# London Lines Replacement Project: Environmental Report

FINAL REPORT

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# Sign-off Sheet

This document entitled London Lines Replacement Project: Environmental Report was prepared by ("Stantec") for the account of Enbridge Gas Inc. (the "Client"). The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

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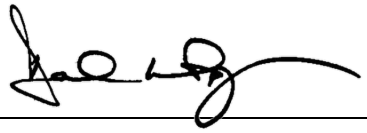
Reviewed by 
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# Executive Summary

Enbridge Gas Inc. (“Enbridge”) is proposing to replace a section of London Lines pipeline. The London Lines Replacement Project (LLRP) (“the Project”) will include the construction of approximately 75 kilometers (km) of Nominal Pipe Size (NPS) 8” high Pressure steel natural gas pipeline that will replace the two pipelines known collectively as the London Lines and install a secondary new pipeline to connect the new NPS 8 pipeline to Strathroy in the Municipality of Strathroy-Caradoc (10.5 km). The pipeline will start within the Township of Dawn-Euphemia at the Dawn Centre on Bentpath Line, 300 m east of Dawn Valley Road. The pipeline will continue through the Municipality of Southwest Middlesex and will end at two locations: within the Municipality of Middlesex Centre approximately 1 km south of the intersection of Glendon Drive and Komoka Road, and at the existing Strathroy Gate Station at Calvert Drive and Sutherland Road in the Municipality of Strathroy-Caradoc.

Enbridge has retained Stantec Consulting Ltd. (“Stantec”) to undertake an environmental study of the construction and operation of the natural gas pipeline that meets the intent of the Ontario Energy Board’s (OEB) *Environmental Guidelines for the Location, Construction and Operation of Hydrocarbon Pipelines and facilities in Ontario, 7th Edition* (2016). The Environmental Report (ER), which summarizes the environmental study, will accompany a future Enbridge ‘Leave to Construct’ (LTC) application to the OEB for the Project.

Enbridge is also required to obtain additional permits and approvals from federal, provincial and municipal agencies that have jurisdiction within the Study Area. This ER will serve to support these permit and approval applications.

The existing route was reviewed, and potential alternative segments were identified. The existing route and alternative segments are collectively referred to as the ‘Study Area’. An extensive consultation program was conducted for the Project to engage federal and provincial agencies, conservation authorities, municipal personnel and elected officials, Indigenous communities, special interest groups, and residents and businesses within 500 metres (m) of the existing route and alternative segments. The consultation program included development and maintenance of a stakeholder contact list which was used to distribute the required notice, newspaper advertisements, agency meetings, a Virtual Open House and provision of feedback to those members of the public who had questions, issues, or concerns or positive feedback about the Project. Enbridge is committed to ongoing consultation with interested and potentially affected parties through detailed design and construction and will respond to stakeholder concerns throughout the life of the Project.

The route evaluation process was undertaken as per the OEB Environmental Guidelines (2016), which identifies the environmental and socio-economic features to take into consideration and the principles to be considered during the route evaluation. Following a comparative evaluation which considered environmental and socio-economic features and the results of the consultation program, a preferred route was identified. The location of the preferred route is shown in Appendix D, Figure D-1.

The potential effects and impacts of the Project on physical, biophysical and socio-economic features have been assessed for the Project. In the opinion of Stantec, the recommended program of supplemental studies, mitigation, protective and contingency measures are considered appropriate to protect the features encountered. Monitoring will assess that mitigation and protective measures have been effective in both the short and long term.

The potential cumulative effects of the Project were assessed by considering development that may begin during construction or that may begin sometime in the future. The Study Area boundary was used to assess potential effects of the Project and other developments on environmental and socio-economic features. As such, the cumulative effects assessment determined that, provided that ongoing consultation, appropriate mitigation and protective measures are implemented, potential cumulative effects will be of low probability and magnitude, short duration, and reversible, positive and are therefore not anticipated to be significant.

With the implementation of the recommendations in the ER, ongoing communication and consultation, and adherence to permit, regulatory and legislative requirements, potential adverse residual environmental and socio-economic impacts of this Project are not anticipated to be significant.

# Abbreviations

| | |
|---|---|
| AA | Archaeological Assessment |
| AMSL | above mean sea level |
| ANSI | Area of Natural and Scientific Interest |
| BGS | Below ground surface |
| CEA | cumulative effects assessment |
| CHAR | Cultural Heritage Assessment Report |
| CHVI | cultural heritage value or interest |
| CLI | Canada Land Inventory for Agriculture |
| CN Railway | Canadian National Railway |
| CP Railway | Canadian Pacific Railway |
| DFO | Fisheries and Oceans Canada |
| EASR | Environmental Activity and Sector Registry |
| ECCC | Environment and Climate Change Canada |
| LUG C&M | Legacy Union Gas Construction and Maintenance Manual |
| ELC | Ecological Land Classification |
| Enbridge | Enbridge Gas Inc. |
| END | Endangered |
| EPP | Environmental Protection Plan |
| ER | Environmental Report |
| ESA | *Endangered Species Act* |
| ESC | Erosion and sediment control |
| GIS | Geographic Information System |
| ha | hectares |

| | |
|---|---|
| HDD | Horizontal Directional Drill |
| HONI | Hydro One Networks Inc. |
| HWIN | Hazardous Waste Information Network |
| IAAC | Impact Assessment Agency of Canada |
| IPZ | Intake Protection Zone |
| km | kilometers |
| LFA | Lambton Federation of Agriculture |
| LHPWSS | Lake Huron Primary Water Supply System |
| LIO | Land Information Ontario |
| LLRP | London Lines Replacement Project |
| LTC | Leave to Construct |
| LTVCA | Lower Thames Valley Conservation Authority |
| m | metres |
| MBCA | *Migratory Birds Convention Act* |
| MECP | Ministry of the Environment, Conservation and Parks |
| MENDM | Ministry of Energy, Northern Development and Mines |
| MFA | Middlesex Federation of Agriculture |
| MHSTCI | Ministry of Heritage, Sport, Tourism and Culture Industries |
| MNHSS | Middlesex Natural Heritage Systems Study |
| MNO | Métis Nation of Ontario |
| MNR | Ministry of Natural Resources |
| MNRF | Ministry of Natural Resources and Forestry |
| MECP | Ministry of Environment, Conservation and Parks |
| MTCS | Ministry of Tourism, Culture and Sport |
| MTO | Ministry of Transportation |
| NHIC | Natural Heritage Information Centre |

| | |
|---|---|
| NPS | Nominal pipeline size |
| OEB | Ontario Energy Board |
| OGS | Ontario Geological Survey |
| OHA | *Ontario Heritage Act* |
| OHT | Ontario Heritage Trust |
| OPCC | Ontario Pipeline Coordinating Committee |
| OPP | Ontario Provincial Police |
| O. Reg. | Ontario Regulation |
| PAHs | polycyclic aromatic hydrocarbon |
| PHCs | petroleum hydrocarbons |
| PSOC | Potential Sources of Contamination |
| PSW | Provincially Significant Wetland |
| PTTW | Permit to Take Water |
| RoW | Right-of-way |
| SAR | Species at Risk |
| SARA | *Species at Risk Act* |
| SARO | *Species at Risk in Ontario* |
| SCRCA | St. Clair Region Conservation Authority |
| SGRAs | significant groundwater recharge areas |
| SOCC | species of conservation concern |
| Stantec | Stantec Consulting Ltd. |
| SWH | Significant Wildlife Habitat |
| TC | Transportation Canada |
| THR | Threatened |
| TSRCPC | Thames-Sydenham and Region Source Protection Committee |
| TSSA | Technical Standards and Safety Authority |

| | |
|---|---|
| TWS | temporary workspace |
| UTRCA | Upper Thames River Conservation Authority |
| WHPA | Wellhead Protection Area |
| WWR | Water Well Records |

# 1.0 INTRODUCTION

## 1.1 PROJECT DESCRIPTION

Enbridge Gas Inc. (“Enbridge”) is proposing to replace a section of London Lines pipeline. The London Lines Replacement Project (LLRP) (“the Project”) will include the construction of approximately 75 kilometers (km) of Nominal Pipe Size (NPS) 8” high Pressure steel natural gas pipeline that will replace the two pipelines known collectively as the London Lines and install a secondary new pipeline to connect the new NPS 8 pipeline to Strathroy in the Municipality of Strathroy-Caradoc (10.5 km). The pipeline will start within the Township of Dawn-Euphemia at the Dawn Centre on Bentpath Line, 300 m east of Dawn Valley Road. The pipeline will continue through the Municipality of Southwest Middlesex and will end at two locations: within the Municipality of Middlesex Centre approximately 1 km south of the intersection of Glendon Drive and Komoka Road, and at the existing Strathroy Gate Station at Calvert Drive and Sutherland Road in the Municipality of Strathroy-Caradoc.

Enbridge has retained Stantec Consulting Ltd. (Stantec) to undertake an environmental study of the construction and operation of the proposed pipeline and related facilities.

## 1.2 ENVIRONMENTAL STUDY

### 1.2.1 Objectives

A multidisciplinary team of environmental planners and scientists from Stantec conducted the environmental study. Enbridge provided environmental support and engineering expertise throughout the study.

The environmental study was completed in accordance with the OEB Environmental Guidelines, as well as relevant federal and provincial environmental guidelines and regulations.

