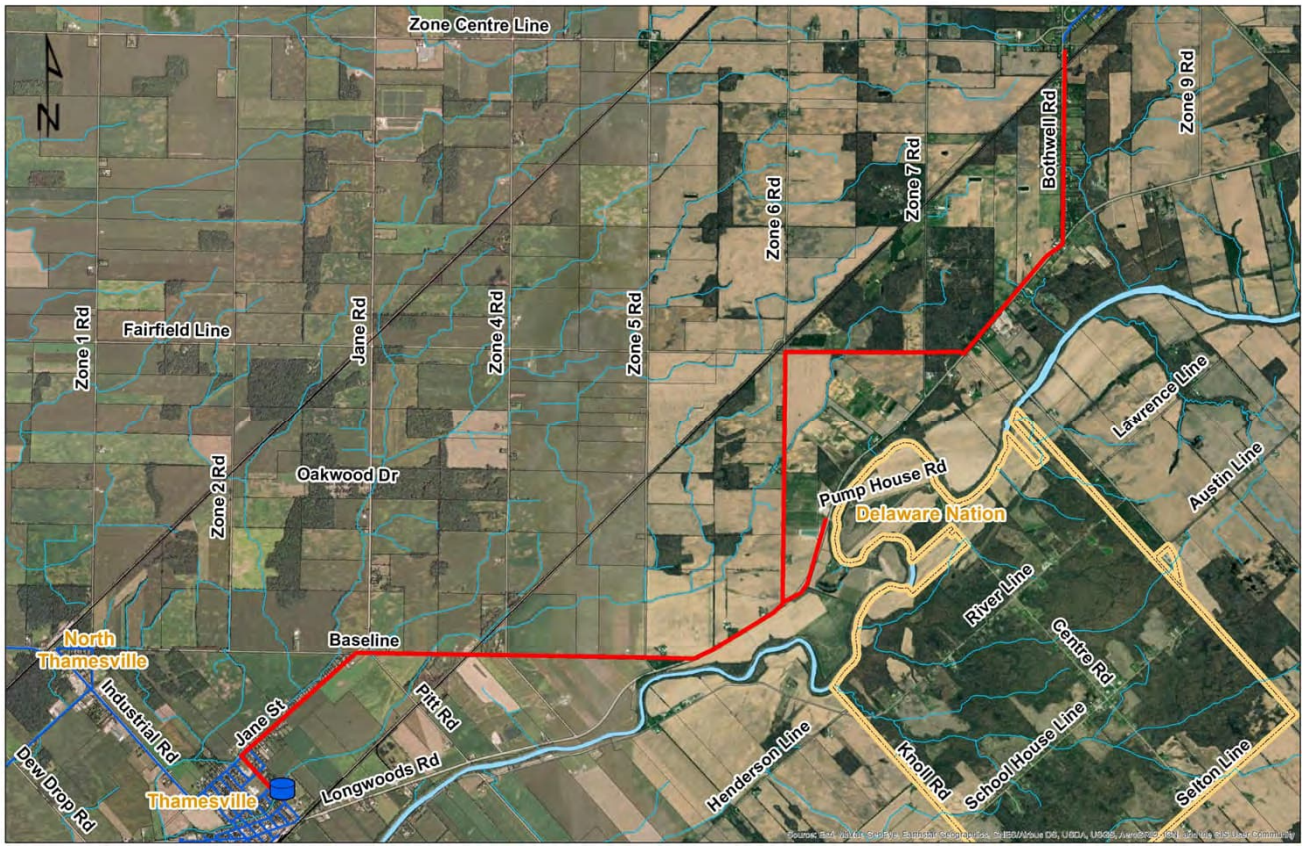
Alternative Route E3

Rationale:

- Avoids the Thames River bank erosion and stability areas, protecting the watermain.
- Provides potential water service connection to approximately 96 properties.

Legend

- Existing Standpipe / Elevated Tank
- Strategy 1 Alternative Route 3



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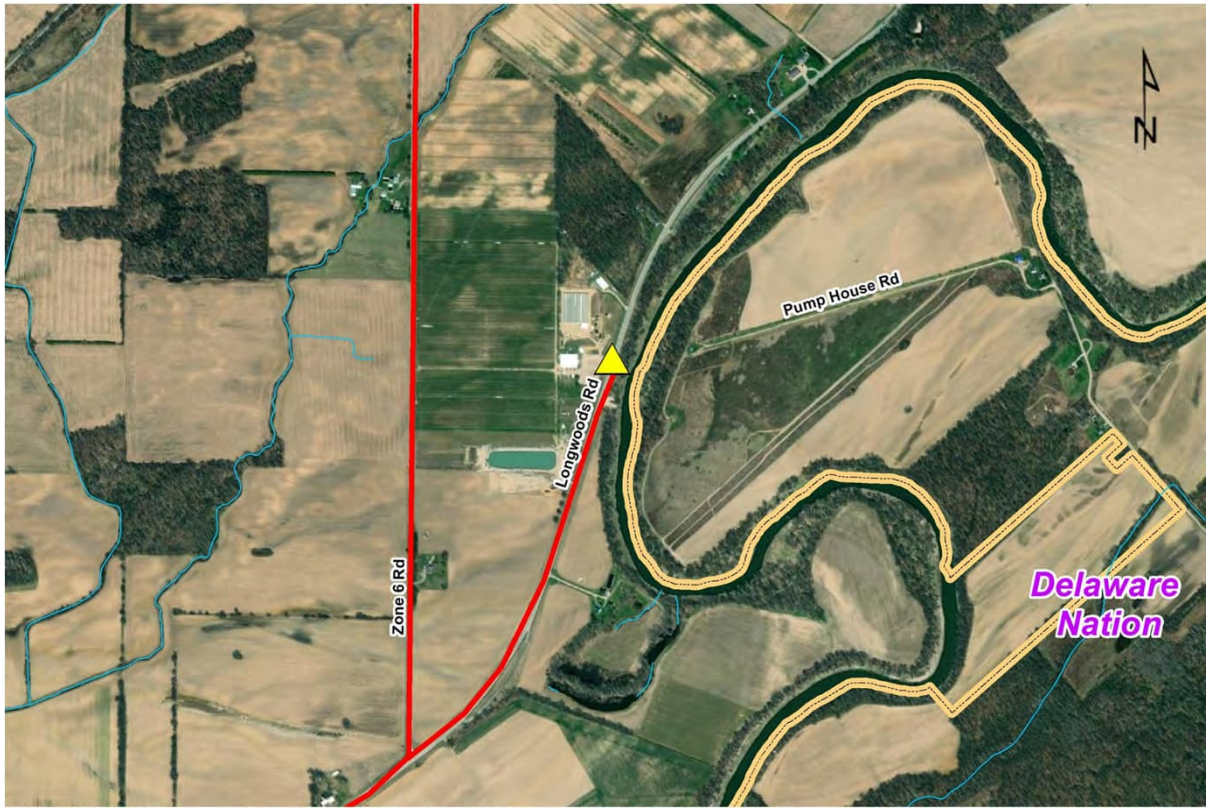
Recommended Route: Focus Study Area - East –Connection to Delaware Nation

- A watermain stub with a meter will be installed at the end of the watermain on Longwoods Road just east of Zone 7 Road.
- Delaware Nation will be completing their own engineering study to connect their water system to the above noted watermain stub.

Legend

Metered Watermain Stub

Proposed Watermain



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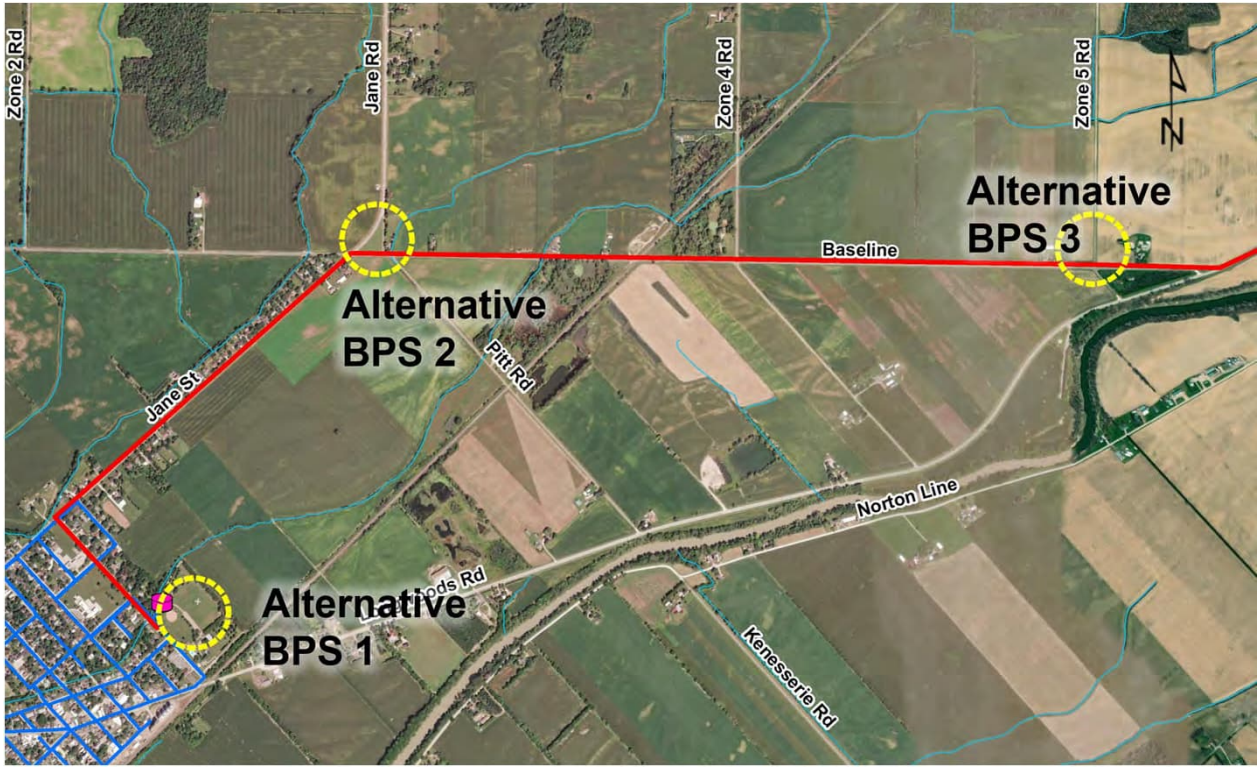
Potential Booster Pump Station Siting Areas

Siting Guidelines

- Strategically located at a suitable distance away from existing Thamesville Standpipe for optimizing the available pressure for existing and future customers.
- Potential to use publicly owned land.
- Minimum site size 40mX40m (includes temporary construction working area)
- Good road access and Proximity to Hydro
- Avoidance of displacing sensitive land uses such as residential properties and significant natural heritage features.



Legend

- Existing Standpipe / Elevated Tank
- Recommended Watermain Route
- Booster Pumping Station Siting Area

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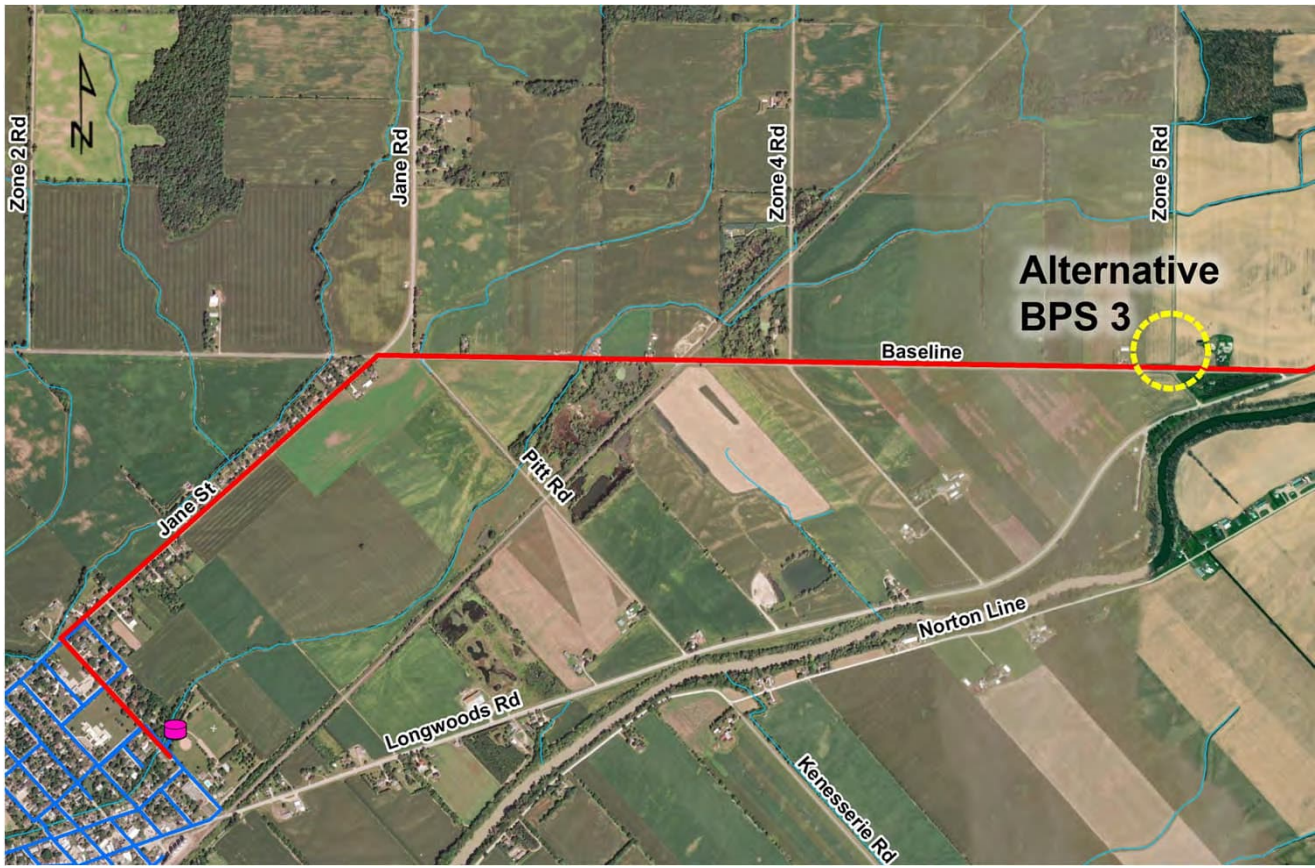
Recommended Booster Pump Station Siting Area

Rationale

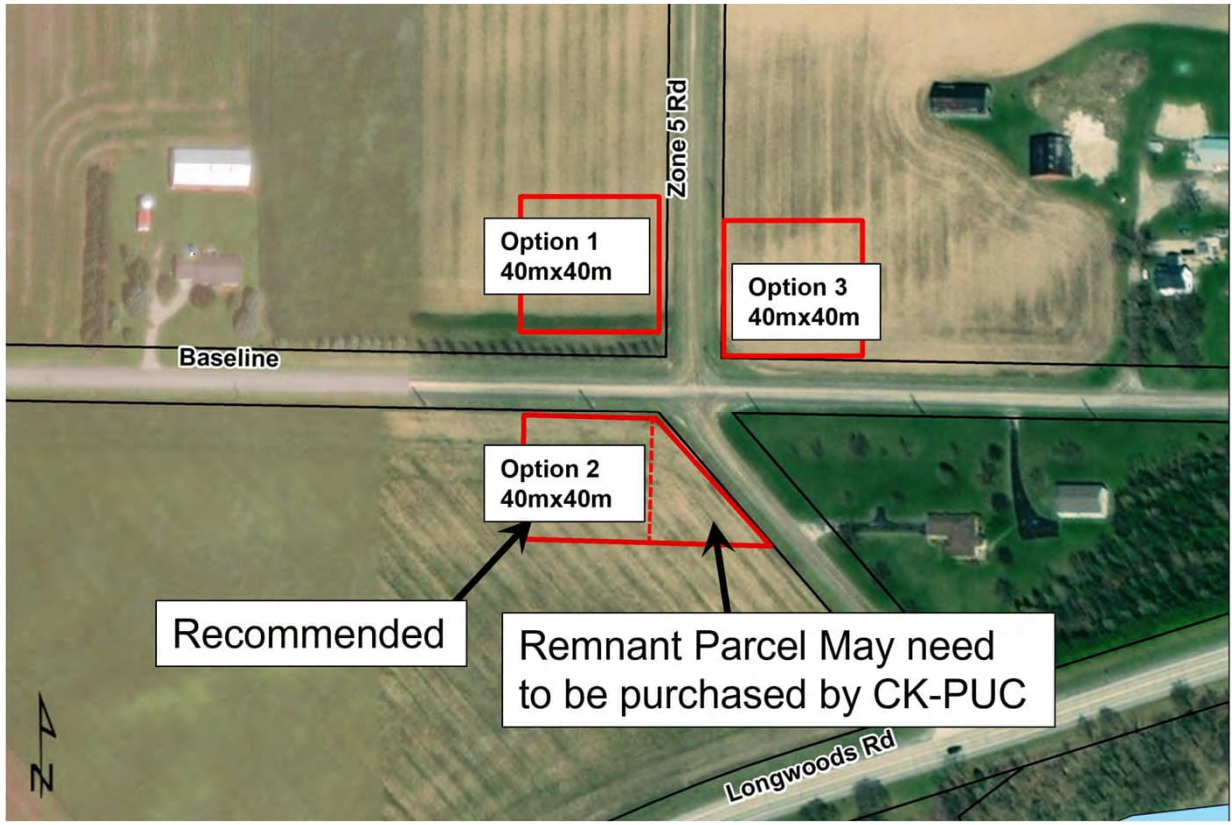
- Plenty of space for construction and operation.
- Does not displace open space park land.
- Having the two facilities at different locations will help from an energy management perspective.



Recommended Booster Pump Station Siting Options

Recommended Option 2 Rationale

- Avoids creating small agricultural area, resulting in difficulty to operate farm equipment compared to Options 1 and 3.
- All 3 sites are located on Class 2 lands which are defined as having limited restrictions for crops.
- Option 2 is the largest land parcel size resulting in the most viable remaining lands for agricultural uses.
- Local Hydro will be contacted to confirm supply of future power demands at each of the siting locations.



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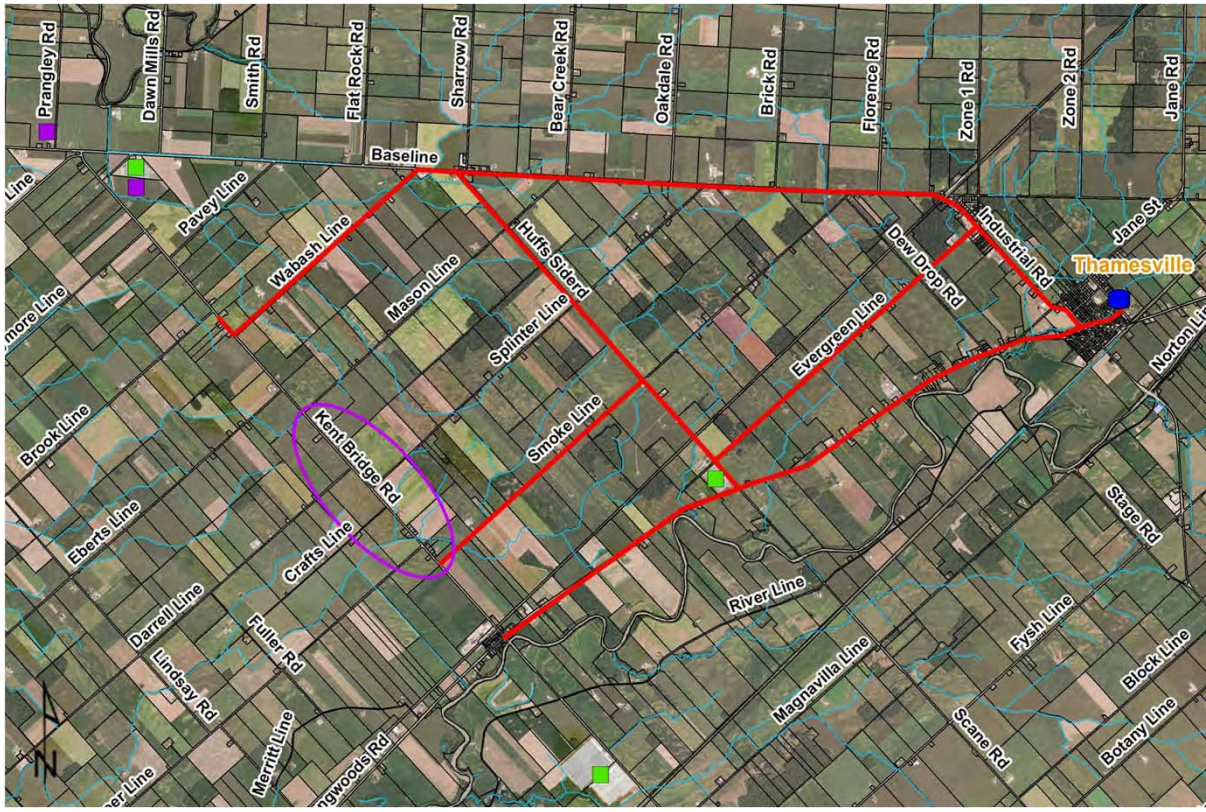
West Side of Thamesville

Focus Study Area - West Future Development Servicing Alternatives

Legend

- Future/Expanding Greenhouse
- Future Greenhouse Siting Area
- Existing Greenhouse
- Existing Standpipe / Elevated Tank
- Combined Routing Alternatives
- Existing Watermains



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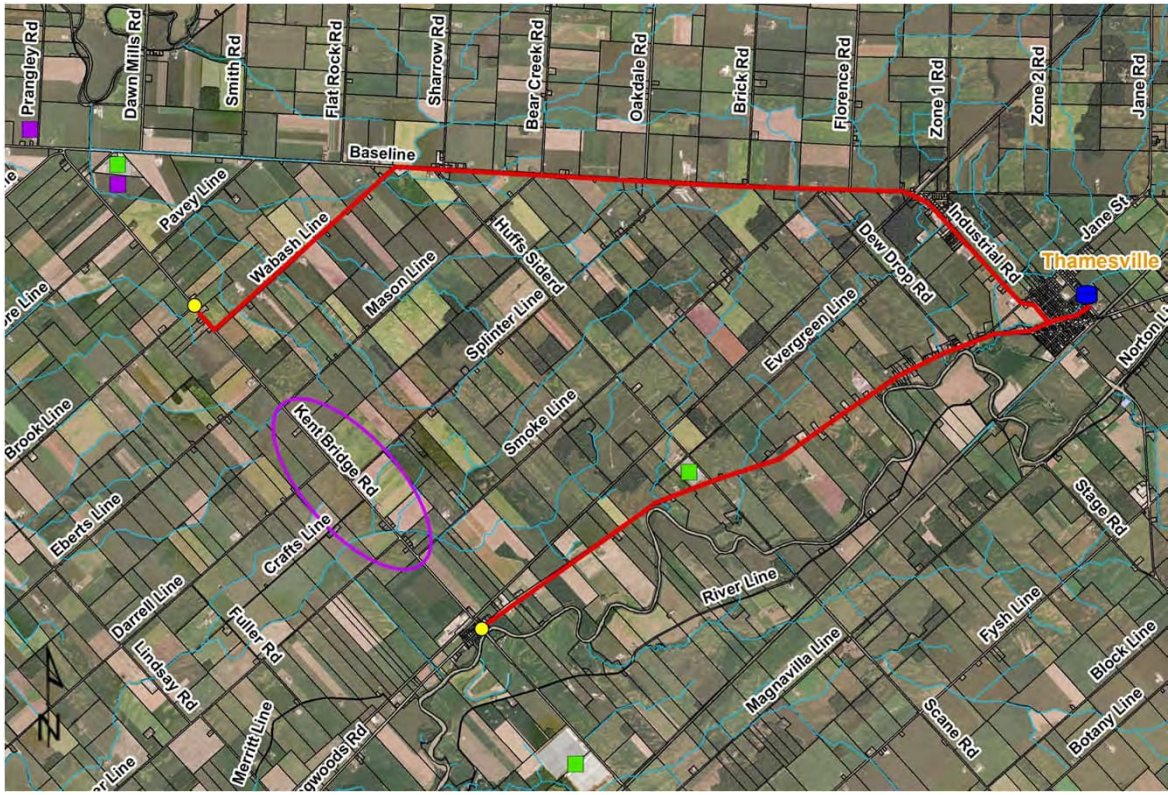
Focus Study Area - West Future Development Servicing Alternative W1

- Approximate watermain length = 24 km
- Approximately 80 properties for potential new water connection

Legend

- Future/Expanding Greenhouse
- Future Greenhouse Siting Area
- Existing Greenhouse
- Existing Standpipe / Elevated Tank
- Alternative Route W1
- Existing Watermains
- Connection Point



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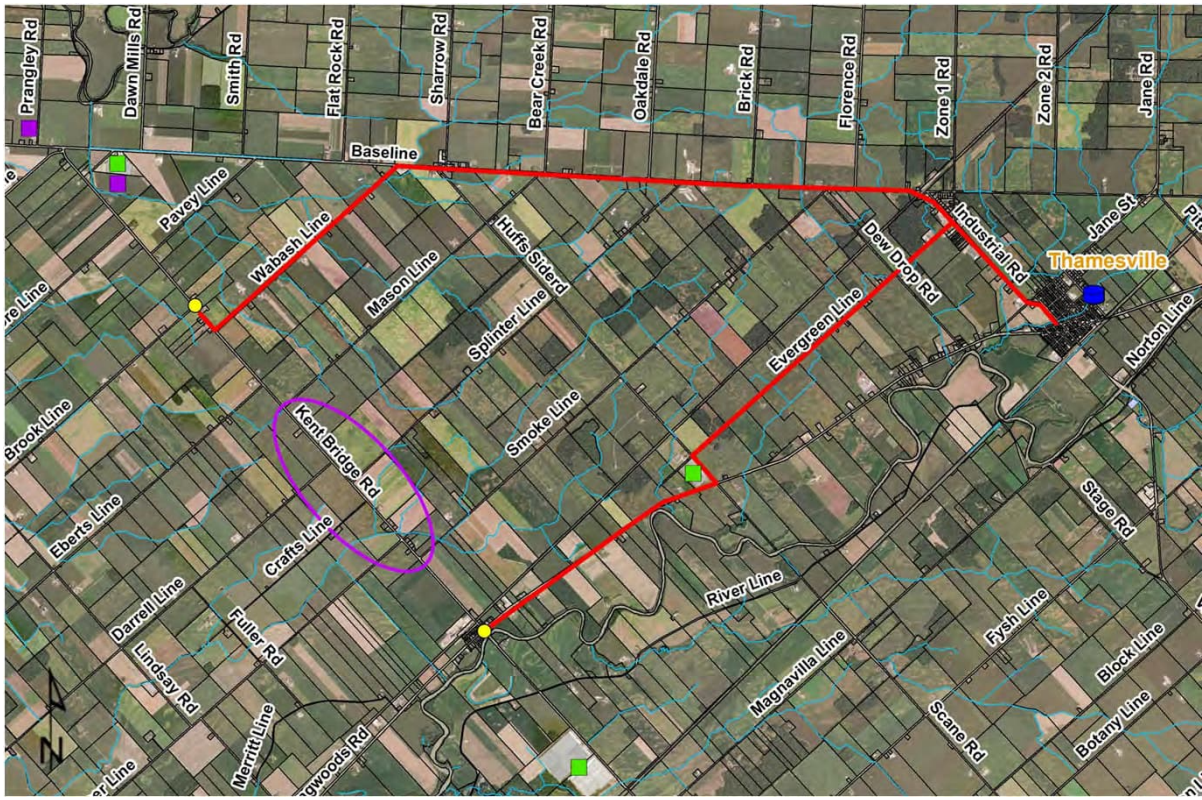
Focus Study Area - West Future Development Servicing Alternative W2

- Approximate watermain length = 22.2 km
- Approximately 20 properties for potential new water connection

Legend

- Future/Expanding Greenhouse
- Future Greenhouse Siting Area
- Existing Greenhouse
- Existing Standpipe / Elevated Tank
- Alternative Route W2
- Existing Watermains
- Connection Point



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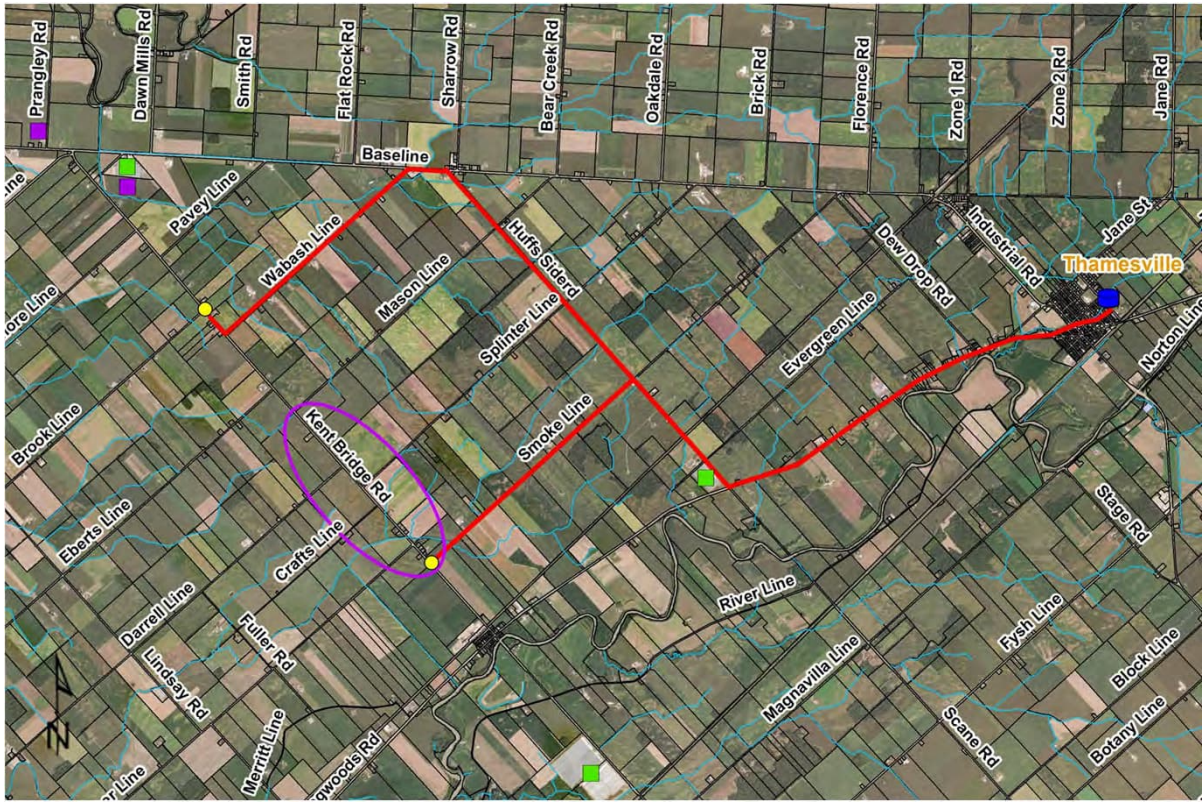
Focus Study Area - West Future Development Servicing Alternative W3

- Approximate watermain length = 19 km
- Approximately 100 properties for potential new water connection

Legend

- Future/Expanding Greenhouse
- Future Greenhouse Siting Area
- Existing Greenhouse
- Existing Standpipe / Elevated Tank
- Alternative Route W3
- Existing Watermains
- Connection Point



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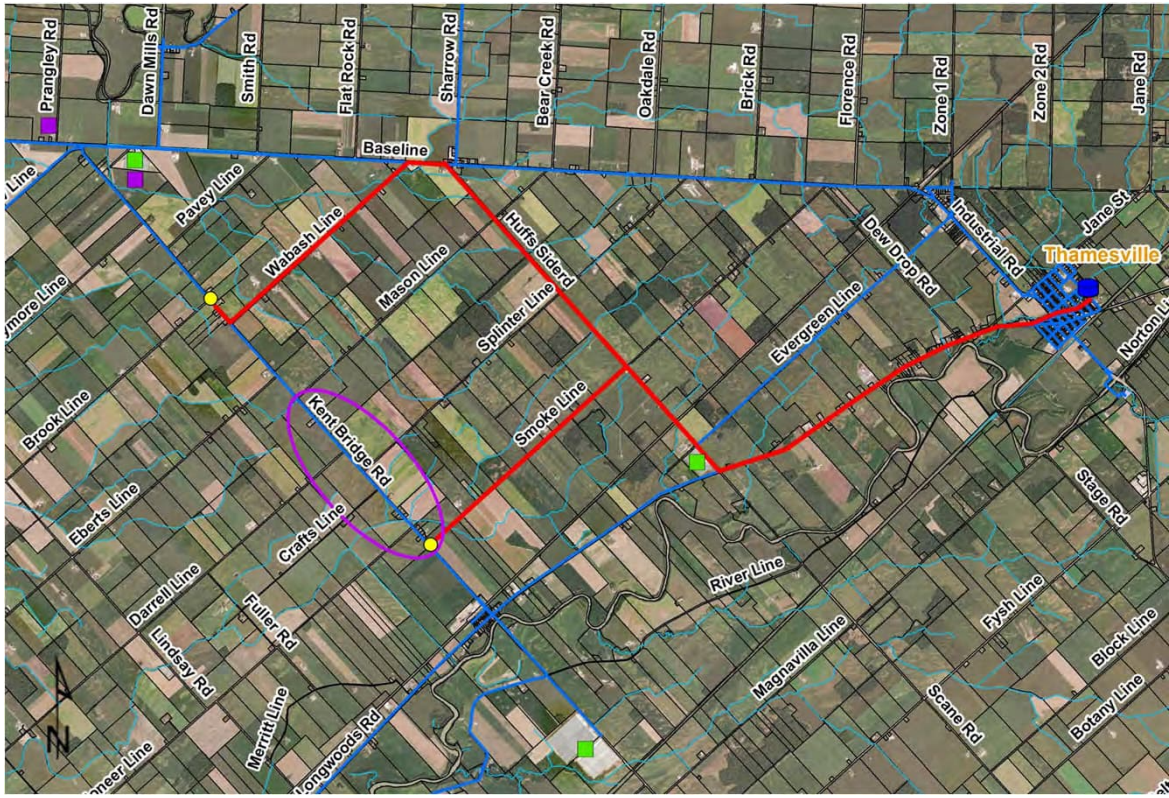
Focus Study Area - West Future Development Recommended Alternative

Rationale:

- Provides watermains on roads that currently do not have any watermains along them, creating system redundancy.
- Shortest Route (lower cost) at 19km.
- Watermain is centrally located providing the ability to service future greenhouse development that is not already in the planning stage.



Legend

- Future/Expanding Greenhouse
- Future Greenhouse Siting Area
- Existing Greenhouse
- Existing Standpipe / Elevated Tank
- Recommended Route
- Existing Watermains
- Connection Point

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Next Steps

- Comments received from this Public Information Centre will be collected, reviewed and considered by the project team and become part of the public record.
- An EA Project File report will be prepared and made available for public review online for 30 days. – September 2022
- If no issues are raised within the 30-day review period, the Municipality can proceed to detailed design, approvals and construction once funding is in place.
- Any issues that cant be resolved within the 30 day review period will be reviewed by the Ministry of the Environment Conservation and Parks (MECP) who will decide appropriate course of action as required.
- Chatham Kent PUC will approve funding for the preferred works from these recommendations through its Capital works budget planning process.
- Detailed design including any identified property acquisition negotiations and permitting would be completed, and construction can begin for the preferred works.

For More Information

Visit the Project Website

- www.letstalkchatham-kent.ca
- https://www.letstalkchatham-kent.ca/north-east-ne-chatham-kent-water-distribution-system-municipal-class-ea-mcea

Contact the Project Team

- Contact us with additional comments or questions at any time.
- Send comments in using the comment sheet found on the project website.

We appreciate the time you have taken to learn more about the project and value your input to this study and encourage you to stay connected.

Ali Akl, M.Eng., P.Eng
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Chatham-Kent PUC
Tel: 226-312-2023 ext. 4347
Email : alia@chatham-kent.ca

Paul Adams, CPT
Environmental Planner,
AECOM Canada Ltd.
250 York Street, Suite 410
London ON, N6A 6K2
Tel: 519-636-6448
Email: paul.adams2@aecom.com

AECOM | Chatham-Kent Public Utilities Commission

Appendix A

A.4 Indigenous Community Consultation

Adams, Paul (London ON)

From:	Adams, Paul (London ON)
Sent:	August 12, 2021 9:27 AM
To:	director.operations@delawarenation.on.ca; denise.stonefish@delawarenation.on.ca
Subject:	Chatham Kent PUC - NE WDS Notice of Study Commencement
Attachments:	CK PUC_NE CK WDS_Notice of Commencment.pdf

Hello Chief Stonefish,

Please see the attached Notice of Study Commencement for the CK-PUC NE WDS project. As discussed in our previous meetings, please don't hesitate to reach out if you have any questions.

Regards,

Paul.

Paul Adams, CPT
Environmental Planner, Environment
D +1-519-963-5873
M +1-519-636-6448
paul.adams2 @aecom.com

AECOM
250 York Street
Suite 410
London, Ontario, N6A 6K2, Canada
T +1-519-673-0510
aecom.com

Delivering a better world

LinkedIn | Twitter | Facebook | Instagram

Adams, Paul (London ON)

From:	Adams, Paul (London ON)
Sent:	August 12, 2021 10:06 AM
Subject:	CK - PUC NE Water Distribution System Class EA Notice of Commencement
Attachments:	CK PUC_NE CK WDS_Notice of Commencment.pdf

Hello,

Please see the attached notice of study commencement for the Chatham Kent Public Utilities Commission – North East CK Water Distribution System Municipal Class Environmental Assessment.

Regards,

Paul.

Paul Adams, CPT
Environmental Planner, Environment
D +1-519-963-5873
M +1-519-636-6448
paul.adams2 @aecom.com

AECOM
250 York Street
Suite 410
London, Ontario, N6A 6K2, Canada
T +1-519-673-0510
aecom.com

Delivering a better world

LinkedIn | Twitter | Facebook | Instagram

Adams, Paul (London ON)

From:	Adams, Paul (London ON)
Sent:	August 12, 2021 9:57 AM
To:	adrian.chrisjohn@oneida.on.ca; holly.elijah@oneida.on.ca; cherilyn.hill@oneida.on.ca; ccounciltemp@oneida.on.ca
Subject:	Notice of Commencement
Attachments:	CK PUC_NE CK WDS_Notice of Commencment.pdf

Hello Chief Chrisjohn,

Please see attached Notice of Study Commencement for the CK-PUC NE CK WDS Class EA.

As we proceed with this Class EA, the project team is initiating the Indigenous Community engagement and consultation process. The project team would like to hear from your community and would welcome your input and feedback.

As the study progresses, the project team can provide you with the results of analyses that may be of interest to your community. We would be happy to discuss how your community would like to be involved.

Please do not hesitate to contact if you have any questions or concerns

Regards,

Paul.

Paul Adams, CPT
Environmental Planner, Environment
D +1-519-963-5873
M +1-519-636-6448
paul.adams2 @aecom.com

AECOM
250 York Street
Suite 410
London, Ontario, N6A 6K2, Canada
T +1-519-673-0510
aecom.com

Adams, Paul (London ON)

From:	Adams, Paul (London ON)
Sent:	August 12, 2021 9:54 AM
To:	chief@munsee.ca; reception@munsee.ca; glenn@munsee.ca
Subject:	Notice of Commencement
Attachments:	CK PUC_NE CK WDS_Notice of Commencment.pdf

Hello Chief Thomas,

Please see attached Notice of Study Commencement for the CK-PUC NE CK WDS Class EA.

As we proceed with this Class EA, the project team is initiating the Indigenous Community engagement and consultation process. The project team would like to hear from your community and would welcome your input and feedback.

As the study progresses, the project team can provide you with the results of analyses that may be of interest to your community. We would be happy to discuss how your community would like to be involved.

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Regards,

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D +1-519-963-5873
M +1-519-636-6448
paul.adams2 @aecom.com

AECOM
250 York Street
Suite 410
London, Ontario, N6A 6K2, Canada
T +1-519-673-0510
aecom.com

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Adams, Paul (London ON)

From:	Adams, Paul (London ON)
Sent:	August 12, 2021 9:52 AM
To:	KPAssistant@kettlepoint.org
Subject:	Notice of Study Commencement
Attachments:	CK PUC_NE CK WDS_Notice of Commencment.pdf

Hello Chief Henry,

Please see attached Notice of Study Commencement for the CK-PUC NE CK WDS Class EA.

As we proceed with this Class EA, the project team is initiating the Indigenous Community engagement and consultation process. The project team would like to hear from your community and would welcome your input and feedback.

As the study progresses, the project team can provide you with the results of analyses that may be of interest to your community. We would be happy to discuss how your community would like to be involved.

Please do not hesitate to contact if you have any questions or concerns

Regards,

Paul.

Paul Adams, CPT
Environmental Planner, Environment
D +1-519-963-5873
M +1-519-636-6448
paul.adams2 @aecom.com

AECOM
250 York Street
Suite 410
London, Ontario, N6A 6K2, Canada
T +1-519-673-0510
aecom.com

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Adams, Paul (London ON)

From:	Adams, Paul (London ON)
Sent:	August 12, 2021 9:51 AM
To:	band.rep@caldwellfirstnation.ca; chief@caldwellfirstnation.ca; nikki@caldwellfirstnation.ca
Subject:	Notice of Study Commencement
Attachments:	CK PUC_NE CK WDS_Notice of Commencment.pdf

Hello Chief Duckworth,

Please see attached Notice of Study Commencement for the CK-PUC NE CK WDS Class EA.

As we proceed with this Class EA, the project team is initiating the Indigenous Community engagement and consultation process. The project team would like to hear from your community and would welcome your input and feedback.

As the study progresses, the project team can provide you with the results of analyses that may be of interest to your community. We would be happy to discuss how your community would like to be involved.

Please do not hesitate to contact if you have any questions or concerns

Regards,

Paul.

Paul Adams, CPT
Environmental Planner, Environment
D +1-519-963-5873
M +1-519-636-6448
paul.adams2 @aecom.com

AECOM
250 York Street
Suite 410
London, Ontario, N6A 6K2, Canada
T +1-519-673-0510
aecom.com

Adams, Paul (London ON)

From:	Adams, Paul (London ON)
Sent:	August 12, 2021 9:50 AM
To:	chief@aamjiwnaang.ca; sjohnston@aamjiwnaang.ca; jsimon@aamjiwnaang.ca; lrosales@aamjiwnaang.ca
Subject:	Notice of Study Commencement - Chatham Kent Public Utilities Commission NE CK Water Distribution System Class EA
Attachments:	CK PUC_NE CK WDS_Notice of Commencment.pdf

Hello Chief Plain,

Please see attached Notice of Study Commencement for the CK-PUC NE CK WDS Class EA.

As we proceed with this Class EA, the project team is initiating the Indigenous Community engagement and consultation process. The project team would like to hear from your community and would welcome your input and feedback.

As the study progresses, the project team can provide you with the results of analyses that may be of interest to your community. We would be happy to discuss how your community would like to be involved.

Please do not hesitate to contact if you have any questions or concerns

Regards,

Paul.

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D +1-519-963-5873
M +1-519-636-6448
paul.adams2 @aecom.com

AECOM
250 York Street
Suite 410
London, Ontario, N6A 6K2, Canada
T +1-519-673-0510
aecom.com

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Appendix A

A.5 Agency Consultation

Ministry of the Environment, Conservation and Parks

Environmental Assessment Branch

1st Floor
135 St. Clair Avenue W
Toronto ON M4V 1P5
Tel.: 416 314-8001
Fax.: 416 314-8452

Ministère de l'Environnement, de la Protection de la nature et des Parcs

Direction des évaluations environnementales

Rez-de-chaussée
135, avenue St. Clair Ouest
Toronto ON M4V 1P5
Tél. : 416 314-8001
Téléc. : 416 314-8452

September 16, 2021

Paul Adams
Environmental Planner
AECOM Canada Ltd.

Re: **North-East Chatham-Kent Water Distribution System**
Chatham-Kent Public Utilities Commission
Municipal Class EA
Response to Notice of Commencement

Dear Paul Adams,

This letter is in response to the Notice of Commencement for the above noted project. The Ministry of the Environment, Conservation and Parks (MECP) acknowledges that the Chatham-Kent Public Utilities Commission (proponent) has indicated that the study is following the approved environmental planning process for a Schedule B project under the Municipal Class Environmental Assessment (Class EA).

The **updated (February 2021)** attached "Areas of Interest" document provides guidance regarding the ministry's interests with respect to the Class EA process. Please address all areas of interest in the EA documentation at an appropriate level for the EA study. Proponents who address all the applicable areas of interest can minimize potential delays to the project schedule. **Further information is provided at the end of the Areas of Interest document relating to recent changes to the Environmental Assessment Act through Bill 197, Covid-19 Economic Recovery Act 2020.**

The Crown has a legal duty to consult Aboriginal communities when it has knowledge, real or constructive, of the existence or potential existence of an Aboriginal or treaty right and

contemplates conduct that may adversely impact that right. Before authorizing this project, the Crown must ensure that its duty to consult has been fulfilled, where such a duty is triggered. Although the duty to consult with Aboriginal peoples is a duty of the Crown, the Crown may delegate procedural aspects of this duty to project proponents while retaining oversight of the consultation process.

The proposed project may have the potential to affect Aboriginal or treaty rights protected under Section 35 of Canada's *Constitution Act* 1982. Where the Crown's duty to consult is triggered in relation to the proposed project**, the MECP is delegating the procedural aspects of rights-based consultation to the proponent through this letter.** The Crown intends to rely on the delegated consultation process in discharging its duty to consult and maintains the right to participate in the consultation process as it sees fit.

Based on information provided to date and the Crown`s preliminary assessment the proponent is required to consult with the following communities who have been identified as potentially affected by the proposed project:

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

Steps that the proponent may need to take in relation to Aboriginal consultation for the proposed project are outlined in the "Code of Practice for Consultation in Ontario's Environmental Assessment Process". Additional information related to Ontario's Environmental Assessment Act is available online at: www.ontario.ca/environmentalassessments.

Please also refer to the attached document "A Proponent's Introduction to the Delegation of Procedural Aspects of consultation with Aboriginal Communities" for further information, including the MECP's expectations for EA report documentation related to consultation with communities.

The proponent must contact the Director of Environmental Assessment Branch (EABDirector@ontario.ca) under the following circumstances subsequent to initial discussions with the communities identified by the MECP:

- Aboriginal or treaty rights impacts are identified to you by the communities
- You have reason to believe that your proposed project may adversely affect an Aboriginal or treaty right
- Consultation with Indigenous communities or other stakeholders has reached an

impasse
- A Part II Order request is expected on the basis of impacts to Aboriginal or treaty rights

The MECP will then assess the extent of any Crown duty to consult for the circumstances and will consider whether additional steps should be taken, including what role you will be asked to play should additional steps and activities be required.

A draft copy of the report should be sent directly to me prior to the filing of the final report, allowing a minimum of 30 days for the ministry's technical reviewers to provide comments.

Please also ensure a copy of the final notice is sent to the ministry's Southwest Region EA notification email account (eanotification.swregion@ontario.ca) after the draft report is reviewed and finalized.

Should you or any members of your project team have any questions regarding the material above, please contact me at mark.badali1@ontario.ca.

Yours truly,

Mark Badali
Regional Environmental Planner – Southwest Region

Cc: Pierre Adrien, Manager, Sarnia District Office, MECP
Marc Bechard, Water Compliance Supervisor, Sarnia District Office, MECP
Ali Akl, Project Engineer, Chatham-Kent Public Utilities Commission, Municipality of Chatham-Kent

Encl. Areas of Interest
A Proponent's Introduction to the Delegation of Procedural Aspects of Consultation with Aboriginal Communities

AREAS OF INTEREST (v. February 2021)

It is suggested that you check off each section after you have considered / addressed it.

☐ **Planning and Policy**

- Projects located in MECP Central Region are subject to **A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2020).** Parts of the study area may also be subject to the Oak Ridges Moraine Conservation Plan (2017), Niagara Escarpment Plan (2017), Greenbelt Plan (2017) or Lake Simcoe Protection Plan (2014). Applicable plans and the applicable policies should be identified in the report, and the proponent should describe how the proposed project adheres to the relevant policies in these plans.

- The **Provincial Policy Statement (2020)** contains policies that protect Ontario's natural heritage and water resources. Applicable policies should be referenced in the report, and the proponent should describe how the proposed project is consistent with these policies.

- In addition to the provincial planning and policy level, the report should also discuss the planning context at the municipal and federal levels, as appropriate.

☐ **Source Water Protection**

The *Clean Water Act*, 2006 (CWA) aims to protect existing and future sources of drinking water. To achieve this, several types of vulnerable areas have been delineated around surface water intakes and wellheads for every municipal residential drinking water system that is located in a source protection area. These vulnerable areas are known as a Wellhead Protection Areas (WHPAs) and surface water Intake Protection Zones (IPZs). Other vulnerable areas that have been delineated under the CWA include Highly Vulnerable Aquifers (HVAs), Significant Groundwater Recharge Areas (SGRAs), Event-based modelling areas (EBAs), and Issues Contributing Areas (ICAs). Source protection plans have been developed that include policies to address existing and future risks to sources of municipal drinking water within these vulnerable areas.

Projects that are subject to the Environmental Assessment Act that fall under a Class EA, or one of the Regulations, have the potential to impact sources of drinking water if they occur in designated vulnerable areas or in the vicinity of other at-risk drinking water systems (i.e. systems that are not municipal residential systems). MEA Class EA projects may include activities that, if located in a vulnerable area, could be a threat to sources of drinking water (i.e. have the potential to adversely affect the quality or quantity of drinking water sources) and the activity could therefore be subject to policies in a source protection plan. Where an activity poses a risk to drinking water, policies in the local source protection plan may impact how or where that activity is undertaken. Policies may prohibit certain activities, or they may require risk management measures for these activities. Municipal Official Plans, planning decisions,

Class EA projects (where the project includes an activity that is a threat to drinking water) and prescribed instruments must conform with policies that address significant risks to drinking water and must have regard for policies that address moderate or low risks.

- In October 2015, the MEA Parent Class EA document was amended to include reference to the Clean Water Act (Section A.2.10.6) and indicates that proponents undertaking a Municipal Class EA project must identify early in their process whether a project is or could potentially be occurring with a vulnerable area. **Given this requirement, please include a section in the report on source water protection.**

    - The proponent should identify the source protection area and should clearly document how the proximity of the project to sources of drinking water (municipal or other) and any delineated vulnerable areas was considered and assessed. Specifically, the report should discuss whether or not the project is located in a vulnerable area and provide applicable details about the area.

    - If located in a vulnerable area, proponents should document whether any project activities are prescribed drinking water threats and thus pose a risk to drinking water (this should be consulted on with the appropriate Source Protection Authority). Where an activity poses a risk to drinking water, the proponent must document and discuss in the report how the project adheres to or has regard to applicable policies in the local source protection plan. This section should then be used to inform and be reflected in other sections of the report, such as the identification of net positive/negative effects of alternatives, mitigation measures, evaluation of alternatives etc.

- While most source protection plans focused on including policies for significant drinking water threats in the WHPAs and IPZs it should be noted that even though source protection plan policies may not apply in HVAs, these are areas where aquifers are sensitive and at risk to impacts and within these areas, activities may impact the quality of sources of drinking water for systems other than municipal residential systems.

- In order to determine if this project is occurring within a vulnerable area, proponents can use this mapping tool: http://www.applications.ene.gov.on.ca/swp/en/index.php. Note that various layers (including WHPAs, WHPA-Q1 and WHPA-Q2, IPZs, HVAs, SGRAs, EBAs, ICAs) can be turned on through the “Map Legend” bar on the left. The mapping tool will also provide a link to the appropriate source protection plan in order to identify what policies may be applicable in the vulnerable area.

- For further information on the maps or source protection plan policies which may relate to their project, proponents must contact the appropriate source protection authority. **Please consult with the local source protection authority to discuss potential impacts on drinking water. Please document the results of that consultation within the report and include all communication documents/correspondence.**

More Information

For more information on the *Clean Water Act*, source protection areas and plans, including specific information on the vulnerable areas and drinking water threats, please refer to Conservation Ontario's website where you will also find links to the local source protection plan/assessment report.

A list of the prescribed drinking water threats can be found in section 1.1 of Ontario Regulation 287/07 made under the *Clean Water Act*. In addition to prescribed drinking water threats, some source protection plans may include policies to address additional "local" threat activities, as approved by the MECP.

- **Climate Change**

The document "Considering Climate Change in the Environmental Assessment Process" (Guide) is now a part of the Environmental Assessment program's Guides and Codes of Practice. The Guide sets out the MECP's expectation for considering climate change in the preparation, execution and documentation of environmental assessment studies and processes. The guide provides examples, approaches, resources, and references to assist proponents with consideration of climate change in EA. Proponents should review this Guide in detail.

- **The MECP expects proponents of Class EA projects to:**

    1. Consider during the assessment of alternative solutions and alternative designs, the following:
        a. the project's expected production of greenhouse gas emissions and impacts on carbon sinks (climate change mitigation); and
        b. resilience or vulnerability of the undertaking to changing climatic conditions (climate change adaptation).
    2. Include a discrete section in the report detailing how climate change was considered in the EA.

How climate change is considered can be qualitative or quantitative in nature and should be scaled to the project's level of environmental effect. In all instances, both a project's impacts on climate change (mitigation) and impacts of climate change on a project (adaptation) should be considered.

- The MECP has also prepared another guide to support provincial land use planning direction related to the completion of energy and emission plans. The "Community Emissions Reduction Planning: A Guide for Municipalities" document is designed to educate stakeholders on the municipal opportunities to reduce energy and greenhouse gas emissions, and to provide guidance on methods and techniques to incorporate consideration of energy and greenhouse gas emissions into municipal activities of all types. We encourage you to review the Guide for information.

Air Quality, Dust and Noise

- If there are sensitive receptors in the surrounding area of this project, a quantitative air quality/odour impact assessment will be useful to evaluate alternatives, determine impacts and identify appropriate mitigation measures. The scope of the assessment can be determined based on the potential effects of the proposed alternatives, and typically includes source and receptor characterization and a quantification of local air quality impacts on the sensitive receptors and the environment in the study area. The assessment will compare to all applicable standards or guidelines for all contaminants of concern. **Please contact this office for further consultation on the level of Air Quality Impact Assessment required for this project if not already advised.**

- If a quantitative Air Quality Impact Assessment is not required for the project, the MECP expects that the report contain a qualitative assessment which includes:

    - A discussion of local air quality including existing activities/sources that significantly impact local air quality and how the project may impact existing conditions;
    - A discussion of the nearby sensitive receptors and the project's potential air quality impacts on present and future sensitive receptors;
    - A discussion of local air quality impacts that could arise from this project during both construction and operation; and
    - A discussion of potential mitigation measures.

- As a common practice, "air quality" should be used an evaluation criterion for all road projects.

- Dust and noise control measures should be addressed and included in the construction plans to ensure that nearby residential and other sensitive land uses within the study area are not adversely affected during construction activities.

- The MECP recommends that non-chloride dust-suppressants be applied. For a comprehensive list of fugitive dust prevention and control measures that could be applied, refer to *Cheminfo Services Inc. Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities* report prepared for Environment Canada. March 2005.

- The report should consider the potential impacts of increased noise levels during the operation of the completed project. The proponent should explore all potential measures to mitigate significant noise impacts during the assessment of alternatives.

Ecosystem Protection and Restoration

- Any impacts to ecosystem form and function must be avoided where possible. The report should describe any proposed mitigation measures and how project planning will protect and enhance the local ecosystem.

- Natural heritage and hydrologic features should be identified and described in detail to assess potential impacts and to develop appropriate mitigation measures. The following sensitive environmental features may be located within or adjacent to the study area:
  - Key Natural Heritage Features: Habitat of endangered species and threatened species, fish habitat, wetlands, areas of natural and scientific interest (ANSIs), significant valleylands, significant woodlands; significant wildlife habitat (including habitat of special concern species); sand barrens, savannahs, and tallgrass prairies; and alvars.
  - Key Hydrologic Features: Permanent streams, intermittent streams, inland lakes and their littoral zones, seepage areas and springs, and wetlands.
  - Other natural heritage features and areas such as: vegetation communities, rare species of flora or fauna, Environmentally Sensitive Areas, Environmentally Sensitive Policy Areas, federal and provincial parks and conservation reserves, Greenland systems etc.

We recommend consulting with the Ministry of Natural Resources and Forestry (MNRF), Fisheries and Oceans Canada (DFO) and your local conservation authority to determine if special measures or additional studies will be necessary to preserve and protect these sensitive features. In addition, you may consider the provisions of the Rouge Park Management Plan if applicable.

Species at Risk

- The Ministry of the Environment, Conservation and Parks has now assumed responsibility of Ontario's Species at Risk program. Information, standards, guidelines, reference materials and technical resources to assist you are found at https://www.ontario.ca/page/species-risk.

- The Client's Guide to Preliminary Screening for Species at Risk (Draft May 2019) has been attached to the covering email for your reference and use. Please review this document for next steps.

- For any questions related to subsequent permit requirements, please contact SAROntario@ontario.ca.

Surface Water

- The report must include enough information to demonstrate that there will be no negative impacts on the natural features or ecological functions of any watercourses within the study area. Measures should be included in the planning and design process to ensure that any impacts to watercourses from construction or operational activities (e.g. spills, erosion, pollution) are mitigated as part of the proposed undertaking.

- Additional stormwater runoff from new pavement can impact receiving watercourses and flood conditions. Quality and quantity control measures to treat stormwater runoff should be considered for all new impervious areas and, where possible, existing surfaces. The ministry's Stormwater Management Planning and Design Manual (2003) should be referenced in the report and utilized when designing stormwater control methods. **A Stormwater Management Plan should be prepared as part of the Class EA process** that includes:

    - Strategies to address potential water quantity and erosion impacts related to stormwater draining into streams or other sensitive environmental features, and to ensure that adequate (enhanced) water quality is maintained
    - Watershed information, drainage conditions, and other relevant background information
    - Future drainage conditions, stormwater management options, information on erosion and sediment control during construction, and other details of the proposed works
    - Information on maintenance and monitoring commitments.

- Ontario Regulation 60/08 under the *Ontario Water Resources Act* (OWRA) applies to the Lake Simcoe Basin, which encompasses Lake Simcoe and the lands from which surface water drains into Lake Simcoe. If the proposed sewage treatment plant is listed in Table 1 of the regulation, the report should describe how the proposed project and its mitigation measures are consistent with the requirements of this regulation and the OWRA.

- Any potential approval requirements for surface water taking or discharge should be identified in the report. A Permit to Take Water (PTTW) under the OWRA will be required for any water takings that exceed 50,000 L/day, except for certain water taking activities that have been prescribed by the Water Taking EASR Regulation – *O. Reg. 63/16*. These prescribed water-taking activities require registration in the EASR instead of a PTTW. Please review the Water Taking User Guide for EASR for more information. Additionally, an Environmental Compliance Approval under the OWRA is required for municipal stormwater management works.

Groundwater

- The status of, and potential impacts to any well water supplies should be addressed. If the project involves groundwater takings or changes to drainage patterns, the quantity and quality of groundwater may be affected due to drawdown effects or the redirection of existing contamination flows. In addition, project activities may infringe on existing wells such that they must be reconstructed or sealed and abandoned. Appropriate information to define existing groundwater conditions should be included in the report.

- If the potential construction or decommissioning of water wells is identified as an issue, the report should refer to Ontario Regulation 903, Wells, under the OWRA.

- Potential impacts to groundwater-dependent natural features should be addressed. Any changes to groundwater flow or quality from groundwater taking may interfere with the ecological processes of streams, wetlands or other surficial features. In addition, discharging contaminated or high volumes of groundwater to these features may have direct impacts on their function. Any potential effects should be identified, and appropriate mitigation measures should be recommended. The level of detail required will be dependent on the significance of the potential impacts.

- Any potential approval requirements for groundwater taking or discharge should be identified in the report. A Permit to Take Water (PTTW) under the OWRA will be required for any water takings that exceed 50,000 L/day, with the exception of certain water taking activities that have been prescribed by the Water Taking EASR Regulation – *O. Reg. 63/16*. These prescribed water-taking activities require registration in the EASR instead of a PTTW. Please review the Water Taking User Guide for EASR for more information.

- Consultation with the railroad authorities is necessary wherever there is a plan to use construction dewatering in the vicinity of railroad lines or where the zone of influence of the construction dewatering potentially intercepts railroad lines.

Excess Materials Management

- In December 2019, MECP released a new regulation under the Environmental Protection Act, titled "On-Site and Excess Soil Management" (O. Reg. 406/19) to support improved management of excess construction soil. This regulation is a key step to support proper management of excess soils, ensuring valuable resources don't go to waste and to provide clear rules on managing and reusing excess soil. New risk-based standards referenced by this regulation help to facilitate local beneficial reuse which in turn will reduce greenhouse gas emissions from soil transportation, while ensuring strong protection of human health and the environment. The new regulation is being phased in over time, with the first phase

in effect on January 1, 2021. For more information, please visit https://www.ontario.ca/page/handling-excess-soil.

- The report should reference that activities involving the management of excess soil should be completed in accordance with O. Reg. 406/19 and the MECP's current guidance document titled "Management of Excess Soil – A Guide for Best Management Practices" (2014).

- All waste generated during construction must be disposed of in accordance with ministry requirements

Contaminated Sites

- Any current or historical waste disposal sites should be identified in the report. The status of these sites should be determined to confirm whether approval pursuant to Section 46 of the EPA may be required for land uses on former disposal sites. We recommend referring to the MECP's D-4 guideline for land use considerations near landfills and dumps.
  - Resources available may include regional/local municipal official plans and data; provincial data on large landfill sites and small landfill sites; Environmental Compliance Approval information for waste disposal sites on Access Environment.

- Other known contaminated sites (local, provincial, federal) in the study area should also be identified in the report (Note – information on federal contaminated sites is found on the Government of Canada's website).

- The location of any underground storage tanks should be investigated in the report. Measures should be identified to ensure the integrity of these tanks and to ensure an appropriate response in the event of a spill. The ministry's Spills Action Centre must be contacted in such an event.

- Since the removal or movement of soils may be required, appropriate tests to determine contaminant levels from previous land uses or dumping should be undertaken. If the soils are contaminated, you must determine how and where they are to be disposed of, consistent with *Part XV.1 of the Environmental Protection Act* (EPA) and Ontario Regulation 153/04, Records of Site Condition, which details the new requirements related to site assessment and clean up. Please contact the appropriate MECP District Office for further consultation if contaminated sites are present.

Servicing, Utilities and Facilities

- The report should identify any above or underground utilities in the study area such as transmission lines, telephone/internet, oil/gas etc. The owners should be consulted to discuss impacts to this infrastructure, including potential spills.

- The report should identify any servicing infrastructure in the study area such as wastewater, water, stormwater that may potentially be impacted by the project.

- Any facility that releases emissions to the atmosphere, discharges contaminants to ground or surface water, provides potable water supplies, or stores, transports or disposes of waste must have an Environmental Compliance Approval (ECA) before it can operate lawfully. Please consult with MECP's Environmental Permissions Branch to determine whether a new or amended ECA will be required for any proposed infrastructure.

- We recommend referring to the ministry's environmental land use planning guides to ensure that any potential land use conflicts are considered when planning for any infrastructure or facilities related to wastewater, pipelines, landfills or industrial uses.

Mitigation and Monitoring

- Contractors must be made aware of all environmental considerations so that all environmental standards and commitments for both construction and operation are met. Mitigation measures should be clearly referenced in the report and regularly monitored during the construction stage of the project. In addition, we encourage proponents to conduct post-construction monitoring to ensure all mitigation measures have been effective and are functioning properly.

- Design and construction reports and plans should be based on a best management approach that centres on the prevention of impacts, protection of the existing environment, and opportunities for rehabilitation and enhancement of any impacted areas.

- The proponent's construction and post-construction monitoring plans must be documented in the report, as outlined in Section A.2.5 and A.4.1 of the MEA Class EA parent document.

Consultation

- The report must demonstrate how the consultation provisions of the Class EA have been fulfilled, including documentation of all stakeholder consultation efforts undertaken during the planning process. This includes a discussion in the report that identifies concerns that were raised and **describes how they have been addressed by the proponent** throughout

the planning process. The report should also include copies of comments submitted on the project by interested stakeholders, and the proponent's responses to these comments (as directed by the Class EA to include full documentation).

- Please include the full stakeholder distribution/consultation list in the documentation.

Class EA Process

- If this project is a Master Plan: there are several different approaches that can be used to conduct a Master Plan, examples of which are outlined in Appendix 4 of the Class EA. **The Master Plan should clearly indicate the selected approach for conducting the plan**, by identifying whether the levels of assessment, consultation and documentation are sufficient to fulfill the requirements for Schedule B or C projects. Please note that any Schedule B or C projects identified in the plan would be subject to Part II Order Requests under the Environmental Assessment Act, although the plan itself would not be. **Please include a description of the approach being undertaken (use Appendix 4 as a reference).**

- If this project is a Master Plan: Any identified projects should also include information on the MCEA schedule associated with the project.

- The report should provide clear and complete documentation of the planning process in order to allow for transparency in decision-making.

- The Class EA requires the consideration of the effects of each alternative on all aspects of the environment (including planning, natural, social, cultural, economic, technical). The report should include a level of detail (e.g. hydrogeological investigations, terrestrial and aquatic assessments, cultural heritage assessments) such that all potential impacts can be identified, and appropriate mitigation measures can be developed. Any supporting studies conducted during the Class EA process should be referenced and included as part of the report.

- Please include in the report a list of all subsequent permits or approvals that may be required for the implementation of the preferred alternative, including but not limited to, MECP's PTTW, EASR Registrations and ECAs, conservation authority permits, species at risk permits, MTO permits and approvals under the *Impact Assessment Act*, 2019.

- Ministry guidelines and other information related to the issues above are available at http://www.ontario.ca/environment-and-energy/environment-and-energy. We encourage you to review all the available guides and to reference any relevant information in the report.

Amendments to the EAA through the Covid-19 Economic Recovery Act, 2020
Once the EA Report is finalized, the proponent must issue a Notice of Completion providing a minimum 30-day period during which documentation may be reviewed and comment and input can be submitted to the proponent. The Notice of Completion must be sent to the appropriate MECP Regional Office email address (for projects in MECP Southwest Region, the email is eanotification.swregion@ontario.ca).

The public has the ability to request a higher level of assessment on a project if they are concerned about potential adverse impacts to constitutionally protected Aboriginal and treaty rights. In addition, the Minister may issue an order on his or her own initiative within a specified time period. The Director (of the Environmental Assessment Branch) will issue a Notice of Proposed Order to the proponent if the Minister is considering an order for the project within 30 days after the conclusion of the comment period on the Notice of Completion. At this time, the Director may request additional information from the proponent. Once the requested information has been received, the Minister will have 30 days within which to make a decision or impose conditions on your project.

Therefore, the proponent cannot proceed with the project until at least 30 days after the end of the comment period provided for in the Notice of Completion. Further, the proponent may not proceed after this time if:

- a Part II Order request has been submitted to the ministry regarding potential adverse impacts to constitutionally protected Aboriginal and treaty rights, or
- the Director has issued a Notice of Proposed order regarding the project.

Please ensure that the Notice of Completion advises that outstanding concerns are to be directed to the proponent for a response, and that in the event there are outstanding concerns regarding potential adverse impacts to constitutionally protected Aboriginal and treaty rights, Part II Order requests on those matters should be addressed in writing to:

Minister Jeff Yurek
Ministry of Environment, Conservation and Parks
777 Bay Street, 5th Floor
Toronto ON M7A 2J3
minister.mecp@ontario.ca

and

Director, Environmental Assessment Branch
Ministry of Environment, Conservation and Parks
135 St. Clair Ave. W, 1st Floor
Toronto ON, M4V 1P5
EABDirector@ontario.ca

A PROPONENT'S INTRODUCTION TO THE DELEGATION OF PROCEDURAL ASPECTS OF CONSULTATION WITH ABORIGINAL COMMUNITIES

DEFINITIONS

The following definitions are specific to this document and may not apply in other contexts:

Aboriginal communities – the First Nation or Métis communities identified by the Crown for the purpose of consultation.

Consultation – the Crown's legal obligation to consult when the Crown has knowledge of an established or asserted Aboriginal or treaty right and contemplates conduct that might adversely impact that right. This is the type of consultation required pursuant to s. 35 of the *Constitution Act, 1982*. Note that this definition does not include consultation with Aboriginal communities for other reasons, such as regulatory requirements.

Crown – the Ontario Crown, acting through a particular ministry or ministries.

Procedural aspects of consultation – those portions of consultation related to the process of consultation, such as notifying an Aboriginal community about a project, providing information about the potential impacts of a project, responding to concerns raised by an Aboriginal community and proposing changes to the project to avoid negative impacts.

Proponent – the person or entity that wants to undertake a project and requires an Ontario Crown decision or approval for the project.

I. PURPOSE

The Crown has a legal duty to consult Aboriginal communities when it has knowledge of an existing or asserted Aboriginal or treaty right and contemplates conduct that may adversely impact that right. In outlining a framework for the duty to consult, the Supreme Court of Canada has stated that the Crown may delegate procedural aspects of consultation to third parties. This document provides general information about the Ontario Crown's approach to delegation of the procedural aspects of consultation to proponents.

This document is not intended to instruct a proponent about an individual project, and it does not constitute legal advice.

II. WHY IS IT NECESSARY TO CONSULT WITH ABORIGINAL COMMUNITIES?

The objective of the modern law of Aboriginal and treaty rights is the *reconciliation* of Aboriginal peoples and non-Aboriginal peoples and their respective rights, claims and interests. Consultation is an important component of the reconciliation process.

The Crown has a legal duty to consult Aboriginal communities when it has knowledge of an existing or asserted Aboriginal or treaty right and contemplates conduct that might adversely impact that right. For example, the Crown's duty to consult is triggered when it considers

issuing a permit, authorization or approval for a project which has the potential to adversely impact an Aboriginal right, such as the right to hunt, fish, or trap in a particular area.

The scope of consultation required in particular circumstances ranges across a spectrum depending on both the nature of the asserted or established right and the seriousness of the potential adverse impacts on that right.

Depending on the particular circumstances, the Crown may also need to take steps to accommodate the potentially impacted Aboriginal or treaty right. For example, the Crown may be required to avoid or minimize the potential adverse impacts of the project.

III. THE CROWN'S ROLE AND RESPONSIBILITIES IN THE DELEGATED CONSULTATION PROCESS

The Crown has the responsibility for ensuring that the duty to consult, and accommodate where appropriate, is met. However, the Crown may delegate the procedural aspects of consultation to a proponent.

There are different ways in which the Crown may delegate the procedural aspects of consultation to a proponent, including through a letter, a memorandum of understanding, legislation, regulation, policy and codes of practice.

If the Crown decides to delegate procedural aspects of consultation, the Crown will generally:

- Ensure that the delegation of procedural aspects of consultation and the responsibilities of the proponent are clearly communicated to the proponent;
- Identify which Aboriginal communities must be consulted;
- Provide contact information for the Aboriginal communities;
- Revise, as necessary, the list of Aboriginal communities to be consulted as new information becomes available and is assessed by the Crown;
- Assess the scope of consultation owed to the Aboriginal communities;
- Maintain appropriate oversight of the actions taken by the proponent in fulfilling the procedural aspects of consultation;
- Assess the adequacy of consultation that is undertaken and any accommodation that may be required;
- Provide a contact within any responsible ministry in case issues arise that require direction from the Crown; and
- Participate in the consultation process as necessary and as determined by the Crown.

IV. THE PROPONENT'S ROLE AND RESPONSIBILITIES IN THE DELEGATED CONSULTATION PROCESS

Where aspects of the consultation process have been delegated to a proponent, the Crown, in meeting its duty to consult, will rely on the proponent's consultation activities and documentation of those activities. The consultation process informs the Crown's decision of whether or not to approve a proposed project or activity.

A proponent's role and responsibilities will vary depending on a variety of factors including the extent of consultation required in the circumstance and the procedural aspects of consultation the Crown has delegated to it. Proponents are often in a better position than the Crown to discuss a project and its potential impacts with Aboriginal communities and to determine ways to avoid or minimize the adverse impacts of a project.

A proponent can raise issues or questions with the Crown at any time during the consultation process. If issues or concerns arise during the consultation that cannot be addressed by the proponent, the proponent should contact the Crown.

a) What might a proponent be required to do in carrying out the procedural aspects of consultation?

Where the Crown delegates procedural aspects of consultation, it is often the proponent's responsibility to provide notice of the proposed project to the identified Aboriginal communities. The notice should indicate that the Crown has delegated the procedural aspects of consultation to the proponent and should include the following information:

- a description of the proposed project or activity;
- mapping;
- proposed timelines;
- details regarding anticipated environmental and other impacts;
- details regarding opportunities to comment; and
- any changes to the proposed project that have been made for seasonal conditions or other factors, where relevant.

Proponents should provide enough information and time to allow Aboriginal communities to provide meaningful feedback regarding the potential impacts of the project. Depending on the nature of consultation required for a project, a proponent also may be required to:

- provide the Crown with copies of any consultation plans prepared and an opportunity to review and comment;
- ensure that any necessary follow-up discussions with Aboriginal communities take place in a timely manner, including to confirm receipt of information, share and update information and to address questions or concerns that may arise;

- as appropriate, discuss with Aboriginal communities potential mitigation measures and/or changes to the project in response to concerns raised by Aboriginal communities;
- use language that is accessible and not overly technical, and translate material into Aboriginal languages where requested or appropriate;
- bear the reasonable costs associated with the consultation process such as, but not limited to, meeting hall rental, meal costs, document translation(s), or to address technical & capacity issues;
- provide the Crown with all the details about potential impacts on established or asserted Aboriginal or treaty rights, how these concerns have been considered and addressed by the proponent and the Aboriginal communities and any steps taken to mitigate the potential impacts;
- provide the Crown with complete and accurate documentation from these meetings and communications; and
- notify the Crown immediately if an Aboriginal community not identified by the Crown approaches the proponent seeking consultation opportunities.

b) What documentation and reporting does the Crown need from the proponent?

Proponents should keep records of all communications with the Aboriginal communities involved in the consultation process and any information provided to these Aboriginal communities.

As the Crown is required to assess the adequacy of consultation, it needs documentation to satisfy itself that the proponent has fulfilled the procedural aspects of consultation delegated to it. The documentation required would typically include:

- the date of meetings, the agendas, any materials distributed, those in attendance and copies of any minutes prepared;
- the description of the proposed project that was shared at the meeting;
- any and all concerns or other feedback provided by the communities;
- any information that was shared by a community in relation to its asserted or established Aboriginal or treaty rights and any potential adverse impacts of the proposed activity, approval or disposition on such rights;
- any proposed project changes or mitigation measures that were discussed, and feedback from Aboriginal communities about the proposed changes and measures;
- any commitments made by the proponent in response to any concerns raised, and feedback from Aboriginal communities on those commitments;
- copies of correspondence to or from Aboriginal communities, and any materials distributed electronically or by mail;

- information regarding any financial assistance provided by the proponent to enable participation by Aboriginal communities in the consultation;
- periodic consultation progress reports or copies of meeting notes if requested by the Crown;
- a summary of how the delegated aspects of consultation were carried out and the results; and
- a summary of issues raised by the Aboriginal communities, how the issues were addressed and any outstanding issues.

In certain circumstances, the Crown may share and discuss the proponent's consultation record with an Aboriginal community to ensure that it is an accurate reflection of the consultation process.

c) Will the Crown require a proponent to provide information about its commercial arrangements with Aboriginal communities?

The Crown may require a proponent to share information about aspects of commercial arrangements between the proponent and Aboriginal communities where the arrangements:

- include elements that are directed at mitigating or otherwise addressing impacts of the project;
- include securing an Aboriginal community's support for the project; or
- may potentially affect the obligations of the Crown to the Aboriginal communities.

The proponent should make every reasonable effort to exempt the Crown from confidentiality provisions in commercial arrangements with Aboriginal communities to the extent necessary to allow this information to be shared with the Crown.

The Crown cannot guarantee that information shared with the Crown will remain confidential. Confidential commercial information should not be provided to the Crown as part of the consultation record if it is not relevant to the duty to consult or otherwise required to be submitted to the Crown as part of the regulatory process.

V. WHAT ARE THE ROLES AND RESPONSIBILITIES OF ABORIGINAL COMMUNITIES' IN THE CONSULTATION PROCESS?

Like the Crown, Aboriginal communities are expected to engage in consultation in good faith. This includes:

- responding to the consultation notice;
- engaging in the proposed consultation process;
- providing relevant documentation;

- clearly articulating the potential impacts of the proposed project on Aboriginal or treaty rights; and
- discussing ways to mitigates any adverse impacts.

Some Aboriginal communities have developed tools, such as consultation protocols, policies or processes that provide guidance on how they would prefer to be consulted. Although not legally binding, proponents are encouraged to respect these community processes where it is reasonable to do so. Please note that there is no obligation for a proponent to pay a fee to an Aboriginal community in order to enter into a consultation process.

To ensure that the Crown is aware of existing community consultation protocols, proponents should contact the relevant Crown ministry when presented with a consultation protocol by an Aboriginal community or anyone purporting to be a representative of an Aboriginal community.

VI. WHAT IF MORE THAN ONE PROVINCIAL CROWN MINISTRY IS INVOLVED IN APPROVING A PROPONENT'S PROJECT?

Depending on the project and the required permits or approvals, one or more ministries may delegate procedural aspects of the Crown's duty to consult to the proponent. The proponent may contact individual ministries for guidance related to the delegation of procedural aspects of consultation for ministry-specific permits/approvals required for the project in question. Proponents are encouraged to seek input from all involved Crown ministries sooner rather than later.

CK - PUC NE Water Distribution System Class EA Notice of Commencement

Reply | Reply All

AP

Adams, Paul (London ON)

To

Bcc ckfire@chatham-kent.ca; reneec@chatham-kent.ca; garyc@chatham-kent.ca; Ckhealth@chatham-kent.ca; Larry.Applewhaite@cogeco.com; jim.hogan@entegrus.com; secondarylanduse@hydroone.com; Dave.Epp@parl.gc.ca; rick.nicholllsco@pc.ola.org; rpieta@uniongas.com; CKmayor@chatham-kent.ca; mark.authier@chatham-kent.ca; melissa.harrigan@chatham-kent.ca; Anthony Ceccacci; Trevor Thompson; clairel@chatham-kent.ca; steve.pinsonneault@chatham-kent.ca; marjorie.crew@chatham-kent.ca; jamie.mcgrail@chatham-kent.ca; joe.faas@chatham-kent.ca; aaron.hall@chatham-kent.ca; carmen.mcgregor@chatham-kent.ca; michael.bondy@chatham-kent.ca; brock.mcgregor@chatham-kent.ca; douglas.sulman@chatham-kent.ca; karen.kirkwood-whyte@chatham-kent.ca; amy.finn@chatham-kent.ca; april.rietdyk@chatham-kent.ca; thomas.kelly@chatham-kent.ca; bruce.mcallister@chatham-kent.ca; teresa.bendo@chatham-kent.ca; tim.dick@chatham-kent.ca; chris.thibert@chatham-kent.ca; ryan.brown@chatham-kent.ca

You replied to this message on 2021-11-23 10:00 AM.

CK PUC_NE CK WDS_Notice of Commencment.pdf
126 KB

Hello,

Please see the attached notice of study commencement for the Chatham Kent Public Utilities Commission – North East CK Water Distribution System Municipal Class Environmental Assessment.

Regards,

Paul.

Paul Adams, CPT
Environmental Planner, Environment
D +1-519-963-5873
M +1-519-636-6448
paul.adams2 @aecom.com

AECOM
250 York Street
Suite 410
London, Ontario, N6A 6K2, Canada
T +1-519-673-0510
aecom.com

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Notice of Study Commencement

Adams, Paul (London ON)
To
Bcc 'karla.barboza@ontario.ca'; Rebecca.Quach@ontario.ca; matt.garrow@ontario.ca; heather.levecque@ontario.ca; noticereview@infrastructureontario.ca; MNRF.Ayl.Planners@ontario.ca; dawn.irish@ontario.ca

You replied to this message on 2021-11-23 10:02 AM.

CK PUC_NE CK WDS_Notice of Commencment.pdf
126 KB

Hello,

Please refer to the attached Notice of Study Commencement for the Chatham Kent Public Utilities Commission – North East Chatham Kent Water Distribution System Class Environmental Assessment.

Regards,

Paul.

Paul Adams, CPT
Environmental Planner, Environment
D +1-519-963-5873
M +1-519-636-6448
paul.adams2 @aecom.com

AECOM
250 York Street
Suite 410
London, Ontario, N6A 6K2, Canada
T +1-519-673-0510
aecom.com

Adams, Paul (London ON)

From:	Adams, Paul (London ON)
Sent:	August 12, 2021 9:35 AM
To:	eanotification.swregion@ontario.ca
Subject:	Notice of Study Commencement
Attachments:	CK PUC_NE CK WDS_Notice of Commencment.pdf; CK-PUC NE WDS_ea_project_information_form_.xlsx

NOTICE OF STUDY COMMENCEMENT
CHATHAM KENT PUBLIC UTILITIES COMMISSION NORTH EAST WATER DISTRIBUTION SYSTEM
SCHEDULE B MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

Please find attached Notice of Study Commencement for the Municipal Class Environmental Assessment (Class EA) for the CK-PUC NE WDS.

Paul Adams, CPT
Environmental Planner, Environment
D +1-519-963-5873
M +1-519-636-6448
paul.adams2 @aecom.com

AECOM
250 York Street
Suite 410
London, Ontario, N6A 6K2, Canada
T +1-519-673-0510
aecom.com

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Appendix B

B.1 Hydraulic Analysis Memorandum

AECOM Canada Ltd.
105 Commerce Valley Drive West, 7th Floor
Markham, ON L3T 7W3
Canada

T: 905.886.7022
F: 905.538.8076
www.aecom.com

To: Ali Akl, P.Eng., CK PUC

Date: December 23, 2022

Project #: 60654246

From: Kevin Sze, P.Eng.

CC: Antony Aruldoss, AECOM
Benny Wan, AECOM

Memorandum

Subject: **NE Chatham-Kent WDS – Municipal Class Environmental Assessment**
Hydraulic Evaluation of the Water Servicing Strategy Alternatives

1. Introduction

AECOM was retained by the Chatham-Kent Public Utilities Commission (CK PUC) to complete a Schedule B Municipal Class Environmental Assessment (MCEA) study for the Northeast (NE) Chatham-Kent Water Distribution System (WDS).

The study area limits cover two (2) specific focus study areas: Focus Study Area-East (east side of Thamesville) and Focus Study Area-West (west side of Thamesville), as shown in Figure 1.

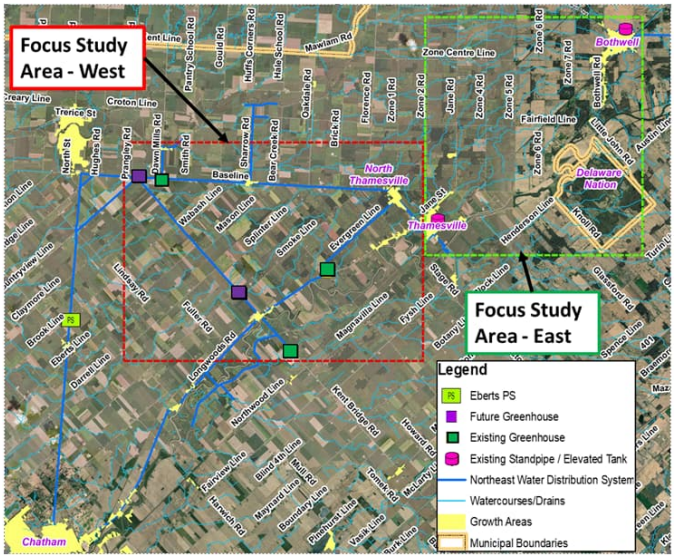


Figure 1: Study Areas

The study developed and evaluated water servicing strategy alternatives to provide a sustainable municipal water supply to the NE Chatham-Kent area to accommodate long-term future growth demands while also

providing reliable municipal water to the Delaware Nation Community. When determining the future infrastructure upgrade requirements, the servicing alternatives evaluation considered the potential future servicing option for Bothwell Community by the Chatham water system.

As part of this Class EA, AECOM completed the hydraulic evaluation of the ten (10) modelling scenarios for the East Focus Study Area, involving six (6) watermain routing options to Bothwell, and three (3) booster station/elevated tank siting options (Site 1 – Ferguson Park, Site 2 – North Thamesville and Site 3 – along Baseline) under multiple water servicing alternative solutions. Additionally, three (3) modelling scenarios for the West Focus Study Area were evaluated for the system hydraulics, involving three (3) watermain routing options to provide water servicing to the west side of Thamesville focus area. The hydraulic analysis is intended to support the selection of a recommended alternative solution in accordance with the Class EA requirements.

The following summarizes the water servicing alternatives for the East and West Focus Study Areas:

Focus Study Area - East:

Two (2) water servicing strategy alternatives were identified in the Class EA to provide water servicing to the east side of Thamesville focus area. Each servicing alternative involves multiple watermain routing options (Thamesville Area to Bothwell) to be evaluated:

- **Servicing Alternative 1:**
  - New Booster Pumping Station (BPS) evaluated based on the two potential siting options (Option BPS 1 located at Site 1 and Option BPS 3 located at Site 3) and Existing Standpipe (SP) / New Elevated Tank (ET) located in the East End of Thamesville in Ferguson Park.
- **Servicing Alternative 2:**
  - New Booster Pumping Station and New Elevated Tank located in North Thamesville Area.

Focus Study Area - West:

Three (3) potential watermain routing options were identified in the Class EA to provide water servicing to the west side of Thamesville focus area.

2. Background

The NE Chatham-Kent water distribution system encompasses the area between the following communities:

- **Eberts, Dresden, Kent Bridge and Thamesville:** Currently supplied by the Chatham WDS with Ex. Dresden ET (HWL = 228 m and LWL = 219 m) and Ex. Thamesville SP (HWL = 222 m and LWL = 213 m) providing water storage and maintaining system pressure for the water system.
- **Bothwell:** Currently serviced from Tri-County water supply system through the connection from the Municipality of Southwest Middlesex with Ex. Bothwell ET (HWL = 249 m and LWL = 239), providing water storage and maintaining system pressure for the water system.

The Delaware Nation of Moraviantown First Nation (Moraviantown) is currently serviced with an existing groundwater well system.

The Class EA Study focuses on the expansion of NE water distribution system to meet the growing municipal water demands within the system. The expansion of the NE water distribution system also provides the

opportunity to service Moraviantown, Bothwell, future greenhouse demands and individual properties; and improve water system pressure particularly in the communities of Thamesville and North Thamesville. The following Sections provides a summary of the East and West Focus Study Areas servicing alternative solutions for the hydraulic evaluation.

3. East Focus Study Area Servicing Alternatives

The two (2) servicing alternatives (Servicing Alternatives 1 and 2) were developed in the Class EA for the evaluation, with the following identified options for routing the new watermain to Bothwell system and siting the new pumping station/elevated tank:

- **Servicing Alternative 1:** Install a new Thamesville BPS and Rehabilitate or Replace the Ex. Thamesville SP.
  - Three watermain routing options from Thamesville to Bothwell:
    - Route Option E1 – follows Longwoods Road from Thamesville to West Bothwell Road
    - Route Option E2 – follows Longwoods Road from Thamesville, Zone Road 7 to Zone Centre Line and then east to West Bothwell Road on Zone Centre Line.
    - Route Option E3 – follows Jane Street from Thamesville to Base Line and east to Longwoods Road. The route then follows Zone Road 6 to Fairfield Line and east to Longwoods Road. From there the watermain extends northeast to West Bothwell Road.
  - Siting area for the new Thamesville ET:
    - ET Site 1: Same site as the Ex. Thamesville SP in Ferguson Park, Thamesville to locate a new booster station and elevated tank.
  - Siting area for the new Booster Pump Station:
    - Option BPS 1: Located in Ferguson Park near the existing standpipe (Site 1).
    - Option BPS 2: Located at the intersection of Jane Street and Base Line (Site 3).
    - Option BPS 3: Located at the intersection of Zone Road 5 and Base Line (Site 3).
  - The following seven (7) water servicing modelling scenarios are under the potential alternatives evaluated in the Class EA, as detailed in the Table 1 below. Please note that the CK PUC has considered siting area option for the proposed BPS location at Site 3 (modelling Scenario 1g) and has recently asked AECOM to find a new alternative location for the proposed BPS in the vicinity of the Option BPS 2 and Option BPS 3 siting area. A detailed hydraulic analysis for the proposed BPS will be required during the design stage.

Table 1: Servicing Alternative 1 Modelling Scenarios

Modelling Scenario	New BPS Siting Area	Thamesville Storage Facility	Watermain Route
Scenario 1a	Option BPS 1 (at Site 1)	Ex. Thamesville SP	Route Option E1
Scenario 1b	Option BPS 1 (at Site 1)	Ex. Thamesville SP	Route Option E2
Scenario 1c	Option BPS 1 (at Site 1)	Ex. Thamesville SP	Route Option E3
Scenario 1d	Option BPS 1 (at Site 1)	New Thamesville ET (at Site 1)	Route Option E1
Scenario 1e	Option BPS 1 (at Site 1)	New Thamesville ET (at Site 1)	Route Option E2
Scenario 1f	Option BPS 1 (at Site 1)	New Thamesville ET (at Site 1)	Route Option E3
Scenario 1g	Option BPS 3 (at Site 3)	New Thamesville ET (at Site 1)	Route Option E3

- **Servicing Alternative 2:** Install a new North Thamesville BPS, decommission the Ex. Thamesville SP and replace the SP with a new ET.
  - Three watermain routing options from North Thamesville to Bothwell:
    - Route Option 1 – follows Base Line, Longwoods Road to West Bothwell Road
    - Route Option 2 – follows Base Line, Jane Road, Fairfield Line, Longwoods Road to West Bothwell Road.
    - Route Option 3 – follows Industrial Road, Longwoods Road to West Bothwell Road.
  - Siting area for the new Thamesville ET and new BPS:
    - ET Site 2: Five potential alternative locations identified in North Thamesville to locate a new booster station and elevated tank.
  - The following three (3) water servicing modelling scenarios are under the potential alternatives evaluated in the Class EA, as detailed in the Table 2 below.

Table 2: Servicing Alternative 2 Modelling Scenarios

Modelling Scenario	New BPS Siting Area	Thamesville Storage Facility	Watermain Route
Scenario 2a	New BPS (at Site 2)	New Thamesville ET (at Site 2)	Route Option 1
Scenario 2b	New BPS (at Site 2)	New Thamesville ET (at Site 2)	Route Option 2
Scenario 2c	New BPS (at Site 2)	New Thamesville ET (at Site 2)	Route Option 3

Additionally, there are four alternative connection routes through Bothwell to connect to the Ex. Bothwell ET:

- Bothwell Connection Route 1 – Watermain continues along Longwoods Road to 9 Zone Road north to the elevated tank on Jane Street.
- Bothwell Connection Route 2a – Watermain follows railway tracks from West Bothwell Road to 9 Zone Road north to the elevated tank on Jane Street.
- Bothwell Connection Route 2b – Watermain continues along West Bothwell Road to Elm Street and follows Elm Street to 9 Zone Road north to the elevated tank on Jane Street.
- Bothwell Connection Route 2c – Watermain continues along West Bothwell Road to Main Street and follows Main Street to Cherry Street to the elevated tank on Jane Street.

4. West Focus Study Area Servicing Alternatives

The Northeast Chatham Kent area is experiencing growth in greenhouse development. To provide adequate water servicing to these proposed and future greenhouses, new watermains need to be installed west of Thamesville. There are three (3) potential routes that the watermain can follow to provide water servicing to the west side of Thamesville focus area, as shown below:

- **Route Option W1:** Provides 2 new watermain connections to the existing watermain on Kent Bridge Road. A southerly east-west watermain following Longwoods Road connecting to Kent Bridge Road watermain and a northerly east-west watermain that follows Industrial Road to Baseline which then follows Wabash Line connecting to Kent Bridge Road watermain. A new watermain connecting from the new Elevated Tank in Thamesville to the southerly and northerly watermains.
- **Route Option W2:** Provides 2 watermain connections to the existing watermain on Kent Bridge Road. A southern east-west watermain follows Evergreen Road to Huffs Side Road and then follows Huffs Side Road south to Longwoods Road connecting to Kent Bridge Road watermain. A northerly east-west watermain follows Industrial Road to Baseline which then follows Wabash Line connecting to Kent Bridge Road watermain. A new watermain connecting from the new Elevated Tank in Thamesville to the northerly watermain.
- **Route Option W3:** Provides a watermain along Longwoods Road to Huffs Side Road. The watermain follows Huffs Side Road to Baseline then follows Wabash Line and connects to Kent Bridge Road watermain. Another watermain follows Smoke Line and connects to the existing Kent Bridge Road watermain. A new watermain connecting from the new Elevated Tank in Thamesville to the southerly watermain.
- The following three (3) water servicing modelling scenarios are under the potential alternatives evaluated in the Class EA, as detailed in the Table 3 below.