The principal objective of the environmental study was to outline various environmental mitigation and protection measures for the construction and operation of the project while meeting the intent of the OEB Environmental Guidelines. To meet this objective, the environmental study was prepared to:

- Complete a detailed review of environmental features along the existing route and alternative segments (the “Study Area”)
- Implement a consultation program to receive input from interested and potentially affected parties
- Identify a preferred route that minimizes potential environmental impacts in areas where the existing London Lines pipelines are not located within a road allowance
- Assess potential environmental impacts of the project on the environmental features, and establish mitigation and protective measures that may be used to minimize or eliminate potential environmental impacts of the project

- Identify any necessary supplemental studies, monitoring and contingency plans

### 1.2.2 Process

The environmental study was divided into the following three main phases:

- Phase I: Identification of a existing route and alternative segments
- Phase II: The route evaluation and selection process
- Phase III: Confirmation of the preferred route, development of mitigation and protective measures and preparation of this ER

The maps produced during the route evaluation are included as Appendix A, maps of existing environmental and socio-economic conditions are included as Appendix C, and a map of the preferred route is included as Appendix D.

**Phase I: Identification of Alternative Segments and the Study Area**

The environmental study began with delineating the Study Area (as described in Section 4.2) and notifying the following entities:

- federal and provincial agencies and authorities
- municipal personnel
- special interest groups
- third party utility providers
- directly affected landowners
- residents and businesses within 500 m of the existing route and alternative segments
- Indigenous communities and the Métis Nation of Ontario (MNO)

Environmental features and conditions in the Study Area were mapped and characterized using relevant published literature, maps and digital data. Geographically based environmental features were incorporated onto a series of digital base maps. Discussions with relevant agencies and municipalities provided information for compiling the existing conditions inventory and mapping.

Route options were generated based on the routing objectives, Study Area, and environmental and socio-economic constraints and opportunities identified in Section 4.3. To assist in the generation of route options, Stantec personnel conducted site visits, reviewed aerial photography, and mapped existing environmental and socio-economic constraints and opportunities.

**Phase II: Route Evaluation and Selection Process**

The alternative segments were identified through an initial review of the existing route and the general study area, as described in Section 4.4. The consultation program (Section 2.0) provided opportunities to comment on the Project, the route evaluation and selection process, and the existing route and alternative segments. Feedback was sought through written correspondence from stakeholders, meetings via phone call with interested parties, newspaper notices, letters, a targeted Facebook Advertisement and a Virtual Open House held between April 20 and May 1, 2020.

**Phase III: Confirmation of the Preferred Route; Environmental Report**

Based on feedback received during the consultation program (Section 2.0) and the evaluation of the existing route and alternative segments, the preferred route was confirmed. Phase III concluded with the preparation of this ER as well as Environmental Alignment Sheets to identify site-specific mitigation and protective measures to be implemented during construction along the preferred route (see Appendix H).

### 1.2.3 The Environmental Report

The environmental study has relied on a technically sound and consistently applied approach that is replicable and transparent. As described above, the study was undertaken in accordance with the OEB Environmental Guidelines, as well as relevant federal and provincial environmental guidelines and regulations. The ER, which documents the environmental study, will form the basis for future environmental management activities related to the project.

The ER is organized into the following sections:

**1.0** **Introduction:** provides a description of the project and the environmental study

**2.0** **Consultation Program:** describes the consultation program

**3.0** **Existing Conditions:** describes the environmental and socio-economic existing conditions

**4.0** **Route Evaluation and Selection**: provides an overview of the pipeline route evaluation and selection process

**5.0** **Impact Identification, Assessment and Mitigation:** predicts potential effects and impacts, recommends supplemental studies, mitigation and protective measures, and considers net impacts

**6.0** **Cumulative Effects**: provides an analysis of potential cumulative effects associated with the proposed project

**7.0** **Monitoring and Contingency Plans**: describes monitoring and contingency plans to address potential environmental impacts of the proposed project

**8.0** **Conclusion:** provides a discussion and consideration of the potential environmental impacts associated with the proposed project

The ER also includes references, and appendices for documentation.

### 1.2.4 The OEB Regulatory Process

Once complete, the ER is circulated to the Ontario Pipeline Coordinating Committee (OPCC) for their review and comment. The OPCC is an inter-ministerial committee that includes provincial government ministries, boards, and authorities with potential interest in the construction and operation of hydrocarbon transmission and storage facilities. The ER will accompany a future Enbridge 'Leave-to-Construct' (LTC) application to the OEB for the proposed Project.

While the ER illustrates the general location of the preferred route, Enbridge will undertake detailed design to determine the exact location of the running line within the road allowance and cross-country routing. Detailed design will also be influenced by supplemental environmental and engineering studies and site-specific requests from landowners and agencies. Information on the engineering and other matters will be included in the application to the OEB, along with additional required information.

Upon receiving the application, the OEB will hold a public hearing. Communication about the hearing will include notices in local newspapers and letters to directly affected landowners, both of which will outline how the general public and landowners can get involved with the hearing process. If, after the public hearing, the OEB finds the project is in the public interest, it will approve construction of the project and issue an LTC order. The OEB typically attaches conditions to approved projects. Enbridge must comply with these conditions at all stages of the Project, including during construction, site restoration and post construction.

### 1.2.5 Additional Environmental Regulatory Processes

Enbridge will also be required to obtain additional environmental permits and approvals from federal provincial and municipal agencies and departments and provide notifications to municipalities, as outlined in Table 1-1 below. This ER will serve to support these permit and approval applications and notifications.

## Table 1-1: Summary of Potential Environmental Permits/Regulatory Requirements

| Permit/Approval Name | Administering Agency | Description |
|---|---|---|
| **FEDERAL PERMITS AND APPROVALS** | | |
| Clearing of Vegetation under the *Migratory Bird Convention Act* (MBCA) (Government of Canada, 1994)<br><br>*No permit is necessary; however, measures should be implemented to monitor that no breeding birds or their nests are harmed or destroyed during the bird nesting season* | Environment and Climate Change Canada (ECCC) | All vegetation clearing and removal should be completed outside the primary breeding (nesting) period for birds. The primary nesting period is defined as the period when the percent of total nesting species is greater than 10% based on the ECCC's Nesting Calendar, and due diligence mitigation measures are generally recommended (ECCC 2016); however, if vegetation removal occurs within this window (April 1 to August 31), a qualified biologist must conduct nest surveys in the marked areas to be cleared in accordance with the MBCA. If nests are found, clearing of the area will cease until the young have naturally fledged. |
| Authorizations under the *Fisheries* Act (Government of Canada, 1985) | Fisheries and Oceans Canada (DFO) | DFO review and possible *Fisheries Act* authorization is required at watercourse crossings containing species protected under the *Species at Risk Act* (SARA) (2002). The DFO may authorize activities that have the potential to affect fish or mussel species protected under the SARA (2002).<br><br>As per Section 35 (1) of the *Fisheries Act* (1985), "No person shall carry on any work, undertaking or activity that results in the harmful alteration, disruption or destruction of fish habitat." As per Section 35 (2)(b) of the *Fisheries Act* (1985), there are some exceptions under which a person may carry on a work, undertaking or activity without contravening subsection (1), including an authorization from DFO, which typically includes a number of conditions.<br><br>Following determination of final crossing methods, a fish habitat impact screening (self-assessment) should be completed to determine if DFO review/authorization will be required. |
| Permitting under the SARA (Government of Canada, 2002) | DFO | A SARA permit is required to capture, handle and relocate SARA Schedule 1 fish or mussel species during construction.<br><br>As indicated in Section 32 (1) of the SARA (2002), "No person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species."<br><br>As indicated in Section 73 (1) of the SARA (2002), "The competent minister may enter into an agreement with a person, or issue a permit to a person, authorizing the person to engage in an activity affecting a listed wildlife species, any part of its critical habitat or the residences of its individuals." |

## Table 1-1: Summary of Potential Environmental Permits/Regulatory Requirements

| Permit/Approval Name | Administering Agency | Description |
|---|---|---|
| **PROVINCIAL PERMITS AND APPROVALS** | | |
| Development Permits under *Ontario Regulations 157/06* (Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses), as per the *Conservation Authorities Act* (1990) | Upper Thames River Conservation Authority (UTRCA) | Required for works within UTRCA Regulated Areas, including shorelines, watercourses, wetlands and hazardous lands (flooding and erosion hazards, and unstable soils and bedrock). |
| Development Permits under *Ontario Regulations 152/06* (Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses), as per the *Conservation Authorities Act* (1990) | Lower Thames Valley Conservation Authority (LTVCA) | Required for works within LTVCA Regulated Areas, including shorelines, watercourses, wetlands and hazardous lands (flooding and erosion hazards, and unstable soils and bedrock). |
| Development Permits under *Ontario Regulations 171/06* (Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses), as per the *Conservation Authorities Act* (1990) | St. Clair Region Conservation Authority (SCRCA) | Required for works within SCRCA Regulated Areas, including shorelines, watercourses, wetlands and hazardous lands (flooding and erosion hazards, and unstable soils and bedrock). |
| Permit to Take Water (PTTW) or Environmental Activity and Sector Registry (EASR) (surface and groundwater) under the *Ontario Water Resources Act* (1990) | Ministry of the Environment, Conservation and Parks (MECP) | Under Ontario Regulation (O. Reg.) 64/16 and O. Reg. 63/16, the MECP requires a PTTW for dewatering in excess of 400,000 L/day, and an EASR for dewatering between 50,000 and 400,000 L/day. This can include trench dewatering and taking water for hydrostatic testing from a pond, lake, etc. There are some exceptions for surface water takings where active or passive surface water diversions occur such that all water taken is returned to within another portion of the same surface water feature. |

## Table 1-1: Summary of Potential Environmental Permits/Regulatory Requirements

| Permit/Approval Name | Administering Agency | Description |
|---|---|---|
| Permitting or registration under the *Endangered Species Act* (ESA) (2007) | MECP | An ESA permit or Registration is required for activities that could impact species protected under the ESA. Consultation will occur with the MECP to determine ESA permitting requirements.<br>As indicated in Section 9 (1) a of the ESA (2007), "No person shall kill, harm, harass, capture or take a living member of a species that is listed on the Species at Risk in Ontario List as an extirpated, endangered or threatened species."<br>As indicated in Section 17 (1), "the Minister may issue a permit to a person that, with respect to a species specified in the permit that is listed on the Species at Risk in Ontario List as an extirpated, endangered or threatened species, authorizes the person to engage in an activity specified in the permit that would otherwise be prohibited by section 9 or 10." |
| Archaeological clearance under the *Ontario Heritage Act* (OHA) (1990) | Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI) | A Stage 1 and Stage 2 archaeological assessment (AA) is required along the right-of-way (RoW) to identify areas of archaeological potential prior to any ground disturbances and/or site alterations. Depending on the results of the Stage 1 and Stage 2 AAs, Stage 3 and 4 AAs may be required. The completed archaeological assessment reports are forwarded to the MHSTCI for review and comment. |
| Review of Built Heritage and Cultural Landscape under the OHA (1990) | MHSTCI | A Heritage Overview Study will be completed to determine the presence of built heritage and cultural landscapes. If identified, a Heritage Impact Assessment is required to determine the effects of the project on heritage resources and recommend mitigation measures, if necessary. |
| Encroachment Permit under the *Public Transportation and Highway Improvement Act* (1990) | Ministry of Transportation (MTO) | An encroachment is any installation or works upon, under or within the limits of a provincial highway right-of-way place by someone other than MTO.<br>Encroachments may include signs, survey work, banners, acceleration and deacceleration lanes, curbs, gutters, sidewalks, safety islands, sewers pipelines, coaxial or fibre optic cable, or other works or structures that may during the construction, installation or maintenance thereof, obstruct, cause material to be deposited upon, enter upon, take up, bridge over, tunnel under or in any way interfere with the land within the limits of a highway or the roadway or any structure forming a part of the highway. |

## Table 1-1: Summary of Potential Environmental Permits/Regulatory Requirements

| Permit/Approval Name | Administering Agency | Description |
|---|---|---|
| **MUNICIPAL PERMITS AND APPROVALS** | | |
| Noise By-Law No. 30-13 | Municipality of Strathroy-Caradoc | Project activities should adhere to local noise by-laws. |
| Noise By-Law No. 2019-039 | Municipality of Southwest Middlesex | |
| Noise By-Law 2016-066 | Municipality of Middlesex Centre | |
| N/A | Township of Dawn-Euphemia | During the consultation process and preparation of the ER, no applicable by-laws for the Township of Dawn-Euphemia were noted; however, prior to the onset construction activities an additional review will be completed to ensure no by-laws are applicable to the Project. |
| By-Law No. 13 of 2008 | County of Lambton | Prior to the placement, reconstruction or alteration of any private pipeline or related plant/appurtenance (gas, sewer, watermain, etc.) under, along or across the County road allowance, permission must be obtained from the Public Works Department in accordance with By-Law 13-2008.<br>Each application submitted to the Public Works Department must be accompanied by the appropriate application and road use fees (Schedule A of the By-Law). |
| By-Law No. 88 of 1998 | | An Oversize and Overweight Permit is required for the transportation of goods not conforming to the standards detailed in the *Highway Traffic Act* (R.S.O. 1990, Chapter 198). |
| Permit – Moving Oversize Load/Weight Vehicles on Middlesex County Roads | County of Middlesex | A Moving Oversize Load/Weight Vehicles on Middlesex County Roads Permit is required under the *Highway Traffic Act* (R.S.O. 1990, Chapter 198).<br>Note that overweight permits are not issued in March or April, or other periods when road bases are potentially soft. |

## Table 1-1: Summary of Potential Environmental Permits/Regulatory Requirements

| Permit/Approval Name | Administering Agency | Description |
|---|---|---|
| **OTHER PERMITS AND APPROVALS** | | |
| Pipeline Crossing / Encroachment Application | Canadian National Railway (CN Railway) | Required for crossing CN Railway lines. |
| Utility Access / Crossing Request | Canadian Pacific Railway (CP Railway) | Required for crossing CP Railway lines. |
| Crossing Approval | Hydro One Networks Inc. (HONI) | Required for crossing HONI's electric transmission corridors. |

# 2.0 CONSULTATION PROGRAM

## 2.1 OBJECTIVES

Consultation is an important component of the *OEB Environmental Guidelines, 7th Edition* (2016). Consultation is the process of identifying interested and potentially affected parties and informing them about the Project, soliciting information about their values and local environmental and socio-economic circumstances, and receiving input into key Project decisions before those decisions are finalized.

The consultation program for this Project included the following objectives:

- Identify interested and potentially affected parties early in the process.
- Inform and educate interested parties about the nature of the project, potential impacts, proposed mitigation measures and how to participate in the consultation program in a clear, concise, relevant and timely manner.
- Provide a forum for the identification of issues.
- Identify how input will be used in the planning stages of the Project.
- Summarize issues for resolution and resolve as many issues, as feasible.
- Revise the program to meet the needs of those being consulted, as feasible.
- Develop a framework for ongoing communication during the construction and operation phase of the Project.
- An extensive consultation program was undertaken for the Project, including the development and maintenance of a stakeholder and Indigenous contact list. The contact list was used to identify distribution lists for notices, newspaper advertisements, agency meetings and the virtual information session. The contact list also facilitated the feedback to stakeholders who had questions, issues, concerns or positive feedback about the Project. The communication and consultation activities are described in Sections 2.2 - 2.4 below.
- As a result of the physical distancing requirements set out by the Government of Canada and the Province of Ontario due to the COVID-19 pandemic, a Virtual Open House was held in place of an in-person Open House. Public participation in the Virtual Open House was found to exceed what is typically recorded at an in-person Open House in terms of number of attendees and completed questionnaires. Virtual Open House participation levels are detailed in Section 2.4.2.
- Consultation activities with the Indigenous Communities identified as part of the MECP Duty to Consult process are briefly mentioned in this section. A comprehensive Indigenous Consultation Summary Report will be submitted as part of the LTC Application and will provide additional details on engagement activities for this Project.

## 2.2 IDENTIFYING INTERESTED AND POTENTIALLY AFFECTED PARTIES

The identification of interested and potentially affected parties was undertaken using a variety of sources, including the OEB's OPCC Members List, the MECP's Environmental Assessment Government Review Team Master Distribution List, and the experience of Enbridge and Stantec.

In addition, the parties listed below were among those considered when developing the initial stakeholder contact lists:

- federal and provincial agencies and authorities, including the UTRCA, LTVCA and SCRCA and members of the OPCC
- municipal personnel, including elected officials
- special interest groups
- residents and businesses within 500 m of the Study Area
- Indigenous communities identified by the Ministry of Energy, Northern Development and Mines (MENDM) through their Duty to Consult process

The initial contact list was updated as the environmental study progressed because of changes in personnel, correspondence received and attendees at meetings and Information Sessions. The final Agency and Indigenous Contact List is in Appendix B1.

Members of the public who provided feedback or who participated in the Virtual Open House were tracked in a Public Contact List.

## 2.3 COMMUNICATION METHODS

### 2.3.1 Newspaper Notices

A Notice of Study Commencement and Virtual Open House was published on April 15 and April 22, 2020 in The Herald (serving Thamesville, Dresden and Bothwell) and on April 16 and April 23, 2020 in the Strathroy-Age Dispatch. The Notice described the project, provided a map, listed project contact information, and provided a website link to access the Virtual Open House.

Copies of tear sheets from the newspaper notices are in Appendix B2.

### 2.3.2 Notice of Commencement and Virtual Open House, and Notice of Project Change

A hardcopy of the Notice of Commencement and Virtual Open House, as published in the newspapers, was distributed through Canada Post unaddressed admail (4,715 in total) on April 16, 2020 to all residents and businesses within 500 m of the existing route and alternative routes.

The Notice of Commencement and Virtual Open House emails were sent to all parties identified on the Agency and Indigenous Contact List, Public Contact List and Other Stakeholder List on April 8, 2020 to provide information on the project, the existing route and alternative segments, and on the Information Session. Appended to the letters and emails was a map of the existing route and alternative segments. Hardcopy letters were not mailed to the Agencies or Indigenous Communities due to COVID-19 office closures.