Table 3: West Side Focused Study Area Modelling Scenarios

Modelling Scenario	Thamesville Storage Facility	Watermain Route
Scenario 3a	New Thamesville ET (at Site 1)	Route Option W1
Scenario 3b	New Thamesville ET (at Site 1)	Route Option W2
Scenario 3c	New Thamesville ET (at Site 1)	Route Option W3

5. Water Demand

The following summarizes the water demands used for the analysis:

- The Water demands for Moraviantown, Bothwell and future greenhouses under future Maximum Day Demand (MDD) are shown in Table 4. The Moraviantown and Bothwell demands were lumped and allocated to the two modelling junctions. Note that the local distribution network of both service areas was outside the scope of work, and therefore not added to the model. Figure 2 provides a screenshot for the locations of these model demand junctions.

Table 4: Water Demand Summary

Demand Type	General Location	Model Junction ID	Address	Future MDD (L/s)
Bothwell*	Demand allocated on Elm Street	J-4546	--	9.0
Moraviantown**	Demand allocated on Longwoods Road	J-4538	--	9.5
Future Greenco Greenhouse	Kent Bridge Road and Baseline Road	J-487282	10845 Baseline Road, Dresden	40
Future Cedarline Greenhouse	Kent Bridge Road and Baseline Road	J-448623	11080 Baseline Road, Dresden	40
Future Greenhill Greenhouse***	Smoke Line and Kent Bridge Road	J-565	N/A	35

*Notes: * Future Bothwell demand obtained from Chatham WDS Modelling Report July 2020 by AECOM.*
*** Future MDD for Moraviantown demand based on the letter from Delaware Nation dated September 24, 2021.*

**** Future Greenhill Greenhouse demand of 30 to 35 L/s based on the information provided by the CK PUC. For conservative analysis, 35 L/s used for the future MDD demand of Greenhill Greenhouse.*

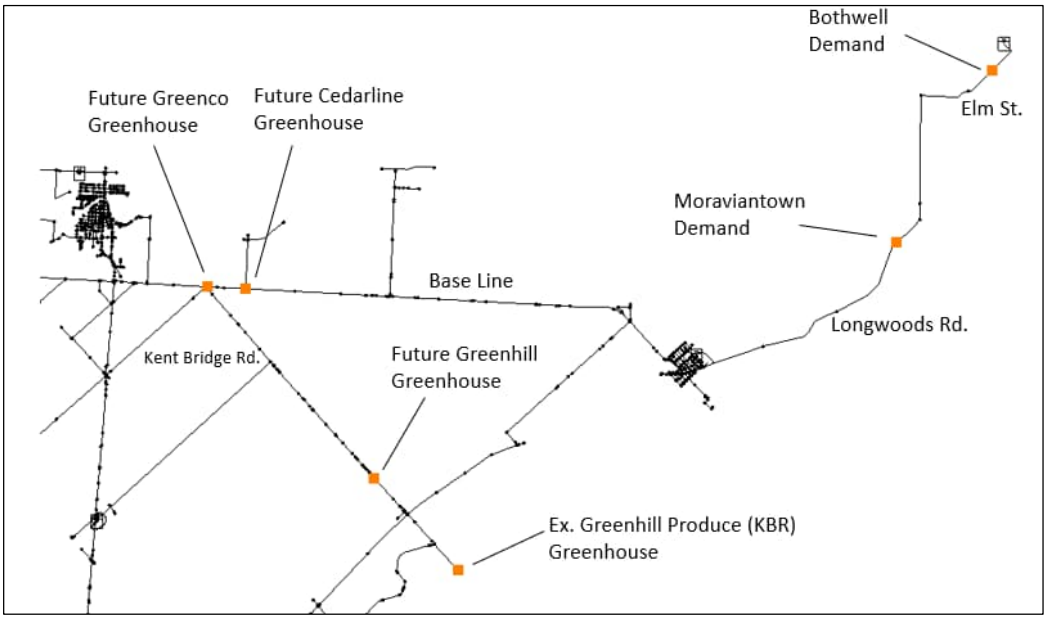


Figure 2: Demand Locations

- The water demands for properties to be serviced from potential new water connections to the new watermains under the multiple routing alternatives for the East and West Focus Study Areas are presented in Table 5 and Table 6 below.

Table 5: Potential Water Demand for East Focus Study Area Servicing Alternatives

Servicing Alternatives	Routing Option	Approx. Properties for Potential New Water Connection under Routing Option	Approx. Properties for Potential New Water Connection under Bothwell Connection Route*	Total Approx. Properties for Potential New Water Connection	MDD (L/s)**
1	E1	95	7	102	2.1
	E2	80	7	87	1.8
	E3	96	7	103	2.1
2	1	90	7	97	2.0
	2	110	7	117	2.4
	3	110	7	117	2.4

*Notes: * For a conservative analysis, use the largest no. of properties for potential connection under Bothwell connection route.*
*** Calculated using 2.5 ppu; 350 L/cap/day; and MDD peaking factor of 2.0 based on CK PUC design manual (Feb 2019)*

Table 6: Potential Water Demand for West Focus Study Area Servicing Alternatives

Routing Option	Approx. Properties for Potential New Water Connection under Routing Option	MDD (L/s)
W1	80	1.6
W2	20	0.4
W3	100	2.0

6. Storage Capacity Evaluation

The storage requirement for the new Thamesville ET was determined per the Ministry of Environment, Conservation and Parks (MECP) design guidelines as shown in the following table:

Planning Year	Demand (L/s)	Storage (ML)			Total Storage Requirement (ML)
	MDD*	Fire Flow**	Equalization	Emergency	
Future (Exclude the Greenhouse demands)	14.9	0.27	0.32	0.15	0.74

*Water demand within proposed Thamesville zone under new pressure zones servicing strategy (PI-8 improvement) for North Chatham WDS (Dresden/Eberts), as detailed in Section 5

**Required fire storage based on Chatham WDS Modelling Report July 2020 by AECOM

Based on the MECP guidelines, the minimum required size of the new Thamesville ET is 0.74 ML. The equalization storage in the storage volume calculation excluded the existing and future greenhouses as the flows controlled by the rate of flow control valves to restrict/reduce water supply.

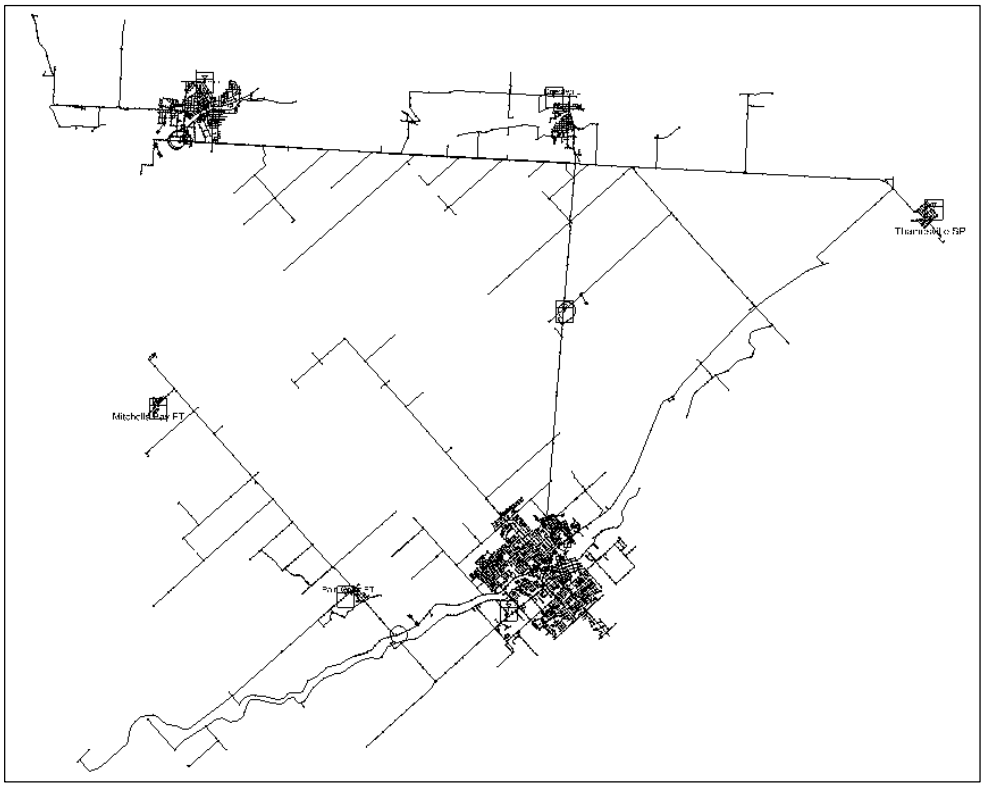
The proposed Thamesville zone was identified with sufficient existing available storages to meet the future demand conditions. The proposed size of the new Thamesville ET is recommended to be the same as the existing Thamesville SP with volume of 2.3 ML. Higher HGL (with high water level of 228.8 m and Low water level of 217.8 m) in the new ET was modelled to meet the minimum pressure requirements of the demands such as greenhouses and improve the water system pressure in the Thamesville and North Thamesville areas.

Note that it is assumed that available storage capacity in Bothwell system is sufficient to meet the water demand for the properties associated with the potential water connections to the new watermain (from Thamesville area to Bothwell). We recommend that a detailed storage capacity evaluation be taken for the Bothwell water supply system.

7. Analysis Methodology and Assumptions

The following methodologies and assumptions were utilized for the analysis:

- The latest Chatham and Wallaceburg WDS integrated master model developed by AECOM was used as a basis for this study, shown in the following screenshot. The hydraulic modelling was completed in a 7-day extended period simulation (EPS).

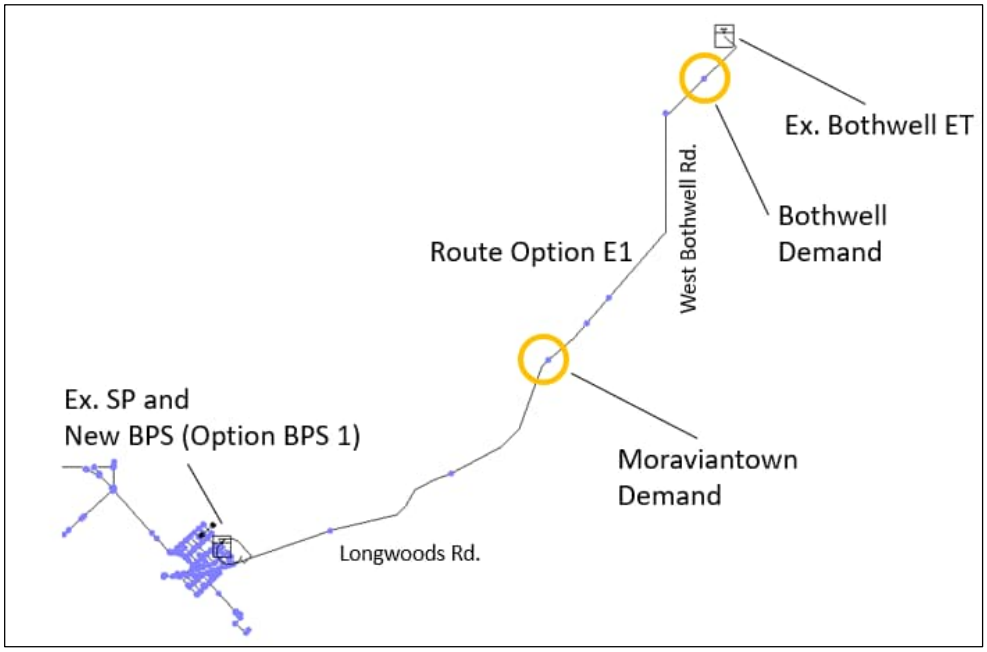


- Elevation was assigned to the added model junctions based on the TIN (Triangular Irregular Network) DEM layer provided by the CK PUC. An ArcGIS 3D Analyst “Add Surface Information” tool was used.
- The system analysis was completed for the 13 modelling scenarios under the future maximum week demand (MWD) condition to identify respective infrastructure upgrade requirements. No separate peak hour demand scenarios were created. The demand patterns applied to maximum day demand simulates peak hour demand condition as the highest point on the diurnal curve.
- The west side service area was identified based on current and planned greenhouse developments in relation to existing water distribution network and routing alignment opportunities. The required infrastructure upgrades for the West Focus Study Area were evaluated with the new Thamesville ET online alone without Eberts pump station operated at all times based on the discussions with the CK PUC for the system boundary condition.
- The system analysis evaluated hydraulic parameters, including system pressure, flow velocity and storage operation. The following criteria were used to assess the system hydraulic performance:
  - Minimum system pressure = 40 psi (275 kPa)
  - Maximum system pressure = 100 psi (700 kPa)
  - Maximum flow velocity = 2.0 m/s
- The Hazen-Williams “C” Factor values for new watermains were based on the CK PUC Design Manual (Feb 2019):
  - C = 120 for PVC material; up to 600 mm diameter
  - C = 130 for PVC/DI material; 600 mm or more diameter

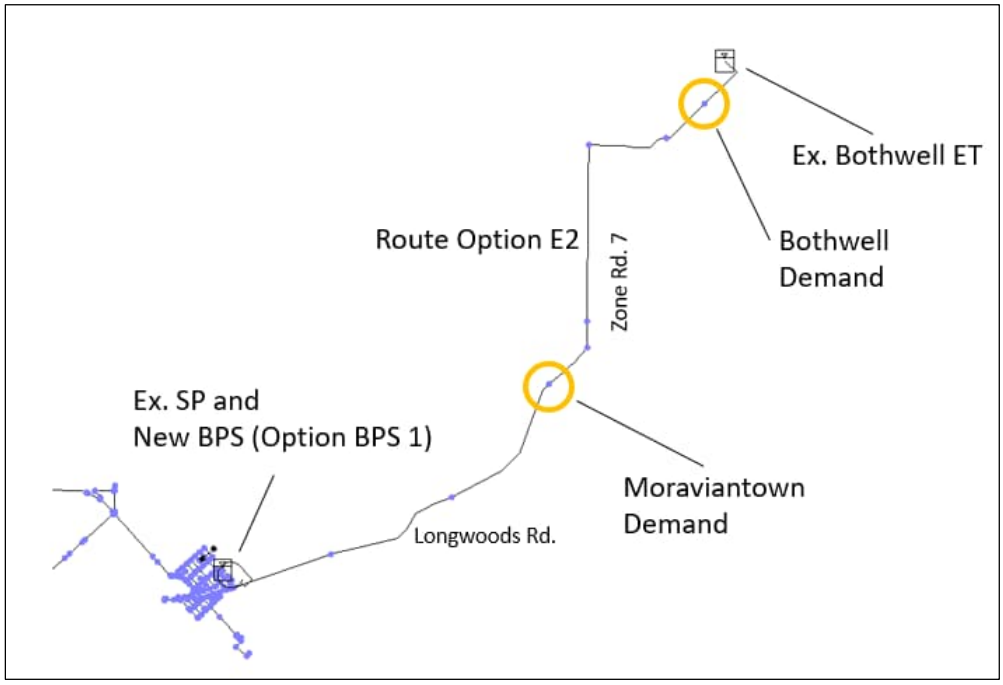
- The following shows the schematic model layouts of the 13 modelling scenarios under different servicing alternatives for the East and West Focus Study Areas. For modelling purposes, all modelling scenarios used Bothwell ET connection Route 2b, as the modelling results for each connection route to Bothwell ET would be comparable from a hydraulic standpoint. The siting option for ET Site 2 in North Thamesville area with the highest ground elevation (189.7 m) near west of railway track and Base Line was modelled for the hydraulic performance. Additionally, the new BPS was modelled with pump capacity of 21 L/s at 40 m TDH.

East Focus Study Area Servicing Alternative 1:

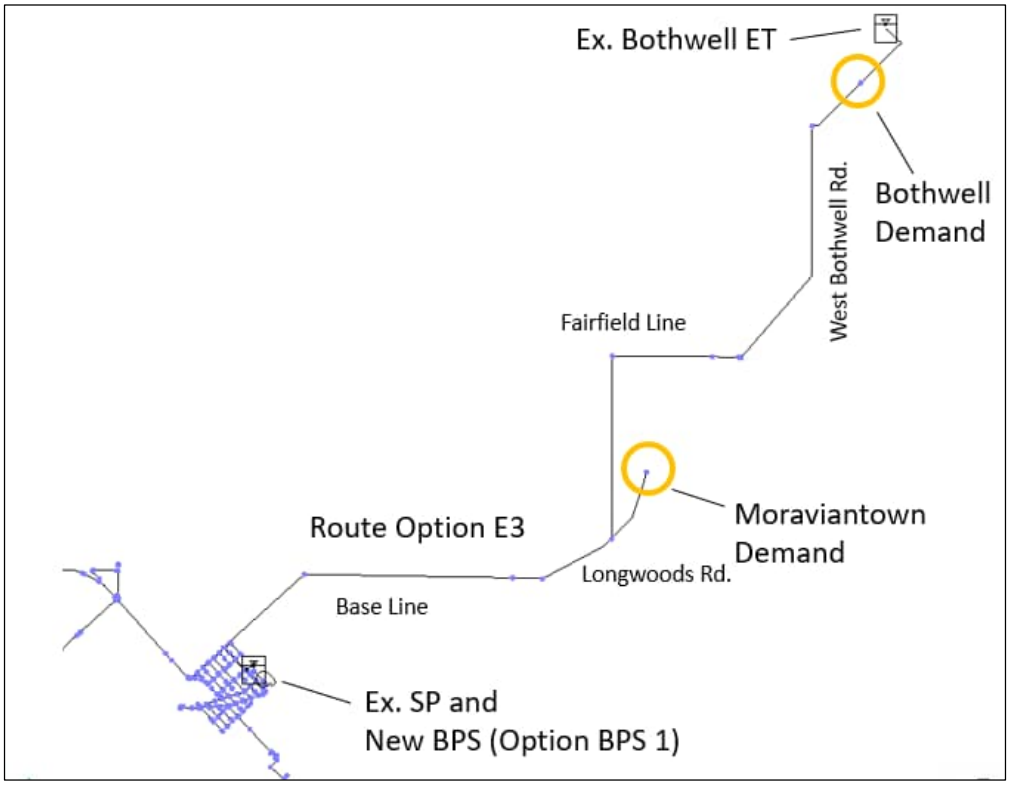
Scenario 1a: Route Option E1 and Ex. Thamesville SP



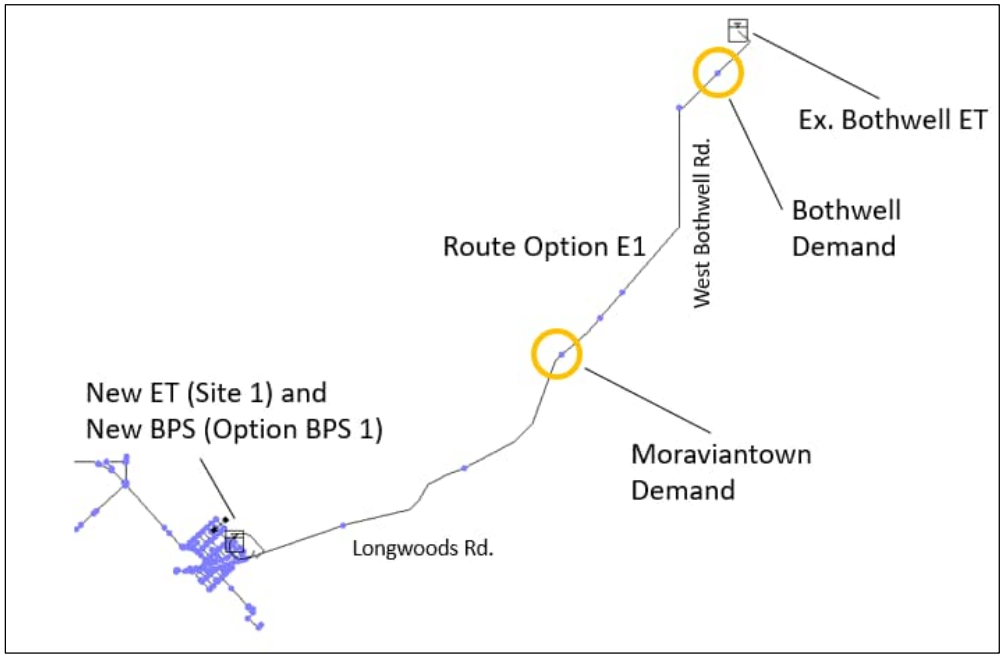
Scenario 1b: Route Option E2 and Ex. Thamesville SP



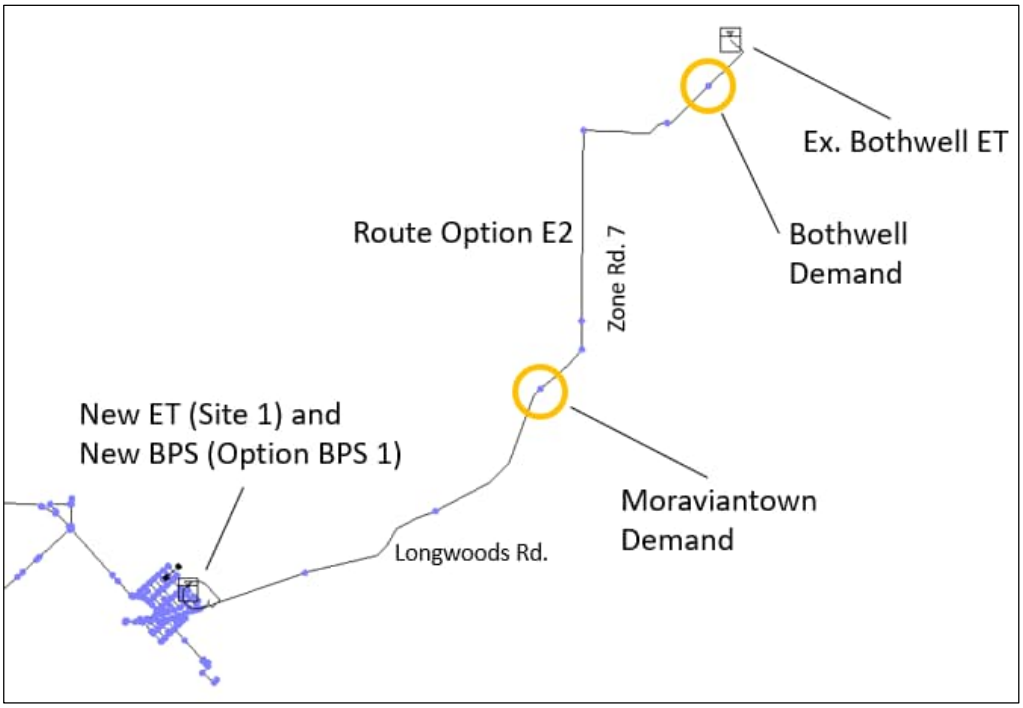
Scenario 1c: Route Option E3 and Ex. Thamesville SP



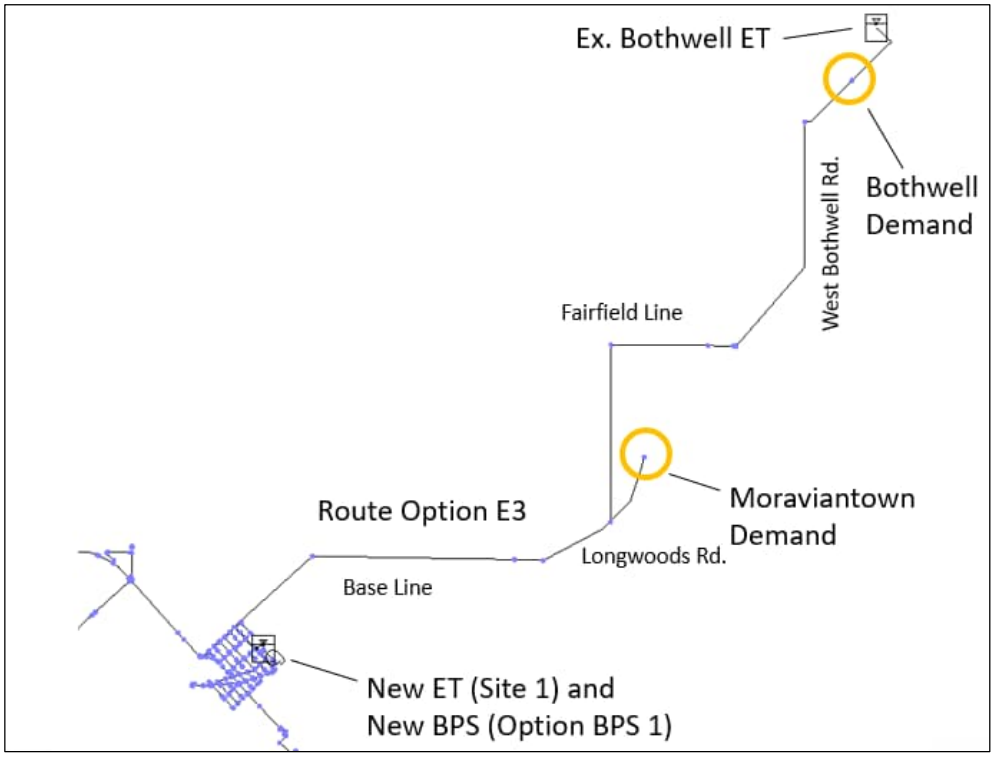
Scenario 1d: Route Option E1 and New Thamesville ET Site 1



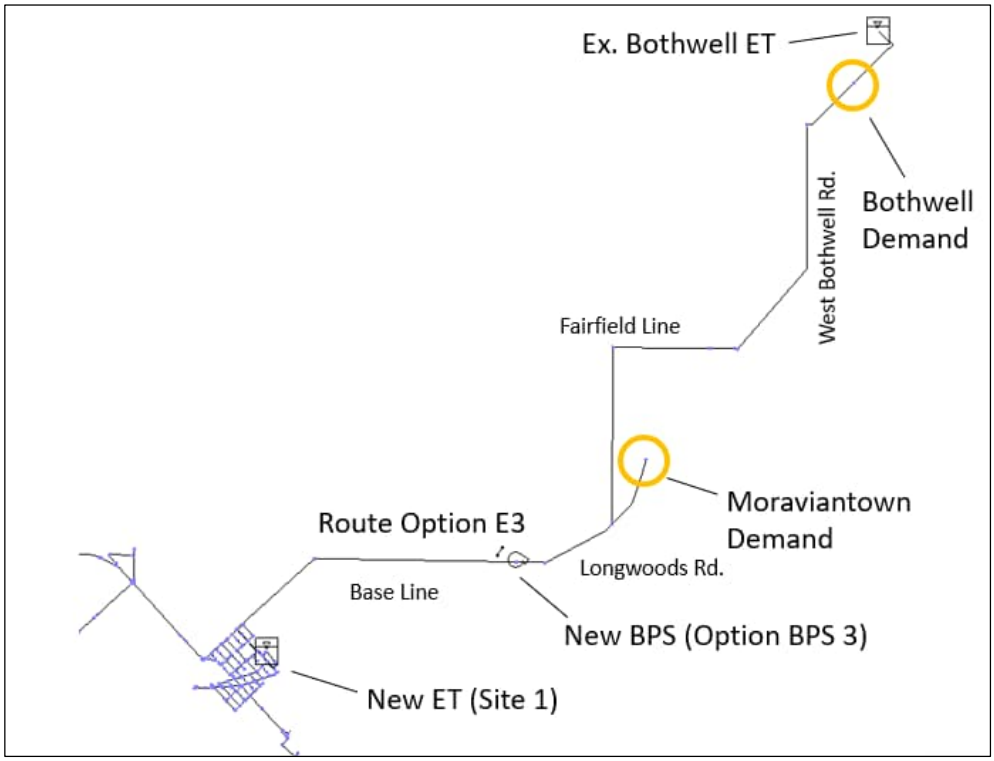
Scenario 1e: Route Option E2 and New Thamesville ET Site 1



Scenario 1f: Route Option E3 and New Thamesville ET Site 1

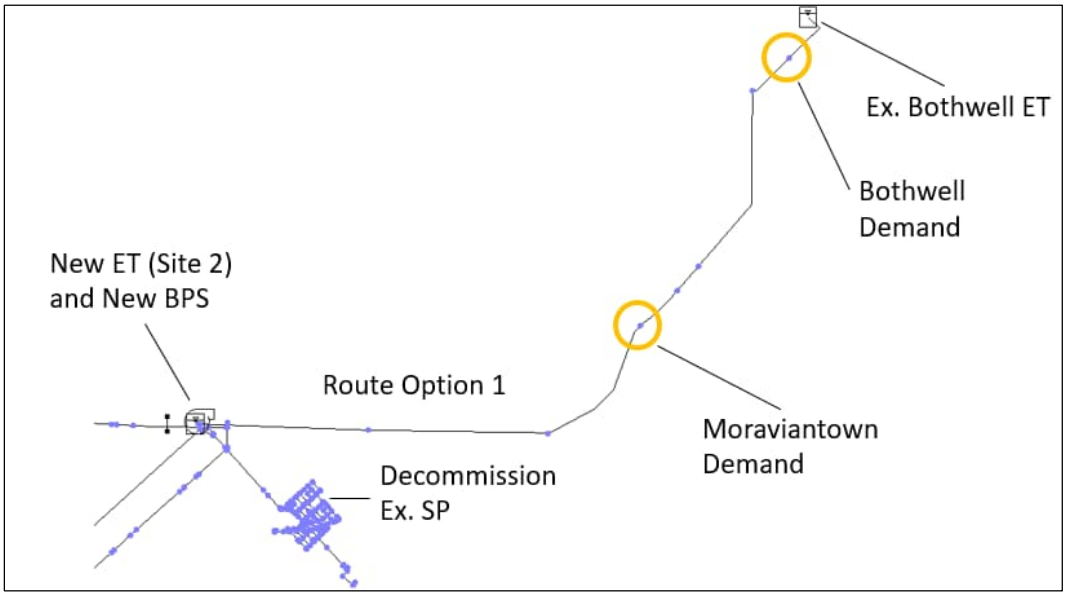


Scenario 1g: Route Option E3, New Thamesville ET Site 1 and New BPS Site 3

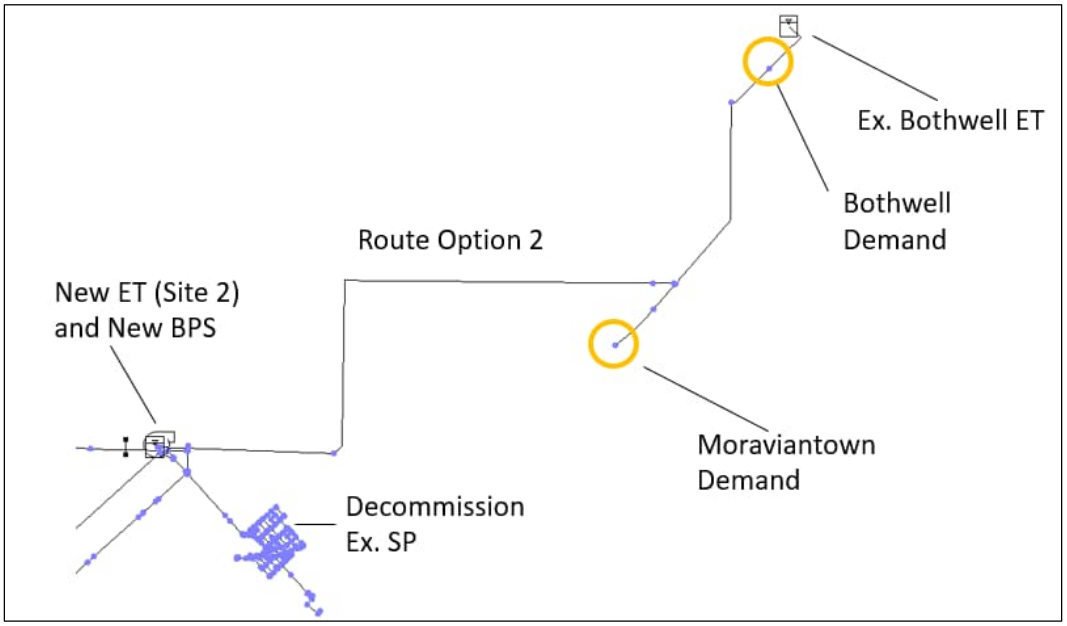


East Focus Study Area Servicing Alternative 2:

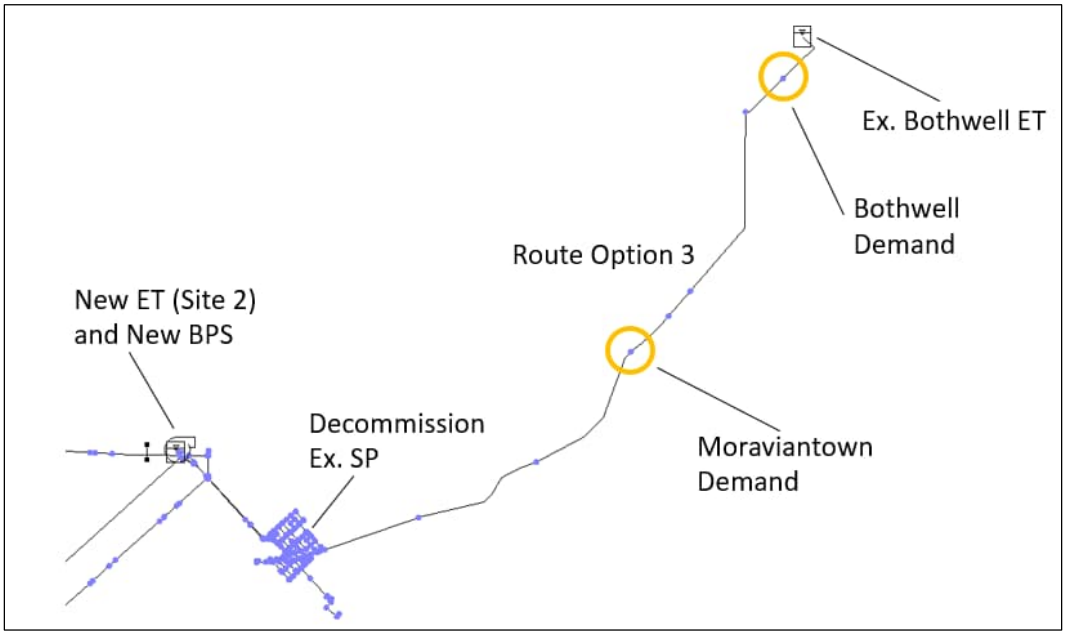
Scenario 2a: Route Option 1 and new Thamesville ET Site 2



Scenario 2b: Route Option 2 and new Thamesville ET Site 2

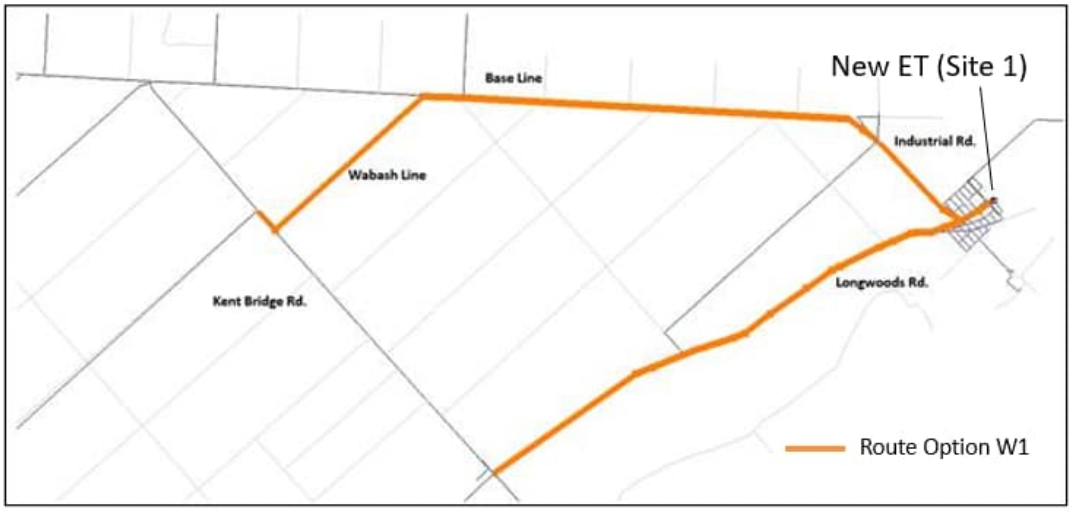


Scenario 2c: Route Option 3 and new Thamesville ET Site 2

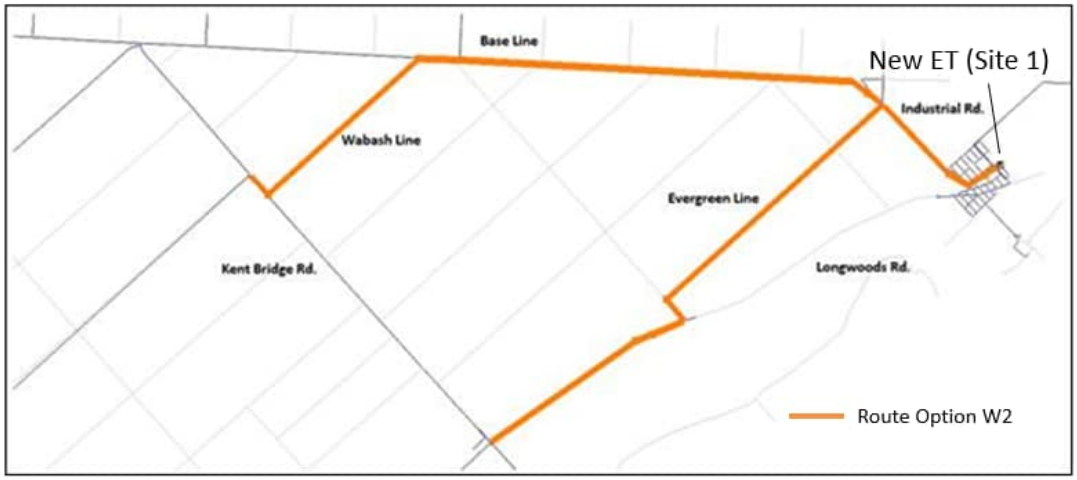


West Focus Study Area Servicing Alternatives:

Scenario 3a: Route Option W1 and new Thamesville ET Site 1



Scenario 3b: Route Option W2 and new Thamesville ET Site 1

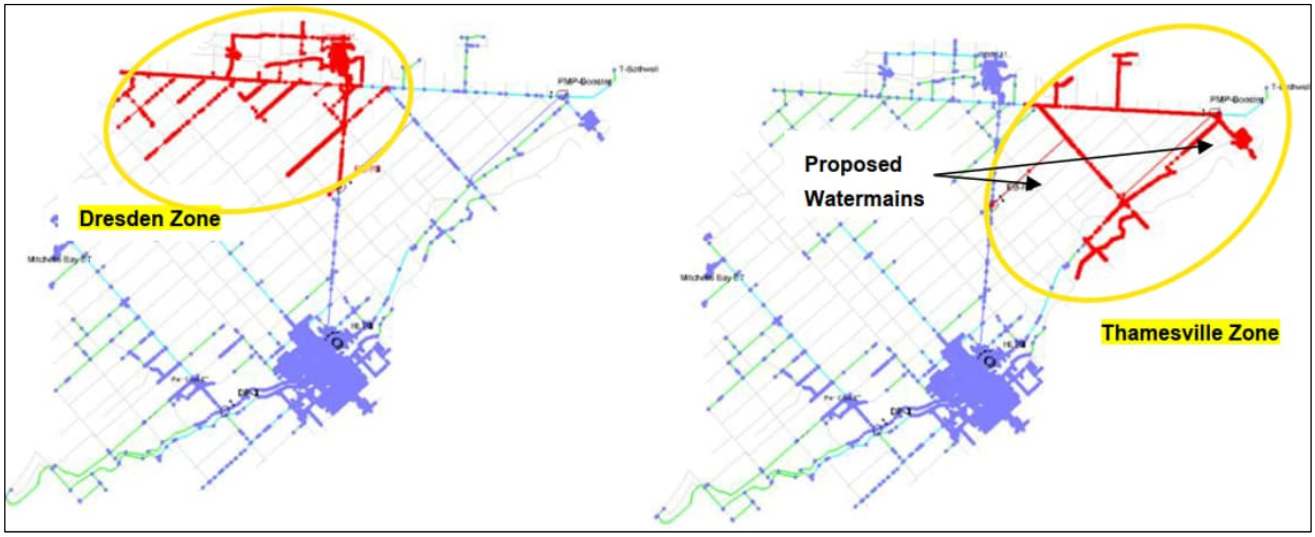


Scenario 3c: Route Option W3 and new Thamesville ET Site 1

- The following recommended improvements (identified from Chatham WDS Modelling Study by AECOM) were included in the model network under all the modelling scenarios. The reference number for the proposed improvement (PI) as per the Chatham Water Distribution System Modelling Final Report:
  - A new 600 mm watermain (PI-1 improvement) from Eberts BPS discharge to Kent Bridge Road (KBR). Note: this new Watermain is currently under design.
  - New Pressure Zones (PI-8 improvement) servicing strategy to support the proposed greenhouse demands:
    - In this servicing strategy, Chatham WDS area North of Eberts PS was divided into two separate pressure zones: Dresden zone and Thamesville zone (see below screenshot). The purpose of this split is to improve the system pressure and to meet proposed greenhouses demands. As requested by the CK PUC, this servicing strategy for North

Chatham WDS (Dresden/Eberts) was utilized as the supply boundary condition in the hydraulic modelling analysis.

- Upgrade the Eberts pump station to create the Dresden and Thamesville pressure zones. After replacement, Eberts PS would feed the two zones by assigning two pumps to feed each zone from the existing Chatham system.



8. Hydraulic Analysis Results

Based on the modelling results, the following summarizes the model outputs:

East Focus Study Area Water Servicing Alternative 1:

- **Scenarios 1a to 1g:**
  - The distribution system pressure was maintained within the pressure criteria of 40 to 100 psi (275 to 700 kPa). The pipe flow velocities under the future MDD condition were reviewed. No velocity constraints were identified for the future MDD, except for the existing 150 mm pipe in the control valve within the Thamesville Rechlorination Station located at the intersection of Industrial Road and Jane Street with moderately high velocity (maximum velocity of around 2.6 m/s). The CK PUC may consider upgrading the existing pipe in the station to mitigate the high velocity.
  - Figures 3 to 9 provides a color-coded representation of minimum system pressures under future MDD condition for Scenarios 1a to 1g, respectively.
  - Figure 10 shows the graphical representation of the maximum velocities within the distribution system during the modelling Scenario 1g.
  - Figures 11 and 12 shows the pressures at Bothwell and Moraviantown demand locations.
  - Figures 13, 14 and 15 shows the Ex. Bothwell ET, Ex. Thamesville SP and Prop. Thamesville ET (at Site 1) levels. All storage levels were balancing and cycling properly.

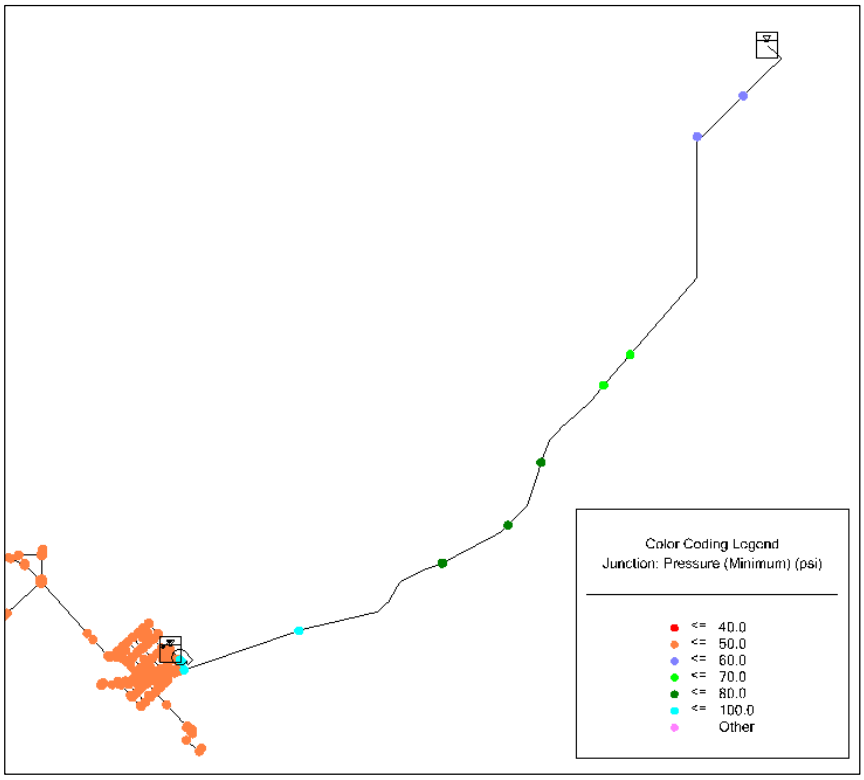


Figure 3: Minimum System Pressure – Scenario 1a

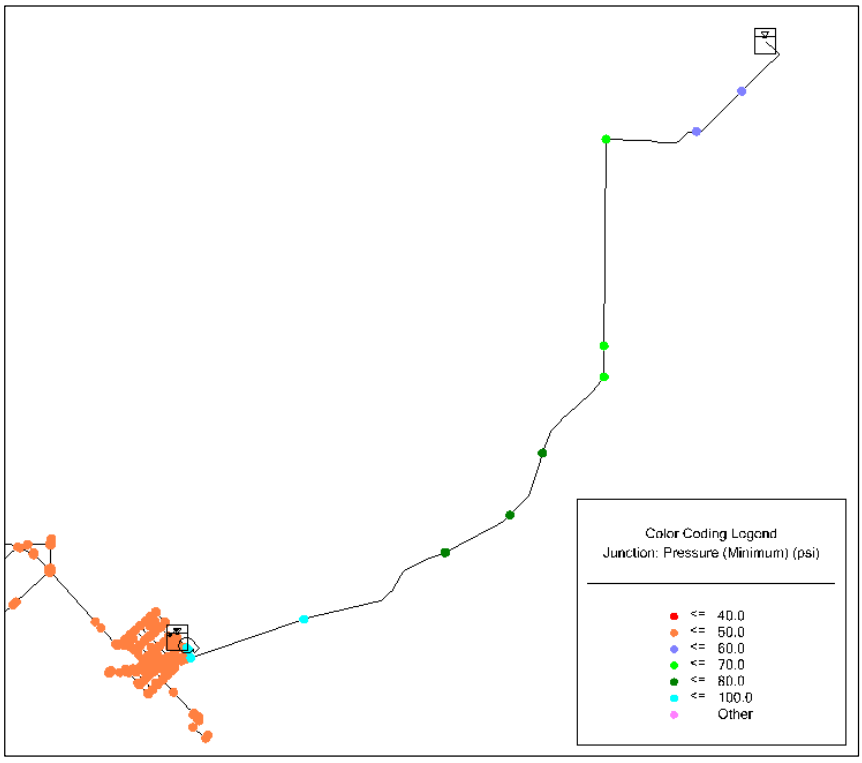


Figure 4: Minimum System Pressure – Scenario 1b

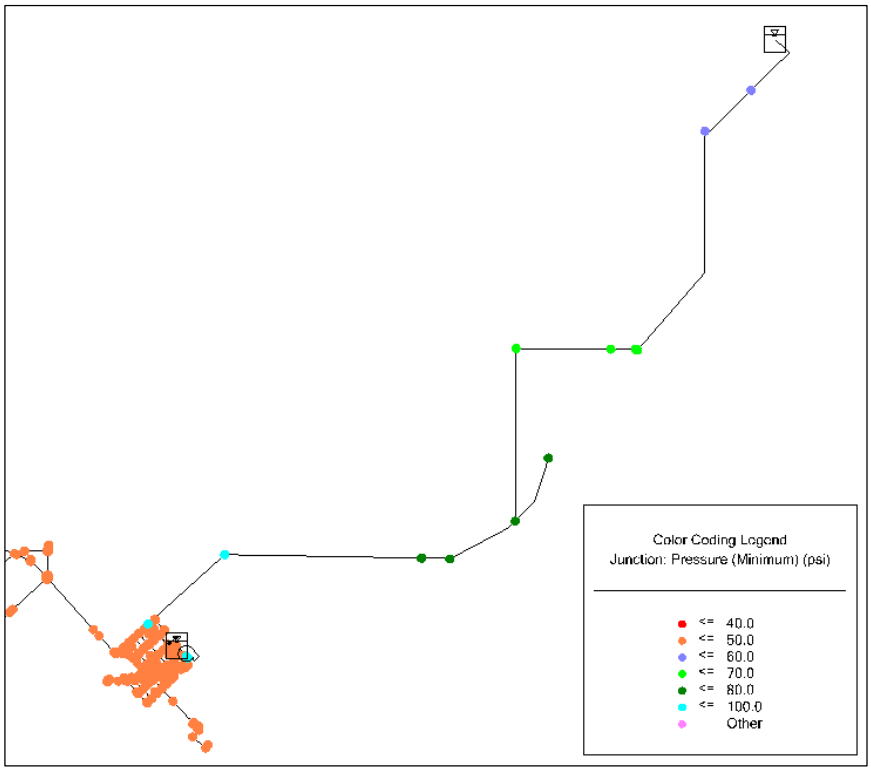


Figure 5: Minimum System Pressure – Scenario 1c

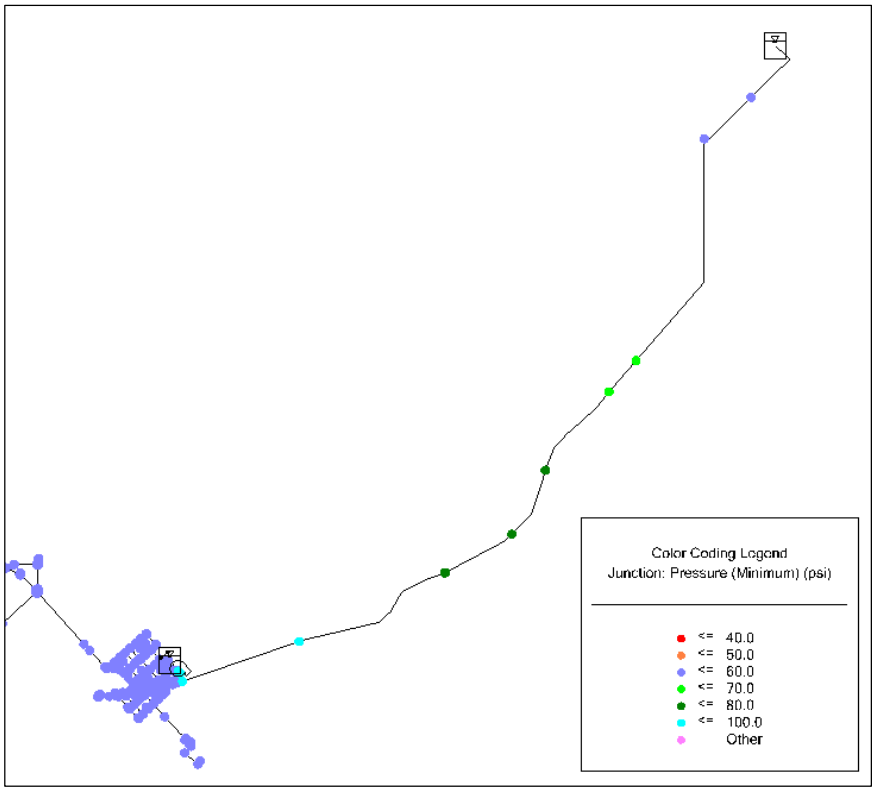


Figure 6: Minimum System Pressure – Scenario 1d

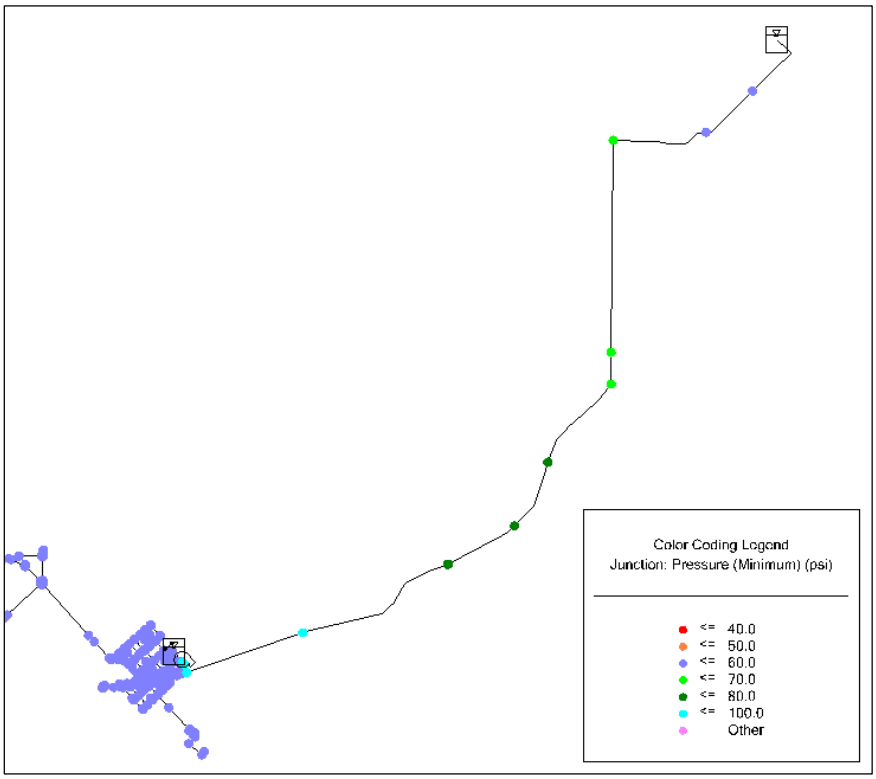


Figure 7: Minimum System Pressure – Scenario 1e

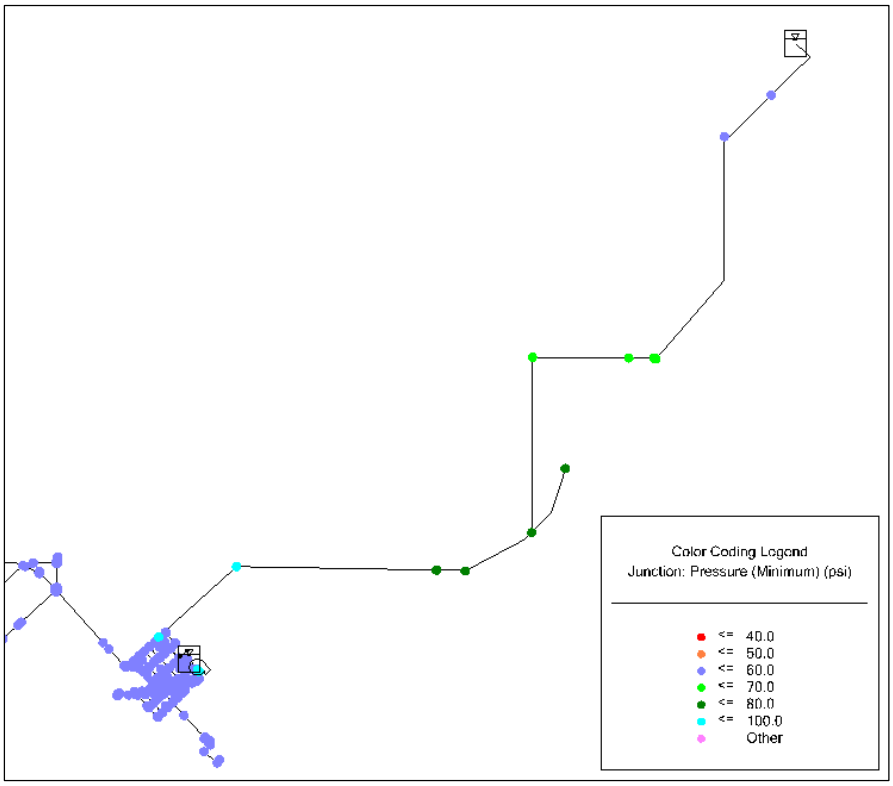


Figure 8: Minimum System Pressure – Scenario 1f

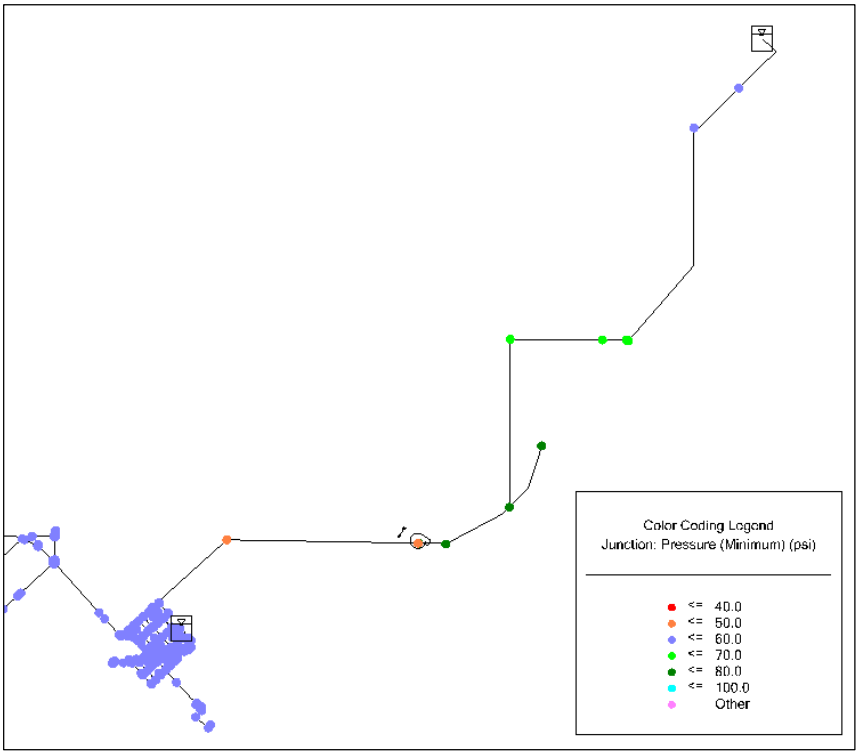


Figure 9: Minimum System Pressure – Scenario 1g

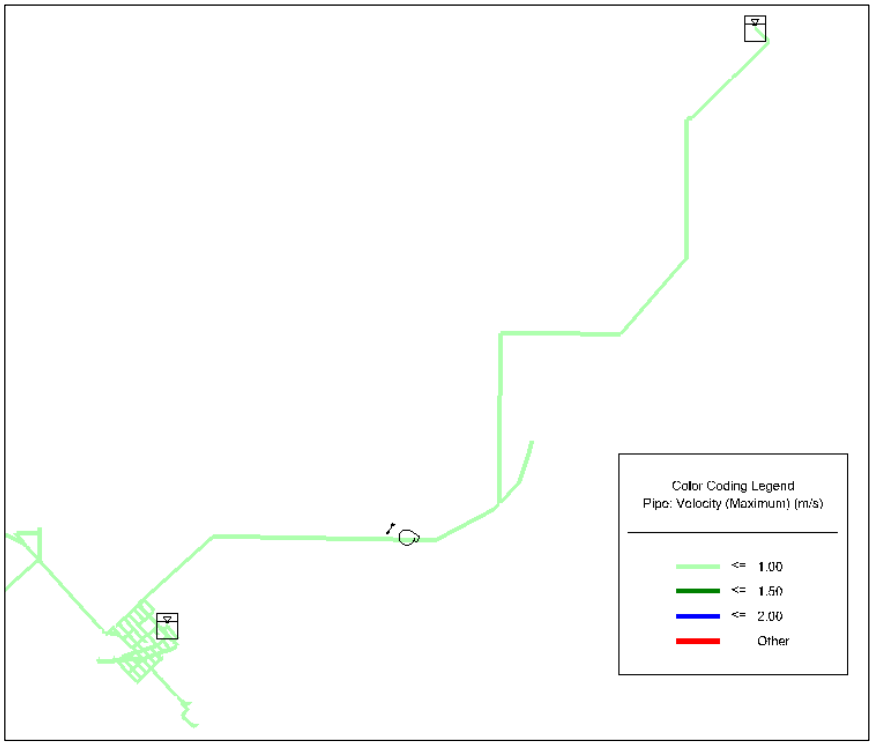


Figure 10: Maximum Watermain Velocity – Scenario 1g

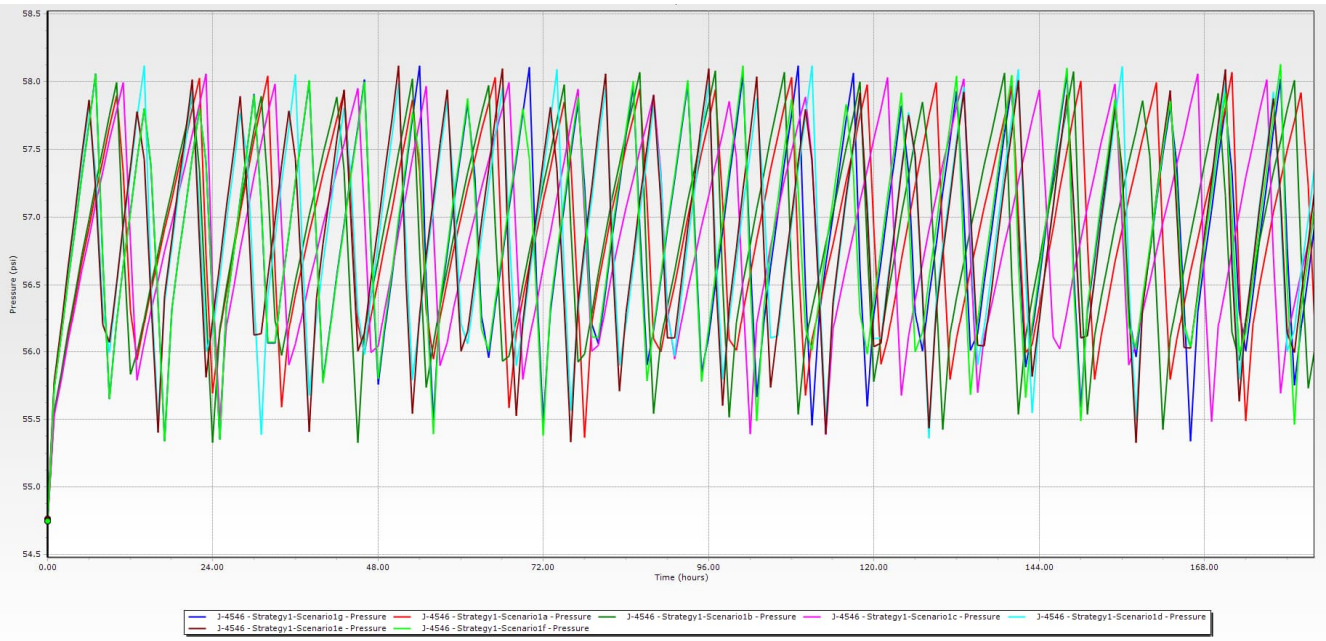


Figure 11: Pressure at Bothwell Demand Location

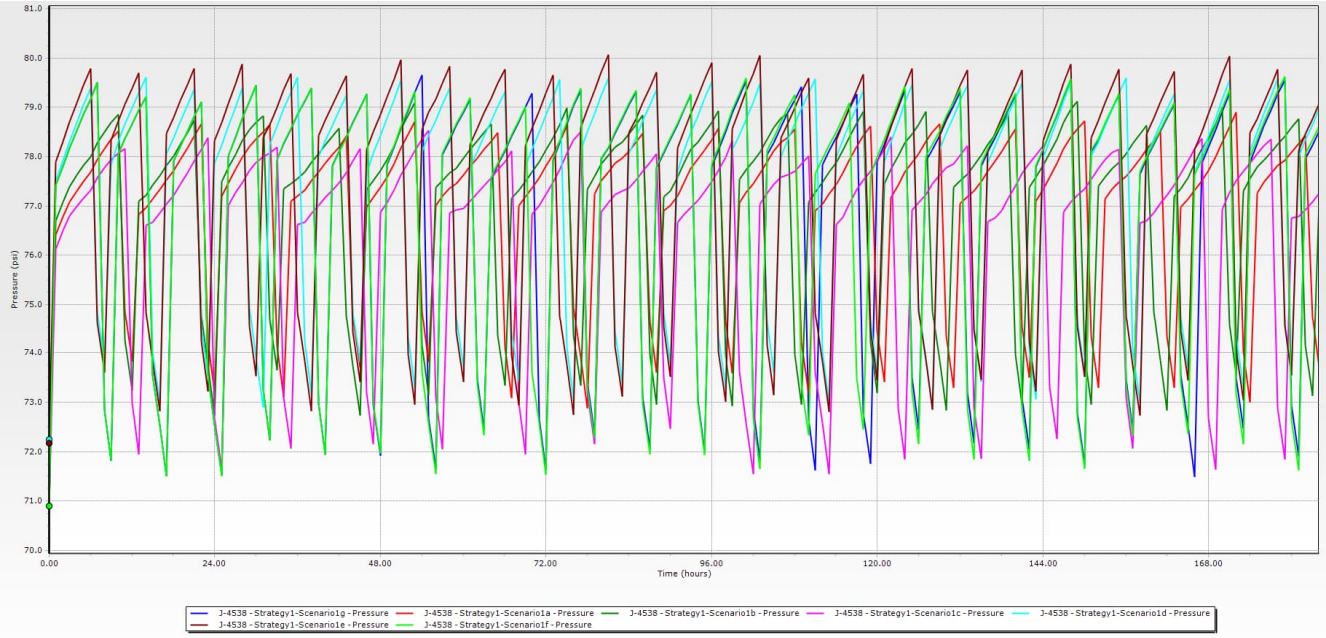


Figure 12: Pressure at Moraviantown Demand Location

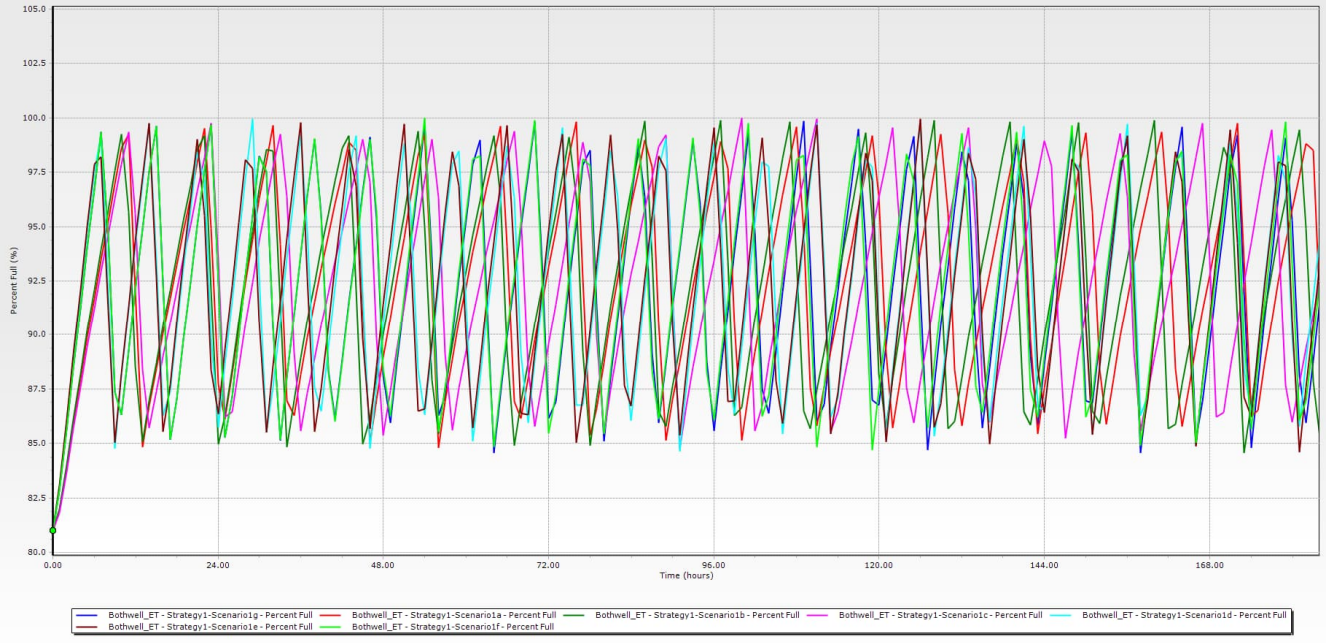


Figure 13: Ex. Bothwell ET Level

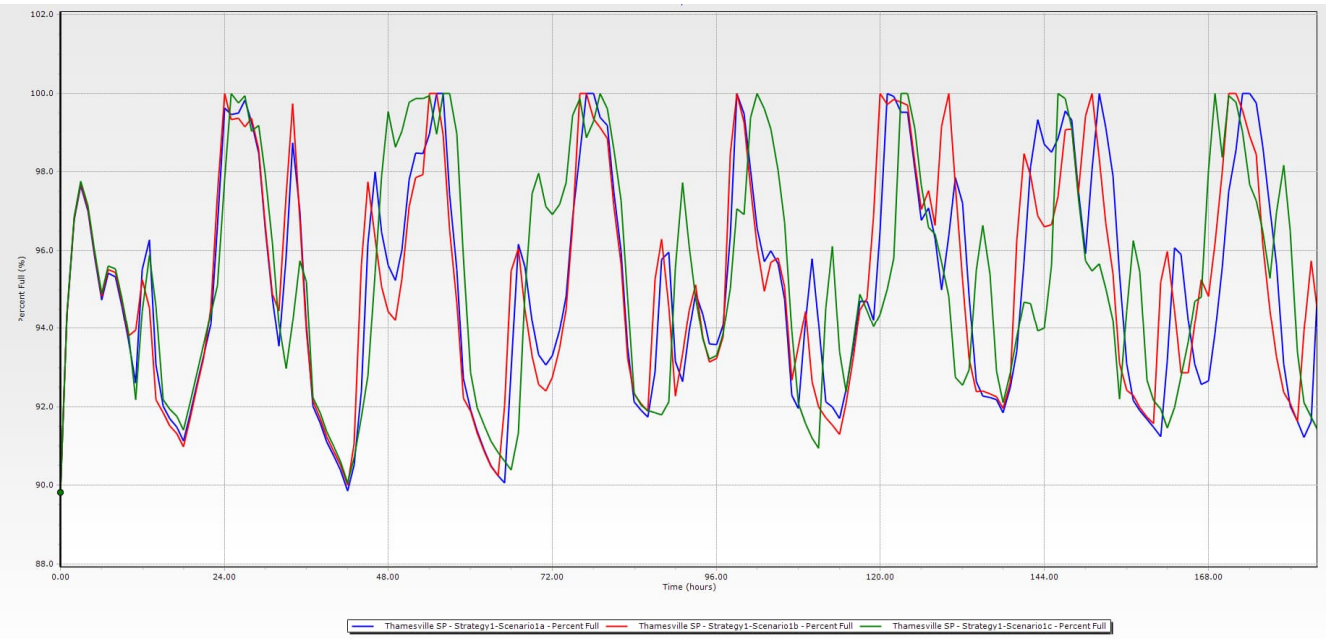


Figure 14: Ex. Thamesville SP Level

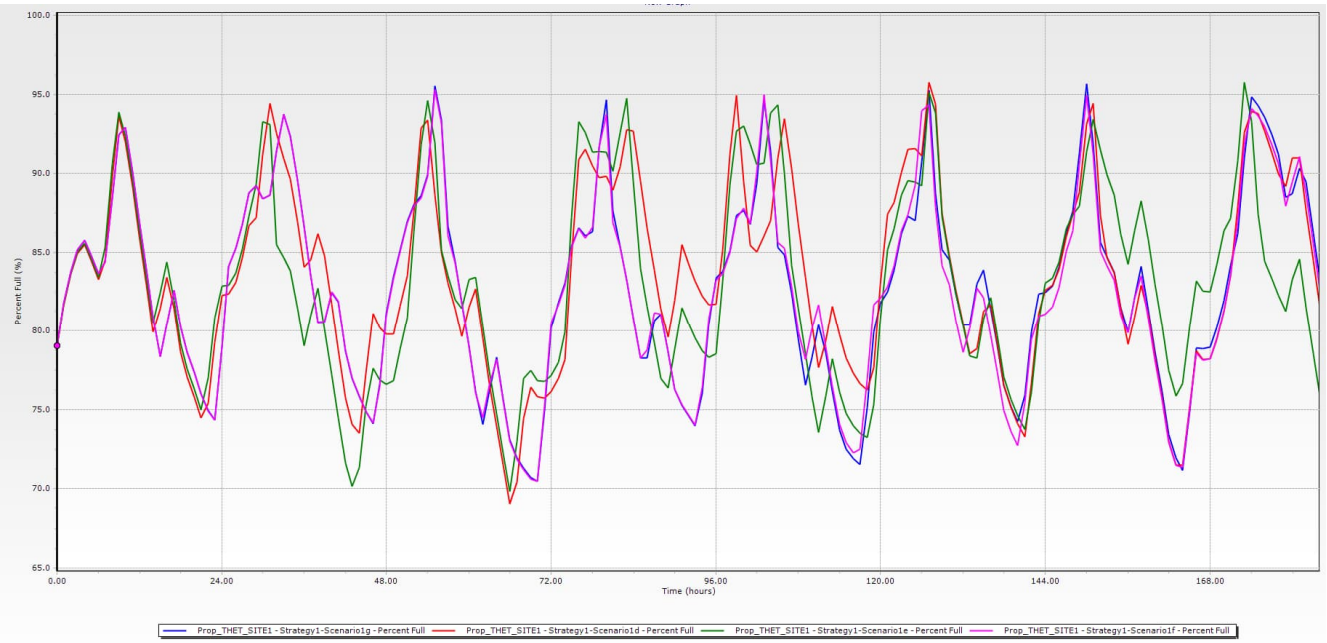


Figure 15: Prop. Thamesville ET Level

East Focus Study Area Water Servicing Alternative 2:

- **Scenarios 2a to 2c:**
  - The distribution system pressure was maintained within the pressure criteria of 40 to 100 psi (275 to 700 kPa). The pipe flow velocities under the future MDD condition were reviewed. No velocity constraints were identified for the future MDD.
  - Figures 16 to 18 provides a color-coded representation of minimum system pressures under future MDD condition for Scenarios 2a to 2c, respectively.
  - Figures 19 shows the graphical representation of the maximum velocities within the distribution system during the modelling Scenario 2a.
  - Figures 20 and 21 shows the pressures at Bothwell and Moraviantown demand locations.
  - Figures 22 and 23 shows the Ex. Bothwell ET and Prop. Thamesville ET (at Site 2) levels. All storage levels were balancing and cycling properly.

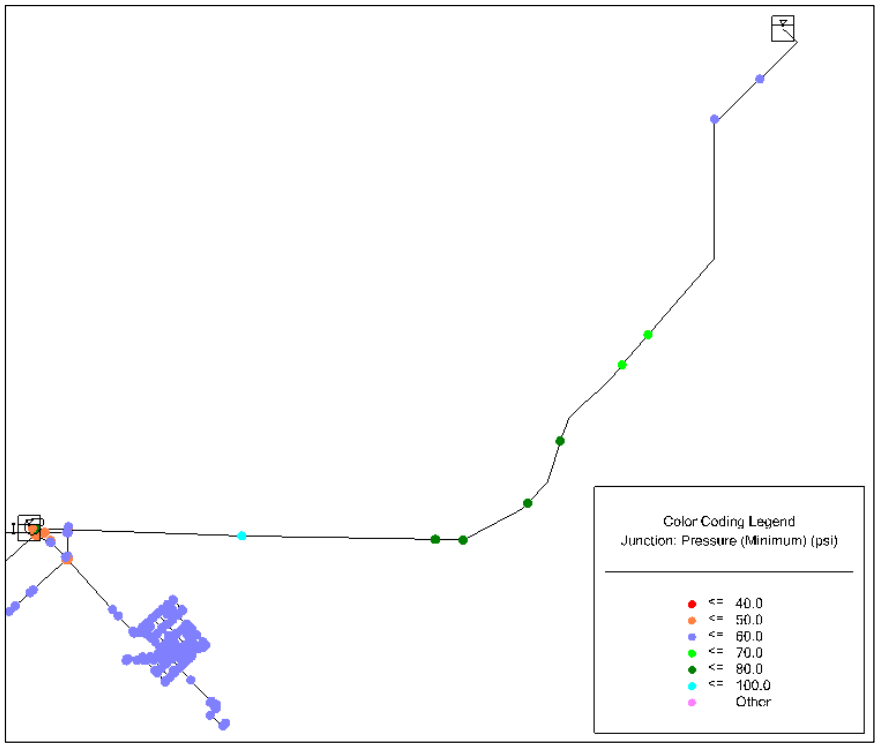


Figure 16: Minimum System Pressure – Scenario 2a

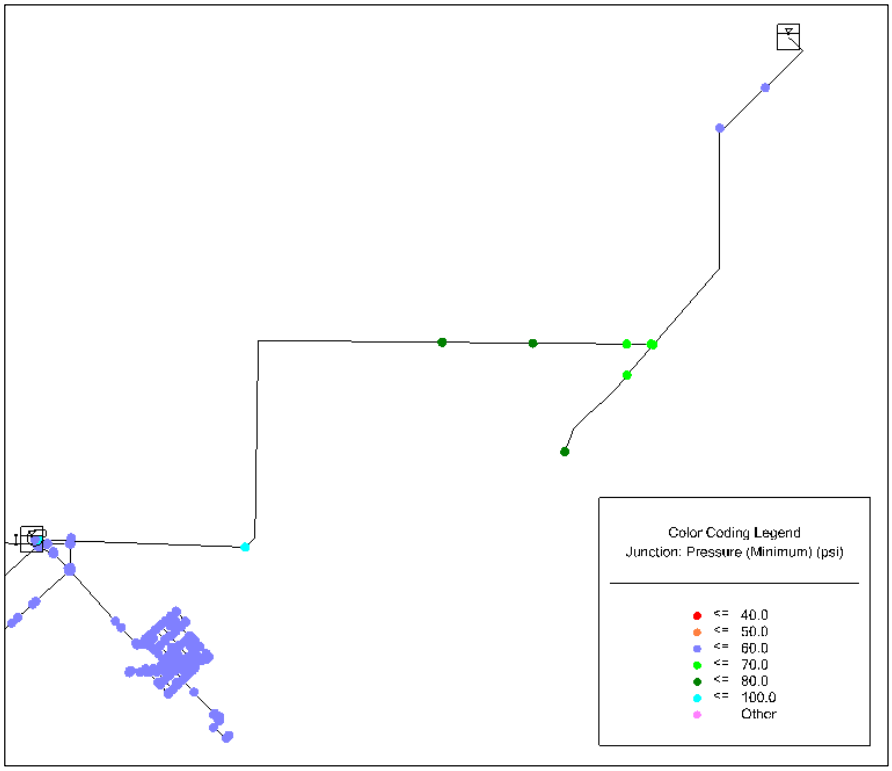


Figure 17: Minimum System Pressure – Scenario 2b

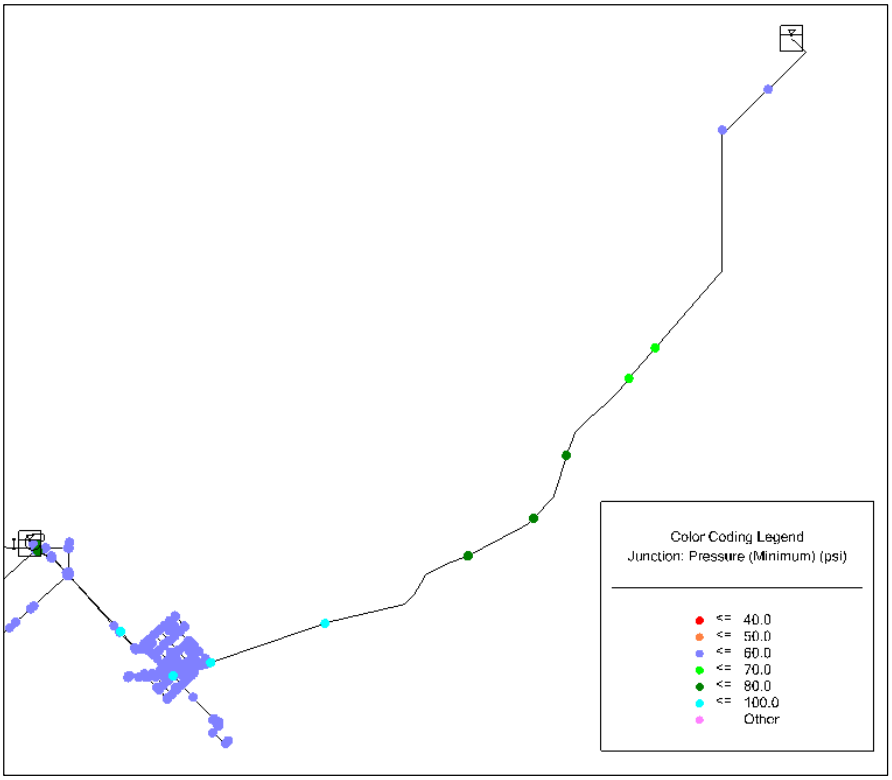


Figure 18: Minimum System Pressure – Scenario 2c

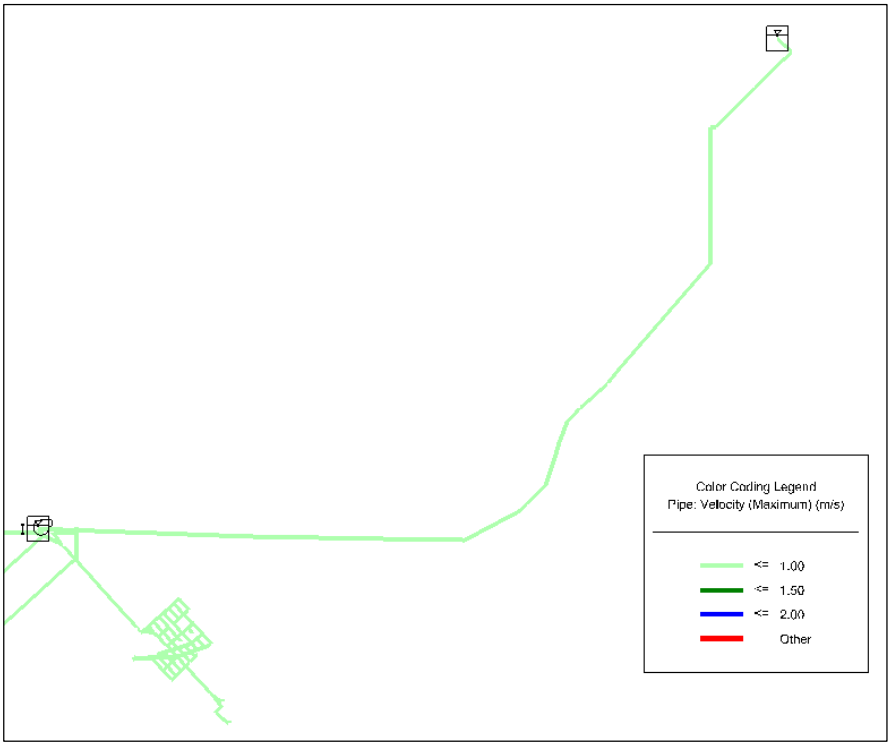


Figure 19: Maximum Watermain Velocity – Scenario 2a

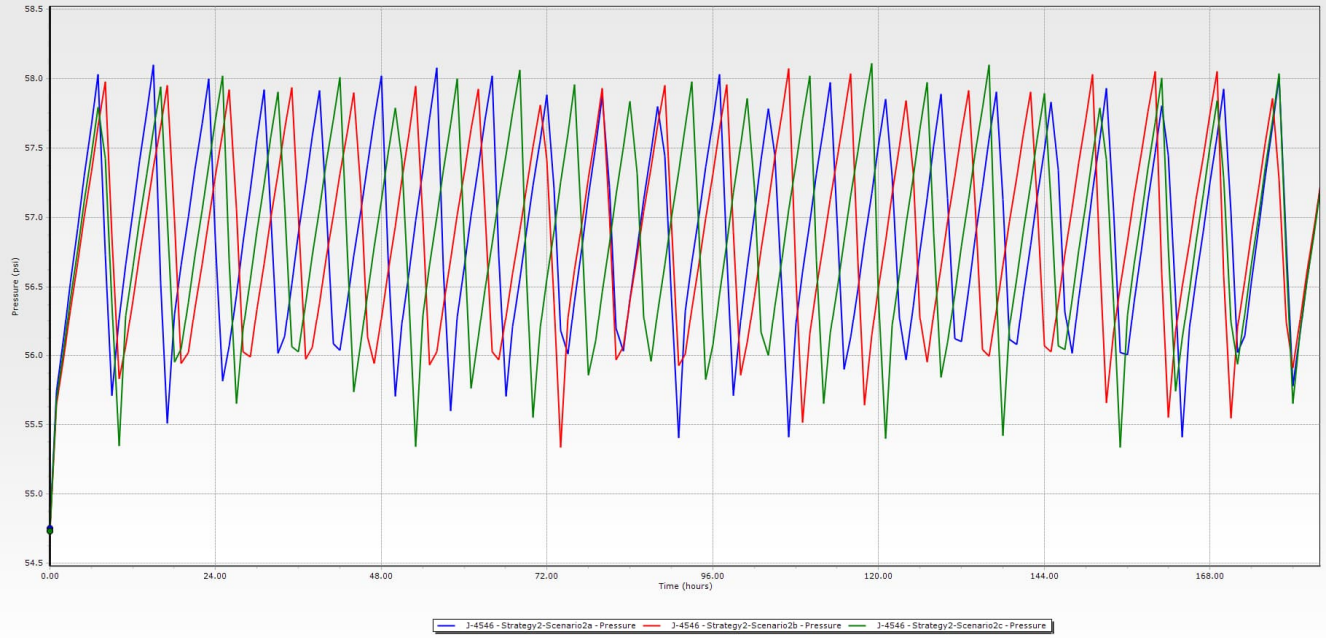


Figure 20: Pressure at Bothwell Demand Location

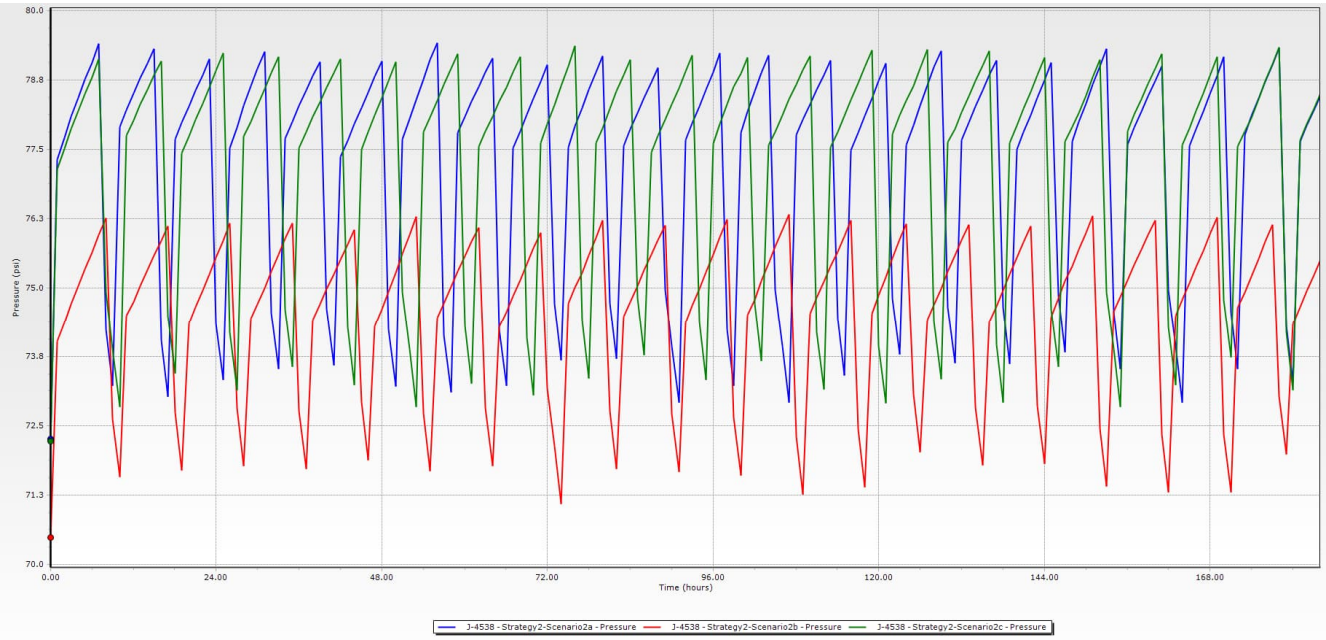


Figure 21: Pressure at Moraviantown Demand Location

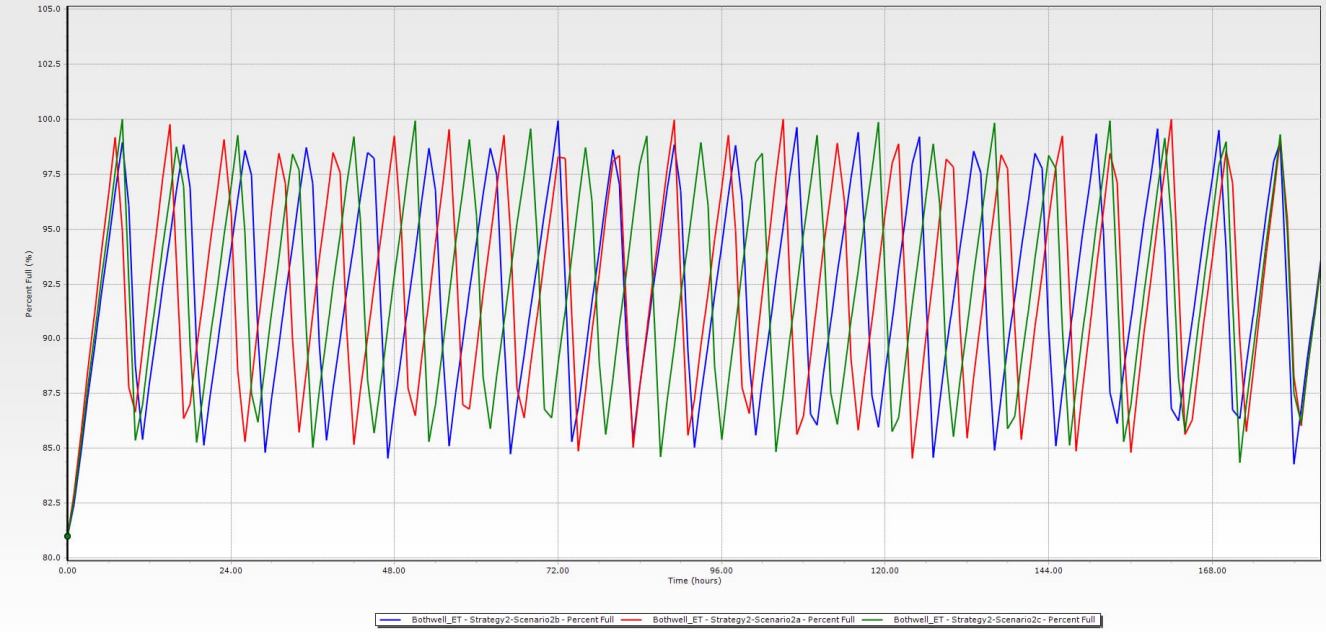


Figure 22: Ex. Bothwell ET Level

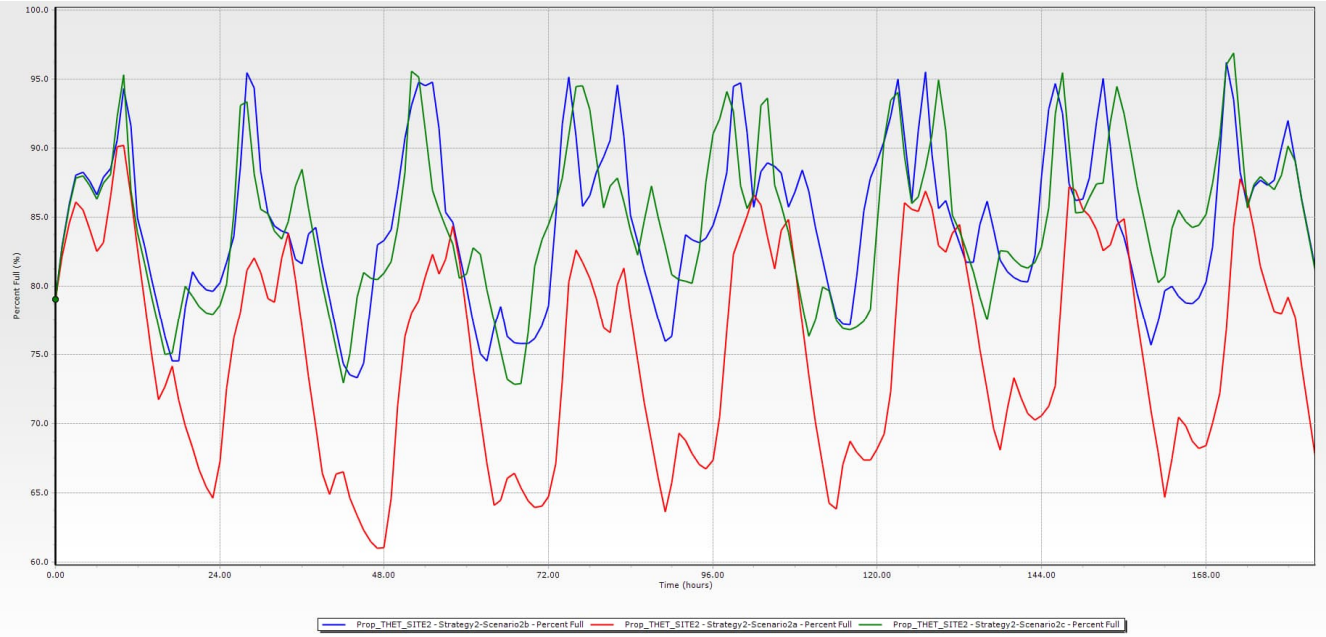


Figure 23: Prop. Thamesville ET Level

West Focus Study Area Water Servicing Alternatives:

- **Scenarios 3a to 3c:**
  - The distribution system pressure was maintained within the pressure criteria of 40 to 100 psi (275 to 700 kPa). The pipe flow velocities under the future MDD condition were reviewed. No velocity constraints were identified for the future MDD.
  - Figure 24 provides a color-coded representation of minimum system pressures under future MDD condition for modelling Scenario 3c.
  - Figures 25 shows the graphical representation of the maximum velocities within the distribution system during the modelling Scenario 3c.