Through consultation with the Municipality of Strathroy-Caradoc, two additional alterative pipeline segments, Strathroy Alternative 3 and Strathroy Alternative 4, were added in the Strathroy area. A Notice of Project change dated May 8, 2020 was distributed through Canada Post unaddressed admail to all residents and businesses within 500 m of the two additional alternative routes. The Notice of Project Change was emailed to the Municipality of Southwest Middlesex, the County of Middlesex, and the Indigenous parties on the Contact List on May 15, 2020.

Generic copies of the letters noted above are included in Appendix B3.

### 2.3.3 Presentation Slides, Interactive Map and Exit Questionnaire

Presentation slides were developed for the Virtual Open House. The presentation slides provided information on the project, the regulatory process, the existing route and alternative segments, anticipated environmental and socio-economic impacts and mitigation, and next steps. A voiceover recording was paired with the presentation slides.

A link to an exit questionnaire and an interactive map were provided in the presentation slides. A downloadable version of the presentation slides, script and the exit questionnaire were provided in a “Resources” tab in the presentation slides. The exit questionnaire requested feedback on potential impacts, the existing route and alternative segments, and the content of the Virtual Open House. The interactive map allowed Virtual Open House attendees to view the entire preferred route and study area on a web-based map. A search function was made available on the interactive map to locate a specific address, review natural environment map layers such as waterways and wooded areas, and leave comments directly on the map.

Copies of the presentation slides, a screenshot of the interactive map and the exit questionnaire are in Appendix B4.

### 2.3.4 Project Webpage

A Project webpage was developed on the Enbridge website (enbridgegas.com/about-us). The webpage contains information on the project, the regulatory process and Enbridge' commitment to the environment. Communication materials were regularly updated on the webpage as the environmental study progressed. The project website was communicated to interested and potentially affected parties on the presentation slides.

## 2.4 CONSULTATION EVENTS

### 2.4.1 Meetings

Meetings regarding the Project have occurred between Enbridge, Municipalities and Conservation Authorities, key stakeholders, Indigenous communities and directly impacted landowners, and will continue as the project progresses towards detailed design and construction.

### 2.4.2 Virtual Open House

Due to physical distancing requirements set out by the Government of Canada and the Province of Ontario due to the COVID-19 pandemic, a Virtual Open House was hosted online and was accessible from April 20, 2020 to May 1, 2020. This two-week time period was selected to allow agencies, indigenous communities, landowners, residents and other stakeholders ample opportunity to review the project information and provide input.

The purpose of the Virtual Open House was to:

- Inform the community about the project
- Outline the existing route and alternative segments
- Provide attendees the opportunities to ask questions and comment on the project
- Respond to questions and comments

A project email address and project phone number were provided in the Virtual Open House for attendees to ask questions and leave comments. Nineteen (19) completed exit questionnaires were received as of May 21, 2020. Redacted copies of the completed exit questionnaires are included in Appendix B5.

The Virtual Open House was visited 514 times between April 20 and May 1, 2020. Participants who registered their attendance were added to the appropriate contact list to receive future Project notices. Participants were mainly directly affected landowners in the Study Area who had questions about the Project (access to natural gas, tree damage, compensation, traffic impacts, location of facilities, etc.). Public participation levels, including the total number of participants and those who completed a questionnaire, were higher than what is typically recorded for in-person Information Sessions.

# 2.5 INPUT RECEIVED

The consultation and engagement program allowed interested or potentially affected parties to provide input into the Project. Input was evaluated and integrated into the project. The following sections summarize key input received.

A comment-response summary table and a copy of all written comments and responses are in Appendix B5.

## 2.5.1 Public Input

Twenty-five (25) comments were received from the public at the time of writing this ER. The main areas of input included:

- Traffic, noise and dust impacts and mitigation measures
- Monetary compensation for loss of crops, business, landscaping and/or enjoyment of property
- Unique features along the route
- Status and removal of easements on private property

## 2.5.2 Agency Input

Nine (9) comments were received from agencies at the time of writing this ER. Comments were:

- The Lambton Federation of Agriculture (LFA) noted that internet access may be limited and therefore some landowners may not be able to participate in the Virtual Open House. The LFA inquired about the possibility of an in-person Open House.
- The Ministry of Transportation (MTO) provided comments regarding the LLRP, specifically regarding impacts to the travelling public and future conflicts with highways improvement projects. MTO noted Enbridge will be required to meet MTO guidelines and obtain permits, where necessary.
- The Technical Standards and Safety Authority (TSSA) requested confirmation that Enbridge will submit an Application for Review of Pipeline Project to the OEB.
- The Minister of Heritage, Sport, Tourism and Culture Industries (MHSTCI) provided a letter noting their general requirements for the project.
- Transportation Canada (TC) responded noting that proponents are asked to self-assess if their project will interact with a federal property and/or waterway, or if it will require approval and/or authorization under any Acts administered by TC.
- The Upper Thames River Conservation Authority (UTRCA) provided a letter noting their general requirements for the Project and discussed their general requirements during a phone meeting with Enbridge and Stantec.

- The Lower Thames Valley Conservation Authority (LTVCA) requested shapefiles of the project location. The LTVCA noted there are 3 watercourse crossings within their regulated boundary.
- The St. Clair Region Conservation Authority (SCRCA) discussed their general requirements during a phone meeting with Enbridge and Stantec.
- The Middlesex Federation of Agriculture (MFA) provided a letter requesting that future natural gas needs for farming operations and agricultural businesses be taken into consideration as part of the Project, and that Enbridge consider the profile and depth of the gas lines.

### 2.5.3 Municipal Input

Two (2) communications were received from municipalities at the time of writing this ER. Comments were:

- The Municipality of Middlesex Centre noted that Glendon Drive is a county road, and as such the County of Middlesex should be consulted as well.
- The County of Lambton noted they have received no development applications within the Study Area.

### 2.5.4 Indigenous Input

No comments were received from Indigenous communities at the time of writing this ER.

### 2.5.5 Interest Group Input

No comments were received from interest groups at the time of writing this ER.

## 2.6 REFINEMENTS BASED ON INPUT

At each stage of the consultation program input received was compiled, reviewed, and incorporated into the environmental study process. Responses were provided, as applicable, to questions and comments received.

Enbridge has committed to on-going consultation with directly affected and interested parties during detailed design and construction and will continue to respond to concerns through the life of the project. Input from agencies was reviewed and considered during the identification of potential impacts and determination of mitigation and protective measures.

The Enbridge lands department will work with landowners to address specific concerns they may have regarding tile drainage repairs, monetary compensation, land access during construction, field crew access, and safety. Discussions between Enbridge and Middlesex County, Lambton County, Municipality of Strathroy-Caradoc, Municipality of Southwest Middlesex, Municipality of Middlesex Centre, and the Township of Dawn-Euphemia are ongoing regarding road crossing methods and depth of cover.

It is not uncommon for residential homes to be located adjacent to natural gas pipelines. The pipeline will be designed to meet or exceed all safety regulations and codes. In addition, Enbridge has a rigorous safety and integrity program so that the pipeline is constructed and maintained to operate safely.

# 3.0 EXISTING CONDITIONS

## 3.1 METHODOLOGY

The potential effects and impacts of the project on physical, biophysical and socio-economic features have been assessed within the Study Area. With an understanding of pipeline construction and operation activities (see Sections 3.1.1 and 3.1.2), the assessment describes the environmental and socio-economic setting along the existing route and alternative segments.

The inventory of existing environmental conditions, determination of effects and impacts, and mitigation and protective measures considered:

- Comments expressed during the consultation program
- Information available from published and unpublished literature
- Maps and digital data
- Mitigation guidance documents
- Field assessments conducted by Stantec technical staff
- The pipeline development experience of Enbridge and Stantec

Specific information requests were made to several agencies throughout the project. The information collected assisted in identifying environmental features and constraints located on and adjacent to the existing route and alternative segments, the potential presence of SAR and their habitat, predicting effects and potential impacts, and developing mitigation and protective measures.

The existing conditions maps (Appendix C) have been generated from base mapping provided from Enbridge (2020) and data obtained from Land Information Ontario (LIO). A Mapbook of the Study Area is provided in Appendix C, Figure C-1. Conservation Authority regulated area data was obtained from SCRCA, UTRCA and LTVCA. Scales have been adjusted from the original source to better represent the features mapped. Stantec has digitally reproduced features added to the base maps. Additional mapping sources are identified on the respective map, and in the references.

### 3.1.1 Construction

The pipeline construction process includes various activities as described below and will be undertaken in accordance with the Legacy Union Gas Construction and Maintenance Manual (LUG C&M), 2020:

1. Site Preparation: The first crew to enter the construction site is typically the survey and staking crew who delineate the boundaries of the road allowance. Safety fence is installed at the edge of the construction road allowance where public safety considerations are required, and aspects of the traffic management plan are implemented (i.e., signs, vehicle access).

2. Clearing: The clearing crew clears brush and other vegetation on the road allowance to permit construction of the pipeline.

3. Grading and Stripping: Next, the grading crew prepares the road allowance for access by construction equipment. At this stage, the topsoil (on agricultural lands) or the duff layer (on natural lands) is stripped by bulldozers and graders then segregated so it will not be mixed with the subsoil later removed from the trench. Existing landscaping is also removed and dewatering undertaken, where necessary.