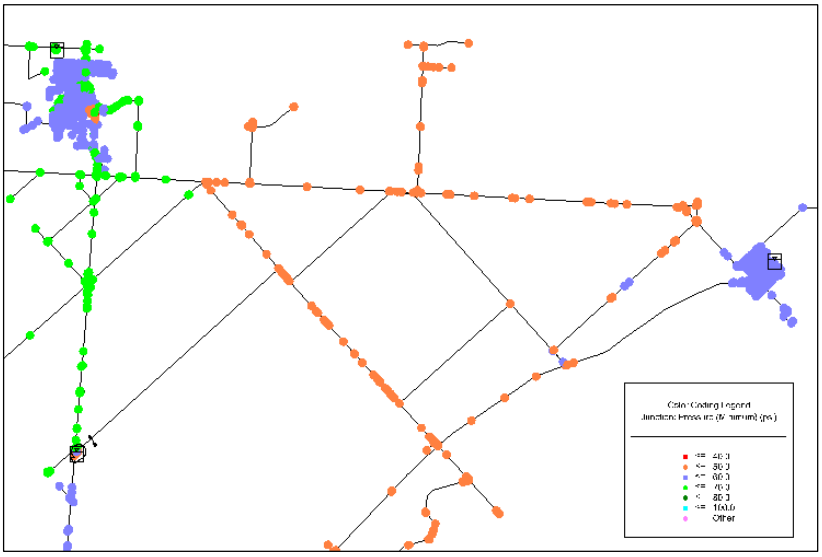


Figure 24: Minimum System Pressure – Scenario 3c

Figure 25: Maximum Watermain Velocity – Scenario 3c

9. Conclusions and Recommendations

The completion of the hydraulic modelling analysis for evaluating the water servicing strategy alternatives lead to the following conclusions and recommendations:

- Based on the hydraulic modelling evaluation, the servicing alternatives for the East and West Focus Study Areas with multiple routing options are feasible to provide sustainable water service for the NE Chatham-Kent to accommodate the water system expansion and future growth demands.

- A localized PRV station may be required at the service connection, as the service pressure will be above 80 psi (with max. of around 98 psi) for the new BPS location closer to the elevated tank.

- As the existing Thamesville SP is aging and nearing the end of its service life, a new Thamesville ET is recommended to replace the existing Thamesville SP with higher HGL to meet the minimum pressure requirements of the demands such as greenhouses and improve the water system pressure in the Thamesville and North Thamesville areas.

- The recommended watermain sizes associated with the multiple routing options under the water servicing alternatives for the East and West Focus Study Area are summarized below:

East Focus Study Area Water Servicing Alternative 1:

  - Watermain Route Option E1 (Total length of 14,470 m) with total approximately 102 properties for potential new water service connections:
    - 6,810 m -300 mm (from Thamesville to Moraviantown Connection)
    - 7,660 m -300 mm (from Moraviantown Connection to Bothwell ET)
  - Watermain Route Option E2 (Total length of 15,250 m) with total approximately 87 properties for potential new water service connections:
    - 6,810 m -300 mm (from Thamesville to Moraviantown Connection)
    - 8,440 m -300 mm (from Moraviantown Connection to Bothwell ET)
  - Watermain Route Option E3 (Total length of 16,900 m) with total approximately 103 properties for potential new water service connections:
    - 7,010 m -300 mm (from Thamesville to Moraviantown Connection)
    - 9,890 m -300 mm (from Moraviantown Connection to Bothwell ET)

East Focus Study Area Water Servicing Alternative 2:

  - Watermain Route Option 1 (Total length of 16,240 m) with total approximately 97 properties for potential new water service connections:
    - 9,140 m -300 mm (from North Thamesville to Moraviantown Connection)
    - 7,100 m -300 mm (from Moraviantown Connection to Bothwell ET)
  - Watermain Route Option 2 (Total length of 17,660 m) with total approximately 117 properties for potential new water service connections:
    - 12,080 m -300 mm (from North Thamesville to Moraviantown Connection)
    - 5,580 m -300 mm (from Moraviantown Connection to Bothwell ET)
  - Watermain Route Option 3 (Total length of 17,530 m) with total approximately 117 properties for potential new water service connections:

- 10,430 m -300 mm (from North Thamesville to Moraviantown Connection)
- 7,100 m -300 mm (from Moraviantown Connection to Bothwell ET)

West Focus Study Area Water Servicing Alternatives:

– Watermain Route Option W1 (Total length of 22,770 m) with total approximately 80 properties for potential new water service connections:

– Watermain Route Option W2 (Total length of 22,970 km) with total approximately 20 properties for potential new water service connections:

– Watermain Route Option W3 (Total length of 19,340 m) with total approximately 100 properties for potential new water service connections:

- 15,680 m -500 mm (along Longwoods Road from the new Elevated tank to Huffs Side Road; along Huffs Side Road from Longwoods Road to Baseline; and along Wabash Line from Baseline to Kent Bridge Road)
- 3,660 m -400 mm (along Smoke Line from Huffs Side Road to Kent Bridge Road)

- The proposed booster pump station and watermains could be constructed in two phases:
  - Phase 1 (to service Moraviantown and individual properties): a small booster pump station capacity of 10 L/s and proposed watermain from Thamesville to Moraviantown connection.
  - Phase 2 (to service Bothwell and individual properties): a large booster pump station capacity of 21 L/s and proposed watermain from Moraviantown connection to Bothwell.

Prepared by

Kevin Sze, P.Eng.
Senior Hydraulic Engineer

Reviewed by

Antony Aruldoss, P.Eng.
Senior Project Manager

Benny Wan, P.Eng.
Hydraulic Modelling Lead

AECOM

Appendix B

B.2 Natural Heritage

AECOM Imagine it. Delivered.

Chatham-Kent Public Utilities Commission

Municipal Class Environmental Assessment for the Northeast Chatham-Kent Water Distribution System)

Natural Environment Inventory Report

Prepared by:

AECOM Canada Ltd.
105 Commerce Valley Drive West, 7th Floor
Markham, ON L3T 7W3
Canada

T: 905.886.7022
F: 905.886.9494
www.aecom.com

Date: September, 2022

Project #: 60654246

Statement of Qualifications and Limitations

The attached Report (the "Report") has been prepared by AECOM Canada Ltd. ("AECOM") for the benefit of the Chatham Kent Public Utilities Commission ("Client") in accordance with the agreement between AECOM and Client, including the scope of work detailed therein (the "Agreement").

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AECOM: 2015-04-13

Authors

Report Prepared By:

Insert electronic signature

Courtney Bender, B.EM (Hons.)

Terrestrial Ecologist

Insert electronic signature

Nick Allen, B.ES, M.ES

Aquatic Ecologist

Report Reviewed By:

Insert electronic signature

Olga Hropach, B.Sc. (Hons.)

Senior Terrestrial Ecologist

Report Approved By:

Insert electronic signature

Katie Easterling, B.Sc. (Hons.)

Senior Aquatic Ecologist

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1. Introduction

AECOM Canada Ltd. (AECOM) has been retained by Chatham-Kent Public Utilities Commission to complete a Municipal Class Environmental Assessment for the Northeast Chatham-Kent Water Distribution System. This Municipal Class Environmental Assessment has followed the Schedule "B" process under the Ontario Environmental Assessment Act. The goal of the Project is to ensure that the water distribution system within North East Chatham Kent becomes a reliable water source to the current and future users. The Municipality, through that goal, is aiming to achieve the following objectives:

- Complete enhanced Schedule B Municipal Class Environmental Assessment to identify municipal water servicing requirements within the Northeast Chatham-Kent Water Distribution System.
- Investigate-and confirm the capacity of the Chatham Water Treatment Plant for the possibility of meeting the near and long term demands of the Northeast Chatham Kent Water Distribution System.
- Establish the additional infrastructure, to supply water from the end point of Zone 1 Road and Industrial Road.
- Identify the suitable infrastructure to service the Thamesville Community (e.g. rehabilitation of existing Standpipe versus New Elevated Tank), Bothwell Community, identified greenhouses, and Delaware Nation at Moraviantown.
- Confirm the need for the continuation of the existing connection from Middlesex Tri County to Bothwell Community Water Supply System.
- Coordination with the current Chatham-Kent Wallaceburg water treatment plant Municipal Class Environmental Assessment team who is looking at serving Dresden.

There are two Focus Study Areas located in the Municipality of Chatham Kent that span the communities of Thamesville and Bothwell. The Study Areas encompass a series of alternative strategies for the Water Distribution System, which are outlined below and are also shown in **Appendix A**, **Figure 1**.

a) East Focus Study Area – East Alternatives

- Strategy 1 Recommended Water Servicing Strategy: The new Thamesville area Booster Pumping Station will replace or repair the existing 2.3ML standpipe. It is located in the east end of Thamesville in Ferguson Park.
    - Alternate Route E1: From Longwoods Road to West Bothwell Road.
    - Alternate Route E2: From Longwoods Road to 7 Zone Road.

    - Alternate Route E3: From Jane Street to Baseline Road to Longwoods Road, to Fairfield Line to Longwoods Road to West Bothwell Road.

- Strategy 2 Alternative: The new North Thamesville Booster Pumping Station (BPS) will include a new 2.3ML Elevated Tank. The following are the Booster Pumping Station Sitting Areas:
    - Alternate BPS 1 is located in Ferguson Park
    - Alternate BPS 2 is located at the Jane St and Jane Road intersection
    - Alternate BPS 3 is located at the intersection of Baseline Road and Zone 5 Road
        - Option 1 is located at the northwest corner of Baseline Road and Zone 5 Road intersection.
        - Option 2 is located at the southwest corner of Baseline Road and Zone 5 Road intersection.
        - Option 3 is located at the northeast corner of Baseline Road and Zone 5 Road intersection
- West Focus Study Area – West Alternatives
    - Alternative Route W1: Industrial Road to Baseline Road to Wabash Line with another section parrel between Evergreen Line and River Line.
    - Alternate Route W2: Industrial Road to Baseline Road to Wabash Line with another section from Industrial Road to Evergreen Line.
    - Alternate Route W3 (recommended): From Thamesville to Huffs Sideroad to Smoke Line and also to Wabash Line.

The intent of this Natural Environment Technical Memorandum is to document the existing terrestrial and aquatic features associated with the proposed Northeast Chatham-Kent Water Distribution System infrastructure components and includes the following:

a) Desktop review of background information and information requests from regulatory agencies;
b) Preliminary Species at Risk Habitat Screening and Significant Wildlife Habitat Screening;
c) Natural heritage feature mapping;
d) Potential effects evaluation of each alternative route;
e) Identification of anticipated permits and approvals; and
f) Identification of additional natural environment field studies for the preferred alternative to be completed during detailed design.

The information presented in this memorandum may be used during the preparation of the Project's Municipal Class Environmental Assessment Project File Report.

2. Legislative and Regulatory Framework

The Project requires consideration of legislation and polices at all three levels of government: municipal, provincial and federal. **Table 2-1** summarizes the legislations relevant to the understanding of the natural environment within the Study Areas.

Table 2-1: Legislation Applicable to Project

Level of Government	Applicable/Policy Legislation	Description
Federal	Species at Risk Act, 2002	The Species at Risk Act and its associated regulations afford protection to terrestrial species listed in Schedule 1 of the Act when they occur on federal land, land subject to federal approvals, or are regulated under the Migratory Birds Convention Act (Migratory Birds Convention Act). The federal government has authority to regulate in relation to fisheries, shipping and navigation and jurisdiction over these subject areas applies for all parts of the oceans, lakes, rivers and streams within the Canadian provinces and territories. As such, Species at Risk Act regulates any activity that affects a Species at Risk Act-protected aquatic species, such as fish, shellfish, crustaceans, marine animals or marine plants. The Species at Risk Act contains several prohibitions to species listed on Schedule 1 of Species at Risk Act as Endangered or Threatened, including prohibitions on harming an individual Species at Risk, their residence or the Critical Habitat of the listed aquatic species and Migratory Birds Convention Act-protected migratory birds.
Federal	Fisheries Act, 1985 (and as amended)	On August 28, 2019, the new Fish and Fish Habitat Protection Provisions of the Amended Fisheries Act came into force. Changes to the Act include a return to the policies that were enforced prior to the 2012 amendments, focusing on the following key concepts:

Level of Government	Applicable/Policy Legislation	Description
		– Protecting all fish and fish habitat (i.e., the focus is no longer on only protecting Commercial, Recreational and Aboriginal fisheries); – Restoring the previous prohibition against 'harmful alteration, disruption or destruction of fish habitat' ; and, – Restoring a prohibition against causing 'the death of a fish by any other means than fishing'. The Fish and Fish Habitat Protection Program ensures compliance with relevant provisions under the Fisheries Act and Species at Risk Act. In cases where harm to fish or the harmful alteration, disruption or destruction of fish habitat cannot be avoided and/or mitigated, activities take place in a waterbody where Fisheries and Oceans Canada (D F O) review is not required or the scope of work cannot be covered under a Standard or Code of Practice, proponents are asked to submit a request for review to D F O. If death of a fish, or harmful alteration, disruption or destruction is likely to result from a project, the proponent will be required to obtain an Authorization from D F O. An Authorization includes terms and conditions the proponent must follow to avoid, mitigate, offset and monitor the impacts to fish and fish habitat resulting from the Project.
Federal	Migratory Birds Convention Act, 1994	The Migratory Birds Convention Act is intended to protect migratory birds, their eggs, and their active nests. The Act includes protections for more than 700 species of birds. The Migratory Birds Convention Act prohibits the possession, destruction, and harm of migratory birds and/or their nests while there is a live bird or a viable egg in it for most migratory birds except for 18 species that have site fidelity and reuse their nests from year to year and receive year-round nest protection whether there are eggs or live birds in there or not.

Level of Government	Applicable/Policy Legislation	Description
Provincial	Provincial Policy Statement, 2020	The Provincial Policy Statement, 2020 identifies seven types of natural heritage features to be protected: ◆ Significant habitat of Endangered or Threatened species ◆ Significant wetlands ◆ Coastal wetlands ◆ Significant woodlands in Ecoregions 6E and 7E. ◆ Significant valley lands in Ecoregions 6E and 7E ◆ Significant wildlife habitat, including habitat of Species of Conservation Concern ◆ Significant Areas of Natural and Scientific Interest (Areas of Natural and Scientific Interest) Policies in the Provincial Policy Statement are used to guide decision making in land-use planning. Under the Provincial Policy Statement development and site alteration are prohibited in significant wetlands in Ecoregion 6E and 7E. In addition, development and site alteration are not permitted in or within the remaining natural heritage features unless it can be shown that there will be no negative impact or permits or approvals are obtained under other regulations and legislations as appropriate.
Provincial	Endangered Species Act, 2007	Under the Endangered Species Act, species are listed as Extirpated, Endangered, Threatened and Special Concern. ◆ The Endangered Species Act prohibits the killing, harming or harassment of Endangered or Threatened species and the damage or destruction of their habitat. ◆ Ministry of the Environment, Conservation and Parks may grant a permit, or other authorization, for activities that would otherwise not be allowable under the Endangered Species Act. ◆ For the purposes of this report Special Concern species are considered Species of Conservation Concern.
Provincial	Fish and Wildlife	The Fish and Wildlife Conservation Act (1997) affords protection for some species of birds, amphibians, reptiles and

Level of Government	Applicable/Policy Legislation	Description
	Conservation Act, 1997	mammals in Ontario. Some bird species which are not afforded protection under the Migratory Birds Convention Act are afforded protection under the FWCA, such as raptors. Nests of these bird species can only be removed if a permit is obtained from Ministry of Natural Resources and Forestry.
Provincial	Conservation Authorities Act(1990)	The Ontario Regulation 171/06: St. Clair Region Conservation Authority: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses and the Ontario Regulation 152/06: Lower Thames Valley Conservation Authority: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses under the Conservation Authorities Act (1990) provide protections to the shoreline of the Great Lakes-St. Lawrence River System, river or stream valleys that have depressional features associated with a river or stream, hazardous lands, wetlands or other areas where development could interfere with the hydrological function or a wetland or other water features. Any development or site alteration within the regulated areas as mapped by the St. Clair Region Conservation Regulation and/or Lower Thames Valley Conservation Authority, will need to apply for a permit under Ontario Regulations 171/06 and/or Ontario Regulation 152/06.
Municipal	Municipality of Chatham-Kent (2014)	Portions of the Study Areas are designated as natural heritage features under this Plan, which includes Areas of Natural and Scientific Interest, significant wetlands, significant woodlands, wildlife habitat, Species at Risk habitat, lands adjacent to significant wetlands, watercourses or aquatic Species at Risk habitat. Development within provincially significant natural areas is prohibited including Provincially Significant Wetlands and Habitat of Species at Risk. Exceptions are activities that create or maintain infrastructure authorized under the environmental assessment process.

Level of Government	Applicable/Policy Legislation	Description
		Development and site alteration can occur in accordance with provincial and federal requirements. All natural heritage features and their protection policies are found in Section 4 of the Chatham-Kent Official Plan.

3. Methods

3.1 Desktop Background Information Review

A review of background information including agency correspondence, background reports and online databases was conducted to assist in characterizing the existing aquatic and terrestrial environmental conditions within the Focus Study Areas. A 120 m buffer around each of the alternative routes was used to collect natural heritage data in accordance with the Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement – Second Edition (Ministry of Natural Resources and Forestry, 2010). This allows for the assessment of ecological functions and potential impacts of the proposed development on lands adjacent to natural heritage features protected under the Provincial Policy Statement. This included a review of the following secondary sources:

- Ministry Natural Resources and Forestry Land Information Ontario GeoHub database mapping data, (Ministry of Natural Resources and Forestry, 2020a; Land Information Ontario) for:
  - Designated natural areas (e.g., Areas of Natural and Scientific Interests, wooded; areas, Provincially Significant Wetlands/Locally Significant Wetland/unevaluated wetlands, provincial parks);
  - Aquatic Resource Areas;
  - Wildlife habitats; and
  - Natural Heritage Information Centre provincially tracked species.

- Wildlife Atlases and Online Mapping Tools:
  - Ontario Butterfly Atlas (Toronto Entomologists' Association, 2022);
  - Ontario Breeding Bird Atlas Website (BSC et al., 2006);
  - Ontario Reptile and Amphibian Atlas (Ontario Nature, 2022);
  - Bat Conservation International Species Profiles (Bat Conservation International 2022);
  - eBird (2022)
  - iNaturalist (2022);
  - Ministry of Natural Resources and Forestry's Fish Online Mapping Tool (2022);
  - Ontario Ministry of Environment, Conservation and Parks Species at Risk Species Range Maps (2022);
  - Department of Fisheries and Oceans aquatic Species at Risk Online Mapping Tool (2022); and
  - Ministry of Natural Resources and Forestry's Make-a-Map: Natural Heritage Areas Application (2022).

- Other Documents, Databases and Guidelines:
  - Natural Heritage Information Request Guide (Ministry of Natural Resources and Forestry, 2010);
  - Significant Wildlife Habitat Technical Guide (Ministry of Natural Resources and Forestry, 2000);
  - Relevant Species at Risk status reports from Committee on the Statues of Endangered Wildlife in Canada and the Committee on the Status of Species at Risk in Ontario
  - Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E (Ministry of Natural Resources and Forestry, 2015);
  - Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement – Second Edition (Ministry of Natural Resources and Forestry, 2010); and
  - Municipality of Chatham-Kent Official Plan (Municipality of Chatham-Kent, 2014).

3.1.1 Agency Correspondence

AECOM consulted with the Ministry of Environment Conservation and Parks, Lower Thames Valley Conservation Authority, St. Clair Region Conservation Authority and the Ministry Natural Resources and Forestry Alymer District to obtain background information relevant to the Project Study Area. A response was received from, St. Clair Region Conservation Authority on February 23, 2022, and from, Lower Thames Valley Conservation Authority on April 4, 2022.

Table 3-1 below provides a summary of the agency correspondence undertaken to date. Agency Correspondence is provided in **Attachment B.**

Table 3-1: Summary of Agency Correspondence

Agency	Contact	Date Sent	Information Requested	Date Received	Information Received
Ministry Natural Resources and Forestry Alymer District	Not Applicable	February 16, 2022	• Presence of Natural Areas (Environmentally Significant / Sensitive Areas, provincially significant wetlands, Areas of Natural and • Scientific Interest [Areas of Natural and Scientific Interests], Provincial Parks, Conservation Reserves, and Wildlife Management Areas); • Natural Area Reports; • Ecological Land Classification mapping; • In-water Timing Restrictions; • Water Quantity / Quality Data; • Groundwater Discharge Areas;	February 16, 2022	• Not Applicable

Agency	Contact	Date Sent	Information Requested	Date Received	Information Received
			• Watercourse Names, Thermal and Flow Regimes; • Fish Habitat Sensitivity; • Habitat Information and Location; • Fisheries Management Objectives / plans; • Fish Community Records; • Benthic Invertebrate data; • Known fish spawning; • Aboriginal Fisheries; • Significant Wildlife Habitat including Species of Conservation Concern occurrences or Wildlife use of the area; and		
Ministry of Environment Conservation and Parks	Not Applicable	February 16, 2022	• Aquatic and terrestrial Species at Risk data	February 16, 2022	• Not Applicable

Agency	Contact	Date Sent	Information Requested	Date Received	Information Received
Lower Thames Valley Conservation Authority	Valerie Towsley (Watershed Resource Planner)	February 16, 2022	• Presence of Natural Areas (Environmentally Significant / Sensitive Areas, provincially significant wetlands, Areas of Natural and • Scientific Interest [Areas of Natural and Scientific Interests], Provincial Parks, Conservation Reserves, and Wildlife Management Areas); • Natural Area Reports; • Ecological Land Classification mapping; • In-water Timing Restrictions; • Water Quantity / Quality Data; • Groundwater Discharge Areas; • Watercourse Names, Thermal and Flow Regimes;	February 16, 2022 On September 15, 2022 regulation limit maps were received.	• Both study areas would have Lower Thames Conservation Authority Regulations apply. • Any works within a regulated area would require a permit from the Lower Thames Conservation Authority office prior to any work being undertaken. • Both Study Areas have a lot of Provincially Significant Wetlands (provincially significant wetland) and their 120 m Adjacent Lands within them. No works can be permitted within the provincially significant wetland, and permits are required for work within the 120 m Adjacent Lands.

Agency	Contact	Date Sent	Information Requested	Date Received	Information Received
			• Fish Habitat Sensitivity; • Habitat Information and Location; • Fisheries Management Objectives / plans; • Fish Community Records; • Benthic Invertebrate data; • Known fish spawning; • Aboriginal Fisheries; • Significant Wildlife Habitat including Species of Conservation Concern occurrences or Wildlife use of the area; and • Regulation limits.		
St. Clair Region Conservation Authority	Sarah Hodgkiss (Manager of Planning and Natural Heritage)	February 16, 2022	• Presence of Natural Areas (Environmentally Significant / Sensitive Areas, provincially significant wetlands, Areas of Natural and	February 16, 2022	• Indicated that the only areas within the SCRCA watershed was in Study Area 2 in areas north of George St/the railway line. • Regulation limit is the meander belt associated with the drains,

Agency	Contact	Date Sent	Information Requested	Date Received	Information Received
			• Scientific Interest [Areas of Natural and Scientific Interests], Provincial Parks, Conservation Reserves, and Wildlife Management Areas); • Natural Area Reports; • Ecological Land Classification mapping; • In-water Timing Restrictions; • Water Quantity / Quality Data; • Groundwater Discharge Areas; • Watercourse Names, Thermal and Flow Regimes; • Fish Habitat Sensitivity; • Habitat Information and Location; • Fisheries Management Objectives / plans;		which is 30 m on either side of the drain.

Agency	Contact	Date Sent	Information Requested	Date Received	Information Received
			• Fish Community Records; • Benthic Invertebrate data; • Known fish spawning; • Aboriginal Fisheries; • Significant Wildlife Habitat including Species of Conservation Concern occurrences or Wildlife use of the area; and • Regulation limits.		

3.2 Significant Wildlife Habitat Assessment

The Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E (Ministry of Natural Resources and Forestry, 2015) outline recommended criteria, based on science and expert knowledge, for identifying significant wildlife habitat within Ecoregion 7E, which encompasses the Project Study Area. Ministry of Natural Resources and Forestry generally categorizes significant wildlife habitat into the following:

- Seasonal concentration areas;
- Rare vegetation communities or specialized habitats for wildlife;
- Habitats of Species of Conservation Concern; and
- Animal movement corridors.

According to the Ministry of Natural Resources and Forestry Natural Heritage Reference Manual (Ministry of Natural Resources and Forestry, 2010), which was developed to provide technical guidance for implementing the natural heritage policies of the Provincial Policy Statement, significant wildlife habitat includes the habitat of Species of Conservation Concern, which consists of the following:

- Species with Provincial S-rank assigned by Natural Heritage Information Centre as S1 (critically imperiled), S2 (imperiled) or S3 (vulnerable);
- Species listed as Special Concern under the Endangered Species Act; and
- Species identified as nationally Endangered or Threatened by the Committee on the Status of Endangered Wildlife in Canada, which are not protected under the Endangered Species Act.

The Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E (Ministry of Natural Resources and Forestry, 2015) was used to assess for the presence/absence of candidate or confirmed significant wildlife habitat within 120 metres of Project alternatives based on the secondary sources listed in **Section 3.1** as part of the desktop background information review. The assessment included screening suitable habitat (candidate significant wildlife habitat) criteria and indicator wildlife species required to confirm presence against habitat conditions and wildlife species records. There were no species-specific surveys completed to confirm candidate significant wildlife habitat in the field.

Although Species of Conservation Concern do not receive legal protection under the Endangered Species Act, they may be afforded protection under other Acts, such as the Provincial Policy Statement, Migratory Birds Convention Act, Fish and Wildlife Conservation

Act, and other planning documents, and are therefore discussed herein. A screening for Species of Conservation Concern was completed as per **Section 3.4** below.

While the Natural Heritage Reference Manual (Ministry of Natural Resources and Forestry, 2010) definition of Species of Conservation Concern does not include species that have been federally listed as special concern, for the purposes of this report they are included in this definition as these species are not afforded the same protections under Species at Risk Act as Threatened/ Endangered species. To further simplify, for this memorandum, species that are designated as either Threatened or Endangered under either Endangered Species Act and/or Species at Risk Act are referred to as Species at Risk while the species that are designated as Special Concern under either Endangered Species Act and/or Species at Risk Act are referred to as Species of Conservation Concern.

3.3 Species at Risk Habitat Assessment

A preliminary Species at Risk habitat screening was conducted as a desktop exercise, using the sources listed in **Section 3.1** within 120 metres of the alternative routes. For the purposes of this memorandum, Species at Risk will refer to terrestrial species listed as Extirpated, Endangered or Threatened under the provincial Endangered Species Act. Aquatic Species at Risk will refer to species listed as Extirpated, Endangered or Threatened on the Species at Risk in Ontario list that receive both individual and habitat protection under the Endangered Species Act and those that are identified as Extirpated, Endangered or Threatened and afforded protection under the federal Species at Risk Act. Species at Risk with ranges overlapping the Project Study Area or recent occurrence records in the vicinity of the Project Study Area were identified and then screened by comparing their habitat requirements to the habitat conditions observed through desktop analysis within 120 metres of the alternative routes. The potential for each species to occur was then determined through a probability of occurrence whereby the following rankings were applied:

- **Low Probability**: no suitable habitat identified for the species within the area of investigation although records of species presence were identified through background review;
- **Medium Probability**: potentially suitable Species at Risk habitat identified within the area of investigation, but species was not identified during field investigations although records of species presence were identified through background review; and,
- **High Probability**: good quality Species at Risk habitat identified within the area of investigation and known species record in the Project Study Area.

3.4 Site Reconnaissance Surveys for Recommended Alternatives

A site reconnaissance survey was completed on July 28, 2022, for the preferred alternative routes from publicly accessible areas (i.e. municipal road right-of-ways) and consisted of the following windshield surveys:

- Vegetation community classification and mapping, including documentation of dominant species associations, following the Ecological Land Classification (Ecological Land Classification) Manual for Southern Ontario (Lee et al., 1998) to Ecosite or Vegetation Type;
- List of plant species observed;
- Watercourse presence assessment based on bank stability, substrate sorting, and vegetation.
- Location and species of any bird nests on, under or in any structure likely to be affected by construction;
- List of wildlife species observed, and evidence of wildlife habitat on man-made structures including direct observation and incidental evidence;
- Assessment of significant wildlife habitat potential based on wildlife observations and site conditions; and
- Location of any Species at Risk, Species of Conservation Concern or their habitats.

4. Desktop Background Information Review Results

4.1 Designated Natural Areas

Designated natural areas include Provincially Significant Wetlands , Locally Significant Wetlands, Areas of Natural and Scientific Interests, significant wildlife habitat and significant woodlands that receive protection under the Provincial Policy Statement and other legislation and may be identified by the planning authorities (e.g., province, municipality, conservation authority). Several designated natural areas were identified through the background information review. **Appendix A, Figure 1** displays the natural heritage feature found within each of the alternative routes and booster pumping station sitting areas.

Two provincially significant wetlands were identified within the East Focus Study Area, including the Thamesville Conservation Club Wetland Complex and the Skunk's Misery wetland Complex. The Thamesville Conservation Club Provincially Significant Wetland is located within 120 metres of Alternative Route E1, E2 and E3. The Thamesville Conservation Club wetland is a complex of wetlands, congregated southeast of Pitt Rd and Baseline Rd intersection. It provides swamp, marsh and fen habitat. The Skunk's Misery Provincially Significant Wetland Complex was also identified within 120 metres of Alternative Route E1, E2 and E3 and consists of a complex of wetlands that provides swamp and marsh habitat. The Skunk's Misery Provincially Significant Wetland also extends beyond 120 metres from the alternative routes and forms part of an Important Bird Area (County of Middlesex 2022). While the IBA is situated more than 120 metres from the alternative routes, the potential exists for rare and Species at Risk birds to use the portions of the provincially significant wetlands identified above.

Thamesville Moor Regional Life Science Areas of Natural and Scientific Interest was identified within West Focus Study Area within 120 metres of Alternative Routes W1 and W2. This Areas of Natural and Scientific Interest is located north of the intersection of Baseline Rd and Industrial Rd. It is also identified as a significant woodland.

Significant woodlands are present throughout both the East and West Focus Study Areas, and within 120 metres of all east and west alternative routes.

There were no designated natural areas present within 120 m of the Alternative Booster Pumping Siting Stations.

Significant wildlife habitats and potential for species at risk are further discussed in **Sections 3.2** and **3.3** respectively.

4.2 Policy Areas

The study areas fall within the jurisdiction of the Municipality of Chatham-Kent. Schedule C1 of the Chatham-Kent Official Plan demonstrate the significant woodlands and provincial areas of natural scientific interest that are afforded protections.

The East Focus Study Area and the Booster Pumping Station Sitting Areas fall entirely under the jurisdiction of the Lower Thames Valley Conservation Authority, with regulated areas existing along alternative routes E1, E2, E3, and sitting areas BPS 1, BPS 2, and BPS 3.

The West Focus Study Area falls within both jurisdictions of the Lower Thames Valley Conservation Authority and the St. Clair Region Conservation Authority. The boundary of the two-conservation authority's is adjacent to the Canadian Pacific Railway with the Lower Thames Valley Conservation Authority to the south of the Railway and the St. Clair Region Conservation Authority to the North.

Regulated areas for the East and West Focus Study Areas are provided in **Appendix C**.

4.3 Vegetation Communities

A brief description of the vegetation communities identified within 120 m of each alternative route is provided below based on aerial imagery (2021) interpretation. Further field investigations during detailed design will be required to accurately identify these communities.

East Focus Study Area– Alternative Route E1

The Alternative Route E1 is primarily adjacent to agriculture fields. There are a few deciduous forest communities as well as a marsh community that are within the study area.

East Focus Study Area– Alternative Route E2

The alternative route E2 is primarily adjacent to agriculture fields. There are a deciduous forest communities as well as a marsh community that are within the Study Area.

East Focus Study Area– Alternative Route E3

The alternative route E3 is primarily adjacent to agriculture fields. There are a few deciduous forest communities as well as a marsh community that are within the study area. Further field

investigations during detailed design will be required to accurately identify these communities.

West Focus Study Area– Alternative Route W1

The alternative route W1 is adjacent to many agriculture fields. It has a few deciduous forest communities within the Study Area.

West Focus Study Area– Alternative Route W2

The alternative route W2 is adjacent to many agriculture fields. It has a few deciduous forest communities within the Study Area.

West Focus Study Area– Alternative Route W3

The alternative route W3 is adjacent to many agriculture fields. It has a few deciduous forest communities within the Study Area.

Booster Pumping Station Sitting Area BPS 1

This booster pumping station is located in Ferguson Park with open fields. There are no vegetation communities found within the study area.

Booster Pumping Station Sitting Area BPS 2

This booster pumping station is located at the corner of Jane St. and Jane Road. It is adjacent to agriculture fields. There are no vegetation communities found within the study area.

Booster Pumping Station Sitting Area BPS 3

This booster pumping station is located at the intersection of Baseline Road and Zone 5 Road. It is adjacent to agriculture fields. There are no vegetation communities found within the study area

4.4 Fish and Fish Habitat

4.4.1 Watercourses and Waterbodies

A brief description of the watercourses identified within 120 m of each alternative route is provided below:

East Focus Study Area – Alternative Route E1

Based on aerial imagery and watercourse mapping, the alternative E1 route crosses nine watercourses. The watercourse crossings are:

1. Unnamed Tributary to the Thames River 002 (O G F #651021406) – Confirmed via aerial imagery
2. Marchand Drain (O G F #127991526) – Not visible on aerial imagery, likely buried
3. Marcus Drain (O G F #110152426) – Confirmed via aerial imagery
4. Unnamed Tributary to the Thames River 003 (O G F #651021612) – Confirmed via aerial imagery
5. McGillvary Award Drain (O G F #127991532) – Not visible on aerial imagery, likely buried
6. 1st Crossing – Bedford Drain South (O G F #127991530) – Not visible on aerial imagery, likely buried
7. 2nd Crossing – Bedford Drain South (O G F #127991530) – Not visible on aerial imagery, likely buried
8. Unnamed Tributary to the Thames River 004 (O G F #651022077) / Unnamed Drain 001 (O G F # 110149553) – Confirmed via aerial imagery
9. Unnamed Drain 002 (O G F # 110149068) – Not visible on aerial imagery, likely buried

East Focus Study Area – Alternative Route E2

Based on aerial imagery and watercourse mapping, the E2 route crosses 12 watercourses. The watercourse crossings are:

1. Brandy Drain (O G F # 124060451) / Unnamed Watercourse 001 (O G F # 127712812) – Confirmed via aerial imagery
2. Unnamed Watercourse 002 (O G F # 127712809) – Confirmed via aerial imagery
3. Sussex Drain (O G F # 110156171) / Unnamed Watercourse 003 (O G F # 651021203) – Confirmed via aerial imagery
4. Gordon Hodge Drain (O G F # 110155338) / Unnamed Watercourse 004 (O G F # 651021312) – Confirmed via aerial imagery
5. Brewer Drain (O G F # 110154807) – Confirmed via aerial imagery
6. 7-8 Concession Drain (O G F # 110154423) / Unnamed Watercourse 005 (O G F # 651021336) – Confirmed via aerial imagery
7. Woods Drain (O G F # 110153748) / Cornwall Creek (O G F # 651021429) – Confirmed via aerial imagery
8. Unnamed Tributary to the Thames River 003 (O G F #651021612) – Confirmed via aerial imagery

9. McGillvary Award Drain (O G F #127991532) – Not visible on aerial imagery, likely buried
10. 1st Crossing – Bedford Drain South (O G F #127991530) – Not visible on aerial imagery, likely buried
11. 2nd Crossing – Bedford Drain South (O G F #127991530) – Not visible on aerial imagery, likely buried
12. Unnamed Tributary to the Thames River 004 (O G F #651022077) / Unnamed Drain 001 (O G F # 110149553) – Confirmed via aerial imagery
13. Unnamed Drain 002 (O G F # 110149068) – Not visible on aerial imagery, likely buried

East Focus Study Area – Alternative Route E3

Based on aerial imagery and watercourse mapping, the E3 route crosses 13 watercourses. The watercourse crossings are:

1. Unnamed Tributary to the Thames River 001 (O G F #651021267) – Confirmed via aerial imagery
2. Unnamed Tributary to the Thames River 002 (O G F #651021406) – Confirmed via aerial imagery
3. Marchand Drain (O G F #127991526) – Not visible on aerial imagery, likely buried
4. 1st Crossing – Woods Drain (O G F # 110153748) / Cornwall Creek (O G F # 651021429) – Confirmed via aerial imagery
5. 2nd Crossing – Woods Drain (O G F # 110153748) / Cornwall Creek (O G F # 651021429) – Confirmed via aerial imagery
6. 1st Crossing – McGillvary Award Drain (O G F #127991532) – Not visible on aerial imagery, likely buried
7. 2nd Crossing – McGillvary Award Drain (O G F #127991532) – Not visible on aerial imagery, likely buried
8. 1st Crossing – Bedford Drain South (O G F #127991530) – Not visible on aerial imagery, likely buried
9. 2nd Crossing – Bedford Drain South (O G F #127991530) – Not visible on aerial imagery, likely buried
10. 3rd Crossing – McGillvary Award Drain (O G F #127991532) – Not visible on aerial imagery, likely buried
11. 3rd Crossing – Woods Drain (O G F # 110153748) / Cornwall Creek (O G F # 651021429) – Confirmed via aerial imagery
12. Dickson Drain (O G F # 110151218) / Unnamed Watercourse 006 (O G F #651021911) – Confirmed via aerial imagery

13. 4th Crossing – Woods Drain (O G F # 110153748) / Cornwall Creek (O G F # 651021429) – Confirmed via aerial imagery

West Focus Study Area– Alternative Route W1

Based on aerial imagery and watercourse mapping, the W1 route has 30 watercourse crossings. The watercourse crossings are:

1. Woods Drain (O G F # 110153748) / Cornwall Creek (O G F # 651021429) – Confirmed via aerial imagery
2. Cruikshank Creek Drain (O G F # 110149755) / Unnamed Watercourse 007 (O G F # 67871431) – Confirmed via aerial imagery
3. Unnamed Drain 003 (O G F # 110149558) – Not visible on aerial imagery, likely buried
4. Unnamed Drain 004 (O G F # 110150029) – Not visible on aerial imagery, likely buried
5. Cryderman Drain (O G F # 110149741) / Unnamed Watercourse 008 (O G F # 651021996) – Confirmed via aerial imagery
6. Unnamed Drain (O G F # 110149966) – Confirmed via aerial imagery
7. Unnamed Drain 005 (O G F # 110150960) / Unnamed Watercourse 009 (O G F # 127712742) – Confirmed via aerial imagery
8. Unnamed Drain 006 (O G F # 110151059) / Unnamed Watercourse 010 (O G F # 127712733) – Confirmed via aerial imagery
9. Unnamed Drain 007 (O G F # 110150152) / Unnamed Watercousre 011 (O G F # 127712743) – Confirmed via aerial imagery
10. Unnamed Drain 008 (O G F # 110150213) / Unnamed Watercourse 012 (O G F # 127712744) – Confirmed via aerial imagery
11. Unnamed Drain 009 (O G F # 110150413) / Unnamed Watercourse 013 (O G F # 127712748) – Confirmed via aerial imagery
12. 1st Crossing – Unnamed Drain 010 (O G F # 110150333) / Unnamed Watercourse 014 (O G F # 127712756) – Confirmed via aerial imagery
13. 2nd Crossing – Unnamed Drain 010 (O G F # 110150333) / Unnamed Watercourse 014 (O G F # 127712756) – Confirmed via aerial imagery
14. Unnamed Drain 011 (O G F # 110149870) / Unnamed Watercourse 015 (O G F # 127712724) – Confirmed via aerial imagery
15. Unnamed Drain 012 (O G F # 110149696) / Unnamed Watercourse 016 (O G F # 127712713) – Confirmed via aerial imagery
16. Unnamed Drain 013 (O G F # 110148488) / Unnamed Watercourse 017 (O G F # 127712712) – Confirmed via aerial imagery

17. Hyatt Drain (O G F # 110148485) – Confirmed via aerial imagery
    Unnamed Drain 014 (O G F # 110148426) – Not visible on aerial image, likely buried
19. Cruikshank Creek Drain (O G F # 110149755) / Cornwall Creek (O G F # 651021429) – Confirmed via aerial imagery
20. Unnamed Drain 015 (O G F # 110147999) – Not visible on aerial image, likely buried
21. Wallace Drain (O G F # 110148520) / Unnamed Watercourse 018 (O G F # 651022304) – Confirmed via in-field observation
22. Unnamed Drain 016 (O G F # 110147213) – Not visible on aerial image, likely buried
23. Unnamed Drain 017 (O G F # 110147137) – Not visible on aerial image, likely buried
24. Agar Drain (O G F # 110147365) – Not visible on aerial image, likely buried
25. Highway No. 2 Drain (O G F # 110147008) – Not visible on aerial image, likely buried
26. Cryderman Drain (O G F # 110147057) / Unnamed Watercourse 008 (OGF# 651022466) – Confirmed via aerial image
27. Langford Drain (O G F # 110145334) – Not visible on aerial image, likely buried
28. Mason Drain (O G F # 110147221) / Unnamed Watercourse 019 (O G F # 651022509) – Confirmed via aerial image
29. Unnamed Drain 018 (O G F # 110144644) – Not visible on aerial image, likely buried
30. Labute Drain (O G F # 110143760) – Confirmed via aerial image

West Focus Study Area– Alternative Route W2

Based on aerial imagery and watercourse mapping, the W2 route has 30 watercourse crossings. The watercourse crossings are:

1. Woods Drain (O G F # 110153748) / Cornwall Creek (O G F # 651021429) – Confirmed via aerial imagery
2. Cruikshank Creek Drain (O G F # 110149755) / Unnamed Watercourse 007 (O G F # 67871431) – Confirmed via aerial imagery
3. Unnamed Drain 003 (O G F # 110149558) – Not visible on aerial imagery, likely buried
4. Unnamed Drain 004 (O G F # 110150029) – Not visible on aerial imagery, likely buried
5. 1st Crossing – Cryderman Drain (O G F # 110149741) / Unnamed Watercourse 008 (O G F # 651021996) – Confirmed via aerial imagery
6. Unnamed Drain (O G F # 110149966) – Confirmed via aerial imagery
7. Unnamed Drain 005 (O G F # 110150960) / Unnamed Watercourse 009 (O G F # 127712742) – Confirmed via aerial imagery

8. Unnamed Drain 006 (O G F # 110151059) / Unnamed Watercourse 010 (O G F # 127712733) – Confirmed via aerial imagery
9. Unnamed Drain 007 (O G F # 110150152) / Unnamed Watercousre 011 (O G F # 127712743) – Confirmed via aerial imagery
10. Unnamed Drain 008 (O G F # 110150213) / Unnamed Watercourse 012 (O G F # 127712744) – Confirmed via aerial imagery
11. Unnamed Drain 009 (O G F # 110150413) / Unnamed Watercourse 013 (O G F # 127712748) – Confirmed via aerial imagery
12. 1st Crossing – Unnamed Drain 010 (O G F # 110150333) / Unnamed Watercourse 014 (O G F # 127712756) – Confirmed via aerial imagery
13. 2nd Crossing – Unnamed Drain 010 (O G F # 110150333) / Unnamed Watercourse 014 (O G F # 127712756) – Confirmed via aerial imagery
14. Unnamed Drain 011 (O G F # 110149870) / Unnamed Watercourse 015 (O G F # 127712724) – Confirmed via aerial imagery
15. Unnamed Drain 012 (O G F # 110149696) / Unnamed Watercourse 016 (O G F # 127712713) – Confirmed via aerial imagery
16. Unnamed Drain 013 (O G F # 110148488) / Unnamed Watercourse 017 (O G F # 127712712) – Confirmed via aerial imagery
17. Hyatt Drain (O G F # 110148485) – Confirmed via aerial imagery
18. Unnamed Drain 014 (O G F # 110148426) – Not visible on aerial image, likely buried
19. 2nd Crossing – Cryderman Drain (O G F # 110149571) / Unnamed Watercourse 008 (O G F # 651022058) – Confirmed via aerial imagery
20. 3rd Crossing – Cryderman Drain (O G F # 110149571) / Unnamed Watercourse 008 (O G F # 651022111) – Confirmed via aerial imagery
21. Poissant Drain (O G F # 110148769) – Not visible on aerial image, likely buried
22. Smith Drain (O G F # 110148482) – Confirmed via aerial image
23. Carson Drain (O G F # 110148479) – Not visible on aerial image, likely buried
24. 4th Crossing – Cryderman Drain (O G F # 110148252) / Unnamed Watercourse 008 (O G F # 651022251) – Confirmed via aerial imagery
25. Pumphery Drain (O G F # 110147591) – Confirmed via aerial image
26. Vanbody Drain (O G F # 110147537) / Unnamed Watercourse 20 (O G F # 651022337) – Not visible on aerial image, likely buried
27. Unnamed Drain 019 (O G F # 110145958) – Not visible on aerial image, likely buried
28. Mason Drain (O G F # 110147221) / Unnamed Watercourse 019 (O G F # 651022509) – Confirmed via aerial image

29. Unnamed Drain 018 (O G F # 110144644) – Not visible on aerial image, likely buried
30. Labute Drain (O G F # 110143760) – Confirmed via aerial image

West Focus Study Area– Alternative Route W3

Based on aerial imagery and watercourse mapping, the W2 route has 27 watercourse crossings. The watercourse crossings are:

1. 1st Crossing – Courtney Drain (O G F # 110148560) / Unnamed Watercourse 020 (O G F # 127712718) – Confirmed via aerial imagery
2. Unnamed Drain 020 (O G F # 110149294) / Unnamed Watercourse 021 (O G F # 127712721) – Confirmed via aerial image
3. Unnamed Drain 021 (O G F # 110149340) / Unnamed Watercourse 022 (O G F # 127712727) – Confirmed via aerial image
4. Unnamed Drain 022 (O G F # 110150160) / Unnamed Watercourse 023 (O G F # 127712736) – Confirmed via aerial image
5. Unnamed Drain 023 (O G F # 110150250) / Unnamed Watercourse 024 (O G F # 127712748) – Confirmed via aerial image
6. 1st Crossing – Unnamed Drain 010 (O G F # 110150333) / Unnamed Watercourse 014 (O G F # 127712756) – Confirmed via aerial imagery
7. 2nd Crossing – Unnamed Drain 010 (O G F # 110150333) / Unnamed Watercourse 014 (O G F # 127712756) – Confirmed via aerial imagery
8. Unnamed Drain 011 (O G F # 110149870) / Unnamed Watercourse 015 (O G F # 127712724) – Confirmed via aerial imagery
9. Unnamed Drain 012 (O G F # 110149696) / Unnamed Watercourse 016 (O G F # 127712713) – Confirmed via aerial imagery
10. Unnamed Drain 013 (O G F # 110148488) / Unnamed Watercourse 017 (O G F # 127712712) – Confirmed via aerial imagery
11. Hyatt Drain (O G F # 110148485) – Confirmed via aerial imagery
    Unnamed Drain 014 (O G F # 110148426) – Not visible on aerial image, likely buried
13. Cruikshank Creek Drain (O G F # 110149755) / Cornwall Creek (O G F # 651021429) – Confirmed via aerial imagery
14. Unnamed Drain 015 (O G F # 110147999) – Not visible on aerial image, likely buried
15. Wallace Drain (O G F # 110148520) / Unnamed Watercourse 018 (O G F # 651022304) – Confirmed via in-field observation
16. Unnamed Drain 016 (O G F # 110147213) – Not visible on aerial image, likely buried
17. Unnamed Drain 017 (O G F # 110147137) – Not visible on aerial image, likely buried

18. Agar Drain (O G F # 110147365) – Not visible on aerial image, likely buried
19. Highway No. 2 Drain (O G F # 110147008) – Not visible on aerial image, likely buried
20. Cryderman Drain (O G F # 110147057) / Unnamed Watercourse 008 (OGF# 651022466) – Confirmed via aerial image
21. Langford Drain (O G F # 110145334) – Not visible on aerial image, likely buried
22. Mason Drain (O G F # 110147216) / Unnamed Watercourse 019 (O G F # 651022418) – Confirmed via aerial image
23. Unnamed Drain 024 (O G F # 110147381) / Unnamed Watercourse 025 (O G F # 127712714) – Confirmed via aerial imagery
24. Unnamed Drain 025 (O G F # 110146972) – Not visible on aerial image, likely buried
25. Unnamed Drain 026 (O G F # 110146780) – Not visible on aerial image, likely buried
26. 2nd Crossing – Courtney Drain (O G F # 110148560) / Unnamed Watercourse 020 (O G F # 127712718) – Confirmed via aerial imagery
27. 3rd Crossing – Courtney Drain (O G F # 110148560) / Unnamed Watercourse 020 (O G F # 127712718) – Confirmed via aerial imagery

Booster Pumping Station Sitting Area BPS 1

This booster pumping station is located in Ferguson Park with no adjacent watercourses.

Booster Pumping Station Sitting Area BPS 2

This booster pumping station is located at the corner of Jane St. and Jane Road. It is adjacent to Dickson Drain (O G F # 110151218) / Unnamed Watercourse 006 (O G F #651021911).

Booster Pumping Station Sitting Area BPS 3

This booster pumping station is located at the intersection of Baseline Road and Zone 5 Road with no adjacent watercourses.

4.4.2 Fish and Fish Habitat

Fish community data has been combined and collected for both the East and West Focus Study Areas. **Table 4-1** outlines the fish present within the combined study areas.

Table 4-1: Fish Species Present within East and West Focus Study Area

Common Name	Scientific Name	Species at Risk Act	Endangered Species Act	Thermal Regime
Blacknose Dace	Rhinichthys atratulus	-	-	coolwater
Black Redhorse	Moxostoma duquesnei	Threatened	Threatened	warmwater
Blackside Darter	Percina maculata	-	-	coolwater
Bluegill	Lepomis macrochirus	-	-	warmwater
Bluntnose Minnow	Pimephales notatus	Not At Risk	Not At Risk	warmwater
Brindled Madtom	Noturus miurus	-	-	warmwater
Brook Stickleback	Culaea inconstans	-	-	coolwater
Central Stoneroller	Campostoma anomalum	Not At Risk	Not At Risk	coolwater
Channel Catfish	Ictalurus punctatus	-	-	warmwater
Common Carp	Cyprinus carpio	-	-	warmwater
Common Shiner	Luxilus cornutus	-	-	coolwater
Creek Chub	Semotilus atromaculatus	-	-	coolwater
Eastern Sand Darter	Ammocrypta pellucida	Threatened	Threatened	warmwater
Emerald Shiner	Notropis atherinoides	-	-	coolwater

Common Name	Scientific Name	Species at Risk Act	Endangered Species Act	Thermal Regime
Fantail Darter	Etheostoma flabellare	-	-	coolwater
Fathead Minnow	Pimephales promelas	-	-	warmwater
Ghost Shiner	Notropis buchanani	-	-	warmwater
Gizzard Shad	Dorosoma cepedianum	-	-	coolwater
Golden Redhorse	Moxostoma erythrurum	Not At Risk	Not At Risk	warmwater
Gravel Chub	Erimystax x-punctatus	Extirpated	Extirpated	coolwater
Green Sunfish	Lepomis cyanellus	Not At Risk	Not At Risk	warmwater
Johnny Darter	Etheostoma nigrum	-	-	coolwater
Largemouth Bass	Micropterus salmoides	-	-	warmwater
Least Darter	Etheostoma microperca	-	-	warmwater
Logperch	Percina caprodes	-	-	warmwater
Longnose Gar	Lepisosteus osseus	-	-	warmwater
Mimic Shiner	Notropis volucellus	-	-	warmwater
Mooneye	Hiodon tergisus	-	-	coolwater
Northern Hog Sucker	Hypentelium nigricans	-	-	warmwater

Common Name	Scientific Name	Species at Risk Act	Endangered Species Act	Thermal Regime
Northern Madtom	Noturus stigmosus	Endangered	Endangered	warmwater
Northern Redbelly Dace	Chrosomus eos	-	-	coolwater
Northern Sunfish	Lepomis peltastes	Special Concern	Special Concern	warmwater
Pugnose Minnow	Opsopoeodus emiliae	Threatened	Threatened	warmwater
Pumpkinseed	Lepomis gibbosus	-	-	warmwater
Quillback	Carpiodes cyprinus	-	-	coolwater
Rainbow Darter	Etheostoma caeruleum	-	-	coolwater
Rainbow Trout	Oncorhynchus mykiss	-	-	coldwater
River Redhorse	Moxostoma carinatum	Special Concern	Special Concern	warmwater
Rock Bass	Ambloplites rupestris	-	-	coolwater
Round Goby	Neogobius melanostomus	-	-	coolwater
Shorthead Redhorse	Moxostoma macrolepidotum	-	-	warmwater
Spotted Sucker	Minytrema melanops	Special Concern	Special Concern	warmwater
Silver Chub	Macrhybopsis storeriana	Endangered	Endangered	coolwater

Common Name	Scientific Name	Species at Risk Act	Endangered Species Act	Thermal Regime
Silver Lamprey	Ichthyomyzon unicuspis	Special Concern	Special Concern	coolwater
Silver Redhorse	Moxostoma anisurum	-	-	coolwater
Silver Chub	Macrhybopsis storeriana	Endangered	Threatened	-
Silver Shiner	Notropis photogenis	Threatened	Threatened	-
Smallmouth Bass	Micropterus dolomieu	-	-	coolwater
Spotfin Shiner	Cyprinella spiloptera	-	-	warmwater
Spotted Sucker	Minytrema melanops	Special Concern	Special Concern	-
Stonecat	Noturus flavus	-	-	warmwater
Trout-perch	Percopsis omiscomaycus	-	-	coldwater
White Bass	Morone chrysops	-	-	warmwater
White Perch	Morone americana	-	-	warmwater
White Sucker	Catostomus commersonii	-	-	coolwater
Yellow Perch	Perca flavescens	-	-	coolwater
Fawnsfoot	Truncilla donaciformis	Endangered	Endangered	-
Hickorynut	Obovaria olivaria	Endangered	Endangered	-

Common Name	Scientific Name	Species at Risk Act	Endangered Species Act	Thermal Regime
Kidneyshell	Ptychobranchus fasciolaris	Endangered	Endangered	-
Mapleleaf	Quadrula quadrula	Special Concern	Special Concern	-
Purple Wartyback*	Cyclonaias tuberculate	Threatened	-	-
Round Hickorynut	Obovaria subrotunda	Endangered	Endangered	-
Round Pigtoe	Pleurobema sintoxia	Endangered	Endangered	-
Threehorn Wartyback	Obliquaria reflexa	Threatened	Threatened	-

*Purple Wartyback's Species at Risk Act ranking will be uplisted from no ranking to Threatened by 2023.

Source: D F O (2022), Ministry of Natural Resources and Forestry LIO (2022),

4.5 Preliminary Significant Wildlife Habitat Screening

Using the criteria from Significant Wildlife Habitat Criteria Schedule for Ecoregion 7E (Ministry of Natural Resources and Forestry, 2015), **Table 4-2** provides a summary of all candidate and confirmed significant wildlife habitat identified for each alternative route and its associated infrastructure based on the results from the desktop background information review. The full Significant Wildlife Habitat screening assessment can be found in **Attachment D**. A comprehensive habitat screening for Species at Risk and Species of Conservation Concern is provided in **Attachment E.**

Table 4-2: Preliminary Significant Wildlife Habitat Screening for each Alternative Routing Option

Alternative Route	Seasonal Concentration Areas	Rare Vegetation Communities or Specialized Habitats for Wildlife	Habitats for Species of Conservation Concern	Animal Movement Corridors
East Focus Study Area – Alternative Route E1	Candidate: 1. Raptor Wintering Area 2. Bat Maternity Colonies 3. Reptile Hibernaculum	Candidate: 4. Old Growth Forest: Skunks Misery Areas of Natural and Scientific Interest that is just east of the Study Area contains old growth forest (Talbot Land Thames Trust, 2008), therefore protected forested communities apart of the Skunk's Misery Wetland Complex may also contain old growth forest. 5. Other Rare Vegetation Communities 6. Bald Eagle and Osprey Nesting, Foraging and Perching Habitat 7. Woodland Raptor Nesting Habitat 8. Turtle Nesting Sites 9. Seeps and Springs 10. Amphibian Breeding Habitat (Woodland) 11. Amphibian Breeding Habitat (Wetlands)	Candidate: 12. Woodland Area-Sensitive Bird Breeding Habitat 13. Terrestrial Crayfish 14. Habitat for the following Species of Conservation Concern (refer to Attachment C): ▪ Bald eagle (Haliaeetus leucocephalus) ▪ Canada warbler (Cardellina canadensis) ▪ Eastern wood-pewee (Contopus virens) ▪ Evening Grosbeak (Coccothraustes vespertinus) ▪ Wood Thrush (Hylocichla mustelina) ▪ Northern Sunfish(Great Lakes - Upper St.Lawrence populations) (Lepomis peltastes) ▪ Monarch (Danaus plexippus) ▪ Woodland Vole (Microtus pinetorum) ▪ Mapleleaf (Great Lakes Upper St. Lawrence population) (Quadrula quadrula) ▪ Rainbow (Villosa iris) ▪ Broad Beech Fern (Phegopteris hexagonoptera) ▪ Green Dragon (Arisaema dracontium) ▪ Northern Map Turtle (Graptemys geographica) ▪ Snapping Turtle (Chelydra serpentina)	Candidate: 15. Amphibian Movement Corridors
East Focus Study Area – Alternative Route E2	Candidate: 1. Raptor Wintering Area: 2. Bat Maternity Colonies	Candidate: 4. Old Growth Forest: Skunks Misery Areas of Natural and Scientific Interest that is just east of the Study Area contains old growth forest (Talbot Land Thames Trust, 2008), therefore protected forested communities apart of the Skunk's Misery Wetland Complex may also contain old growth forest. 5. Other Rare Vegetation Communities	Candidate: 12. Woodland Area-Sensitive Bird Breeding Habitat 13. Terrestrial Crayfish 14. Habitat for the following Species of Conservation Concern (refer to Attachment C): ▪ Bald eagle ▪ Canada warbler	Candidate: 15. Amphibian Movement Corridors

Alternative Route	Seasonal Concentration Areas	Rare Vegetation Communities or Specialized Habitats for Wildlife	Habitats for Species of Conservation Concern	Animal Movement Corridors
	3. Reptile Hibernaculum	6. Bald Eagle and Osprey Nesting, Foraging and Perching Habitat 7. Woodland Raptor Nesting Habitat 8. Turtle Nesting Sites 9. Seeps and Springs 10. Amphibian Breeding Habitat (Woodland) 11. Amphibian Breeding Habitat (Wetlands)	▪ Eastern wood-pewee ▪ Evening Grosbeak ▪ Wood Thrush ▪ Northern Sunfish(Great Lakes - Upper St.Lawrence populations) ▪ Monarch ▪ Woodland Vole ▪ Mapleleaf (Great Lakes Upper St. Lawrence population) ▪ Rainbow ▪ Broad Beech Fern ▪ Green Dragon ▪ Northern Map Turtle ▪ Snapping Turtle)	
East Focus Study Area – Alternative Route E3	Candidate: 1. Raptor Wintering Area: 2. Bat Maternity Colonies 3. Reptile Hibernaculum	Candidate: 4. Old Growth Forest: Skunks Misery Areas of Natural and Scientific Interest that is just east of the Study Area contains old growth forest (Talbot Land Thames Trust, 2008), therefore protected forested communities apart of the Skunk's Misery Wetland Complex may also contain old growth forest. 5. Other Rare Vegetation Communities 6. Bald Eagle and Osprey Nesting, Foraging and Perching Habitat 7. Woodland Raptor Nesting Habitat 8. Turtle Nesting Sites 9. Seeps and Springs 10. Amphibian Breeding Habitat (Woodland) 11. Amphibian Breeding Habitat (Wetlands)	Candidate: 12. Woodland Area-Sensitive Bird Breeding Habitat 13. Terrestrial Crayfish 14. Habitat for the following Species of Conservation Concern (refer to Attachment C): ▪ Bald eagle ▪ Canada warbler ▪ Eastern wood-pewee ▪ Evening Grosbeak ▪ Wood Thrush ▪ Northern Sunfish(Great Lakes - Upper St.Lawrence populations) ▪ Monarch ▪ Woodland Vole ▪ Mapleleaf (Great Lakes Upper St. Lawrence population) ▪ Rainbow ▪ Broad Beech Fern ▪ Green Dragon ▪ Northern Map Turtle	Candidate: 15. Amphibian Movement Corridors

Alternative Route	Seasonal Concentration Areas	Rare Vegetation Communities or Specialized Habitats for Wildlife	Habitats for Species of Conservation Concern	Animal Movement Corridors
			▪ Snapping Turtle)	
West Focus Study Area– Alternative Route W1	<u>Candidate:</u> None found.	<u>Candidate:</u> 1. Turtle Nesting Sites 2. Amphibian Breeding Habitat (Wetlands)	<u>Candidate:</u> 3. Habitat for the following Species of Conservation Concern: Habitats for Species of Conservation Concern were identified and detailed in Attachment C. ▪ Northern Sunfish(Great Lakes - Upper St.Lawrence populations) ▪ Monarch ▪ Mapleleaf (Great Lakes Upper St. Lawrence population) ▪ Rainbow ▪ Broad Beech Fern ▪ Green Dragon ▪ Northern Map Turtle ▪ Snapping Turtle	<u>Candidate:</u> None found.
West Focus Study Area– Alternative Route W2	<u>Candidate:</u> None found.	<u>Candidate:</u> 1. Turtle Nesting Sites 2. Amphibian Breeding Habitat (Wetlands)	<u>Candidate:</u> 3. Habitat for the following Species of Conservation Concern: Habitats for Species of Conservation Concern were identified and detailed in Attachment C. ▪ Northern Sunfish(Great Lakes - Upper St.Lawrence populations) ▪ Monarch ▪ Mapleleaf (Great Lakes Upper St. Lawrence population) ▪ Rainbow ▪ Broad Beech Fern ▪ Green Dragon ▪ Northern Map Turtle ▪ Snapping Turtle	<u>Candidate:</u> None found.

Alternative Route	Seasonal Concentration Areas	Rare Vegetation Communities or Specialized Habitats for Wildlife	Habitats for Species of Conservation Concern	Animal Movement Corridors
West Focus Study Area– Alternative Route W3	Candidate: None found.	Candidate: 1. Turtle Nesting Sites 2. Amphibian Breeding Habitat (Wetlands)	Candidate: 3. Habitat for the following Species of Conservation Concern: Habitats for Species of Conservation Concern were identified and detailed in Attachment C. ▪ Northern Sunfish(Great Lakes - Upper St.Lawrence populations) ▪ Monarch ▪ Mapleleaf (Great Lakes Upper St. Lawrence population) ▪ Rainbow ▪ Broad Beech Fern ▪ Green Dragon ▪ Northern Map Turtle ▪ Snapping Turtle .	Candidate: None found.
Booster Pumping Station Sitting Area – BPS 1	Candidate: Reptile Hibernaculum	Candidate: None found.	Candidate: None found.	Candidate: None found.
Booster Pumping Station Sitting Area – BPS 2	Candidate: Reptile Hibernaculum	Candidate: None found.	Candidate: None found.	Candidate: None found.
Booster Pumping Station Sitting Area – BPS 3	Candidate: Reptile Hibernaculum	Candidate: None found.	Candidate: None found.	Candidate: None found.

4.6 Preliminary Species at Risk Habitat Screening

Records of known Species at Risk within and in the vicinity of the Project Study Area collected from all background reports and agency correspondence are presented in **Attachment E.** No Species at Risk were identified as having a high probability of occurrence for any of the routes as an observation in the field is required. The total number of Species at Risk with and their probability of occurrence within the Study Areas are provided in **Table 4-3.** No Species at Risk were observed during the 2022 field investigations.

Table 4-3: Probability of Species at Risk Occurrences and Total Number Species at Risk within Alternatives

Alternatives	Species At Risk with A High Probability Of Occurrence	Species At Risk with A Medium Probability Of Occurrence	Species at Risk with a Low Probability of Occurrence
E1	1	29	3
E2	1	29	3
E3	1	29	3
W1	0	19	13
W2	0	19	13
W3	0	19	13
BPS 1	0	4	28
BPS 2	0	4	28
BPS 3	0	4	28

5. Identification and Assessment of Alternatives

All of the alternative routes are proposed to be within the existing Right-of-Way (ROW) of roads and highways, which have already fragmented and created edge effects on existing vegetation communities that facilitate invasion and spread of invasive plant species and non-native weeds. It is anticipated that vegetation removal will be limited to within the ROWs and will be minimal.

The existing conditions as described in **Section 3** were used to evaluate the potential constraints of the alternative routes for the Northeast Chatham-Kent Water Distribution System as part of a preliminary screening. The following considerations were taken into account when determining potential constraints:

- Potential effects from existing infrastructure (e.g., fragmentation, edge effects, noise and disturbance of road or train traffic);
- Level of potential effect on terrestrial and aquatic natural heritage features (e.g., low, medium or high impact);
- Level of potential effect on Species at Risk and their habitats (e.g., low medium or high impact); and
- Potential for permits/authorizations requirements under the Endangered Species Act, Species at Risk Act, Fisheries Act and other regulations.

▪ The following ranking system has been employed to denote the level of anticipated potential constraints for each alternative with respect to the natural environment:

  - o Low Impact
  - o Low to Moderate Impact
  - o Moderate Impact
  - o Moderate to High Impact
  - o High Impact

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

Table 5-1 presents potential effects upon the natural environment that may occur as a result of development within each proposed alternative. Additionally, potential effects on Species at Risk are presented as well as any anticipated environmental permitting and approval considerations. A final overall impact rating is also provided for each alternative.

Table 5-1. Potential Effects and Evaluation of Alternative Routes for the Northeast Chatham-Kent Water Distribution System

Alternative	Potential effects on terrestrial/aquatic habitat and species	Potential effects on species at risk and habitat	Anticipated environmental permitting and approval considerations	Natural Environment Evaluation Ranking
E1	**Terrestrial Environment** • Approximate watermain length is 11 km • Most of the vegetation found within 120 m of E1 was culturally disturbed and characterized by agricultural fields. Some forest communities are found within the Study Area, mostly found adjacent to the Thames River. • Minimal vegetation removal is anticipated which is predominately already disturbed. Other indirect effects to vegetation may include accidental intrusion/damage, soil and sediment erosion, groundwater and soil contamination, dewatering effects, and introduction and spread of invasive species. • Due to the presence of forest communities and the Thames River within the 120 m of the route, 15 candidate significant wildlife habitat were recorded. The majority of these significant wildlife habitats are not anticipated to be affected as the proposed works will be limited within the existing ROW which is already disturbed. • Wildlife, including bats, Migratory Birds Convention Act protected breeding birds and Species of Conservation Concern may be affected by vegetation removal via habitat loss, potential displacement or disturbance, or construction related injury or mortality. **Aquatic Environment** Route E1 has 9 mapped watercourse crossings. Work in/near water could potentially impact fish and fish habitat via the following: • Potential changes in sediment and / or contaminant concentrations in the event of the release of sediment and / or deleterious substances to the watercourse. • Potential changes to habitat structure and / or cover as a result of the removal and / or alteration of riparian vegetation. • Potential for changes in baseflow or water temperatures as a result of alterations of groundwater flows to surface water and / or changes in slope or drainage. • Potential changes in food and / or nutrient concentrations as a result of the removal and / or alteration of riparian vegetation.	**Terrestrial Environment** A total of 18 terrestrial Species at Risk and their habitat may potentially occur in or within 120 m of the alternate Route E1, including: **Threatened:** bank swallow (Riparia riparia), barn swallow (Hirundo rustica), bobolink (Dolichonyx oryzivorus), cerulean warbler (Setophaga cerulea), chimney swift (Chaetura pelagica), eastern meadowlark (Sturnella magna), blue ash (Fraxinus quadrangulate), Blanding's turtle (Emydoidea blandingii), eastern hog-nose snake (Heterodon platirhinos). **Endangered:** eastern small-footed myotis (Myotis leibii), little brown myotis (Myotis lucifugus), northern myotis (Myotis septentrionalis), tri-colored bat (Perimyotis subflavus), American badger (Taxidea taxus), Red-headed Woodpecker (Melanerpes erythrocephalus) American chestnut (Castanea dentata), eastern flowering dogwood (Cornus nuttallii), and spiny softshell (Apalone spinifera). **Aquatic Environment** A total of 13 aquatic Species at Risk and their habitat may potentially occur in or within 120 m of the alternate Route E1, including: **Threatened:** Threehorn Wartyback (Obliquaria reflexa), Eastern Sand Darter (Ammocrypta pellucida), Pugnose Minnow (Opsopoedus emiliae), Black Redhorse (Moxostoma duquesnei), and Silver Shiner (Notropis photogenis). **Endangered:** Fawnsfoot (Truncilla donaciformis), Northern Madtom (Noturus stigmosus), Kidneyshell (Ptychibranchus fasciolaris), Silver Chub (Macrhybopis storeriana), Round Hickorynut (Obovaria subrotunda), Round Pigtoe (Pleurobema sintoxia), Snuffbox (Epioblasma triquetra).	• Authorization under the Endangered Species Act may be required if impacts to habitats confirmed to be used by species at risk through species-specific surveys cannot be avoided by design or mitigation measures. • D F O assessment may be required if works are proposed below the High Water Mark (HWM) of waterbodies or where applicable measures to protect fish and fish habitat or Codes of Practice for work near water cannot be implemented. • A permit under the Ontario Regulation 152/06 will be required if proposed works occurs within Lower Thames Valley Conservation Authority regulated areas associated with watercourses and wetlands.	Low to moderate impact

Alternative	Potential effects on terrestrial/aquatic habitat and species	Potential effects on species at risk and habitat	Anticipated environmental permitting and approval considerations	Natural Environment Evaluation Ranking
	These changes could result in alteration and/or loss of habitat and habitat function, or displacement, harm or mortality to fish. Impacts to species at risk and their habitats are not anticipated as the proposed works will be limited to watercourses that do not have species at risk mapped to them and no work within the Thames River where all the species at risk potentially occur.	**Extirpated:** Gravel Chub(Exrimystax x-punctatus).		
E2	**<u>Terrestrial Environment</u>** • Approximate watermain length is 13 km • Most of the vegetation found within 120 m of E1 was culturally disturbed and characterized by agricultural fields. Some forest communities are found within the Study Area, mostly found adjacent to the Thames River. • Minimal vegetation removal is anticipated which is predominately already disturbed. Other indirect effects to vegetation may include accidental intrusion/damage, soil and sediment erosion, groundwater and soil contamination, dewatering effects, and introduction and spread of invasive species. • Due to the presence of forest communities and the Thames River within the study area 15 candidate significant wildlife habitat were recorded. the majority of these significant wildlife habitats are not anticipated to be affected as the proposed works will be limited within the existing ROW which is already disturbed. • Wildlife, including bats, Migratory Birds Convention Act protected breeding birds and Species of Conservation Concern may be affected by vegetation removal via habitat loss, potential displacement or disturbance, or construction related injury or mortality. **<u>Aquatic Environment</u>** Route E2 has 12 mapped watercourse crossings. Work in/near water could potentially impact fish and fish habitat via the following: • Potential changes in sediment and / or contaminant concentrations in the event of the release of sediment and / or deleterious substances to the watercourse. • Potential changes to habitat structure and / or cover as a result of the removal and / or alteration of riparian vegetation. • Potential for changes in baseflow or water temperatures as a result of alterations of groundwater flows to surface water and / or changes in slope or drainage.	**<u>Terrestrial Environment</u>** A total of 18 terrestrial Species at Risk and their habitat may potentially occur in or within 120 m of the alternate Route E2, including: **Threatened:** bank swallow, barn swallow, bobolink, cerulean warbler, chimney swift, eastern meadowlark, blue ash, Blanding's turtle, eastern hog-nose snake. **Endangered:** eastern small-footed myotis, little brown myotis, northern myotis, tri-colored bat, American badger, American chestnut, eastern flowering dogwood, and spiny softshell. **<u>Aquatic Environment</u>** A total of 13 aquatic Species at Risk and their habitat may potentially occur in or within 120 m of the alternate Route E2, including: **Threatened:** Threehorn Wartyback (Obliquaria reflexa), Eastern Sand Darter (Ammocrypta pellucida), Pugnose Minnow (Opsopoedus emiliae), Black Redhorse (Moxostoma duquesnei), and Silver Shiner (Notropis photogenis). **Endangered:** Fawnsfoot (Truncilla donaciformis), Northern Madtom (Noturus stigmosus), Kidneyshell (Ptychibranchus fasciolaris), Silver Chub (Macrhybopis storeriana), Round Hickorynut (Obovaria subrotunda), Round Pigtoe (Pleurobema sintoxia), Snuffbox (Epioblasma triquetra). **Extirpated:** Gravel Chub(Exrimystax x-punctatus).	• Authorization under the Endangered Species Act may be required if impacts to habitats confirmed to be used by species at risk through species-specific surveys cannot be avoided by design or mitigation measures. • D F O assessment may be required if works are proposed below the High Water Mark (HWM) of waterbodies or where applicable measures to protect fish and fish habitat or Codes of Practice for work near water cannot be implemented. • A permit under the Ontario Regulation 152/06 will be required if proposed works occurs within Lower Thames Valley Conservation Authority regulated areas associated with watercourses and wetlands.	Low to moderate impact

Alternative	Potential effects on terrestrial/aquatic habitat and species	Potential effects on species at risk and habitat	Anticipated environmental permitting and approval considerations	Natural Environment Evaluation Ranking
	• Potential changes in food and / or nutrient concentrations as a result of the removal and / or alteration of riparian vegetation. These changes could result in alteration and/or loss of habitat and habitat function, or displacement, harm or mortality to fish. Impacts to species at risk and their habitats are not anticipated as the proposed works will be limited to watercourses that do not have species at risk mapped to them and no work within the Thames River where all the species at risk potentially occur.			
E3	**<u>Terrestrial Environment</u>** • Approximate watermain length is 14 km • Most of the vegetation found within 120 m of E1 was culturally disturbed and characterized by agricultural fields. Some forest communities are found within the Study Area, mostly found adjacent to the Thames River, which E1 largely avoids. • Minimal vegetation removal is anticipated which is predominately already disturbed. Other indirect effects to vegetation may include accidental intrusion/damage, soil and sediment erosion, groundwater and soil contamination, dewatering effects, and introduction and spread of invasive species. • Due to the presence of forest communities and the Thames River within the study area 15 candidate significant wildlife habitat were recorded. the majority of these significant wildlife habitats are not anticipated to be affected as the proposed works will be limited within the existing ROW which is already disturbed. • Wildlife, including bats, Migratory Birds Convention Act protected breeding birds and Species of Conservation Concern may be affected by vegetation removal via habitat loss, potential displacement or disturbance, or construction related injury or mortality. **<u>Aquatic Environment</u>** Route E3 has 13 mapped watercourse crossings. Work in/near water could potentially impact fish and fish habitat via the following: • Potential changes in sediment and / or contaminant concentrations in the event of the release of sediment and / or deleterious substances to the watercourse. • Potential changes to habitat structure and / or cover as a result of the removal and / or alteration of riparian vegetation. • Potential for changes in baseflow or water temperatures as a result of	**<u>Terrestrial Environment</u>** A total of 18 terrestrial Species at Risk and their habitat may potentially occur in or within 120 m of the alternate Route E3, including: **Threatened:** bank swallow, barn swallow, bobolink, cerulean warbler, chimney swift, eastern meadowlark, blue ash, Blanding's turtle, eastern hog-nose snake. **Endangered:** eastern small-footed myotis, little brown myotis, northern myotis, tri-colored bat, American badger, American chestnut, eastern flowering dogwood, and spiny softshell. **<u>Aquatic Environment</u>** A total of 13 aquatic Species at Risk and their habitat may potentially occur in or within 120 m of the alternate Route E3, including: **Threatened:** Threehorn Wartyback (Obliquaria reflexa), Eastern Sand Darter (Ammocrypta pellucida), Pugnose Minnow (Opsopoedus emiliae), Black Redhorse (Moxostoma duquesnei), and Silver Shiner (Notropis photogenis). **Endangered:** Fawnsfoot (Truncilla donaciformis), Northern Madtom (Noturus stigmosus), Kidneyshell (Ptychibranchus fasciolaris), Silver Chub (Macrhybopis storeriana), Round Hickorynut (Obovaria subrotunda), Round Pigtoe (Pleurobema sintoxia), Snuffbox (Epioblasma triquetra). **Extirpated:** Gravel Chub(Exrimystax x-punctatus).	• Authorization under the Endangered Species Act, 2007 may be required for potential Species at Risk identified above, but especially for tree removal within bat Species at Risk habitat (Forested Communities). • D F O assessment may be required if works are proposed below the High Water Mark (HWM) of waterbodies or where applicable measures to protect fish and fish habitat or Codes of Practice for work near water cannot be implemented. • A permit under the Ontario Regulation 152/06 will be required if proposed works occurs within Lower Thames Valley Conservation Authority regulated areas associated with	Most Preferred – low impact. Although this alternative route is the longest compared to E1 and E2, it avoids the bank erosion and stability areas along the Thames River, which supports several aquatic Species at Risk. Furthermore, it is anticipated that impacts for terrestrial environment, including Species at Risk will be low as the proposed works will be limited within the municipal road right-of-ways.

Alternative	Potential effects on terrestrial/aquatic habitat and species	Potential effects on species at risk and habitat	Anticipated environmental permitting and approval considerations	Natural Environment Evaluation Ranking
	alterations of groundwater flows to surface water and / or changes in slope or drainage. • Potential changes in food and / or nutrient concentrations as a result of the removal and / or alteration of riparian vegetation. These changes could result in alteration and/or loss of habitat and habitat function, or displacement, harm or mortality to fish. Impacts to species at risk and their habitats are not anticipated as the proposed works will be limited to watercourses that do not have species at risk mapped to them and no work within the Thames River where all the species at risk potentially occur.		watercourses and wetlands.	
W1	**<u>Terrestrial Environment</u>** • Approximate watermain length is 24 km • There were no Areas of Natural and Scientific Interests, significant woodland, or environmentally significant areas identified within 120 m of the alternative. • Most of the vegetation found within 120 m of W1 was culturally disturbed and characterized by agricultural fields • Minimal vegetation removal is anticipated which is predominately already disturbed. Other indirect effects to vegetation may include accidental intrusion/damage, soil and sediment erosion, groundwater and soil contamination, dewatering effects, and introduction and spread of invasive species. • There are three candidate significant wildlife habitat within the Study Area. • Wildlife, including bats, Migratory Birds Convention Act protected breeding birds and Species of Conservation Concern may be affected by vegetation removal via habitat loss, potential displacement or disturbance, or construction related injury or mortality. **<u>Aquatic Environment</u>** Route W1 has 30 mapped watercourse crossings. Work in/near water could potentially impact fish and fish habitat via the following: • Potential changes in sediment and / or contaminant concentrations in the event of the release of sediment and / or deleterious substances to the watercourse. • Potential changes to habitat structure and / or cover as a result of the removal and / or alteration of riparian vegetation. • Potential for changes in baseflow or water temperatures as a result of	**<u>Terrestrial Environment</u>** A total of 7 terrestrial Species at Risk and their habitat may potentially occur in or within 120 m of the alternate Route W1, including: **Threatened:** bank swallow, barn swallow, bobolink, chimney swift and eastern meadowlark **Endangered:** spiny softshell and American badger. **<u>Aquatic Environment</u>** A total of 13 aquatic Species at Risk and their habitat may potentially occur in or within 120 m of the alternate Route W1, including: **Threatened:** Threehorn Wartyback (Obliquaria reflexa), Eastern Sand Darter (Ammocrypta pellucida), Pugnose Minnow (Opsopoedus emiliae), Black Redhorse (Moxostoma duquesnei), and Silver Shiner (Notropis photogenis). **Endangered:** Fawnsfoot (Truncilla donaciformis), Northern Madtom (Noturus stigmosus), Kidneyshell (Ptychibranchus fasciolaris), Silver Chub (Macrhybopis storeriana), Round Hickorynut (Obovaria subrotunda), Round Pigtoe (Pleurobema sintoxia), Snuffbox (Epioblasma triquetra). **Extirpated:** Gravel Chub(Exrimystax x-punctatus).	• Authorization under the Endangered Species Act, 2007 may be required for potential Species at Risk identified above. • D F O assessment may be required if works are proposed below the High Water Mark (HWM) of waterbodies or where applicable measures to protect fish and fish habitat or Codes of Practice for work near water cannot be implemented. • A permit under the Ontario Regulation 152/06 will be required if proposed works occurs within Lower Thames Valley Conservation Authority regulated areas associated with watercourses and wetlands. • A permit under the	Low to moderate impact

Alternative	Potential effects on terrestrial/aquatic habitat and species	Potential effects on species at risk and habitat	Anticipated environmental permitting and approval considerations	Natural Environment Evaluation Ranking
	alterations of groundwater flows to surface water and / or changes in slope or drainage. • Potential changes in food and / or nutrient concentrations as a result of the removal and / or alteration of riparian vegetation. • These changes could result in alteration and/or loss of habitat and habitat function, or displacement, harm or mortality to fish. These changes could result in alteration and/or loss of habitat and habitat function, or displacement, harm or mortality to fish. Impacts to species at risk and their habitats are not anticipated as the proposed works will be limited to watercourses that do not have species at risk mapped to them and no work within the Thames River where all the species at risk potentially occur.		Ontario Regulation 171/06 will be required if proposed works occurs within St. Clair Conservation Authority regulated areas associated with watercourses and wetlands.	
W2	**<u>Terrestrial Environment</u>** • Approximate watermain length is 22.2 km • There were no Areas of Natural and Scientific Interests, significant woodland, or environmentally significant areas identified within 120 m of the alternative. • Most of the vegetation found within 120 m of W2 was culturally disturbed and characterized by agricultural fields • Minimal vegetation removal is anticipated which is predominately already disturbed. Other indirect effects to vegetation may include accidental intrusion/damage, soil and sediment erosion, groundwater and soil contamination, dewatering effects, and introduction and spread of invasive species. • There are three candidate significant wildlife habitat within the Study Area. • Wildlife, including bats, Migratory Birds Convention Act protected breeding birds and Species of Conservation Concern may be affected by vegetation removal via habitat loss, potential displacement or disturbance, or construction related injury or mortality. **<u>Aquatic Environment</u>** Route W2 has 30 mapped watercourse crossings. Work in/near water could potentially impact fish and fish habitat via the following: • Potential changes in sediment and / or contaminant concentrations in the event of the release of sediment and / or deleterious substances to the watercourse. • Potential changes to habitat structure and / or cover as a result of the	**<u>Terrestrial Environment</u>** A total of 7 terrestrial Species at Risk and their habitat may potentially occur in or within 120 m of the alternate Route W1, including: **Threatened:** bank swallow, barn swallow, bobolink, chimney swift and eastern meadowlark **Endangered:** spiny softshell and American badger. **<u>Aquatic Environment</u>** A total of 10 aquatic Species at Risk and their habitat may potentially occur in or within 120 m of the alternate Route W2, including: **Threatened:** Threehorn Wartyback (Obliquaria reflexa), Eastern Sand Darter (Ammocrypta pellucida), Pugnose Minnow (Opsopoedus emiliae), Black Redhorse (Moxostoma duquesnei), and Silver Shiner (Notropis photogenis). **Endangered:** Fawnsfoot (Truncilla donaciformis), Northern Madtom (Noturus stigmosus), Silver Chub (Macrhybopis storeriana), Round Hickorynut (Obovaria subrotunda). **Extirpated:** Gravel Chub (Exrimystax x-punctatus).	• Authorization under the Endangered Species Act, 2007 may be required for potential Species at Risk identified above. • D F O assessment may be required if works are proposed below the High Water Mark (HWM) of waterbodies or where applicable measures to protect fish and fish habitat or Codes of Practice for work near water cannot be implemented. • A permit under the Ontario Regulation 152/06 will be required if proposed works occurs within Lower Thames Valley Conservation Authority regulated areas associated with watercourses and	Low to moderate impact

Alternative	Potential effects on terrestrial/aquatic habitat and species	Potential effects on species at risk and habitat	Anticipated environmental permitting and approval considerations	Natural Environment Evaluation Ranking
	removal and / or alteration of riparian vegetation. • Potential for changes in baseflow or water temperatures as a result of alterations of groundwater flows to surface water and / or changes in slope or drainage. • Potential changes in food and / or nutrient concentrations as a result of the removal and / or alteration of riparian vegetation. These changes could result in alteration and/or loss of habitat and habitat function, or displacement, harm or mortality to fish. Impacts to species at risk and their habitats are not anticipated as the proposed works will be limited to watercourses that do not have species at risk mapped to them and no work within the Thames River where all the species at risk potentially occur.		wetlands. • A permit under the Ontario Regulation 171/06 will be required if proposed works occurs within St. Clair Conservation Authority regulated areas associated with watercourses and wetlands.	
W3	**<u>Terrestrial Environment</u>** • Approximate watermain length is 19 km • There were no Areas of Natural and Scientific Interests, significant woodland, or environmentally significant areas identified within 120 m of the alternative. • Most of the vegetation found within 120 m of W3 was culturally disturbed and characterized by agricultural fields • Minimal vegetation removal is anticipated which is predominately already disturbed. Other indirect effects to vegetation may include accidental intrusion/damage, soil and sediment erosion, groundwater and soil contamination, dewatering effects, and introduction and spread of invasive species. • There are three candidate significant wildlife habitat within the Study Area. • Wildlife, including bats, Migratory Birds Convention Act protected breeding birds and Species of Conservation Concern may be affected by vegetation removal via habitat loss, potential displacement or disturbance, or construction related injury or mortality. **<u>Aquatic Environment</u>** Route W3 has 27 mapped watercourse crossings. Work in/near water could potentially impact fish and fish habitat via the following: • Potential changes in sediment and / or contaminant concentrations in the event of the release of sediment and / or deleterious substances to the watercourse. • Potential changes to habitat structure and / or cover as a result of the	**<u>Terrestrial Environment</u>** A total of 7 terrestrial Species at Risk and their habitat may potentially occur in or within 120 m of the alternate Route W3, including: **Threatened:** bank swallow, barn swallow, bobolink, chimney swift and eastern meadowlark **Endangered:** spiny softshell and American badger. **<u>Aquatic Environment</u>** A total of 13 aquatic Species at Risk and their habitat may potentially occur in or within 120 m of the alternate Route W3, including: **Threatened:** Threehorn Wartyback (Obliquaria reflexa), Eastern Sand Darter (Ammocrypta pellucida), Pugnose Minnow (Opsopoedus emiliae), Black Redhorse (Moxostoma duquesnei), and Silver Shiner (Notropis photogenis). **Endangered:** Fawnsfoot (Truncilla donaciformis), Northern Madtom (Noturus stigmosus), Kidneyshell (Ptychibranchus fasciolaris), Silver Chub (Macrhybopis storeriana), Round Hickorynut (Obovaria subrotunda), Round Pigtoe (Pleurobema sintoxia), Snuffbox (Epioblasma triquetra). **Extirpated:** Gravel Chub(Exrimystax x-punctatus).	• Authorization under the Endangered Species Act, 2007 may be required for potential Species at Risk identified above. • D F O assessment may be required if works are proposed below the High Water Mark (HWM) of waterbodies or where applicable measures to protect fish and fish habitat or Codes of Practice for work near water cannot be implemented. • A permit under the Ontario Regulation 152/06 will be required if proposed works occurs within Lower Thames Valley Conservation Authority regulated areas associated with watercourses and	Most Preferred – low impact. This alternative is the shortest route compared to W1 and W3 and is anticipated to have low impact on the natural environment as the proposed work will be limited to within the municipal road right-of-ways.

Alternative	Potential effects on terrestrial/aquatic habitat and species	Potential effects on species at risk and habitat	Anticipated environmental permitting and approval considerations	Natural Environment Evaluation Ranking
	removal and / or alteration of riparian vegetation. • Potential for changes in baseflow or water temperatures as a result of alterations of groundwater flows to surface water and / or changes in slope or drainage. • Potential changes in food and / or nutrient concentrations as a result of the removal and / or alteration of riparian vegetation. • These changes could result in alteration and/or loss of habitat and habitat function, or displacement, harm or mortality to fish. These changes could result in alteration and/or loss of habitat and habitat function, or displacement, harm or mortality to fish. Impacts to species at risk and their habitats are not anticipated as the proposed works will be limited to watercourses that do not have species at risk mapped to them and no work within the Thames River where all the species at risk potentially occur.		wetlands. • A permit under the Ontario Regulation 171/06 will be required if proposed works occurs within St. Clair Conservation Authority regulated areas associated with watercourses and wetlands.	
BPS 1	**<u>Terrestrial Environment</u>** • There were no Areas of Natural and Scientific Interests, significant woodland, or environmentally significant areas identified within 120 m of the alternative. • Most of the vegetation found within 120 m of BPS 1 was culturally disturbed and characterized by agricultural fields. • Minimal vegetation removal is anticipated which is predominately already disturbed. Other indirect effects to vegetation may include accidental intrusion/damage, soil and sediment erosion, groundwater and soil contamination, dewatering effects, and introduction and spread of invasive species. • There are no candidate significant wildlife habitat within the Study Area. • Wildlife, including bats, Migratory Birds Convention Act protected breeding birds and Species of Conservation Concern may be affected by vegetation removal via habitat loss, potential displacement or disturbance, or construction related injury or mortality. **<u>Aquatic Environment</u>** No watercourses present; therefore no aquatic impacts are anticipated.	**<u>Terrestrial Environment</u>** A total of 4 terrestrial Species at Risk and their habitat may potentially occur in or within 120 m of BPS 1 including: **Threatened:** barn swallow, bobolink, chimney swift, eastern meadowlark. **<u>Aquatic Environment</u>** There is no potential to encounter aquatic Species at Risk since there are no watercourses in or within 120 m of BPS1.	• Authorization under the Endangered Species Act, 2007 may be required for potential Species at Risk identified above. • D F O assessment may be required if works are proposed below the High Water Mark (HWM) of waterbodies or where applicable measures to protect fish and fish habitat or Codes of Practice for work near water cannot be implemented. • A permit under the Ontario Regulation 152/06 will be required if proposed works occurs within Lower Thames Valley Conservation Authority regulated areas	Low Impact All options are situated in agricultural fields with limited potential impacts on the terrestrial or aquatic environments.

Alternative	Potential effects on terrestrial/aquatic habitat and species	Potential effects on species at risk and habitat	Anticipated environmental permitting and approval considerations	Natural Environment Evaluation Ranking
			associated with watercourses and wetlands.	
BPS 2	**<u>Terrestrial Environment</u>** • There were no Areas of Natural and Scientific Interests, significant woodland, or environmentally significant areas identified within 120 m of the alternative. • Most of the vegetation found within 120 m of BPS 2 was culturally disturbed and characterized by agricultural fields. • Minimal vegetation removal is anticipated which is predominately already disturbed. Other indirect effects to vegetation may include accidental intrusion/damage, soil and sediment erosion, groundwater and soil contamination, dewatering effects, and introduction and spread of invasive species. • There are no candidate significant wildlife habitat within the Study Area. • Wildlife, including bats, Migratory Birds Convention Act protected breeding birds and Species of Conservation Concern may be affected by vegetation removal via habitat loss, potential displacement or disturbance, or construction related injury or mortality. **<u>Aquatic Environment</u>** BPS 2 is near a watercourse. Work in/near water could potentially impact fish and fish habitat via the following: • Potential changes in sediment and / or contaminant concentrations in the event of the release of sediment and / or deleterious substances to the watercourse. • Potential changes to habitat structure and / or cover as a result of the removal and / or alteration of riparian vegetation. • Potential for changes in baseflow or water temperatures as a result of alterations of groundwater flows to surface water and / or changes in slope or drainage. • Potential changes in food and / or nutrient concentrations as a result of the removal and / or alteration of riparian vegetation. • These changes could result in alteration and/or loss of habitat and habitat function, or displacement, harm or mortality to fish.	**<u>Terrestrial Environment</u>** A total of 4 terrestrial Species at Risk and their habitat may potentially occur in or within 120 m of BPS 2 including: **Threatened:** barn swallow, bobolink, chimney swift, eastern meadowlark. **<u>Aquatic Environment</u>** The potential to encounter aquatic Species at Risk in or within 120 m of BPS2 is low based on Species at Risk range maps.	• Authorization under the Endangered Species Act, 2007 may be required for potential Species at Risk identified above. • D F O assessment may be required if works are proposed below the High Water Mark (HWM) of waterbodies or where applicable measures to protect fish and fish habitat or Codes of Practice for work near water cannot be implemented. • A permit under the Ontario Regulation 152/06 will be required if proposed works occurs within Lower Thames Valley Conservation Authority regulated areas associated with watercourses and wetlands.	Low Impact All options are situated in agricultural fields with limited potential impacts on the terrestrial or aquatic environments.

Alternative	Potential effects on terrestrial/aquatic habitat and species	Potential effects on species at risk and habitat	Anticipated environmental permitting and approval considerations	Natural Environment Evaluation Ranking
BPS 3	**Terrestrial Environment** There were no Areas of Natural and Scientific Interests, significant woodland, or environmentally significant areas identified within 120 m of the alternative. Most of the vegetation found within 120 m of BPS 3 was culturally disturbed and characterized by agricultural fields. Minimal vegetation removal is anticipated which is predominately already disturbed. Other indirect effects to vegetation may include accidental intrusion/damage, soil and sediment erosion, groundwater and soil contamination, dewatering effects, and introduction and spread of invasive species. There are no candidate significant wildlife habitat within the Study Area. Wildlife, including bats, Migratory Birds Convention Act protected breeding birds and Species of Conservation Concern may be affected by vegetation removal via habitat loss, potential displacement or disturbance, or construction related injury or mortality. **Aquatic Environment** No watercourses present; therefore no aquatic impacts are anticipated.	**Terrestrial Environment** A total of 4 terrestrial Species at Risk and their habitat may potentially occur in or within 120 m of BPS 3 including: **Threatened:** barn swallow, bobolink, chimney swift, eastern meadowlark. **Aquatic Environment** There is no potential to encounter aquatic Species at Risk since there are no watercourses in or within 120 m of BPS3.	• Authorization under the Endangered Species Act, 2007 may be required for potential Species at Risk identified above. • D F O assessment may be required if works are proposed below the High Water Mark (HWM) of waterbodies or where applicable measures to protect fish and fish habitat or Codes of Practice for work near water cannot be implemented. • A permit under the Ontario Regulation 152/06 will be required if proposed works occurs within Lower Thames Valley Conservation Authority regulated areas associated with watercourses and wetlands.	Low Impact All options are situated in agricultural fields with limited potential impacts on the terrestrial or aquatic environments.

5.1 Preferred Alternative

Of the proposed Northeast Chatham-Kent Water Distribution System routes and booster pumping station siting alternatives, alternative routes E3, W3 and BPS 3 (Option 2) were the recommended alternatives from a natural environment perspective. Theses routes were recommended because they pose the least risk to sensitive natural environmental features as discussed in **Table 5-1**.

Preferred Alternative Route E3

Route E3 is recommended because it avoids the bank erosion and stability areas along the Thames River. Route E3 will provide potential water service connection to approximately 96 properties. It will also provide Delaware Nation the ability to connect their water system to the watermain stub.

Preferred Alternative Route W3

Route W3 is recommended because it will provide watermains on roads that currently do not have any watermains along them, creating system redundancy. It is the shortest route on the west side at 19 km. The watermain is centrally located providing the ability to service future greenhouse development that is not already in the planning stage.

Preferred Booster Pumping Station Sitting Area BPS-3 (Option 2)

BPS 3 (Option 2) is recommended as the preferred booster pump station sitting area because there is plenty of space for construction and operation. It does not displace open space park land and having the two facilities at different locations will help from an energy management perspective. Option 2 is the preferred alternative because it avoids fragmenting agriculture lands, thus resulting in areas difficult to operate farm equipment on compared to options 1 and 3. All three sites are located on Class 2 lands which are defined as having limited restrictions for crops. Option 2 is the largest land parcel size resulting in the most viable remaining lands for agriculture uses.

AECOM ecologists completed a site reconnaissance survey on July 28, 2022, to refine the desktop background information review results for the preferred alternatives. The results are reported in the following sections to document the existing conditions for the preferred alternatives, Routes E3, W3 and BPS.

5.1.1 Ecological Land Classification for Preferred Alternatives

5.1.1.1 Preferred Alternative Route E3

The preferred E3 route generally lacked natural vegetation cover along it and was largely surrounded by agriculture fields yielding corn (Zea mays). Two communities were identified along the route, a Mineral Shallow Marsh (MAS2) community and fresh-moist lowland deciduous forest (FOD7) communities. **Table 5-2** provides a summary of the Ecological Land Classification communities observed within 120 m of the preferred alternatives. A representative photographic log is provided in **Appendix F**.

A plant list is provided in **Appendix G.** A total of 28 plant species were recorded, of which 79% are considered native and 21% are considered introduced. The invasives species consisted of Tartarian honeysuckle (Lonicera tatarica), black locust (Robinia pseudoacacia) and narrow-leaved cattail (Typha angustifolia). Communities within the Study Area had an average Floristic Quality Index (FQI) score of 33 with 77% of species observed falling within the lowest CC sensitivity ranking, 45% in the moderate sensitivity ranking, 5% in the high sensitivity ranking, and 0% in the highest sensitivity ranking. The average FQI score for the Study Area and percentage of species with moderate CC rankings indicate that, on average, species observed within the Study Area are likely to have more specific habitat requirements and but have the ability to tolerate moderate levels of disturbance.

Table 5-2: **Ecological Land Classification Communities Along Preferred Alternative Route E3**

Ecological Land Classification Code	Ecological Land Classification Name	Community Description
FOD7	Fresh-Moist Lowland Deciduous Forest Ecosite	Trees observed within the canopy included black walnut (Juglans nigra), eastern cottonwood (Populus deltoides), green ash (Fraxinus pennsylvanica), eastern white pine (Pinus strobus), sugar maple (Acer saccharum), bur oak (Quercus macrocarpa), white elm (Ulmus americana), trembling aspen (Populus tremuloides), shagbark hickory (Carya ovata), black locust, white spruce (Picea glauca), blue spruce (Picea pungens), and tamarack (Larix laricina). Species observed within the shrub layer include Tartarian honeysuckle, common

Ecological Land Classification Code	Ecological Land Classification Name	Community Description
		juniper (Juniperus communis), staghorn sumac (Rhus typhina), black locust, grey dogwood (Cornus racemose), and silky dogwood (Cornus obliqua). The herbaceous layer is comprised of riverbank grape (Vitis riparia), common dandelion (Taraxacum officinale), tall goldenrod (Solidago altissima), thicket creeper (Parthenocissus vitacea), wild bergamot (Monarda fistulosa).
MAS2	Mineral Shallow Marsh Ecosite	Very few trees were found in this community but the few that were found included Salix x fragilis, green ash and Eastern cottonwood. Species observed within the shrub layer included narrow-leaved cattail, and broad-leaved cattail (Typha latifolia). The herbaceous layer is comprised of narrow-leaved cattail common dandelion, riverbank grape, broad-leaved cattail, tall goldenrod, and common dandelion.

5.1.1.2 Preferred Alternative Route W3

Similar to the preferred E3 route, the preferred W3 route was surrounded by agriculture fields yielding corn. No large vegetation communities were observed within the study area for this route.

5.1.1.3 Preferred Booster Pumping Station Sitting Area BPS 3 (Option 2)

The preferred booster pumping station BPS 3 (Option 2) is located in an agriculture field yielding corn.

5.1.2 Fish habitat

5.1.2.1 Preferred Alternative Route E3

The E3 route has 13 watercourse crossings of which 7 are confirmed to provide potential fish habitat:

1. Unnamed Tributary to the Thames River 001 (O G F #651021267) – Confirmed surface water feature that may provide fish habitat.
2. Unnamed Tributary to the Thames River 002 (O G F #651021406) – Confirmed as fish habitat with a permanent barrier immediately downstream used to maintain koi in downstream online pond.
3. 1st Crossing – Woods Drain (O G F # 110153748) / Cornwall Creek (O G F # 651021429) – Confirmed surface water feature that may provide fish habitat.
4. 2nd Crossing – Woods Drain (O G F # 110153748) / Cornwall Creek (O G F # 651021429) – Confirmed surface water feature that may provide fish habitat.
5. 3rd Crossing – Woods Drain (O G F # 110153748) / Cornwall Creek (O G F # 651021429) – Confirmed surface water feature that may provide fish habitat.
6. Dickson Drain (O G F # 110151218) / Unnamed Watercourse 006 (O G F #651021911) – Confirmed surface water feature that may provide fish habitat.
7. 4th Crossing – Woods Drain (O G F # 110153748) / Cornwall Creek (O G F # 651021429) – Confirmed surface water feature that may provide fish habitat.

The W3 route has 27 watercourse crossings of which 18 are confirmed to have potential fish habitat:

1. Cruikshank Creek Drain (O G F # 110149755) / Cornwall Creek (O G F # 651021429) – Confirmed surface water feature that may provide fish habitat.
2. Wallace Drain (O G F # 110148520) / Unnamed Watercourse 018 (O G F # 651022304) – Confirmed surface water feature that may provide fish habitat.
3. Cryderman Drain (O G F # 110147057) / Unnamed Watercourse 008 (OGF# 651022466) – Confirmed surface water feature that may provide fish habitat.
4. Mason Drain (O G F # 110147216) / Unnamed Watercourse 019 (O G F # 651022418) – Confirmed surface water feature that may provide fish habitat.
5. Unnamed Drain 024 (O G F # 110147381) / Unnamed Watercourse 025 (O G F # 127712714) – Confirmed surface water feature that may provide fish habitat.
6. 1st Crossing – Courtney Drain (O G F # 110148560) / Unnamed Watercourse 020 (O G F # 127712718) – Confirmed surface water feature that may provide fish habitat.
7. Unnamed Drain 020 (O G F # 110149294) / Unnamed Watercourse 021 (O G F # 127712721) – Confirmed surface water feature that may provide fish habitat.
8. Unnamed Drain 021 (O G F # 110149340) / Unnamed Watercourse 022 (O G F # 127712727) – Confirmed surface water feature that may provide fish habitat.
9. Unnamed Drain 022 (O G F # 110150160) / Unnamed Watercourse 023 (O G F # 127712736) – Confirmed surface water feature that may provide fish habitat.

10. Unnamed Drain 023 (O G F # 110150250) / Unnamed Watercourse 024 (O G F # 127712748) – Confirmed surface water feature that may provide fish habitat.
11. 1st Crossing – Unnamed Drain 010 (O G F # 110150333) / Unnamed Watercourse 014 (O G F # 127712756) – Confirmed surface water feature that may provide fish habitat.
12. 2nd Crossing – Unnamed Drain 010 (O G F # 110150333) / Unnamed Watercourse 014 (O G F # 127712756) – Confirmed surface water feature that may provide fish habitat.
13. Unnamed Drain 011 (O G F # 110149870) / Unnamed Watercourse 015 (O G F # 127712724) – Confirmed surface water feature that may provide fish habitat.
14. Unnamed Drain 012 (O G F # 110149696) / Unnamed Watercourse 016 (O G F # 127712713) – Confirmed surface water feature that may provide fish habitat.
15. Unnamed Drain 013 (O G F # 110148488) / Unnamed Watercourse 017 (O G F # 127712712) – Confirmed surface water feature that may provide fish habitat.
16. Hyatt Drain (O G F # 110148485) – Confirmed surface water feature that may provide fish habitat.
17. 2nd Crossing – Courtney Drain (O G F # 110148560) / Unnamed Watercourse 020 (O G F # 127712718) – Confirmed surface water feature that may provide fish habitat.
18. 3rd Crossing – Courtney Drain (O G F # 110148560) / Unnamed Watercourse 020 (O G F # 127712718) – Confirmed surface water feature that may provide fish habitat.

5.1.2.2 Preferred Booster Pumping Station Sitting Area BPS 3 (Option 2)

There were no surface water features within 120 of the BPS 3 (Option 2) layout.

5.1.3 Significant Wildlife Habitat for Preferred Alternatives

5.1.3.1 Preferred Alternative Route E3

The preferred route E3 is adjacent to some fresh-moist lowland deciduous forest (FOD7) communities which could provide significant habitat for many species. Due to the presence of FOD7 communities as well as the Thames River being within 120 m of the preferred E3 route the following are considered to be candidate significant wildlife habitat:

- Seasonal Concentration Areas of Animals:
    - Raptor Wintering Area
    - Bat Maternity Colonies
    - Reptile Hibernaculum
- Rare Vegetation Community:

    - Old Growth Forest
        - Skunks Misery Areas of Natural and Scientific Interest that is just east of the Study Area contains old growth forest (Talbot Land Thames Trust, 2008), therefore protected forested communities apart of the Skunk's Misery Wetland Complex may also contain old growth forest.
    - Other Rare Vegetation Communities
- Specialized Habitats of Wildlife:
    - Bald Eagle and Osprey Nesting, Foraging and Perching Habitat
    - Woodland Raptor Nesting Habitat
    - Turtle nesting areas
    - Seeps and Springs
    - Amphibian Breeding Habitat (Woodland)
    - Amphibian-Breeding Habitat (Wetlands)
- Habitats of Species of Conservation Concern:
    - Woodland Area Sensitive Bird-Breeding Habitat
    - Terrestrial Crayfish
    - Special Concern and Rare Wildlife Species including:
        - Bald eagle
        - Canada warbler
        - Eastern wood-pewee
        - Evening Grosbeak
        - Wood Thrush
        - Northern Sunfish(Great Lakes - Upper St.Lawrence populations)
        - Monarch
        - Woodland Vole
        - Mapleleaf (Great Lakes Upper St. Lawrence population)
        - Rainbow
        - Broad Beech Fern
        - Green Dragon
        - Northern Map Turtle
        - Snapping Turtle

5.1.3.2 Preferred Alternative Route W3

The following are candidate habitat for the preferred W3 route.

- Seasonal Concentration Areas of Animals:
    - Reptile Hibernaculum
- Specialized Habitats of Wildlife:
    - Turtle nesting areas

    - Amphibian-Breeding Habitat (Wetlands)
- Habitats of Species of Conservation Concern
    - Special Concern and Rare Wildlife Species including:
        - Northern Sunfish(Great Lakes - Upper St.Lawrence populations)
        - Monarch
        - Mapleleaf (Great Lakes Upper St. Lawrence population)
        - Rainbow
        - Broad Beech Fern
        - Green Dragon
        - Northern Map Turtle
        - Snapping Turtle

5.1.3.3 Preferred Booster Pumping Station Sitting Area BPS 3 (Option 2)

There are no significant wildlife habitat for the preferred BPS 3 (option 2) sitting area.

5.1.4 Species at Risk for Preferred Alternative

5.1.4.1 Preferred Alternative Route E3

During the site reconnaissance survey, no suitable habitat for eastern meadowlark and bobolink was observed as the agriculture fields were planted corn. However, these fields could potentially be habitat in the future if wheat is planted as part of crop rotation.

There was one barn within 120 metres of the preferred route and it was confirmed to have barn swallow present. Furthermore, an abandoned grain elevator was observed along the E3 route. This can provide habitat for barn swallow as well as Species at Risk bat species. **Appendix F** contains images of these structures as well as the location.

Given the presence of the fresh-moist lowland deciduous forest (FOD7), these forest communities may provide habitat for bat and tree species at risk.

5.1.4.2 Preferred Alternative Route W3

During the site reconnaissance survey, no suitable habitat for eastern meadowlark or bobolink was observed as the agriculture fields were planted corn. However, these fields could potentially be habitat in the future if wheat is planted as part of crop rotation.

A barn swallow nest was observed under two bridges. They were located at water crossing ID 23686 23600 on Huffs Side Road and water crossing ID: 1237-11651 on Smoke Line. **Appendix F** contains images of the barn swallow nest.

5.1.4.3 Preferred Booster Pumping Station Sitting Area BPS 3 (Option 2)

No Species at Risk or Species at Risk habitat was observed at the preferred booster pumping sitting area BPS 3 (Option 2).

6. General Mitigation Measures and Monitoring Requirements

The potential impacts and mitigation measures described herein are general in nature and appropriate for the evaluation of alternatives for the project components. **Table 6-1** provides a summary of potential effects and best management practices for the preferred alternative routes and options, including E3, W3 and BPS3 (Option 2). Overall, potential effects described below are anticipated to be low for all proposed routes given that the proposed works will be limited to within the municipal road right-of-way and provided that the mitigation measures and monitoring as summarized in **Table 6-1** below are implemented. It was assumed that Once construction activities have been completed, no adverse effects to the natural environment are expected due to the operation of the new Water Distribution System.

These potential effects and recommended general mitigation measures will need to be reviewed and refined during the detail design phase of this project for the preferred solution.

Table 6-1 Potential Effects, Mitigation Measures and Monitoring Recommendations During Construction and Operation Phases

Natural Heritage Feature	Project Phase	Potential Effect	Mitigation Measures	Monitoring Requirements	Preferred Alternative Route E3	Preferred Alternative Route W3	Booster Pumping Station Sitting Area BPS 3 (Option 2)
Designated Natural Areas	Construction	• Loss of vegetation along the edge of Thamesville Conservation Club provincially significant wetland or Skunk's Misery provincially significant wetland • Potential effects of erosion / sedimentation on unevaluated wetlands.	• Avoid vegetation removal within the Thamesville Conservation Club provincially significant wetland. The Thamesville Conservation Club provincially significant wetland limits should be staked in the field during detailed design for the preferred alternative Route E3 in consultation with the Lower Thames River Conservation Authority. The provincially significant wetland limits will be identified on construction drawings. • Refer to increased soil and sedimentation for Erosion and Sediment Control mitigation below. • Refer below to mitigation measures described for Vegetation Communities.	• Refer to increased soil and sedimentation for Erosion and Sediment Control monitoring requirements below. • Refer below to monitoring described for Vegetation Communities.	Applicable	Not Applicable	Not Applicable
Policy Areas	Construction	• Vegetation removal within Regulated Areas for Lower Thames Conservation Authority and the St. Clair Conservation Authority	• Refer to increased soil and sedimentation for Erosion and Sediment Control mitigation below. • Refer below to mitigation measures described for Vegetation Communities.	• Refer below to monitoring described for Vegetation Communities. • Recommendations for additional monitoring related to vegetation removal within Regulated Areas may be determined through consultation with the Ministry of Natural Resources and Forestry.	Applicable	Not Applicable	Not Applicable
Vegetation Communities	Construction	• Removal of a variety of vegetation as well as isolated trees may be required. • Damage to adjacent vegetation or Ecological Land Classification communities as a	• Vegetation removal will be kept to a minimum and limited to within the municipal road ROW. • Avoid tree and shrub removal to the extent possible. • Construction protective fencing and / or silt fencing, where appropriate, will be installed and maintained to clearly define the construction footprint and prevent accidental damage or intrusion to adjacent vegetation (FOD7 and MAS). These will remain in place until all construction activities are completed. • Temporarily disturbed areas will be re-vegetated using non-invasive, preferably native plantings and / or seed mix appropriate to the site	• On-site inspection will be undertaken to confirm the implementation of the mitigation measures and identify corrective actions if required. Corrective actions may include additional site maintenance and alteration of activities to minimize impacts. • The approach to compensation monitoring will be determined by	Applicable	Applicable	Applicable

Natural Heritage Feature	Project Phase	Potential Effect	Mitigation Measures	Monitoring Requirements	Preferred Alternative Route E3	Preferred Alternative Route W3	Booster Pumping Station Sitting Area BPS 3 (Option 2)
		result of accidental intrusion.	conditions and adjacent vegetation communities. Seed mixes will be used in conjunction with an appropriate non-invasive cover crop as needed.	property ownership, applicable governing by-laws / regulations and location with respect to ecological functioning.			
Vegetation Communities	Construction	• Indirect loss of vegetation through dust suppression	• Dust suppressants during dry periods should be applied to those areas which generate large amounts of dust. • Restrict earth movement immediately adjacent to woodlands or water features during periods of high dust generation.	• On-site inspection will be undertaken to confirm the implementation of the mitigation measures and identify corrective actions if required. Corrective actions may include additional site maintenance and alteration of activities to minimize impacts.	Applicable	Applicable	Applicable
Vegetation Communities	Construction	• Degradation of plant health and loss of vegetation leading to vegetation community changes as result of dewatering activities.	• During detailed design the need for a dewatering zone of influence assessment and dewatering monitoring plan should be evaluated. The dewatering monitoring plan, should it be deemed required, will be developed in consultation with the conservation authorities, will monitor for potential negative effects on the associated water crossing and adjacent vegetation communities if affected due to dewatering activities, and will provide an adaptive management plan should said negative effects be observed.	• On-site inspection will be undertaken to confirm the implementation of the mitigation measures and identify corrective actions if required. Corrective actions may include additional site maintenance and alteration of activities to minimize impacts.	Applicable	Applicable	Applicable
Vegetation Communities	Construction	• Potential for the spread of emerald ash borer, (Agrilus planipennis) associated with removal, handing and transport of ash trees.	• Removal of ash trees, or portions of ash trees, will be carried out in compliance with the Canada Food and Inspection Agency Directive 'D-03-08: Phytosanitary Requirements to Prevent the Introduction into and Spread within Canada of the emerald ash borer, Agrilus planipennis (Fairmaire). To comply with this Directive, all Ash trees requiring removal, including any wood, bark or chips, will be restricted from being transported outside of the emerald ash borer regulated areas of Canada.	• On-site inspection will be undertaken to confirm the implementation of the mitigation measures and identify corrective actions if required. Corrective actions may include additional site maintenance and alteration of activities to minimize impacts. • Ensure precautions are being taken to minimize the spread of invasive species by cleaning equipment prior to moving sites.	Applicable	Applicable	Applicable

Natural Heritage Feature	Project Phase	Potential Effect	Mitigation Measures	Monitoring Requirements	Preferred Alternative Route E3	Preferred Alternative Route W3	Booster Pumping Station Sitting Area BPS 3 (Option 2)
Vegetation Communities	Construction	• Increased soil and sedimentation	• Construction fencing and / or silt fencing, where appropriate, will be installed and maintained to clearly define the construction footprint, prevent accidental damage or intrusion to adjacent vegetation or Ecological Land Classification communities and prevent entry of sediment into the watercourse or wetland. • Sediment and erosion control measures will be implemented prior to and maintained during the construction phases. • The erosion and sediment control strategies outlined on the plans are not static and may need to be upgraded/amended as site conditions change to prevent sediment releases to the natural environment. • The contractor shall monitor the weather several days in advance of the onset of the project to ensure that the works will be conducted during favourable weather conditions. Should an unexpected storm arise, the contractor will remove all unfixed items from the Regional Storm Floodplain and slope that would have the potential to cause a spill/ pollution (i.e., fuel tanks, porta-potties, machinery) or an obstruction to flow (i.e. machinery, equipment). Prior to forecasted precipitation event, all Erosion and Sediment Control measures are to be inspected and confirmed to be in good condition. • An Erosion and Sediment Control Plan will be prepared prior to and implemented during construction to minimize the risk of sedimentation to the vegetation communities. • Stockpiled materials and equipment will be stored within the construction footprint but shall be kept at least 30 metres away from the watercourse or wetland.	• All erosion and sediment control measures should be inspected weekly, after every rainfall and significant snow melt event, and daily during periods of extended rain or snow melt. • All damaged erosion and sediment control measures will be repaired and/or replaced within 48 hours of the inspection.	Applicable	Applicable	Applicable
Vegetation Communities	Construction	• Soil or water contamination as a result of spills (e.g., grease and / or fuel) from equipment use. • Introduction and spread of invasive species.	• A Spill Prevention and Contingency Plan will be developed and adhered to. Spills will be immediately contained and cleaned up in accordance with provincial regulatory requirements and the contingency plan. • Refuelling of equipment will occur at least 30 metres away from a watercourse or wetland vegetation. • Refuelling shall be done within refuelling stations lined with appropriate material to prevent seepage and fuel discharge.	• On-site inspection will be undertaken to confirm the implementation of the mitigation measures and identify corrective actions if required. Corrective actions may include additional site maintenance and alteration of activities to minimize impacts	Applicable	Applicable	Applicable

Natural Heritage Feature	Project Phase	Potential Effect	Mitigation Measures	Monitoring Requirements	Preferred Alternative Route E3	Preferred Alternative Route W3	Booster Pumping Station Sitting Area BPS 3 (Option 2)
			• All machinery, construction equipment and vehicles arriving on site should be in clean condition (e.g., free of fluid leaks, soils containing seeds of plant material from invasive species) and be inspected and washed in accordance with the Clean Equipment Protocol for Industry (Halloran et al., 2013) prior to arriving and leaving the construction site in order to prevent the spread of invasive species between locations. • If removing stands of common reed (Phragmites australis) for construction, ensure to follow the best management practices for appropriate removal methods and disposal in accordance with the Invasive Phragmites – Best Management Practices (Ministry of Natural Resources, 2011).				
Wildlife	Construction	• Disturbance, displacement or mortality of wildlife. • Wildlife movement is not anticipated to be significantly affected by the temporary construction work as the preferred route will be within existing road or railroad ROWs, which is already disturbed. Vegetation within temporarily disturbed areas are anticipated to recover quickly.	• Construction personnel will be trained in ways to prevent a wildlife encounter from occurring, including the following: o No personnel shall approach, feed or harass wildlife; o Food waste will be properly stored and disposed of; and o Vehicles will yield to wildlife. • If wildlife is encountered, measures will be implemented to avoid destruction, injury, or interference with the species, and / or its habitat. For example, construction activities will cease or be reduced, and wildlife will be encouraged to move offsite and away from the construction area on its own. A qualified Biologist will be contacted to define the appropriate buffer required from wildlife or to move the wildlife to a nearby suitable habitat outside of the construction site if necessary. • Tree removal in forested habitats is also to occur outside of the bat roosting season (April 1 to September 30). • The installation of turtle exclusion fencing around any work locations adjacent to wetlands, ponds, lakes or other potential habitat with works planned between May 15 and July 15. The fencing should be erected prior to May 15 and maintained until July 15 to prevent turtles from nesting in the work area • Limit construction activity to a period after 7 am and before 7 pm daily. • Confirm that caps on all strung pipe remain in place until immediately prior to welding to avoid trapping or confining wildlife.	• On-site inspection will be undertaken to confirm the implementation of the mitigation measures and identify corrective actions if required. Corrective actions may include additional site maintenance and alteration of activities to minimize impacts. • Daily monitoring of open and excavated areas for the duration of construction would be conducted by the Contractor to determine if any trapped amphibians or small mammals have fallen in overnight. If required, any trapped animals would be released to adjacent suitable habitat.	Applicable	Applicable	Applicable

Natural Heritage Feature	Project Phase	Potential Effect	Mitigation Measures	Monitoring Requirements	Preferred Alternative Route E3	Preferred Alternative Route W3	Booster Pumping Station Sitting Area BPS 3 (Option 2)
			• Any open trenches will be backfilled as soon as practical following excavation. • Use a tarp and/or magnets to collect the bevel shavings on a daily basis to prevent ingestion or injury by wildlife.				
Migratory Breeding Birds and Nests	Construction	• Disturbance or destruction of migratory bird nests	• Schedule vegetation removal to outside of the breeding bird season (April 1 to August 31). • If activities are proposed to remove natural vegetation during the general nesting period, a nest survey will be undertaken prior to required activities in simple habitat. Nest searches by an experienced searcher are required and will be completed by a qualified Biologist no more than 48 hours prior to vegetation removal. • If an active nest of a migratory bird is found outside of this nesting period it still must be avoided until young birds have fledged.	• Regular monitoring will be undertaken to confirm that activities do not encroach into nesting areas or disturb active nesting sites.	Applicable	Applicable	Applicable

Natural Heritage Feature	Project Phase	Potential Effect	Mitigation Measures	Monitoring Requirements	Preferred Alternative Route E3	Preferred Alternative Route W3	Booster Pumping Station Sitting Area BPS 3 (Option 2)
Aquatic Environment	Construction – Work Near a Watercourse	• Increased sedimentation and erosion. • Risk of water contamination as result of spills (e.g., grease, soils, and/or fuel) from equipment use. • Effects on fish and fish habitat.	• Stockpiled material will be stored at a safe distance (30 m) from watercourses to ensure that no deleterious substances enter the water. • Sediment and erosion control measures (e.g. sediment fence) will be installed and will be maintained during the work phase and until the site has been stabilized. • Any temporary mitigation measures will be installed prior to the commencement of any site clearing, grubbing, excavation, filling or grading works and will be inspected and maintained on a regular basis, prior to and after runoff events. • A Spill Prevention and Contingency Plan will be developed and adhered to. Spills will be immediately contained and cleaned up in accordance with provincial regulatory requirements and the contingency plan. • Design water management system and dewatering operations (if needed, in excavated work areas above the high water mark) to prevent erosion and/or release of sediment-laden or contaminated water to the adjacent watercourse. • Refuelling of equipment will occur at least 30 metres away from the watercourse. • All machinery, construction equipment and vehicles arriving on site should be in clean condition (e.g., free of fluid leaks).	• All erosion and sediment control measures should be inspected weekly, after every rainfall and significant snow melt event, and daily during periods of extended rain or snow melt. • All damaged erosion and sediment control measures should be repaired and/or replaced within 48 hours of the inspection.	Applicable	Applicable	Applicable

Natural Heritage Feature	Project Phase	Potential Effect	Mitigation Measures	Monitoring Requirements	Preferred Alternative Route E3	Preferred Alternative Route W3	Booster Pumping Station Sitting Area BPS 3 (Option 2)
Aquatic Environment	Construction – Open-Cut Crossing Method	• Potential effects on fish and fish habitat	• If open-cut methods are selected as the preferred option for the watermain installation across all of the water crossings the following mitigation and protection measures are recommended but may not be limited to: o Machinery will arrive on-site clean and in good condition; a spill response plan will be prepared and implemented as necessary. o Avoid in-water work during the appropriate timing restrictions for fish and mussel species. o Minimize the time in-water by appropriately staging all equipment and materials to minimize the disturbance to fish and fish habitat. o Fish relocation should be completed immediately following the isolation of any wetted areas during the crossing activity. o All water-intakes will be screened in accodance with D F O Code of Practice for fish protection screens. o Follow industry Best Management Practices for the placement of temporary fill within watercourses. o Stockpiled materials will be located at an appropriate distance from the edge of the water feature and/or wetland features. o ESC will be installed to reduce the risk of sediment-laden runoff from entering a water feature and/or wetland features. • Any disturbed areas will be seeded with native species appropriate to the soil conditions and restored as close as possible to pre-construction conditions.	• Regular monitoring of watercourses for the duration of construction would be conducted by the Contractor to determine if Erosion and Sediment Control measures are working as designed. • In the event of a significant sediment release, Ministry of the Environment, Conservation and Parks's Spills Action Centre will be notified as appropriate.	Applicable	Applicable	Applicable

Natural Heritage Feature	Project Phase	Potential Effect	Mitigation Measures	Monitoring Requirements	Preferred Alternative Route E3	Preferred Alternative Route W3	Booster Pumping Station Sitting Area BPS 3 (Option 2)
Aquatic Environment	Construction – Trenchless Crossing Method	• Potential effects on fish habitat.	• If trenchless methods are selected as the preferred option for the watermain installation across all of the water crossings the following mitigation and protection measures are recommended but may not be limited to: o The drill path will be designed to an appropriate depth below the watercourses to minimize the risk of frac out and to a depth to reduce the risk of the line from becoming exposed due to natural scouring of the streambed. Entry and exit pits will be far enough from the banks of all watercourses to have minimal impacts on these areas. o Stockpiled materials will be located at an appropriate distance from the edge of the water feature and/or wetland features. o ESC will be installed to reduce the risk of sediment-laden runoff from entering a water feature and/or wetland features. o Machinery will arrive on-site clean and in good condition; a spill response plan will be prepared and implemented as necessary. o Water crossings will be monitored to observe signs of surface migration (frac out) of drilling mud during all phases of construction. In the event of frac out, a frac out response and contingency plan will be implemented. The Plan will consist of the following: ▪ All material and equipment needed to contain and clean up drilling mud releases will be kept on site and readily accessible in the event of a frac out; ▪ In the event of a frac out, drilling will be stopped immediately and the Ministry of the Environment, Conservation and Parks's Spills Action Centre will be notified as appropriate ▪ Measures will be taken to contain the drilling mud and reduce the risk of its further migration into the watercourse or wetland feature. Measures may include the use of vacuum trucks, excavation of relief pits, etc.;	• Regular monitoring of drill sites and watercourses for the duration of construction would be conducted by the Contractor to determine if frac out occurs. • In the event of a frac out, Ministry of the Environment, Conservation and Parks' Spills Action Centre will be notified as appropriate.	Applicable	Applicable	Applicable

Natural Heritage Feature	Project Phase	Potential Effect	Mitigation Measures	Monitoring Requirements	Preferred Alternative Route E3	Preferred Alternative Route W3	Booster Pumping Station Sitting Area BPS 3 (Option 2)
			▪ Cleanup and disposal activities will be prioritized; and, ▪ Once the spill has been deemed secure, a new drill attempt beneath the river can be made or a new crossing method will be reviewed to accommodate site-specific conditions as the need arises. • Any disturbed areas will be seeded with native species appropriate to the soil conditions and restored as close as possible to pre-construction conditions.				

Natural Heritage Feature	Project Phase	Potential Effect	Mitigation Measures	Monitoring Requirements	Preferred Alternative Route E3	Preferred Alternative Route W3	Booster Pumping Station Sitting Area BPS 3 (Option 2)
Species at Risk	Construction	• Removal of Species at Risk habitat • Disturbance, displacement, injury or mortality of individual Species at Risk	• Species-specific surveys to confirm presence or absence of Species at Risk may be required for the preferred route. Specific mitigation measures may be developed based on the results of the Species at Risk surveys and detailed design of the preferred route to minimize potential effects. Should impacts to habitat or individual Species at Risk be unavoidable, permitting under the Endangered Species Act may be required from the Ministry of the Environment, Conservation and Parks.	• To be determined based on results of species-specific surveys.	Applicable	Applicable	Applicable

7. Anticipated Permits and Approvals

Table 6-1 below provides a summary of anticipated permits and approvals for the preferred routes and booster pumping siting area. Refer to **Table 2-1** for descriptions of applicable regulatory legislations.

Table 6-1 Anticipated Permits and Approvals for the Preferred Alternative

Level of Legislation	Federal Legislation	Anticipated Permit and Approval Requirements
Federal	Species at Risk Act, 2002	Not anticipated for federal Species at Risk birds regulated under the Migratory Birds Convention Act as individual and residence (i.e., nest) protection would be applied under vegetation removal timing windows for breeding birds. No aquatic species designated as Threatened or Endangered under Species at Risk Act were identified.
Federal	Fisheries Act, 1985 (and as amended)	An assessment of harmful alteration, disruption or destruction to fish and fish habitat may be required for activities occurring near and/or below the HWM of any fish bearing watercourse. In cases where harmful alteration, disruption or destruction cannot be avoided and/or mitigated or the scope of work cannot be covered under a Standard or Code of Practice, a Request for Review shall be submitted to D F O. If death of fish or harmful alteration, disruption or destruction to fish habitat is likely to result from project activities, an Authorization under the Fisheries Act will likely be required.
Federal	Migratory Birds Convention Act, 1994	Contravention of the Migratory Birds Convention Act is not anticipated provided vegetation removal occurs outside of the breeding bird season (April 1 to August 31).

Level of Legislation	Federal Legislation	Anticipated Permit and Approval Requirements
Provincial	Provincial Policy Statement, 2020	There are no permits to be obtained under the Provincial Policy Statement; however, mitigation measures and best management practices will reduce the likelihood of, or minimize effects on identified Significant Wildlife Habitat, fish habitat and wetlands.
Provincial	Endangered Species Act, 2007	Authorization under the Endangered Species Act may be required for the following Species at Risk if confirmed present and impacts to the individuals or habitats cannot be avoided: ▪ American chestnut ▪ Bat Species at Risk ▪ Black redhorse ▪ Blue ash ▪ Butternut ▪ Barn Swallow ▪ Blandings turtle ▪ Bobolink ▪ Cerulean Warbler ▪ Eastern flowering dogwood ▪ Eastern hog-nose snake ▪ Eastern Meadowlark ▪ Eastern sand darter ▪ Fawnsfoot ▪ Kidneyshell ▪ Lake Sturgeon ▪ Rayed bean ▪ Red-headed woodpecker ▪ Round hickorynut ▪ Round pigtoe ▪ Northern madtorn ▪ Northern riffleshell ▪ Salamander mussel

Level of Legislation	Federal Legislation	Anticipated Permit and Approval Requirements
		▪ Snuffbox ▪ Spiny softshell
Provincial	Fish and Wildlife Conservation Act, 1997	A Licence to Collect Fish and a Wildlife Capture Authorization may be required for capture, handlings and/or relocation of fish and herpetofauna (e.g., frogs) will be required from Ministry of Natural Resources and Forestry if fish relocations/wildlife salvages are required for in-water works, if any.
Provincial	Conservation Authorities Act(1990)	Under Regulation 171/06: St. Clair Region Conservation Authority: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses and the Ontario Regulation 152/06: Lower Thames Valley Conservation Authority: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses a permit may be required if work occurs within their regulated areas
Municipal	Municipality of Chatham-Kent (2014)	This Municipal Class Environmental Assessment is anticipated to meet the requirements of the Environmental Impact Study.

8. Summary and Recommendations

Based on AECOM's review and analysis of background information, the following is a summary of the results and considerations for next steps to support the evaluation of alternative solutions.

a) Based on aerial imagery and the site visit by AECOM ecologists the majority of the Study Areas are dominated by agriculture fields yielding corn. Natural areas are scattered through the East Focus Study area routes and are largely presented as small, forested communities. These vegetation communities may provide nesting habitat for breeding birds protected under the Migratory Birds Convention Act and therefore construction timing restrictions may apply such as no vegetation removal between April 1 and August 30.

b) A variety of communities within each of the alternative routes provides potential significant wildlife habitat including, raptor wintering area, bat maternity colonies, reptile hibernaculum, old growth forest, other rare vegetation communities, bald eagle and osprey nesting, foraging and perching habitat, woodland raptor nesting habitat, turtle nesting areas, seeps and springs, amphibian breeding habitat (woodland), amphibian-breeding habitat (wetlands), woodland area sensitive bird-breeding habitat, terrestrial crayfish and special concern and rare wildlife species. These areas should be confirmed by a qualified biologist during detailed design. If development is proposed within or immediately adjacent to these Significant Wildlife Habitat features, specific mitigation measures to avoid or minimize negative effects on these features as result of the development will be required.

c) Although the majority of the flora and fauna identified through the background review are common, tolerant of disturbances and widespread throughout Ontario, a total of 30 Species at Risk on the East Focus Study Area routes, 20 Species at Risk on the West Focus Study Area routes and four Species at Risk on the Booster Pumping Station Sitting Area locations were identified to potentially occur within the Study Areas based on available suitable habitat. Species-specific surveys targeting these species are recommended once the preferred alternative is identified along with further consultation with the Ministry of the Environment, Conservation and Parks. If any Species at Risk is identified during these surveys, Ministry of the Environment, Conservation

and Parks should be consulted with to determine appropriate mitigation and avoidance measures as well as any permitting requirements.

d) Initial consultation had been undertaken with Ministry of the Environment, Conservation and Parks and Ministry of Natural Resources and Forestry to bolster the background review information with results not otherwise publicly available. Further consultation with the Ministry of the Environment, Conservation and Parks is recommended at the Detailed Design kick-off phase to determine if any permitting will be required under the Endangered Species Act and/or the Public Lands Act.

e) All proposed routes cross waterbodies that directly support fish and contain fish habitat. In-water work may be required for each route depending on the crossing methodology employed. Mitigation measures will be implemented to avoid or minimize the potential for harm to fish, or harmful alteration, disruption or destruction of fish habitat. Where such harm cannot be avoided, an Authorization from D F O under the Fisheries Act may be needed. Trenchless crossing methods are recommended for detail design.

f) General project mitigation measures for the preferred routes Route E1, W3 and BPS 3 (option 2) were provided in **Section 6**.

g) Approvals from government organizations that may be required for this study include Request for Review to D F O (Fisheries Act), Authorization under the Endangered Species Act , a License to Collect Fish and a Wildlife Capture Authorization (if open-cut crossing methods are employed) as well as permits under Ontario Regulation 171/06 and Ontario Regulation 152/06.

The following addition investigations will be required for the preferred solution during the detail design phase:

- Updated species at risk habitat screening.
- Fish habitat assessment of watercourse crossed by the preferred solution.
- A tree inventory and tree protection plan.
- A dewatering zone of influence assessment and dewatering monitoring plan may be required.
- The following Species at Risk surveys may be completed during detailed design in support of anticipated Endangered Species Act authorizations:
    - Phases II (leaf on surveys) and III (acoustic monitoring) of the Survey Protocol for Species at Risk Bats within Treed Habitats Little Brown Myotis, Northern Myotis & Tri-Colored Bat (Ministry of Natural

Resources and Forestry, 2017) to quantify habitat and confirm presence or absence of bat Species at Risk if tree removal in forests or treed swamps is required.

- Windshield survey to identify presence of suitable habitat (for example, tall grasslands, pastures, hayfields) for eastern meadowlark or bobolink. If any are present, presence/absence surveys following Ministry of the Environment, Conservation and Parks protocols will be required if impacts to these habitats cannot be avoided.
- Nest checks under bridges or culverts for Migratory Birds Convention Act protected birds or Barn Swallow nests that may be affected by the preferred solution.
- Additional species-specific surveys may be required as requested by Ministry of the Environment, Conservation and Parks through consultation.

9. Limitations

The findings documented in this report are based on desktop review of secondary sources and a windshield site reconnaissance survey completed in 2022. The results and recommendations presented in this report may change for the preferred alternative following the findings of additional studies and as the Project design advances through preliminary and detailed design phases. The information presented in this Report may be used during the preparation of the Project's Municipal Class Environmental Assessment Project File Report.

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Appendix A

Figures

Cryderman Drain
Ferguson Drain
Industrial Rd
Wallace Drain
Mceachran - Hopkins Drain
Facey Drain
Snobden Drain
Dee Drain
Cruikshank North Drain
Cruikshank Creek Drain
Cruikshank Drain
Sussex Drain
McIntyre Drain
Main Line
Bothwell Station
Longwoods Rd
London Rd
Thamesville
Dickson Drain
Vogler Drain
Birkner Drain
Gordon Hodge Drain
Terry & Brewer Drain
Ould's Drain
Cornwall Creek
Brewer Drain
Elm St W
Bothwell
Main St N
MAS2
7-8 Concession Drain
W Bothwell Rd
Burk Extension Drain
Victoria St S
Thames River
Victoria Rd
Duffus Drain
Burton Drain
Alternative BPS 3
FOD7
Longwoods Rd
Moraviantown
Deleware Nation
Ashton Drain
Thames River
Aerial imagery provided by: Maxar, 2021

LEGEND

- Study Area (120 m)

Focus Study Area - East - Recommended Alternative

- Alternative E3
- Recommended Booster Pump Station Siting Area

General Features (LIO, MNRF, 2022)

- Main Railway
- Spur Railway
- District, County, or Regional Road
- Waterbody
- Watercourse
- Aboriginal Reservation
- Municipal Boundary

Vegetation Community (AECOM, 2022)

- FOD
- MAS

E.L.C. Vegetation Code Description

FOD7: Fresh-Moist Lowland Deciduous Forest Ecosite

MAS2: Mineral Shallow Marsh Ecosite

Map Extents

Chatham-Kent Public utilities Commission Municipal Class Environmental Assessment for the North-East Chatham-Kent Water Distribution System

Recommended East Alternative
Site Visit Results

0 0.5 1 2 KM
NAD 1983 UTM Zone 17N

Data Sources:
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AECOM | Chatham-Kent

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Figure: 3-1

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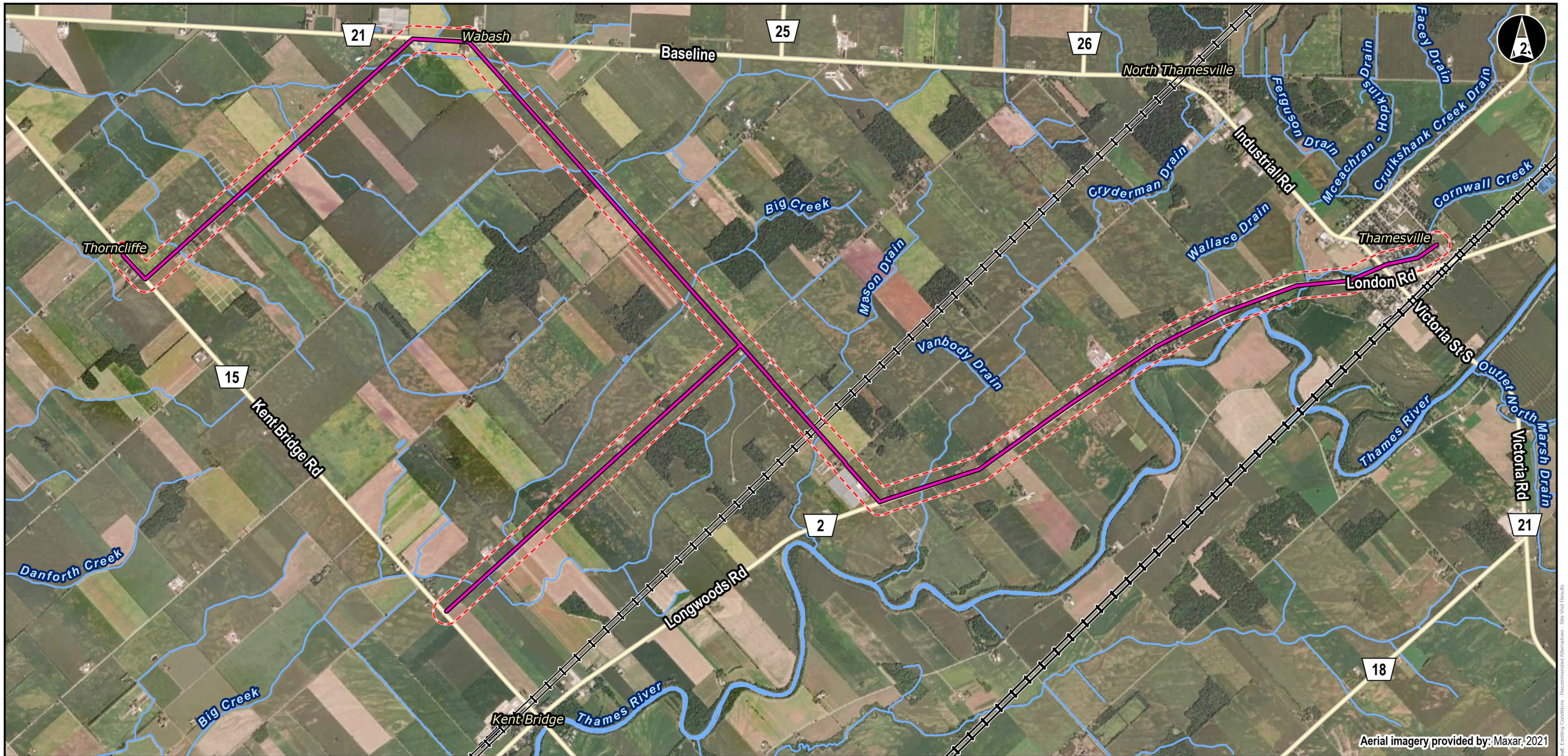


LEGEND

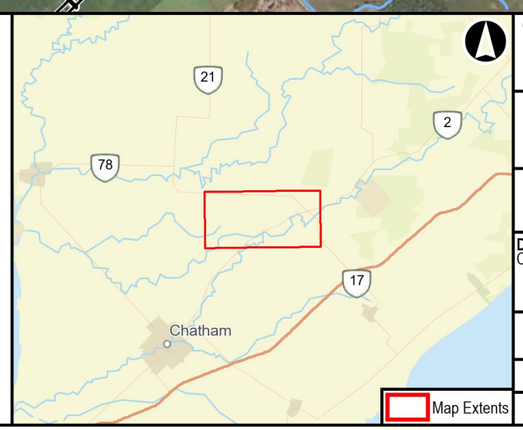
- Study Area (120 m)

Focus Study Area - West - Recommended Alternative

- Alternative W3

General Features (LIO, MNRF, 2022)

- Main Railway
- Spur Railway
- District, County, or Regional Road
- Waterbody
- Watercourse
- Municipal Boundary



Chatham-Kent Public utilities Commission Municipal Class Environmental Assessment for the North-East Chatham-Kent Water Distribution System

Recommended West Alternative
Site Visit Results

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NAD 1983 UTM Zone 17N

Data Sources:
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Alternative BPS 3

FOD7

Recommended Booster Pump Station Siting Options

Option 2

Baseline

Zone 5 Rd

0 20 40 80 M

Aerial imagery provided by: Maxar, 2021

LEGEND

Recommended Booster Pump Station Siting Area

General Features (LIO, MNRF, 2022)

Main Railway

Spur Railway

District, County, or Regional Road

Waterbody

Watercourse

Municipal Boundary

Vegetation Community (AECOM, 2022)

FOD

MAS

E.L.C. Vegetation Code Description

FOD7: Fresh-Moist Lowland Deciduous Forest Ecosite

MAS2: Mineral Shallow Marsh Ecosite

Map Extents

Chatham-Kent Public utilities Commission Municipal Class Environmental Assessment for the North-East Chatham-Kent Water Distribution System

Recommended Booster Pump Station Alternative Site Visit Results

0 100 200 400 600 800 1,000 Meters

NAD 1983 UTM Zone 17N

Data Sources:
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Figure: 3-3

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Alternative BPS 2
Alternative BPS 1
Alternative BPS 3
Thamesville Conservation Club Wetland Complex (LT 38) PSW
Skunk's Misery Wetland Complex (LT 22) PSW
Thamesville Oxbow RSW
West Moraviantown Woods (Regional ANSI, Life Science)
Deleware Nation
Moraviantown
Thamesville
Bothwell
Cornwall Creek
Longwoods Rd
London Rd
Industrial Rd
Victoria St S
Victoria Rd
Main Line
Main St N
Elm St W
W Bothwell Rd
23
24
16
22
21
18
2

Aerial imagery provided by: Maxar, 2021

LEGEND

- Study Area (120 m)

Focus Study Area - East

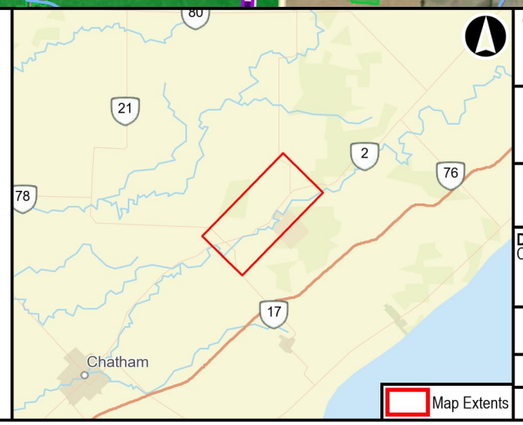
- Alternative E1
- Alternative E2
- Alternative E3
- Potential Booster Pump Station Siting Area

Municipality of Chatham-Kent Schedule of Natural Heritage and Hazard Features, January 2015

- Significant Woodland

General Features (LIO, MNRF, 2022)

- Main Railway
- Spur Railway
- District, County, or Regional Road
- Waterbody
- Watercourse
- Life Science ANSI
- Provincially Significant Wetland (PSW)
- Locally Significant Wetland (LSW)
- Aboriginal Reservation
- Municipal Boundary



Chatham-Kent Public utilities Commission Municipal Class Environmental Assessment for the North-East Chatham-Kent Water Distribution System

East Alternatives
Natural Heritage Features

0 0.5 1 2 KM

NAD 1983 UTM Zone 17N

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Figure: 1-1

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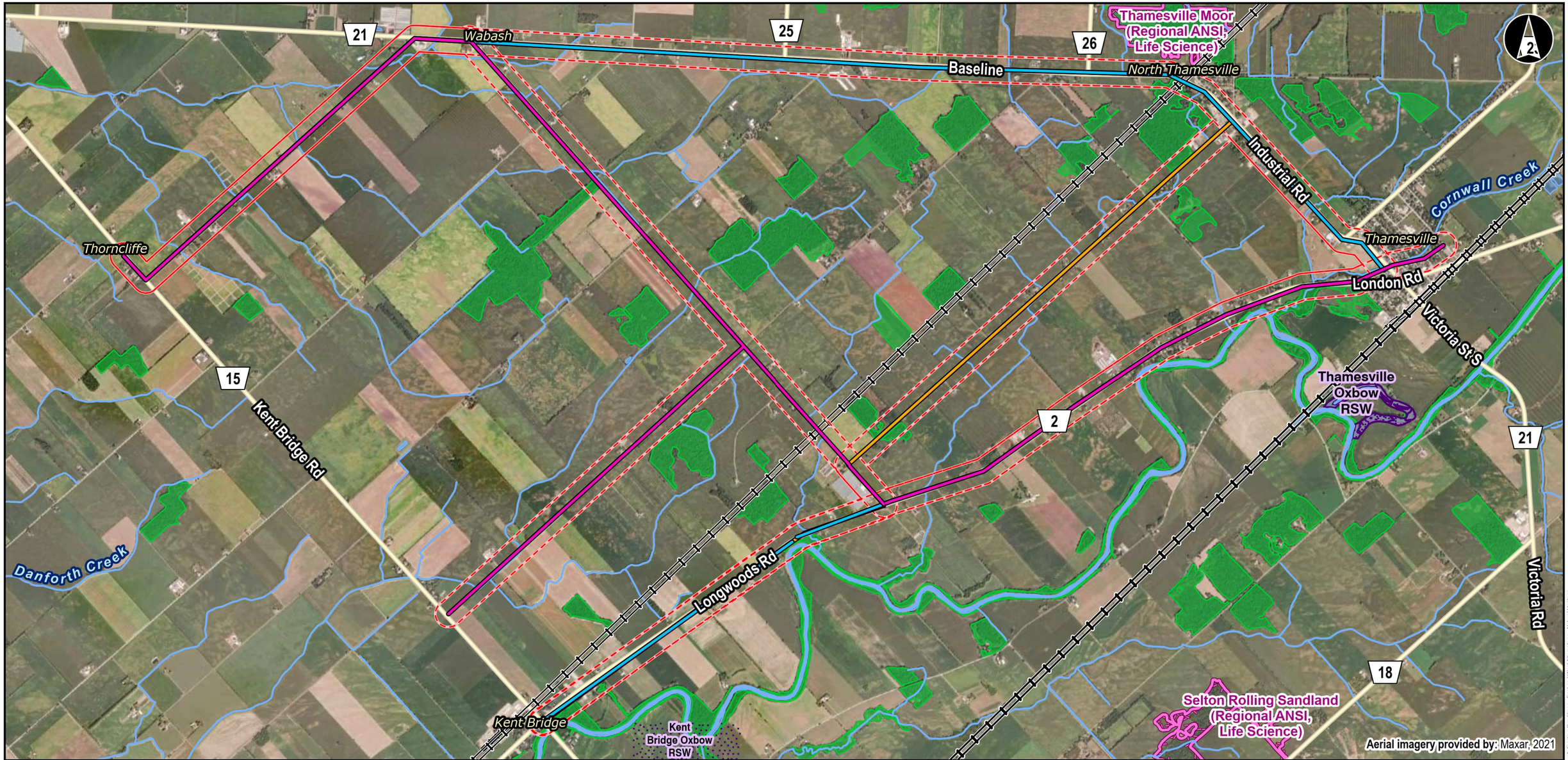


LEGEND

- Study Area (120 m)

Focus Study Area - West

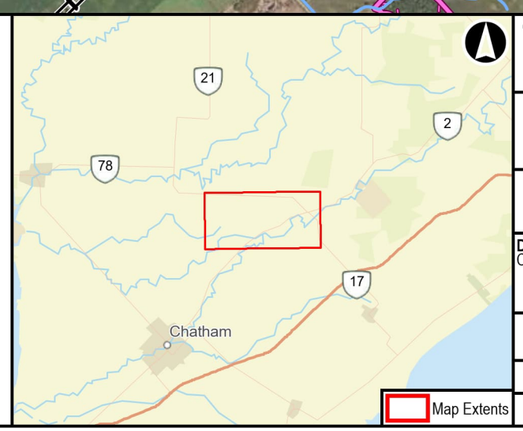
- Alternative W1
- Alternative W2
- Alternative W3

Municipality of Chatham-Kent Schedule of Natural Heritage and Hazard Features, January 2015

- Significant Woodland

General Features (LIO, MNRF, 2022)

- Main Railway
- Spur Railway
- District, County, or Regional Road
- Waterbody
- Watercourse
- Life Science ANSI
- Locally Significant Wetland (LSW)
- Municipal Boundary



Chatham-Kent Public utilities Commission Municipal Class Environmental Assessment for the North-East Chatham-Kent Water Distribution System

West Alternatives
Natural Heritage Features

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NAD 1983 UTM Zone 17N

Data Sources:
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AECOM | Chatham-Kent

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Figure: 1-2

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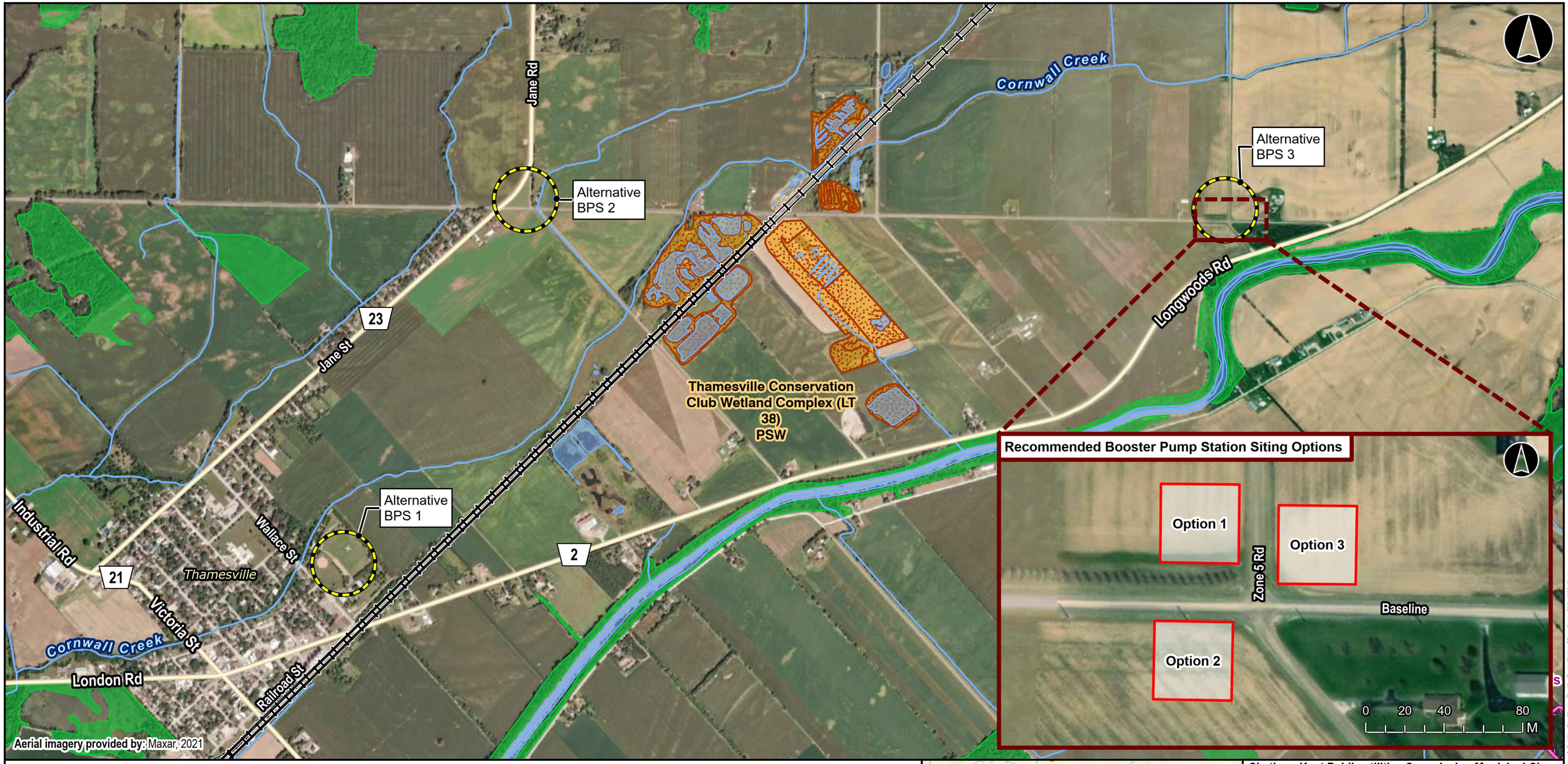


LEGEND

Potential Booster Pump Station Siting Area

Municipality of Chatham-Kent Schedule of Natural Heritage and Hazard Features, January 2015

Significant Woodland

General Features (LIO, MNRF, 2022)

Main Railway

Spur Railway

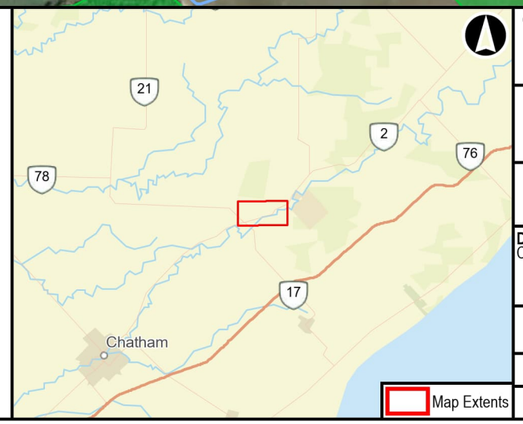
District, County, or Regional Road

Waterbody

Watercourse

Provincially Significant Wetland (PSW)

Municipal Boundary



Chatham-Kent Public utilities Commission Municipal Class Environmental Assessment for the North-East Chatham-Kent Water Distribution System

Potential Booster Pump Station Alternatives
Natural Heritage Features

0 100 200 400 600 800 1,000 Meters

NAD 1983 UTM Zone 17N

Data Sources:
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Figure: 1-3

Cryderman Drain
Ferguson Drain
Industrial Rd
Wallace Drain
Mceachran - Hopkins Drain
Facey Drain
23
Dee Drain
Cruikshank North Drain
Cruikshank Creek Drain
Bothwell Station
Main Line
Alternative BPS 2
21
Longwoods Rd
Cruikshank Creek Drain
Cruikshank Drain
Sussex Drain
24
McIntyre Drain
Birkner Drain
Gordon Hodge Drain
Terry & Brewer Drain
Dickson Drain
Vogler Drain
Thamesville
Alternative BPS 1
London Rd
Cornwall Creek
Oulds Drain
Brewer Drain
16
Main St N
Elm St W
Bothwell
2
Victoria St S
7-8 Concession Drain
W Bothwell Rd
Burk Drain
Thames River
22
Alternative BPS 3
Duffus Drain
Victoria Rd
North Marsh Drain
Burton Drain
18
Thames River
Longwoods Rd
Moraviantown
Outlet
Deleware Nation
Aerial imagery provided by: Maxar, 2021

LEGEND

- Study Area (120 m)

Focus Study Area - East

- Alternative E1
- Alternative E2
- Alternative E3
- Potential Booster Pump Station Siting Area

D.F.O. Aquatic Species at Risk Habitat Status (D.F.O., 2022)

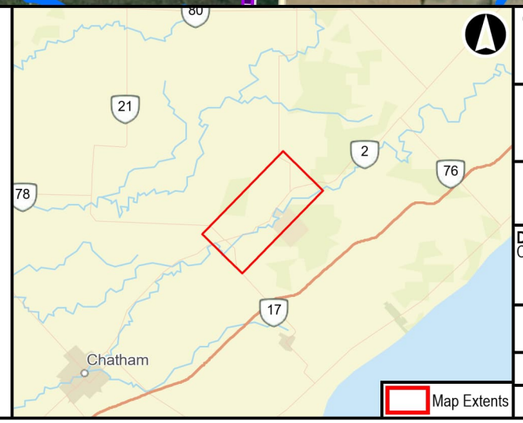
- Critical Habitat
- Watercourse with No S.A.R. Presence

General Features (LIO, MNRF, 2022)

- Main Railway
- Spur Railway
- District, County, or Regional Road
- Constructed Drain
- Aboriginal Reservation
- Municipal Boundary

Watercourse Thermal Regime

- Warm Water



Chatham-Kent Public utilities Commission Municipal Class Environmental Assessment for the North-East Chatham-Kent Water Distribution System

East Alternatives
Aquatic Habitat

0 0.5 1 2 KM

NAD 1983 UTM Zone 17N

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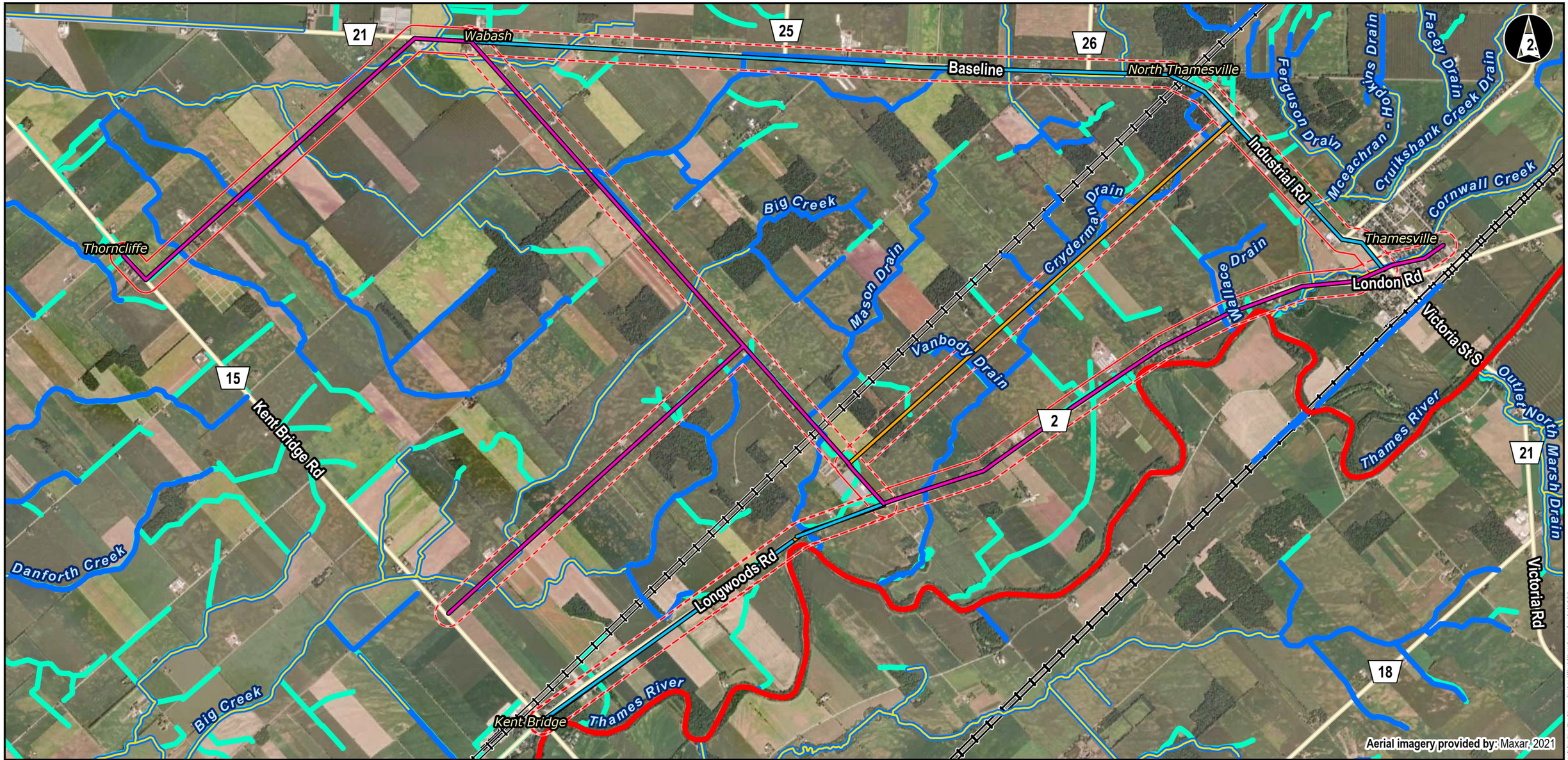
Figure: 2-1

Project Location: E:\Projects\60654246_CK_PUC_NE_WDS\Data\PIs\60654246_CK_PUC_NE_WDS.aprx Layout: Existing Conditions - East and West Alternatives - Aquatic Habitat
Date Saved: 9/15/2022 2:26 PM User: cravis



LEGEND

- Study Area (120 m)

Focus Study Area - West

- Alternative W1
- Alternative W2
- Alternative W3

D.F.O. Aquatic Species at Risk Habitat Status (D.F.O., 2022)

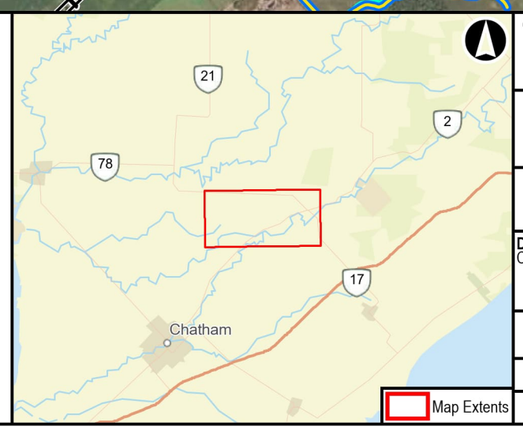
- Critical Habitat
- Watercourse with No S.A.R. Presence

General Features (LIO, MNRF, 2022)

- Main Railway
- Spur Railway
- District, County, or Regional Road
- Constructed Drain
- Municipal Boundary

Watercourse Thermal Regime

- Warm Water



Chatham-Kent Public utilities Commission Municipal Class Environmental Assessment for the North-East Chatham-Kent Water Distribution System

West Alternatives
Aquatic Habitat

0 0.5 1 2 KM

NAD 1983 UTM Zone 17N

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Figure: 2-2

Alternative BPS 1

Alternative BPS 2

Alternative BPS 3

Jane Rd

Facey Drain

Dickson Drain

Ould's Drain

Cornwall Creek

Thames River

Longwoods Rd

Jane St

23

Mceachran - Hopkins Drain

Ferguson Drain

Cruikshank Creek Drain

Industrial Rd

21

Thamesville

Wallace St

Victoria St

London Rd

Railroad St

2

Duffus Drain

Aerial imagery provided by: Maxar, 2021

Recommended Booster Pump Station Siting Options

Option 1

Option 2

Option 3

Zone 5 Rd

Baseline

0 20 40 80 M

LEGEND

Potential Booster Pump Station Siting Area

D.F.O. Aquatic Species at Risk Habitat Status (D.F.O., 2022)

Critical Habitat

Watercourse with No S.A.R. Presence

General Features (LIO, MNRF, 2022)

Main Railway

Spur Railway

District, County, or Regional Road

Constructed Drain

Municipal Boundary

Watercourse Thermal Regime

Warm Water

21 2 76 78 17 Chatham

Map Extents

Chatham-Kent Public utilities Commission Municipal Class Environmental Assessment for the North-East Chatham-Kent Water Distribution System

Potential Booster Pump Station Alternatives
Aquatic Habitat

0 100 200 400 600 800 1,000 Meters

NAD 1983 UTM Zone 17N

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P:60654246	Rev:00

Figure: 2-3

Project Location: C:\PJ\60654246_CK_PUC_ISE_WDS\Data\PH1\60654246-CK_PUC_ISE_WDS.aprx Layout: Existing Conditions - Booster Pump Station Alternatives - Aquatic Habitat
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Appendix B

Agency Correspondence

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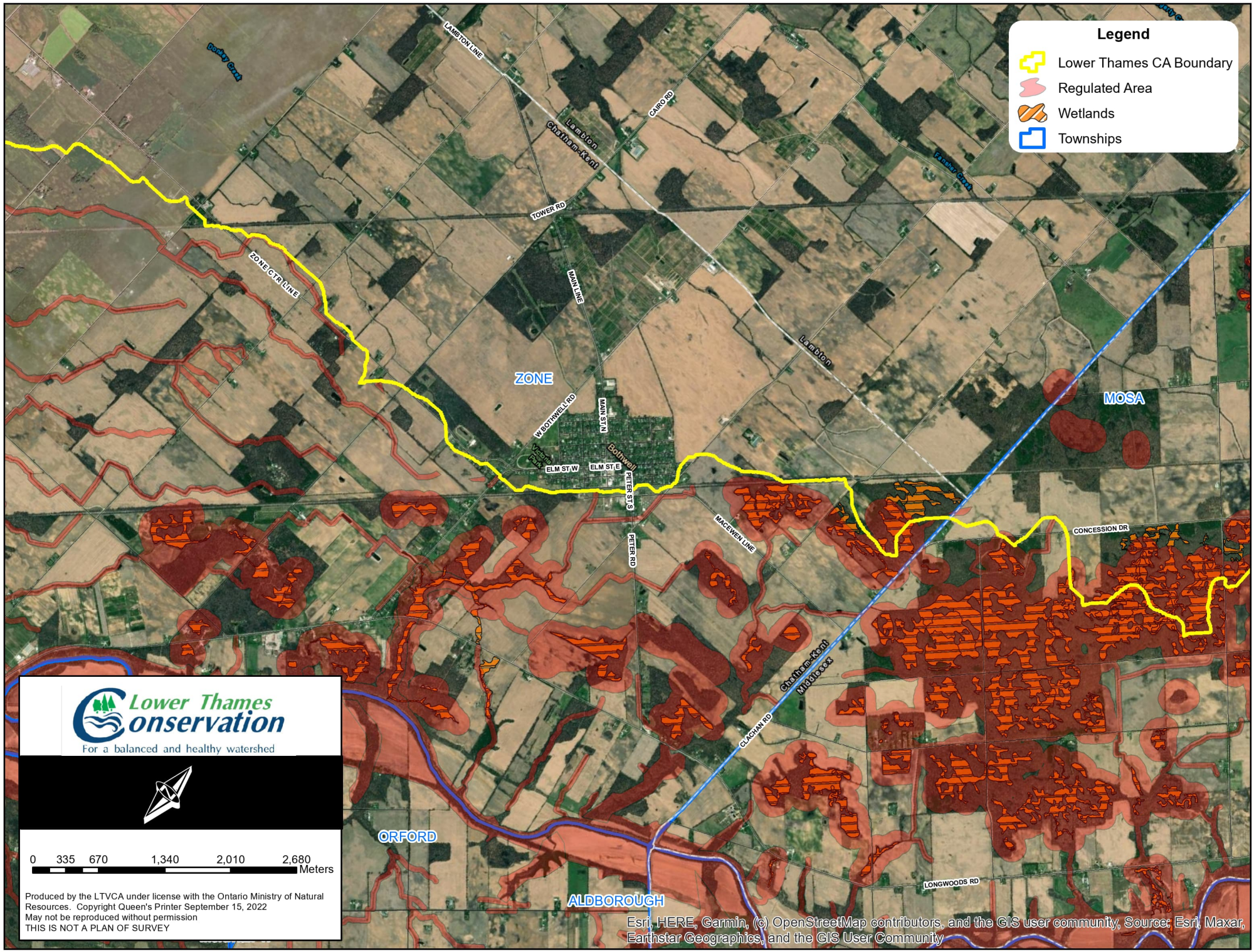
Appendix C

Regulation Area Maps


Legend
Lower Thames CA Boundary
Regulated Area
Wetlands
Townships
LAMBTON LINE
CAIRO RD
Chatham-Kent
Lambton
TOWER RD
ZONE CTR LINE
MAIN LINE
ZONE
MOSA
W BOTHWELL RD
MAIN ST N
Victoria Park
ELM ST W
ELM ST E
Bothwell
PETER ST S
PETER RD
MACEWEN LINE
CONCESSION DR
Chatham-Kent
Middlesex
CLACHAN RD
ORFORD
ALDBOROUGH
LONGWOODS RD
Lower Thames Conservation
For a balanced and healthy watershed
0 335 670 1,340 2,010 2,680
Meters
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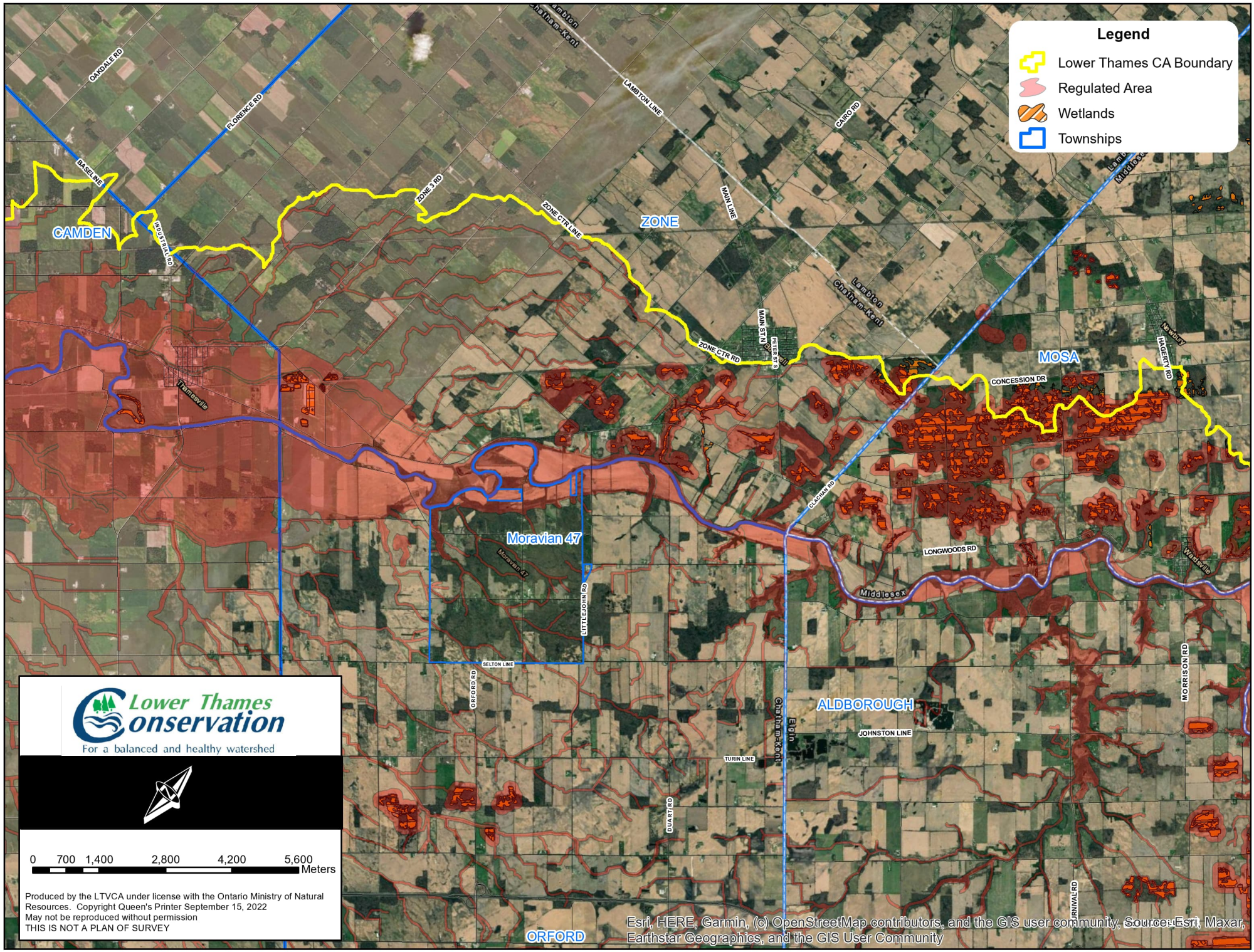
Legend
Lower Thames CA Boundary
Regulated Area
Wetlands
Townships
CAMDEN
ZONE
MOSA
ALDBOROUGH
ORFORD
Moravian 47
Thamesville
Wardsville
OAKDALE RD
FLORENCE RD
BASELINE
INDUSTRIAL RD
ZONE 3 RD
ZONE CTR LINE
ZONE CTR RD
LAMBTON LINE
MAIN LINE
CAIRO RD
MAIN ST N
PETER ST S
CONCESSION DR
NAIRN RD
MAGERY RD
CLACHAN RD
LONGWOODS RD
Middlesex
LITTLEJOHN RD
SELTON LINE
ORFORD RD
JOHNSTON LINE
TURIN LINE
QUARRY RD
MORRISON RD
Chatham-Kent
Elgin
Lower Thames Conservation
For a balanced and healthy watershed
0 700 1,400 2,800 4,200 5,600
Meters
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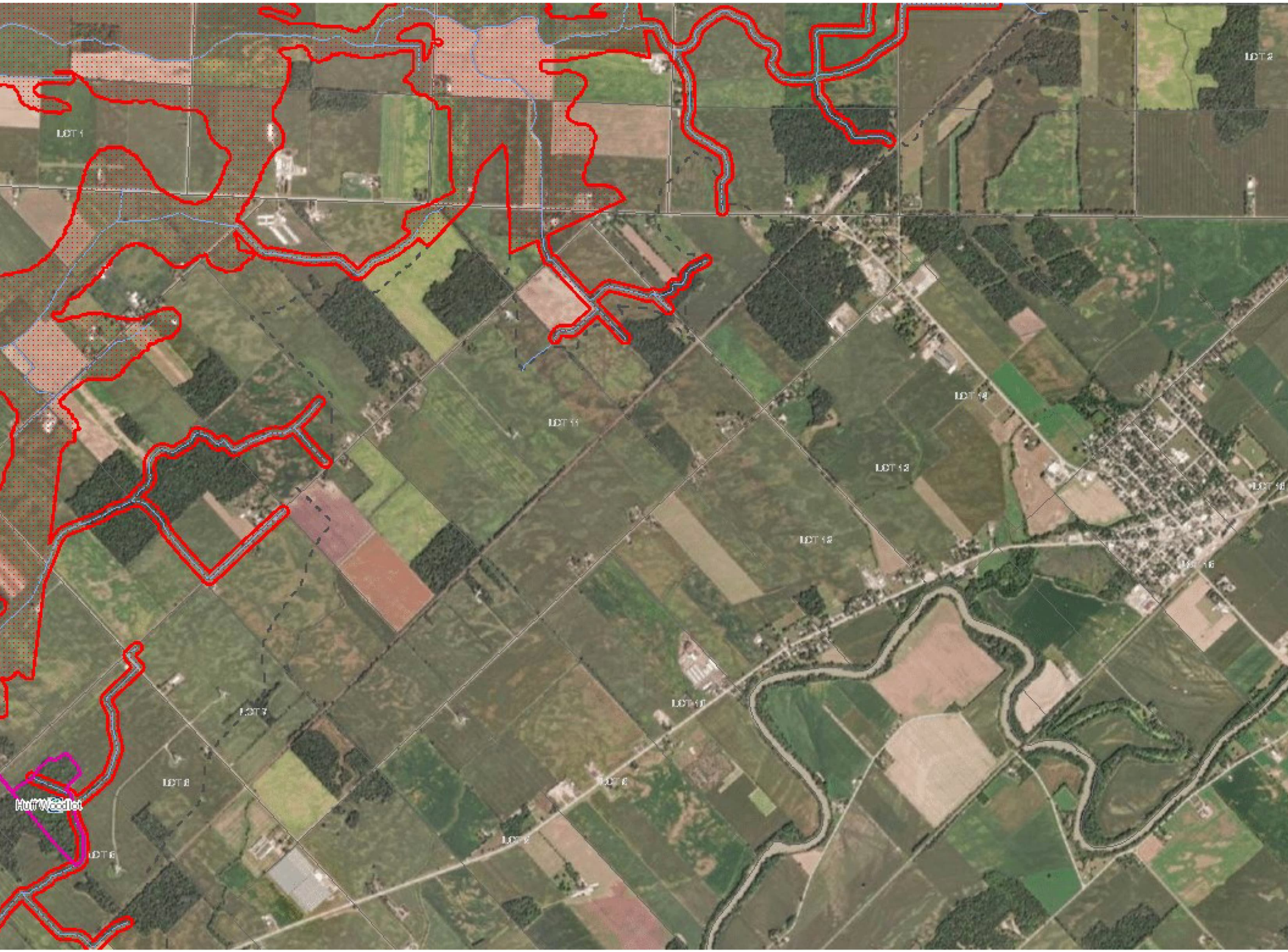
LOT 1
LOT 2
LOT 11
LOT 12
LOT 13
LOT 14
LOT 15
LOT 16
LOT 17
LOT 7
LOT 8
LOT 9
LOT 10
Hutt Woodlot

AECOM

Appendix D

Significant Wildlife Habitat Screening

SWH Ecoregion 7E Criterion Schedule

Table 1.1 Seasonal Concentration Areas of Animals.