4. Stringing: The stringing crew lays pipe on rollers adjacent to the proposed trench location.

5. Horizontal Directional Drilling (HDD): The drill set up area is graded; TWS is prepared for stringing of the drill pull section and drill entry and exit pits are excavated. The pipeline is then installed utilizing HDD.

6. Trenching: Once the road allowance has been graded, a hydraulic hoe will excavate the trench to a depth of at least 1m, which will then be prepared for the installation of the new pipeline. Laneways and trails are left over the trench as long as feasible where requested by the landowner.

7. Pipe Fabrication and Lowering: Next, the pipe is bent as required and the welding crew welds the pipe into continuous lengths. The pipe welds are x-rayed and coated then inspected before the pipeline is lowered into the trench. Crews also install pipes under obstacles such as roads or watercourses by directional drilling. The welds are global positioning system located with locations identified on the weld map along with the identification of each pipe section for future identification.

8. Backfilling: The backfilling crew backfills the originally excavated subsoil over the pipe in the trench. In shallow water table areas, the pipeline may be weighted to provide negative buoyancy. Surplus backfill material will be removed from the road allowance. The trench line will be crowned to allow for soil settlement.

9. Hydrostatic Test: The pipeline is then tested hydrostatically according to procedures outlined in the Legacy Union Gas Construction and Maintenance Manual (LUG C&M) [2020]. Water is drawn from a suitable local source based on discussions with the appropriate authorities and will be disposed of appropriately (e.g., discharged to land or sanitary sewer, or removed by an Enbridge approved waste disposal provider). Upon completion of the hydrostatic testing, the pipeline is dried, purged of air and prepared for delivery of the product.

10. Clean-Up and Restoration: The clean-up crew is responsible for the restoration of the road allowance and other work areas. In natural areas the clean-up crew undertakes restoration including re-seeding of the road allowance and restoring ditch banks, watercourse crossings, and wetland areas, and removing erosion and sediment controls. In developed areas the clean-up crew undertakes landscaping plans developed for site restoration.

### 3.1.2 Operation and Maintenance

Upon completion of the Project, the Project components will be transferred to Enbridge's operations for inclusion in the existing Pipeline Integrity Program. Enbridge has procedures in place to inspect and maintain the pipelines, including RoW inspection. Enbridge's Pipeline Integrity team has extensive technical, operational, and industry knowledge, and whose members remain current with industry practices. Detailed procedures and programs will be modified to include the new pipelines and to ensure the operation and maintenance activities for the Project comply with applicable provincial and federal legislation, regulations and guidelines.

Pipeline operation consists of monitoring and regulating the gas flowing through or being stored in the pipelines. Valves will serve to shut off and isolate the pipelines for maintenance and security purposes. Above-ground facilities along the pipeline, at the tie in or end point will include stations that will regulate the pressure of the gas in the pipelines.

## 3.2 PHYSICAL FEATURES

### 3.2.1 Bedrock Geology and Drift Thickness

**Existing Conditions**

The bedrock geology of the Study Area is comprised of limestone and shale of the Hamilton Group along the eastern portion of the route, and is comprised of shale and siltstone of the Kettle Point Formation in the western portions of the route (Armstrong and Dodge, 2001). A review of available Water Well Records (WWR) within 500 m of the existing route and alternative segments indicates the depth to bedrock is between approximately 8.5 m to 71 m below ground surface (BGS) (MECP, 2020a).

### 3.2.2 Surficial Geology and Physiography

**Existing Conditions**

The topography of the Study Area slopes gradually from approximately 240 m above mean sea level (AMSL) at the eastern end of the Study Area to 190 m AMSL at the western end. The western portion of the Study Area, between the communities of Bentpath and Oakdale is relatively flat. East of this, the topography becomes slightly undulating.

The Study Area crosses four (4) physiographic regions. In the west, the St. Clair Clay Plains is the dominant physiographic region, which is characterized by beveled till plains. East from the community of Shetland to the village of Glencoe and in the eastern portion of the Study Area, sand plains associated with the Bothwell Sand Plains and the Caradoc Sand Plains and London Annex are present. In the central portion of the Study Area, the dominant physiographic region is the Ekfrid Clay Plain (Chapman and Putnam, 2007).

Surficial geology mapping suggests that the majority of the eastern portion of the Study Area crosses fine- and coarse-textured glaciolacustrine deposits (OGS, 2010). Modern alluvial deposits of clay, silt, sand, gravel, and possible organic deposits are also present along the Study Area and is prominent on the eastern end of the Study Area. The western portion of the Study Area crosses clay to silt-textured till (OGS, 2010).

### 3.2.3 Hydrogeology

**Existing Conditions**

Based on physiographic and surficial geology mapping (Chapman and Putnam, 2007; OGS, 2010), the Study Area traverses fine- and coarse-textured glaciolacustrine deposits, clay to silt-textured till and localized modern alluvial deposits. Aquifer vulnerability mapping by the Thames-Sydenham and Region Source Protection Committee (TSRCPC) indicates that some areas of the Study Area, particularly in the eastern portion, have highly vulnerable aquifers. The eastern portion of the Study Area crosses significant groundwater recharge areas (SGRAs) with a vulnerability score of 6. The Study Area also crosses two (2) small SGRAs with vulnerability scores of 4 (TSRCPC, 2015).

The MECP WWRs within 500 m of the existing route and alternative segments indicate approximately 600 water supply wells are present. 283 of these wells are for domestic use, 145 for irrigation and livestock, 26 are monitoring or observation wells, 21 are for commercial or industrial purposes, 19 are test holes, and two (2) are for cooling and air conditioning (MECP, 2020a). The remaining wells are other, mislabelled, not used or have unknown use.

Regional groundwater flow near the Study Area in the overburden aquifer is modeled as flowing generally to the north towards Lake Huron and to the southeast towards Lake St. Clair (Waterloo Hydrogeologic Inc, 2007). Local groundwater flow conditions are impacted by surface water features.

The Study Area does not cross through any wellhead protection areas (WHPA) since there are no municipal groundwater supply systems nearby. The closest WHPA to the Study Area is approximately 8 km from the route and is associated with the London-Hyde Park WHPA. A review of nearby surface water system intake protection zones (IPZ) indicates that the Study Area does not cross any IPZ-1 or IPZ-2 for a surface water system. The nearest IPZ is in the town of Wallaceburg and is approximately 20 km from the Study Area (MECP Source Protection Atlas, 2020b).

### 3.2.4 Extractive Resources: Aggregates and Petroleum Pools

**Existing Conditions**

A review of the County of Lambton Official Plan (2019), the Township of Dawn-Euphemia Official Plan (2015), the Municipality of Southwest Middlesex Official Plan (2019), Municipality of Strathroy-Caradoc (2018), indicates that no aggregate resources are located within the Study Area. A review of the County of Middlesex Official Plan (2006) and the Municipality of Middlesex Centre Official Plan (2018) indicate the presence of aggregate resources in the most eastern extent of the Study Area. The resources appear to occur within the Study Area in the former Town of Komoka, now considered part of the Municipality of Middlesex Centre. The County of Middlesex Official Plan mapping notes that although there appears to

be an absence of aggregate resource areas in the Municipalities of Strathroy-Caradoc and Southwest Middlesex, this is “only as a result of incomplete aggregate mapping for the County”.

There are oil and gas wells within the Study Area, primarily in the Township of Dawn-Euphemia and the Municipalities of Southwest Middlesex and Strathroy-Caradoc. There are a total of 28 oil and gas wells within 100m of the existing route and alternative segments, the closest of which located approximately 13 m from the alternative segment that extends parallel to Sutherland Road in the Municipality of Strathroy-Caradoc.

A map of the aggregates and petroleum pools is in Appendix C, Figure C-5.

### 3.2.5 Soil and Soil Capability

**Existing Conditions**

There are numerous soil types identified within the Study Area. The soils types, found in The Soil Survey of Middlesex County (Hagerty and Kingston, 1992) and The Soil Survey of Lambton County (Matthews et al., 1957) are in Table 3-1 below.

Soil capability for agriculture is mapped by Agriculture and Agri-Food Canada. Lands classified as Class 1 are the most agriculturally productive, while those classified as Class 7 have the lowest capability for agriculture. Class 1 to 5 agricultural lands are generally arable. Classes 1 through 3 are defined by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) to be prime agricultural soils for common field crop production. With crop use limitations in classes 1 through 3 ranging from insignificant to moderately severe, these soils require only normal conservation practices.

Table 3-1 shows the soil types mapped within the study area, the percentage of the study area that the soil covers and the Canada Land Inventory for Agriculture (CLI) rating of each soil type. The CLI rating of most of the agricultural lands within the Study Area are Class 2. Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices (AAFC, 2005).

**Table 3-1: Soil and Soil Capability Along the Existing Route and Alternative Segments**

| CLI Class | Soil Type(s) | % of Study Area |
|---|---|---|
| 1 | Huron Clay, Perth Clay, Berrien, Tuscola, Vittoria, Normandale | 8 |
| 2 | Brookston Clay, Colwood, Tavistock, Wattford, Brady Sand, Brady Sandy Loam, Beverly, St. Williams, Berrien, Wauseon, Burford, Gobles, Tuscola | 56 |
| 3 | Plainfield, Walsingham, Ekfrid, Kelvin, Toledo, Waterin, Bookton | 32 |
| 5 | Bottom Land | 0.2 |
| 0 (No CLI Class) | Built up area, deep mesic organic soils, shallow mesic organic soils, valley complex, eroded channel and “not mapped” | 3.7 |

### 3.2.6 Agricultural Tile Drains

**Existing Conditions**

Within the Study Area there are multiple properties mapped as containing agricultural tile drains. While majority of the Study Area (80%) is not mapped as containing agricultural tile drainage, systematic tile drainage covers 18% and random tile drainage covers 2% (OMAFRA, 2019).