Wildlife Habitat	Wildlife Species	CANDIDATE SWH		CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
Waterfowl Stopover and Staging Areas (Terrestrial) **Rationale:** Habitat important to migrating waterfowl.	American Black Duck Northern Pintail Gadwall Blue-winged Teal Green-winged Teal American Wigeon Northern Shoveler Tundra Swan	CUM1 CUT1 - Plus evidence of annual spring flooding from melt water or run-off within these Ecosites. - Fields with waste grain in the Long Point, Rondeau, Lk. St. Clair, Grand Bend and Pt. Pelee areas may be important to Tundra Swans.	Fields with sheet water during Spring (mid- March to May). • Fields flooding during spring melt and run-off provide important invertebrate foraging habitat for migrating waterfowl. • Agricultural fields with waste grains are commonly used by waterfowl, these are not considered SWH unless they have spring sheet water available. <u>Information Sources</u> • Anecdotal information from the landowner, adjacent landowners or local naturalist clubs may be good information in determining occurrence. • Reports and other information available from Conservation Authorities (CAs) • Sites documented through waterfowl planning processes (eg. EHJV implementation plan) • Field Naturalist Clubs • Ducks Unlimited Canada • Natural Heritage Information Centre (NHIC) Waterfowl Concentration Area	Studies carried out and verified presence of an annual concentration of any listed species, evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • Any mixed species aggregations of 100Ⓔ • or more individuals required. • The area of the flooded field ecosite habitat plus a 100-300m radius buffer dependant on local site conditions and adjacent land use is the significant wildlife habitat [cxlviii]. • Annual use of habitat is documented from information sources or field studies (annual use can be based on studies or determined by past surveys with species numbers and dates). • SWHMIST[cxlix] Index #7 provides development effects and mitigation measures.	No	No	No	No	No	No	No	No	No
Waterfowl Stopover and Staging Areas (Aquatic) **Rationale:** Important for local and migrant waterfowl populations during the spring or fall migration or both periods combined. Sites identified are usually only one of	Northern Shoveler American Wigeon Gadwall Green-winged Teal Blue-winged Teal Hooded Merganser Common Merganser Lesser Scaup Greater Scaup Long-tailed Duck Surf Scoter White-winged Scoter Black Scoter Ring-necked duck Common Goldeneye	MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7	<u>Information Sources</u> • Environment Canada • Naturalist clubs often are aware of staging/stopover areas. • OMNRF Wetland Evaluations indicate presence of locally and regionally significant waterfowl staging. • Sites documented through waterfowl planning processes (eg. EHJV implementation plan) • Ducks Unlimited projects • Element occurrence specification by Nature Serve: http://www.natureserve.org • Natural Heritage Information Centre (NHIC) Waterfowl Concentration Area	Studies carried out and verified presence of: • Aggregations of 100 Ⓔ or more of listed species for 7 daysⒺ, results in > 700 waterfowl use days. • Areas with annual staging of ruddy ducks, canvasbacks, and redheads are SWH [cxlix] • The combined area of the ELC ecosites and a 100m radius area is the SWH [cxlviii] • Wetland area and shorelines associated with sites identified within the SWHTG [cxlviii] Appendix K [cxlix] are significant wildlife habitat. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • Annual Use of Habitat is Documented from Information Sources or Field Studies (Annual can be based on completed studies or determined from past surveys with species numbers and dates recorded). • SWH MIST[cxlix] Index #7 provides development effects and mitigation measures.	No	No	No	No	No	No	No	No	No

Wildlife Habitat	Wildlife Species	CANDIDATE SWH		CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
a few in the eco-district.	Bufflehead Redhead Ruddy Duck Red-breasted Merganser Brant Canvasback Ruddy Duck												
Shorebird Migratory Stopover Area **<u>Rationale:</u>** High quality shorebird stopover habitat is extremely rare and typically has a long history of use.	Greater Yellowlegs Lesser Yellowlegs Marbled Godwit Hudsonian Godwit Black-bellied Plover American Golden-Plover Semipalmated Plover Solitary Sandpiper Spotted Sandpiper Semipalmated Sandpiper Pectoral Sandpiper White-rumped Sandpiper Baird's Sandpiper Least Sandpiper Purple Sandpiper Stilt Sandpiper Short-billed Dowitcher Red-necked Phalarope Whimbrel Ruddy Turnstone Sanderling Dunlin	BBO1 BBO2 BBS1 BBS2 BBT1 BBT2 SDO1 SDS2 SDT1 MAM1 MAM2 MAM3 MAM4 MAM5	Shorelines of lakes, rivers and wetlands, including beach areas, bars and seasonally flooded, muddy and un-vegetated shoreline habitats. Great Lakes coastal shorelines, including groynes and other forms of armour rock lakeshores, are extremely important for migratory shorebirds in May to mid-June and early July to October. Sewage treatment ponds and storm water ponds do not qualify as a SWH, <u>Information Sources</u> • Western hemisphere shorebird reserve network. • Canadian Wildlife Service (CWS) Ontario Shorebird Survey. • Bird Studies Canada • Ontario Nature • Local birders and naturalist clubs • NHIC Shorebird Migratory Concentration Area	Studies confirming: • Presence of 3 or more of listed species and > 1000[Í] shorebird use days during spring or fall migration period. (shorebird use days are the accumulated number of shorebirds counted per day over the course of the fall or spring migration period) • Whimbrel stop briefly (<24hrs) during spring migration, any site with >100[Í] Whimbrel used for 3 years or more is significant. • The area of significant shorebird habitat includes the mapped ELC shoreline ecosites plus a 100m radius area [cxlviii] • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWH MIST[cxlix] Index #8 provides development effects and mitigation measures.	No	No	No	No	No	No	No	No	No
Raptor Wintering Area **<u>Rationale;</u>** Sites used by multiple species, a high number of	Rough-legged Hawk Red-tailed Hawk Northern Harrier American Kestrel Snowy Owl	**<u>Hawks/Owls</u>** Combination of ELC Community Series; need to have present one Community Series from each land class; Forest: FOD, FOM, FOC.	The habitat provides a combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors. Raptor wintering(hawk/owl) sites need to be > 20 ha [cxlviii, cxlix] with a combination of forest and upland.[xvi, xvii, xviii, xix, xx, xxi] Least disturbed sites, idle/fallow or lightly grazed field/meadow (>15ha) with adjacent woodlands [cxlix]	Studies confirm the use of these habitats by: • One or more Short-eared Owls or; One of more Bald Eagles or; At least 10 individuals and two of listed hawk/owl species Ⓔ. • To be significant a site must be used regularly (3 in 5 years) [cxlix] for a minimum of 20 days by the above number of birds Ⓔ.	Yes	Yes	Yes	NO	NO	NO	NO	NO	NO

Wildlife Habitat	Wildlife Species	CANDIDATE SWH		CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
individuals and used annually are most significant	**Special Concern:** Short-eared Owl Bald Eagle	Upland: CUM; CUT; CUS; CUW. **Bald Eagle:** Forest community Series: FOD, FOM, FOC, SWD, SWM or SWC on shoreline areas adjacent to large rivers or lakes with open water (hunting areas).	Field area of the habitat is to be wind swept with limited snow depth or accumulation. Eagle sites have open water and large trees and snags available for roosting. Information Sources: • OMNR Ecologist or Biologist • Naturalist club • Natural Heritage Information Center (NHIC) Raptor Winter Concentration Area • Data from Bird Studies Canada, most notably for Short-eared Owls. • Results of Christmas Bird Counts. • Reports and other information available from Conservation Authorities.	• The habitat area for an Eagle winter site is the shoreline forest ecosites directly adjacent to the prime hunting area Ⓔ. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWH MIST[cxlix] Index #10 and #11 provides development effects and mitigation measures.									
Bat Hibernacula **Rationale:** Bat hibernacula are rare habitats in all Ontario landscapes.	Big Brown Bat Tri-colored Bat	Bat Hibernacula may be found in these ecosites: CCR1 CCR2 CCA1 CCA2 (Note: buildings are not considered to be SWH)	Hibernacula may be found in caves, mine shafts, underground foundations and Karsts. Active mine sites should not be considered as SWH. The locations of bat hibernacula are relatively poorly known. Information Sources • OMNR for possible locations and contact for local experts • Natural Heritage Information Center (NHIC) Bat Hibernaculum • Ministry of Northern Development and Mines for location of mine shafts. • Clubs that explore caves (eg. Sierra Club) • University Biology Departments with bat experts.	• All sites with confirmed hibernating bats are SWH Ⓔ. • The area includes 200m radius around the entrance of the hibernaculum [cxlviii, ccvii, Ⓔ] for most development types and 1000m for wind farms. • Studies are to be conducted during the peak swarming period (Aug. – Sept.). Surveys should be conducted following methods outlined in the "Guideline for Wind Power Projects Potential Impacts to Bats and Bat Habitats"[ccv]. • SWH MIST[cxlix] Index #1 provides development effects and mitigation measures.	No	No	No	No	No	No	No	No	No

Wildlife Habitat	Wildlife Species	CANDIDATE SWH		CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
Bat Maternity Colonies **Rationale:** Known locations of forested bat maternity colonies is extremely rare in all Ontario landscapes.	Big Brown Bat Silver-haired Bat	Maternity colonies considered SWH are found in forested Ecosites. All ELC Ecosites in ELC Community Series: FOD FOM SWD SWM	Maternity colonies can be found in tree cavities, vegetation and often in buildlings[xxii, xxv, xxvi, xxvii, xxxi] (buildings are not considered to be SWH). Maternity roosts are not found in caves and mines in Ontario[xxii]. • Maternity colonies located in Mature deciduous or mixed forest stands[ccix, ccx] with >10/ha large diameter (>25cm dbh) wildlife trees[ccvii] • Female Bats prefer wildlife tree (snags) in early stages of decay, class 1-3 [ccxiv] or class 1 or 2 [ccxii]. • Silver-haired Bats prefer older mixed or deciduous forest and form maternity colonies in tree cavities and small hollows. Older forest areas with at least 21 snags/ha are preferred[ccx] Information Sources • OMNR for possible locations and contact for local experts • University Biology Departments with bat experts.	• Maternity Colonies with confirmed use by; – >10 Big Brown Bats[Í] – >5 Adult Female Silver-haired Bats[Í] • The area of the habitat includes the entire woodland or the forest stand ELC Ecosite containing the maternity colonies[Í]. • Evaluation methods for maternity colonies should be conducted following methods outlined in the "Bats and Bat Habitats: Guidelines for Wind Power Projects""[ccv]. • SWH MIST[cxlix] Index #12 provides development effects and mitigation measures.	Yes	Yes	Yes	NO	NO	NO	NO	NO	NO
Turtle Wintering Areas **Rationale:** Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant.	Midland Painted Turtle **Special Concern:** Northern Map Turtle Snapping Turtle	Snapping and Midland Painted turtles; ELC Community Classes; SW, MA, OA and SA. ELC Community Series; FEO and BOO Northern Map Turtle - Open Water areas such as deeper rivers or streams and lakes with current can also be used as over-wintering habitat.	For most turtles, wintering areas are in the same general area as their core habitat. Water has to be deep enough not to freeze and have soft mud substrates. • Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen. [cix, cx, cxi, cxviii] • Man-made ponds such as sewage lagoons or storm water ponds should not be considered SWH. Information Sources • EIS studies carried out by Conservation Authorities. • Field Naturalist Clubs • OMNRF Ecologist or Biologist • Natural Heritage Information Center (NHIC)	• Presence of 5 over-wintering Midland Painted Turtles is significant[Í]. • One or more Northern Map Turtle or Snapping Turtle over-wintering within a wetland is significant[Í]. • The mapped ELC ecosite area with the over wintering turtles is the SWH. If the hibernation site is within a stream or river, the deep-water pool where the turtles are over wintering is the SWH. • Over wintering areas may be identified by searching for congregations (Basking Areas) of turtles on warm, sunny days during the fall (Sept. – Oct.) or spring (Mar. – May) [cvii]. Congregation of turtles is more common where wintering areas are limited and therefore significant [cix, cx, cxi, cxii]. • SWH MIST[cxlix] Index #28 provides development effects and mitigation measures for turtle wintering habitat.	No	. No	No	No	No	No	No	No	No
Reptile Hibernaculum **Rationale:** Generally sites are	**Snakes:** Eastern Gartersnake Northern Watersnake Northern Red-bellied Snake	For all snakes, habitat may be found in any ecosite other than very wet ones. Talus, Rock Barren, Crevice and Cave, and Alvar sites may	For snakes, hibernation takes place in sites located below frost lines in burrows, rock crevices and other natural or naturalized locations. The existence of features that go below frost line; such as rock piles or slopes, old stone fences, and abandoned crumbling foundations assist in identifying candidate SWH.	Studies confirming: • Presence of snake hibernacula used by a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. • Congregations of a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. near potential hibernacula (eg. foundation or rocky	Yes	Yes	Yes	Yes	Yes	Yes	NO	NO	NO

Wildlife Habitat	Wildlife Species	CANDIDATE SWH		CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
the only known sites in the area. Sites with the highest number of individuals are most significant.	Northern Brownsnake Smooth Green Snake Northern Ring-necked Snake **Special Concern:** Milksnake Eastern Ribbonsnake	be directly related to these habitats. Observations of congregations of snakes on sunny warm days in the spring or fall is a good indicator.	Areas of broken and fissured rock are particularly valuable since they provide access to subterranean sites below the frost line[xliv, l, li, lii, cxii]. Wetlands can also be important over-wintering habitat in conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock ground cover. Information Sources • In spring, local residents or landowners may have observed the emergence of snakes on their property (e.g.old dug wells). • Reports and other information available from Conservation Authorities. • Field Naturalist Clubs • University herpetologists. • Natural Heritage Information Center (NHIC)	slope) on sunny warm days in Spring (Apr/May) and Fall (Sept/Oct)[Í]. • Note: If there are Special Concern Species present, then site is SWH • Note: Sites for hibernation possess specific habitat parameters (e.g. temperature, humidity, etc.) and consequently are used annually, often by many of the same individuals of a local population [i.e. strong hibernation site fidelity.]. Other critical life processes (e.g. mating) often take place in close proximity to hibernacula. The feature in which the hibernacula is located plus a 30 m buffer is the SWH[Ⓔ] • SWH MIST[cxlix] Index #13 provides development effects and mitigation measures for snake hibernacula.									
Colonially -Nesting Bird Breeding Habitat (Bank and Cliff) **Rationale:** Historical use and number of nests in a colony make this habitat significant. An identified colony can be very important to local populations. All swallow population are declining in Ontario.	Cliff Swallow Northern Rough-winged Swallow (this species is not colonial but can be found in Cliff Swallow colonies).	Eroding banks, sandy hills, borrow pits, steep slopes, and sand piles, cliff faces, bridge abutments, silos, barns (Cliff Swallows). Habitat found in the following ecosites: CUM1 CUT1 CUS1 BLO1 BLS1 BLT1 CLO1 CLS1 CLT1	• Any site or areas with exposed soil banks, undisturbed or naturally eroding that is not a licensed/permitted aggregate area. • Does not include man-made structures (bridges or buildings) or recently (2 years) disturbed soil areas, such as berms, embankments, soil or aggregate stockpiles. • Does not include a licensed/permitted Mineral Aggregate Operation. Information Sources • Reports and other information available from Conservation Authorities • Ontario Breeding Bird Atlas [ccv]. • Bird Studies Canada; *NatureCounts* http://www.birdscanada.org/birdmon/ • Field Naturalist Clubs.	Studies confirming: • Presence of 1 or more nesting sites with 8[cxlvix] or more cliff swallow pairs and/or rough-winged swallow pairs during the breeding season. • A colony identified as SWH will include a 50m radius habitat area from the peripheral nests[ccvii] • Field surveys to observe and count swallow nests are to be completed during the breeding season (May-June). Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWH MIST[cxlix] Index #4 provides development effects and mitigation measures	No	No	No	No	No	No	No	No	No
Colonially -Nesting Bird Breeding Habitat (Tree/Shrubs)	Great Blue Heron Black-crowned Night-Heron Great Egret Green Heron	SWM2 SWM3 SWM5 SWM6 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7 FET1	• Nests in live or dead standing trees in wetlands, lakes, islands, and peninsulas. Shrubs and occasionally emergent vegetation may also be used. • Most nests in trees are 11 to 15 m from ground, near the top of the tree.	Studies confirming: • Presence of 2[Ⓔ] or more active nests of Great Blue Heron or other listed species.. • The habitat extends from the edge of the colony and a minimum 300 m radius or extend of the	No	No	No	No	No	No	No	No	No

Wildlife Habitat	Wildlife Species	CANDIDATE SWH		CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
Rationale; Large colonies are important to local bird population, typically sites are only known colony in area and are used annually.			Information Sources • Ontario Breeding Bird Atlas [ccv], colonial nest records. • Ontario Heronry Inventory 1991 available from Bird Studies Canada or NHIC (OMNRF). • Natural Heritage Information Center (NHIC) Mixed Wader Nesting Colony • Aerial photographs can help identify large heronries. • Reports and other information available from Conservation Authorities • MNRF District Offices. • Local naturalist clubs.	Forest Ecosite containing the colony or any island <15.0ha with a colony is the SWH [cc, ccvii] • Confirmation of active heronries are to be achieved through site visits conducted during the nesting season (April to August) or by evidence such as the presence of fresh guano, dead young and/or eggshells • SWH MIST[cxlix] Index #5 provides development effects and mitigation measures.									
Colonially -Nesting Bird Breeding Habitat (Ground) **Rationale:** Colonies are important to local bird population, typically sites are only known colony in area and are used annually.	Herring Gull Great Black-backed Gull Little Gull Ring-billed Gull Common Tern Caspian Tern Brewer's Blackbird	Any rocky island or peninsula (natural or artificial) within a lake or large river (two-lined on a 1;50,000 NTS map). Close proximity to watercourses in open fields or pastures with scattered trees or shrubs (Brewer's Blackbird) MAM1 – 6; MAS1 – 3; CUM CUT CUS	• Nesting colonies of gulls and terns are on islands or peninsulas associated with open water or in marshy areas. • Brewers Blackbird colonies are found loosely on the ground in or in low bushes in close proximity to streams and irrigation ditches within farmlands. Information Sources • Ontario Breeding Bird Atlas [ccv], rare/colonial species records. • Canadian Wildlife Service • Reports and other information available from Conservation Authorities • Natural Heritage Information Center (NHIC) Colonial Waterbird Nesting Area • MNRF District Offices. • Field Naturalist Clubs.	Studies confirming: • Presence of > 25 active nests for Herring Gulls or Ring-billed Gulls, >5 active nests for Common Tern or >2 active nests for Caspian Tern Ⓔ. • Presence of 5 or more pairs for Brewer's Blackbird Ⓔ • Any active nesting colony of one or more Little Gull, and Great Black-backed Gull is significant Ⓔ. • • The edge of the colony and a minimum 150m radius area of habitat, or the extent of the ELC ecosites containing the colony or any island <3.0ha with a colony is the SWH [cc, ccvii] • Studies would be done during May/June when actively nesting. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWH MIST[cxlix] Index #6 provides development effects and mitigation measures.	No	No	No	No	No	No	No	No	No
Migratory Butterfly Stopover Areas **Rationale:** Butterfly stopover areas are extremely rare habitats and are biologically important for butterfly species that migrate	Painted Lady Red Admiral Special Concern Monarch	Combination of ELC Community Series; need to have present one Community Series from each landclass: Field: CUM CUT CUS Forest: FOC FOD FOM CUP Anecdotally, a candidate sight for butterfly stopover will have a history of butterflies being observed.	A butterfly stopover area will be a minimum of 10 ha in size with a combination of field and forest habitat present, and will be located within 5 km of Lake Erie and Ontario [cxlix]. • The habitat is typically a combination of field and forest, and provides the butterflies with a location to rest prior to their long migration south [xxxii, xxxiii, xxxiv, xxxv, xxxvi]. • The habitat should not be disturbed, fields/meadows with an abundance of preferred nectar plants and woodland edge providing shelter are requirements for this habitat [cxlviii, cxlix]. • Stopover areas usually provide protection from the elements and are often spits of land or areas with the shortest distance to cross the Great Lakes [xxxvii, xxxviii, xxxix, xl, xli]. Information Sources • MNRF district Offices • Natural Heritage Information Center (NHIC)	Studies confirm: • The presence of Monarch Use Days (MUD) during fall migration (Aug/Oct)[xliii]. MUD is based on the number of days a site is used by Monarchs, multiplied by the number of individuals using the site. Numbers of butterflies can range from 100-500/day[xxxvii], significant variation can occur between years and multiple years of sampling should occur [xl, xlii]. • Observational studies are to be completed and need to be done frequently during the migration period to estimate MUD • MUD of >5000 **or** >3000 with the presence of Painted Ladies or Red Admiral's is to be considered significant. Ⓔ SWH MIST [cxlix] Index #16 provides development effects and mitigation measures.	No	No	No	No	No	No	No	No	No

Wildlife Habitat	Wildlife Species	CANDIDATE SWH		CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
south for the winter.			• Agriculture Canada in Ottawa may have list of butterfly experts. • Field Naturalist Clubs • Toronto Entomologists Association • Conservation Authorities										
Land bird Migratory Stopover Areas **Rationale:** Sites with a high diversity of species as well as high numbers are most significant.	All migratory songbirds. Canadian Wildlife Service Ontario website: http://www.ec.gc default.asp?lanc 1B7A9D All migrant raptors species: Ontario Ministry of Natural Resources: Fish and Wildlife Conservation Act, 1997. Schedule 7: Specially Protected Birds (Raptors)	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD	Woodlots need to be >5 haⒺ in size and within 5 km [iv, v, vi, vii, viii, ix, x, xi, xii, xiii, xiv, xv] of Lake Ontario and Erie. If woodlands are rare in an area of shoreline, woodland fragments 2-5ha can be considered for this habitat. Ⓔ • • If multiple woodlands are located along the shoreline those Woodlands <2km from Lake Erie and Lake Ontario are more significant [cxlix] • Sites have a variety of habitats; forest, grassland and wetland complexes [cxlix]. • The largest sites are more significant [cxlix] • Woodlots and forest fragments are important habitats to migrating birds[ccxviii], these features located along the shore and located within 5km of Lake Erie and Lake Ontario are Candidate SWH [cxlviii]. Information Sources • Bird Studies Canada • Ontario Nature • Local birders and naturalist club • Ontario Important Bird Areas (IBA) Program	Studies confirm: • Use of the woodlot by >200 birds/day and with >35 spp with at least 10 bird spp. recorded on at least 5 different survey datesⒺ. This abundance and diversity of migrant bird species is considered above average and significant. • Studies should be completed during spring (March to May) and fall (Aug to Oct) migration using standardized assessment techniques. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWH MIST [cxlix] Index #9 provides development effects and mitigation measures.	No	No	No	No	No	No	No	No	No
Deer Winter Congregation Areas **Rationale:** Deer movement during winter in the southern areas of Ecoregion 7E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodland	White-tailed Deer	All Forested Ecosites with these ELC Community Series; FOC FOM FOD SWC SWM SWD Conifer plantations much smaller than 50 ha may also be used.	• Woodlots >100 ha in size or if large woodlots are rare in a planning area woodlots>50ha Ⓔ. • Deer movement during winter in the southern areas Ecoregion 7E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands [cxlviii]. • Large woodlots > 100ha and up to 1500 ha are known to be used annually by densities of deer that range from 0.1-1.5 deer/ha [ccxxiv]. • Woodlots with high densities of deer due to artificial feeding are not significantⒺ. Information Sources • MNRF District Offices. • LIO/NRVIS	Studies confirm: • Deer management is an MNRF responsibility, deer winter congregation areas considered significant will be mapped by MNRF [cxlviii]. • Use of the woodlot by white-tailed deer will be determined by MNRF, all woodlots exceeding the area criteria are significant, unless determined not to be significant by MNRFⓅ • Studies should be completed during winter (Jan/Feb) when >20cm of snow is on the ground using aerial survey techniques[ccxxiv] , ground or road surveys, or a pellet count deer density survey[ccxxv]. • SWH MIST [cxlix] Index #2 provides development effects and mitigation measures.	No	No	No	No	No	No	No	No	No

Wildlife Habitat	Wildlife Species	CANDIDATE SWH		CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
s to reduce or avoid the impacts of winter conditions [cxlviii].													

Table 1.2.1 Rare Vegetation Communities.

Rare Vegetation Community	CANDIDATE SWH			CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
	ELC Ecosite Code	Habitat Description	Detailed Information and Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3 Bothwell Option 2C
Cliffs and Talus Slopes **Rationale:** Cliffs and Talus Slopes are extremely rare habitats in Ontario.	Any ELC Ecosite within Community Series: TAO CLO TAS CLS TAT CLT	A Cliff is vertical to near vertical bedrock >3m in height. A Talus Slope is rock rubble at the base of a cliff made up of coarse rocky debris	Most cliff and talus slopes occur along the Niagara Escarpment. Information Sources • The Niagara Escarpment Commission has detailed information on location of these habitats. • OMNRF Districts • Natural Heritage Information Center (NHIC) has location information available their website • Field Naturalist Clubs • Conservation Authorities	• Confirm any ELC Vegetation Type for Cliffs or Talus Slopes [lxxviii] • SWH MIST[cxlix] Index #21 provides development effects and mitigation measures.	No	No	No	No	No	No	No	No	No
Sand Barren **Rationale:** Sand barrens are rare in Ontario and support rare species. Most Sand Barrens have been lost due to cottage development and forestry	ELC Ecosites: SBO1 SBS1 SBT1 Vegetation cover varies from patchy and barren to continuous meadow (SBO1), thicket-like (SBS1), or more closed and treed (SBT1). Tree cover always ≤ 60%.	Sand Barrens typically are exposed sand, generally sparsely vegetated and caused by lack of moisture, periodic fires and erosion. Usually located within other types of natural habitat such as forest or savannah. Vegetation can vary from patchy and barren to tree covered but less than 60%.	A sand barren area >0.5ha in size Ⓔ. Information Sources • OMNRF Districts. • Natural Heritage Information Center (NHIC) has location information available on their website • Field Naturalist Clubs • Conservation Authorities	• Confirm any ELC Vegetation Type for Sand Barrens [lxxviii] • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics) Ⓔ. • SWHMIST[cxlix] Index #20 provides development effects and mitigation measures.	No	No	No	No	No	No	No	No	No
Alvar **Rationale:** Alvars are extremely rare habitats in Ecoregion 7E.	ALO1 ALS1 ALT1 FOC1 FOC2 CUM2 CUS2 CUT2-1 CUW2 **Five Alvar Indicator Species:**	An alvar is typically a level, mostly unfractured calcareous bedrock feature with a mosaic of rock pavements and bedrock overlain by a thin veneer of soil. The hydrology of alvars is complex, with alternating periods of inundation and drought. Vegetation cover varies from sparse lichen-moss associations to grasslands and	An Alvar site > 0.5 ha in size [lxxv]. Alvar is particularly rare in Ecoregion 7E where the only known sites are found in the western islands of Lake Erie.[cxcix] Information Sources • Alvars of Ontario (2000), Federation of Ontario Naturalists [lxxvi]. • Ontario Nature – Conserving Great Lakes Alvars[ccviii]. • Natural Heritage Information Center (NHIC) has location	Field studies identify four of the five Ⓔ **Alvar Indicator Species** [lxxv] at a Candidate Alvar site is Significant. • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics). • The alvar must be in excellent condition and fit in with surrounding landscape with few conflicting land uses [lxxv].	No	No	No	No	No	No	No	No	No

Rare Vegetation Community	CANDIDATE SWH			CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
	ELC Ecosite Code	Habitat Description	Detailed Information and Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3 Bothwell Option 2C
	1)*Carex crawei* 2)*Panicum philadelphicum* 3)*Elocharis compressa* 4)*Scutellaria parvula* 5)*Trichostema brachiatum* These indicator species are very specific to Alvars within Ecoregion 7EⒺ.	shrublands and comprising a number of characteristic or indicator plant. Undisturbed alvars can be phyto- and zoogeographically diverse, supporting many uncommon or are relict plant and animals species. Vegetation cover varies from patchy to barren with a less than 60% tree cover [lxxviii].	information available on their website • OMNRF Staff. • Field Naturalist Clubs. • Conservation Authorities.	• SWH MIST[cxlix] Index #17 provides development effects and mitigation measures.									
Old Growth Forest **<u>Rationale:</u>** Due to historic logging practices and land clearance for agriculture, old growth forest is rare in Ecoregion 7E.	Forest Community Series: FOD FOC FOM SWD SWC SWM	Old-growth forests are characterized by heavy mortality or turnover of over-storey trees resulting in mosaic of gaps that encourage development of multi-layered canopy and an abundance of snags and downed woody debris.	• Woodland area is >0.5 haⒺ. <u>Information Sources</u> • OMNRF Forest Resource Inventory mapping • OMNRF Districts. • Field Naturalist Clubs • Conservation Authorities • Sustainable Forestry Licence (SFL) companies will possibly know locations through field operations. • Municipal forestry departments	Field Studies will determine: • If dominant trees species of the ecosite are >140 years old, then area containing these trees is Significant Wildlife Habitat [cxlviii]. • The forested area containing the old growth characteristics will have experienced no recognizable forestry activities (cut steps will not be present) • The area of forest ecosites combined or an eco-element within an ecosite that contain the old growth characteristics is the SWH. • Determine ELC vegetation types for the forest area containing the old growth characteristics[lxxviii]. • SWH MIST[cxlix] Index #23 provides development effects and mitigation measures.	Yes	Yes	Yes	NO	NO	NO	NO	NO	NO
Savannah **<u>Rationale:</u>** Savannahs are extremely rare habitats in Ontario.	TPS1 TPS2 TPW1 TPW2 CUS2	A Savannah is a tallgrass prairie habitat that has tree cover between 25 – 60%. In ecoregion 7E, known Tallgrass Prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie shoreline, in Brantford and in the Toronto area (north of Lake Ontario).	No minimum size to site Ⓔ Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH. <u>Information Sources</u> • Natural Heritage Information Center (NHIC) has location data available on their website. • OMNRF Districts. • Field Naturalists Clubs. • Conservation Authorities.	Field studies confirm one or more of the Savannah indicator species listed in [lxxv] Appendix N should be present Ⓔ. Note: Savannah plant spp. list from Ecoregion 7E should be used • Area of the ELC Ecosite is the SWH· • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics). • SWH MIST[cxlix] Index #18 provides development effects and mitigation measures.	No	No	No	No	No	No	No	No	No

Rare Vegetation Community	CANDIDATE SWH			CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
	ELC Ecosite Code	Habitat Description	Detailed Information and Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3 Bothwell Option 2C
Tallgrass Prairie **<u>Rationale:</u>** Tallgrass Prairies are extremely rare habitats in Ontario.	TPO1 TPO2	A Tallgrass Prairie has ground cover dominated by prairie grasses. An open Tallgrass Prairie habitat has < 25% tree cover. In ecoregion 7E, known Tallgrass Prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie shoreline, in Brantford and in the Toronto area (north of Lake Ontario). [cc]	No minimum size to site Ⓔ. Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH. <u>Information Sources</u> • OMNRF Districts. • Natural Heritage Information Center (NHIC) has location data available on their website. • Field Naturalists Clubs. • Conservation Authorities •	Field studies confirm one or more of the Prairie indicator species listed in [lxxv] Appendix N should be present Ⓔ. Note: Prairie plant spp. list from Ecoregion 7E should be used • Area of the ELC Ecosite is the SWH • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics). • SWH MIST[cxlix] Index #19 provides development effects and mitigation measures.	No	No	No	No	No	No	No	No	No
Other Rare Vegetation Communities **<u>Rationale:</u>** Plant communities that often contain rare species which depend on the habitat for survival.	Provincially Rare S1, S2 and S3 vegetation communities are listed in Appendix M of the SWHTG[cxlviii] . Any ELC Ecosite Code that has a possible ELC Vegetation Type that is Provincially Rare is Candidate SWH.	Rare Vegetation Communities may include beaches, fens, forest, marsh, barrens, dunes and swamps.	ELC Ecosite codes that have the potential to be a rare ELC Vegetation Type as outlined in appendix M [cxlviii] The OMNRF/NHIC will have up to date listing for rare vegetation communities. <u>Information Sources</u> • OMNRF Districts. • Natural Heritage Information Center (NHIC) has location data available on their website. • Field Naturalists Clubs. • Conservation Authorities •	Field studies should confirm if an ELC Vegetation Type is a rare vegetation community based on listing within Appendix M of SWHTG[cxlviii] . • Area of the ELC Vegetation Type polygon is the SWH. • SWH MIST [cxlix] Index #37 provides development effects and mitigation measures.	Yes	Yes	Yes	NO	NO	NO	NO	NO	NO

Table 1.2.2 Specialized Habitats of Wildlife considered SWH.

Specialized Wildlife Habitat	Wildlife Species	CANDIDATE SWH		CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
Waterfowl Nesting Area **Rationale;** Important to local waterfowl populations, sites with greatest number of species and highest number of individuals are significant.	American Black Duck Northern Pintail Northern Shoveler Gadwall Blue-winged Teal Green-winged Teal Wood Duck Hooded Merganser Mallard	All upland habitats located adjacent to these wetland ELC Ecosites are Candidate SWH: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SWT1 SWT2 SWD1 SWD2 SWD3 SWD4 **Note: includes adjacency to Provincially Significant Wetlands**	A waterfowl nesting area extends 120 m [cxlix] from a wetland (> 0.5 ha) or a wetland (>0.5 ha) with small wetlands (<0.5ha) within 120m or a cluster of 3 or more small (<0.5 ha) wetlands within 120 m of each individual wetland where waterfowl nesting is known to occur [cxlix]. • Upland areas should be at least 120m wide so that predators such as racoons, skunks, and foxes have difficulty finding nests. • Wood Ducks and Hooded Mergansers utilize large diameter trees (>40cm dbh) in woodlands for cavity nest sites. Information Sources • Ducks Unlimited staff may know the locations of particularly productive nesting sites. • OMNRF Wetland Evaluations for indication of significant waterfowl nesting habitat. • Reports and other information available from Conservation Authorities	Studies confirmed: • Presence of 3 or more nesting pairs for listed species excluding Mallards(E) , or; • Presence of 10 or more nesting pairs for listed species including Mallards(E) • Any active nesting site of an American Black Duck is considered significant. • Nesting studies should be completed during the spring breeding season (April - June). Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • A field study confirming waterfowl nesting habitat will determine the boundary of the waterfowl nesting habitat for the SWH, this may be greater or less than 120 m [cxlviii] from the wetland and will provide enough habitat for waterfowl to successfully nest. • SWH MIST[cxlix] Index #25 provides development effects and mitigation measures.	No	No	No	No	No	No	No	No	No
Bald Eagle and Osprey Nesting, Foraging and Perching Habitat **Rationale;** Nest sites are fairly uncommon in Ecoregion 7E and are used annually by these species. Many suitable nesting locations may be lost due to increasing shoreline development pressures and scarcity of habitat.	Osprey **Special Concern** Bald Eagle	ELC Forest Community Series: FOD, FOM, FOC, SWD, SWM and SWC directly adjacent to riparian areas – rivers, lakes, ponds and wetlands	Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water. • Osprey nests are usually at the top a tree whereas Bald Eagle nests are typically in super canopy trees in a notch within the tree's canopy. • Nests located on man-made objects are not to be included as SWH (e.g. telephone poles and constructed nesting platforms). Information Sources •Natural Heritage Information Center (NHIC) compiles all known nesting sites for Bald Eagles in Ontario. • MNRF values information (LIO/NRVIS) will list known nesting locations, Note: data from NRVIS is provided as a point and does not represent all the habitat. • Nature Counts, Ontario Nest Records Scheme data. • OMNRF Districts. • Check the Ontario Breeding Bird Atlas [ccv] or Rare Breeding Birds in Ontario for species documented • Reports and other information available from Conservation Authorities • Field naturalist Clubs	Studies confirm the use of these nests by: • One or more active Osprey or Bald Eagle nests in an area[cxlviii] . • Some species have more than one nest in a given area and priority is given to the primary nest with alternate nests included within the area of the SWH. • For an Osprey, the active nest and a 300 m radius around the nest or the contiguous woodland stand is the SWH [ccvii], maintaining undisturbed shorelines with large trees within this area is important[cxlviii]. • For a Bald Eagle the active nest and a 400-800 m radius around the nest is the SWH. [cvi, ccvii] Area of the habitat from 400-800m is dependant on site lines from the nest to the development and inclusion of perching and foraging habitat [cvi] • To be significant a site must be used annually. When found inactive, the site must be known to be inactive for ≥ 3 years or suspected of not being used for >5 years before being considered not significant. [ccvii] • Observational studies to determine nest site use, perching sites and foraging areas need to be done from mid March to mid August. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWH MIST[cxlix] Index #26 provides development effects and mitigation measures	Yes	Yes	Yes	NO	NO	NO	NO	NO	NO
Woodland Raptor Nesting Habitat **Rationale:**	Northern Goshawk Cooper's Hawk	May be found in all forested ELC Ecosites. May also be found in SWC, SWM, SWD and CUP3	All natural or conifer plantation woodland/forest stands combined >30ha or with >4 ha of interior habitat [lxxxviii, lxxxix, xc, xci, xciii, xciv, xcv,xcvi, cxxxiii]. Interior habitat determined with a 200m buffer[cxlviii]	Studies confirm: • Presence of 1 or more active nests from species list is considered significant[cxlviii]. • Red-shouldered Hawk and Northern Goshawk – A 400m radius around the nest or 28 ha habitat area	Yes	Yes	Yes	NO	NO	NO	No	No	No

Specialized Wildlife Habitat	Wildlife Species	CANDIDATE SWH		CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
Nests sites for these species are rarely identified; these area sensitive habitats are often used annually by these species.	Sharp-shinned Hawk Red-shouldered Hawk Barred Owl Broad-winged Hawk		• Stick nests found in a variety of intermediate-aged to mature conifer, deciduous or mixed forests within tops or crotches of trees. Species such as Coopers hawk nest along forest edges sometimes on peninsulas or small off-shore islands. • In disturbed sites, nests may be used again, or a new nest will be in close proximity to old nest. <u>Information Sources</u> • OMNRF Districts. • Check the Ontario Breeding Bird Atlas [ccv] or Rare Breeding Birds in Ontario for species documented. • Check data from Bird Studies Canada. • Reports and other information available from Conservation Authorities •	would be applied where optimal habitat is irregularly shaped around the nest) [ccvii]. • Barred Owl – A 200m radius around the nest is the SWH [ccvii]. • Broad-winged Hawk and Coopers Hawk,– A 100m radius around the nest is the SWH[ccvii]. • Sharp-Shinned Hawk – A 50m radius around the nest is the SWH[ccvii]. • Conduct field investigations from mid-March to end of May. The use of call broadcasts can help in locating territorial (courting/nesting) raptors and facilitate the discovery of nests by narrowing down the search area. • SWH MIST[cxlix] Index #27 provides development effects and mitigation measures.									
Turtle Nesting Areas **<u>Rationale;</u>** These habitats are rare and when identified will often be the only breeding site for local populations of turtles.	Midland Painted Turtle <u>Special Concern Species</u> Northern Map Turtle Snapping Turtle	Exposed mineral soil (sand or gravel) areas adjacent (<100m) [cxlviii] or within the following ELC Ecosites: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 BOO1 FEO1	• Best nesting habitat for turtles are close to water and away from roads and sites less prone to loss of eggs by predation from skunks, raccoons or other animals. • For an area to function as a turtle-nesting area, it must provide sand and gravel that turtles are able to dig in and are located in open, sunny areas. Nesting areas on the sides of municipal or provincial road embankments and shoulders are not SWH. • Sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes, and rivers are most frequently used. <u>Information Sources</u> • Use Ontario Soil Survey reports and maps to help find suitable substrate for nesting turtles (well-drained sands and fine gravels). • Check the Ontario Herpetofaunal Atlas records (or other similar atlases) for uncommon turtles; location information may help to find potential nesting habitat for them. • Natural Heritage Information Center (NHIC) • Field Naturalist Clubs	Studies confirm: • Presence of 5 or more nesting Midland Painted Turtles Ⓔ • One or more Northern Map Turtle or Snapping Turtle nesting is a SWH Ⓔ. • The area or collection of sites within an area of exposed mineral soils where the turtles nest, plus a radius of 30-100m around the nesting area dependant on slope, riparian vegetation and adjacent land use is the SWH.[cxlviii] • Travel routes from wetland to nesting area are to be considered within the SWH as a part of the 30-100m area of habitat. [cxlix] • Field investigations should be conducted in prime nesting season typically late spring to early summer. Observational studies observing the turtles nesting is a recommended method. • SWH MIST [cxlix] Index #28 provides development effects and mitigation measures for turtle nesting habitat.	Yes	Yes	Yes	Yes	Yes	Yes	NO	No	No
Seeps and Springs **<u>Rationale;</u>** Seeps/Springs are typical of headwater areas and are often at the source of coldwater streams.	Wild Turkey Ruffed Grouse Spruce Grouse White-tailed Deer Salamander spp.	Seeps/Springs are areas where ground water comes to the surface. Often they are found within headwater areas within forested habitats. Any forested Ecosite within the headwater areas of a stream could have seeps/springs.	Any forested area (with <25% meadow/field/pasture) within the headwaters of a stream or river system [cxvii, cxlix]. • Seeps and springs are important feeding and drinking areas especially in the winter will typically support a variety of plant and animal species [cxix, cxx, cxxi, cxxii, cxiii, cxiv]. <u>Information Sources</u> • Topographical Map. • Thermography. • Hydrological surveys conducted by Conservation Authorities and MOE.	Field Studies confirm: • Presence of a site with 2 or more Ⓔ seeps/springs should be considered SWH. • The area of a ELC forest ecosite or ecoelement within ecosite containing the seeps/springs is the SWH. The protection of the recharge area considering the slope, vegetation, height of trees and groundwater condition need to be considered in delineation the habitat [cxlviii]. • SWH MIST [cxlix] Index #30 provides development effects and mitigation measures	Yes	Yes	Yes	NO	NO	NO	NO	NO	NO

Specialized Wildlife Habitat	Wildlife Species	CANDIDATE SWH		CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
			• Field Naturalists Clubs and landowners. • Municipalities and Conservation Authorities may have drainage maps and headwater areas mapped.										
Amphibian Breeding Habitat (Woodland). **<u>Rationale:</u>** These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations	Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Wood Frog	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD Breeding pools within the woodland or the shortest distance from forest habitat are more significant because they are more likely to be used due to reduced risk to migrating amphibians	• Presence of a wetland, pond or woodland pool(including vernal pools) >500m^2 within or adjacent (within 120m) to a woodland (no minimum size).[clxxxii, lxiii, lxv, lxvi, lxvii, lxviii, lxix, lxx.] Some small wetlands may not be mapped and may be important breeding pools for amphibians. • Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat [cxlviii] <u>Information Sources</u> • Ontario Herpetofaunal Summary Atlas (or other similar atlases) for records • Local landowners may also provide assistance as they may hear spring-time choruses of amphibians on their property. • OMNRF Districts and wetland evaluations • Field Naturalist Clubs • Canadian Wildlife Service Amphibian Road Call Survey • Ontario Vernal Pool Association: http://www.ontariovernalpools.org	Studies confirm; • Presence of breeding population of 1 or more of the listed salamander species or 2 or more of the listed frog species with at least 20 individuals (adults, juveniles, eggs/larval masses) [lxxi] or 2 or more of the listed frog species wioth Call Level Codes of 3 Ⓔ. • A combination of observation study and call count survey will be required during the sping (March-June) when amphibians are concentrated around suitable breeding habitat within or near the woodland/wetlands. • The habitat is the wetland area plus a 230m radius of area. If a wetland area is adjacent to a woodland, a travel corridor connecting the wetland to the woodland is to be included in the habitat. • SWH MIST [cxlix] Index #14 provides development effects and mitigation measures.	Yes	Yes	Yes	NO	NO	NO	NO	NO	NO
Amphibian Breeding Habitat (Wetlands) **<u>Rationale:</u>** Wetlands supporting breeding for these amphibian species are extremely important and fairly rare within Central Ontario landscapes.	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	ELC Community Classes SW, MA, FE, BO, OA and SA. Typically these wetland ecosites will be isolated (>120m) from woodland ecosites, however larger wetlands containing predominantly aquatic species (e.g. Bull Frog) may be adjacent to woodlands.	• Wetlands>500m2 (about 25m diameter)) [ccvii] ,supporting high species diversity are significant; some small or ephemeral habitats may not be identified on MNRF mapping and could be important amphibian breeding habitats [clxxxii] . • Presence of shrubs and logs increase significance of pond for some amphibian species because of available structure for calling, foraging, escape and concealment from predators. • Bullfrogs require permanent water bodies with abundant emergent vegetation. <u>Information Sources</u> • Ontario Herpetofaunal Summary Atlas (or other similar atlases) •Canadian Wildlife Service Amphibian Road Surveys and Backyard Amphibian Call Count. •OMNRF Districts and wetland evaluations. •Reports and other information available from Conservation Authorities.	Studies confirm: •Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog/toad species with at least 20 individuals (adults or eggs masses) [lxxi] or 2 or more of the listed frog/toad species with Call Level Codes of 3Ⓔ. or; Wetland with confirmed breeding Bullfrogs are significantⒺ. • The ELC ecosite wetland area and the shoreline are the SWH. • A combination of observational study and call count surveys cviii will be required during the spring (March-June) when amphibians are concentrated around suitable breeding habitat within or near the wetlands. • If a SWH is determined for Amphibian Breeding Habitat (Wetlands) then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule. • SWH MIST cxlix Index #15 provides development effects and mitigation measures.	No	No	No	No	No	No	No	No	No

Table 1.3. Habitats of Species of Conservation Concern considered SWH.

Wildlife	Species	CANDIDATE SWH		CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
		ELC Ecosite	Habitat Criteria and Information Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W 3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
Woodland Area-Sensitive Bird Breeding Habitat **<u>Rationale:</u>** Large, natural blocks of mature woodland habitat within the settled areas of Southern Ontario are important habitats for area sensitive interior forest song birds.	Yellow-bellied Sapsucker Red-breasted Nuthatch Veery Blue-headed Vireo Northern Parula Black-throated Green Warbler Blackburnian Warbler Black-throated Blue Warbler Ovenbird Scarlet Tanager Winter Wren Pileated Woodpecker <u>Special Concern:</u> Cerulean Warbler Canada Warbler	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD	• Habitats where interior forest breeding birds are breeding, typically large mature (>60 yrs old) forest stands or woodlots >30 ha. [cv, cxxxi, cxxxii, cxxxiii, cxxxiv, cxxxv, cxxxvi, cxxxvii, cxxxviii, cxxxix, cxl, cxli, cxlii, cxliii, cxliv, cxlv, cxlvi, cl, cli, clii, cliii, cliv, clv, clvi, clvii, clviii, clix,] • Interior forest habitat is at least 200 m from forest edge habitat. [clxiv] <u>Information Sources</u> • Local birder clubs. • Canadian Wildlife Service (CWS) for the location of forest bird monitoring . • Bird Studies Canada conducted a 3-year study of 287 woodlands to determine the effects of forest fragmentation on forest birds and to determine what forests were of greatest value to interior species • Reports and other information available from Conservation Authorities	Studies confirm: • Presence of nesting or breeding pairs of 3 or more of the listed wildlife species. Ⓔ • <u>Note:</u> any site with breeding Cerulean Warblers or Canada Warbler is to be considered SWH.Ⓔ • Conduct field investigations in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWH MIST [cxlix] Index #34 provides development effects and mitigation measures.	Yes	Yes	Yes	NO	NO	NO	NO	NO	NO
Marsh Breeding Bird Habitat **<u>Rationale:</u>** Wetlands for these bird species are typically productive and fairly rare in Southern Ontario landscapes.	American Bittern Virginia Rail Sora Common Moorhen American Coot Pied-billed Grebe Marsh Wren Sedge Wren Common Loon Green Heron Trumpeter Swan **Special Concern:** Black Tern Yellow Rail	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SAS1 SAM1 SAF1 FEO1 BOO1 For Green Heron: All SW, MA and CUM1 sites.	• Nesting occurs in wetlands. • All wetland habitat is to be considered as long as there is shallow water with emergent aquatic vegetation present cxxiv. • For Green Heron, habitat is at the edge of water such as sluggish streams, ponds and marshes sheltered by shrubs and trees. Less frequently, it may be found in upland shrubs or forest a considerable distance from water. <u>Information Sources</u> • OMNRF District and wetland evaluations. • Field Naturalist clubs • Natural Heritage Information Centre (NHIC) Records. • Reports and other information available from Conservation Authorities. • Ontario Breeding Bird Atlas.	Studies confirm: • Presence of 5 or more nesting pairs of Sedge Wren or Marsh Wren **or** breeding by any combination of 4 or more of the listed species Ⓔ. • Note: any wetland with breeding of 1 or more Black Terns, Trumpeter Swan, Green Heron or Yellow Rail is SWH Ⓔ. • Area of the ELC ecosite is the SWH. • Breeding surveys should be done in May/June when these species are actively nesting in wetland habitats. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects' • SWH MIST Index #35 provides development effects and mitigation measures	No	No	No	No	No	No	No	No	No
Open Country Bird Breeding Habitat **<u>Rationale:</u>** This wildlife habitat is declining throughout Ontario and North America. Species such as the Upland Sandpiper	Upland Sandpiper Grasshopper Sparrow Vesper Sparrow Northern Harrier Savannah Sparrow **Special Concern** Short-eared Owl	CUM1 CUM2	Large grassland areas (includes natural and cultural fields and meadows) >30 ha [clx, clxi, clxii, clxiii, clxiv, clxv, clxvi, clxvii, clxviii, clxix].	Field Studies confirm:	No	No	No	No	No	No	No	No	No

Wildlife	Species	CANDIDATE SWH		CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
		ELC Ecosite	Habitat Criteria and Information Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W 3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
have declined significantly the past 40 years based on CWS (2004) trend records.			• Grasslands not Class 1 or 2 agricultural lands, and not being actively used for farming (i.e. no row cropping or intensive hay or livestock pasturing in the last 5 years) Ⓔ. • Grassland sites considered significant should have a history of longevity, either abandoned fields, mature hayfields and pasturelands that are at least 5 years or older. • The Indicator bird species are area sensitive requiring larger grassland areas than the common grassland species. Information Sources Agricultural land classification maps, Ministry of Agriculture. Local bird clubs. Ontario Breeding Bird Atlas EIS Reports and other information available from Conservation Authorities.	•Presence of nesting or breeding of 2 or more of the listed species. Ⓔ • A field with 1 or more breeding Short-eared Owls is to be considered SWH. • The area of SWH is the contiguous ELC ecosite field areas. • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”ccxi • SWH MIST cxlix Index #32 provides development effects and mitigation measures									
Shrub/Early Successional Bird Breeding Habitat **Rationale:** This wildlife habitat is declining throughout Ontario and North America. The Brown Thrasher has declined significantly over the past 40 years based on CWS (2004) trend records[cxcix].	Indicator Spp: Brown Thrasher Clay-coloured Sparrow Common Spp. Field Sparrow Black-billed Cuckoo Eastern Towhee Willow Flycatcher **Special Concern:** Yellow-breasted Chat Golden-winged Warbler	CUT1 CUT2 CUS1 CUS2 CUW1 CUW2 Patches of shrub ecosites can be complexed into a larger habitat for some bird species	Large field areas succeeding to shrub and thicket habitats >10ha[clxiv] in size. • Shrub land or early successional fields, not class 1 or 2 agricultural lands, not being actively used for farming (i.e. no row-cropping, haying or live-stock pasturing in the last 5 years) Ⓔ. • Shrub thicket habitats (>10 ha) are most likely to support and sustain a diversity of these species clxxiii. • Shrub and thicket habitat sites considered significant should have a history of longevity, either abandoned fields or pasturelands.	Field Studies confirm: • Presence of nesting or breeding of 1 of the indicator species and at least 2 of the common species. Ⓔ • A habitat with breeding Yellow-breasted Chat or Golden-winged Warbler is to be considered as Significant Wildlife Habitat. Ⓔ • The area of the SWH is the contiguous ELC ecosite field/thicket area.	No	No	No	No	No	No	No	No	No

Wildlife	Species	CANDIDATE SWH		CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
		ELC Ecosite	Habitat Criteria and Information Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W 3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
			Information Sources Agricultural land classification maps, Ministry of Agriculture. Local bird clubs. Ontario Breeding Bird Atlas Reports and other information available from Conservation Authorities.	• Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"ccxi • SWH MIST • cxlix Index #33 provides development effects and mitigation measures.									
Terrestrial Crayfish; **Rationale:** Terrestrial Crayfish are only found within SW Ontario in Canada and their habitats are very rare. [ccii]	Chimney or Digger Crayfish; (*Fallicambarus fodiens*) Devil Crawfish or Meadow Crayfish; (*Cambarus Diogenes*)	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 MAS1 MAS2 MAS3 SWD SWT SWM	Wet meadow and edges of shallow marshes (no minimum size) should be surveyed for terrestrial crayfish. • Constructs burrows in marshes, mudflats, meadows, the ground can't found far from water. • Both species are a semi-terrestrial burrower which spends most of its life within burrows consisting of a network of tunnels. Usually the soil is not too moist so that the tunnel is well formed. Information Sources • Information sources from "Conservation Status of Freshwater Crayfishes" by Dr. Premek Hamr for the WWF and CNF March 1998	Studies Confirm: •Presence of 1 or more individuals of species listed or their chimneys (burrows) in suitable meadow marsh, swamp or moist terrestrial sites cci • Area of ELC ecosite or an Habitat ecoelement area of meadow marsh or swamp within the larger ecosite area is the SWH. • Surveys should be done April to August in temporary or permanent water. Note the presence of burrows or chimneys are often the only indicator of presence, observance or collection of individuals is very difficult cci • SWH MIST cxlix Index #36 provides development effects and mitigation measures.	Yes	Yes	Yes	NO	NO	NO	NO	NO	NO
Special Concern and Rare Wildlife Species **Rationale:** These species are quite rare or have experienced significant population declines in Ontario.	All Special Concern and Provincially Rare (S1-S3, SH) plant and animal species. Lists of these species are tracked by the Natural Heritage Information Centre (NHIC).	All plant and animal element occurrences (EO) within a 1 or 10km grid. Older element occurrences were recorded prior to GPS being available, therefore location information may lack accuracy	• When an element occurrence is identified within a 1 or 10 km grid for a Special Concern or provincially Rare species; linking candidate habitat on the site needs to be completed to ELC Ecosites lxxviii • Information Sources • Natural Heritage Information Centre (NHIC) will have Special Concern and Provincially Rare (S1-S3, SH) species lists with element occurrences data. • NHIC Website "Get Information" : http://nhic.mnr.gov.on.ca • Ontario Breeding Bird Atlas•	Studies Confirm: • Assessment/inventory of the site for the identified special concern or rare species needs to be completed during the time of year when the species is present or easily identifiable. • The area of the habitat to the finest ELC scale that protects the habitat form and function is the SWH, this must be delineated through detailed field studies. The habitat needs be easily mapped and cover an important life stage component	Yes	Yes	Yes	Yes	Yes	Yes	NO	NO	NO

Wildlife	Species	CANDIDATE SWH		CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
		ELC Ecosite	Habitat Criteria and Information Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W 3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
			• Expert advice should be sought as many of the rare spp. have little information available about their requirements.	for a species e.g. specific nesting habitat or foraging habitat. • SWH MIST Index #37 provides c effects and mitigation measures.									

Table 1.4 Animal Movement Corridors

Habitat	SPECIES	CANDIDATE SWH		CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
		ELC Eco-sites	Habitat Criteria and Information Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
Amphibian Movement Corridors **Rationale;** Movement corridors for amphibians moving from their terrestrial habitat to breeding habitat can be extremely important for local populations.	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	Corridors may be found in all ecosites associated with water. • Corridors will be determined based on identifying the significant breeding habitat for these species in Table 1.1	Movement corridors between breeding habitat and summer habitat [clxxiv, clxxv, clxxvi, clxxvii, clxxviii, clxxix, clxxx, clxxxi]. Movement corridors must be determined when Amphibian breeding habitat is confirmed as SWH from Table 1.2.2 (Amphibian Breeding Habitat –Wetland) of this Schedule Ⓔ . Information Sources •MNRF District Office. •Natural Heritage Information Centre (NHIC). •Reports and other information available from Conservation Authorities. •Field Naturalist Clubs.	• Field Studies must be conducted at the time of year when species are expected to be migrating or entering breeding sites. * Corridors should consist of native vegetation, with several layers of vegetation. Corridors unbroken by roads, waterways or bodies, and undeveloped areas are most significant cxlix • Corridors should have at least 15m of vegetation on both sides of waterway cxlix or be up to 200m wide cxlix of woodland habitat and with gaps <20m cxlix . • Shorter corridors are more significant than longer corridors, however amphibians must be able to get to and from their summer and breeding habitat cxlix. • SWH MIST cxlix Index #40 provides development effects and mitigation measures	Yes	Yes	Yes	No	No	No	No	No	No

Table 1.5 Significant Wildlife Habitat Exceptions for Ecodistricts within Eco-Region 7E

Habitat	SPECIES	CANDIDATE SWH		CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
		ELC Eco-sites	Habitat Criteria and Information Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
7E-2	**Bat Migratory Stopover Area** Rationale: Stopover areas for long distance migrant bats are important during fall migration. Hoary Bat Eastern Red Bat Silver-haired Bat	No specific ELC types.	• Long distance migratory bats typically migrate during late summer and early fall from summer breeding habitats throughout Ontario to southern wintering areas. Their annual fall migration may concentrate these species of bats at stopover areas. • This is the only known bat migratory stopover habitats based on current information. Information Sources • OMNRF for possible locations and contact for local experts • University of Waterloo, Biology Department	• Long Point (42°35'N, 80°30'E, to 42°33'N, 80°03'E) has been identified as a significant stop-over habitat for fall migrating Silver-haired Bats, due to significant increases in abundance, activity and feeding that was documented during fall migration ccxv. • The confirmation	No	No	No	No	No	No	No	No	No

Habitat	SPECIES	CANDIDATE SWH		CONFIRMED SWH	Candidate Habitat Present Within the Study Area								
		ELC Eco-sites	Habitat Criteria and Information Sources	Defining Criteria	Focus Study Area East Route E1	Focus Study Area East Route E2	Focus Study Area East Route E3	Focus Study Area West Route W1	Focus Study Area West Route W2	Focus Study Area West Route W3	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
				criteria and habitat areas for this SWH are still being determined. • SWH MIST cxlix Index #38 provides development effects and itigation measures									

AECOM

Appendix E

Species at Risk Screening

Present (P) Absent (A)	Taxonomy	Species	ESA Status	SARA Status	COSEWIC Status	Preferred Habitat[1, 2]	Associated ELC Communities	Known Species Range[1, 2]	Source Identifying Species Record	Focus Study Area East E1 Route	Focus Study Area East E2 Route	Focus Study Area East E3 Route	Focus Study Area West W1 Route	Focus Study Area West W2 Route	Focus Study Area West W3 Route	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
p	Birds	Acadian Flycatcher *Empidonax virescens*	END	END Schedule 1	END	It is typically found in mature, shady forests with ravines, or in forested swamps with lots of maple and beech trees. The nest is placed near the tip of a lower limb on a tree, and is loosely woven, with strands of plant material hanging down. In Canada, the Acadian Flycatcher nests only in southwestern Ontario, mostly in large forests and forested ravines near the shore of Lake Erie. The Acadian Flycatcher requires large areas of mature undisturbed forest. Most individuals occur in forests more than 40 hectares in size. The species is also considered to be a forest interior species, meaning that it avoids forest edges and build their nests in areas that are more than 100 meters from the forest edge. The bird lives in the understory of woods with a closed canopy. It is often found in well-wooded swamps and ravines. Acadian Flycatchers also occupy dry woods but they usually prefer to hang their nests over water. Prior to the 1800's, the Carolinian area of Ontario would have had abundant suitable habitat for this species. Currently, very little of the forest remains and the remnants are highly fragmented. Throughout the Carolinian Forest region of Ontario, most of the remaining forest patches are very small (less than three hectares) and only an extremely small percentage of them is large enough to meet the species' requirements.	**SWD**, **FOD** communities that are mature, have a closed canopy, and are of sufficient size.	In Ontario, the Acadian Flycatcher primarily lives in the warmer climate of southern Ontario's Carolinian forests. It needs large, undisturbed forests, often more than 40 hectares in size. It has also been known to nest at a few sites in the Greater Toronto Area but this is unusual. In Canada, the Acadian Flycatcher occurs in very low numbers in the Carolinian area of southern Ontario. The species is thought to have been more widespread and numerous in Canada prior to the clearing of forests in the early 1800s. Today, there is relatively little habitat remaining that is suitable for the species.	iNaturalist	Low - No large undistrubed forests	Low - Forests are very fragmented	Low - Forests are very fragmented	Low - Forests are very fragmented	Low - Forests are very fragmented	Low - No large undistrubed forests	Low - No large undistrubed forests	Low - No large undistrubed forests
p	Birds	Bald Eagle *Haliaeetus leucocephalus*	SC	No Status	Not at Risk	Bald Eagles nest in a variety of habitats and forest types, almost always near a major lake or river where they do most of their hunting. While fish are their main source of food, Bald Eagles can easily catch prey up to the size of ducks, and frequently feed on dead animals, including White-tailed Deer. They usually nest in large trees such as pine and poplar. During the winter, Bald Eagles sometimes congregate near open water such as the St. Lawrence River, or in places with a high deer population where carcasses might be found.	**FOC**, **FOM**, **FOD**, **SWC**, **SWM** and **SWD**. Nests typically located near major bodies of water.	In Ontario, they nest throughout the north, with the highest density in the northwest near Lake of the Woods. Historically they were also relatively common in southern Ontario, especially along the shore of Lake Erie, but this population was all but wiped out 50 years ago. After an intensive re-introduction program and environmental clean-up efforts, the species has rebounded and can once again be seen in much of its former southern Ontario range.	OBBA,NHIC, ebird	Medium - Wooded communities in study area that runs adjacent to Thames River may provide suitable habitat.	Medium - Wooded communities in study area that runs adjacent to Thames River may provide suitable habitat.	Medium - Wooded communities in study area that are in proximity to Thames River may provide suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Birds	Bank Swallow *Riparia riparia*	THR	THR Schedule 1	THR	Bank Swallows nest in burrows in natural and human-made settings where there are vertical faces in silt and sand deposits. Many nests are on banks of rivers and lakes, but they are also found in active sand and gravel pits or former ones where the banks remain suitable. The birds breed in colonies ranging from several to a few thousand pairs. The Bank Swallow breeds in a wide variety of natural and artificial sites with vertical banks, including riverbanks, lake and ocean bluffs, aggregate pits, road cuts, and stock piles of soil. Sand-silt substrates are preferred for excavating nest burrows. Breeding sites tend to be somewhat ephemeral due to the dynamic nature of bank erosion. Breeding sites are often situated near open terrestrial habitat used for aerial foraging (e.g., grasslands, meadows, pastures, and agricultural cropland). Large wetlands are used as communal nocturnal roost sites during post-breeding, migration, and wintering periods.		The Bank Swallow is found all across southern Ontario, with sparser populations scattered across northern Ontario. The largest populations are found along the Lake Erie and Lake Ontario shorelines, and the Saugeen River (which flows into Lake Huron). In North America, it breeds widely across the northern two-thirds of the U.S., north to the treeline. It breeds in all Canadian provinces and territories, except perhaps Nunavut.	ebird, OBBA	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Agricultural croplands may be used for foraging and Thames River nearby may have suitable nesting habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Birds	Barn Swallow *Hirundo rustica*	THR	THR Schedule 1	THR	Barn Swallows often live in close association with humans, building their cup-shaped mud nests almost exclusively on human-made structures such as open barns, under bridges, and in culverts. The species is attracted to open structures that include ledges where they can build their nests, which are often re-used from year to year. They prefer unpainted, rough-cut wood, since the mud does not adhere as well to smooth surfaces. Before European colonization, Barn Swallows nested mostly in caves, holes, crevices, and ledges in cliff faces. Following European settlement, they shifted largely to nesting in and on artificial structures, including barns and other outbuildings, garages, houses, bridges, and road culverts. Barn Swallows prefer various types of open habitats for foraging, including grassy fields, pastures, various kinds of agricultural crops, lake and river shorelines, cleared rights-of-way, cottage areas and farmyards, islands, wetlands, and subarctic tundra.	**TPO, CUM1, MAM, MAS, OAO, SAS1, SAM1, SAF1**; containing or adjacent structures that are suitable for nesting.	The Barn Swallow may be found throughout southern Ontario and can range as far north as Hudson Bay, wherever suitable locations for nests exist. The Barn Swallow has become closely associated with human rural settlements. It breeds across much of North America south of the treeline, south to central Mexico. In Canada, it is known to breed in all provinces and territories.	ebird	High - Confirmed barn swallow observed during 2022 preliminary field investigations. Open fields, ponds and over the Thames River may provide suitable foraging habitat. Suitable nesting habitat may be present in barns or residential buildings that are present within the Study Area.	High - Confirmed barn swallow observed during 2022 preliminary field investigations. Open fields, ponds and over the Thames River may provide suitable foraging habitat. Suitable nesting habitat may be present in barns or residential buildings that are present within the Study Area.	High - Confirmed barn swallow observed during 2022 preliminary field investigations. Open fields, ponds and over the Thames River may provide suitable foraging habitat. Suitable nesting habitat may be present in barns or residential buildings that are present within the Study Area.	Medium - Open fields, ponds and over the Thames River may provide suitable foraging habitat. Suitable nesting habitat may be present in barns or residential buildings that are present within the Study Area.	Medium - Open fields and over ponds may provide suitable foraging habitat. Suitable nesting habitat may be present in barns or residential buildings that are present within the Study Area.	Medium - Open fields, ponds and over the Thames River may provide suitable foraging habitat. Suitable nesting habitat may be present in barns or residential buildings that are present within the Study Area.	Medium - Open fields may provide suitable foraging habitat. Suitable nesting habitat may be present in barns or residential buildings that are present within the Study Area.	Medium - Open fields may provide suitable foraging habitat. Suitable nesting habitat may be present in barns or residential buildings that are present within the Study Area.	Medium - Open fields may provide suitable foraging habitat. Suitable nesting habitat may be present in barns or residential buildings that are present within the Study Area.
p	Birds	Bobolink *Dolichonyx oryzivorus*	THR	THR Schedule 1	THR	Historically, Bobolinks lived in North American tallgrass prairie and other open meadows. With the clearing of native prairies, Bobolinks moved to living in hayfields. Bobolinks often build their small nests on the ground in dense grasses. Both parents usually tend to their young, sometimes with a third Bobolink helping. Most of this prairie was converted to agricultural land over a century ago, and at the same time the forests of eastern North America were cleared to hayfields and meadows that provided habitat for the birds. Since the conversion of the prairie to cropland and the clearing of the eastern forests, the Bobolink has nested in forage crops (e.g., hayfields and pastures dominated by a variety of species, such as clover, Timothy, Kentucky Bluegrass, and broadleaved plants). The Bobolink also occurs in various grassland habitats including wet prairie, graminoid peatlands, and abandoned fields dominated by tall grasses, remnants of uncultivated virgin prairie (tall-grass prairie), no-till cropland, small-grain fields, restored surface mining sites, and irrigated fields in arid regions. It is generally not abundant in short-grass prairie, Alfalfa fields, or in row crop monocultures (e.g., corn, soybean, wheat), although its use of Alfalfa may vary with region.	**TPO, TPS, CUM1** and **MAM2**.	The Bobolink breeds across North America. In Ontario, it is widely distributed throughout most of the province south of the boreal forest, although it may be found in the north where suitable habitat exists. The breeding range of the Bobolink in North America includes the southern part of all Canadian provinces from British Columbia to Newfoundland and Labrador and south to the northwestern, north-central and northeastern U.S.	OBBA	Medium - Open fields within Study Area may provide suitable habitat.	Medium - Open fields within Study Area may provide suitable habitat.	Medium - Open fields within Study Area may provide suitable habitat.	Medium - Open fields within Study Area may provide suitable habitat.	Medium - Open fields within Study Area may provide suitable habitat.	Medium - Open fields within Study Area may provide suitable habitat.	Medium - Open fields within Study Area may provide suitable habitat.	Medium - Open fields within Study Area may provide suitable habitat.	Medium - Open fields within Study Area may provide suitable habitat.

Present (P) Absent (A)	Taxonomy	Species	ESA Status	SARA Status	COSEWIC Status	Preferred Habitat[1, 2]	Associated ELC Communities	Known Species Range[1, 2]	Source Identifying Species Record	Focus Study Area East E1 Route	Focus Study Area East E2 Route	Focus Study Area East E3 Route	Focus Study Area West W1 Route	Focus Study Area West W2 Route	Focus Study Area West W3 Route	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
p	Birds	Canada Warbler *Cardellina canadensis*	SC	THR Schedule 1	THR	The Canada Warbler breeds in a range of deciduous and coniferous, usually wet forest types, all with a well-developed, dense shrub layer. Dense shrub and understory vegetation help conceal Canada Warbler nests that are usually located on or near the ground on mossy logs or roots, along stream banks or on hummocks. It is also found in riparian shrub forests on slopes and in ravines and in old-growth forests with canopy openings and a high density of shrubs, as well as in stands regenerating after natural disturbances, such as forest fires, or anthropogenic disturbances, such as logging. Canada Warbler habitat is believed to be in decline, especially in South America, where the Canada Warbler overwinters. Habitat loss has also been observed in the eastern part of its breeding range, where wet forests have been drained for urban development or farming.	**FOC3, FOC4, FOM6, FOM7, FOM8, FOD6, FOD7, FOD8, FOD9, SWC, SWM** and **SWD** with a well-developed shrub layer.	The Canada Warbler only breeds in North America and 80% of its known breeding range is in Canada. Its primary breeding range is in the Boreal Shield, extending north into the Hudson Plains and south into the Mixedwood Plains. Although the Canada Warbler breeds at low densities across its range, in Ontario it is most abundant along the Southern Shield. The Canada Warbler breeds primarily across much of southeastern Canada, the northeastern United States, the Great Lakes region. In Canada, it breeds in all provinces and territories except Nunavut and Newfoundland and Labrador.	OBBA	Medium - Forested communities may provide suitable habitat if the understorys are dense.	Medium - Forested communities may provide suitable habitat if the understorys are dense.	Medium - Forested communities may provide suitable habitat if the understorys are dense.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Birds	Cerulean Warbler *Setophaga cerulea*	THR	END Schedule 1	END	Cerulean Warblers spend their summers (breeding seasons) in mature, deciduous forests with large, tall trees and an open understorey. They are found in both wet bottomland forests and upland areas. At a finer spatial scale, canopy configuration (e.g., foliage stratification, gap distribution, tree species distribution) are predictors of habitat suitability.	**FOD** and **SWD** that are mature and contain an open understory.	The Cerulean Warbler's breeding range extends from extreme southwestern Quebec and southern Ontario west to Minnesota and Nebraska and south to Texas and other Gulf states across to North Carolina. In southern Ontario, populations appear to be separated into two distinct bands: one from southern Lake Huron to western Lake Ontario, and further north, the other from the Bruce Peninsula and Georgian Bay area to the Ottawa River. This species breeds in the deciduous forests of eastern North America but has a patchy distribution. The Canadian breeding range consists of two main geographic clusters in southwestern and southeastern Ontario, plus a small number of breeding individuals in southwestern Quebec.	NHIC	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Birds	Chimney Swift *Chaetura pelagica*	THR	THR Schedule 1	THR	Before European settlement, Chimney Swifts mainly nested on cave walls and in hollow trees or tree cavities in old growth forests. However, due to the land clearing associated with colonization, hollow trees became increasingly rare, which led Chimney Swifts to move into house chimneys. Today, they are more likely to be found in and around urban settlements where they nest and roost (rest or sleep) in chimneys and other manmade structures. It is likely that a small portion of the population continues to use hollow trees. They also tend to stay close to water as this is where the flying insects they eat congregate. The Chimney Swift spends the major part of the day in flight feeding on insects. In the northern part of the breeding range, the Chimney Swift favours sites where the ambient temperature is relatively stable.	**TPO, CUM1, MAM, MAS, OAO, SAS1, SAM1, SAF1** containing or adjacent structures with suitable nesting habitat (i.e. chimneys).	The Chimney Swift breeds in eastern North America, possibly as far north as southern Newfoundland. In Ontario, it is most widely distributed in the Carolinian zone in the south and southwest of the province, but has been detected throughout most of the province south of the 49th parallel. The Chimney Swift breeds mainly in eastern North America, from southern Canada down to Texas and Florida. The species breeds in east central Saskatchewan, southern Manitoba, southern Ontario, southern Quebec, New Brunswick, Nova Scotia, and possibly in Prince Edward Island and southwestern Newfoundland.	ebird, OBBA	Medium - Open fields and ponds within the study area may provide suitable foraging habitat. Residential buildings within and adjacent to the Study Area may provide nesting habitat	Medium - Open fields and ponds within the study area may provide suitable foraging habitat. Residential buildings within and adjacent to the Study Area may provide nesting habitat	Medium - Open fields and ponds within the study area may provide suitable foraging habitat. Residential buildings within and adjacent to the Study Area may provide nesting habitat	Medium - Open fields and ponds within the study area may provide suitable foraging habitat. Residential buildings within and adjacent to the Study Area may provide nesting habitat	Medium - Open fields and ponds within the study area may provide suitable foraging habitat. Residential buildings within and adjacent to the Study Area may provide nesting habitat	Medium - Open fields and ponds within the study area may provide suitable foraging habitat. Residential buildings within and adjacent to the Study Area may provide nesting habitat	Medium - Open fields within the study area may provide suitable foraging habitat. Residential buildings within and adjacent to the Study Area may provide nesting habitat	Medium - Open fields within the study area may provide suitable foraging habitat. Residential buildings within and adjacent to the Study Area may provide nesting habitat	Medium - Open fields within the study area may provide suitable foraging habitat. Residential buildings within and adjacent to the Study Area may provide nesting habitat
p	Birds	Eastern Meadowlark *Sturnella magna*	THR	THR Schedule 1	THR	Eastern Meadowlarks breed primarily in moderately tall grasslands, such as pastures and hayfields, but are also found in alfalfa fields, weedy borders of croplands, roadsides, orchards, airports, shrubby overgrown fields, or other open areas. Small trees, shrubs, or fence posts are used as elevated song perches. Eastern Meadowlarks prefer grassland habitats, including native prairies and savannahs, as well as non-native pastures, hayfields, weedy meadows, herbaceous fencerows, and airfields.	**TPO, TPS, CUM1, CUS**, and **MAM2** with elevated song perches.	In Ontario, the Eastern Meadowlark is primarily found south of the Canadian Shield but it also inhabits the Lake Nipissing, Timiskaming, and Lake of the Woods areas. Including all subspecies, the Eastern Meadowlark's global breeding range extends from central and eastern North America, south through parts of South America. However, there is only one subspecies in Canada and the neighbouring northeastern U.S. In Canada, the bulk of the population breeds in southern Ontario.	OBBA, NHIC	Medium - Open fields within Study Area may provide suitable habitat.	Medium - Open fields within Study Area may provide suitable habitat.	Medium - Open fields within Study Area may provide suitable habitat.	Medium - Open fields within Study Area may provide suitable habitat.	Medium - Open fields within Study Area may provide suitable habitat.	Medium - Open fields within Study Area may provide suitable habitat.	Medium - Open fields within Study Area may provide suitable habitat.	Medium - Open fields within Study Area may provide suitable habitat.	Medium - Open fields within Study Area may provide suitable habitat.
p	Birds	Eastern Wood-pewee *Contopus virens*	SC	SC Schedule 1	SC	The Eastern Wood-pewee lives in the mid-canopy layer of forest clearings and edges of deciduous and mixed forests. It is most abundant in intermediate-age mature forest stands with little understory vegetation. During migration, a variety of habitats are used, including forest edges and early successional clearings.	**FOC, FOM, FOD, SWD, SWM** and **CUW**.	The Eastern Wood-pewee is found across most of southern and central Ontario, and in northern Ontario as far north as Red Lake, Lake Nipigon, and Timmins. The breeding range of the Eastern Wood-pewee covers much of south-central and eastern North America.	ebird, OBBA, NHIC, iNaturalist	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Birds	Evening Grosbeak *Coccothraustes vespertinus*	SC	SC Schedule 1	SC	During the breeding season, the Evening Grosbeak is generally found in open, mature mixed-wood forests dominated by fir species, White Spruce, and/or Trembling Aspen. Its abundance is strongly linked to the cycle of its primary prey, the Spruce Budworm. Outside the breeding season, the species depends mostly on seed crops from tree species in the boreal forest, such as firs and spruces. It is also attracted to ornamental trees that have seeds or fruit, and may visit bird feeders.	**FOC** and **FOM**	The Evening Grosbeak is found in all Canadian provinces and territories except Nunavut. In Ontario, it breeds in coniferous forests across northern Ontario, as far south as southern Georgian Bay. Evening Grosbeak breeds in Canada, the United States, and Mexico. In winter, it is nomadic and can range widely, depending on the quantity of seeds produced in the boreal forest. Historically, this species was restricted to western North America, but expanded eastward in the late 19th and early 20th centuries.	NHIC, iNaturalist	Medium - May be present in forested communities occasionally as an irregular migrant or in winter only.	Medium - May be present in forested communities occasionally as an irregular migrant or in winter only.	Medium - May be present in forested communities occasionally as an irregular migrant or in winter only.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.

Present (P) Absent (A)	Taxonomy	Species	ESA Status	SARA Status	COSEWIC Status	Preferred Habitat[1, 2]	Associated ELC Communities	Known Species Range[1, 2]	Source Identifying Species Record	Focus Study Area East E1 Route	Focus Study Area East E2 Route	Focus Study Area East E3 Route	Focus Study Area West W1 Route	Focus Study Area West W2 Route	Focus Study Area West W3 Route	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
p	Birds	Louisiana Waterthrush *Parkesia motacilla*	THR	THR Schedule 1	THR	The Louisiana Waterthrush is usually found in steep, forested ravines with fast-flowing streams. The Louisiana Waterthrush occupies specialized habitat, showing a strong preference for nesting along relatively pristine headwater streams and wetlands situated in large tracts of mature forest. Although it prefers running water (especially clear, coldwater streams), it also inhabits heavily wooded swamps with vernal or semi-permanent pools, where its territories can overlap with its sister species the Northern Waterthrush. It is often classified as both an area-sensitive forest species, and a riparian-obligate species. Louisiana Waterthrush nests are constructed within niches in steep stream banks, in the roots of uprooted trees, or in mossy logs and stumps, usually within a few metres of water.	**FOD**, **FOM**, and **SWD** with fast flowing coldwater streams or large pools of open water.	The Louisiana Waterthrush summer range extends from the lower Great Lakes south to Georgia and west to Kansas. In Canada, the Louisiana Waterthrush breeds only in southern Ontario, along the Niagara Escarpment, in woodlands along Lake Erie, and scattered locations elsewhere. In Canada, the Louisiana Waterthrush breeds in southern Ontario, where it is considered a rare, but regular local summer resident. The bulk of the Canadian population is concentrated in two areas of Ontario: the Norfolk Sand Plain region bordering the north shore of Lake Erie, and the central Niagara Escarpment between Hamilton and Owen Sound.	NHIC	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Birds	Red-headed Woodpecker *Melanerpes erythrocephalus*	END	THR Schedule 1	END	The Red-headed Woodpecker lives in open woodland and woodland edges, and is often found in parks, golf courses, and cemeteries. These areas typically have many dead trees, which the bird uses for nesting and perching. A few of these birds will stay the winter in woodlands in southern Ontario if there are adequate supplies of nuts. The Red-headed Woodpecker is found in a variety of habitats, including oak and beech forests, grasslands, forest edges, orchards, pastures, riparian forests, roadsides, beaver ponds, and burns.	**TPS, TPW, CUW, FOD1, FOD2, FOD4-1, FOD6, FOD7**, and **FOD9** that are open and have an abundance of dead trees.	The Red-headed Woodpecker is found across southern Ontario, where it is widespread but rare. In Canada, its range includes southern Saskatchewan, Manitoba, Ontario, and Quebec.	OBBA	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Birds	Wood Thrush *Hylocichla mustelina*	SC	THR Schedule 1	THR	The Wood Thrush lives in mature deciduous and mixed (conifer-deciduous) forests. They seek moist stands of trees with well-developed undergrowth and tall trees for singing perches. These birds prefer large forests, but will also use smaller stands of trees. They build their nests in living saplings, trees, or shrubs, usually in Sugar Maple or American Beech. In Canada, the Wood Thrush nests mainly in second-growth and mature deciduous and mixed forests, with saplings and well-developed understory layers. This species prefers large forest mosaics, but may also nest in small forest fragments.	**FOD** and **FOM** that are greater than 1 ha in size.	The Wood Thrush is found all across southern Ontario. It is also found, but less common, along the north shore of Lake Huron, as far west as the southeastern tip of Lake Superior. There is a very small population near Lake of the Woods in northwestern Ontario, and there have been scattered sightings in the mixed forest of northern Ontario. The Wood Thrush breeds in southeastern Canada from southern Ontario east to Nova Scotia.	OBBA, NHIC	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Birds	Yellow-breasted Chat *Icteria virens* Yellow-breasted Chat (virens subspecies) *Icteria virens virens*	END	END Schedule 1	END	The Yellow-breasted Chat lives in thickets and scrub, especially locations where clearings have become overgrown. This bird eats insects gathered from the foliage of low, dense shrubs, or from the ground. The Yellow-breasted Chat is a shrub specialist, occurring in early successional shrub habitats in eastern North America. In Ontario, habitat has declined since the early 1960s, because of land conversion and successional change.	**CUT** and **SWT**	In Canada, it lives in southern British Columbia, the Prairies, and southwestern Ontario, where it is concentrated in Point Pelee National Park and Pelee Island in Lake Erie. Yellow-breasted Chats breed in North America, south of the boreal forest. The virens subspecies breeds from the east-central Great Plains and eastern Texas eastward, and north to southwestern Ontario.	NHIC	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Fish	Black Redhorse *Moxostoma duquesnei*	THR	THR Schedule 1	THR	In Ontario, the Black Redhorse lives in pools and riffle areas of medium-sized rivers and streams that are usually less than two metres deep. These rivers usually have few aquatic plants, a moderate to fast current, and a sandy or gravel bottom. In the spring, it migrates to breeding habitat where eggs are laid on gravel in fast water. The winter is spent in deeper pools. Adults feed on crustaceans and aquatic insects, while the young fish feed on plankton. The Black Redhorse is found in medium-size rivers, where the river bed is composed of sand or gravel and bedrock substrates, where siltation is minimal and where the current is fairly strong. The Black Redhorse has typically been caught in waters that are oxygen rich and fertile which have a mean temperature of 20 °C in July.		In Canada, the Black Redhorse is found only in southwestern Ontario at a few locations in the Bayfield River, Maitland River, Ausable River, Grand River, Thames River, and Spencer Creek watersheds. In Canada, this fish in found in the Great Lakes basin; it has been seen in Catfish Creek and in the Grand, Thames, and Maitland Rivers. Its distribution extends into the United States, in the Mississippi River system.	NHIC	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Water courses through study areas may provide suitable habitat.	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Fish	Blackstripe Topminnow *Fundulus notatus*	SC	SC Schedule 1	SC	This species prefers slow-flowing streams which have abundant plant cover within the stream. In addition, a key part of the species habitat is an abundance of vegetation on the stream banks. These vegetated areas are important habitats as they provide areas where the species can hide from predators and where they can find food. Blackstripe Topminnows prefer sluggish rivers and streams with low gradients, where there is extensive edge cover offered by plants. This fish tolerates waters with high turbidity. During the summer, Blackstripe Topminnows are found near the surface, but in the winter they are found in deeper waters.	**OAO, SAS, SAM, SAF** characterized as slow-flowing streams with abundant aquatic plant cover and an abundance of vegetation on the stream banks.	In Canada, this species occurs only in the Sydenham River and associated creeks in southwestern Ontario. The Blackstripe Topminnow is found in the southern Great Lakes drainage (Erie and Michigan) and in the Mississippi drainage basin from Illinois to the Gulf of Mexico. In Canada, its distribution is limited to an area of approximately 60 km² in the Sydenham River in southwestern Ontario. This species was first discovered in Canada in 1972.	NHIC	Low - Study Area is outside of range	Low - Study Area is outside of range	Low - Study Area is outside of range	Low - Study Area is outside of range	Low - Study Area is outside of range	Low - Study Area is outside of range	Low - Study Area is outside of range	Low - Study Area is outside of range	Low - Study Area is outside of range
p	Fish	Eastern Sand Darter (Ontario populations) *Ammocrypta pellucida*	END	THR Schedule 1	THR	The Eastern Sand Darter prefers shallow habitats in lakes, streams, and rivers with clean, sandy bottoms. It often buries itself completely in the sand. It feeds on aquatic insects, but due to its small mouth is limited in the size of prey it can eat. The preferred habitat of the Eastern Sand Darter is sand-bottomed areas in streams and rivers, and sandy shoals in lakes. Spawning has not been observed in nature but, in the laboratory, Eastern Sand Darter spawned on a mixed sand and gravel substrate. Eastern Sand Darter habitats in Canada have been extensively impacted by land clearing, intensive agriculture, urban development, impoundments, and stream channel modifications.	**OAO** with sandy bottoms.	In Ontario, the Eastern Sand Darter is found in Lake St. Clair, Lake Erie, West Lake, Big Creek, and in the Grand, Sydenham, Thames, and Detroit rivers. The species may have disappeared from several other rivers in southwestern Ontario. In 2008 it was rediscovered in Big Creek after an absence of more than 50 years. The Eastern Sand Darter occurs in the Ohio River basin (Ohio, Indiana, Illinois, Kentucky, West Virginia, Pennsylvania), a portion of the lower Great Lakes drainage (Lake Huron, Lake St. Clair and Lake Erie drainages in Michigan, Ohio, New York, Pennsylvania, and Ontario), and farther east in the St. Lawrence River and Lac Champlain drainages (Québec, Vermont, New York). In Ontario, populations have been found in seven southwestern Ontario watersheds as well as lakes Erie and St. Clair.	DFO, NHIC	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Water courses through study areas may provide suitable habitat.	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Fish	Lake Sturgeon (Great Lakes-Upper St. Lawrence River populations) *Acipenser fulvescens*	END	No Status	THR	The Lake Sturgeon lives almost exclusively in freshwater lakes and rivers with soft bottoms of mud, sand, or gravel. They are usually found at depths of five to 20 metres. They spawn in relatively shallow, fast-flowing water (usually below waterfalls, rapids, or dams) with gravel and boulders at the bottom. However, they will spawn in deeper water where habitat is available. They also are known to spawn on open shoals in large rivers with strong currents. The species occupies a wide variety of aquatic ecosystem types (e.g., stepped-gradient Boreal Shield rivers, low-gradient meandering Prairie rivers, low gradient Hudson lowland rivers, Great Lakes and associated tributaries). Lake Sturgeon requires a variety of habitats to complete its lifecycle, and the species has evolved to exploit typical upstream to downstream hydraulic and substrate gradients. Hatch is contingent on aeration by flowing water, after which larvae apparently require gravel substrate in which to bury and remain while development continues. Once the yolk sac is absorbed, larvae drift downstream via water currents. Habitat requirements at the age-0 stage are not well understood, but may not be as strict as previously assumed. Aside from the requirement of adequate benthic prey items, the habitat requirements for middle to later life stages (juveniles and adults) are not particularly narrow. Habitat trends vary across the species' range. In some areas, the construction of dams has ceased but, in other areas, it is expected to continue into the foreseeable future. Sediment and water quality has improved in many areas formerly impacted by pollution from the pulp-and-paper industry.	**OAO**. Large lakes/rivers > 20m deep with soft mud, sand, or gravel bottoms required.	In North America, Lake Sturgeon can be found from Alberta to the St. Lawrence drainage of Quebec and from the southern Hudson Bay to the lower Mississippi. In Ontario, the Lake Sturgeon is found in the rivers of the Hudson Bay basin, the Great Lakes basin, and their major connecting waterways, including the St. Lawrence River. There are three distinct populations in Ontario: Great Lakes - Upper St. Lawrence, Saskatchewan - Nelson River, and Southern Hudson Bay - James Bay.	NHIC	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.

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p	Fish	Northern Madtom *Noturus stigmosus*	END	END Schedule 1	END	The Northern Madtom usually lives in large creeks and rivers with a moderate to swift current, and a sand, gravel, or mud bottom. However, in Ontario, this fish has also been captured in the deeper waters of Lake St. Clair and the Detroit River. It prefers clean, unpolluted water but can tolerate slightly muddy water. Adults eat aquatic insects, crustaceans, and smaller fish. During the summer breeding season, Northern Madtoms normally build nests under large flat rocks and logs. The fish occurs on bottoms of sand, gravel, and stones, occasionally with silt, detritus, and accumulated debris. It is sometimes associated with large aquatic plants, and is typically collected at depths of less than 7 m.	**OAO** with a moderate to swift current and a sand gravel or mud bottom.	In Canada, the Northern Madtom is only found in Ontario in the St. Clair River, Lake St. Clair, the Detroit River, and the Thames River. It has not been seen in the Sydenham River since 1975. The Northern Madtom is found in the central United States south of the Great Lakes, and reaches the northern extent of its range in southern Ontario.	DFO, NHIC	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Fish	Northern Sunfish (Great Lakes - Upper St.Lawrence populations) *Lepomis peltastes*	SC	SC Schedule 1	SC	In Ontario, the Northern Sunfish lives in shallow vegetated areas of quiet, slow flowing rivers and streams, as well as warm lakes and ponds, with sandy banks or rocky bottoms. Northern Sunfish prefer to be near aquatic vegetation where they can avoid strong currents. During the breeding season, males guard their nests which are made by digging saucer like depressions in gravel or cobble substrates. It eats mostly aquatic insect larvae and algae, but is known for feeding at the water's surface more frequently than other sunfish. Northern Sunfish usually occurs in clear waters and is considered intolerant of siltation. Substrate usually consists of sand and gravel, as in the Thames River.		In Canada, the Northern Sunfish only lives in Ontario and Quebec. The Great Lakes - Upper St. Lawrence populations are found throughout southern Ontario including waters flowing into Lake Huron, Georgian Bay, Lake St. Clair, Lake Erie, and Lake Ontario, as well as rivers and small lakes in eastern Ontario. In Canada, Northern Sunfish range includes northwestern Ontario, south and central Ontario, and southern Québec. Because Northern Sunfish is found in Canada in two National Freshwater Biogeographic Zones it is assessed as two designatable units.	DFO	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Insects	Monarch *Danaus plexippus*	SC	SC Schedule 1	END	Throughout their life cycle, Monarchs use three different types of habitat. Only the caterpillars feed on milkweed plants and are confined to meadows and open areas where milkweed grows. Adult butterflies can be found in more diverse habitats where they feed on nectar from a variety of wildflowers. Milkweeds (numerous species) are the sole food plant for Monarch caterpillars. These plants grow predominantly in open and periodically disturbed habitats such as roadsides, fields, wetlands, prairies, and open forests. Milkweeds are often planted outside their native range, and sometimes wayward Monarchs are observed at these patches. Monarchs require staging areas which are used to rest, feed, and avoid inclement weather during migration. In Canada, they are found along the north shores of the Great Lakes where Monarchs roost in trees before crossing large areas of open water.	**AI, TP,** and **CUM** where milkweed plants are present.	The Monarch's range extends from Central America to southern Canada. In Canada, Monarchs are most abundant in southern Ontario and Quebec where milkweed plants and breeding habitat are widespread. During late summer and fall, Monarchs from Ontario migrate to central Mexico where they spend the winter months. During migration, groups of Monarchs numbering in the thousands can be seen along the north shores of Lake Ontario and Lake Erie. The overall native range of the Monarch occurs from Central America northward through the continental United States to southern Canada, and from the Atlantic Coast westward to the Pacific Coast. The Canadian range of occurrence includes portions of all ten provinces and the Northwest Territories. Monarchs are loosely divided into eastern and western subgroups based on their migratory routes and overwintering sites. Eastern Monarchs breed from Alberta east to Nova Scotia and migrate south to overwinter in the mountains of Central Mexico. The breeding range in Canada is south of the 50° latitude in Ontario, Quebec, and the Maritimes. Each fall hundreds of thousands of Monarchs migrate through Long Point in southern Ontario but it's unknown what proportion of the Canadian population these individuals represent.	NHIC, OBA	Medium - Some small open areas between agricultural fields and roadsides may provide suitable habitat.	Medium - Some small open areas between agricultural fields and roadsides may provide suitable habitat.	Medium - Some small open areas between agricultural fields and roadsides may provide suitable habitat.	Medium - Some small open areas between agricultural fields and roadsides may provide suitable habitat.	Medium - Some small open areas between agricultural fields and roadsides may provide suitable habitat.	Medium - Some small open areas between agricultural fields and roadsides may provide suitable habitat.	Medium - Some small open areas between agricultural fields and roadsides may provide suitable habitat.	Medium - Some small open areas adjacent roadsides and railway may provide suitable habitat.	Medium - Some small open areas adjacent roadsides and railway may provide suitable habitat.
p	Mammals	Eastern Small-footed Myotis (Eastern Small-footed Bat) *Myotis leibii*	END	N/A	N/A	In the spring and summer, Eastern Small-footed Bats will roost in a variety of habitats, including in or under rocks, in rock outcrops, in buildings, under bridges, or in caves, mines, or hollow trees. These bats often change their roosting locations every day. At night, they hunt for insects to eat, including beetles, mosquitos, moths, and flies. In the winter, these bats hibernate, most often in caves and abandoned mines. They seem to choose colder and drier sites than similar bats and will return to the same spot each year.		The Eastern Small-footed Bat has been found from south of Georgian Bay to Lake Erie and east to the Pembroke area. There are also records from the Bruce Peninsula, the Espanola area, and Lake Superior Provincial Park. Most documented sightings are of bats in their winter hibernation sites.	BCI	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Mammals	Little Brown Myotis (Little Brown Bat) *Myotis lucifugus*	END	END Schedule 1	END	Bats are nocturnal. During the day they roost in trees and buildings. They often select attics, abandoned buildings, and barns for summer colonies where they can raise their young. Bats can squeeze through very tiny spaces (as small as six millimetres across) and this is how they access many roosting areas. Little Brown Bats hibernate from October or November to March or April, most often in caves or abandoned mines that are humid and remain above freezing. Their specific physiological requirements limit the number of suitable sites for overwintering. In the east, large numbers (i.e., >3000 bats) of several species typically overwinter in relatively few hibernacula. In the west, there are fewer known hibernacula, and numbers appear lower per site. Females establish summer maternity colonies, often in buildings or large-diameter trees. Foraging occurs over water, along waterways, and forest edges. Large open fields or clearcuts generally are avoided. In autumn, bats return to hibernacula, which may be hundreds of kilometres from their summering areas, swarm near the entrance, mate, and then enter that hibernaculum, or travel to different hibernacula to overwinter.		The Little Brown Bat is widespread in southern Ontario and found as far north as Moose Factory and Favourable Lake. In Canada, *Myotis lucifugus* occurs from Newfoundland to British Columbia, and northward to near the treeline in Labrador, Northwest Territories and Yukon.	BCI	Medium - Forested communities and buildings may provide suitable habitat.	Medium - Forested communities and buildings may provide suitable habitat.	Medium - Forested communities and buildings may provide suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Mammals	American Badger (Southwestern population) *Taxidea taxus* (*Taxidea taxus jacksoni*)	END	END Schedule 1	END	In Ontario, badgers are found in a variety of habitats, such as tall grass prairie, sand barrens, and farmland. These habitats provide badgers with small prey, including groundhogs, rabbits and small rodents. Since badgers are primarily nocturnal and quite wary of people, not many people are fortunate enough to spot one in the wild. The habitat requirements of the American Badger are not well understood, however friable soil suitable for badgers to burrow in and to support small burrowing mammals upon which badgers prey appears to be a key element. Open habitats, whether natural (grasslands) or man-made (agricultural fields, road right-of-ways, golf courses), are generally used. Little is known about badger habitat in southern Ontario, but it appears to be severely fragmented by human development, and individual badgers are at high risk of being killed on roads.	**TPS1, CUM1, CUS, SBO** with dry sandy soil.	The American Badger ranges from California and Texas to the Great Lakes region. In Ontario, the Southwestern population of American Badger is found in the southwestern part of the province, primarily close to Lake Erie in the Norfolk and Middlesex area. Badgers can travel sizeable distances and occupy large home ranges of many square kilometres. The range of the *jacksoni* subspecies of the American Badger includes the area around the Great Lakes on both sides of the Canada-US border. In Canada, the subspecies has a very restricted range and now occurs in extreme southwestern Ontario south of the Bruce and Niagara peninsulas. The size of the population is estimated at 0 to 200 individuals, and trends are unknown. It is completely isolated from all other badger populations.	NHIC	Medium - Open habitats and agricultural fields may provide suitable habitat.	Medium - Open habitats and agricultural fields may provide suitable habitat.	Medium - Open habitats and agricultural fields may provide suitable habitat.	Medium - Open habitats and agricultural fields may provide suitable habitat.	Medium - Open habitats and agricultural fields may provide suitable habitat.	Medium - Open habitats and agricultural fields may provide suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.

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p	Mammals	Northern Myotis (Northern Long-eared Bat) *Myotis septentrionalis*	END	END Schedule 1	END	Northern Long-eared Bats are associated with boreal forests, choosing to roost under loose bark and in the cavities of trees. These bats hibernate from October or November to March or April. The Northern Long-eared Bat overwinters in cold and humid hibernacula (caves/mines). Their specific physiological requirements limit the number of suitable sites for overwintering. In the east, large numbers (i.e., >3000 bats) of several species typically overwinter in relatively few hibernacula. In the west, there are fewer known hibernacula, and numbers appear lower per site. Females establish summer maternity colonies in buildings or large-diameter trees. Foraging occurs along waterways, forest edges, and in gaps in the forest. Large open fields or clearcuts generally are avoided. In autumn, bats return to hibernacula, which may be hundreds of kilometres from their summering areas, swarm near the entrance, mate, and then enter that hibernaculum, or travel to different hibernacula to overwinter.	**FOC, FOM, FOD, SWC, SWM,** and **SWD** where suitable roosting (i.e. cavity trees and trees with loose bark) habitat is available.	The Northern Long-eared Bat is found throughout forested areas in southern Ontario, to the north shore of Lake Superior and occasionally as far north as Moosonee, and west to Lake Nipigon. In Canada, *Myotis septentrionalis* occurs from Newfoundland to British Columbia, and northward to near the treeline in Labrador, Northwest Territories, and Yukon.	BCI	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Mammals	Tri-colored Bat *Perimyotis subflavus*	END	END Schedule 1	END	During the summer, the Tri-colored Bat is found in a variety of forested habitats. It forms day roosts and maternity colonies in older forest and occasionally in barns or other structures. They forage over water and along streams in the forest. Tri-colored Bats eat flying insects and spiders gleaned from webs. At the end of the summer they travel to a location where they swarm; it is generally near the cave or underground location where they will overwinter. They overwinter in caves where they typically roost by themselves rather than part of a group. The Tri-colored Bat overwinters in cold and humid hibernacula (caves/mines). Their specific physiological requirements limit the number of suitable sites for overwintering. In the east, large numbers (i.e., >3000 bats) of several species typically overwinter in relatively few hibernacula. In the west, there are fewer known hibernacula, and numbers appear lower per site. Females establish summer maternity colonies in buildings or large-diameter trees. Foraging occurs over water, along waterways, and forest edges. Large open fields or clearcuts generally are avoided. In autumn, bats return to hibernacula, which may be hundreds of kilometres from their summering areas, swarm near the entrance, mate, and then enter that hibernaculum, or travel to different hibernacula to overwinter.		This bat is found in southern Ontario and as far north as Espanola near Sudbury. Because it is very rare, it has a scattered distribution. It is also found from eastern North America down to Central America. In Canada, *Perimyotis subflavus* occurs in Nova Scotia, New Brunswick, Quebec, and Ontario.	BCI	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Mammals	Woodland Vole *Microtus pinetorum*	SC	SC Schedule 1	SC	In Ontario, the Woodland Vole lives in mature deciduous forest in the Carolinian region where there is a deep litter layer that allows it to burrow. Woodland Voles are commonly associated with deciduous forests but also inhabit scrubby sand dunes, swamps, and orchards. They are influenced by the amount and type of cover, soil moisture, and soil type, preferring areas with dense herbaceous vegetation and friable soils with low saturation. Fragmentation of habitat has occurred in southern Ontario over the past century and overall forest cover is low. In the areas where Woodland Voles occur, forest cover is much higher than average and there has been little change since the last assessment.	**FOD** with a deep leaf litter and loose soils.	The Woodland Vole is found throughout much of eastern North America, with a range that extends from southern Quebec, Ontario, and Maine, south to northern Florida and Texas, and west to Michigan and Wisconsin. In Ontario, it is known to exist at 30 sites from the Municipality of Chatham-Kent and Lambton County, east to Haldimand County, and north to Halton Regional Municipality and the City of Hamilton. Because it spends most of its time below ground, this species is difficult to spot and may have been missed at other locations in the province. There is a large unsurveyed area with some potentially suitable habitat between the ranges in each province.	NHIC	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Molluscs	Fawnsfoot *Truncilla donaciformis*	END	END Schedule 1	END	The Fawnsfoot inhabits medium and large rivers with moderate to slow flowing water. It usually inhabits shallow waters (1 to 5 metres deep) with gravel, sand, or muddy bottoms. The Fawnsfoot is generally found in the lower portions of medium to large rivers.		Fawnsfoot is only found in North America, where it primarily occurs in the Great Lakes and Mississippi drainages. In Canada, this species is limited to tributaries of the Great Lakes. In most areas where Fawnsfoot occurs, it has a patchy distribution and is limited to the lower portions of large rivers. The Fawnsfoot is widely distributed throughout central North America, occurring in 23 American states and one Canadian province. Historically, this mussel was reported in lakes Huron, St. Clair, and Erie and some of their tributaries. Currently, its distribution is restricted to the lower Thames River and to single sites in the St. Clair delta, Muskrat Creek (Saugeen River drainage), lower Sydenham River, and lower Grand River. At two of these sites, only a single specimen has been found.	NHIC,DFO	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Potentially suitable habitat may be present in Thames River.	Medium - River may provide suitable habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Molluscs	Kidneyshell *Ptychobranchus fasciolaris*	END	END Schedule 1	END	The Kidneyshell is typically found in small to medium sized rivers. It prefers shallow, clear, swift-moving water with gravel and sand. It also used to occur on gravel shoals in the Great Lakes. All mussels filter water to find food, such as bacteria and algae. Mussel larvae are parasitic and must attach to a fish host, where they consume nutrients from the fish body until they transform into juvenile mussels that drop off of the fish. The Kidneyshell has three known fish hosts in Canada: Blackside Darter, Fantail Darter, and Johnny Darter. The presence of fish hosts is one of the key features for an area to support a healthy mussel population. The Kidneyshell is most often found in small to medium-sized rivers and streams, where it prefers shallow areas with clear, swift-flowing water and substrates of firmly packed coarse gravel and sand. It is rarely found in either large rivers or headwater creeks, but has been found on gravel shoals in Lake Erie and Lake St. Clair. It is often found near beds of Water Willow, an aquatic plant. It is usually found deeply buried in the substrate.	**OAO** with shallow, clear, swift flowing water with a gravel and sand substrate.	In Canada, the Kidneyshell is currently found in four areas in southwestern Ontario. There are reproducing populations in the East Sydenham River and in the Ausable River. Small populations are also found in St. Clair River delta in Lake St. Clair and a tributary of the Thames River. The species no longer occurs in Lake Erie or the Detroit, Thames, Grand, Welland, or Niagara rivers. Its distribution in Canada is now limited to Lake St. Clair and the Sydenham and Ausable rivers in southern Ontario. The Kidneyshell was always rare in Lake Erie, Lake St. Clair, and the Niagara and Detroit rivers, but has now been virtually extirpated from these waters by the Zebra Mussel *Dreissena polymorpha*. It is now restricted to two reproducing populations that occupy a 100-km reach of the East Sydenham and a 25-km reach of the Ausable River.	NHIC,DFO, iNaturalist	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Potentially suitable habitat may be present in Thames River.	Medium - River may provide suitable habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Molluscs	Mapleleaf (Great Lakes - Upper St. Lawrence population) *Quadrula quadrula*	SC	SC Schedule 1	SC	Mussels filter water to find food, such as bacteria and algae. Mussel larvae must attach to a fish, called a host, where they consume nutrients from the fish body until they transform into juvenile mussels and then drop off. In Canada, the fish host of the Mapleleaf is the Channel Catfish. Presence of the fish host is one of the key features determining whether the body of water can support a healthy mussel population. *Quadrula quadrula* occurs in a variety of habitats ranging from medium to large rivers with slow to moderate current, to lakes and reservoirs in mud, sand, or gravel bottoms. In Ontario and Manitoba, *Q. quadrula* is most typically recovered from medium to large rivers in firmly packed coarse gravel and sand to firmly packed clay/mud bottom.		In Canada, the Mapleleaf is found in Manitoba and in southwestern Ontario. In Ontario, this species is found in several large rivers that drain into Lake St. Clair and Lake Erie including the Sydenham, Ausable, Grand, and Thames and Welland rivers. The species has disappeared from Lake Erie and the Detroit and Niagara rivers. In Canada, this species is limited in southern Ontario to the coastal areas and medium to large rivers of the Lake Huron, Lake St. Clair, Lake Erie, and Lake Ontario watersheds. In Ontario, *Q. quadrula* is restricted to a few coastal areas and rivers draining into Lake Huron, Lake Erie, Lake St. Clair, and Lake Ontario. The mussel community in this region is in decline with many species considered extirpated from areas they once occupied. Comparison with historical records indicates some reduction in the distribution of this species in Ontario.	DFO	Medium - Potentially suitable habitat may be present in Thames River.	Low - No suitable habitat.	Medium - River may provide suitable habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.