Agricultural tile drains are mapped in Figure C-2, Appendix C.

### 3.2.7 Natural Hazards

**Existing Conditions**

Natural hazards are elements of the physical environment that have the potential to affect a project in an adverse manner. While the potential is low, natural hazards that may occur within the Study Area are seismic activity and flooding.

The Study Area lies within the southern Great Lakes Seismic Zone (Natural Resources Canada, 2019). This zone has a low to moderate level of seismicity when compared to the more active seismic zones to the east, along the Ottawa River and in Quebec. Over the past 30 years, on average, 2 to 3 magnitude 2.5 or larger earthquakes have been recorded in the southern Great Lakes region. By comparison, over the same time period, the smaller region of Western Quebec experienced 15 magnitude 2.5 or greater earthquakes per year.

Three moderately sized (magnitude 5) events have occurred in the 250 years of European settlement of this region, all of them in the United States - 1929, Attica, New York, 1986, near Cleveland, Ohio, and 1998, near the Pennsylvania/Ohio border. All three of these earthquakes were widely felt but caused no damage in Ontario.

A map of the floodplain and regulation limits of UTRCA, LTVCA and SCRCA is in Appendix C, Figure C-4.

## 3.3 BIOPHYSICAL FEATURES

### 3.3.1 Aquatic Features

The background information summarized in this section is based on online data sources. Aquatic background data were collected from the Natural Heritage Information Centre (NHIC) database (MNRF 2020a), Land Information Ontario (LIO) database (MNRF 2020b), and DFO Species at Risk Mapping (DFO 2019a).

Spring site investigations were conducted in 2020 at the proposed watercourse crossings to confirm the presence of mapped watercourses and to identify potentially unmapped crossings. Data collected during field investigations will be used to provide a preliminary identification of potential that a watercourse supports fish habitat. Additional field investigations will be conducted in summer 2020 to further refine the fish habitat designation at each crossing.

## Existing Conditions

Overview of Watercourse Crossings

The existing route and alternative segment options cross two major watersheds: the Sydenham and Lower Thames. These watersheds lie within the jurisdiction of three Conservation Authorities: Upper Thames River Conservation Authority (UTRCA), Lower Thames Valley Conservation Authority (LTVCA), and St. Clair Region Conservation Authority (SCRCA).

Collectively, 115 watercourse crossings were identified from all project components associated with all route options. Fourteen of the watercourse crossings are in the Lower Thames watershed and 101 watercourse crossings in the Sydenham watershed. The route options and associated watercourse crossings are shown on Figure C-4, Appendix C, as summarized below:

- The Existing / Alternate route crosses 73 watercourses
- The Alternative Segments routes crosses 28 watercourses
- Strathroy Alternative 1 route crosses five watercourses
- Strathroy Alternative 2 route crosses three watercourses
- Strathroy Alternative 3 route crosses four watercourses
- Strathroy Alternate 4 route crosses five watercourses

Additional information used to assess habitat sensitivity included using the DFO drainage classification developed for the Municipal Drain Class Authorization Process. Drainage classification is determined by a combination of flow periodicity (i.e., permanent vs. intermittent flow regime), thermal regime, fish species present, and time since the last drain cleanout. The classification system provides an indication of fish habitat sensitivity in the drain. For the purposes of this project, drainage classification was used to identify if a watercourse crossing was identified as a drain that was classified as fish habitat and if the habitat was associated with top predators or sensitive species. Table 3-2 provides a summary of the drainage classification system (DFO 2014).

### Table 3-2: Drain Classification Summary (DFO 2014)

| DFO Drain Classification | Flow Regime | Thermal Regime | Fish Species | Time Since Last Cleanout |
|---|---|---|---|---|
| A | Permanent | Cold/Cool/Unknown | No trout or salmon | N/A |
| B | Permanent | Warm | Top Predators and/or Ecosystem Indicators | Less than 10 years |
| C | Permanent | Warm | Forage Fish | N/A |
| D | Permanent | Cold/Cool/Unknown | Trout and/or Salmon | N/A |
| E | Permanent | Warm | Top Predators and/or Ecosystem Indicators | Greater than 10 years |

### Table 3-2: Drain Classification Summary (DFO 2014)

| DFO Drain Classification | Flow Regime | Thermal Regime | Fish Species | Time Since Last Cleanout |
|---|---|---|---|---|
| F | Intermittent | N/A | N/A | N/A |
| T | Tiled | N/A | N/A | N/A |

Along the **Existing Route**, the following drain types were identified at watercourse crossings:

- Three Class C permanent drains (WC-72, WC-75, and WC-89)
- One Class D permanent drain (WC-108)
- Seven Class E permanent drains (WC-28, WC-29, WC-78, WC-79, WC-80, WC-81, and WC-86)
- Thirty Class F intermittent drains
- Six Class T tiled drains

Along the **Alternative Segments,** the following drain types were identified at watercourse crossings:

- Three Class D permanent drains (WC-105, WC-106, and WC-107)
- Twelve Class F intermittent drains
- One Class T tiled drain

Along the **Strathroy Alternate Route 1**, the following drain types were identified at watercourse crossings:

- One Class C permanent drain (WC-92)
- One Class E permanent drain (WC-95)
- One Class F intermittent drain

Along the **Strathroy Alternate Route 2**, the following drain type was identified at watercourse crossings:

- One Class F intermittent drain

Along the **Strathroy Alternate Route 3**, the following drain type was identified at watercourse crossings:

- One Class E permanent drain (WC-117)

Along the **Strathroy Alternate Route 4**, the following drain type was identified at watercourse crossings:

- One Class E permanent drain (WC-117)

Available background data for each watercourse crossing, including drains, is provided in Table 3-3.

## Table 3-3: Aquatic Background Data for Watercourse Crossings in the Study Area (MNRF 2020b)

| Stantec Crossing ID | Watercourse / Drain Name | Conservation Authority | Watershed | DFO Drain Classification | Thermal Regime | Project Component |
|---|---|---|---|---|---|---|
| WC-01 | Unnamed | SCRCA | Sydenham | F | - | Existing Route |
| WC-02 | 3rd Concession Road Drain | SCRCA | Sydenham | F | - | Existing Route |
| WC-03 | Unnamed | SCRCA | Sydenham | F | - | Existing Route |
| WC-04 | Wm. Eden Drain | SCRCA | Sydenham | F | - | Existing Route |
| WC-05 | Long Creek | SCRCA | Sydenham | NR | - | Existing Route |
| WC-06 | 11th Concession Road Drain | SCRCA | Sydenham | F | - | Existing Route |
| WC-07 | Lowrie Irwin Drain | SCRCA | Sydenham | T | - | Existing Route |
| WC-08 | Unnamed | SCRCA | Sydenham | F | - | Existing Route |
| WC-09 | Unnamed | SCRCA | Sydenham | NR | - | Existing Route |
| WC-10 | Roberts Drain | SCRCA | Sydenham | F | - | Alternative Segments |
| WC-11 | Roberts Drain | SCRCA | Sydenham | F | - | Existing Route |
| WC-12 | Naylor Drain | SCRCA | Sydenham | F | - | Alternative Segments |
| WC-13 | Trousdell Drain | SCRCA | Sydenham | NR | - | Alternative Segments |
| WC-14 | Unnamed | SCRCA | Sydenham | F | - | Alternative Segments |
| WC-15 | Thompson Drain | SCRCA | Sydenham | T | - | Existing Route |
| WC-16 | Thompson Drain | SCRCA | Sydenham | T | - | Alternative Segments |
| WC-17 | Water Drain | SCRCA | Sydenham | NR | - | Existing Route |
| WC-18 | Evans Drain | SCRCA | Sydenham | F | - | Existing Route |
| WC-19 | Unnamed | SCRCA | Sydenham | F | - | Existing Route |
| WC-20 | Unnamed | SCRCA | Sydenham | F | - | Existing Route |
| WC-21 | Unnamed | SCRCA | Sydenham | F | - | Existing Route |