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p	Molluscs	Northern Riffleshell *Epioblasma torulosa* (*Epioblasma torulosa rangiana*)	END	END Schedule 1	END	Like all freshwater mussels, this species feeds on algae and bacteria that it filters out of the water. Mussel larvae are parasitic and must attach to a fish host, where they consume nutrients from the fish body until they transform into juvenile mussels and drop off. The presence of fish hosts is one of the key features for an area to support a healthy mussel population. The Northern Riffleshell lives in highly oxygenated riffle areas of rivers and streams on rocky and sandy bottoms (substrates) or firmly packed sand and fine-to-coarse gravel. It is a moderately long-lived, sexually dimorphic species (males and females look different from each other) with a lifespan of 15 years or more. Spawning likely occurs in late summer and the glochidia (larvae) are released the following spring. Like most other freshwater mussels, the glochidia are parasitic on fishes. In this case, the female Northern Riffleshell lures and grabs a host fish with her shell, releasing glochidia into the fish's mouth. The glochidia then attach to the host fish as they flow through its gills. Here they will remain until they reach their juvenile, free-living stage and drop off onto the substrate below. Adults are essentially sessile and may move only a few metres along the substrate. The known host fishes for this mussel in Canada are the Blackside Darter, Logperch, Iowa Darter, Johnny Darter, Rainbow Darter, Brook Stickleback, and Mottled Sculpin. Like all species of freshwater mussels, the Northern Riffleshell filters its food from the water. Bacteria and algae are its primary food sources.	**OAO** in riffles with rocky, sand, or gravel bottoms.	In Ontario, it is now only found in the Sydenham River and Ausable River in southwestern Ontario. Populations in Lake Erie, Lake St. Clair and the Detroit River have disappeared. The Northern Riffleshell is one of the last remaining members of the near-extinct genus *Epioblasma*; its range has been reduced in North America by 95% over the last century. In Canada, it was once found in western Lake Erie, Lake St. Clair, and the Detroit, Thames, Ausable, and Sydenham rivers, but is now restricted to a 91 kilometre reach of the East Sydenham River and a 44 kilometre reach of the Ausable River. However, the East Sydenham River population is one of only three known reproducing populations in the world and is considered the healthiest population of the Northern Riffleshell in Canada. Historically, the mussel was found throughout the Ohio River system and in portions of the Lake Erie and Lake St. Clair drainages. In Canada, there are 20 known records for this rare subspecies. Now it is restricted to a 40 km reach of the Sydenham River, where it occurs in low densities.	NHIC, iNaturalist	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Potentially suitable habitat may be present in Thames River.	Medium - River may provide suitable habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - Study Area is outside of range	Low - Study Area is outside of range	Low - Study Area is outside of range
p	Molluscs	Rainbow *Villosa iris*	SC	SC Schedule 1	SC	The Rainbow mussel prefers small to medium-sized rivers with a moderate to strong current and sand, rocky, or gravel bottoms. It is found in or near riffle areas and along the edges of vegetation in water less than 1 metre deep. All mussels filter water to find food, such as bacteria and algae. Mussel larvae must attach to a fish, called a host, where they consume nutrients from the fish body until they transform into juvenile mussels and then drop off. The Rainbow mussel uses a variety of fish hosts in Ontario, including Striped Shiner, Smallmouth Bass, Largemouth Bass, Green Sunfish, Greenside Darter, Rainbow Darter, and Yellow Perch. The Rainbow is most often found in shallow, well-oxygenated reaches of small- to medium-sized rivers, and sometimes lakes, on substrates (bottoms) of cobble, gravel, sand, and occasionally mud.		In Canada, the Rainbow mussel is found only in Ontario in the Ausable, Bayfield, Detroit, Grand, Maitland, Moira, Niagara, Salmon, Saugeen, Sydenham, Thames, and Trent rivers and in Lake St. Clair. It may no longer exist in the St. Clair, Detroit, and Niagara rivers, and Lake Erie. The current distribution of the Rainbow in North America is similar to its historical distribution: from Wisconsin east to Ontario and New York, and south to Oklahoma, Arkansas and Alabama. However, this species has been declining in part of its range—particularly in the Great Lakes, where it has been lost from Lake Erie and the Detroit and Niagara rivers and much of Lake St. Clair. The Maitland River still supports the largest remaining population of Rainbow; overall however, this mussel has been lost from 30% of its historical Canadian range.	NHIC, iNaturalist	Medium - Potentially suitable habitat may be present in Thames River.	Medium - River may provide suitable habitat.	Medium - River may provide suitable habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Molluscs	Rayed Bean *Villosa fabalis*	END	END Schedule 1	END	The Rayed Bean is typically found buried in sand or gravel in shallow, clear headwaters and riffle areas of small tributaries. It is often found buried among the roots of aquatic plants. The Rayed Bean filters water to find food, such as bacteria and algae. Mussel larvae are parasitic and must attach to a fish host, where they consume nutrients from the fish body until they transform into juvenile mussels and drop off. In Ontario, the fish hosts of the Rayed bean include: the Brook Stickleback, Largemouth Bass, Greenside Darter, Johnny Darter, Rainbow Darter, Logperch, and Mottled Sculpin. The presence of fish hosts is one of the key features for an area to support a healthy mussel population. It is occasionally reported from shallow water areas of lakes and large rivers. The historical distribution of the species in Canada falls within a region that is heavily impacted by agriculture and urban development.	**OAO** that are clear headwaters and riffle areas of small tributaries with a sand or gravel substrate and the presence of fish host species.	In Canada, the Rayed Bean is found only in southern Ontario, in the East Sydenham River and a small section of the North Thames River. The species has been lost from Lake Erie and the Detroit River. In Ontario, its range once included the Detroit River, the Sydenham and Thames rivers in the Lake St. Clair drainage, and western Lake Erie. Now it is restricted to the Sydenham River. There are 30 known Canadian records for this species, which burrows deeply into the substrate and can be easily overlooked. Along the 45 km reach of the Sydenham River that represents the entire Canadian range for the species, it occurs at low densities and is probably declining.	DFO, iNaturalist	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Potentially suitable habitat may be present in Thames River.	Medium - River may provide suitable habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Molluscs	Round Hickorynut *Obovaria subrotunda*	END	END Schedule 1	END	In Ontario, the Round Hickorynut is mainly found in rivers with clay, sand, or gravel bottoms. It also lives in shallow areas of lakes with firm sand. It prefers moderately fast moving water. Like all mussels, this species filters water to find food, such as bacteria and algae. Mussel larvae are parasitic and must attach to a fish host, where they consume nutrients from the fish body until they transform into juvenile mussels and drop off. The fish hosts of the Round Hickorynut in Canada have not been confirmed but may include the Greenside Darter and the Eastern Sand Darter, which is also a Species At Risk. The presence of fish hosts is one of the key features for an area to support a healthy mussel population. The preferred habitat of the Round Hickorynut is generally described as freshwater with steady, moderate flows and sand and gravel bottoms, at depths of up to 2 m. In southeastern Michigan and southwestern Ontario, however, it has mainly been found in murky, low-gradient rivers with clay/sand or clay/gravel substrates. In Lake St. Clair, it currently occupies shallow (<1 m) nearshore areas with firm, sandy substrates.	**OAO** that are rivers with clay, sand, or gravel bottoms or shallow areas of lakes with a firm sand substrate.	The Round Hickorynut has been lost from 90% of its former range in Canada. It is now found only in the Sydenham River and the St. Clair River delta in Lake St. Clair in southwest Ontario. Populations have been lost from the rest of Lake St. Clair, the Thames River, the Detroit River, Lake Erie, and the Grand and Niagara River drainages. In Canada, the Round Hickorynut now occurs only in southern Ontario, and is restricted to the Lake St. Clair delta and the Sydenham River. The only significant population left in Canada occurs in the shallow waters of the Lake St. Clair delta, but it is not known if the population will continue to survive.	iNaturalist	Medium - River may provide suitable habitat.	Medium - River may provide suitable habitat.	Medium - River may provide suitable habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - Study Area is outside of range.	Low - Study Area is outside of range.	Low - Study Area is outside of range.
p	Molluscs	Round Pigtoe *Pleurobema sintoxia*	END	END Schedule 1	END	The Round Pigtoe is usually found in rivers of various sizes with deep water and sandy, rocky, or mud bottoms. Like all freshwater mussels, this species feeds on algae and bacteria that it filters out of the water. Mussel larvae are parasitic and must attach to a fish host, where they consume nutrients from the fish body until they transform into juvenile mussels and drop off. Known fish hosts of the Round Pigtoe include: Bluegill, Spotfin Shiner, Bluntnose Minnow, and Northern Redbelly Dace. The presence of fish hosts is one of the key features for an area to support a healthy mussel population. The Round Pigtoe appears to be a habitat generalist. It may be found in small, medium-sized, and large rivers with moderate flows on mixed substrates of gravel, cobble, boulder, sand, and mud. In Lake Erie and Lake St. Clair, it occurs in shallow (<1 m) nearshore areas with firm sandy substrates. In large rivers it is often found at depths greater than 3 m.	**OAO** rivers with deep water and sandy, rocky or mud substrates.	In Canada, Round Pigtoe are found only in southwestern Ontario, mainly in the St. Clair River delta and the Sydenham River, but small populations still exist in the Grand and Thames rivers and in shallow areas near the shorelines of Lake Erie and Lake St. Clair. The Round Pigtoe was historically distributed from New York and Ontario in the east to South Dakota, Kansas, and Oklahoma in the west and south to Arkansas and Alabama. In Canada, it was known from the Niagara, Detroit, Grand, Thames, and Sydenham rivers as well as Lake Erie and Lake St. Clair.	DFO, iNaturalist	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Potentially suitable habitat may be present in Thames River.	Medium - River may provide suitable habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Molluscs	Salamander Mussel (Mudpuppy Mussel) *Simpsonaias ambigua*	END	END Schedule 1	END	Salamander Mussel larvae are parasitic and use the Mudpuppy as a host, where they consume nutrients from the salamander's body until they transform into juvenile mussels and drop off. Adult mussels feed by filtering algae and bacteria from the water. The Mudpuppy Mussel is most often found in sand or silt under large, flat rocks in shallow areas with a swift current, but it may sometimes be found in mud and on gravel bars. Essentially, it is found in areas with enough cover to meet the nesting and sheltering requirements of its larval host, the Mudpuppy salamander.	**OAO** with a soft sand or silt substrate and a swift current.	In Ontario, the Salamander Mussel occurs only in the East Sydenham River and at one location in the Thames River. The species has disappeared from the Detroit River due to Zebra Mussel impacts, but it may remain in the small area of the St. Clair River delta in Lake St. Clair. The Mudpuppy Mussel was historically known from 14 of the United States and in the province of Ontario. In Canada, the species was always restricted to a small area of southwestern Ontario, with only three known historical records from the Sydenham and Detroit rivers. The species now appears to be restricted to a 50 km reach of the East Sydenham River in the Lake St. Clair drainage of Ontario.	iNaturalist	Medium - Potentially suitable habitat may be present in Thames River.	Medium - Potentially suitable habitat may be present in Thames River.	Medium - River may provide suitable habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.

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p	Molluscs	Snuffbox *Epioblasma triquetra*	END	END Schedule 1	END	Mussel larvae are parasitic and must attach to a fish host, where they consume nutrients from the fish body until they transform into juvenile mussels and drop off. In Ontario, the main fish host for Snuffbox is the Logperch but other host fish may include various darter species, Largemouth Bass, Mottled Sculpin, and Brook Stickleback. Like all freshwater mussels, the Snuffbox feeds on algae and bacteria that it filters out of the water. The Snuffbox is typically found in small- to medium-sized rivers in shallow riffle areas with clean, clear, swift-flowing water and firm rubble/gravel/sand substrates that are free of silt.	**OAO** characterized as small to medium sized rivers with clear, clear, swift flowing water and firm rocky, gravel, or sandy substrates.	In Canada, the Snuffbox is now only found in the East Sydenham River and the Ausable River in southwest Ontario. The total population size is very small. Historically, the species was also found in Lake Erie, Lake St. Clair, and the Thames, Detroit, Grand, and Niagara rivers. The Snuffbox was historically known from 18 of the United States and the province of Ontario. In Canada, it occurs only in Ontario and is now restricted to several small populations in a 50-km reach of the East Sydenham River, and possibly in the the Ausable River. It is believed that in North America there are fewer than 50 extant sites where the Snuffbox is reproducing.	DFO, NHIC	Medium - River may provide suitable habitat.	Medium - River may provide suitable habitat.	Medium - River may provide suitable habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - Study Area is outside of range.	Low - Study Area is outside of range.	Low - Study Area is outside of range.
p	Plants	American Chestnut *Castanea dentata*	END	END Schedule 1	END	The American Chestnut prefers drier upland deciduous forests with sandy, acidic to neutral soils. In Ontario, it is only found in the Carolinian Zone between Lake Erie and Lake Huron. The species grows alongside Red Oak, Black Cherry, Sugar Maple, American Beech, and other deciduous tree species.	**FOD** with dry sandy soil.	The American Chestnut has almost disappeared from eastern North America due to an epidemic caused by a fungal disease called the chestnut blight (*Cryphonectria parasitica*). In Canada, the American Chestnut is restricted primarily to southwestern Ontario. This species occurs throughout eastern North America from southern Maine to southern Ontario and Michigan, south to Georgia to Mississippi. Remnants of once large populations of this tree still survive across most of its historical range in southern Ontario as well as most of the states within its range to the south.	NHIC, iNaturalist	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Plants	Blue Ash *Fraxinus quadrangulata*	THR	SC Schedule 1	THR	In Ontario, Blue Ash grows in deciduous floodplain forests, and along sandy beaches and on limestone outcrops associated with Lake Erie. Blue Ash grows in a variety of habitats and soil types. In Ontario, it is found in three distinctive habitat types. They include floodplains and river valleys where Blue Ash grows in rich soils in association with a variety of other tree species; shallow soils on alvar and limestone on the Lake Erie Islands; and stabilized beaches at Point Pelee National Park, and Fish Point on Pelee Island. All of these habitats have declined in area and quality over the last 100 years. While the effects of habitat fragmentation on Blue Ash have not been assessed, it is expected that fragmentation will result in ecological degradation and perhaps genetic degradation over a longer timeframe, which may contribute to decreasing the likelihood of persistence of subpopulations.	**BBO, BBS, BBT, SDO, SDS, SDT, FOD6, FOD7, FOD8, FOD9, ALO, ALS,** and **ALT**.	The range of Blue Ash extends from southwestern Ontario south to Oklahoma and Georgia. In Canada, it occurs only in southwestern Ontario, at the northern limits of its range, where about 56 occurrences are known. Blue Ash has a restricted distribution in Canada and occurs only in southwestern Ontario in the counties and municipalities of Elgin, Middlesex, Lambton, Chatham-Kent, and Essex. It is found at Point Pelee, Peche Island at the mouth of the Detroit River, and the Erie Islands, as well as in river valleys along the Thames River, Sydenham River, and Catfish Creek.	iNaturalist	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Plants	Broad Beech Fern *Phegopteris hexagonoptera*	SC	SC Schedule 3	SC	The Broad Beech Fern prefers to grow in rich soils in deciduous forests, often in areas dominated by maple and beech trees. It requires moist soil and usually grows in full shade.	**FOD5** and **FOD6** with moist soils and closed canopies.	The Broad Beech Fern grows in eastern North America from the southern Great Lakes region west to southeast Kansas and northeast Oklahoma, south to northeast Texas and the Gulf Coast, and east to the Atlantic coast. In Ontario, the species is found in forest remnants in southern Muskoka, along Lake Erie, and in the eastern Lake Ontario-St. Lawrence River region. In Canada, this plant is at the northern limit of its climatic range. In Canada, the fern is found only in southern Ontario and southern Quebec. Several Canadian populations of Broad Beech Fern have disappeared.	NHIC	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Plants	Common Hoptree *Ptelea trifoliata*	SC	SC Schedule 1	SC	In Canada, Common Hoptree is found often along shorelines in areas of nutrient poor sandy soils, although it is sometimes found on thin soils overlying limestone. It does best in full sun and is intolerant of shade. In Ontario, Common Hoptree occurs almost entirely along or near the Lake Erie shoreline. It is often found in areas of natural disturbance where it forms part of the outer edge of shoreline woody vegetation.	**BBO2, BBS1, BBT1, SDO, SDS, SDT, SBO, SBS, SBT, ALO, ALS** and **ALT** typically in fairly open areas near water.	Common Hoptree ranges from the lower Great Lakes south to Texas, and from eastern Pennsylvania to northern Florida. In Canada, Common Hoptree is found only in southwestern Ontario along the Lake Erie and Lake St. Clair shorelines, on Lake Erie islands, and near Lake Ontario in the Niagara Region.	#N/A	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Plants	Eastern Flowering Dogwood *Cornus florida*	END	END Schedule 1	END	Eastern Flowering Dogwood grows under taller trees in mid-age to mature deciduous or mixed forests. It most commonly grows on floodplains, slopes, bluffs, and in ravines, and is also sometimes found along roadsides and fencerows. This species is generally found in the drier areas of its habitat, although it is occasionally found in slightly moist environments. The Eastern Flowering Dogwood grows in sandy soil, more or less clayey. The species typically occurs in clusters within larger parcels of apparently suitable, though unoccupied, habitat. Historically, the Eastern Flowering Dogwood occupied a significant portion of the Carolinian forest in southern Ontario. However, large portions of the forest have been cleared to make way for agricultural activities, residential areas, and industrial facilities. This profound transformation resulted in a significant reduction and fragmentation of forest cover and suitable habitat.	**FOD** and **FOM**	In Canada, it can only be found in southern Ontario in the Carolinian Zone (the small area of Ontario southwest of Toronto to Sarnia down to the shores of Lake Erie). The Eastern Flowering Dogwood occurs in eastern North America from southern Michigan, Ontario, and Maine, to eastern Texas and northern Florida. In Canada, this species is only found in the deciduous forests of southern Ontario: in Oakville just west of Toronto, along the Niagara escarpment through Halton and Hamilton, and in several sites scattered throughout the Niagara region and towards the southwest. The Eastern Flowering Dogwood is particularly plentiful on the sand plain of Norfolk County.	NHIC, iNaturalist	Medium - Potentially suitable habitat may be present in wooded communities.	Medium - Potentially suitable habitat may be present in wooded communities.	Medium - Potentially suitable habitat may be present in wooded communities.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Plants	Green Dragon *Arisaema dracontium*	SC	SC Schedule 3	SC	The Green Dragon grows in somewhat wet to wet deciduous forests along streams, particularly maple forest and forest dominated by Red Ash and White Elm trees.	**FOD6, FOD7, FOD8, FOD9,** and **SWD** with moist soils.	Primarily a plant of the southern United States, the Green Dragon is found from the Great Lakes region and southern Quebec east to the Atlantic coast, south to Florida and the Gulf coast, and west to Texas and Nebraska. In Ontario, it is believed to still occur at about 30 to 35 sites in the southwestern part of the province. In Canada, the Green Dragon is found in southern Ontario and southwestern Quebec.	iNaturalist	Medium - Forested communities with water courses may provide suitable habitat.	Medium - Forested communities with water courses may provide suitable habitat.	Medium - Forested communities with water courses may provide suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Reptiles	Blanding's Turtle (Great Lakes / St. Lawrence population) *Emydoidea blandingii*	THR	THR Schedule 1	END	Blanding's Turtles live in shallow water, usually in large wetlands and shallow lakes with lots of water plants. It is not unusual, though, to find them hundreds of metres from the nearest water body, especially while they are searching for a mate or traveling to a nesting site. Blanding's Turtles hibernate in the mud at the bottom of permanent water bodies from late October until the end of April. In the Great Lakes/St. Lawrence population, Blanding's Turtles are often observed using clear water, eutrophic wetlands. Blanding's Turtles have strong site fidelity but may use several connected water bodies throughout the active season. Females nest in a variety of substrates including sand, organic soil, gravel, cobblestone, and soil-filled crevices of rock outcrops. Adults and juveniles overwinter in a variety of water bodies that maintain pools averaging about 1 m in depth; however, hatchling turtles have been observed hibernating terrestrially during their first winter. Reported mean home ranges generally fall between 10-60 ha (maximum 382 ha) or 1000-2500 m (maximum 7000 m); however, most studies likely underestimate Blanding's Turtle home range size because few have utilized GPS loggers to track daily movements throughout one or more entire active seasons.	**SWT2, SWT3, SWD, SWM, MAS2, SAS1, SAM1**, where open water is present.	The Blanding's Turtle is found in and around the Great Lakes Basin, with isolated populations elsewhere in the United States and Canada. In Canada, the Blanding's Turtle is separated into the Great Lakes-St. Lawrence population and the Nova Scotia population. Blanding's Turtles can be found throughout southern, central, and eastern Ontario. In its Canadian range, the Great Lakes/St. Lawrence population of the Blanding's Turtle occurs primarily in southern Ontario (with isolated reports as far north as Timmins) and southern Québec (with isolated reports occurring as far north as the Abitibi-Témiscamingue region and as far east as the Capitale-Nationale region in Québec). Across the North American range, Blanding's Turtles mainly occur in small, isolated subpopulations that maintain a few dozen to approximately 100 turtles.	NHIC, ORAA	Medium - The Thamesville Conservation Club Provincially Significant Wetland may provide suitable habitat.	Medium - The Thamesville Conservation Club Provincially Significant Wetland may provide suitable habitat.	Medium - The Thamesville Conservation Club Provincially Significant Wetland may provide suitable habitat.	Low - there are no provincial significant wetlands along this route to provide habitat for Blanding's Turtle. The Thames River is unlikely to provide suitable habitat as this species generally prefers standing open water features such as ponds, shallow aquatic marshes and wetlands.	Low - there are no provincial significant wetlands along this route to provide habitat for Blanding's Turtle. The Thames River is unlikely to provide suitable habitat as this species generally prefers standing open water features such as ponds, shallow aquatic marshes and wetlands.	Low - there are no provincial significant wetlands along this route to provide habitat for Blanding's Turtle. The Thames River is unlikely to provide suitable habitat as this species generally prefers standing open water features such as ponds, shallow aquatic marshes and wetlands.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.

Present (P) Absent (A)	Taxonomy	Species	ESA Status	SARA Status	COSEWIC Status	Preferred Habitat[1, 2]	Associated ELC Communities	Known Species Ranges[1, 2]	Source Identifying Species Record	Focus Study Area East E1 Route	Focus Study Area East E2 Route	Focus Study Area East E3 Route	Focus Study Area West W1 Route	Focus Study Area West W2 Route	Focus Study Area West W3 Route	Booster Pumping Station Sitting Area BPS 1	Booster Pumping Station Sitting Area BPS 2	Booster Pumping Station Sitting Area BPS 3
p	Reptiles	Eastern Hog-nosed Snake *Heterodon platirhinos*	THR	THR Schedule 1	THR	The Eastern Hog-nosed Snake specializes in hunting and eating toads, and usually only occurs where toads can be found. Eastern Hog-nosed Snakes prefer sandy, well-drained habitats such as beaches and dry forests where they can lay their eggs and hibernate. They use their up-turned snout to dig burrows below the frost line in the sand where eggs are deposited. The Eastern Hog-nosed Snake prefers habitats with sandy, well-drained soil and open vegetative cover, such as open woods, brushland, fields, forest edges, and disturbed sites. The species is often found near water. Eastern Hog-nosed Snakes in shoreline areas often rely on driftwood and other ground cover in beach and beach dune habitats, where toads, their prey of choice, are found. South of Parry Sound, in the Georgian Bay region, the species appears to prefer fields and forest habitats that have been modified by people rather than rock, wetland, or aquatic habitats. They can live in slightly cooler areas if there are exposed south-facing sandy slopes that provide soil conditions that are warm enough for incubation. The types of habitats preferred by Eastern Hog-nosed Snakes have declined or disappeared because the habitats have soils favourable for agriculture or for beach and water-related recreation.	**BBO** and **FOD**. Sandy soils required.	The Eastern Hog-nosed Snake is only found in eastern North America. In Canada, it is restricted to two geographically distinct areas in southern and south-central Ontario: the Carolinian region of southwestern Ontario and the Great Lakes–St. Lawrence region of central Ontario south of the French River and Lake Nipissing and east of Georgian Bay. The Eastern Hog-nosed Snake has been extirpated from the regional municipalities of Halton, Peel, and York, as well as from Pelee Island and from Point Pelee National Park of Canada. In addition, the records from Bruce, Grey, and Prince Edward counties are considered historical; the species may be extirpated from these areas as well as from Hastings and Durham counties.	ORAA, iNaturalist	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Medium - Forested communities may provide suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Reptiles	Eastern Milksnake *Lampropeltis triangulum*	N/A	SC Schedule 1	SC	Eastern Milksnakes are habitat generalists but prefer open habitats, including rock outcrops and meadows. They require suitable microhabitats for egg laying, hibernation, and thermoregulation. Eastern Milksnakes are well known for occupying barns, sheds, and houses in rural landscapes. At the landscape scale, the abundance of Eastern Milksnakes appears to correlate with regions where forest cover is relatively high. Eastern Milksnake habitat in portions of southwestern Ontario and parts of southwestern Quebec (e.g. urban regions and areas subject to intensive agriculture) is fragmented and consists of relatively small, natural areas.	**BL, TA, AL, RB, TP, CUM, FOC, FOM,** and **FOD**.	The global range of the Eastern Milksnake is confined to southeastern Canada and eastern U.S. In Canada, the Eastern Milksnake is mostly found in the Great Lakes / St. Lawrence and Carolinian regions within southern and central Ontario and southwestern Quebec. In Ontario, the Eastern Milksnake ranges from southwestern Ontario to Lake Nipissing. Although the species is widespread, there is evidence that Eastern Milksnake localities have been lost from large urban centres and regions with intensive agriculture.	NHIC, ORAA	Medium - Open habitats and forested communities within Study Area may provide suitable habitat.	Medium - Open habitats and forested communities within Study Area may provide suitable habitat.	Medium - Open habitats and forested communities within Study Area may provide suitable habitat.	Medium - Open habitats and forested communities within Study Area may provide suitable habitat.	Medium - Open habitats and forested communities within Study Area may provide suitable habitat.	Medium - Open habitats and forested communities within Study Area may provide suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Reptiles	Northern Map Turtle *Graptemys geographica*	SC	SC Schedule 1	SC	The Northern Map Turtle inhabits rivers and lakeshores where it basks on emergent rocks and fallen trees throughout the spring and summer. In winter, the turtles hibernate on the bottom of deep, slow-moving sections of river. They require high-quality water that supports the female's mollusc prey. Their habitat must contain suitable basking sites, such as rocks and deadheads, with an unobstructed view from which a turtle can drop immediately into the water if startled. The Northern Map Turtle inhabits both lakes and rivers, showing a preference for slow moving currents, muddy bottoms, and abundant aquatic vegetation. These turtles need suitable basking sites (such as rocks and logs) and exposure to the sun for at least part of the day.	**OAO, SA** with emergent rocks and fallen trees suitable habitat for prey.	The Northern Map Turtle's range extends from the Great Lakes region west to Oklahoma and Kansas, south to Louisiana, and east to the Adirondack and Appalachian mountain barrier. In Canada, it is found in southwestern Quebec and southern Ontario. In southern Ontario, it lives primarily on the shores of Georgian Bay, Lake St. Clair, Lake Erie, and Lake Ontario, and along larger rivers including the Thames, Grand, and Ottawa. It reaches its northern limit in southern Ontario and southwestern Quebec, where it is associated with the Great Lakes Basin and the St. Lawrence River.	NHIC, iNaturalist, ORAA	Medium - River may provide suitable habitat.	Medium - River may provide suitable habitat.	Medium - River may provide suitable habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Reptiles	Snapping Turtle *Chelydra serpentina*	SC	SC Schedule 1	SC	Snapping Turtles spend most of their lives in water. They prefer shallow waters so they can hide under the soft mud and leaf litter, with only their noses exposed to the surface to breathe. During the nesting season, from early to mid summer, females travel overland in search of a suitable nesting site, usually gravelly or sandy areas along streams. Snapping Turtles often take advantage of man-made structures for nest sites, including roads (especially gravel shoulders), dams, and aggregate pits. Although Snapping Turtles have been observed in shallow water in almost every kind of freshwater habitat, the preferred habitat of the species is characterized by slow-moving water with a soft mud bottom and dense aquatic vegetation. Established populations are most often located in ponds, sloughs, shallow bays or river edges, and slow streams, or areas combining several of these wetland habitats. Individual turtles will persist in urbanized water bodies, such as golf course ponds and irrigation canals, but it is unlikely that a population could become established in such habitats. The Snapping Turtle can occur in highly polluted waterways, but environmental contamination is known to reduce the already low reproductive output of this species. Basking on offshore logs and protruding rocks can be common in	**OAO, SA** near gravelly or sandy areas.	The Snapping Turtle's range extends from Ecuador to Canada. The Snapping Turtle's range is contracting. In Canada, the species is widespread from Nova Scotia to southeastern Saskatchewan, though it is absent from northwestern Ontario, where summers are likely too cool for Snapping Turtle embryos to complete development successfully. The Snapping Turtle is therefore present in mainland Nova Scotia, southern New Brunswick, southern and central Quebec, southern and central Ontario, southern Manitoba, and southeastern Saskatchewan, primarily in the Qu'Appelle watershed.	NHIC, iNaturalist, ORAA	Medium - Potentially suitable ponds located in close proximity to Study Area may provide suitable habitat.	Medium - Potentially suitable ponds located in close proximity to Study Area may provide suitable habitat.	Medium - Potentially suitable ponds located in close proximity to Study Area may provide suitable habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.
p	Reptiles	Spiny Softshell *Apalone spinifera*	END	END Schedule 1	END	Spiny Softshells are highly aquatic turtles that rarely travel far from water. They are found primarily in rivers and lakes but also in creeks and even ditches and ponds near rivers. Key habitat requirements are open sand or gravel nesting areas, shallow muddy or sandy areas to bury in, deep pools for hibernation, areas for basking, and suitable habitat for crayfish and other food species. These habitat features may be distributed over an extensive area, as long as the intervening habitat doesn't prevent the turtles from traveling between them. Spiny Softshell inhabits a wide variety of aquatic habitats, including rivers, marshy creeks, oxbows, lakes, and impoundments. Common habitat features include a soft bottom with sparse aquatic vegetation, as well as sandbars or mudflats. Overwintering sites are generally in well oxygenated lakes and rivers.	**OAO** characterized as rivers with nearby open sand or gravel nesting areas, shallow muddy or sandy substrates, deep pools, basking areas and suitable habitat for food species.	In Canada, the Spiny Softshell is found only in Quebec and southwestern Ontario in the Lake St. Clair, Lake Erie, and western Lake Ontario watersheds. The majority of Spiny Softshells in Ontario are found in the Thames and Sydenham rivers and at two sites in Lake Erie. The size of the home range of this turtle depends on availability of habitat features such as nesting and hibernation sites. Some turtles travel up to 30 kilometres in a year from one part of their home range to another. Globally, the Spiny Softshell occurs in eastern North America from the New England states through extreme southern Quebec and Ontario, west to Nebraska, south to Texas, and across the Gulf states to the Atlantic. The Canadian population is divided into two geographically distinct subpopulations: a Great Lakes/St. Lawrence subpopulation in southern Quebec and a Carolinian subpopulation in southern Ontario.	NHIC	Medium - Thames River and nearby ponds may provide suitable habitat.	Medium - Thames River and nearby ponds may provide suitable habitat.	Medium - Thames River and nearby ponds may provide suitable habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Medium - Thames River may have suitable banks for nests and may provide suitable foraging habitat.	Low - No suitable habitat.	Low - No suitable habitat.	Low - No suitable habitat.

Appendix F

Photo Log

Photograph 1. ↑
Fresh-Moist Lowland Deciduous Forest (FOD7) Community.
Location: 17T 426794 4716325

Photograph 2. ↑
Fresh-Moist Lowland Deciduous Forest (FOD7) Community.
Location: 17T 426794 4716325

Photograph 3. ↑
Fresh-Moist Lowland Deciduous Forest (FOD7) Community.
Location: 17T 426794 4716325

Photograph 4. ↑
Edge of Fresh-Moist Lowland Deciduous Forest (FOD7) community. Location: 17T 425687 4716330

Photograph 5.
Barn providing habitat for barn swallow. Confirmed barn swallow in barn.
Location: 17T 425096 4715265

Photograph 6.
Field across the street from barn.
Location: 17T 425096 4715265

Photograph 7.
Agriculture Fields surround most of study area.
Location: 17T 425309 4714024

Photograph 8.
Open aggregate pit area.
Location: 17T 425309 4714024

Photograph 9. ↑
Possible Bat SAR habitat along road.
Location: 17T 425398 4714014

Photograph 10. ↑
Possible Bat SAR habitat along road.
Location: 17T 425398 4714014

Photograph 11. ↑
Agriculture Fields surround study area.
Location: 17T 423310 4712724

Photograph 12. ↑
Possible SAR Bat Habitat
Location: 17T 423310 4712724

Photograph 13. ↑
Cultural Thicket (CUT) communities along road near Thamesville. Area not large enough to have own ELC.
Location: 17T 420231 4711564

Photograph 14. ↑
Cultural Thicket (CUT) communities along road near Thamesville. Area not large enough to have own ELC.
Location: 17T 420231 4711564

Photograph 15. ↑
Agriculture fields around study area
Location: 17T 423292 4713264

Photograph 16. ↑
Agriculture fields around study area
Location: 17T 423292 4713264

Photograph 17. ↑
Mineral Shallow Marsh (MAS2) community
Location: 17T 422196 4713311

Photograph 18. ↑
Mineral Shallow Marsh (MAS2) community
Location: 17T 422196 4713311

Photograph 19. ↑
Agriculture fields.
Location: 17T 421587 4713315

Photograph 20. ↑
Agriculture fields.
Location: 17T 421587 4713315

Photograph 21. ↑
Small Fresh-Moist Lowland Deciduous Forest (FOD7) community along road.
Location: 17T 418912 4711463

Photograph 22. ↑
Small Fresh-Moist Lowland Deciduous Forest (FOD7) community along road.
Location: 17T 418912 4711463

Photograph 23. ↑
Small section of Fresh-Moist Lowland Deciduous Forest (FOD7) community in study area.
Location: 17T 412377 4712438

Photograph 24. ↑
Small section of Fresh-Moist Lowland Deciduous Forest (FOD7) community in study area.
Location: 17T 412377 4712438

Photograph 25. ↑
Corn in many of the agriculture fields present in study area.
Location: 17T 411313 4708695

Photograph 26. ↑
Corn in many of the agriculture fields present in study area.
Location: 17T 411313 4708695

Photograph 27. ↑
Agriculture field surround study area.
Location: 17T 411313 4708695

Photograph 28. ↑
Agriculture field surround study area.
Location: 17T 411313 4708695

Photograph 29. ↑
Barn swallow nest under bridge.
Water Crossing 23686 23600 on Huffs Side Road

Photograph 30. ↑
Barn swallow nest under bridge.
Water Crossing 1237-11651 on Smoke Line

Appendix G

Plant List

Common Name	Scientific Name	Family	CC	CW	Native Status	Invasive (Y/N)	Tall-grass Species (Y/N)	SRANK	NRANK	GRank	COSEWIC	SARO	CK	Type	Flowering Season	CCVI	CCVI Confidence	ELC Code:	FOD7	MAS2
Sugar Maple	Acer saccharum	Aceraceae	4	3	N	N		S5	N5	G5			X	TR		LV	VH		X	
Common Milkweed	Asclepias syriaca	Apocynaceae	0	5	N	N		S5	N5	G5			X	FO	Sum				X	
Silky Dogwood	Cornus obliqua	Cornaceae	2	-3	N	N		S5	N5	G5			X	SH					X	
Grey Dogwood	Cornus racemosa	Cornaceae	2	0	N	N		S5	N5	G5			X	SH					X	
Red Ash	Fraxinus pennsylvanica	Oleaceae	3	-3	N	N		S4	N5	G5			X	TR					X	X
Black Walnut	Juglans nigra	Juglandaceae	5	3	N	N		S4?	N4?	G5			X	TR					X	
Common Juniper	Juniperus communis	Cupressaceae	4	3	N	N		S5	N5	G5			X	SH					X	
Tamarack	Larix laricina	Pinaceae	7	-3	N	N		S5	N5	G5			0	TR					X	
Tatarian Honeysuckle	Lonicera tatarica	Caprifoliaceae	0	3	I	Y		SE5	NNA	GNR			IX	SH					X	
Wild Bergamot	Monarda fistulosa	Lamiaceae	6	3	N	N	Y	S5	N5	G5			0	FO	Sum				X	
Thicket Creeper	Parthenocissus vitacea	Vitaceae	4	3	N	N		S5	N5	G5			X	VW					X	
White Spruce	Picea glauca	Pinaceae	6	3	N	N		S5	N5	G5			0	TR		LV	VH		X	
Blue Spruce	Picea pungens	Pinaceae	0	3	I	N		SE1	NNA	G5			0	TR					X	
Eastern White Pine	Pinus strobus	Pinaceae	4	3	N	N		S5	N5	G5			R	TR		LV	VH		X	
Eastern Cottonwood	Populus deltoides	Salicaceae	4	0	N	N		S5	N5	G5			0	TR					X	X
Trembling Aspen	Populus tremuloides	Salicaceae	2	0	N	N		S5	N5	G5			X	TR					X	
Shagbark Hickory	Carya ovata	Juglandaceae	6	3	N	N		S5	N5	G5			X	TR					X	
Bur Oak	Quercus macrocarpa	Fagaceae	5	3	N	N		S5	N5	G5			X	TR					X	
Staghorn Sumac	Rhus typhina	Anacardiaceae	1	3	N	N		S5	N5	G5			X	SH					X	
Black Locust	Robinia pseudoacacia	Fabaceae	0	3	I	Y		SE5	NNA	G5			IX	TR					X	
Red Raspberry	Rubus idaeus	Rosaceae	2	3	N	N		S5	N5	G5			0	SH					X	
(Salix alba X Salix euxina)	Salix x fragilis	Salicaceae	0	0	I	N		SNA	NNA	GNA			hyb	TR						X
Tall Goldenrod	Solidago altissima	Asteraceae	1	3	N	N		S5	N5	G5			0	FO	Sum-Aut				X	X
Common Dandelion	Taraxacum officinale	Asteraceae	0	3	I	N		SE5	N5	G5			IX	FO	Spr-Aut				X	X
Narrow-leaved Cattail	Typha angustifolia	Typhaceae	0	-5	I	Y		SE5	N5	G5			IX	FO	Sum					X
Broad-leaved Cattail	Typha latifolia	Typhaceae	1	-5	N	N		S5	N5	G5			X	FO	Sum					X
White Elm	Ulmus americana	Ulmaceae	3	-3	N	N		S5	N5	G4			X	TR					X	
Riverbank Grape	Vitis riparia	Vitaceae	0	0	N	N		S5	N5	G5			X	VW					X	X

Floristic Summary and Analysis for Entire Study Area		
Summary		Percent %
Total Species:	28	N/A
Native Species:	22	79
Introduced Species:	6	21
Invasive Species:	3	11
ESA Status		
END	0	0
THR	0	0
SC	0	0
COSEWIC Status		
END	0	0
THR	0	0
SC	0	0
Provincially Rare (S-rank of S1-S3)		
S1	0	0
S1?	0	0
S1S2	0	0
S1S3	0	0
S2	0	0
S2?	0	0
S2S3	0	0
S2S4	0	0
S3	0	0
S3?	0	0
S3S4	0	0
Total S1-S3:	0	0
Co-efficient of Conservatism and Floral Quality Index		
Co-efficient of Conservatism (CC) (average):	7	
CC 0 to 3	17	77
CC 4 to 6	10	45
CC 7 to 8	1	5
CC 9 to 10	0	0
Floral Quality Index (FQI)		
FQI:	33	
Presence of Wetland Species		
Wetness Value (CW) (average):	6	
upland	1	4
facultative upland	16	57
facultative	5	18
facultative wetland	4	15
obligate wetland	2	7

Physiognomy		
Plant Form	No. of Total Species	% of Total Species
Fern	6	0
Forb	15	0
Grass	1	0
Sedge	2	0
Shrub	3	0
Trees	2	0
Vine	1	0
Woody Vine	1	0
Grand Total	31	1

Floristic Summary and Analysis Per ELC		
Summary		
Total Species:	25	8
Native Species:	21	5
Introduced Species:	4	3
Invasive Species:	2	1
ESA Status		
END	0	0
THR	0	0
SC	0	0
COSEWIC Status		
END	0	0
THR	0	0
SC	0	0
Provincially Rare (S-rank of S1-S3)		
S1	0	0
S1?	0	0
S1S2	0	0
S1S3	0	0
S2	0	0
S2?	0	0
S2S3	0	0
S2S4	0	0
S3	0	0
S3?	0	0
S3S4	0	0
Total S1-S3:	0	0
Co-efficient of Conservatism and Floral Quality Index		
Co-efficient of Conservatism (CC) (average):	3	1
CC 0 to 3	14	7
CC 4 to 6	10	1
CC 7 to 8	1	0
CC 9 to 10	0	0
Floral Quality Index (FQI)		
FQI:	13	3
Presence of Wetland Species		
Wetness Value (CW) (average):	2	-1
upland	1	0
facultative upland	16	2
facultative	4	3
facultative wetland	4	1
obligate wetland	0	2

Appendix B

B.3 Stage 1 Archaeological Assessment

Stage 1 Archaeological Assessment

North-East Chatham-Kent Water Distribution System (WDS) Municipal Class Environmental Assessment (MCEA)

Part of Multiple Lots and Concessions, Geographic Townships of Camden, Howard, Orford, and Zone, Historic Kent County, now the Municipality of Chatham-Kent, Ontario

Municipality of Chatham-Kent

Licensee: **Samantha Markham, MES**

License: **P438**

PIF Number: **P438-0269-2021**

Project Number: 60654246

September 2022
Original Report

Delivering a better world

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AECOM: 2015-04-13

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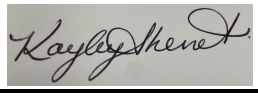
Prepared by 

Kayley Sherret Ba Hons (R1243)
Junior Archaeologist

Checked by 

Samantha Markham, MES (P438)
Project Archaeologist, Cultural Resources Manager

Approved by 

Adria Grant, MA, CAHP (P131)
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Executive Summary

AECOM Canada Ltd. (AECOM) was retained by the Municipality of Chatham-Kent to conduct a Stage 1 archaeological assessment as part of the Municipal Class Environmental Assessment (MCEA) study for the North-East (NE) Chatham-Kent Water Distribution System (WDS), initiated by the Chatham-Kent Public Utilities Commission (CK PUC). The CK PUC currently treats and delivers safe drinking water to a population of approximately 89,000 people within the Municipality of Chatham-Kent. The MCEA study will review and confirm municipal water servicing requirements and identify capital project upgrades required for the NE Chatham Kent WDS in order to provide sustainable municipal water and accommodate near and long-term growth demands, in addition to siting new watermains, pumping, and storage facilities in the Thamesville, Dresden, and Bothwell areas. It will also supply municipal water to the Delaware Nation at Moraviantown. The Study Area addressed within the scope of this report includes multiple route alternatives being considered as part of the EA process and a buffer of approximately 200metres (m) to account for any minor changes in design, located within what is historically known as Part of Multiple Lots and Concessions, Geographic Townships of Camden, Howard, Orford, and Zone, Historic Kent County, now the Municipality of Chatham-Kent, Ontario (Figures 1 and 2).

This Stage 1 archaeological assessment was conducted as part of the MCEA study during the design stage of the project and was triggered by the requirements of the Environmental Assessment Act in accordance with subsection 11(1) (Ontario Government 1990a). This project is subject to the requirements of the Ontario Heritage Act (Government of Ontario 1990b) and Standards and Guidelines for Consultant Archaeologists (Government of Ontario 2011).

All archaeological consulting activities were conducted under PIF number P438-0269-2021 issued to Professional Archaeologist Samantha Markham, MES (P438) in accordance with the Ministry of Tourism, Culture and Sport (MTCS) Standards and Guidelines for Consultant Archaeologists (Ontario Government 2011).

AECOM's Stage 1 background study for the NE Chatham-Kent WDS MCEA Study Area has determined that the potential for the recovery of pre- and post-contact Indigenous and 19th century Euro-Canadian archaeological resources is high. **Based on these findings, Stage 2 archaeological assessment is recommended for all areas of potentially undisturbed land within the Study Area limits addressed within the scope of this report (Figure 7).**

The Stage 2 archaeological assessment must be conducted by a licensed archaeologist and must follow the requirements set out in the *Standards and Guidelines for Consultant Archaeologists* (Ontario Government 2011), including:

- The standard test pit survey method at 5 m intervals is to be conducted in all areas that will be impacted by the project where ploughing is not feasible (e.g. woodlots, overgrown areas, manicured lawns, small sections of agricultural land) and;

- Pedestrian survey at 5m intervals where ploughing is possible (e.g. agricultural fields). This assessment will occur when fields have been recently ploughed, weathered by rain, and exhibit at least 80% surface visibility.

- Poorly drained areas, areas of steep slope, and areas of confirmed previous disturbance (e.g. building footprints, roadways, areas with identifiable underground infrastructure) are to be mapped and photo-documented but are not recommended for Stage 2 survey as they possess low to no archaeological potential. Should additional land outside of the current Study Area boundaries be included as part of the NE Chatham-Kent WDS MCEA, the standard requirements for archaeological assessments to be conducted prior to land disturbance remain in place.

Additionally, there is one registered archaeological site located within the current Study Area limits, the Annette site (AdHl-33). Should proposed construction activities impact the site, further archaeological assessment must be completed prior to ground disturbing activities. The Annette site (AdHl-3) was determined to retain cultural heritage value or interest and requires Stage 3 archaeological assessment following the requirements set out in Section 3.2 and Table 3.1 of *Standards and Guidelines for Consultant Archaeologists* (Ontario Government 2011) (Watts 2000). Given the age of the archaeological report, it is possible the site will not be easily relocated. If the site cannot be successfully relocated, it is recommended that a Stage 2 archaeological assessment be conducted again for the area, following the requirements set out in Section 2 of *Standards and Guidelines for Consultant Archaeologists* (Ontario Government 2011).

Bothwell Cemetery

There is one cemetery within the subject property, Bothwell Cemetery (Figure 2-7), located at 15258 Longwoods Road. Bothwell cemetery was established in the early 1850's by the Honourable George Brown, the town's founder. According to the records held by the Municipality of Chatham-Kent the first internments were on the eastern side of the cemetery in the 1870s (Supplementary Documentation). The cemetery was expanded in 1901, 1921, 1934, 1936, and the 1990s to the west and south. The cemetery was constructed outside of the town borders, within a natural park-like setting. The cemetery still contains many original markers and monuments of a variety of styles, materials, and symbolism. The Bothwell cemetery is still in use today, with interments as recent as this year (Matt 2012).

A plot map was provided by the Municipality of Chatham-Kent who is the owner/operator of the cemetery. It clearly indicates that all the interments associated with the cemetery are located within the fenced limits. As the cemetery was always government operated and formally surveyed upon conception it is reasonable to conclude that the fence line represents the cemetery limits and, in addition to conversations with the cemetery operator, it has been determined that there is no potential for unmarked burials associated with the Bothwell Cemetery to be located outside the current fence line (Figure 9).

The current Study Area overlaps with the Bothwell Cemetery almost entirely. Due diligence necessitates that, if during detail design changes to include impacts by the Project, or any future impacts proposed within the fenced limits of the cemetery property, further archaeological assessment will be required to determine the potential to impact unmarked burials. Arrangements must be made with the cemetery owner/operator, the Bereavement Authority of Ontario and the Ministry of Tourism, Culture and Sport prior to any ground disturbing activities to determine an appropriate strategy for Stage 2 and 3 field methods within the fenced limits of this cemetery to ensure provisions under the *Funeral, Burial, Cremations Services Act* (Ontario Government 2002) are addressed. Any invasive Stage 2-4 archaeological fieldwork within the cemetery limits will also require a Cemetery Investigation Authorization from the Bereavement Authority of Ontario.

Tecumseh Monument

The Stage 2 archaeological assessments at the Tecumseh Monument Land did not result in the identification of any archaeological sites or artifacts and Stage 3 archaeological assessment is not required; however, the Stage 1 background research determined that Lot 5, Gore of Zone was the approximate location of the Battle of the Thames on October 5, 1813, during the War of 1812. According to American General Robert B. McAffee, American, and possibly British soldiers may have been buried on part of the battlefield which could potentially include the current Study Area of the Tecumseh Monument Land (AECOM 2014). The Stage 2 did not result in the identification of any grave shafts, archaeological sites or material (AECOM 2014). It is not evident that the Stage 3 mechanical topsoil removal occurred prior to the installation of the monument. Therefore, to prevent accidental impacts to possible unmarked graves it is recommended that prior to any ground disturbance at the Tecumseh Monument land, a cemetery investigation may be required should impacts be proposed on the property. Given the age of the previous

reports, consultation with the Bereavement Authority of Ontario and the MTCS will be required prior to any work on the property.

Upon completion of the detail design, should work for the proposed alternative be required to occur within any cemetery/Tecumseh Monument limits or fieldwork adjacent to a cemetery/Tecumseh Monument where the boundaries are not clear, arrangements must be made with the Bereavement Authority of Ontario for a Cemetery Investigation Authorization prior to any ground disturbing activities. If human remains are encountered during construction, work must cease immediately and the police or Regional Coroner should be contacted, in addition to the Registrar of the Cemeteries Regulation Unit of the Ministry of Government and Consumer Services and the Bereavement Authority of Ontario.

A large area was assessed as part of this Stage 1 Archaeological Assessment in order to accommodate multiple alternatives being considered as part of the EA process. As such, once a route is chosen and the scope of construction activities has been determined, only those areas of potentially undisturbed lands that will be affected by this project will require Stage 2 Archaeological Assessment.

The MTCS is asked to accept this report into the Ontario Public Register of Archaeological Reports thereby concurring with the recommendations presented herein. **As further archaeological assessment is required, archaeological concerns for the NE Chatham-Kent WDS MCEA Study Area, Part of Multiple Lots and Concessions, Geographic Townships of Camden, Howard, Orford, and Zone, Historic Kent County, now the Municipality of Chatham-Kent, Ontario have not been fully addressed.**

Please note that this archaeological assessment report has been written to meet the requirements of the MTCS's Standards and Guidelines for Consultant Archaeologists (Ontario Government 2011); however properties that are subject to archaeological assessment are not considered cleared for ground disturbance activities until the associated report has been reviewed and accepted by the MTCS. In order to maintain compliance with the MTCS and the *Ontario Heritage Act* (1990), no ground disturbing activities are to occur until the proponent and approval authority receive a formal letter from the MTCS stating that the recommendations provided herein are compliant and that the report has been accepted into the MTCS register of archaeological reports.

Project Personnel

Project Manager	
Environmental Planner	Paul Adams, CPT
Senior Archaeologist	Adria Grant, MA, CAHP (P131)
Licensed Archaeologist	Samantha Markham, MES (P438)
Report Production	Kayley Sherret, BA (Hons), (R1243) and Kristen Nadal
Office Assistance	Jennifer Deline
Senior Review	Samantha Markham, MES, Adria Grant, MA, CAHP
GIS Analyst	Ben Clark, BAA

Acknowledgements

Proponent Contact	Ali Akl, Municipality of Chatham-Kent
Municipality of Chatham-Kent	Collin Mardling, Supervisor, Cemetery Operations

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1. Project Context

1.1 Development Context

AECOM Canada Ltd. (AECOM) was retained by the Municipality of Chatham-Kent to conduct a Stage 1 archaeological assessment as part of the Municipal Class Environmental Assessment (MCEA) study for the North-East (NE) Chatham-Kent Water Distribution System (WDS), initiated by the Chatham-Kent Public Utilities Commission (CK PUC). The CK PUC currently treats and delivers safe drinking water to a population of approximately 89,000 people within the Municipality of Chatham-Kent. The MCEA study will review and confirm municipal water servicing requirements and identify capital project upgrades required for the NE Chatham Kent WDS in order to provide sustainable municipal water and accommodate near and long-term growth demands, in addition to siting new watermains, pumping, and storage facilities in the Thamesville, Dresden, and Bothwell areas. It will also supply municipal water to the Delaware Nation at Moraviantown. The Study Area addressed within the scope of this report includes multiple route alternatives being considered as part of the EA process and a buffer of approximately 200metres (m) to account for any minor changes in design, located within what is historically known as Part of Multiple Lots and Concessions, Geographic Townships of Camden, Howard, Orford, and Zone, Historic Kent County, now the Municipality of Chatham-Kent, Ontario (Figures 1 and 2).

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1.1.1 Objectives

The objective of the Stage 1 background study is to document the archaeological and land use history and present conditions of the Study Area. This information will be used to support recommendations regarding cultural heritage value or interest as well as assessment and mitigation strategies. The Stage 1 research information will be drawn from:

- The MTCS's Archaeological Sites Database (ASDB) for a listing of registered archaeological sites within a 1-kilometre (km) radius of the Study Area;
- Reports of previous archaeological assessment within 50 m of the Study Area;
- Recent and historical maps of the Study Area;
- Archaeological management plans or other archaeological potential mapping where available;
- Municipal Registers of listed heritage properties and properties designated under the *Ontario Heritage Act* (Government of Ontario 1990); and
- Commemorative plaques and monuments identified on or near the property.

1.2 Historical Context

Years of archaeological research and assessments in southern Ontario have resulted in a well-developed understanding of the historic use of land in historic Kent County from the earliest Indigenous peoples to the more

recent Euro-Canadian settlers and farmers. Table 1 provides a breakdown of the cultural and temporal history of past occupations in historic Kent County.

Table 1: Cultural Chronology for Historic Kent County

Archaeological Period	Time Period	Characteristics
Early Paleo	9000-8400 BC	• Fluted Points • Arctic tundra and spruce parkland, caribou hunters
Late Paleo	8400-8000 BC	• Holcombe, Hi-Lo and Lanceolate Points • Slight reduction in territory size
Early Archaic	8000-6000 BC	• Notched and Bifurcate base Points • Growing populations
Middle Archaic	6000-2500 BC	• Stemmed and Brewerton Points, Laurentian Development • Increasing regionalization
Late Archaic	2000-1800 BC	• Narrow Point • Environment similar to present
	1800-1500 BC	• Broad Point • Large lithic tools
	1500-1100 BC	• Small Point • Introduction of bow
Terminal Archaic	1100-950 BC	• Hind Points, Glacial Kame Complex • Earliest true cemeteries
Early Woodland	950-400 BC	• Meadowood Points • Introduction of pottery
Middle Woodland	400 BC – AD 500	• Dentate/Pseudo-scallop Ceramics • Increased sedentism
	AD 550-900	• Princess Point • Introduction of corn horticulture
Late Woodland	AD 900-1300	• Agricultural villages
	AD 1300-1400	• Increased longhouse sizes
	AD 1400-1650	• Warring nations and displacement
Contact Period	AD 1600-1875	• Early written records and treaties
Historic	AD 1749-present	• European settlement (French and English)

Notes: Taken from Ellis and Ferris (1990)

The following sections provide a detailed summary of the archaeological cultures that have settled in the vicinity of the Study Area. As Chapman and Putnam (1984) illustrate, the modern physiography of southern Ontario is largely a product of events of the last major glacial stage and the landscape is a complex mosaic of features and deposits produced during the last series of glacial retreats and advances prior to the withdrawal of the continental glaciers from the area. Southwestern Ontario was finally ice free approximately 12,500 years ago. With continuing ice retreat and lake regressions the land area of southern Ontario progressively increased while barriers to the influx of plants, animals, and people steadily diminished (Karrow and Warner 1990). The land within historic Kent County have been extensively utilized by pre-contact Indigenous peoples who began occupying southwestern Ontario as the glaciers receded from the land, as early as 11,000 BC.

1.2.1 Pre-Contact First Nation Settlement

The Paleo Period

In this period the first human settlement can be traced back to 11,000 BC; these earliest well-documented groups are referred to as paleo which literally means old or ancient. During the Paleo period people were non-agriculturalists who depended on hunting and gathering of wild food; they moved their encampments on a regular basis to be in the locations where these resources naturally became available, and the size of the groups occupying any particular location would vary depending on the nature and size of the available food resources (Ellis and Deller 1990). The picture that has emerged for the early and late Paleo is of groups at low population densities who were residentially mobile and made use of large territories during annual cycles of resource exploitation.

The Archaic Period

The next major cultural period following the Paleo is termed the Archaic, which is broken temporally into the Early, Middle, and Late Archaic periods. There is much debate on how the term Archaic is employed; general practice bases the designation on assemblage content as there are marked differences in artifact suites from the preceding Paleo and subsequent Woodland periods. As Ellis *et al.* (1990) note, from an artifact and site characteristic perspective the Archaic is simply used to refer to non-Paleo manifestations that predate the introduction of ceramics. Ellis *et al.* (1990) stress that Archaic groups can be distinguished from earlier groups based on site characteristics and artifact content.

Early Archaic sites have been reported throughout much of southwestern Ontario and extend as far north as the Lake Huron Basin region and as far east as Rice Lake (Deller *et al.* 1986). A lack of excavated assemblages from southern Ontario has limited understandings and inferences regarding the nature of stone tool kits in the Early Archaic and tool forms other than points are poorly known in Ontario; however, at least three major temporal horizons can be recognized and can be distinguished based on projectile point form (Ellis *et al.* 1990). These horizons are referred to as Side-Notched (*ca.* 8,000-7,700 BC), Corner-Notched (*ca.* 7,700-6,900 BC), and Bifurcated (*ca.* 6,900-6,000 BC) (Ellis *et al.* 1990). Additional details on each of these horizons and the temporal changes to tool types can be found in Ellis *et al*. (1990).

The Middle Archaic period (6,000-2,500 BC), like the Early Archaic, is relatively unknown in southern Ontario. Ellis *et al.* (1990) suggest that artifact traits that have come to be considered as characteristic of the Archaic period, first appear in the Middle Archaic. These traits include fully ground and polished stone tools, specific tool types including banner stones and net-sinkers, and the use of local and/or non-chert type materials for lithic tool manufacture (Ellis *et al.* 1990).

The Late Archaic begins around approximately 2,000 BC and ends with the beginning of ceramics and the Meadowood Phase at roughly 950 BC. Much more is known about this period than the Early and Middle Archaic and several Late Archaic sites are known. Sites appear to be more common than earlier periods, suggesting some degree of population increase. True cemeteries appear and have allowed for the analysis of band size, biological relationships, social organization, and health. Narrow and Small point traditions appear as well as tool recycling wherein points were modified into drills, knives, end scrapers, and other tools (Ellis *et al.* 1990). Other tools include serrated flakes used for sawing or shredding, spokeshaves, and retouched flakes manufactured into perforators, gravers, micro-perforators, or piercers. Tools on coarse-grained rocks such as sandstone and quartz become common and include hammerstones, net-sinkers, anvils, and cobble spalls. Depending on preservation, several Late Archaic sites include bone and/or antler artifacts which likely represent fishing toolkits and ornamentation. These artifacts include bone harpoons, barbs, or hooks, notched projectile points, and awls. Bone ornaments recovered have included tubular bone beads and drilled mammal canine pendants (Ellis *et al.* 1990).

Throughout the Early to Late Archaic periods the natural environment warmed, and vegetation changed from closed conifer-dominated vegetation cover, to the mixed coniferous and deciduous forest in the north and deciduous vegetation in the south we see in Ontario today (Ellis *et al.* 1900). During the Archaic period there are indications of increasing populations and decreasing size of territories exploited during annual rounds; fewer moves of residential camps throughout the year and longer occupations at seasonal campsites; continuous use of certain locations on a seasonal basis over many years; increasing attention to ritual associated with the deceased; and, long range exchange and trade systems for the purpose of obtaining valued and geographically localized resources (Ellis *et al.* 1990).

The Woodland Period

The Early Woodland period is distinguished from the Late Archaic period primarily by the addition of ceramic The Early Woodland period is distinguished from the Late Archaic period primarily by the addition of ceramic technology, which provides a useful demarcation point for archaeologists but is expected to have made less difference in the lives of the Early Woodland peoples. The settlement and subsistence patterns of Early Woodland people shows much continuity with the earlier Archaic with seasonal camps occupied to exploit specific natural resources (Spence *et al.* 1990). During the Middle Woodland well-defined territories containing several key environmental zones were exploited over the yearly subsistence cycle. Large sites with structures and substantial middens appear in the Middle Woodland associated with spring macro-band occupations focussed on utilizing fish resources and created by consistent returns to the same site (Spence *et al.* 1990). Groups would come together into large macro-bands during the spring-summer at lakeshore or marshland areas to take advantage of spawning fish; in the fall inland sand plains and river valleys were occupied for deer and nut harvesting and groups split into small micro-bands for winter survival (Spence *et al.* 1990). This is a departure from earlier Woodland times when macro-band aggregation is thought to have taken place in the winter (Ellis *et al.* 1988; Granger 1978).

The period between the Middle and Late Woodland periods was both technically and socially transitional for the ethnically diverse populations of Southern Ontario and these developments laid the basis for the emergence of settled villages and agriculturally based lifestyles (Fox 1990). A distinct cultural occupation emerged during the late Woodland Period in southern Ontario in the modern counties of Kent, Essex and Lambton as well as portions of west Middlesex and west Elgin. This emerging cultural manifestation may be generally classified as Western Basin Tradition, which was observed also in south-eastern Michigan and north-western Ohio. The inhabitants of these communities are considered distinct from Iroquoian groups to the east and Mississippian to the south. Instead, they represent prehistoric Central Algonquians.

Until recently little attention was paid to Western Basin Late Woodland occupations in southern Ontario, although several sites have been the focus of systematic excavation over the past 30 years, including Walpole Island First Nation in the late 1980s. Based on these investigations, the Late Woodland Western Basin Tradition of Southern Ontario may be broken down into four sub-phases based on evolving ceramic traditions and innovations in settlement-subsistence strategies. The Riviere au Vase Phase (AD 600 - 800/900) grew seamlessly out of the Middle Woodland tradition, with the most visible advancements observed in ceramic production and decoration. Lithic production was also a well-established industry during this early phase of the Late Woodland Period. Typical point forms are corner-notched or, among less well-made examples, side-notched and triangular Levanna-like points appear in the final stages of the Riviere au Vase Phase. Subsistence strategies were maintained from the Middle Woodland Period, with the addition of seasonal harvesting as well as hunting and gathering activities. The general picture suggests that small hunting and gathering groups occupied southwestern Ontario in the early Late Woodland period, exploiting seasonally abundant plant and animal resources. Settlement-subsistence practices over the coldest months are not known.

The following Younge Phase (AD 800 or 900 – 1200) witnessed a shift from seasonally mobile bands moving in an annual cycle to permanent or semi-permanent villages founded inland from major waterways and lakefronts.

Subsistence strategies still comprised regional resource exploitation supplemented by agriculture. During warmer months, the Younge Phase communities focused their activities along lakeshores and major drainages. During colder months, they moved inland to gather nuts and hunt deer and settled in small family winter camps. No formal villages existed at this time.

The Springwells Phase (AD 1200-1400) maintained the trends established during the earlier Late Woodland Period phases. The general practice of exploitation was maintained, although warmer weather settlements began to develop into more established villages with formalised living areas and evidence of longhouses and palisades. These new communities centred around small lineage-based groups. By the end of this phase, large settlements with earthworked enclosures emerged. The shift toward more permanent communities may be partnered with the introduction of maize horticulture into general subsistence activities.

The distinction between the material culture of the Younge and Springwells Phases is blurred, particularly with regard to ceramic styles. Vessels from both periods are well made and highly decorated. The Springwells phase maintains heterogeneity between decorative styles and is characterised by a diffusion of ceramic types throughout the Western Basin Tradition region. Lithic tools are sparse, well-used, and of local, poor-quality chert. Point styles follow the traditions established during the previous Riviere au Vase Phase, and generally comprise a Levanna-like triangular form becoming increasingly narrower.

The last phase, the Wolfe Phase (AD 1400-1550), is poorly represented in the archaeological record because of a general drop in the number of sites. The general trends suggest fewer, larger, fortified settlements supported by seasonal camps. Fewer sites may also indicate a continued western shift into Michigan with an eastern limit marked by sites along Lake Huron and the St. Clair River. Generally, however, a lack of data limits the understanding of the communities at this time, including their relationship with the expanding Iroquoian groups and their overall material culture.

1.2.2 Post-Contact Period Settlement

The post-contact Indigenous occupation of southern Ontario was heavily influenced by the dispersal of Iroquoian speaking peoples, including the Six Nations of the Iroquois – Mohawk, Cayuga, Oneida, Seneca, Onondaga, and Tuscarora. This was followed by the return of Algonkian speaking groups from northern Ontario, including the Michi Saagig, who had temporarily retreated to their wintering grounds in the mid-1600s to avoid warfare and disease as a result of colonial settlement. Algonkian speaking Ojibwe (Chippewa), Odawa (Ottawa), and Pottawatomi, known as the Three Fires Confederacy, remained in their traditional territory that covered a vast area of southern Ontario as well as eastern Michigan.

As European settlers encroached on their territory the nature of First Nation population distribution, settlement size and material culture changed. Despite these changes it is possible to correlate historically recorded villages with archaeological manifestations and the similarity of those sites to more ancient sites reveals an antiquity to documented cultural expressions that confirms a long historical continuity to systems of Indigenous ideology and thought (Ferris 2009).

It is important to note, that when discussing the historical documentation of the movement of Indigenous people, what has been documented by early European explorers and settlers represents only a very small snapshot in time. Documentation of where Indigenous groups were residing during European exploration and settlement is restricted to only a very short period and does not reflect previous and subsequent movements of these groups. This brief history does not reflect the full picture of the pre- or post-contact period occupation of Indigenous groups or cultures. As such, relying on historic documentation regarding Indigenous occupation and movement across the landscape can lead to misinterpretation. For example, noting the movement of Indigenous groups into an area may incorrectly suggest to the reader that these groups had not occupied the area previously; however, this is not the

case. It is clear from Indigenous oral histories and the archaeological record that pre-contact Indigenous populations were extremely mobile and not tied to any one specific area. Over the vast period prior to the arrival of Europeans, Indigenous groups, language families, and cultures were fluid across the landscape.

The majority of the Study Area falls within the limits of McKee Purchase (Treaty No. 2), made on May 19, 1790 between the Crown, represented by British Deputy Agent Alexander McKee, and the Odawa, Chippewa, Pottawatomi, and Huron. This treaty negotiated the acquisition of what is now most of southwestern Ontario by the British Crown, including the counties of Essex, Kent, Elgin, Middlesex, and Lambton (approximately 5,440 km^2), with the southernmost point Point Pelee (Figure 3). This would complete treaty processes originally started with the Niagara treaties of 1781 and 1784. At the time, the Crown agreed to pay £1,200 Halifax currency in valuable merchandise and wares, which would include items such as cloth, tools, looking-glasses, combs, ribbons, and laced hats. The remainder of the Study Area to the north falls within the limits of Treaty 21, or the 'Long Woods Purchase'; this part of Ontario (approximately 2,200 km^2) was purchased by the Crown, represented by John Askin, on March 9, 1819 from the Chippewa for the yearly sum of 600 pounds. The tract purchased was described as follows:

> *Commencing at the northerly side of the River Thames at the south west angle of the Township of London; thence along the western boundary of the Township of London, in a course north 21 degrees, 30 minutes west, twelve miles to the north west angle of the said Township; then on a course about south 62 degrees and 30 minutes west forty-eight miles more or less until it intersects a line on a course produced north two miles from the north east angle of the Shawnee [Sombra] Township; then along the eastern boundary line of the said Township, twelve miles and a half more or less to the northern boundary line of the Township of Chatham; then east twenty-four miles more or less to the River Thames; then along the water[']s edge of the River Thames against the stream to the place of beginning, reserving a tract of land situate[d] on the northerly side of the River Thames nearly opposite to the northerly angle of the Township of Southwold and south west angle of the Del[a]ware Township containing 15,360 acres; also reserving two miles square distant about four miles above the rapids where the Indians have their improvements and nearly parallel to the Moravian Village containing 5,120 acres.*
>
> Morris 1943

Treaty No. 21 was further modified with Treaty Number 280½ and finally confirmed with Treaty No. 25, which modified the method of quantity of payment to the First Nation groups concerned with some minor variation in the description of the land surrender (Morris 1943). The Study Area is also located adjacent to the Delaware Nation at Moraviantown (Moravian 47), a First Nations reserve land measuring approximately 13 km^2 and occupied by the Delaware Nation at Moraviantown First Nation, part of the Christian Munsee branch of the Lenape (Lunaapeew). It is also known as the Moravian of the Thames reserve. The word 'Moravian' comes from the name of a historic region (Moravia), located today within the Czech Republic; missionaries from the Moravian church established missions within the traditional territory of the Lunaapeew, who would join them and establish at least 30 villages, or 'Moravian Towns' between 1740-1815 (Delaware Nation 2021). The Lunaapeew would also pay an integral role in the War of 1812, particularly during the Battle of the Thames, or the Battle of Moravian Town (1813), where Tecumseh was mortally wounded and died on October 5, 1813. Over the next two years, another village was built across the river, on the southern shores of the Thames, which was called New Fairfield; in the 1830s, the community was moved into the more wooded areas of the territory, and eventually renamed Moraviantown (Delaware Nation 2021).

1.2.3 Euro-Canadian Settlement

Kent County

Lieutenant-Governor of Upper Canada John Graves Simcoe created Kent County in 1792, named for the County of Kent in southeast England (Kent Historical Society 1948). The first settler to the area, Parson, had arrived at least two years earlier around 1790 and settled along the southern bank of the Thames River in the township of Raleigh. His son, Edward, born the next year, was said to have been the first Euro-Canadian child to have been born in what would become Kent County. That same year, in 1791, Simcoe became the first Governor of the new Province of Upper Canada and promoted the immigration into Kent County primarily along the Thames River. Chatham, one of

the oldest communities in western Ontario, was founded in 1794. It was planned originally as a military settlement; however, the military function did not develop, and settlement lagged until the 1830s. Lumbering was the first industry in Kent County, and once the land was cleared Chatham developed as a marketing centre for the rich surrounding agricultural area. Chatham became a town in 1855 but only became responsible for its own management in 1879 when it formally separated from Kent County. Thomas McCrae was among the early Parliamentary representatives of the county and his son William McCrae was MP for the county from 1834 to the union of the Provinces. Thomas McCrae is credited with building the first brick house in the County of Kent; he was also part of the Kent Militia and after the capture of Fort Detroit was awarded a cash prize which he used to build the brick house on the Thames River which later became the site of another clash (Kent Historical Society 1948). Early settlement in this area, like so many others, was greatly influenced by Colonel Thomas Talbot, who not only allotted lands to incoming settlers, but also supervised the performance of the settlement duties they were required to uphold, namely cutting out the road fronting their property as well as maintaining it. Kent County originally contained 11 municipalities: the Town of Chatham and the townships of Camden, Chatham, Dover, Harwich, Howard, Orford, Raleigh, Romney, Tilbury East, and Zone.

Geographic Townships of Howard, Camden, Orford, and Zone

Howard and Camden Townships

The survey of Howard Township was completed over many years; it was initially begun by the pioneer surveyor Patrick McNiff in 1790, followed by Abram Iredell in 1795 and Mahlon Burwell between 1821 and 1831, who all contributed to the establishment of the township's lots and concessions (County of Kent 1948). Pioneer settlement in south Kent was along Talbot Road, by Colonel Thomas Talbot, who managed to place a settler on every lot in Howard Township. The first considerable settlement on Talbot Road was Morpeth, where settlers climbing the steep hill would stop to rest, and the nearby creek offered ample power for grist and sawmills in the area. The Canada Southern Railway was completed in 1872, creating new opportunities for transport and settlement. The township takes its name from Thomas Howard, second Earl of Effingham,and eighth Baron Howard.

Like Howard Township, the survey of Camden Township was completed in 1793 by Parick McNiff, and the township was first settled in 1796 by Joshua Cornwall, born in Connecticut, followed by Lemuel Sherman in in 1804 (Lauriston 1939). Other early settlers included the Dolsen, McCrae, Reaume, Peck, Jacobs, Drake, Parsons and Toll families (Belden & Co. 1880), whose farms were used as battlegrounds during the War of 1812. The township takes its name from the Earl of Camden and is often referred to as Camden West to distinguish it from Camden East, located near Kingston.

Thamesville is located 25 km northeast of Chatham. It was named in 1832 when the first post office opened. In 1852, when the Great Western Railway was anticipated, village lots were laid out on the southeast side of the Thames River. At the same time, lots were surveyed on the northwest side of the Thames River and was called Techumseh for the great Shawnee Chief, who died nearby in 1813. When the railway was built in 1854, it passed through Techumseh, and the Thamesville post office was transferred to that site, and its name replaced Techumseh (Rayburn 1997).

Orford Township

The township of Orford takes its name from the town of Orford, located in Suffolk, England; it was first surveyed by John Bostwick in 1794 and settled between 1816 and 1832 (Mika & Mika 1983). In 1825, a tavern was built at Clear Creek by David Baldwin, the township's first postmaster; his tavern would also serve as the first post office and a community space where even municipal government officials were elected in 1827. By 1832, the township's first saw and grist mills were constructed, and settlement continued westward and later northward; the villages of Palmyra, Duart, and Muir Kirk developed.

Zone Township

The township of Zone was first surveyed in 1821; however, the first historical account of the area was recorded in the 'Fairfield Diary' in which David Zeisburger, a Moravian missionary from Ohio, along with fellow Moravian brethren and Delaware First Nations, settled along the north bank of the Thames River in 1792. This village of approximately 50 houses was called Fairfield and remained there until October 6, 1813, when the Americans decided to burn the village to the ground after their victory as part of the Battle of the Thames. Following the abandonment of Fairfield, Zone Township remained relatively uninhabited by Euro-Canadian settlers until after the Great Western Railway began laying the line for its new tract from London to Windsor, travelling through the heart of the township and the towns of Bothwell and Thamesville (Lauriston 1952). The town of Bothwell, founded by newspaper man George Brown, became a boom-and-bust type of community with two oil booms, first during the 1860s and again during the 1890s.

In 1851, George Brown, founder of the Toronto Globe newspaper and one of Canada's Fathers of Confederation, purchased 4,000 acres of land from the Lenni-Lenape (Delaware) Indigenous, which included the present town site. By 1855 the Great Western Railway ran through his property and that year a station and a post office were opened. Brown had the town plot surveyed and laid out the principal streets. The first store opened in 1856. By 1857, others had established several industries (Ontario Historical Plaques). Brown connected Bothwell to the former Lambton County Line and to London Road (Belden 1881). In these early days, most employed worked for Brown. However, Bothwell lacked ready money and his business was done through scrips (Belden 1881). The community prospered until a general depression in 1857-58 but was revived with the local oil boom beginning in 1863 (Ontario Historical Plaques).

In 1863, John M. Lick, an American, struck oil in Cashmere, near the County line (now Clachan Road) and Longwoods Road. As a result, the price of oil and land in the vicinity increased (Belden 1881). This led to the "oil boom" and gave Bothwell recognition in world news (Belden 1881). American operators flocked to Bothwell in the 1860s as oil producing businesses flourished which flanked Mosa Town Line and London Road. In addition, the land between London Road and the Thames River contained evidence of enterprises of the oil industry (Belden 1881). As more wells were sunk around Bothwell, Lick invested in the town, which included opening a hotel (Lauriston 1952:425). In a short time, the population exploded from a few hundred to 8,000 people, making Bothwell the largest centre outside of Toronto. In 1866, Bothwell incorporated as a town (Lauriston 1952:426), with approximately 3,600 inhabitants. During the height of speculation, Bothwell's Main Street was developed with some buildings three storeys in height and made of brick. The block included hotels, banks, billiard halls and gaming houses (Belden 1881). In the early boom days, the town extended as far as the Bothwell Bridge, and to the smaller village of Cashmere on the Thames River (Lauriston 1952:433).

By 1868 the oil industry had faltered, and many attractions had deserted the town (Belden 1881). In the 1880s there were some factories including carriages, sashes, doors and blinds, hub and spoke and pump works, grist and sawmills, and a foundry. In 1881, the corporate limits of the Town of Bothwell extended to the Thames River (Belden 1881) with 1,200 inhabitants (AECOM 2022).

Land Use and Settlement of the Study Area

The 1880 *Illustrated Historic Atlas of the Counties of Essex and Kent* (Beldon & Co. 1880) and 1876 *Historical County Map of Kent County* (Shackleton & McIntosh 1876) was reviewed to identify the potential for the recovery of historic 19th century archaeological resources within the Study Area. It should be noted that not all features of interest, particularly farmhouses and smaller homesteads, were mapped systematically as this would have been beyond the intended scope of the Ontario historical atlas series. In addition, given that atlases were funded by subscription, preference with regard to the level of detail included was given to subscribers. As such, the absence of structures or other features on historic atlas maps does not preclude the presence of historic features at the time

the area was surveyed. The lack of significant development, however, indicates that the land in the Study Area was used for agricultural purposes throughout the 19th century.

Historically, the Study Area falls along multiple lots and concessions within the Geographic Townships of Camden, Howard, Orford, and Zone, Historic Kent County. Table 2 contains details regarding the listed 19th century property owners and any illustrated historic features within, or in immediate proximity to, the Study Area.

Table 2: 1876 and 1880 Key Landowners and Historic Features Listed within the Study Area

Lot	Concession	Township	1876	1880
15	B	Camden	W. Sherman and I. Sherman 2 structures	W. Sherman and I. Sherman 2 Structures
12	II	Camden	S. Clements School House	Thos. Rogers Unnamed Structure
1	XII	Camden	W. Obay and J. McKinley No Structures	Wm. Obeay School House Unnamed Structure
6	V	Zone	W. Watts Covers Lots 5&6	Ed. J. Walls 1 Structure
Unclear	A	Zone	D. Edwards No Structures	Jas. Edwards 1 Structure
Unclear	A	Zone	G.W. Helmer No Structures	B.H Helmer and G.W. Helmer 1 Structure
3	V	Zone	W. Dowsell No Structures	No Name Listed Church
2	V	Zone	W. Moodie School House	No Name Listed School House
5	IV	Zone	A. Crukshanks and J. Cruckshanks No Structures	Alexr Cruckshank 1 Structure
4	IV	Zone	G&H Ray No Structures	Geo. Wray 1 Structure
13	X	Zone	No Name Listed No structures	Dadswell and Finegan No Structures
15	IX	Zone	O. Crowell No Structures	Ors. Crowell 1 Structure
16	IX	Zone	No Name Listed 1 Structure	North end: Wm Gumble and FH Pope South end: M. Doctetuder 3 Structures Including School House
11	VII	Zone	I. Secor and J. Anthony No Structures	Wm. Misner 1 Structure
7	C	Zone	L.E. Volger No Structures	L.E. Voyler 1 Structure
15	A	Zone	No Name Listed No Structures	T.S Durgin (1880) 1 Structure

Cemeteries

There is one cemetery within the subject property, Bothwell Cemetery (Figure 2-7, 9), located at 15258 Longwoods Road. During the initial survey of the town of Bothwell in 1855 town founder George Brown indicated that there would be no cemeteries within the town limits. The Bothwell Cemetery was surveyed and established southwest of the town of Bothwell. In the mid-1800's, the Zone Township Council was responsible for all official services, including

cemeteries. The town of Bothwell was separated from the Zone Township and incorporated in 1867, which resulted in the records of the municipal council being lost. By 1872, the provincial government began the regulation of keeping more accurate burial records, and the Bothwell documentation is visible from this time in the form of Bothwell Town Council minutes. At this time the Bothwell Council established a cemetery committee to oversee the sale of cemetery lots, which initially included eight plots and their maintenance. The cemetery owner, the Municipality of Chatham-Kent (Collin Mardling pers. comm. 2022) indicated the oldest burials at Bothwell Cemetery are located in the eastern side of the property.

By 1889 the first section of the cemetery was fenced and lots were marked with wooden posts. Improvements in 1893 saw the erection of tie posts for horses and chain railing along the front of the cemetery bordering Longwood's Road. The first driveway was established around section one in 1897. In 1901 the lots were re-staked and council purchased more land from Thomas Blake for an extension of the cemetery westward. The committee indicated in 1904 that they were unable to locate previous records, and a new record keeping book was established for the cemetery. In 1911 the cemetery committee replaced the fence across the front of the cemetery and installed a pedestrian and hearse gate. Later that year it was noted in council minutes that complaints were received about unauthorized persons removing bodies from the cemetery, resulting in a motion of council that the removal of bodies to obtain more room was to be left to the advisement of the cemetery committee (Matt 2012).

In 1921, land was purchased to extend the cemetery further west. Between 1921 and 1932 Council also installed an electrical power service, water pump, drains and waterlines. A new fence was built again in 1935, complete with stone pillars erected at the two main gates. In 1934 council purchased one acre of land from Jimmy Tunks for the creation of Section #2, where extensive levelling of the property was required and finally lots were staked. Again in 1936 Council signed a lease with George Willits for use of the property at the back of the cemetery. A new pipe fence was added on Longwoods Road in 1937 (Matt 2012).

In 1967 Section #3 was opened with new lots. In 1972, council passed bylaw 269 for the purchase of further land from Jimmy Tunks. The existing cement block utility service building was built in 1972 (Matt 2012).

During the 1980s, the provincial government cemetery division requested that council appoint a new Cemetery Board that would report directly to them. Given the difficulty in making sense of the records, Members of the Board along with students completely documented the property, as illustrated on the plot mapping in Figure 9 (Matt 2012).

In the 1990s the Board purchased further land from Mike Joyce behind Section #3 for future use, located towards the back southwest section. By 1998 the amalgamation of Chatham-Kent evolved and all responsibilities were relinquished to the new municipality (Matt 2012).

A plot map was provided by Collin Mardling from the Municipality of Chatham-Kent who is the owner/operator of the cemetery. It clearly indicates that all the interments associated with the cemetery are located within the fenced limits. As the cemetery was always government operated and formally surveyed upon conception it is reasonable to conclude that the fence line represents the cemetery limits and, in addition to conversations with the cemetery operator, it has been determined that there is no potential for unmarked burials associated with the Bothwell Cemetery to be located outside the current fence line (Figure 9).

1.3 Archaeological Context

1.3.1 Previous Archaeological Work

To inform the current Stage 1 archaeological assessment and further establish the archaeological context of the Study Area, a search of the ASDB was conducted by AECOM to determine if any previous archeological work has

been completed within the current Study Area or within 50 m of the Study Area boundaries. Four reports were encountered as part of this search, which are detailed in Table 3, discussed below, and illustrated in Figure __.

Table 3: Archaeological Reports with Relevant Background Information

Year	Title	Author	PIF Number
2000	*An Archaeological Survey of the Lower Thames River Watershed Between Glencoe and Thamesville, Ontario: Part 1*	Christopher M. Watts (University of Toronto)	2000-106-001-2000
2001	*An Archaeological Survey of the Lower Thames River Watershed Between Glencoe and Thamesville, Ontario: Part 2*	Christopher M. Watts (University of Toronto)	2001-109-001-2001
2013	*Stage 2 Archaeological Assessment, Thames River Slope Stabilization, Longwoods Road, Part of Lot 6A, South of Longwoods Road, Zone Township, Kent County, Ontario*	AECOM Canada Ltd. (AECOM)	P393-001-2013
2014	*Stage 1-2 Archaeological Assessment, Tecumseh Monument Land 14376 Longwoods Road, Geographic Township of Zone, County of Kent, Ontario*	AECOM Canada Ltd. (AECOM)	P393-0026-2013

As part of a SSHRC funded research project, in 2000 Christopher Watts completed an extensive survey along the Thames River between Glencoe and Thamesville. Over the course of this survey 65 sites were documented. Watt's team utilized purposive testing of properties along this route that exhibited high potential for the identification of Early Late Woodland sites, focusing on areas within 200 m of first or second order waterways. The Watts survey area encompasses the AECOM Study Area and was surveyed using pedestrian survey, at 5 m or 10 m transects during the summer, with crops frequently impeding visibility. When material culture was identified the transects were reduced to 1 m and the sites were then recorded with GPS a. In 2001 this work was continued, this time identifying 68 previously unregistered sites (Watts 2000, 2001).

In 2013 AECOM was contracted by the Municipality of Chatham-Kent to conduct a required Stage 2 archaeological assessment for the road right-of-way (ROW) of an approximate 386 m stretch of Longwoods Road in Zone Township, Kent County Ontario as part of the Thames River Slope Stabilization Project. No archaeological sites or material were identified within the Longwoods Road ROW during this Stage 2 assessment. The cultural heritage value or interest of this Study Area has been sufficiently documented and no further archaeological assessment of the property was recommended (AECOM 2013).

In 2014 AECOM was contracted by the Municipality of Chatham-Kent to conduct the required Stage 1-2 archaeological assessment for the proposed construction of the new monument in honour of Chief Tecumseh to be erected near the battlegrounds of the Battle of the Thames, on part of Lot 5, Gore of Zone, in the Township of Zone, County of Kent, now the Municipality of Chatham-Kent. The land subject to assessment consists of approximately 0.34 ha of manicured grass area on the Tecumseh Monument Land at 14376 Longwoods Road. The Study Area, located approximately halfway between the historic towns of Bothwell and Thamesville, is immediately south of Longwoods Road (Highway #2) and west of the access lane (a segment of the Old Highway #2) and the north bank of the Thames River. The Stage 1 background research determined that the Study Area had a high potential for the presence of both pre-contact Aboriginal and Euro-Canadian archaeological resources to be present and a Stage 2 assessment was recommended for the entire Study Area.

The Stage 2 archaeological assessments at the Tecumseh Monument Land did not result in the identification of any archaeological sites or artifacts and Stage 3 archaeological assessments are not required; however, the Stage 1 background research determined that Lot 5, Gore of Zone was the approximate location of the Battle of the Thames on October 5, 1813, during the War of 1812. According to American General Robert B. McAffee, American, and

possibly British soldiers may have been buried on part of the battlefield which could potentially include the current Study Area of the Tecumseh Monument Land.

To prevent accidental impacts to unmarked graves it was recommended that prior to any ground disturbance at the Tecumseh Monument Land, the topsoil should be mechanically removed under the supervision of a licensed archaeologist. The archaeologist will examine the subsoil surface to determine if grave shafts are present prior to construction beginning. As further archaeological effort is recommended, archaeological concerns under land use planning have not fully been addressed (AECOM 2014).

Despite this recommendation the area does appear to have been developed. Sculptor Gordon Reeve was commissioned to create a dedication to Chief Tecumseh and the First Nations people. Called "A Place of Many Grasses", this site includes gardens with nearly 500 varieties of tall grasses and a path resembling the Two Rows Wampum of 1613. It features a 50-foot by 48-foot stainless steel sculpture titled" Wisdom". The sculpture is etched to represent birch bark and in the shape of a tortoise shell with outlines of animals, fish and fowl along the top. It is unclear if further archaeological work was completed prior to construction of the monument. The MTCS data coordinator Robert von Bitter was also consulted and was unable to find documentation of the mechanical topsoil removal.

It should be noted that the MTCS does not maintain a database of all properties that have had past archaeological investigations and searches of the MTCS's public register do not always result in a complete listing of all archaeological work conducted in a given area. Consequently, in some cases the only way a consulting archaeologist will know that a past assessment has been conducted in a given area is if they have personal knowledge of it, or if the assessment resulted in the discovery and registration of one or more archaeological sites.

Archaeological Management Plans

The Municipality of Chatham-Kent Official Plan (2018) states that it will develop a Municipal Archaeological Master Plan to:

a) identify and map land containing archaeological resources or areas of archaeological potential within Chatham-Kent;

b) develop appropriate policies and procedures for fulfilling the requirements of the Ontario Heritage Act and the Funeral, Burial and Cremation Services Act;

c) develop appropriate policies and procedures for implementing and utilizing the master plan when assessing the requirements for archaeological review during the development approval process; and,

d) to educate and provide clarity to the development community and the general public of their responsibilities relative to the preservation of archaeological resources.

When the Municipality initiates the development of a Municipal Archaeological Master Plan, the appropriate First Nations shall be provided notification with regard to the identification of burial sites and significant archaeological resources relating to the activities of their ancestors, and they will also be invited to participate in the process.

The Municipal Archaeological Master Plan has not yet been developed at the time of the production of this report.

Heritage Properties

A Cultural Heritage Screening Memo was produced by AECOM in 2022 which concluded that there are no Built Heritage Resources (BHR) or Cultural Heritage Landscapes (CHL) within the Study Area, though there are 10 known BHRs and CHLs adjacent to the Study Area (AECOM 2022). These are listed below in Table 4.

Table 4: Heritage Properties Adjacent to the Study Area

Feature ID	Address/Location	Brief Property Description	Heritage Recognition
BHR 1	288 Main Street	Originally the home to one of Chatham-Kent's best dry good stores	Listed Heritage Property
BHR 2	320 Main Street North	Bothwell Town Hall	Designated Heritage Property, IV
BHR 3	190 Elm West Street	Italianate Mansion	Listed Heritage Property
BHR 4	325 Gordon Street	House belonged to Joseph McGill, an oil entrepreneur	Designated Heritage Property, IV
BHR 5	14249-14431 Longwoods Road	Monument and Plaque Commemorating the Battle of the Thames	Ontario Heritage Trust Plaque
BHR 6	62 London Road	The Tecumseh House, Circa 1899	Listed Heritage Property
BHR 7	67 London Road	Commercial building, Circa 1870	Listed Heritage Property
CHL 1	15258 Longwoods Road	The Bothwell Cemetery	Designated, Part IV
CHL 2	29785 Zone 7 Road	Bothwell Zone Oil Museum	Designated Heritage Property, IV
CHL 3	14878 Longwoods Road	Fairfield on the Thames National Historic Site of Canada	Listed on the Canadian Register

The above-ground cultural heritage resources can be classified and defined as either built heritage resources or cultural heritage landscapes, according to the following definitions provided within the Provincial Policy Statement (2020):

- **Built Heritage Resource (BHR)** – means a building, structure, monument, installation or any manufactured or constructed part or remnant that contributes to a property's cultural heritage value or interest as identified by a community, including an Indigenous community. Built heritage resources are located on property that may be designated under Parts IV or V of the *Ontario Heritage Act*, or that may be included on local, provincial, federal and/or international registers.

- **Cultural Heritage Landscape (CHL)** – means a defined geographical area that may have been modified by human activity and is identified as having cultural heritage value or interest by a community, including an Indigenous community. The area may include features such as buildings, structures, spaces, views, archaeological sites or natural elements that are valued together for their interrelationship, meaning or association. Cultural heritage landscapes may be properties that have been determined to have cultural heritage value or interest under the *Ontario Heritage Act*, or have been included on federal and/or international registers, and/or protected through official plan, zoning by-law, or other land use planning mechanisms.

The reader is directed to the completed Cultural Heritage Screening Memo produced as part of this EA (AECOM 2022).

Heritage Plaques

At least three Ontario Heritage Trust provincial plaques are located within or adjacent to the Study Area boundaries, detailed below:

Battle of Moraviantown, 1813 (Battle of the Thames)

located at the original Battle of the Thames Site (Tecumseh Monument location), 14376 Longwoods Road (County Road 21), Thamesville, Ontario

In September 1813, during the second year of the War of 1812, the United States won control of Lake Erie, cutting British supply lines with the east and forcing the British to withdraw from the Detroit River region. Then, on October 5, 1813, 3,000 Americans, including their Aboriginal allies, defeated 950 British, Canadians, and Natives at this site. Among those killed was the famous Shawnee leader, Tecumseh, who had worked to unite the First Nations in neighbouring American territory to resist settler expansion into their homelands and unwanted influence in their lives. The battle placed a small part of Upper Canada under enemy occupation until 1815, when the War of 1812 ended and it returned to British control. Tecumseh's dream, however, largely died with him, as the war only delayed American expansion into Indigenous territory in Ohio, Michigan, Indiana, and Illinois.

The Founding of Bothwell

located on the grounds of the town hall, 320 Main Street, Bothwell

George Brown, one of the Fathers of Confederation, owned some 4,000 acres of land in Kent County. After the Great Western Railway constructed a line and a station on his property in 1855, he had a town plot surveyed. The resulting community, named Bothwell, developed quickly. Its economic prosperity was further stimulated by the discovery of oil some years later.

New Fairfield 1815

located on the grounds of the church on the Delaware of the Thames First Nation, County Road 18, Thamesville

In 1792, Fairfield, a Moravian missionary settlement of Delaware natives, was established on the north bank of the Thames River. Destroyed in 1813 by invading American forces, the mission was rebuilt on the south side of the river after the war.

1.3.2 Known Archaeological Sites

AECOM conducted a data search of the ASDB to determine if any registered archaeological sites are located within the Study Area, as well as within 1 km of the current Study Area boundaries. This search resulted in the identification of 33 registered archaeological sites, detailed in Table 4 below, including two sites within the Study Area boundaries (the Annette site, (AdHl-33), and the Tecumseh Monument (AdHl-29) indicated in **BOLD**). The presence of such a large number of archaeological sites within 1 km supports the finding that the Study Area retains high potential for the presence of archaeological resources.

Table 5: Registered Archaeological Sites Within 1 km

Borden #	Site Name	Cultural Affiliation	Site Type	Development Status
AdHl-1	Couture	Woodland, Late; Woodland, Middle	camp/campsite	Not Provided
AdHl-2	Parks	Woodland, Late	camp/campsite	Not Provided
AdHl-15	Under the Christmas Tree	Post-Contact	hunting	Further CHVI
AdHl-26	Marchand	Archaic, Early; Archaic, Early; Woodland; Woodland, Middle	camp/campsite, scatter	Further CHVI
AdHl-27	Intersection	Woodland	camp/campsite, scatter	Further CHVI

AdHl-28	Red Onion	Woodland	findspot	Further CHVI
AdHl-29	**Tecumseh Monument**	**Woodland**	**scatter**	**Further CHVI**
AdHl-30	Protege	Woodland	scatter	Further CHVI
AdHl-31	Level Crossing	Woodland	scatter	Further CHVI
AdHl-32	Cornwall Creek	Woodland	camp/campsite, scatter	Further CHVI
AdHl-33	**Annette**	**Woodland**	**camp/campsite, scatter**	**Further CHVI**
AdHl-34	Canadian National	Woodland	scatter	Further CHVI
AdHl-35	Luzerne	Woodland; Woodland, Middle	camp/campsite	Further CHVI
AdHl-36	Fifty-Fifty	Woodland	scatter	Further CHVI
AdHl-37	Ask the Audience	Woodland	camp/campsite, scatter	Further CHVI
AdHl-38	Red Pepper	Woodland	camp/campsite, scatter	Further CHVI
AdHl-39	Autumn	Woodland	camp/campsite, scatter	Further CHVI
AdHl-40	Berkeley	Woodland, Early	camp/campsite, scatter	Further CHVI
AdHl-41	Blue Ray	Archaic, Late	findspot	Further CHVI
AdHl-42	Northland	Woodland	camp/campsite, scatter	Further CHVI
AdHl-43	Blue Crop	Woodland	scatter	Further CHVI
AdHl-44	Rolling Thunder	Woodland	camp/campsite, scatter	Further CHVI
AdHl-45	Pope	Pre-Contact	scatter	Further CHVI
AdHl-46	Hradoway	Archaic; Post-Contact; Woodland, Middle	Homestead, scatter	Further CHVI
AdHl-47	Sixty	Archaic, Middle	findspot	Further CHVI
AdHl-48	Leafhopper	Pre-Contact	scatter	Further CHVI
AdHl-49	Swarm	Woodland, Late	findspot	Further CHVI
AdHl-50	Dominon No.12	Woodland, Middle	camp/campsite, scatter	Further CHVI
AdHl-51	Portia	Pre-Contact	scatter	Further CHVI
AdHl-52	Cordelia	Pre-Contact	scatter	Further CHVI
AdHl-53	Mitton	Woodland, Early	camp/campsite, scatter	Further CHVI
AdHl-81	Engagement	Woodland, Late	camp/campsite	Further CHVI

*CHVI = Cultural Heritage Value or Interest

The Annette site (AdHl-33) was recorded by Dr. Watts in 2000 during his survey of the bank of the Thames River. It was located in a ploughed agricultural field located south of Fairfield Line atop the crest and southern slope of a broad knoll northwest of Cornwall Creek. The site “consisted of a loose scatter of lithic debitage and tools, FCR [field chert]

and ceramic sherds" (Watts 2000) attributed to an Early Late Woodland temporal affiliation, and the artifacts were recovered from an area measuring 50 m north-south by 40 m east-west. A total of 10 pieces of lithic debitage, eight cord-marked ceramic body sherds, and three preforms were recovered. The site is located within the Study Area boundaries.

The Tecumseh Monument Site (AdHl-29) was also identified by Dr. Watts in his 2000 Thames River survey. It was located in a ploughed field approximately 50 m southwest of a Tecumseh Monument access laneway. The site was comprised of six pieces of chert debitage, three cord-marked ceramics, and one biface. This site is located within the Study Area boundaries.

The Tecumseh Monument

In 2013 AECOM conducted a Stage 1-2 archaeological assessment of the Tecumseh Monument grounds. The Stage 2 archaeological assessments at the Tecumseh Monument did not result in the identification of any archaeological sites or artifacts and Stage 3 archaeological assessments are not required; however, the Stage 1 background research determined that Lot 5, Gore of Zone was the approximate location of the Battle of the Thames on October 5, 1813, during the War of 1812. According to American General Robert B. McAffee, American, and possibly British soldiers may have been buried on part of the battlefield which could potentially include the Tecumseh Monument land (AECOM 2014). Given the potential for unmarked graves AECOM recommended a cemetery investigation if any ground disturbing activities take place at the Tecumseh Monument grounds. Despite this recommendation the area does currently consist of a metal sculpture, surrounded by naturalized areas. Sculptor Gordon Reeve was commissioned in 2014 to create a dedication to Chief Tecumseh and the First Nations people. Called "A Place of Many Grasses", this site includes gardens with nearly 500 varieties of tall grasses and a path resembling the Two Rows Wampum of 1613. It features a 50-foot by 48-foot stainless steel sculpture titled" Wisdom". The sculpture is etched to represent birch bark and in the shape of a tortoise shell with outlines of animals, fish and fowl along the top. It is unclear if further archaeological work was completed prior to construction of the monument. The MTCS data coordinator Robert von Bitter was also consulted and was unable to find documentation of the mechanical topsoil removal.

Information concerning specific site locations is protected by provincial policy and is not fully subject to the *Freedom of Information and Protection of Privacy Act (FIPPA)*. The release of such information in the past has led to looting or various forms of illegally conducted site destruction. Confidentiality extends to all media capable of conveying location, including maps, drawings, or textual descriptions of a site location. The MTCS will provide information concerning site location to the party or an agent of the party holding title to a property, or to a licensed archaeologist with relevant cultural resource management interests.

1.3.3 Natural Environment

The modern physiography of Southern Ontario is largely a product of events of the last major glacial stage, the Wisconsinan and Late Wisconsinan time (ca. 25,000-10,000 BC). The landscape of historic Kent County is made up of a complex arrangement of features and deposits produced during the last series of glacial advances and retreats by the Simcoe Lobe and Ontario Lobe of the North American Laurentide ice sheet prior to the withdrawal of the glacier from Southern Ontario (Ellis and Ferris 1990). Those features and deposits that were formed by glacial action are represented by till plains, end moraines, and drumlins. The Study Area is located primarily within the Bothwell Sand Plains physiographic region (Figure 6): a large area of fine textured water deposited sands laid down as part of the delta of the glacial Thames River (Chapman and Putnam 1984). The sands were spread thinly (0.9 m – 1.2 m) over the clay floor and as a result, the drainage is poor; this is a region comprised mostly of low-grade soil (Figure 7).

The single most important environmental feature necessary for extended human occupation is potable water. As such, proximity to water is regarded as a useful index for the determination of potential for the presence of archaeological resources. The Study Area is situated within and adjacent to both the Cornwall Creek and the Thames

River, as well as their tributaries; it is located within the Thames River watershed. Given the overall drainage of the area, and the proximity to the river, these environmental characteristics would have provided an ideal environment for both temporary and permanent settlement throughout the pre-and post-contact periods. These water sources would have served as important pre- and post-contact transportation routes as well as sources of potable water and riverine resources. During the 19th and 20th centuries, rapid deforestation resulted in significant land clearance and over time, the once diverse forest life and wide range of tree species and natural resources would have also been depleted as agricultural and modern residential and commercial development continued. Over the course of the 19th century, the Study Area would have been made up of agricultural land just outside of the rapidly expanding municipality along historically surveyed road allowances. As a result of continuing urban development, this portion of southern Ontario is almost completely deforested today.

1.3.4 Existing Conditions

The Study Area consists of a primarily rural landscape, including woodlots and agricultural fields; however, it also includes urban development in Bothwell and Thamesville, manicured lawns, railway lines, and roadways, including Industrial Road, Victoria Street, Longwoods Road, London Road, Jane Road, Fairfield Line, Zone 7 Road, and West Bothwell Road, among others. During the pre-contact and early contact periods, this area of Kent County would have been an ideal location for settlement as it is located along tributaries of Cornwall Creek and the Thames River, which offered rich, cultivable soils and a mixture of deciduous trees interspersed with open areas. During the early 19th century, Euro-Canadian settlers began to clear the forests for agricultural purposes. Over the course of the 19th century, the Study Area would have been made up of agricultural land just outside of the rapidly expanding county along historically surveyed road allowances.

2. Analysis and Conclusions

2.1.1 Determination of Archaeological Potential

Archaeological potential is established by determining the likelihood that archaeological resources may be present on a subject property. Criteria commonly used by the MTCS to determine areas of archaeological potential are listed in Section 1.3.1 of the *Standards and Guidelines for Consultant Archaeologists* (Ontario Government 2011). Distance to modern or ancient water sources is generally accepted as the most important element for past human settlement patterns and when considered alone may result in a determination of archaeological potential. In addition, any combination of two or more of the listed criteria indicates archaeological potential.

Based on a review of the historical, environmental, and archaeological context of the Study Area, it has been determined that potential for the recovery of pre- and post-contact Indigenous and 19th century Euro-Canadian archaeological resources within the Study Area is high based on the presence of the following features:

- Proximity to previously identified archaeological sites (32 Indigenous sites within 1 km, including one site within the Study Area boundaries);
- Distance to various types of water sources (Cornwall Creek, Thames River and their tributaries within and adjacent to the Study Area boundaries);
- Soil texture and drainage (Bothwell Sand Plains Physiographic Region);
- Glacial geomorphology, elevated topography and the general topographic variability of the area;
- Properties listed on municipal register of properties designated under the *Ontario Heritage Act* (Government of Ontario 1990b, see section 1.3.2);
- Areas of early Euro-Canadian settlement and early transportation routes (Longwoods Road, Great Western Railway);
- Properties that local histories or informants have identified with possible archaeological sites, historical events, activities or occupants (War of 1812);
- Historic landmarks or sites (Tecumseh Monument).

Certain features indicate that archaeological potential has been removed, such as land that has been subject to extensive and intensive deep land alterations that have severely damaged the integrity of any archaeological resources. This includes landscaping that involves grading below the topsoil level, building footprints, quarrying and sewage and infrastructure development such as constructed roadways and buildings (Ontario Government 2011). Areas where archaeological potential has been removed within the Study Area include 20th century subdivision and commercial developments as well as road construction and infrastructure within the road ROW's.

2.1.2 Conclusions

AECOM's Stage 1 archaeological assessment has determined that the potential for the recovery of pre- and post-contact First Nation archaeological resources is high based on the Study Area's proximity to the Cornwall Creek and the Thames River, both important sources of potable water and resource areas. The Thames River was also a highly-utilized transportation route. Additionally, the presence of 32 pre-contact registered archaeological sites within 1 km of the Study Area, including one site within the Study Area boundaries, elevates potential for the recovery of archaeological resources. The potential for the recovery of 19th century Euro-Canadian archaeological resources is

also judged to be high based on the well-documented early settlement of the Chatham-Kent area by Euro-Canadian settlers and farmers. The presence of historic roadways such as Longwoods Road, in addition to the Great Western Railway, the presence of 19th century cemeteries and historic landmarks within and adjacent to the Study Area boundaries, as well as the association of the general area with the War of 1812, all indicate significant early settlement and development in the area.

Areas where archaeological potential has been removed include areas that have been subject to extensive land alterations that have significantly compromised the recovery of archaeological materials such as constructed roadways and buildings. Stage 2 archaeological assessment is recommended for all areas identified as retaining archaeological potential. Areas identified as retaining archaeological potential must be subject to Stage 2 archaeological assessment.

3. Recommendations

AECOM's Stage 1 background study for the NE Chatham-Kent WDS MCEA Study Area has determined that the potential for the recovery of pre- and post-contact Indigenous and 19th century Euro-Canadian archaeological resources is high. **Based on these findings, Stage 2 archaeological assessment is recommended for all areas of potentially undisturbed land within the Study Area limits addressed within the scope of this report (Figure 7).**

The Stage 2 archaeological assessment must be conducted by a licensed archaeologist and must follow the requirements set out in the *Standards and Guidelines for Consultant Archaeologists* (Ontario Government 2011), including:

- The standard test pit survey method at 5 m intervals is to be conducted in all areas that will be impacted by the project where ploughing is not feasible (e.g. woodlots, overgrown areas, manicured lawns, small sections of agricultural land) and;

- Pedestrian survey at 5m intervals where ploughing is possible (e.g. agricultural fields). This assessment will occur when fields have been recently ploughed, weathered by rain, and exhibit at least 80% surface visibility.

- Poorly drained areas, areas of steep slope, and areas of confirmed previous disturbance (e.g. building footprints, roadways, areas with identifiable underground infrastructure) are to be mapped and photo-documented but are not recommended for Stage 2 survey as they possess low to no archaeological potential. Should additional land outside of the current Study Area boundaries be included as part of the NE Chatham-Kent WDS MCEA, the standard requirements for archaeological assessments to be conducted prior to land disturbance remain in place.

Additionally, there is one registered archaeological site located within the current Study Area limits, the Annette site (AdHl-33). Should proposed construction activities impact the site, further archaeological assessment must be completed prior to ground disturbing activities. The Annette site (AdHl-3) was determined to retain cultural heritage value or interest and requires Stage 3 archaeological assessment following the requirements set out in Section 3.2 and Table 3.1 of *Standards and Guidelines for Consultant Archaeologists* (Ontario Government 2011) (Watts 2000). Given the age of the archaeological report, it is possible the site will not be easily relocated. If the site cannot be successfully relocated, it is recommended that a Stage 2 archaeological assessment be conducted again for the area, following the requirements set out in Section 2 of *Standards and Guidelines for Consultant Archaeologists* (Ontario Government 2011).

Bothwell Cemetery

There is one cemetery within the subject property, Bothwell Cemetery (Figure 2-7), located at 15258 Longwoods Road. Bothwell cemetery was established in the early 1850's by the Honourable George Brown, the town's founder. According to the records held by the Municipality of Chatham-Kent the first internments were on the eastern side of the cemetery in the 1870s (Supplementary Documentation). The cemetery was expanded in 1901, 1921, 1934, 1936, and the 1990s to the west and south. The cemetery was constructed outside of the town borders, within a natural park-like setting. The cemetery still contains many original markers and monuments of a variety of styles, materials, and symbolism. The Bothwell cemetery is still in use today, with interments as recent as this year (Matt 2012).

A plot map was provided by the Municipality of Chatham-Kent who is the owner/operator of the cemetery. It clearly indicates that all the interments associated with the cemetery are located within the fenced limits. As the cemetery was always government operated and formally surveyed upon conception it is reasonable to conclude that the fence line represents the cemetery limits and, in addition to conversations with the cemetery operator, it has been

determined that there is no potential for unmarked burials associated with the Bothwell Cemetery to be located outside the current fence line (Figure 9).

The current Study Area overlaps with the Bothwell Cemetery almost entirely. Due diligence necessitates that, if during detail design changes to include impacts by the Project, or any future impacts proposed within the fenced limits of the cemetery property, further archaeological assessment will be required to determine the potential to impact unmarked burials. Arrangements must be made with the cemetery owner/operator, the Bereavement Authority of Ontario and the Ministry of Tourism, Culture and Sport prior to any ground disturbing activities to determine an appropriate strategy for Stage 2 and 3 field methods within the fenced limits of this cemetery to ensure provisions under the *Funeral, Burial, Cremations Services Act* (Ontario Government 2002) are addressed. Any invasive Stage 2-4 archaeological fieldwork within the cemetery limits will also require a Cemetery Investigation Authorization from the Bereavement Authority of Ontario.

Tecumseh Monument

The Stage 2 archaeological assessments at the Tecumseh Monument Land did not result in the identification of any archaeological sites or artifacts and Stage 3 archaeological assessment is not required; however, the Stage 1 background research determined that Lot 5, Gore of Zone was the approximate location of the Battle of the Thames on October 5, 1813, during the War of 1812. According to American General Robert B. McAffee, American, and possibly British soldiers may have been buried on part of the battlefield which could potentially include the current Study Area of the Tecumseh Monument Land (AECOM 2014). The Stage 2 did not result in the identification of any grave shafts, archaeological sites or material (AECOM 2014). It is not evident that the Stage 3 mechanical topsoil removal occurred prior to the installation of the monument. Therefore, to prevent accidental impacts to possible unmarked graves it is recommended that prior to any ground disturbance at the Tecumseh Monument land, a cemetery investigation may be required should impacts be proposed on the property. Given the age of the previous reports, consultation with the Bereavement Authority of Ontario and the MTCS will be required prior to any work on the property.

Upon completion of the detail design, should work for the proposed alternative be required to occur within any cemetery/Tecumseh Monument limits or fieldwork adjacent to a cemetery/Tecumseh Monument where the boundaries are not clear, arrangements must be made with the Bereavement Authority of Ontario for a Cemetery Investigation Authorization prior to any ground disturbing activities. If human remains are encountered during construction, work must cease immediately and the police or Regional Coroner should be contacted, in addition to the Registrar of the Cemeteries Regulation Unit of the Ministry of Government and Consumer Services and the Bereavement Authority of Ontario.

A large area was assessed as part of this Stage 1 Archaeological Assessment in order to accommodate multiple alternatives being considered as part of the EA process. As such, once a route is chosen and the scope of construction activities has been determined, only those areas of potentially undisturbed lands that will be affected by this project will require Stage 2 Archaeological Assessment.

The MTCS is asked to accept this report into the Ontario Public Register of Archaeological Reports thereby concurring with the recommendations presented herein. **As further archaeological assessment is required, archaeological concerns for the NE Chatham-Kent WDS MCEA Study Area, Part of Multiple Lots and Concessions, Geographic Townships of Camden, Howard, Orford, and Zone, Historic Kent County, now the Municipality of Chatham-Kent, Ontario have not been fully addressed.**

Please note that this archaeological assessment report has been written to meet the requirements of the MTCS's Standards and Guidelines for Consultant Archaeologists (Ontario Government 2011); however properties that are subject to archaeological assessment are not considered cleared for ground disturbance activities until the associated

report has been reviewed and accepted by the MTCS. In order to maintain compliance with the MTCS and the *Ontario Heritage Act* (1990), no ground disturbing activities are to occur until the proponent and approval authority receive a formal letter from the MTCS stating that the recommendations provided herein are compliant and that the report has been accepted into the MTCS register of archaeological reports.

4. Advice on Compliance with Legislation

This report is submitted to the Ontario Minister of Tourism, Culture and Sport as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection, and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Heritage, Sport, Tourism and Culture Industries, a letter will be issued by the Ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the *Ontario Heritage Act*.

Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48(1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48(1) of the *Ontario Heritage Act*.

Archaeological sites recommended for further archaeological fieldwork or protection remain subject to section 48 (1) of the *Ontario Heritage Act* and may not be altered, or have artifacts removed from them, except by a person holding an archaeological license.

The *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 (when proclaimed in force in 2012) require that any person discovering human remains must notify the police or coroner and the Registrar of Burial Sites, War Graves, Abandoned Cemeteries, and Cemetery Closures.

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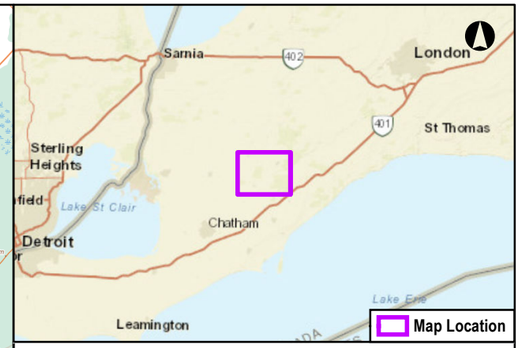
6. Figures

All figures pertaining to the Stage 1 archaeological assessment of the proposed NE Chatham-Kent WDS MCEA in the Municipality of Chatham-Kent, Ontario are provided on the following pages.



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Study Area

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Location of Study Area

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Kilometers

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Figure 1

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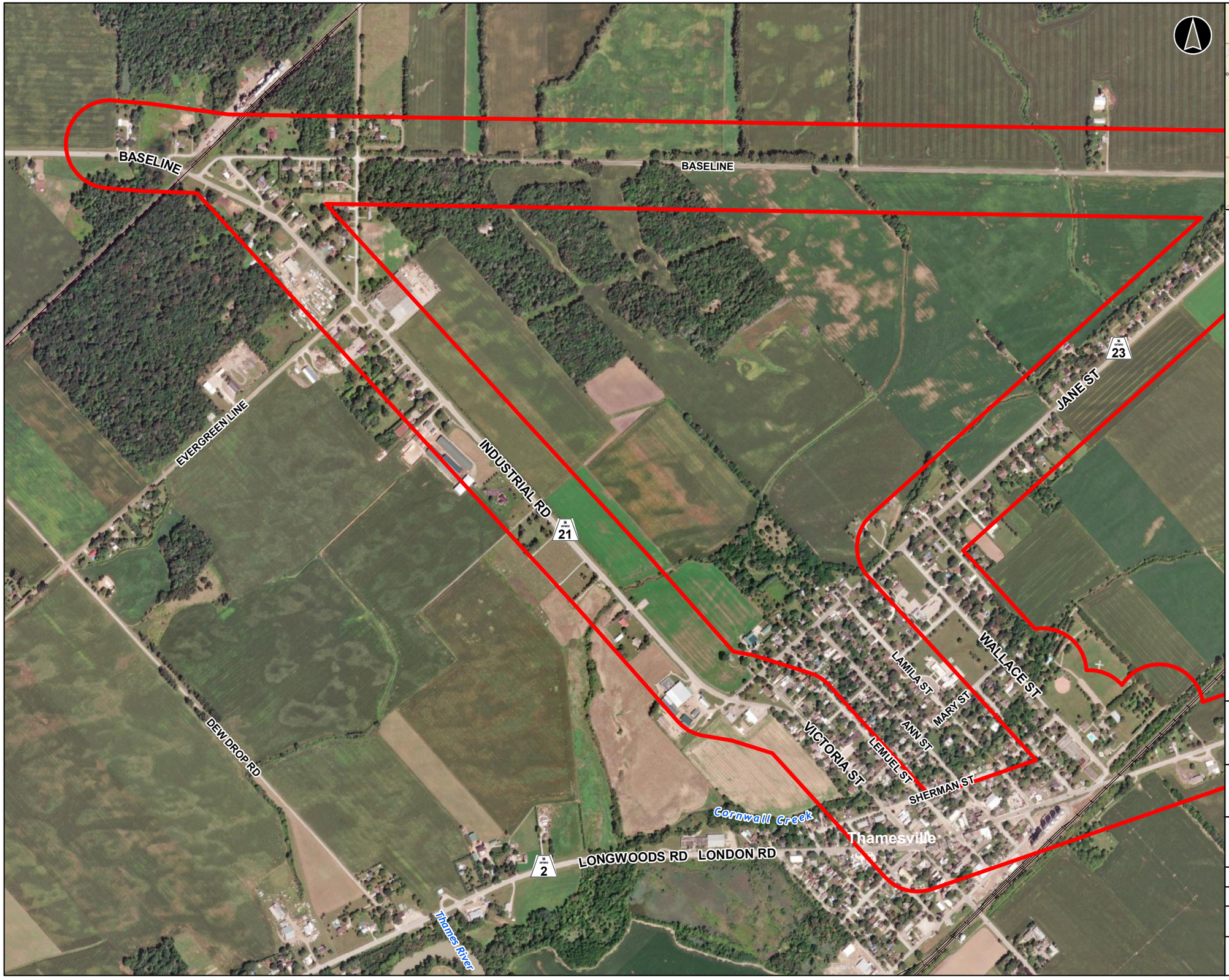

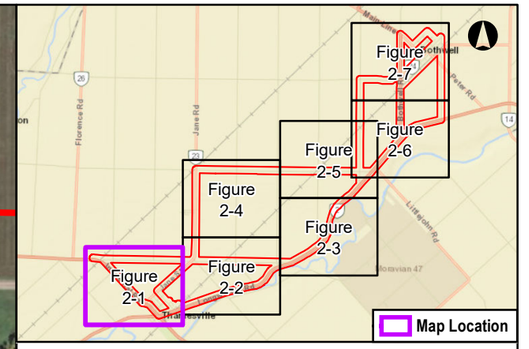

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- Railway
- Study Area

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Study Area in Detail

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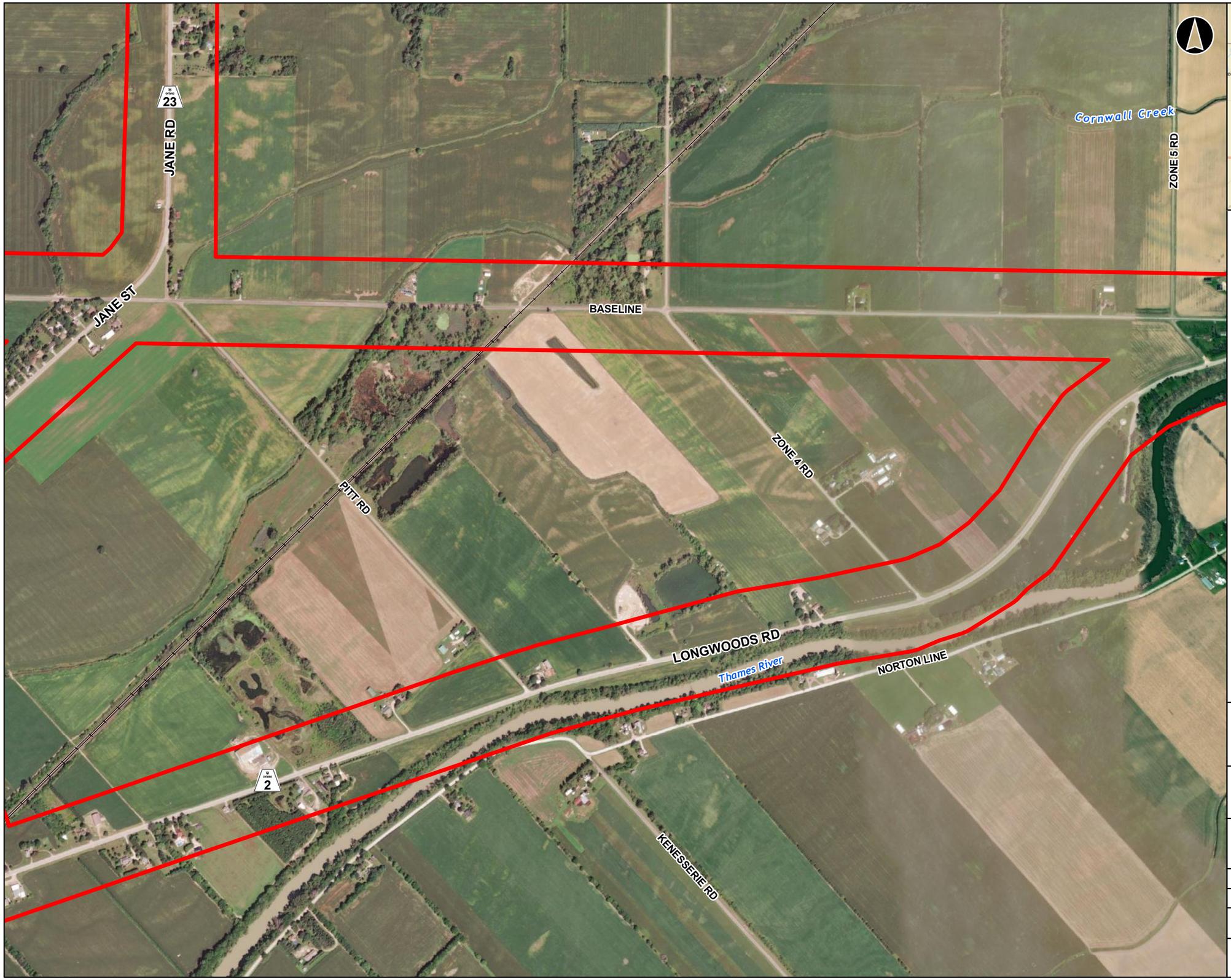

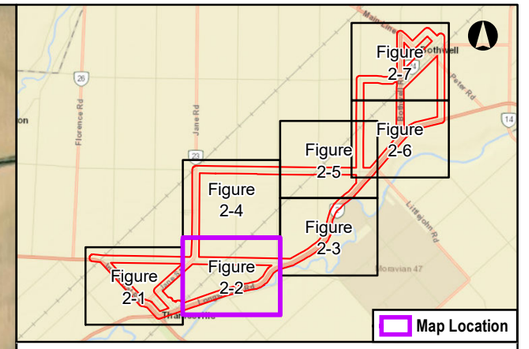

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- Railway
- Study Area

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Study Area in Detail

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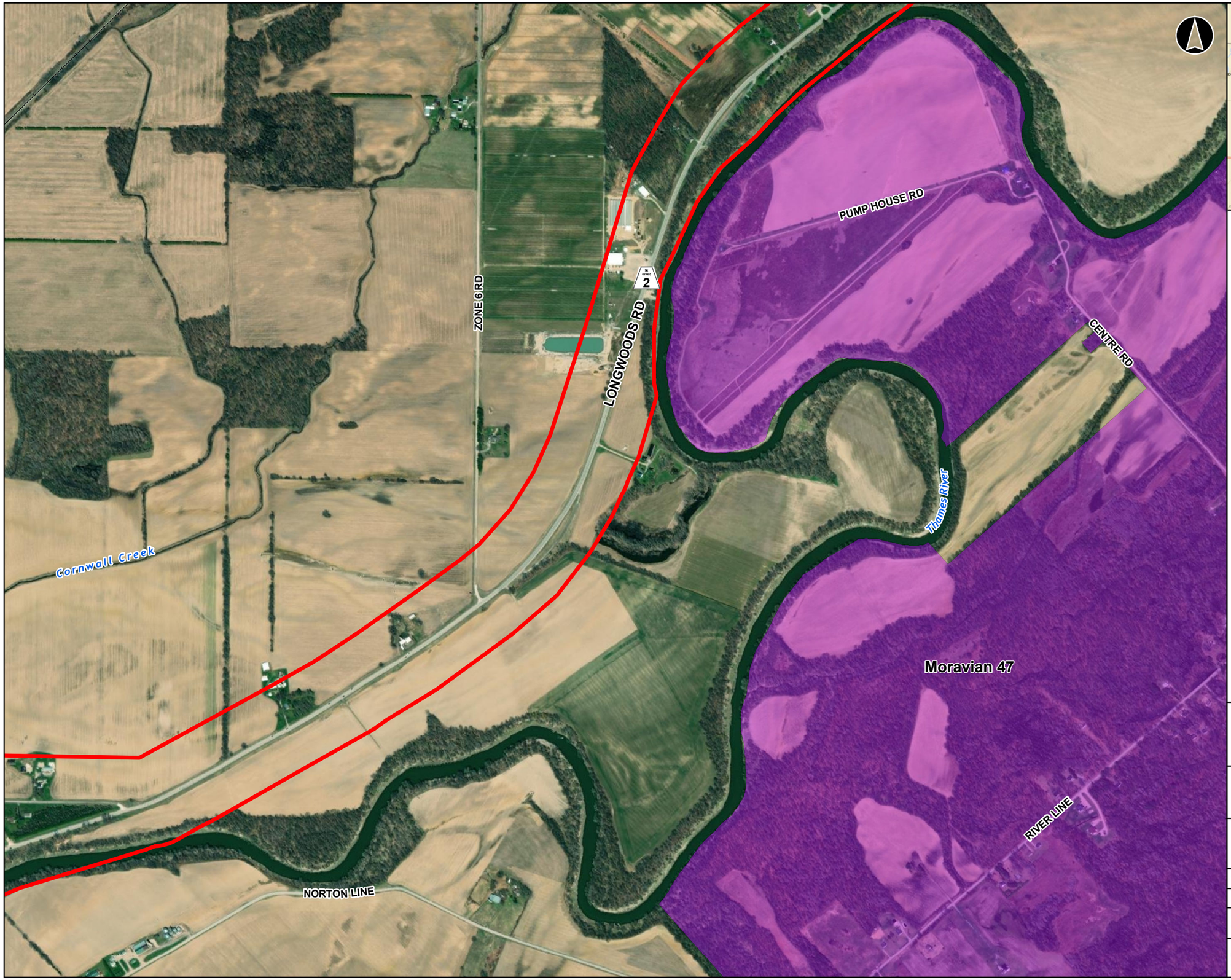

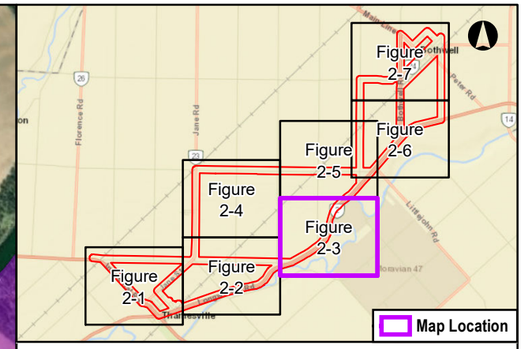

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- Railway
- Study Area
- First Nations Lands

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Study Area in Detail

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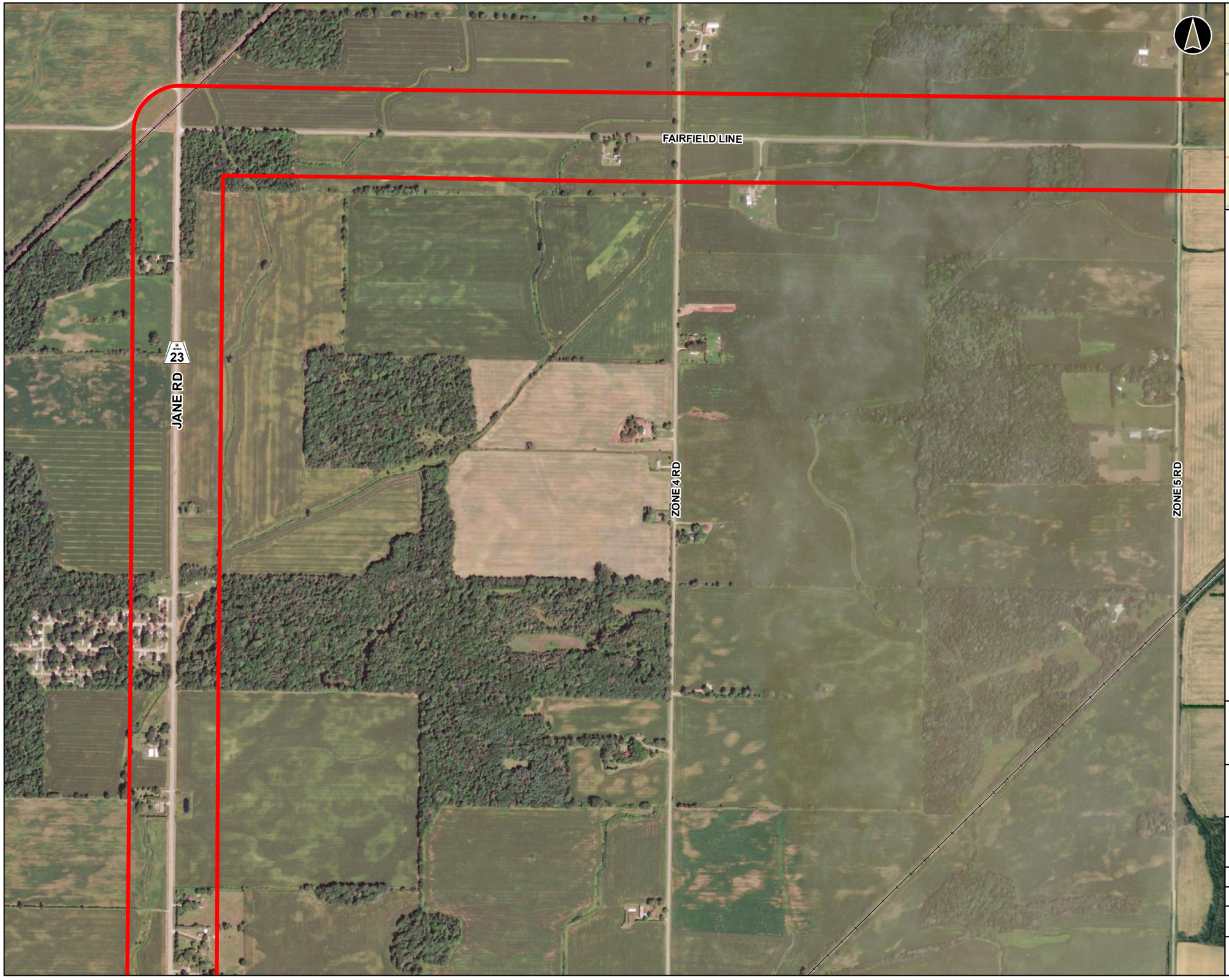

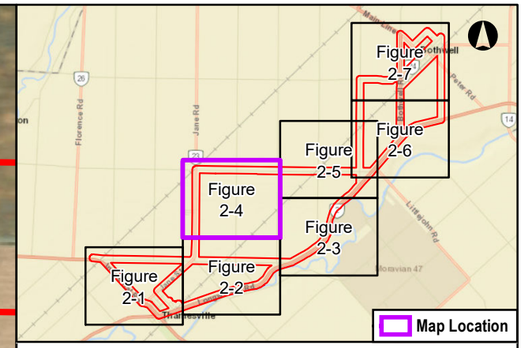

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- Railway
- Study Area

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Study Area in Detail

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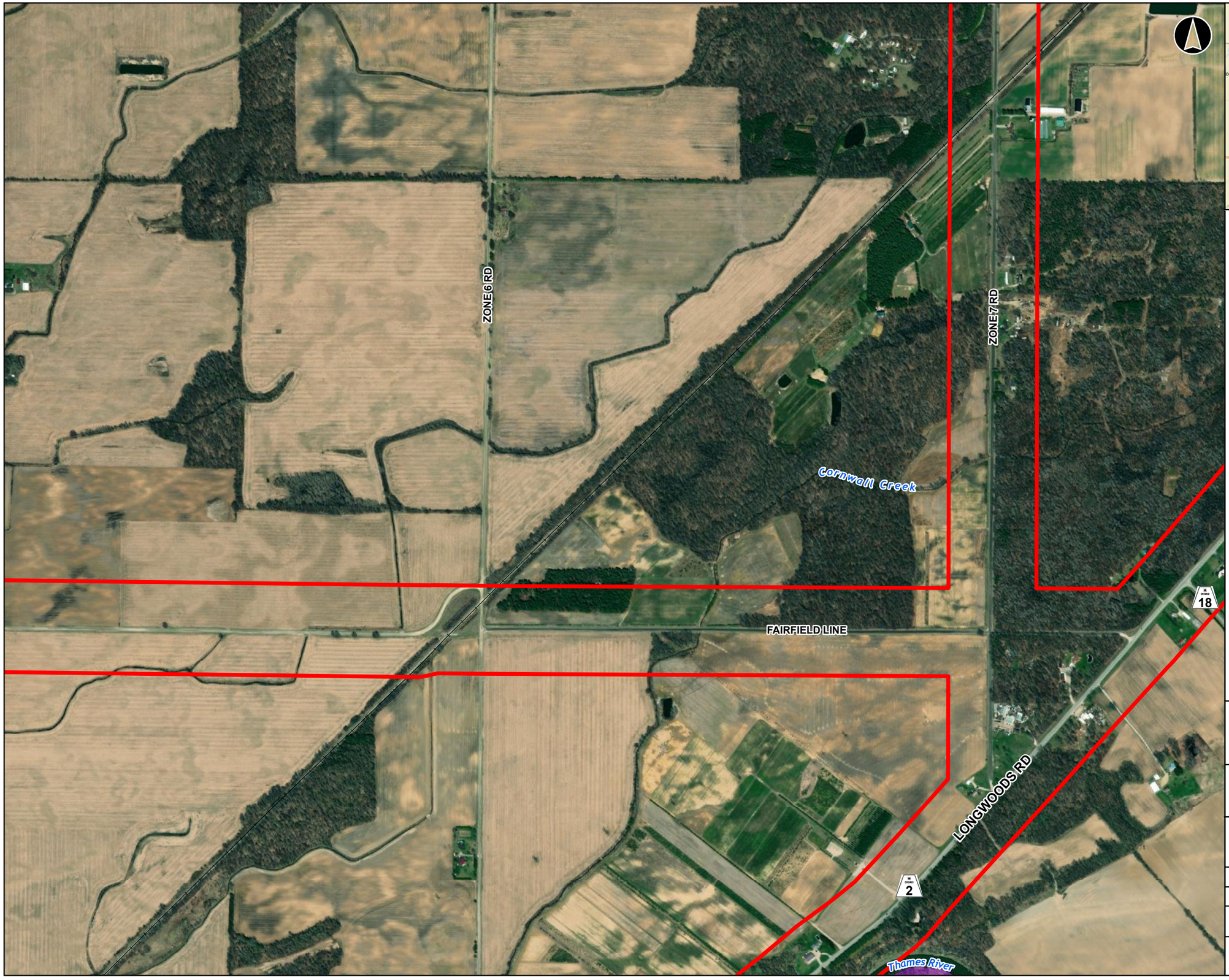

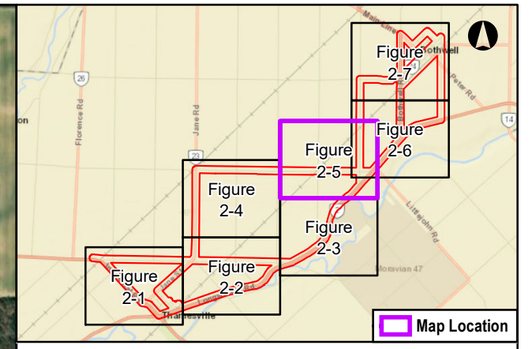

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- Railway
- Study Area
- First Nations Lands

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Study Area in Detail

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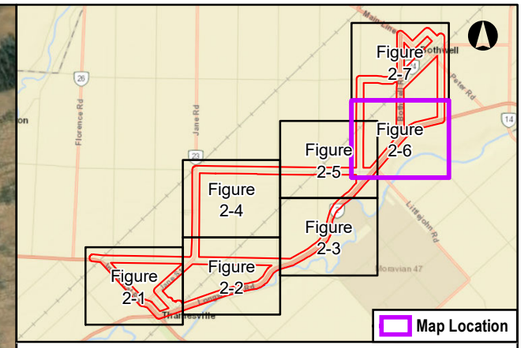

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- Railway
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- West Bothwell Cemetery Propertry

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Study Area in Detail

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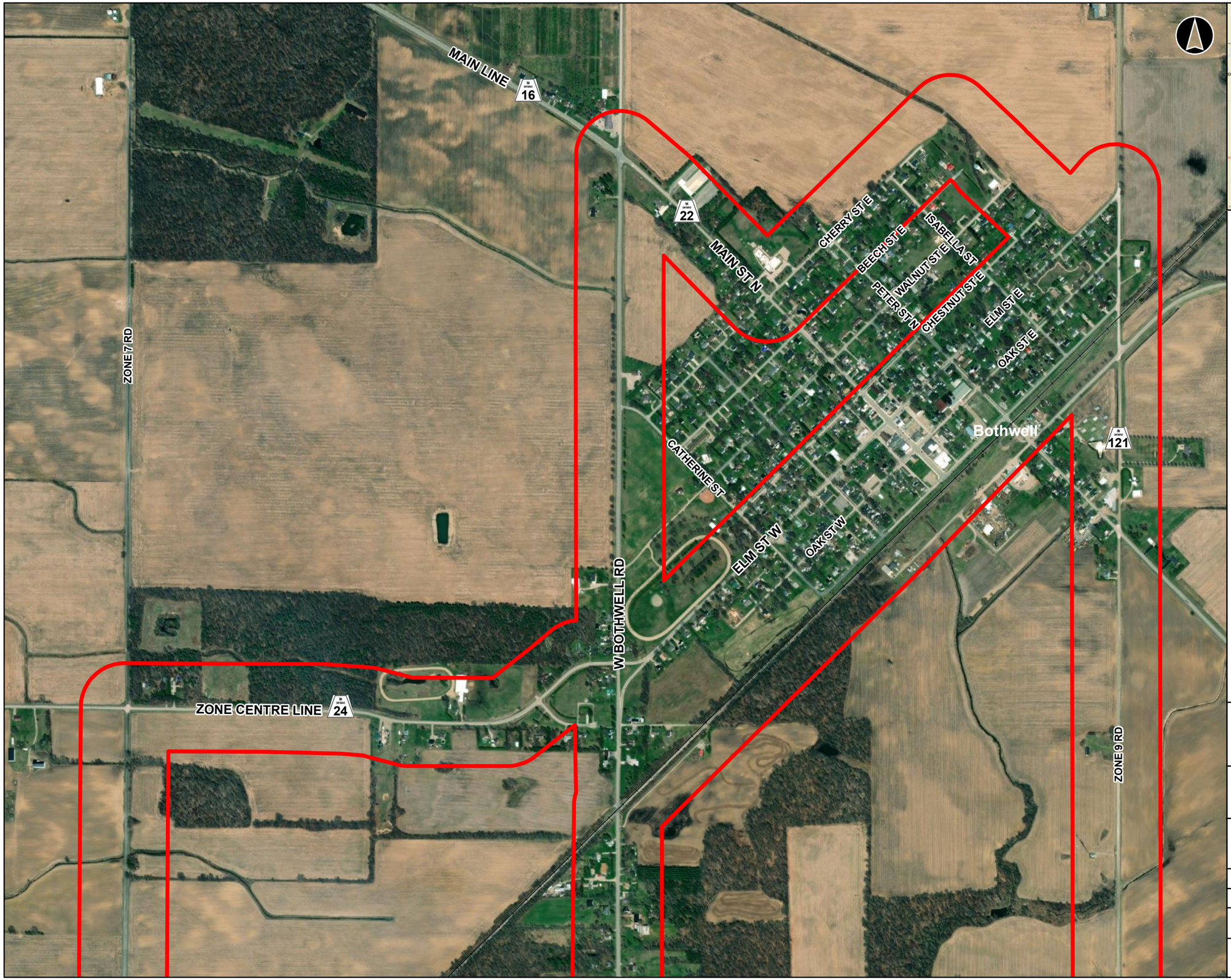

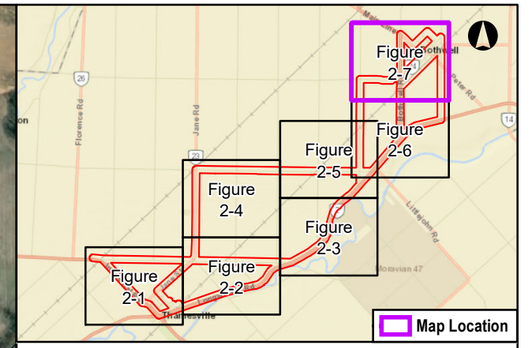

Legend

- Railway
- Study Area

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Study Area in Detail

0 100 200 300 400 500 600 700
Meters
DATUM: NAD 1983 UTM Zone 17N

October 2022	1:10,000 * when printed 11"x17"	Source: MNRF 2020 Image: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
P#: 60654246	V#:	

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Figure 2-7

Map location: \\na.aecomnet.com\fs\AMER\London-CALON1\DC\GIS\Projects\60654246_Chatham-Kent_NE_WDS_EA\Design\01_Reports\AA\S1\Fig2-StudyArea.mxd
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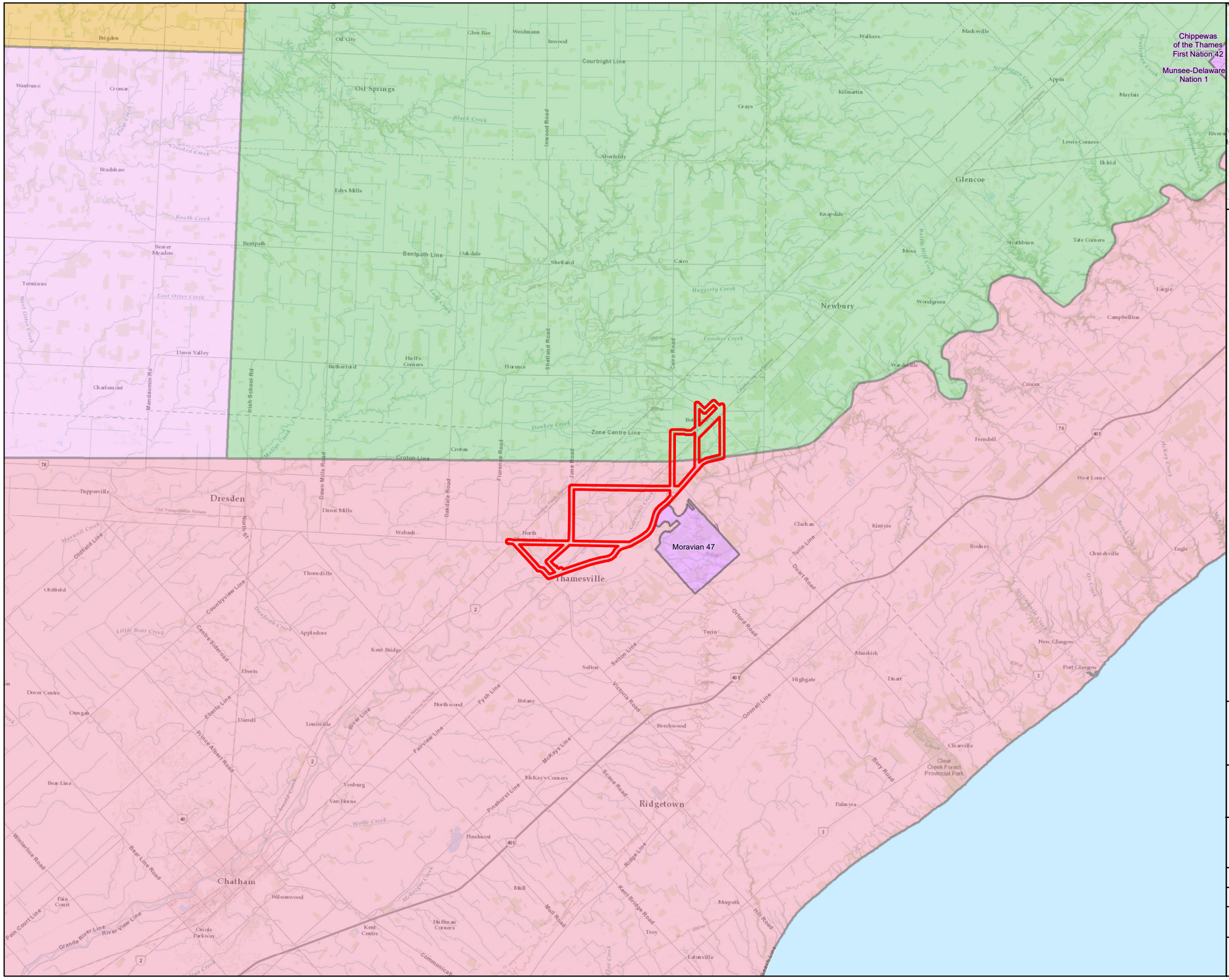

Legend

- Study Area
- First Nations Reserve Land

Treaty

- Huron Tract Purchase, Treaty 29, August 13,1833
- **Long Woods Purchase, Treaty 21, March 9,1819**
- **McKee Purchase, Treaty 2, May 19,1790**
- Sombra Township Purchase, Treaty 7, September 7,1796

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Ontario Treaties Map

0 1 2 4 6 8 10 12 14
Kilometers
DATUM: NAD 1983 UTM Zone 17N

October 2021	1:200,000 * when printed 11"x17"	Source: MNRF 2020, www.ontario.ca/page/map- ontario-treaties-and-reserves#t7 Image: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS
P#: 60654246	V#:	

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Figure 3

Map location: \\na.aecomnet.com\f\AAMER\London-CALON1\DCS\GIS\Projects\60654246_Chatham-Kent_NE_WDS_EA\Design\01_Reports\AAS1115\Fig3-TreatiesPurchases.mxd
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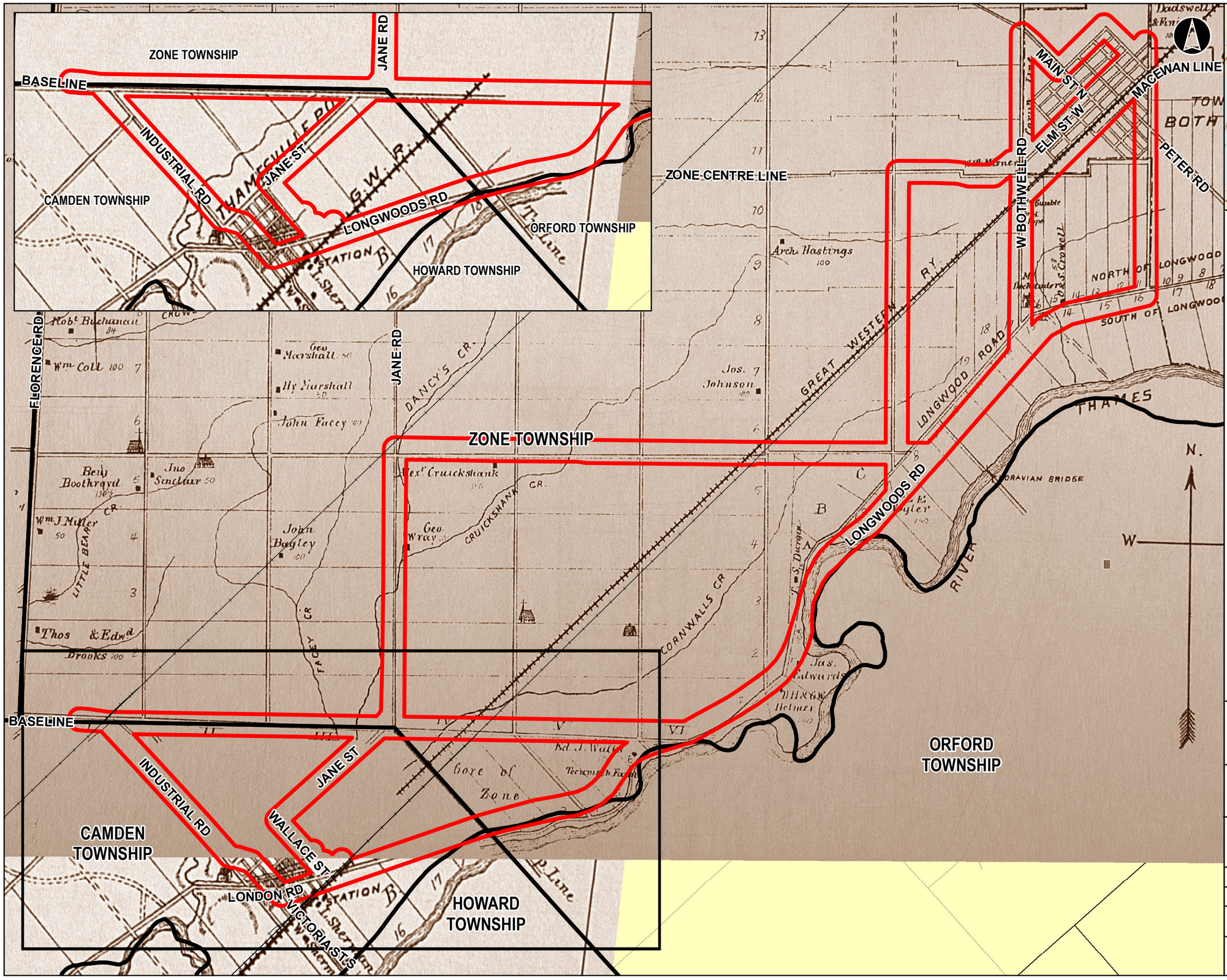

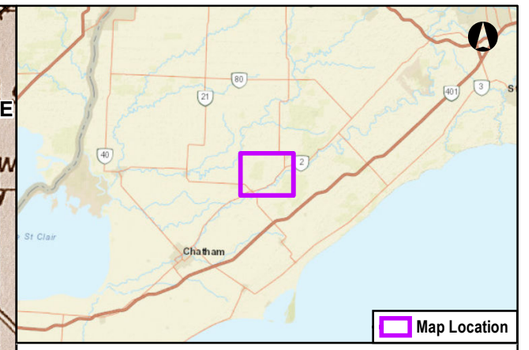

Legend

- Study Area
- Township Boundary

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

A Portion of 1880 Illustrated Historical Atlas of the County of Kent (H. Belden & Co.)

0 1 2 3
Kilometers
DATUM: NAD 1983 UTM Zone 17N

October 2022	1:40,000 * when printed 11"x17"	Source: MNRF 2020 Image: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
P#: 60654246	V#:	

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Figure 4

Map location: \\na.aecomnet.com\ifs\AMER\London-CALON1\DCS\GIS\Projects\60654246_Chatham-Kent_NE_WDS_EA\Design\01_Reports\AA\S1\Fig4-Historic1880.mxd
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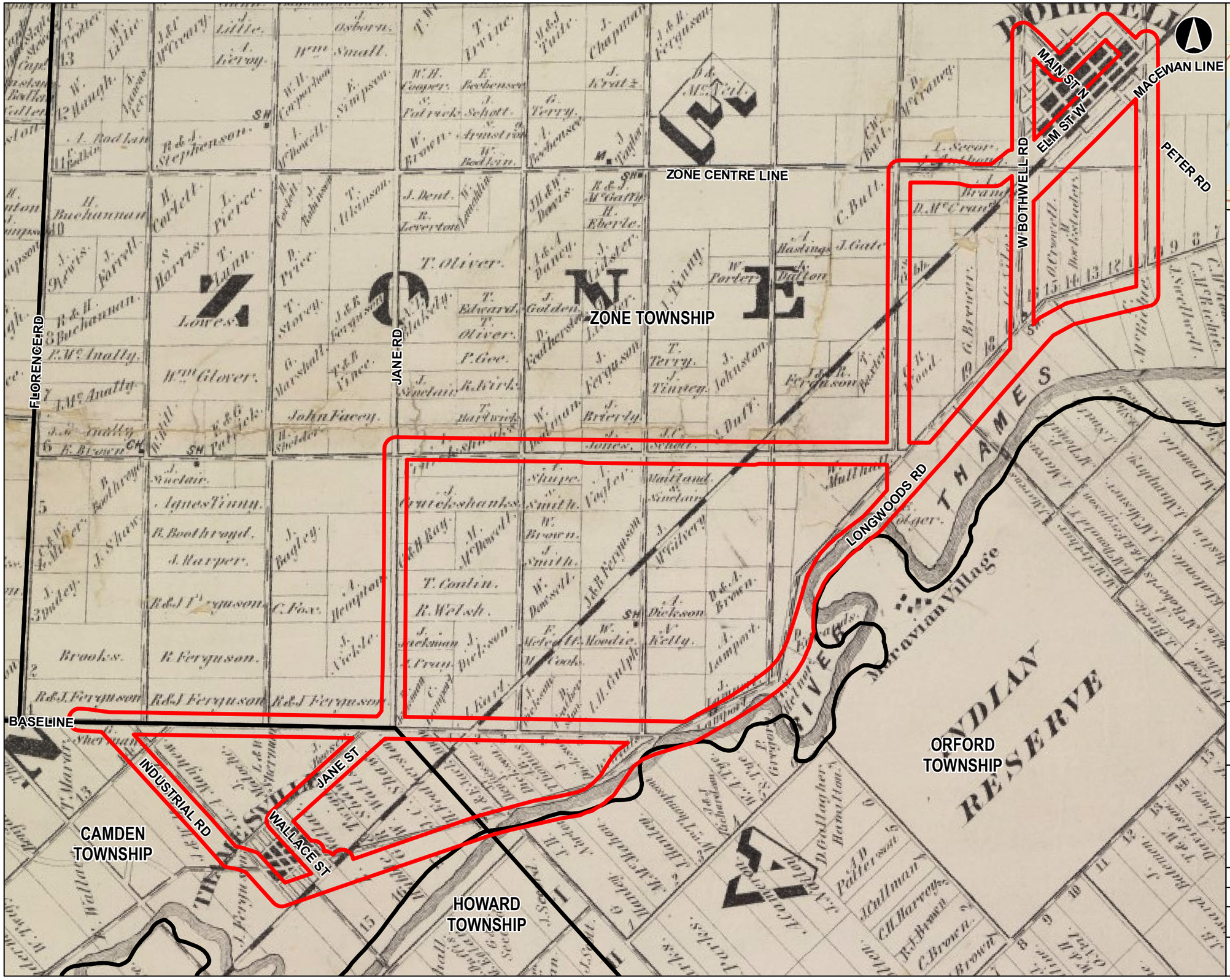

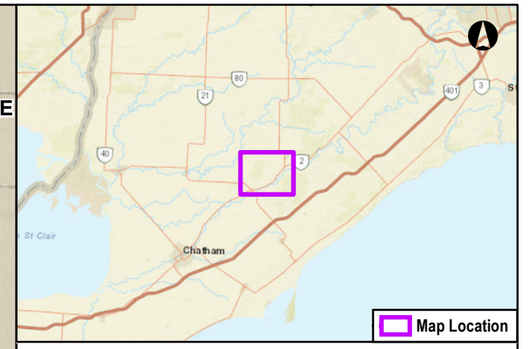

Legend

- Study Area
- Township Boundary

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

A Portion of 1876 Historical County Map of Kent County (Shackleton & McIntosh)

0 1 2 3
Kilometers
DATUM: NAD 1983 UTM Zone 17N

October 2022	1:40,000 * when printed 11"x17"	Source: MNRF 2020 Image: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
P#: 60654246	V#:	

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Figure 5

Map location: \\na.aecomnet.com\ts\AWER\London-CA\ON1\DCS\GIS\Projects\60654246_Chatham-Kent_NE_WDS_EA\Design\01_Reports\AAS1\Fig5-Historic1876.mxd
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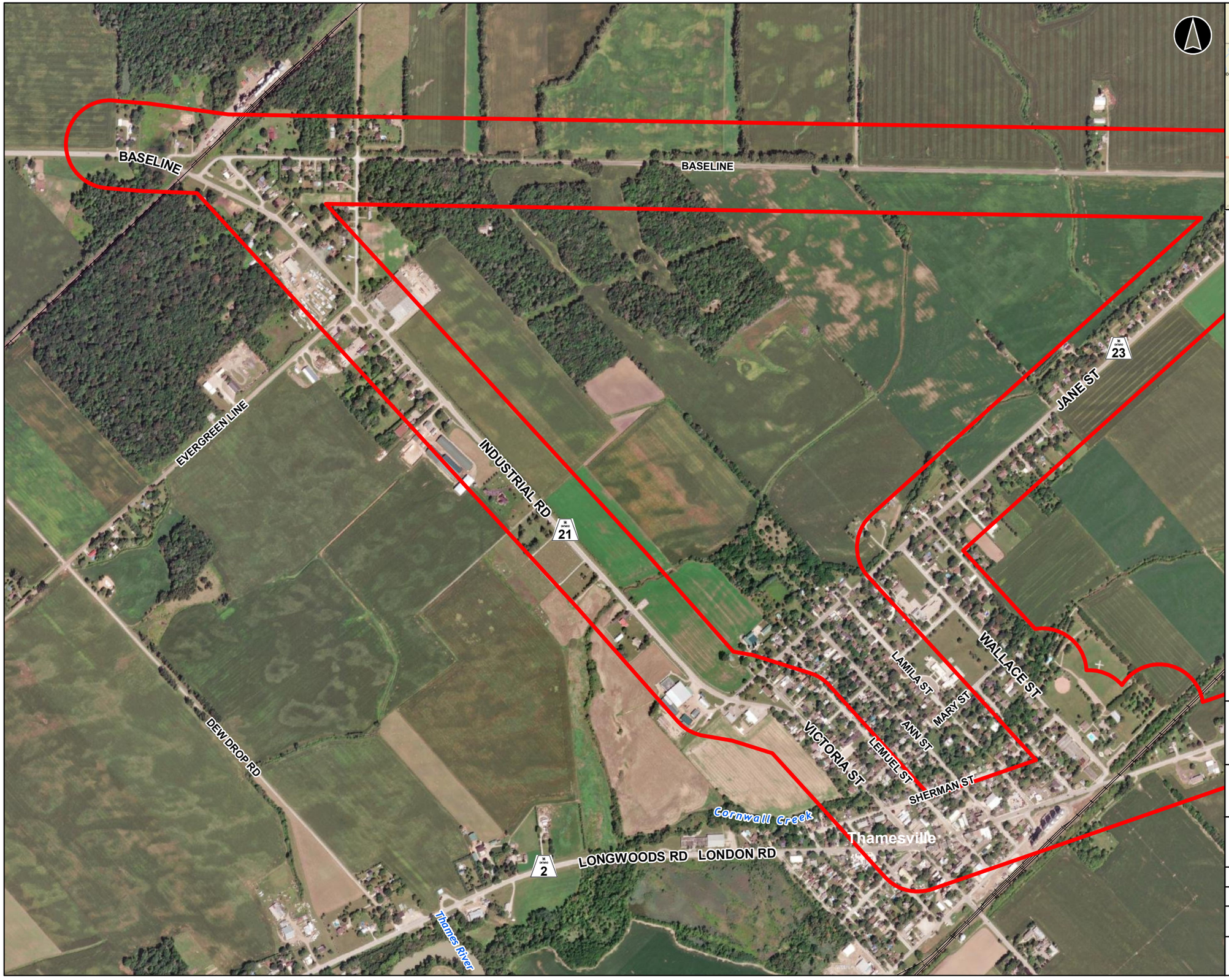

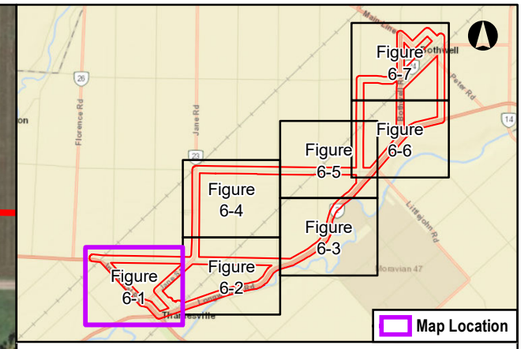

Legend

- Railway
- Study Area
- Previously Assessed - Cleared of Archaeological Concerns (AECOM 2013)
- Previously Assessed - Requires Further Investigation (AECOM 2014)

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Previous Archaeological Assessments

0 100 200 300 400 500 600 700

Meters
DATUM: NAD 1983 UTM Zone 17N

October 2022	1:10,000 * when printed 11"x17"	Source: MNRF 2020 Image: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
P#: 60654246	V#:	

AECOM

Figure 6-1

Map location: \\na.aecomnet.com\fs\AMER\London-CALON1\DC\GIS\Projects\60654246_Chatham-Kent_NE_WDS_EA\Design\01_Reports\AA\81\Fig6-PreviouslyAssessed.mxd
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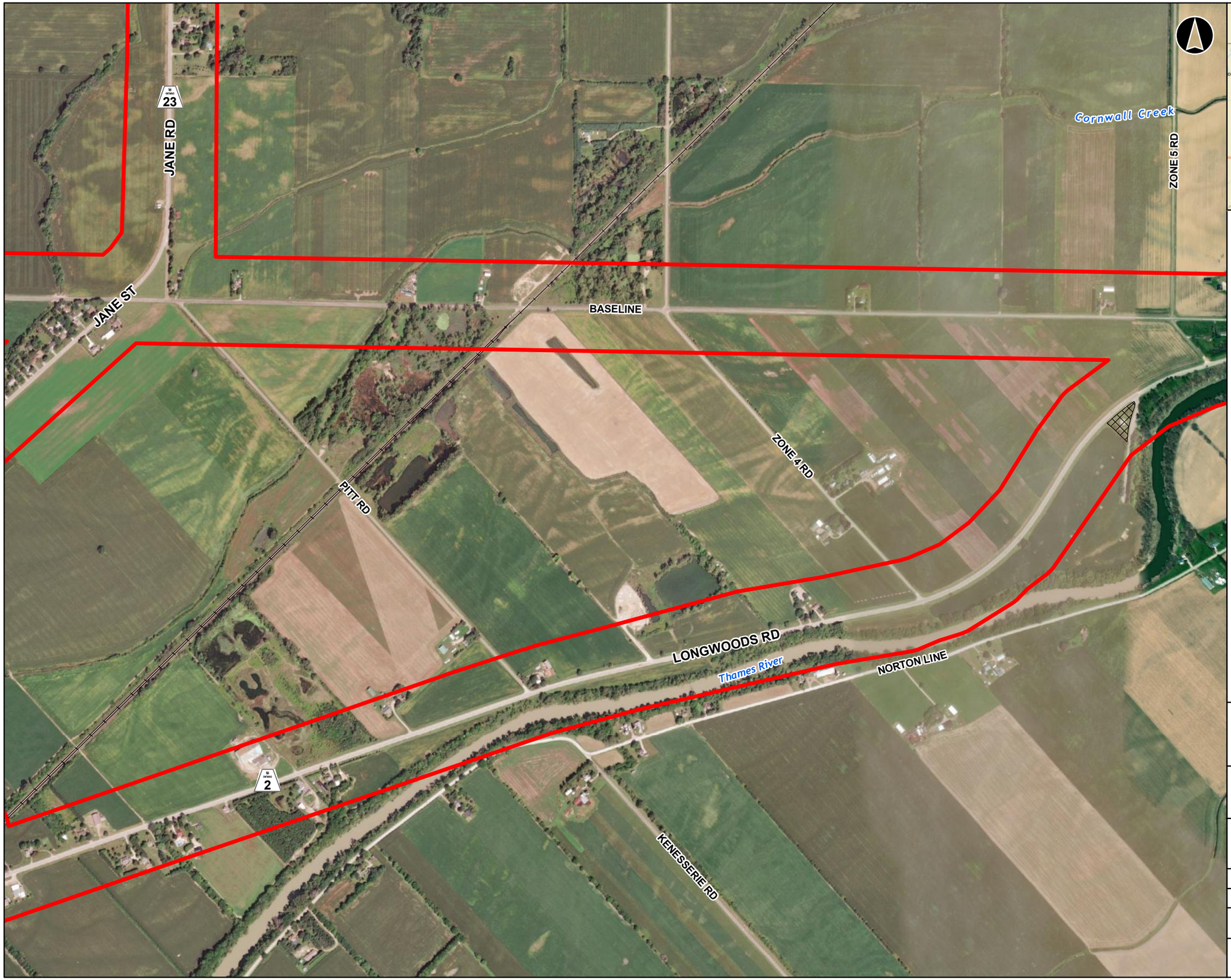

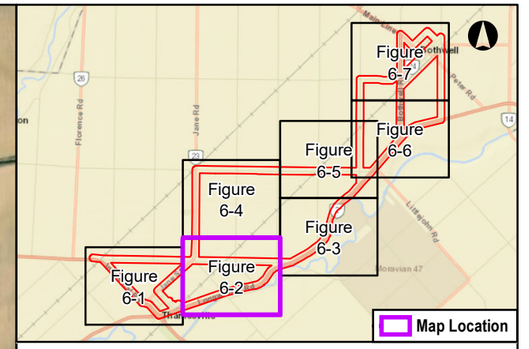

Legend

- Railway
- Study Area
- Previously Assessed - Cleared of Archaeological Concerns (AECOM 2013)
- Previously Assessed - Requires Further Investigation (AECOM 2014)

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Previous Archaeological Assessments

0 100 200 300 400 500 600 700

Meters

DATUM: NAD 1983 UTM Zone 17N

October 2022	1:10,000 * when printed 11"x17"	Source: MNRF 2020 Image: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
P#: 60654246	V#:	

AECOM

Figure 6-2

Map location: \\na.aecomnet.com\ts\AMER\London-CA\LON1\DCS\GIS\Projects\60654246_Chatham-Kent_NE_WDS_EA\Design\01_Reports\AAS1\Fig6-PreviouslyAssessed.mxd
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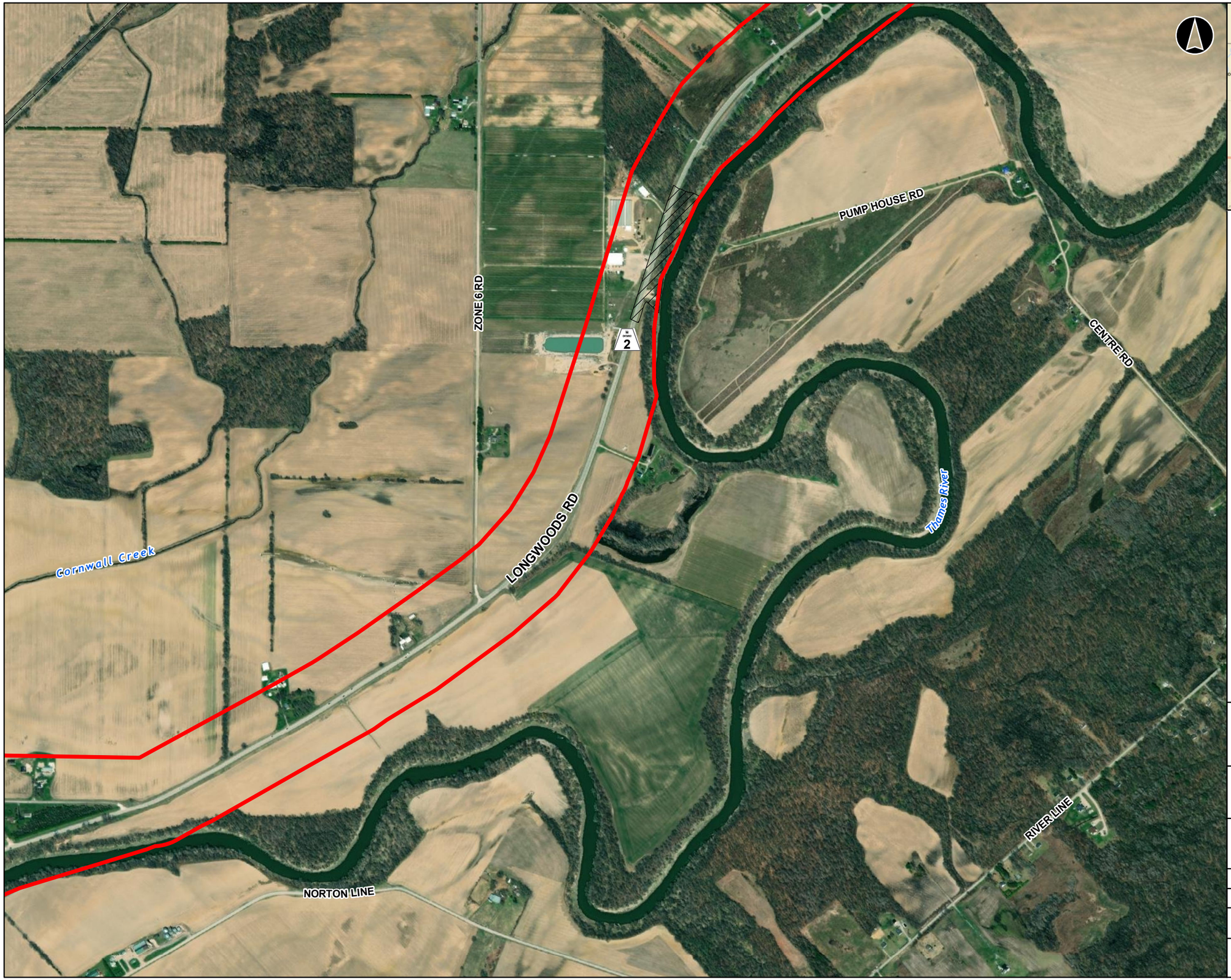

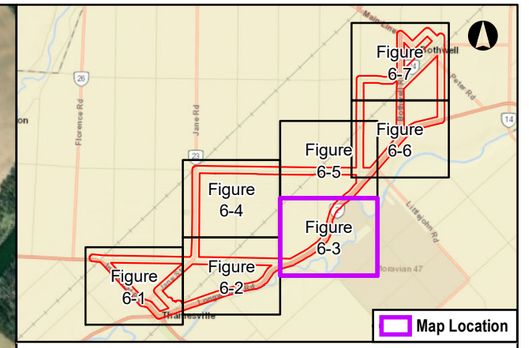

Legend

- Railway
- Study Area
- Previously Assessed - Cleared of Archaeological Concerns (AECOM 2013)
- Previously Assessed - Requires Further Investigation (AECOM 2014)

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Previous Archaeological Assessments

0 100 200 300 400 500 600 700
Meters
DATUM: NAD 1983 UTM Zone 17N

October 2022	1:10,000 * when printed 11"x17"	Source: MNRF 2020 Image: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
P#: 60654246	V#:	

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Figure 6-3

Map location: \\na.aecomnet.com\ifs\AMER\London-CALON\IDC\GIS\Projects\60654246_Chatham-Kent_NE_WDS_EA\Design\01_Reports\AASI\Fig6-PreviouslyAssessed.mxd
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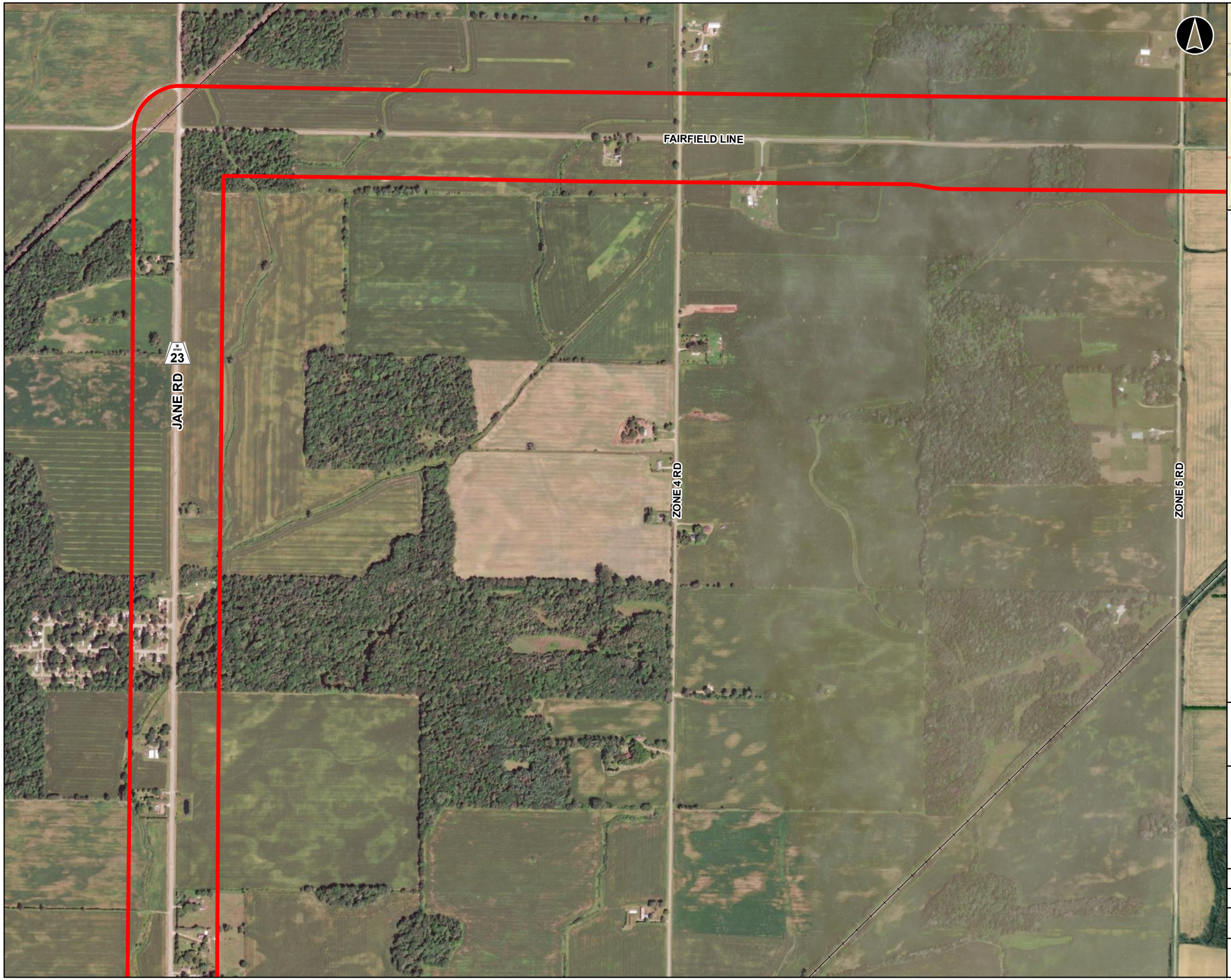

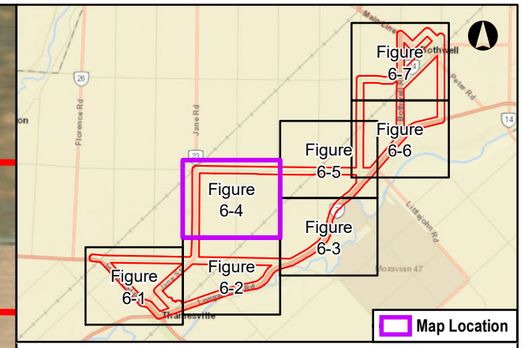

Legend

- Railway
- Study Area
- Previously Assessed - Cleared of Archaeological Concerns (AECOM 2013)
- Previously Assessed - Requires Further Investigation (AECOM 2014)

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Previous Archaeological Assessments

0 100 200 300 400 500 600 700

Meters
DATUM: NAD 1983 UTM Zone 17N

October 2022	1:10,000 * when printed 11"x17"	Source: MNRF 2020 Image: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
P#: 60654246	V#:	

AECOM

Figure 6-4

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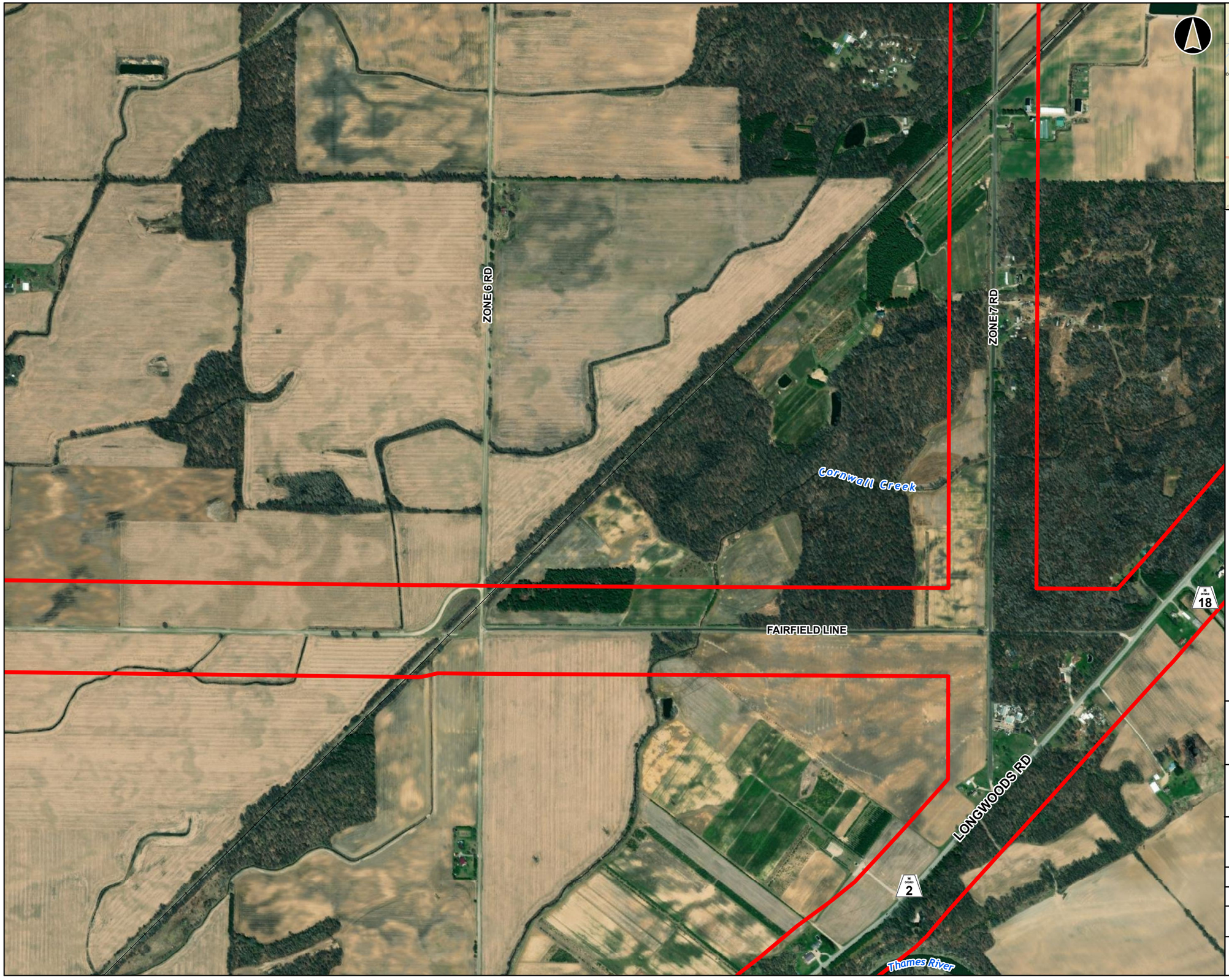

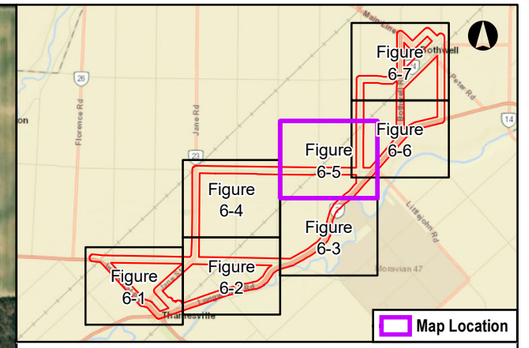

Legend

- Railway
- Study Area
- Previously Assessed - Cleared of Archaeological Concerns (AECOM 2013)
- Previously Assessed - Requires Further Investigation (AECOM 2014)

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Previous Archaeological Assessments

0 100 200 300 400 500 600 700
Meters
DATUM: NAD 1983 UTM Zone 17N

October 2022	1:10,000 * when printed 11"x17"	Source: MNRF 2020 Image: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
P#: 60654246	V#:	

AECOM

Figure 6-5

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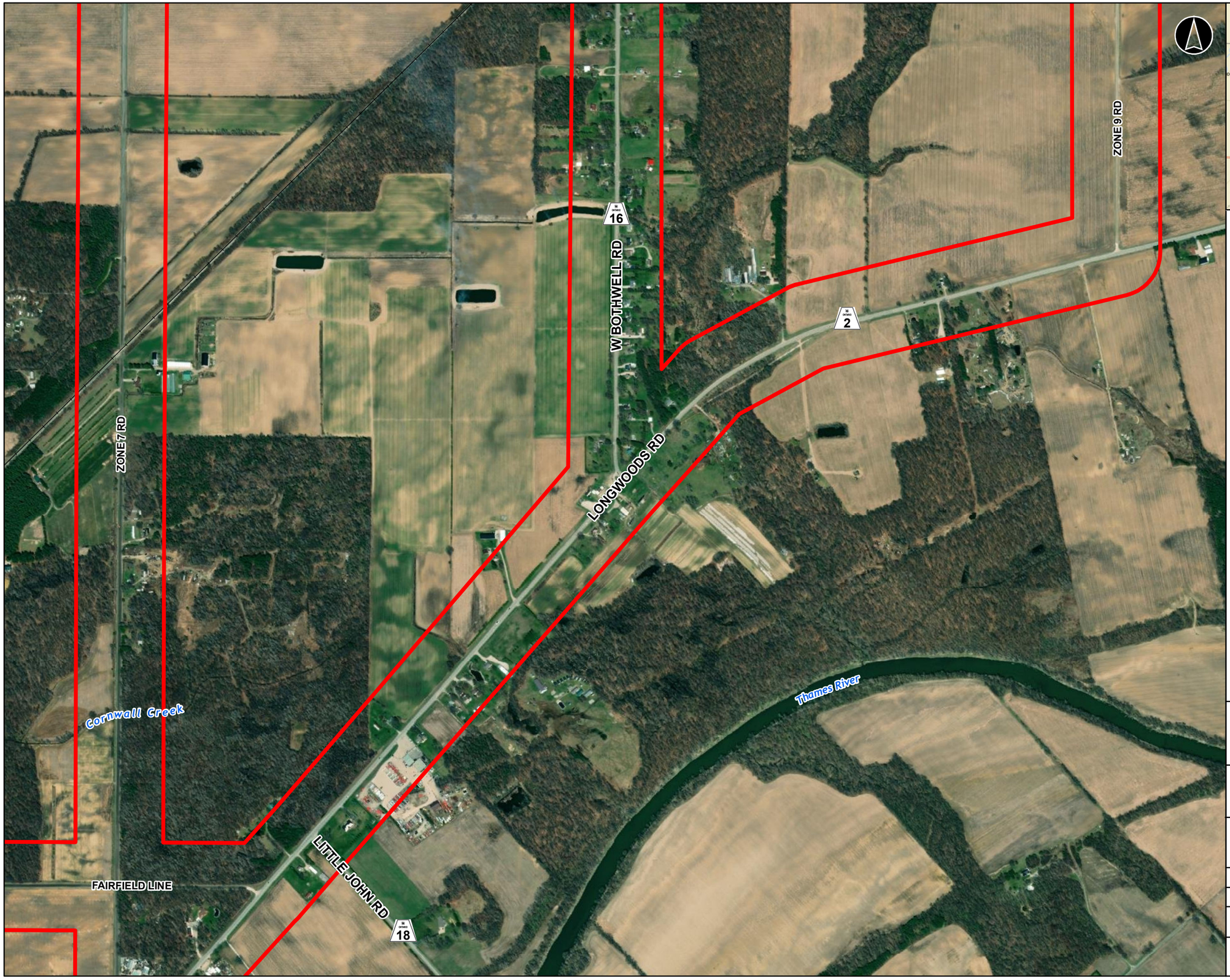

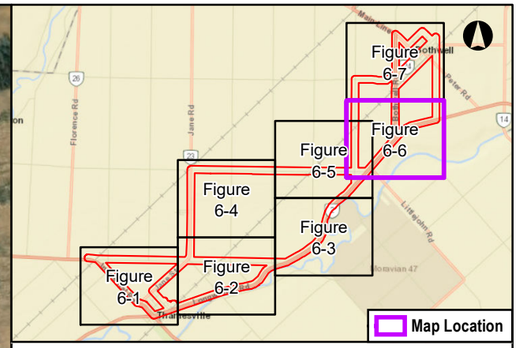

Legend

- Railway
- Study Area
- Previously Assessed - Cleared of Archaeological Concerns (AECOM 2013)
- Previously Assessed - Requires Further Investigation (AECOM 2014)