## Table 3-3: Aquatic Background Data for Watercourse Crossings in the Study Area (MNRF 2020b)

| Stantec Crossing ID | Watercourse / Drain Name | Conservation Authority | Watershed | DFO Drain Classification | Thermal Regime | Project Component |
|---|---|---|---|---|---|---|
| WC-22 | Giboson Drain | SCRCA | Sydenham | NR | - | Existing Route |
| WC-23 | Unnamed | SCRCA | Sydenham | F | warm | Existing Route |
| WC-24 | Unnamed | SCRCA | Sydenham | F | warm | Existing Route |
| WC-25 | Unnamed | SCRCA | Sydenham | F | warm | Existing Route |
| WC-26 | Unnamed | SCRCA | Sydenham | F | warm | Existing Route |
| WC-27 | Unnamed | SCRCA | Sydenham | F | warm | Existing Route |
| WC-28 | Sydenham River | SCRCA | Sydenham | E | warm | Existing Route |
| WC-29 | Sydenham River | SCRCA | Sydenham | E | warm | Existing Route |
| WC-30 | Unnamed | SCRCA | Sydenham | NR | warm | Existing Route |
| WC-31 | Unnamed | SCRCA | Sydenham | NR | warm | Existing Route |
| WC-32 | Unnamed | SCRCA | Sydenham | F | warm | Existing Route |
| WC-33 | Hands-Elsom Drain | SCRCA | Sydenham | NR | - | Existing Route |
| WC-34 | Hands Drain | SCRCA | Sydenham | F | - | Existing Route |
| WC-35 | Turner-Watson Drain | SCRCA | Sydenham | NR | - | Existing Route |
| WC-36 | Unnamed | SCRCA | Sydenham | NR | - | Existing Route |
| WC-37 | Unnamed | SCRCA | Sydenham | NR | - | Existing Route |
| WC-38 | Coleman-Turner Drain | SCRCA | Sydenham | NR | - | Existing Route |
| WC-39 | Patterson Drain | SCRCA | Sydenham | F | - | Existing Route |
| WC-40 | Ross Drain Branch | SCRCA | Sydenham | NR | - | Existing Route |
| WC-41 | Ross Drain | SCRCA | Sydenham | NR | - | Existing Route |
| WC-42 | Ross Drain Branch | SCRCA | Sydenham | NR | - | Existing Route |

## Table 3-3: Aquatic Background Data for Watercourse Crossings in the Study Area (MNRF 2020b)

| Stantec Crossing ID | Watercourse / Drain Name | Conservation Authority | Watershed | DFO Drain Classification | Thermal Regime | Project Component |
|---|---|---|---|---|---|---|
| WC-43 | McTaggart Drain | SCRCA | Sydenham | NR | - | Existing Route |
| WC-44 | Hillman Branch Drain | SCRCA | Sydenham | NR | - | Existing Route |
| WC-45 | Waterworth Drain | SCRCA | Sydenham | NR | - | Existing Route |
| WC-46 | Unnamed | SCRCA | Sydenham | NR | - | Alternative Segments |
| WC-47 | Unnamed | SCRCA | Sydenham | NR | - | Alternative Segments |
| WC-48 | Unnamed | SCRCA | Sydenham | F | - | Existing Route |
| WC-49 | Unnamed | SCRCA | Sydenham | F | - | Alternative Segments |
| WC-50 | Unnamed | SCRCA | Sydenham | F | - | Existing Route |
| WC-51 | Unnamed | SCRCA | Sydenham | NR | - | Alternative Segments |
| WC-52 | Unnamed | SCRCA | Sydenham | F | - | Alternative Segments |
| WC-53 | Unnamed | SCRCA | Sydenham | F | - | Alternative Segments |
| WC-55 | Unnamed | SCRCA | Sydenham | F | - | Existing Route |
| WC-56 | Unnamed | SCRCA | Sydenham | F | - | Alternative Segments |
| WC-57 | Unnamed | SCRCA | Sydenham | F | - | Alternative Segments |
| WC-58 | Unnamed | SCRCA | Sydenham | F | - | Alternative Segments |
| WC-59 | Unnamed | SCRCA | Sydenham | F | - | Alternative Segments |
| WC-60 | Unnamed | SCRCA | Sydenham | F | - | Existing Route |
| WC-61 | Unnamed | SCRCA | Sydenham | NR | - | Alternative Segments |
| WC-62 | Unnamed | SCRCA | Sydenham | F | - | Existing Route |
| WC-63 | Unnamed | SCRCA | Sydenham | F | - | Existing Route |
| WC-64 | Unnamed | SCRCA | Sydenham | F | - | Alternative Segments |

## Table 3-3: Aquatic Background Data for Watercourse Crossings in the Study Area (MNRF 2020b)

| Stantec Crossing ID | Watercourse / Drain Name | Conservation Authority | Watershed | DFO Drain Classification | Thermal Regime | Project Component |
|---|---|---|---|---|---|---|
| WC-65 | Unnamed | LTVCA | Sydenham | F | - | Existing Route |
| WC-66 | Unnamed | SCRCA | Sydenham | NR | - | Alternative Segments |
| WC-67 | McKellar Drain | SCRCA | Sydenham | NR | - | Alternative Segments |
| WC-68 | McKellar Drain | SCRCA | Sydenham | NR | - | Alternative Segments |
| WC-69 | McCracken Drain | SCRCA | Sydenham | F | - | Alternative Segments |
| WC-70 | McCracken Drain | SCRCA | Sydenham | F | - | Existing Route |
| WC-71 | Eddie Drain | LTVCA | Lower Thames | T | - | Existing Route |
| WC-72 | Devlin - McTaggart Drain | LTVCA | Lower Thames | C | warm | Existing Route |
| WC-73 | Johnson Drain | LTVCA | Lower Thames | T | - | Existing Route |
| WC-74 | Unnamed | LTVCA | Lower Thames | T | - | Existing Route |
| WC-75 | Newbiggen Creek / Mikkelsen Drain | LTVCA | Lower Thames | C | warm | Existing Route |
| WC-76 | Reilly Drain | LTVCA | Sydenham | T | - | Existing Route |
| WC-77 | McMaster Drain | SCRCA | Sydenham | NR | - | Existing Route |
| WC-78 | Morrow Drain | SCRCA | Sydenham | E | cold | Existing Route |
| WC-79 | Morrow Drain | SCRCA | Sydenham | E | cold | Existing Route |
| WC-80 | North Branch of the Sutton Drain | SCRCA | Sydenham | E | cold | Existing Route |
| WC-81 | Black Branch of the Morrow Drain | SCRCA | Sydenham | E | cold | Existing Route |
| WC-82 | Kavelaar Drainage Works 1968 | SCRCA | Sydenham | NR | - | Existing Route |
| WC-83 | White Drain | SCRCA | Sydenham | NR | - | Existing Route |
| WC-84 | White Drain | SCRCA | Sydenham | NR | cold | Existing Route |

## Table 3-3: Aquatic Background Data for Watercourse Crossings in the Study Area (MNRF 2020b)

| Stantec Crossing ID | Watercourse / Drain Name | Conservation Authority | Watershed | DFO Drain Classification | Thermal Regime | Project Component |
|---|---|---|---|---|---|---|
| WC-85 | Unnamed | SCRCA | Sydenham | NR | cold | Existing Route |
| WC-86 | Unnamed | SCRCA | Sydenham | E | cold | Existing Route |
| WC-87 | Unnamed | SCRCA | Sydenham | NR | cold | Existing Route |
| WC-88 | Unnamed | SCRCA | Sydenham | NR | cold | Existing Route |
| WC-89 | Unnamed | SCRCA | Sydenham | C | cold | Existing Route |
| WC-90 | Unnamed | SCRCA | Sydenham | NR | cold | Strathroy Alternate 1 |
| WC-91 | Unnamed | SCRCA | Sydenham | NR | cold | Strathroy Alternate 1 |
| WC-92 | Unnamed | SCRCA | Sydenham | C | cold | Strathroy Alternate 1 |
| WC-93 | Unnamed | SCRCA | Sydenham | F | cold | Strathroy Alternate 1 |
| WC-94 | Unnamed | SCRCA | Sydenham | F | cold | Strathroy Alternate 2 |
| WC-95 | Unnamed | SCRCA | Sydenham | E | cold | Strathroy Alternate 1 |
| WC-96 | Unnamed | SCRCA | Sydenham | NR | cold | Strathroy Alternate 2 |
| WC-97 | Unnamed | SCRCA | Sydenham | NR | cold | Strathroy Alternate 2 |
| WC-98 | Unnamed | SCRCA | Sydenham | NR | cold | Alternative Segments |
| WC-99 | Unnamed | SCRCA | Sydenham | NR | cold | Existing Route |
| WC-100 | Walters-Arnold Dr | UTRCA | Lower Thames | NR | warm | Existing Route |
| WC-101 | Walters-Arnold Dr | UTRCA | Lower Thames | NR | warm | Existing Route |
| WC-102 | Kazy Noorenberge Dr | UTRCA | Lower Thames | F | warm | Existing Route |
| WC-103 | Walters-Arnold Dr | UTRCA | Lower Thames | NR | warm | Alternative Segments |
| WC-104 | Walters-Arnold Dr | UTRCA | Lower Thames | NR | warm | Alternative Segments |
| WC-105 | Walters-Arnold Dr | UTRCA | Lower Thames | D | cold | Alternative Segments |

## Table 3-3: Aquatic Background Data for Watercourse Crossings in the Study Area (MNRF 2020b)

| Stantec Crossing ID | Watercourse / Drain Name | Conservation Authority | Watershed | DFO Drain Classification | Thermal Regime | Project Component |
|---|---|---|---|---|---|---|
| WC-106 | Walters-Arnold Dr | UTRCA | Lower Thames | D | cold | Alternative Segments |
| WC-107 | Crow Creek Dr | UTRCA | Lower Thames | D | cold | Alternative Segments |
| WC-108 | Crow Creek Dr | UTRCA | Lower Thames | D | cold | Existing Route |
| WC-111 | Naylor Drain | SCRCA | Sydenham | F | - | Alternative Segments |
| WC-112 | Mierer Drain | SCRCA | Sydenham | NR | - | Existing Route |
| WC-113 | Unnamed | SCRCA | Sydenham | NR | cold | Strathroy Alternate 4 |
| WC-114 | Parker Drain (1998) #1625 | SCRCA | Sydenham | NR | cold | Strathroy Alternate 4 |
| WC-115 | Unnamed | SCRCA | Sydenham | NR | cold | Strathroy Alternate 3 |
| WC-116 | Unnamed | SCRCA | Sydenham | NR | cold | Strathroy Alternate 3, Strathroy Alternate 4 |
| WC-117 | Campbell Drain Extension 2001 | SCRCA | Sydenham | E | cold | Strathroy Alternate 3, Strathroy Alternate 4 |
| WC-118 | Unnamed | SCRCA | Sydenham | NR | cold | Strathroy Alternate 3, Strathroy Alternate 4 |

Aquatic Community

Background aquatic community data (i.e., fish and mussel species records) were available for watercourses within the Study Area. Fish community is documented from background data at forty-nine watercourse crossings. Fish species by watershed are summarized in Table 3-4, and mussel species are summarized in Table 3-5. These species lists do not necessarily imply all the species are in the Study Area; however, they illustrate the aquatic community diversity which has been documented in the watersheds where the project is located.