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Previous Archaeological Assessments

0 100 200 300 400 500 600 700
Meters
DATUM: NAD 1983 UTM Zone 17N

October 2022	1:10,000 * when printed 11"x17"	Source: MNRF 2020 Image: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
P#: 60654246	V#:	
AECOM		**Figure 6-6**

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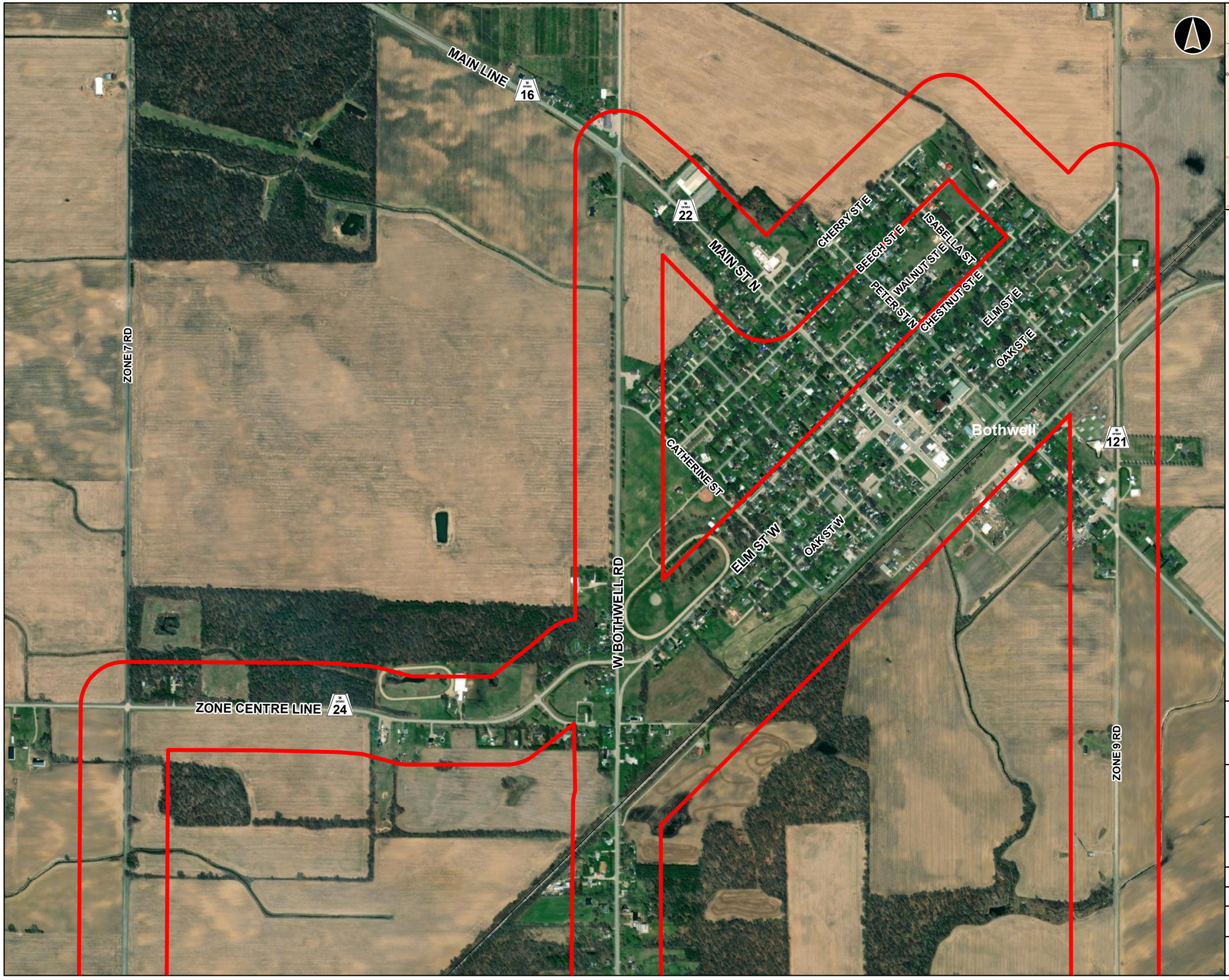
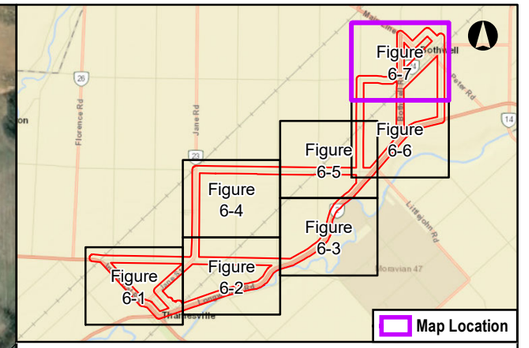




Legend

- Railway
- Study Area
- Previously Assessed - Cleared of Archaeological Concerns (AECOM 2013)
- Previously Assessed - Requires Further Investigation (AECOM 2014)

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Previous Archaeological Assessments

0 100 200 300 400 500 600 700
Meters
DATUM: NAD 1983 UTM Zone 17N

October 2022	1:10,000 * when printed 11"x17"	Source: MNRF 2020 Image: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
P#: 60654246	V#:	

AECOM

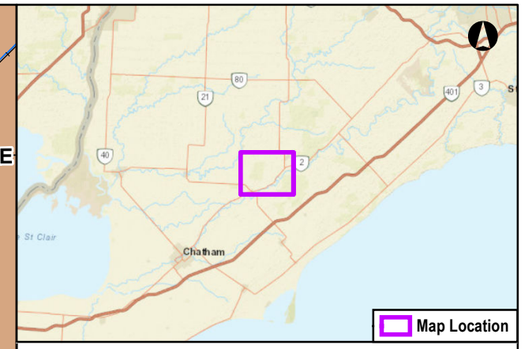
Figure 6-7

Map location: \\na.aecomnet.com\fs\AMER\London-CALON1\DC\GIS\Projects\60654246_Chatham-Kent_NE_WDS_EA\Design\01_Reports\AASI1\Fig6-Previously\Assessed.mxd
Date Saved: 10/18/2022 2:16:32 PM User Name: clarkb

Soils

- B.L. - Unclassified
- BE>TO.L - Berrien, Loamy Fine Sand
- BN.T - Bennington, Loam
- BV - Beverly, Silty Clay Loam
- BV.K - Unclassified, Silty Clay Loam
- BY - Brady, Sandy Loam
- Bc-st - Unclassified, Clay
- Besl - Berrien, Sandy Loam
- CW>TO - Colwood, Silt Loam
- ER - Eroded
- FX - Fox, Sandy Loam
- MA - Maplewood, Fine Sandy Loam
- NM - Unclassified
- NO>SW - Normandale, Loamy Very Fine Sand
- PF>WM - Unclassified, Fine Sand
- Pc - Perth, Clay
- SW>NO - St.Williams, Very Fine Sandy Loam
- TA.T - Tavistock, Very Fine Sandy Loam
- TA>MA - Tavistock, Loam
- TO - Toledo, Silty Clay Loam
- TO.L - Toledo, Loam
- VC - Unclassified
- WM - Walsingham, Loamy Fine Sand
- WN>WM - Waterin, Loamy Fine Sand
- WU - Wauseon, Loamy Fine Sand
- WU.T - Unclassified, Loamy Fine Sand
- ZZ - Water

MAIN LINE
MAIN ST N
MAGEE AN LINE
PETER RD
W BOTHWELL RD
ZONE CENTRE LINE
LONGWOODS RD
LITTLE JOHN RD
FLORENCE RD
JANE RD
JANE ST
BASELINE
INDUSTRIAL RD
WALLACE ST
Bothwell
Thamesville
MUNICIPALITY OF CHATHAM-KENT
Bothwell Sand Plains
Thames River
Cornwall Creek



Legend

- Railway
- Study Area
- Lake
- River
- Pond
- Permanent Stream
- Intermittent Stream
- Physiographic Region
- Ontario Municipalities

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Physiography and Soil Types
within the Study Area

0 1 2 3
Kilometers
DATUM: NAD 1983 UTM Zone 17N

September 2022	1:40,000 * when printed 11"x17"	Source: MNRF 2020 Image: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
P#: 60654246	V#:	

AECOM

Figure 7

Map location: \\na.aecomnet.com\lfs\AAMER\London-CALON1\DCS\GIS\Projects\60654246_Chatham-Kent_NE_WDS_EA\Design\01_Reports\AAS1115g7-Soils.mxd
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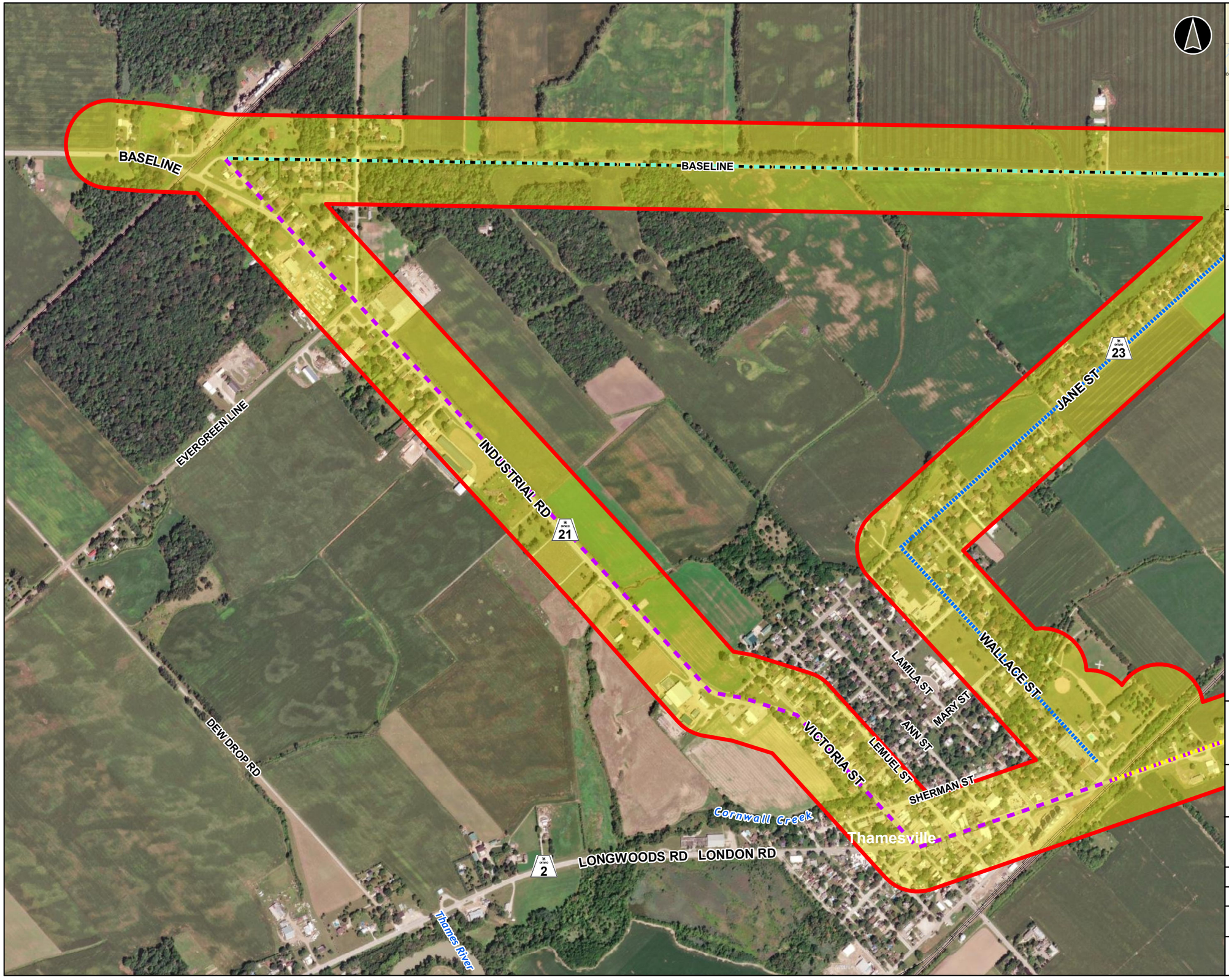

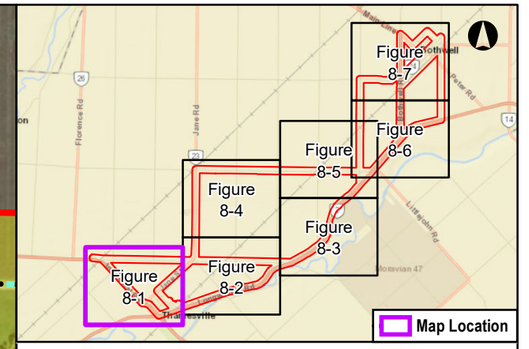

Legend

- Railway
- Study Area
- Stage 2 Archaeological Assessment Required
- Previously Assessed - Requires Further Investigation (AECOM 2014)
- Previously Assessed - Cleared of Archaeological Concerns (AECOM 2013)

Strategy 1 Alternative

- Option 1
- Option 2
- Option 3

Strategy 2 Alternative

- Option 1
- Option 2
- Option 3

Stage 1 Archaeological Assessment Chatham-Kent NE WDS EA Municipality of Chatham-Kent, Ontario

Results of the Stage 1 Archaeological Assessment

0 100 200 300 400 500 600 700
Meters
DATUM: NAD 1983 UTM Zone 17N

October 2022	1:10,000 * when printed 11"x17"	Source: MNRF 2020 Image: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
P#: 60654246	V#:	

AECOM

Figure 8-1

Map location: \\na.aecomnet.com\fs\AMER\London-CALON1\DCS\GIS\Projects\60654246_Chatham-Kent_NE_WDS_EA\Design\01_Reports\AAS1\Fig8-1_Results.mxd
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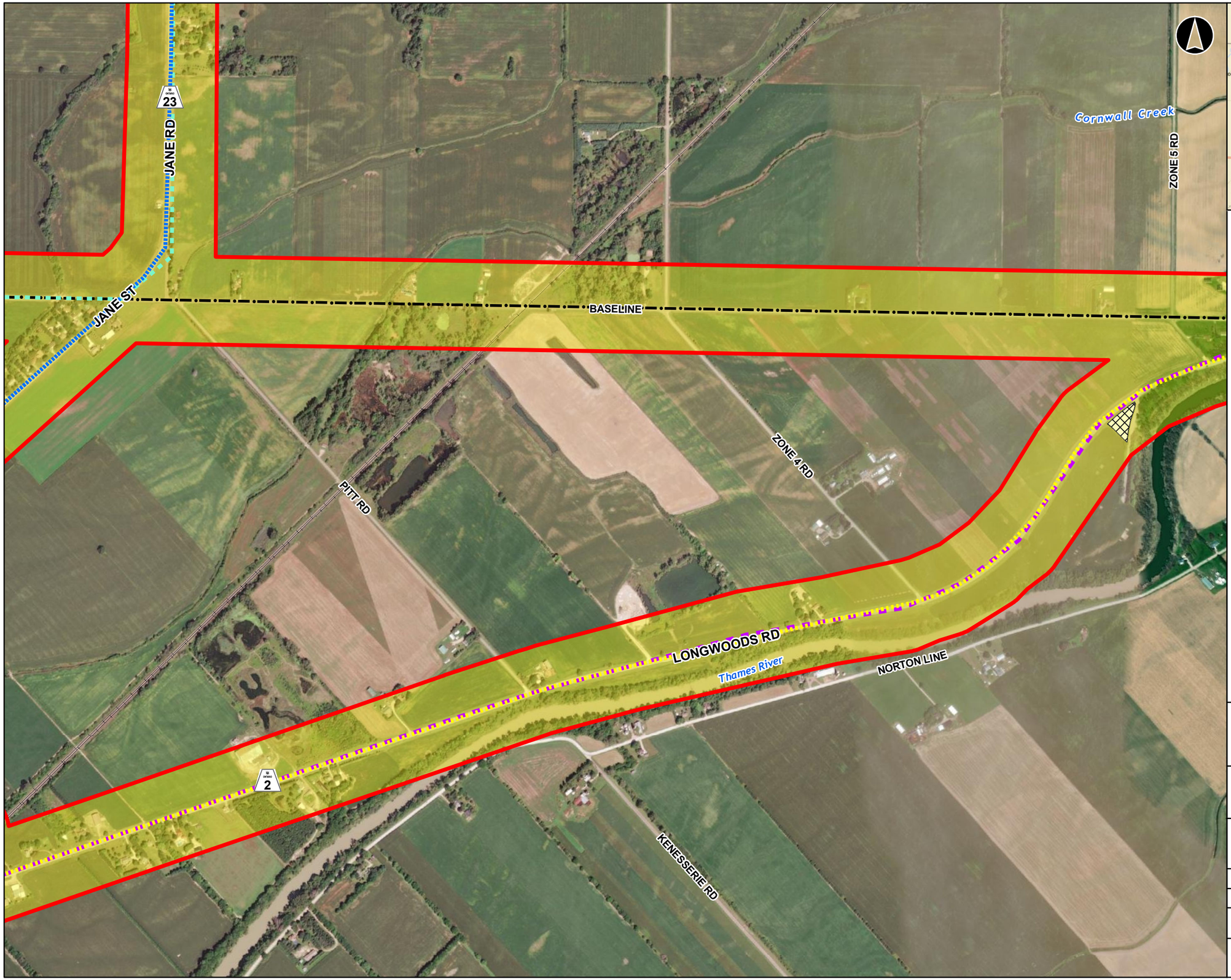

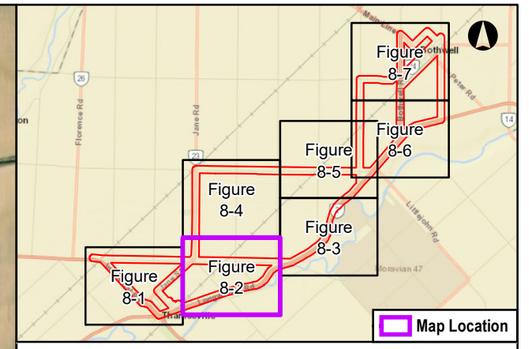

Legend

- Railway
- Study Area
- Stage 2 Archaeological Assessment Required
- Previously Assessed - Requires Further Investigation (AECOM 2014)
- Previously Assessed - Cleared of Archaeological Concerns (AECOM 2013)

Strategy 1 Alternative

- Option 1
- Option 2
- Option 3

Strategy 2 Alternative

- Option 1
- Option 2
- Option 3

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Results of the Stage 1 Archaeological Assessment

0 100 200 300 400 500 600 700
Meters
DATUM: NAD 1983 UTM Zone 17N

October 2022	1:10,000 * when printed 11"x17"	Source: MNRF 2020 Image: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
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AECOM		**Figure 8-2**

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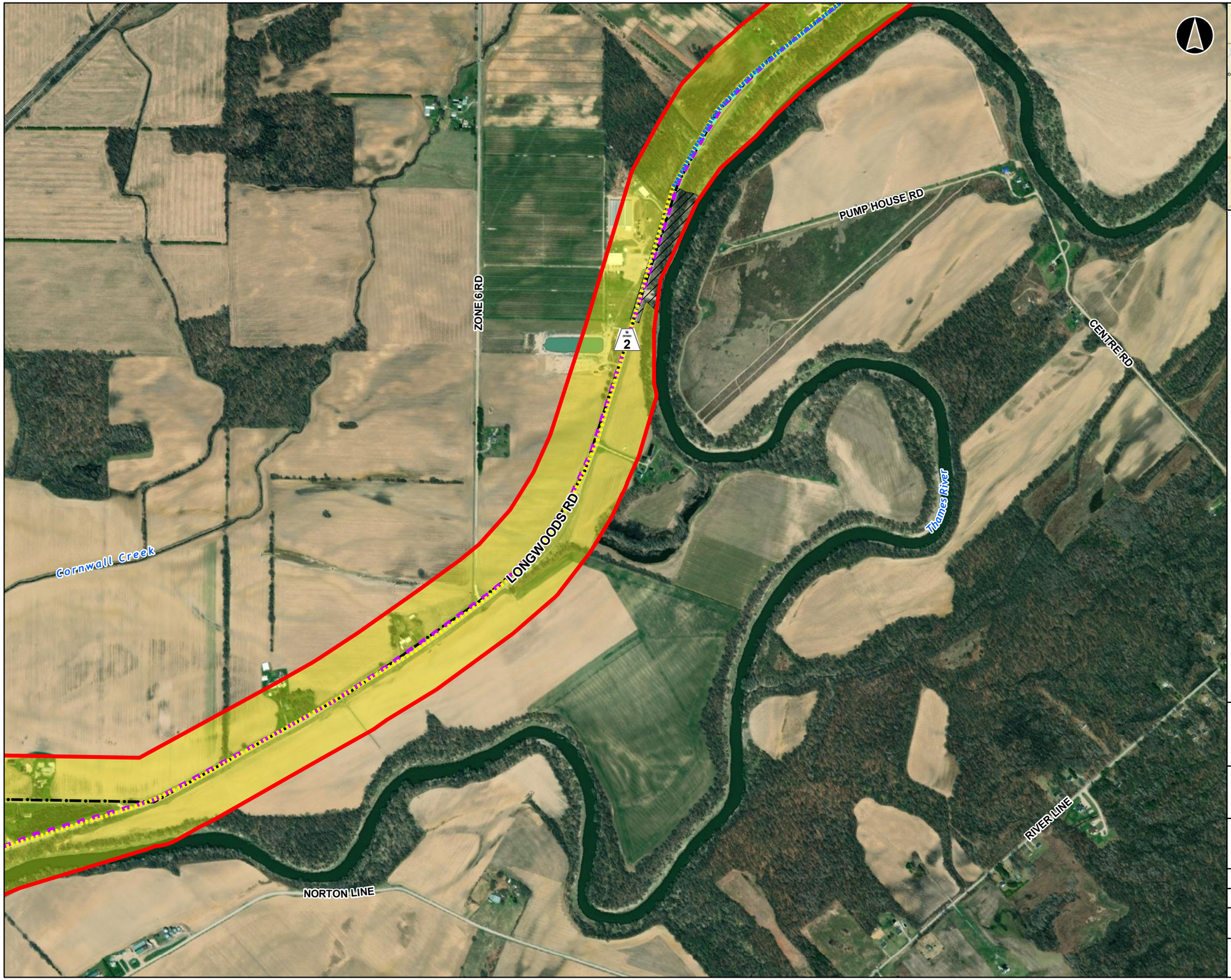

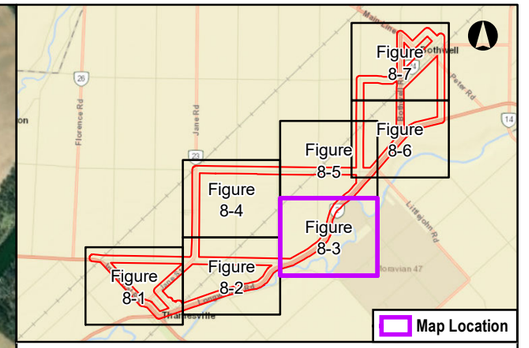

Legend

- Railway
- Study Area
- Stage 2 Archaeological Assessment Required
- Previously Assessed - Requires Further Investigation (AECOM 2014)
- Previously Assessed - Cleared of Archaeological Concerns (AECOM 2013)

Strategy 1 Alternative

- Option 1
- Option 2
- Option 3

Strategy 2 Alternative

- Option 1
- Option 2
- Option 3

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Results of the Stage 1 Archaeological Assessment

0 100 200 300 400 500 600 700
Meters
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Figure 8-3

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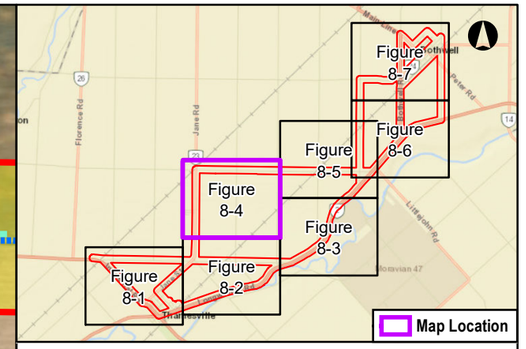
FAIRFIELD LINE

JANE RD

23

ZONE 4 RD

ZONE 5 RD



Legend

- Railway
- Study Area
- Stage 2 Archaeological Assessment Required
- Previously Assessed - Requires Further Investigation (AECOM 2014)
- Previously Assessed - Cleared of Archaeological Concerns (AECOM 2013)

Strategy 1 Alternative

- Option 3

Strategy 2 Alternative

- Option 2

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Results of the Stage 1 Archaeological Assessment

0 100 200 300 400 500 600 700

Meters

DATUM: NAD 1983 UTM Zone 17N

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Figure 8-4

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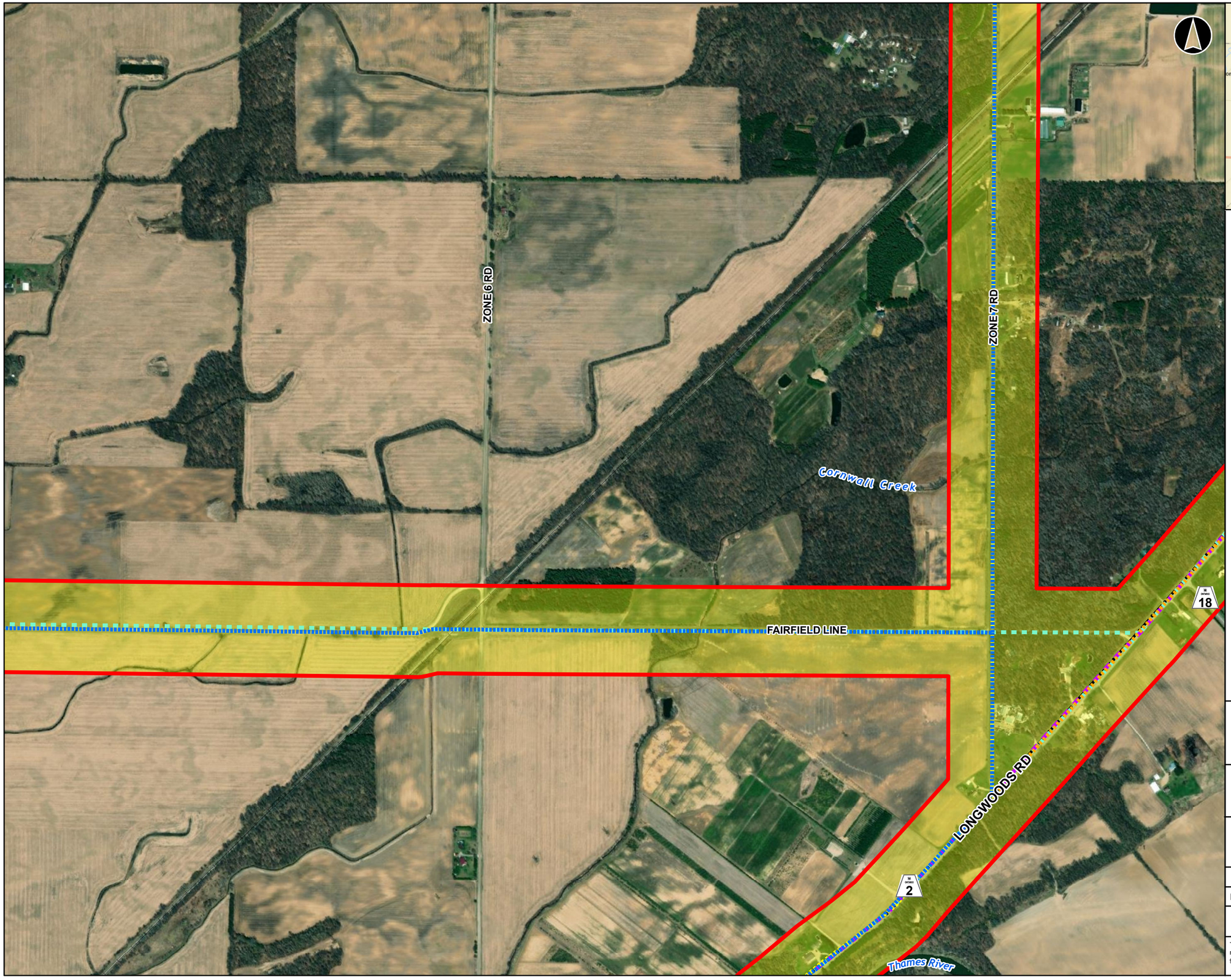

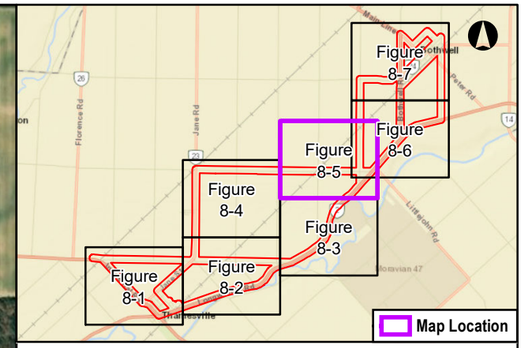

Legend

- Railway
- Study Area
- Stage 2 Archaeological Assessment Required
- Previously Assessed - Requires Further Investigation (AECOM 2014)
- Previously Assessed - Cleared of Archaeological Concerns (AECOM 2013)

Strategy 1 Alternative

- Option 1
- Option 2
- Option 3

Strategy 2 Alternative

- Option 1
- Option 2
- Option 3

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Results of the Stage 1 Archaeological Assessment

0 100 200 300 400 500 600 700
Meters
DATUM: NAD 1983 UTM Zone 17N

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Figure 8-5

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ZONE 7 RD

W BOTHWELL RD

16

ZONE 9 RD

2

LONGWOODS RD

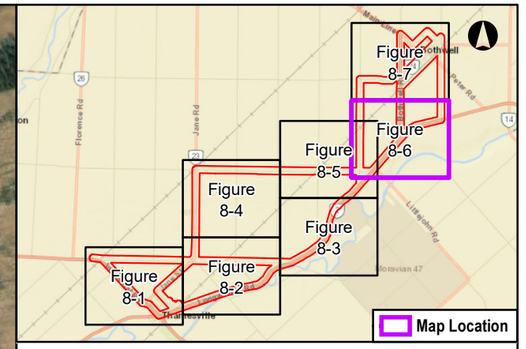
Cornwall Creek

Thames River

LITTLE JOHN RD

18

FAIRFIELD LINE



Legend

- Railway
- Study Area
- Stage 2 Archaeological Assessment Required
- Previously Assessed - Requires Further Investigation (AECOM 2014)
- Previously Assessed - Cleared of Archaeological Concerns (AECOM 2013)
- West Bothwell Cemetery Propertry

Bothwell Option Alternative

- Bothwell Option 1

Strategy 1 Alternative

- Option 1
- Option 2
- Option 3

Strategy 2 Alternative

- Option 1
- Option 2
- Option 3

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Results of the Stage 1 Archaeological Assessment

0 100 200 300 400 500 600 700

Meters

DATUM: NAD 1983 UTM Zone 17N

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Figure 8-6

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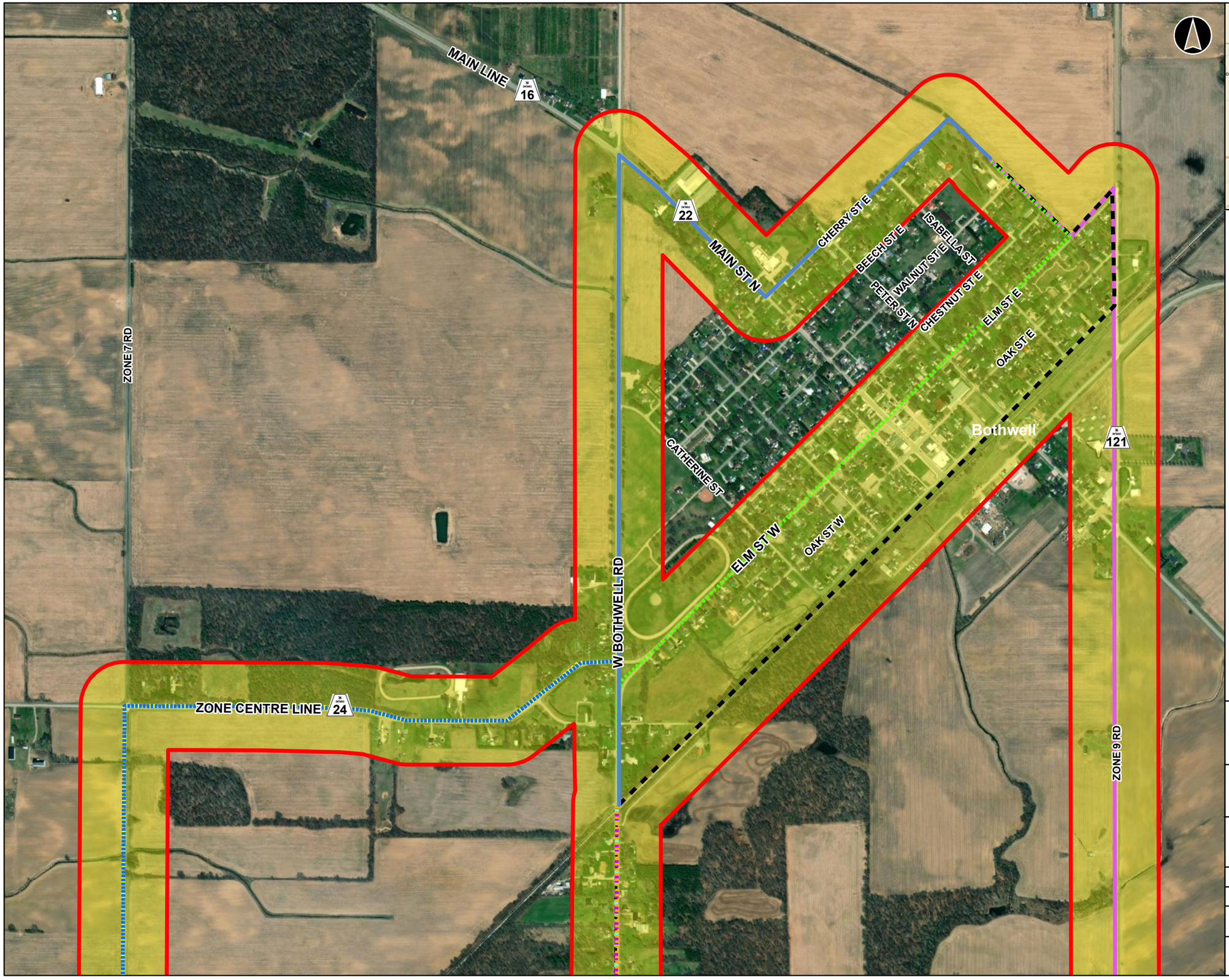

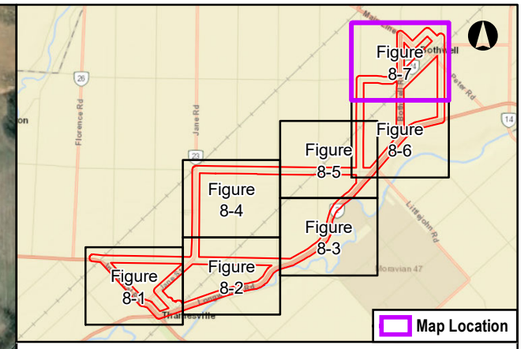

Legend

- Railway
- Study Area
- Stage 2 Archaeological Assessment Required
- Previously Assessed - Requires Further Investigation (AECOM 2014)
- Previously Assessed - Cleared of Archaeological Concerns (AECOM 2013)

Bothwell Option Alternative

- Bothwell Option 1
- Bothwell Option 2A
- Bothwell Option 2B
- Bothwell Option 2C

Strategy 1 Alternative

- Option 1
- Option 2
- Option 3

Strategy 2 Alternative

- Option 1
- Option 2
- Option 3

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Results of the Stage 1 Archaeological Assessment

0 100 200 300 400 500 600 700
Meters
DATUM: NAD 1983 UTM Zone 17N

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Figure 8-7

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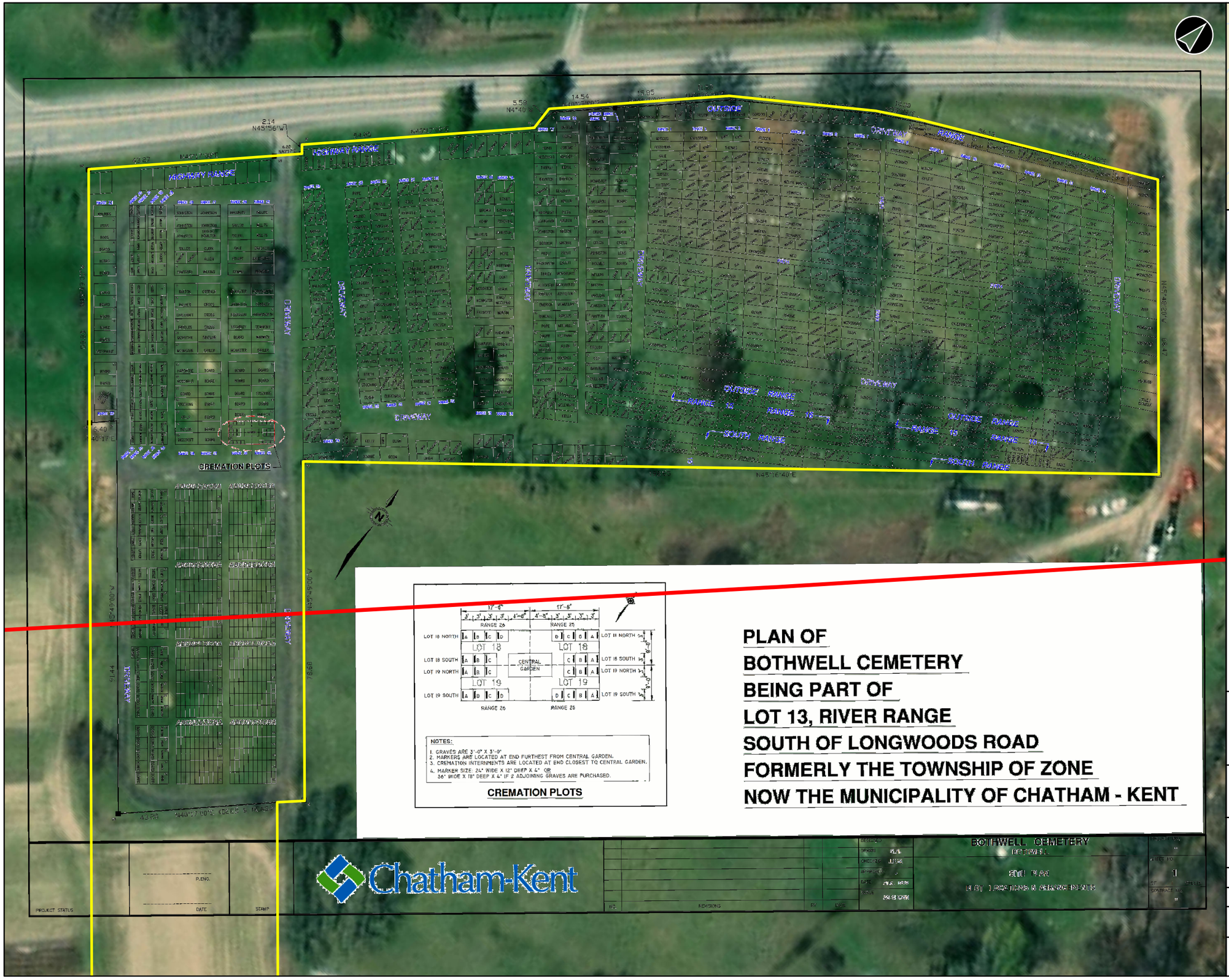

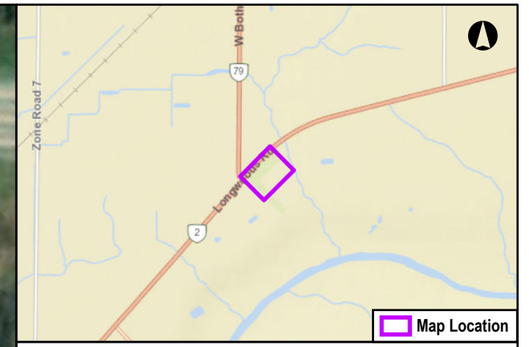

Legend

- Cemetery Property Boundary
- Study Area

Stage 1 Archaeological Assessment
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

West Bothwell Cemetery Plot Map on Aerial Image

0 10 20 30 40 50 60
Meters
DATUM: NAD 1983 UTM Zone 17N

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Figure 9

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Adria Grant, MA, CAHP
Associate Vice President, Impact Assessment and Permitting (IAP)
M +1-519-317-6279
adria.grant@aecom.com

AECOM Canada Ltd.
410 – 250 York Street, Citi Plaza
London, ON N6A 6K2 Canada

T: 519.673.0510
F: 519.673.5975
www.aecom.com

Appendix B

B.4 Cultural Heritage

AECOM Imagine it. Delivered.

Project name: North East Chatham-Kent Water Distribution System Municipal Class Environmental Assessment – Desktop Cultural Heritage Screening Memorandum

Project ref: 60654246

Prepared By:
Liam Ryan, Cultural Heritage Specialist AECOM

Date: February 10, 2022

Reviewed By: Tara Jenkins,
Cultural Heritage Specialist, Lead

AECOM Canada Ltd.
410 – 250 York Street, Citi Plaza
London, ON N6A 6K2,
Canada
aecom.com

Desktop Cultural Heritage Screening Memorandum

North East Chatham-Kent Water Distribution System Municipal Class Environmental Assessment

1.0 Project Context

The Public Utilities Commission for the Municipality of Chatham-Kent (CK PUC) is conducting a study to review and confirm municipal water servicing requirements and identify capital project upgrades required for the North-East (NE) Chatham Kent Water Distribution System (WDS) Study Area in order to provide sustainable municipal water and accommodate near and long-term future growth demands. AECOM Canada Ltd. (AECOM) has been retained by CK PUC to complete this Desktop Cultural Heritage Screening Memorandum for the Municipal Class Environmental Assessment (MCEA). The MCEA will review and confirm municipal water servicing requirements and identify capital project upgrades required for the NE Chatham Kent WDS in order to provide sustainable municipal water and accommodate near and long-term growth demands, in addition to siting new watermains, pumping, and storage facilities in the Thamesville, Dresden, and Bothwell areas. It will also supply municipal water to the Delaware Nation at Moraviantown. The MCEA has followed the Schedule "B" process under the Municipal Engineers Association's, MCEA Manual (October 2000, amended 2007, 2011 and 2015) which is approved under the Ontario *Environmental Assessment Act*.

The goal of the study is to ensure that the water distribution system within NE Chatham Kent becomes a reliable water source to current and future users. The Municipality, through that goal, is aiming to achieve the following objectives:

- Complete enhanced Schedule B MCEA to identify municipal water servicing requirements within the NE Chatham Kent WDS.
- Investigate/confirm the capacity of Chatham Water Treatment Plant (WTP) for the possibility of meeting the near and long-term demands of the NE Chatham Kent WDS.
- Establish the additional infrastructure, to supply water from the endpoint of Zone 1 Road and Industrial Road.

- Identify the suitable infrastructure to service the Thamesville Community (e.g., rehabilitation of existing Standpipe vs. New Elevated Tank), Bothwell Community, identified greenhouses, and the Delaware Nation of Moraviantown (Eelūnaapèewii Lahkèewiit).
- Confirm the need for the continuation of the existing connection from Middlesex Tri-County to the Bothwell Community Water Supply System.
- Coordination with the current CK Wallaceburg WTP MCEA team who is looking at serving Dresden.

The MCEA Study will focus on the expansion of the NE Chatham Kent WDS to meet the growing municipal water demands within the NE Chatham Kent WDS. The expansion of the NE Chatham Kent WDS will also provide the opportunity to:

- Service Moraviantown (currently on groundwater well system) and Bothwell (currently serviced externally from separate water system).
- Improve water system pressure, particularly in the communities of Thamesville and North Thamesville.
- Address water demand for farming operations and service residences and businesses in the rural service area, where requested, to increase customer base and lower operating costs and to address future greenhouse demands.

2.0 Study Area

The Study Area consists of the Connection to the Bothwell Option Alternative, Strategy 1 Alternative, and Strategy 2 Alternative (**Figure 1**). In addition, the Study Area includes potential locations for a booster station in Thamesville and North Thamesville (8 proposed locations) and the potential location of a water tower in Bothwell. The individual project components that form the Study Area are:

Connection to the Bothwell Option Alternative

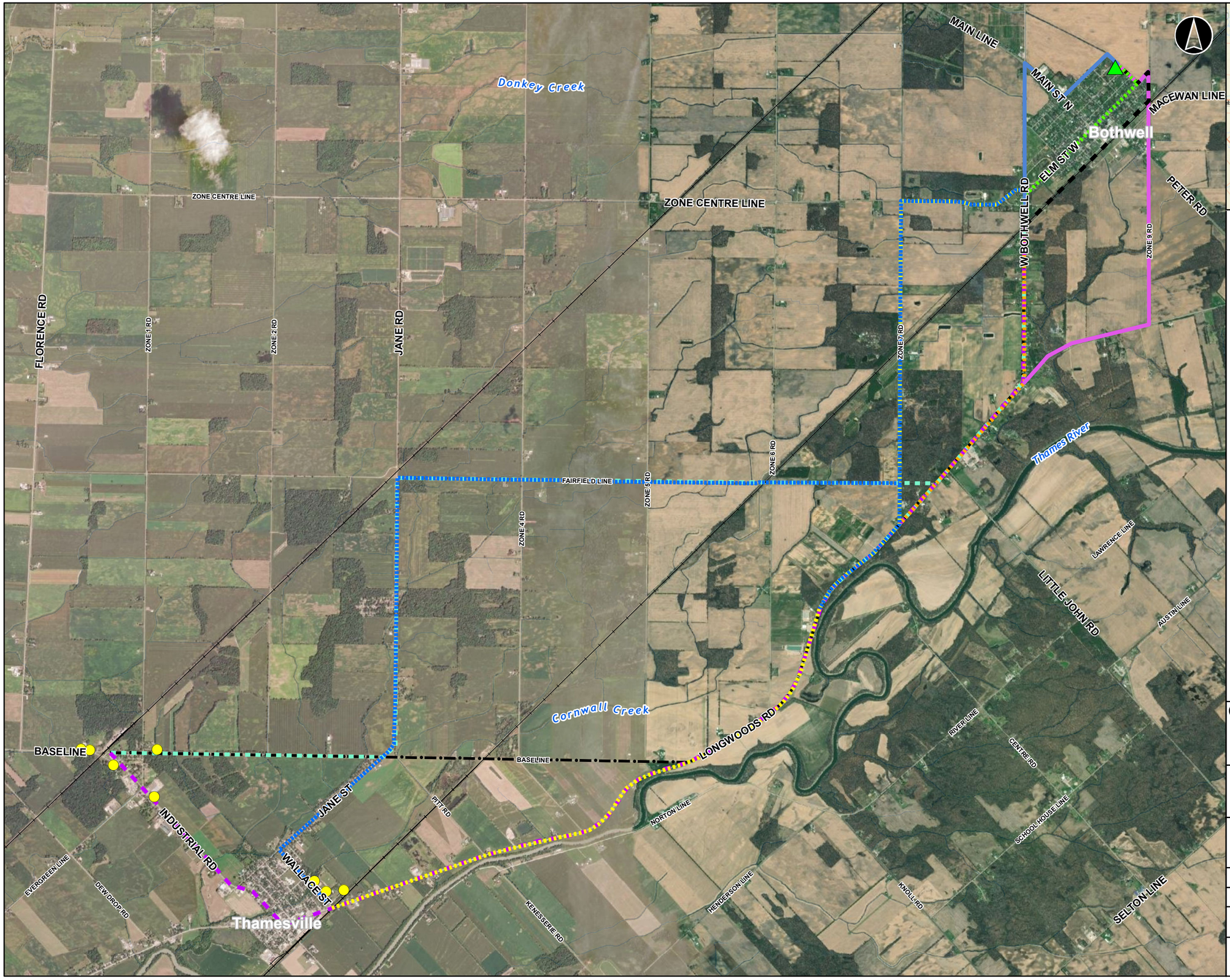
- Bothwell Option 1, Bothwell Option 2, Bothwell Option 2A, Bothwell Option 2B, Bothwell Option 2B, Bothwell Option 2C

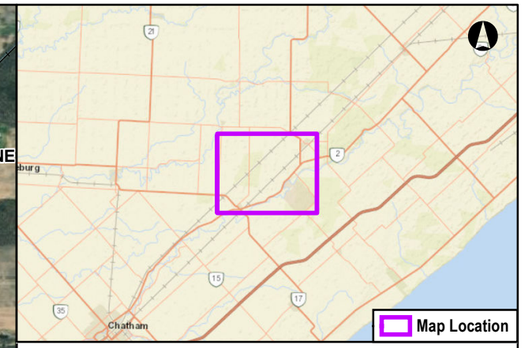
Strategy 1 Alternative

- Option 1, Option 2, Option 3

Strategy 2 Alternative

- Option 1, Option 2, Option 3





Legend

- Approximate Booster Station
- Water Tower
- Railway

Bothwell Option Alternative

- Bothwell Option 1
- Bothwell Option 2A
- Bothwell Option 2B
- Bothwell Option 2C

Strategy 1 Alternative

- Option 1
- Option 2
- Option 3

Strategy 2 Alternative

- Option 1
- Option 2
- Option 3

Cultural Heritage Screening Memorandum
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

Study Area overlaid on Aerial Photography

0 400 800 1,200 1,600 2,000 2,400 2,800

Meters

DATUM: NAD 1983 UTM Zone 17N

January 2022	1:40,000 * when printed 11"x17"	Source: MNRF 2020 Image: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT
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Figure 1

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3.0 Methodology

Following the process for the identification of above-ground cultural heritage resources outlined in the Ministry of Heritage, Sport, Tourism, and Culture Industries' (MHSTCI) *Criteria for Evaluating Potential Built Heritage Resources and Cultural Heritage Landscapes* (MHSTCI Criteria Checklist; 2016) the following steps were taken:

- A review of municipal, provincial, and federal heritage registers and inventories, including the Chatham-Kent Municipal Heritage Register (Last updated 2021);
- A review of available historic mapping;
- Preparation of a brief historical overview of the Study Area;
- A review of several online resources including:
    - The inventory of Ontario Heritage Trust easements;
    - The Ontario Heritage Trust's *Ontario Heritage Plaque Guide;*
    - The Ontario Heritage Trust's *Ontario Heritage Act Register;*
    - *Ontario's Historical Plaques* website;
    - Parks Canada's *Canada's Historic Places* website;
    - Parks Canada's *Directory of Federal Heritage Designations;*
    - Canadian Heritage River System; and
    - United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Sites.
    - Historicbridges.org
- Completion of the MHSTCI Criteria Checklist to screen for known and potential BHRs and CHLs within and adjacent to the Study Area.
- Brief property descriptions were prepared in **Table 2, Table 3** and **Table 4** of all known BHRs and CHLs, including their municipal address, heritage recognition and location in relation to the NE Chatham Kent WDS.

In this Memorandum, above-ground cultural heritage resources can be classified and defined as either built heritage resources or cultural heritage landscapes, according to the following definitions provided within the Provincial Policy Statement (2020):

- **Built Heritage Resource (BHR)** – means a building, structure, monument, installation or any manufactured or constructed part or remnant that contributes to a property's cultural heritage value or interest as identified by a community, including an Indigenous community. Built heritage resources are located on property that may be designated under Parts IV or V of the *Ontario Heritage Act*, or that may be included on local, provincial, federal and/or international registers.

- **Cultural Heritage Landscape (CHL)** – means a defined geographical area that may have been modified by human activity and is identified as having cultural heritage value or interest by a community, including an Indigenous community. The area may include features such as buildings, structures, spaces, views, archaeological sites or natural elements that are valued together for their interrelationship, meaning or association. Cultural heritage landscapes may be properties that have been determined to have cultural heritage value or interest under the *Ontario Heritage Act*, or have been included on federal and/or international registers, and/or protected through official plan, zoning by-law, or other land use planning mechanisms.

For the purpose of this Memorandum, above-ground cultural heritage resources can be categorized as either:

- **Known BHR/CHL** – means BHRs or CHLs that have an existing level of municipal, provincial, or federal heritage protection, designation, or recognition; or

- **Potential BHR/CHL** –means BHRs or CHLs screened for by reviewing the historical map, which may include a building or structure that appears to be older than 40 years of age, informed by the MHSTCI Criteria Checklist, in this study that may have potential cultural heritage value or interest and has no heritage protection, designation or recognition.

For this Memorandum, reviews properties that are within and adjacent to or framing the right-of-way of the Study Area. These properties may be subject to direct or indirect impacts from construction activities related to this project.

This memorandum was completed by a team of AECOM's Cultural Resource Management staff including Liam Ryan, BA (Cultural Heritage Specialist), Tara Jenkins, MA, CAHP (Cultural Heritage Specialist, Lead), and Adria Grant, MA, CAHP (Associate Vice President, Impact Assessment and Permitting).

4.0 Stakeholder Consultation

The following stakeholders were contacted to gather information on potential BHRs and CHLs within the Study Area.

Table 1: Stakeholder Consultation

Contact	Contact Information	Date	Comments
Krystal Power, Ontario Heritage Trust, Natural Heritage Coordinator/Planner	Krystal.Power@heritagetrust.on.ca	December 23, 2021	Krystal Power was contacted to confirm that there are no properties of interest to the OHT adjacent to the Study Area. At the time this report was submitted, no response was received.
Karla Barboza, MHSTCI, Team Lead, Heritage	Karla.Barboza@ontario.ca	December 23, 2021	Karla Barboza was contacted to review and confirm if there are any known Provincial Heritage Properties, and/or Heritage Properties of Provincial Significance adjacent to the Study Area.
		January 4, 2022.	Karla Barboza confirmed that no properties have been designated by the Minister and MHSTCI is not aware of any provincial heritage properties within or adjacent to the study area

5.0 Brief Historic Overview

5.1 Municipality of Chatham-Kent

Chatham-Kent, Ontario was incorporated as a municipality in 1998, consisting of the City of Chatham, Kent County, and 21 additional former municipalities. The Municipality of Chatham-Kent is located on the Thames River, 80 km east of Windsor, Ontario and is bounded by lakes St. Clair and Erie to the west and east, with the lower Thames River running down its length. The Municipality of Chatham-Kent is a single tier municipality and is one of the largest municipalities by geographic boundaries in Ontario with an area of 2,543 square kilometres. The former Town of Chatham is located at the centre of the municipality and is the administrative centre of the area (Frances 2015). According to the 2016 Census, the Regional Municipality of Chatham-Kent had a population of 102,042. In 1998, all townships in Kent County, the City of Chatham and 21 additional former municipalities amalgamated to form the Municipality of Chatham-Kent.

5.2 Township of Zone, Kent County

The Township of Zone was located in the northeast corner of Kent County. It was bound on the north by the Township of Euphema in Lambton County, on the east by the Township of Mosa, Middlesex County and on the south by the Thames River (Belden 1881). The Township included the Town of Bothwell. The first settler to the area was John Stephenson who settled on Lot 11, Concession 2 in 1842. In 1849, the second settler, William Corlett, came to the area and located on the west half of Lot 11, Concession 2 (Belden 1881). In 1852, George Brown purchased a track of 4,000 acres from the Lenni-Lenape (Delaware) Indigenous (land that was not in the McKree Treaty) which included the area of the present-day Bothwell town site (Belden 1881). Brown cleared the tract of land knowing it was excellent for farming, even though it was remote from an urban community (Lauriston 1952:418). In 1852, the Great Western Railway was surveyed through the township. In 1858, Indigenous land in Zone was sold and the present reservation size refined. By the 1860s, the township was part of a spectacular “oil boom” (Lauriston 1952:418).

5.2.1 Settlement of Bothwell, Township of Zone

In 1851, George Brown, founder of the Toronto Globe newspaper and one of Canada’s Fathers of Confederation, purchased 4,000 acres of land from the Lenni-Lenape (Delaware) Indigenous, which included the present town site. By 1855 the Great Western Railway ran through his property and that year a station and a post office were opened. Brown had the town plot surveyed and laid out the principal streets. The first store opened in 1856. By 1857, others had established several industries (Ontario Historical Plaques). Brown connected Bothwell to the former Lambton County Line and to London Road (Belden 1881). In these early days, most employed worked for Brown. However, Bothwell lacked ready money and his business was done through scrips (Belden 1881). The community prospered until a general depression in 1857-58 but was revived with the local oil boom beginning in 1863 (Ontario Historical Plaques).

In 1863, John M. Lick, an American, struck oil in Cashmere, near the County line (now Clachan Road) and Longwoods Road. As a result, the price of oil and land in the vicinity increased (Belden 1881). This led to the “oil boom” and gave Bothwell recognition in world news (Belden 1881). American operators flocked to Bothwell in the 1860s as oil producing businesses flourished which flanked Mosa Town Line and London Road. In addition, the land between London Road and the Thames River contained evidence of enterprises of the oil industry (Belden 1881). As more wells were sunk around Bothwell, Lick invested in the town, which included opening a hotel (Lauriston 1952:425). In a short time, the population exploded from a few hundred to 8,000 people, making Bothwell the largest centre outside of Toronto. In 1866, Bothwell incorporated as a town (Lauriston 1952:426), with approximately 3,600 inhabitants. During the height of speculation, Bothwell’s Main Street was developed with some buildings three storeys in height and made of brick. The block included hotels, banks, billiard halls and

gaming houses (Belden 1881). In the early boom days, the town extended as far as the Bothwell Bridge, and to the smaller village of Cashmere on the Thames River (Lauriston 1952:433).

By 1868 the oil industry had faltered, and many attractions had deserted the town (Belden 1881). In the 1880s there were some factories including carriages, sashes, doors and blinds, hub and spoke and pump works, grist and sawmills, and a foundry. In 1881, the corporate limits of the Town of Bothwell extended to the Thames River (Belden 1881) with 1,200 inhabitants.

5.3 Township of Camden West, Kent County

The Township of Camden West was in the northeastern part of Kent County. It was bounded on the north by the Township of Dawn-Euphemia in Lambton County, on the east by the Township of Zone, Kent County on the south by the Thames River and on the west by Chatham Township, Kent County. The Township includes the settlements of Thamesville and Dresden. The land was first surveyed in 1794 and was later named after the Earl of Camden. Little information is available online about the history of the Township of Camden.

5.3.1 Settlement of Thamesville

Thamesville is located 25 km northeast of Chatham. It was named in 1832 when the first post office opened. In 1852, when the Great Western Railway was anticipated, village lots were laid out on the southeast side of the Thames River. At the same time, lots were surveyed on the northwest side of the Thames River and was called Techumseh for the great Shawnee Chief, who died nearby in 1813. When the railway was built in 1854, it passed through Techumseh, and the Thamesville post office was transferred to that site, and its name replaced Techumseh (Rayburn 1997).

5.4 Orford Township, Kent County

The Township of Orford takes its name from the town of Orford, located in Suffolk, England; it was first surveyed by John Bostwick in 1794 and settled between 1816 and 1832 (Mika & Mika 1983). In 1825, a tavern was built at Clear Creek by David Baldwin, the township's first postmaster; his tavern would also serve as the first post office and a community space where even municipal government officials were elected in 1827. By 1832, the township's first saw and grist mills were constructed, and settlement continued westward and later northward; the villages of Palmyra, Duart, and Muir Kirk developed.

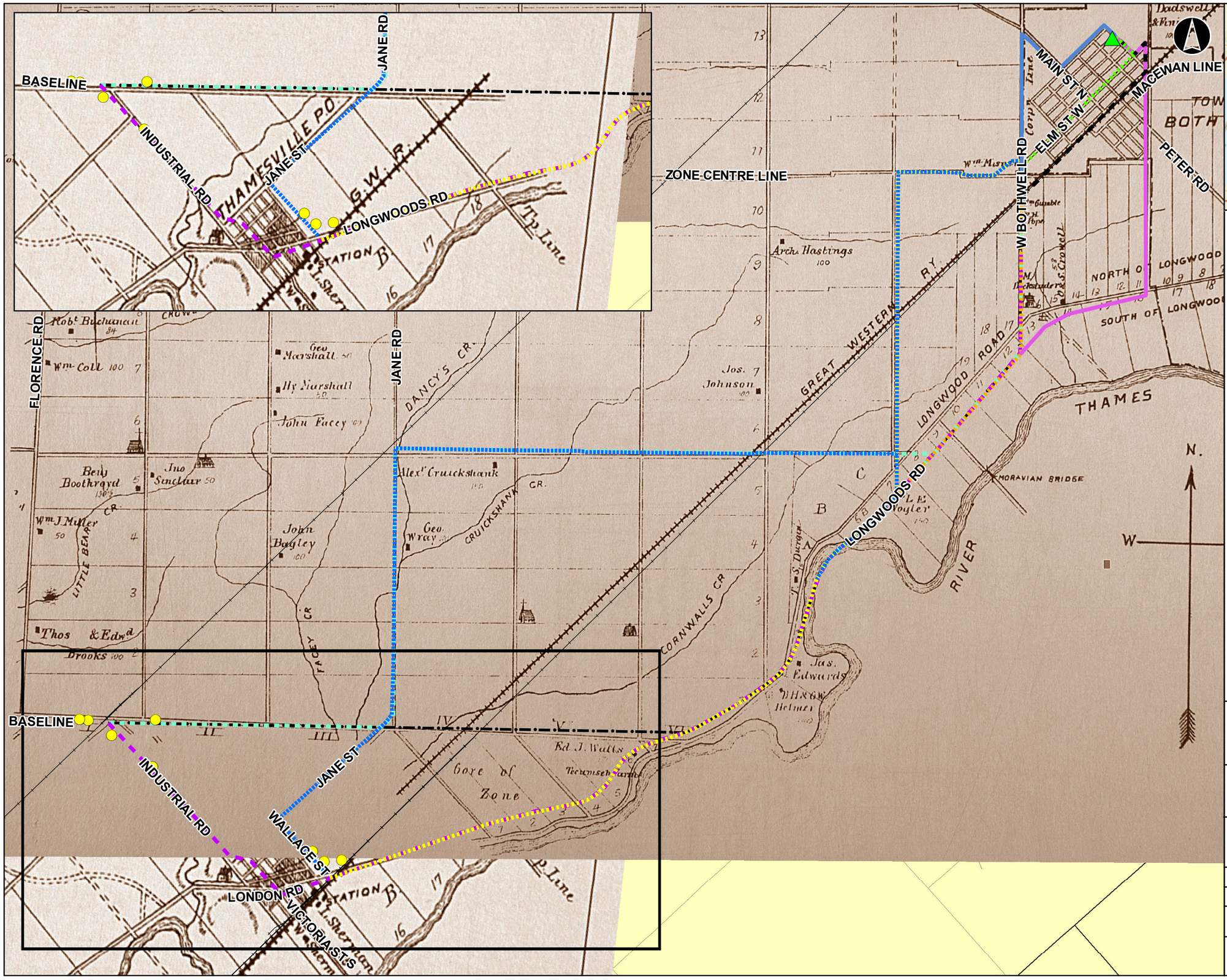
5.5 Historic Mapping Review

Historically, the Study Area falls along multiple lots and concessions within the Geographic Townships of Camden, Orford, and Zone, in Kent County. When examining the *1881 Illustrated Historical Atlas of the County of Kent, Ontario,* it is evident that the Study Area runs through the historical settlements of Thamesville and Bothwell and along concession roads which may have potential for nineteenth and early twentieth century farmsteads (**Figure 2**). Two farmsteads are illustrated in 1881 along the concession roads; one owned by Alexander Cruickshank on Fairfield Line, and the other owned by George Wray on Jane Road. Given this, there is potential for BHRs and CHLs that are not on the Chatham-Kent Municipal Heritage Register adjacent to the proposed route alternatives.

5.6 The Thames River Heritage River Designation

The Thames River was designated a Canadian Heritage River on August 14, 2000. The designation was announced by the Minister of Canadian Heritage, the Honourable Sheila Copps and Ontario's Minister of Natural Resources, the Honourable John Snobelen. The Thames River was recognized as a heritage river for its outstanding contributions to the country's cultural heritage, natural heritage, and recreational opportunities. The broad goal of managing the Thames and a Canadian Heritage river is: *"To increase the appreciation, enjoyment*

and stewardship of the natural, and cultural heritage and recreational opportunities of the Thames River and its watershed through community cooperation and involvement." Currently, the proposed route alternatives are north of the Thames River.



Legend

- Approximate Booster Station
- Water Tower

Bothwell Option Alternative

- Bothwell Option 1
- Bothwell Option 2A
- Bothwell Option 2B
- Bothwell Option 2C

Strategy 1 Alternative

- Option 1
- Option 2
- Option 3

Strategy 2 Alternative

- Option 1
- Option 2
- Option 3

Cultural Heritage Screening Memorandum
Chatham-Kent NE WDS EA
Municipality of Chatham-Kent, Ontario

A Portion of 1881 Illustrated Historical Atlas of the County of Kent (H. Belden & Co.)

0 1 2 3
Kilometers
DATUM: NAD 1983 UTM Zone 17N

January 2022	1:40,000 * when printed 11"x17"	Source: MNRF 2020 Image: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
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AECOM

Figure 2

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6.0 Desktop Data Collection Results

There are no BHRs and CHLs within the Study Area (within the proposed alternative routes). The resources Based on the results of the desktop data collection, there are 10 known BHRs and CHLs adjacent to the Study Area. identified through this desktop review are illustrated on **Figure 3**.

Table 2, **Table 3**, and **Table 4,** below, list a brief description of the known BHRs and CHLs based on the Chatham-Kent Municipal Heritage Register and their proximity to the proposed route alternatives of the Study Area.

Table 2. Known BHRs and CHLs Within or Adjacent to the Study Area – Bothwell Option Alternative

Feature ID	Address/Location	Brief Property Description	Heritage Recognition	Option 1 Y/N	Option 2A Y/N	Option 2B Y/N	Option 2C Y/N
BHR 1	288 Main Street	Originally the home to one of Chatham-Kent's best dry good stores	Listed Heritage Property	N	N	Y-Adjacent	N
BHR 2	320 Main Street North	Bothwell Town Hall	Designated Heritage Property, IV	N	N	Y-Adjacent	N
BHR 3	190 Elm West Street	Italianate Mansion	Listed Heritage Property	N	N	Y-Adjacent	N
BHR 4	325 Gordon Street	House belonged to Joseph McGill, an oil entrepreneur	Designated Heritage Property, IV	N	N	Y-Adjacent	N
CHL 1	15258 Longwoods Road	The Bothwell cemetery	Designated, Part IV	Y-Adjacent	N	N	N

Table 3. Known BHRs and CHLs Within or Adjacent to the Study Area – Strategy 1 Alternative

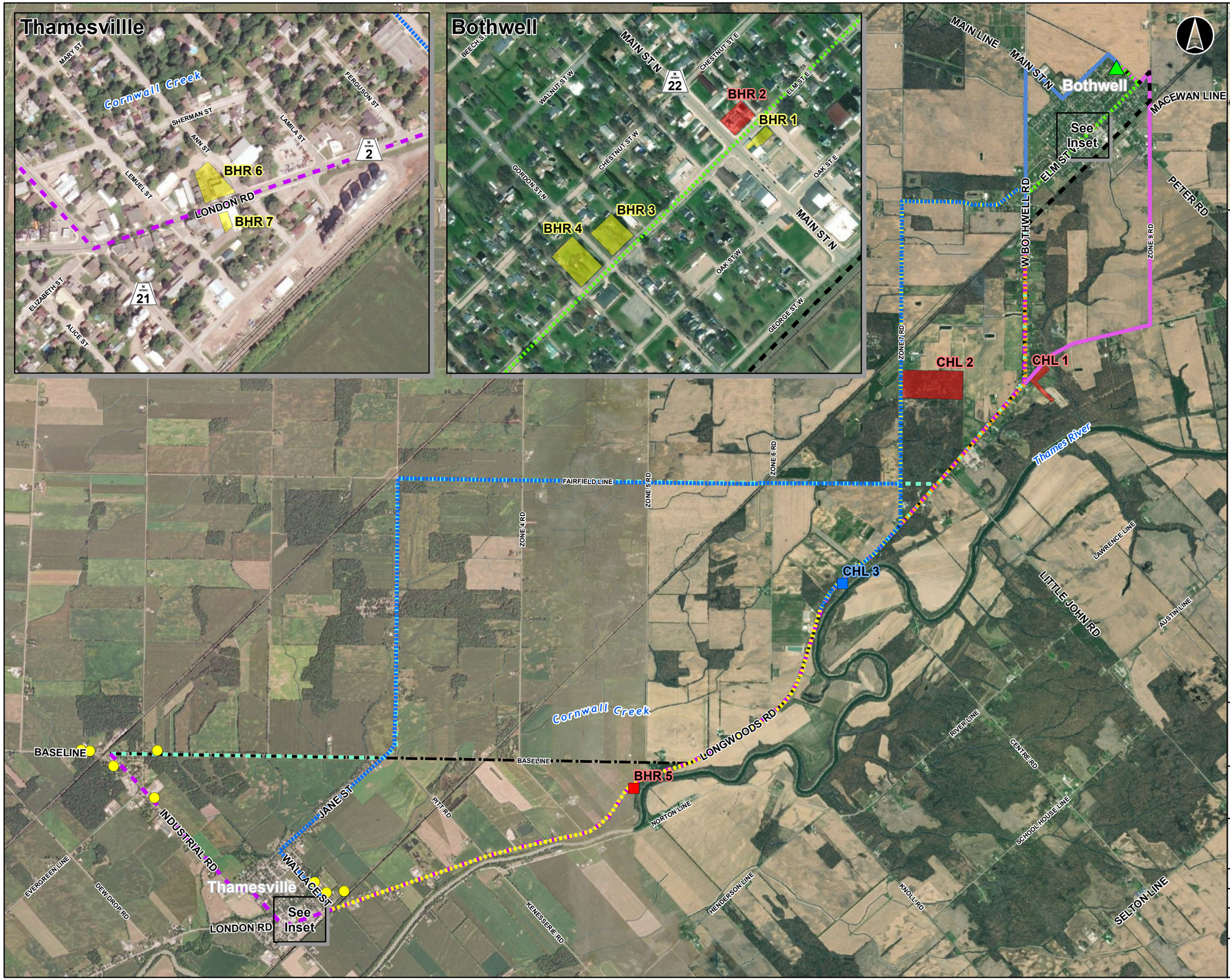
Feature ID	Address/Location	Brief Property Description	Heritage Recognition	Option 1 Y/N	Option 2 Y/N	Option 3 Y/N
CHL 2	29785 Zone 7 Road	Bothwell Zone Oil Museum	Designated Heritage Property, IV	N	Y-Adjacent	Y-Adjacent
CHL 3	14878 Longwoods Road	Fairfield on the Thames National Historic Site of Canada	Listed on the Canadian Register	Y-Adjacent	Y-Adjacent	N
BHR 5	14249-14431 Longwoods Road	Monument and Plaque commemorating the Battle of the Thames	Ontario Heritage Trust Plaque	Y-Adjacent	Y-Adjacent	N

Table 4. Known BHRs and CHLs Within or Adjacent to the Study Area – Strategy 2 Alternative

Feature ID	Address/Location	Brief Property Description	Heritage Recognition	Option 1 Y/N	Option 2 Y/N	Option 3 Y/N
CHL 3	14878 Longwoods Road	Fairfield on the Thames National Historic Site of Canada	Listed on the Canadian Register	Y-Adjacent	N	Y-Adjacent
BHR 5	14249-14431 Longwoods Road	Monument and Plaque commemorating the Battle of the Thames	Ontario Heritage Trust Plaque	N	N	Y-Adjacent
BHR 6	62 London Road	The Tecumseh House, Circa 1899	Listed Heritage Property	N	N	Y-Adjacent
BHR 7	67 London Road	Commercial building, Circa 1870	Listed Heritage Property	N	N	Y-Adjacent

Using the MHSTCI Criteria Checklist and conducting a review of available online resources including historical maps and information, it is evident there is potential for additional BHRs and CHLs adjacent to the Study Area that are not on the Chatham-Kent Municipal Heritage Register. Based on a desktop review, the following summarizes potential BHRs and CHLs that may be adjacent to the Study Area:

- Potential BHRs and CHLs associated with the late 19th and early 20th century settlements of Bothwell and Thamesville (buildings older than 40 years old)
- Potential BHRs and CHLs associated with the rural settlement of the townships (i.e. nineteenth century farmhouses and farm complexes)



Legend

- Approximate Booster Station
- Water Tower
- Listed on the Canadian Register
- Ontario Heritage Trust Plaque
- Railway
- Designated Heritage Property, IV
- Listed Heritage Property
- Listed on the Canadian Register

Bothwell Option Alternative

- Bothwell Option 1
- Bothwell Option 2A
- Bothwell Option 2B
- Bothwell Option 2C

Strategy 1 Alternative

- Option 1
- Option 2
- Option 3

Strategy 2 Alternative

- Option 1
- Option 2
- Option 3

Cultural Heritage Screening Memorandum
Chatham-Kent NE WDS EA
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Results Mapping

0 400 800 1,200 1,600 2,000 2,400 2,800

Meters

DATUM: NAD 1983 UTM Zone 17N

January 2022	1:40,000 * when printed 11"x17"	Source: MNRF 2020 Image: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT
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Figure 3

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8.0 Conclusion and Recommendations

8.1 Key Findings

This Memorandum was completed as part of the MCEA study for the NE Chatham Kent WDS, initiated by the CK PUC.This Memorandum was prepared in order to screen for known and potential BHRs and CHLs within or adjacent to the Study Area. All the Study Area alternative routes are located within the existing rights-of-way, and therefore, the construction work will not directly impact (i.e., remove) any known BHRs and CHLs along any of the proposed route alternatives, the proposed water tower location or the proposed locations of the booster stations.

A total of 10 known BHRs and CHLs were identified adjacent to the Study Area.

Bothwell Option Alternative

- Of the 10 known BHRs and CHLs, 5 are adjacent to Bothwell Alternative Option, including:
    - Option 1: CHL 1
    - Option 2: None
    - Option 2A: None
    - Option 2B: BHR 1, BHR 2, BHR 3, BHR 4
    - Option 2C: None

Strategy 1 Alternative

- Of the 10 known BHRs and CHLs, 3 are adjacent to the Strategy 1 Alternative options.
    - Option 1: CHL 3, BHR 5
    - Option 2: CHL 2, CHL3, BHR 5
    - Option 3: CHL 2

Strategy 2 Alternative

- Of the 10 known BHRs and CHLs, 4 are adjacent to Strategy 2 Alternative.
    - Option 1: CHL 3
    - Option 2: None
    - Option 3: CHL 3, BHR5, BHR 6 and BHR 7

- No known BHRs or CHLs are found adjacent to or within the potential locations of the booster stations or water tower.

- Based on the historical map and aerial photography there is the potential for further potential BHRs and CHLs to be identified adjacent to all the proposed route alternatives through a field investigation.

8.2 Recommendations

Based on the results of this Memorandum, although there are known BHRs and CHLs adjacent to the Study Area, it is not anticipated they will be directly impacted by the construction of watermain for any of the proposed route alternatives. The installation will not require the removal or relocation of any BHRs or CHLs within the Study Area. It is anticipated that all surfaces for the preferred route alternatives will be restored to original or better condition. It is preferred that the routes with the least amount of adjacent known BHRs and CHLs should be selected. The following recommends the preferred routes:

- Bothwell Alternative Option- Option 2 in combination with either Option 2A or Option 2C (preferred)
- Alternative 1 Strategy – Option 3 (preferred)
- Alternative 2 Strategy – Option 2 (preferred)

In addition, the following recommendations have been developed based on the MHSTCI Notice of Commencement for the NE Chatham Kent WDS MCEA study to AECOM:

1. Complete a Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment (CHR) for the preferred alternatives, as early as possible in the planning phase. The CHR will use the desktop baseline conditions presented in this Memorandum and further identify potential BHRs/CHLs in a field review for the preferred alternatives. The CHR should be prepared according to the requirements identified in the MHSTCI *Ontario Heritage Tool Kit* (2006).

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Appendix A:

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

Clear Form Print Form

Ministry of Tourism, Culture and Sport

Programs & Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7

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

A Checklist for the Non-Specialist

The **purpose of the checklist** is to determine:

- if a property(ies) or project area:
  - is a recognized heritage property
  - may be of cultural heritage value
- it includes all areas that may be impacted by project activities, including – but not limited to:
  - the main project area
  - temporary storage
  - staging and working areas
  - temporary roads and detours

Processes covered under this checklist, such as:

- *Planning Act*
- *Environmental Assessment Act*
- *Aggregates Resources Act*
- *Ontario Heritage Act* – Standards and Guidelines for Conservation of Provincial Heritage Properties

Cultural Heritage Evaluation Report (CHER)

If you are not sure how to answer one or more of the questions on the checklist, you may want to hire a qualified person(s) (see page 5 for definitions) to undertake a cultural heritage evaluation report (CHER).

The CHER will help you:

- identify, evaluate and protect cultural heritage resources on your property or project area
- reduce potential delays and risks to a project

Other checklists

Please use a separate checklist for your project, if:

- you are seeking a Renewable Energy Approval under Ontario Regulation 359/09 – separate checklist
- your Parent Class EA document has an approved screening criteria (as referenced in Question 1)

Please refer to the Instructions pages for more detailed information and when completing this form.

Project or Property Name

North East Chatham-Kent Water Distribution System Municipal Class Environmental Assessment

Project or Property Location (upper and lower or single tier municipality)

Municipality of Chatham-Kent, Ontario

Proponent Name

Municipality of Chatham-Kent

Proponent Contact Information

Screening Questions

	Yes	No
1. Is there a pre-approved screening checklist, methodology or process in place?	☐	☑

If Yes, please follow the pre-approved screening checklist, methodology or process.

If No, continue to Question 2.

Part A: Screening for known (or recognized) Cultural Heritage Value

	Yes	No
2. Has the property (or project area) been evaluated before and found **not** to be of cultural heritage value?	☐	☑

If Yes, do **not** complete the rest of the checklist.

The proponent, property owner and/or approval authority will:

- summarize the previous evaluation and
- add this checklist to the project file, with the appropriate documents that demonstrate a cultural heritage evaluation was undertaken

The summary and appropriate documentation may be:

- submitted as part of a report requirement
- maintained by the property owner, proponent or approval authority

If No, continue to Question 3.

	Yes	No
3. Is the property (or project area):		
a. identified, designated or otherwise protected under the *Ontario Heritage Act* as being of cultural heritage value?	☑	☐
b. a National Historic Site (or part of)?	☐	☑
c. designated under the *Heritage Railway Stations Protection Act*?	☐	☑
d. designated under the *Heritage Lighthouse Protection Act*?	☐	☑
e. identified as a Federal Heritage Building by the Federal Heritage Buildings Review Office (FHBRO)?	☐	☑
f. located within a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site?	☐	☑

If Yes to any of the above questions, you need to hire a qualified person(s) to undertake:

- a Cultural Heritage Evaluation Report, if a Statement of Cultural Heritage Value has not previously been prepared or the statement needs to be updated

If a Statement of Cultural Heritage Value has been prepared previously and if alterations or development are proposed, you need to hire a qualified person(s) to undertake:

- a Heritage Impact Assessment (HIA) – the report will assess and avoid, eliminate or mitigate impacts

If No, continue to Question 4.

Part B: Screening for Potential Cultural Heritage Value

	Yes	No
4. Does the property (or project area) contain a parcel of land that:		
a. is the subject of a municipal, provincial or federal commemorative or interpretive plaque?	✔	
b. has or is adjacent to a known burial site and/or cemetery?	✔	
c. is in a Canadian Heritage River watershed?		✔
d. contains buildings or structures that are 40 or more years old?	✔	

Part C: Other Considerations

	Yes	No
5. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area):		
a. is considered a landmark in the local community or contains any structures or sites that are important in defining the character of the area?		✔
b. has a special association with a community, person or historical event?		✔
c. contains or is part of a cultural heritage landscape?		✔

If Yes to one or more of the above questions (Part B and C), there is potential for cultural heritage resources on the property or within the project area.

You need to hire a qualified person(s) to undertake:

- a Cultural Heritage Evaluation Report (CHER)

If the property is determined to be of cultural heritage value and alterations or development is proposed, you need to hire a qualified person(s) to undertake:

- a Heritage Impact Assessment (HIA) – the report will assess and avoid, eliminate or mitigate impacts

If No to all of the above questions, there is low potential for built heritage or cultural heritage landscape on the property.

The proponent, property owner and/or approval authority will:

- summarize the conclusion
- add this checklist with the appropriate documentation to the project file

The summary and appropriate documentation may be:

- submitted as part of a report requirement e.g. under the *Environmental Assessment Act, Planning Act* processes
- maintained by the property owner, proponent or approval authority

Instructions

Please have the following available, when requesting information related to the screening questions below:

- a clear map showing the location and boundary of the property or project area
  - large scale and small scale showing nearby township names for context purposes
- the municipal addresses of all properties within the project area
- the lot(s), concession(s), and parcel number(s) of all properties within a project area

For more information, see the Ministry of Tourism, Culture and Sport's Ontario Heritage Toolkit or Standards and Guidelines for Conservation of Provincial Heritage Properties.

In this context, the following definitions apply:

- **qualified person(s)** means individuals – professional engineers, architects, archaeologists, etc. – having relevant, recent experience in the conservation of cultural heritage resources.
- **proponent** means a person, agency, group or organization that carries out or proposes to carry out an undertaking or is the owner or person having charge, management or control of an undertaking.

1. Is there a pre-approved screening checklist, methodology or process in place?

An existing checklist, methodology or process may already be in place for identifying potential cultural heritage resources, including:

- one endorsed by a municipality
- an environmental assessment process e.g. screening checklist for municipal bridges
- one that is approved by the Ministry of Tourism, Culture and Sport (MTCS) under the Ontario government's Standards & Guidelines for Conservation of Provincial Heritage Properties [s.B.2.]

Part A: Screening for known (or recognized) Cultural Heritage Value

2. Has the property (or project area) been evaluated before and found not to be of cultural heritage value?

Respond 'yes' to this question, if all of the following are true:

A property can be considered not to be of cultural heritage value if:

- a Cultural Heritage Evaluation Report (CHER) - or equivalent - has been prepared for the property with the advice of a qualified person and it has been determined not to be of cultural heritage value and/or
- the municipal heritage committee has evaluated the property for its cultural heritage value or interest and determined that the property is not of cultural heritage value or interest

A property may need to be re-evaluated, if:

- there is evidence that its heritage attributes may have changed
- new information is available
- the existing Statement of Cultural Heritage Value does not provide the information necessary to manage the property
- the evaluation took place after 2005 and did not use the criteria in Regulations 9/06 and 10/06

Note: Ontario government ministries and public bodies [prescribed under Regulation 157/10] may continue to use their existing evaluation processes, until the evaluation process required under section B.2 of the Standards & Guidelines for Conservation of Provincial Heritage Properties has been developed and approved by MTCS.

To determine if your property or project area has been evaluated, contact:

- the approval authority
- the proponent
- the Ministry of Tourism, Culture and Sport

3a. Is the property (or project area) identified, designated or otherwise protected under the *Ontario Heritage Act* as being of cultural heritage value e.g.:

i. designated under the *Ontario Heritage Act*

- individual designation (Part IV)
- part of a heritage conservation district (Part V)

Individual Designation – Part IV

A property that is designated:

- by a municipal by-law as being of cultural heritage value or interest [s.29 of the *Ontario Heritage Act*]
- by order of the Minister of Tourism, Culture and Sport as being of cultural heritage value or interest of provincial significance [s.34.5]. **Note**: To date, no properties have been designated by the Minister.

Heritage Conservation District – Part V

A property or project area that is located within an area designated by a municipal by-law as a heritage conservation district [s. 41 of the *Ontario Heritage Act*].

For more information on Parts IV and V, contact:

- municipal clerk
- Ontario Heritage Trust
- local land registry office (for a title search)

---

ii. subject of an agreement, covenant or easement entered into under Parts II or IV of the *Ontario Heritage Act*

An agreement, covenant or easement is usually between the owner of a property and a conservation body or level of government. It is usually registered on title.

The primary purpose of the agreement is to:

- preserve, conserve, and maintain a cultural heritage resource
- prevent its destruction, demolition or loss

For more information, contact:

- Ontario Heritage Trust - for an agreement, covenant or easement [clause 10 (1) (c) of the *Ontario Heritage Act*]
- municipal clerk – for a property that is the subject of an easement or a covenant [s.37 of the *Ontario Heritage Act*]
- local land registry office (for a title search)

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iii. listed on a register of heritage properties maintained by the municipality

Municipal registers are the official lists - or record - of cultural heritage properties identified as being important to the community.

Registers include:

- all properties that are designated under the *Ontario Heritage Act* (Part IV or V)
- properties that have not been formally designated, but have been identified as having cultural heritage value or interest to the community

For more information, contact:

- municipal clerk
- municipal heritage planning staff
- municipal heritage committee

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iv. subject to a notice of:

- intention to designate (under Part IV of the *Ontario Heritage Act*)
- a Heritage Conservation District study area bylaw (under Part V of the *Ontario Heritage Act*)

A property that is subject to a **notice of intention to designate** as a property of cultural heritage value or interest and the notice is in accordance with:

- section 29 of the *Ontario Heritage Act*
- section 34.6 of the *Ontario Heritage Act.* **Note**: To date, the only applicable property is Meldrum Bay Inn, Manitoulin Island. [s.34.6]

An area designated by a municipal by-law made under section 40.1 of the *Ontario Heritage Act* as a **heritage conservation district study area**.

For more information, contact:

- municipal clerk – for a property that is the subject of notice of intention [s. 29 and s. 40.1]
- Ontario Heritage Trust

v. included in the Ministry of Tourism, Culture and Sport's list of provincial heritage properties

Provincial heritage properties are properties the Government of Ontario owns or controls that have cultural heritage value or interest.

The Ministry of Tourism, Culture and Sport (MTCS) maintains a list of all provincial heritage properties based on information provided by ministries and prescribed public bodies. As they are identified, MTCS adds properties to the list of provincial heritage properties.

For more information, contact the MTCS Registrar at registrar@ontario.ca.

3b. Is the property (or project area) a National Historic Site (or part of)?

National Historic Sites are properties or districts of national historic significance that are designated by the Federal Minister of the Environment, under the *Canada National Parks Act*, based on the advice of the Historic Sites and Monuments Board of Canada.

For more information, see the National Historic Sites website.

3c. Is the property (or project area) designated under the *Heritage Railway Stations Protection Act*?

The *Heritage Railway Stations Protection Act* protects heritage railway stations that are owned by a railway company under federal jurisdiction. Designated railway stations that pass from federal ownership may continue to have cultural heritage value.

For more information, see the Directory of Designated Heritage Railway Stations.

3d. Is the property (or project area) designated under the *Heritage Lighthouse Protection Act*?

The *Heritage Lighthouse Protection Act* helps preserve historically significant Canadian lighthouses. The Act sets up a public nomination process and includes heritage building conservation standards for lighthouses which are officially designated.

For more information, see the Heritage Lighthouses of Canada website.

3e. Is the property (or project area) identified as a Federal Heritage Building by the Federal Heritage Buildings Review Office?

The role of the Federal Heritage Buildings Review Office (FHBRO) is to help the federal government protect the heritage buildings it owns. The policy applies to all federal government departments that administer real property, but not to federal Crown Corporations.

For more information, contact the Federal Heritage Buildings Review Office.

See a directory of all federal heritage designations.

3f. Is the property (or project area) located within a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site?

A UNESCO World Heritage Site is a place listed by UNESCO as having outstanding universal value to humanity under the Convention Concerning the Protection of the World Cultural and Natural Heritage. In order to retain the status of a World Heritage Site, each site must maintain its character defining features.

Currently, the Rideau Canal is the only World Heritage Site in Ontario.

For more information, see Parks Canada – World Heritage Site website.

Part B: Screening for potential Cultural Heritage Value

4a. Does the property (or project area) contain a parcel of land that has a municipal, provincial or federal commemorative or interpretive plaque?

Heritage resources are often recognized with formal plaques or markers.

Plaques are prepared by:

- municipalities
- provincial ministries or agencies
- federal ministries or agencies
- local non-government or non-profit organizations

For more information, contact:

- municipal heritage committees or local heritage organizations – for information on the location of plaques in their community
- Ontario Historical Society's Heritage directory – for a list of historical societies and heritage organizations
- Ontario Heritage Trust – for a list of plaques commemorating Ontario's history
- Historic Sites and Monuments Board of Canada – for a list of plaques commemorating Canada's history

4b. Does the property (or project area) contain a parcel of land that has or is adjacent to a known burial site and/or cemetery?

For more information on known cemeteries and/or burial sites, see:

- Cemeteries Regulations, Ontario Ministry of Consumer Services – for a database of registered cemeteries
- Ontario Genealogical Society (OGS) – to locate records of Ontario cemeteries, both currently and no longer in existence; cairns, family plots and burial registers
- Canadian County Atlas Digital Project – to locate early cemeteries

In this context, adjacent means contiguous or as otherwise defined in a municipal official plan.

4c. Does the property (or project area) contain a parcel of land that is in a Canadian Heritage River watershed?

The Canadian Heritage River System is a national river conservation program that promotes, protects and enhances the best examples of Canada's river heritage.

Canadian Heritage Rivers must have, and maintain, outstanding natural, cultural and/or recreational values, and a high level of public support.

For more information, contact the Canadian Heritage River System.

If you have questions regarding the boundaries of a watershed, please contact:

- your conservation authority
- municipal staff

4d. Does the property (or project area) contain a parcel of land that contains buildings or structures that are 40 or more years old?

A 40 year 'rule of thumb' is typically used to indicate the potential of a site to be of cultural heritage value. The approximate age of buildings and/or structures may be estimated based on:

- history of the development of the area
- fire insurance maps
- architectural style
- building methods

Property owners may have information on the age of any buildings or structures on their property. The municipality, local land registry office or library may also have background information on the property.

Note: 40+ year old buildings or structure do not necessarily hold cultural heritage value or interest; their age simply indicates a higher potential.

A building or structure can include:

- residential structure
- farm building or outbuilding
- industrial, commercial, or institutional building
- remnant or ruin
- engineering work such as a bridge, canal, dams, etc.

For more information on researching the age of buildings or properties, see the Ontario Heritage Tool Kit Guide Heritage Property Evaluation.

Part C: Other Considerations

5a. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) is considered a landmark in the local community or contains any structures or sites that are important to defining the character of the area?

Local or Aboriginal knowledge may reveal that the project location is situated on a parcel of land that has potential landmarks or defining structures and sites, for instance:

- buildings or landscape features accessible to the public or readily noticeable and widely known
- complexes of buildings
- monuments
- ruins

5b. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) has a special association with a community, person or historical event?

Local or Aboriginal knowledge may reveal that the project location is situated on a parcel of land that has a special association with a community, person or event of historic interest, for instance:

- Aboriginal sacred site
- traditional-use area
- battlefield
- birthplace of an individual of importance to the community

5c. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) contains or is part of a cultural heritage landscape?

Landscapes (which may include a combination of archaeological resources, built heritage resources and landscape elements) may be of cultural heritage value or interest to a community.

For example, an Aboriginal trail, historic road or rail corridor may have been established as a key transportation or trade route and may have been important to the early settlement of an area. Parks, designed gardens or unique landforms such as waterfalls, rock faces, caverns, or mounds are areas that may have connections to a particular event, group or belief.

For more information on Questions 5.a., 5.b. and 5.c., contact:

- Elders in Aboriginal Communities or community researchers who may have information on potential cultural heritage resources. Please note that Aboriginal traditional knowledge may be considered sensitive.
- municipal heritage committees or local heritage organizations
- Ontario Historical Society's "Heritage Directory" - for a list of historical societies and heritage organizations in the province

An internet search may find helpful resources, including:

- historical maps
- historical walking tours
- municipal heritage management plans
- cultural heritage landscape studies
- municipal cultural plans

Information specific to trails may be obtained through Ontario Trails.

AECOM

Appendix B

B.5 Preliminary Cost Estimate

Water Supply Scenario	Description	Pipe Diameter (mm)	Pipe Length (m)	Unit Cost	Total Cost ($)
East Side - Initial	Thamesville to 200mm Reducer	300	6,000	$1,200	$7,200,000
	200mm Reducer to Delaware Nation Connection	200	1,150	$1,000	$1,150,000
	Metered Connection / Chamber	N/A	N/A	N/A	$500,000
	Install a new booster pump station (10.3 L/s Capacity)	N/A	N/A	N/A	$3,000,000
	Contingency and Engineering [30% and 15% of Above (45% total)]				$5,332,500
				East Side - Initial Subtotal	$17,182,500
East Side - Upgrade to Ultimate	200mm Reducer to Bothwell	300	8,100	$1,200	$9,720,000
	Upgrade booster pump station (21 L/s Capacity)	N/A	N/A	N/A	$750,000
	Contingency and Engineering [30% and 15% of Above (45% total)]				$4,711,500
				East Side - Upgrade to Ultimate Subtotal	$15,181,500
Thamesville Standpipe	Replace 2.3ML Standpipe				$5,000,000
				East Side Total Including Standpipe	$20,181,500
West Side	Longwoods to Wabash to Kent Bridge	500	15,720	$1,800	$28,296,000
	Smoke Line	400	3,650	$1,400	$5,110,000
	Contingency and Engineering [30% and 15% of Above (45% total)]				$15,032,700
				West Side Subtotal	$48,438,700

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