**Table 3-4: Fish Species Documented in Background Data by Watershed in the Study Area (MNRF 2020b)**

| Fish Species | | Watershed | | Species at Risk | Species of Conservation Concern |
|---|---|---|---|---|---|
| **Common Name** | **Scientific Name** | **Sydenham** | **Lower Thames** | | |
| Black Bullhead | *Ameiurus melas* | ✓ | | | |
| Black Crappie | *Pomoxis nigromaculatus* | ✓ | | | |
| Black Redhorse | *Moxostoma duquesnei* | | ✓ | ✓ | |
| Blackchin Shiner | *Notropis heterodon* | | ✓ | | |
| Blacknose Dace | *Rhinichthys atratulus* | | ✓ | | |
| Blackside Darter | *Percina maculata* | ✓ | ✓ | | |
| Blackstripe Topminnow | *Fundulus notatus* | ✓ | | | ✓ |
| Bluegill | *Lepomis macrochirus* | ✓ | ✓ | | |
| Bluntnose Minnow | *Pimephales notatus* | ✓ | ✓ | | |
| Brassy Minnow | *Hybognathus hankinsoni* | | ✓ | | |
| Brindled Madtom | *Noturus miurus* | ✓ | | | |
| Brook Silverside | *Labidesthes sicculus* | ✓ | | | |
| Brook Stickleback | *Culaea inconstans* | ✓ | ✓ | | |
| Brook Trout | *Salvelinus fontinalis* | | ✓ | | |
| Brown Bullhead | *Ameiurus nebulosus* | | ✓ | | |
| Brown Trout | *Salmo trutta* | | ✓ | | |
| Central Mudminnow | *Umbra limi* | ✓ | ✓ | | |
| Central Stoneroller | *Campostoma anomalum* | | ✓ | | |
| Channel Catfish | *Ictalurus punctatus* | ✓ | ✓ | | |
| Coho Salmon | *Oncorhynchus kisutch* | | ✓ | | |
| Common Carp | *Cyprinus carpio* | ✓ | ✓ | | |
| Common Shiner | *Luxilus cornutus* | ✓ | ✓ | | |
| Creek Chub | *Semotilus atromaculatus* | ✓ | ✓ | | |

## Table 3-4: Fish Species Documented in Background Data by Watershed in the Study Area (MNRF 2020b)

| Fish Species | | Watershed | | Species at Risk | Species of Conservation Concern |
|---|---|---|---|---|---|
| **Common Name** | **Scientific Name** | **Sydenham** | **Lower Thames** | | |
| Eastern Sand Darter | *Ammocrypta pellucida* | ✓ | ✓ | ✓ | |
| Emerald Shiner | *Notropis atherinoides* | ✓ | ✓ | | |
| Fallfish | *Semotilus corporalis* | ✓ | ✓ | | |
| Fantail Darter | *Etheostoma flabellare* | ✓ | ✓ | | |
| Fathead Minnow | *Pimephales promelas* | ✓ | ✓ | | |
| Freshwater Drum | *Aplodinotus grunniens* | | ✓ | | |
| Ghost Shiner | *Notropis buchanani* | | ✓ | | |
| Gizzard Shad | *Dorosoma cepedianum* | ✓ | ✓ | | |
| Golden Redhorse | *Moxostoma erythrurum* | ✓ | ✓ | | |
| Golden Shiner | *Notemigonus crysoleucas* | ✓ | | | |
| Grass Pickerel | *Esox americanus vermiculatus* | ✓ | | | ✓ |
| Greater Redhorse | *Moxostoma valenciennesi* | ✓ | | | |
| Green Sunfish | *Lepomis cyanellus* | ✓ | ✓ | | |
| Greenside Darter | *Etheostoma blennioides* | ✓ | ✓ | | |
| Hornyhead Chub | *Nocomis biguttatus* | ✓ | ✓ | | |
| Iowa Darter | (Not Applicable) | | ✓ | | |
| Johnny Darter | *Etheostoma nigrum* | ✓ | ✓ | | |
| Largemouth Bass | *Micropterus salmoides* | ✓ | ✓ | | |
| Least Darter | *Etheostoma microperca* | ✓ | ✓ | | |
| Logperch | *Percina caprodes* | ✓ | ✓ | | |
| Longnose Dace | *Rhinichthys cataractae* | | ✓ | | |
| Longnose Gar | *Lepisosteus osseus* | ✓ | | | |
| Longnose Sucker | *Catostomus catostomus* | ✓ | | | |
| Mimic Shiner | *Notropis volucellus* | ✓ | ✓ | | |
| Mooneye | *Hiodon tergisus* | ✓ | ✓ | | |
| Mottled Sculpin | *Cottus bairdii* | ✓ | ✓ | | |
| Muskellunge | *Esox masquinongy* | ✓ | ✓ | | |
| Northern Hog Sucker | *Hypentelium nigricans* | ✓ | ✓ | | |
| Northern Madtom | *Noturus stigmosus* | ✓ | | ✓ | |

## Table 3-4: Fish Species Documented in Background Data by Watershed in the Study Area (MNRF 2020b)

| Fish Species | | Watershed | | Species at Risk | Species of Conservation Concern |
|---|---|---|---|---|---|
| **Common Name** | **Scientific Name** | **Sydenham** | **Lower Thames** | | |
| Northern Pearl Dace | *Margariscus nachtriebi* | | ✓ | | |
| Northern Pike | *Esox lucius* | ✓ | ✓ | | |
| Northern Redbelly Dace | *Chrosomus eos* | | ✓ | | |
| Northern Sunfish | *Lepomis peltastes* | ✓ | | | ✓ |
| Pugnose Minnow | *Opsopoeodus emiliae* | ✓ | | ✓ | |
| Pugnose Shiner | *Notropis anogenus* | ✓ | | ✓ | |
| Pumpkinseed | *Lepomis gibbosus* | ✓ | ✓ | | |
| Rainbow Darter | *Etheostoma caeruleum* | ✓ | ✓ | | |
| Rainbow Trout | *Oncorhynchus mykiss* | | ✓ | | |
| River Chub | *Nocomis micropogon* | ✓ | ✓ | | |
| River Darter | *Percina shumardi* | ✓ | ✓ | ✓ | |
| Quillback | *Carpiodes cyprinus* | | ✓ | | |
| Redfin Shiner | *Lythrurus umbratilis* | ✓ | | | |
| Rock Bass | *Ambloplites rupestris* | ✓ | ✓ | | |
| Rosyface Shiner | *Notropis rubellus* | ✓ | ✓ | | |
| Shorthead Redhorse | *Moxostoma macrolepidotum* | ✓ | ✓ | | |
| Silver Lamprey | *Ichthyomyzon unicuspis* | ✓ | | | ✓ |
| Silver Redhorse | *Moxostoma anisurum* | ✓ | ✓ | | |
| Silver Shiner | *Notropis photogenis* | | ✓ | | |
| Smallmouth Bass | *Micropterus dolomieu* | ✓ | ✓ | | |
| Spotfin Shiner | *Cyprinella spiloptera* | ✓ | ✓ | | |
| Spottail Shiner | *Notropis hudsonius* | ✓ | ✓ | | |
| Spotted Gar | *Lepisosteus oculatus* | ✓ | | ✓ | |
| Spotted Sucker | *Minytrema melanops* | ✓ | | | ✓ |
| Striped Shiner | *Luxilus chrysocephalus* | | ✓ | | |
| Stonecat | *Noturus flavus* | ✓ | ✓ | | |
| Tadpole Madtom | *Noturus gyrinus* | ✓ | | | |
| Trout-perch | *Percopsis omiscomaycus* | ✓ | ✓ | | |
| Walleye | *Sander vitreus* | ✓ | ✓ | | |

### Table 3-4: Fish Species Documented in Background Data by Watershed in the Study Area (MNRF 2020b)

| Fish Species | | Watershed | | Species at Risk | Species of Conservation Concern |
|---|---|---|---|---|---|
| **Common Name** | **Scientific Name** | **Sydenham** | **Lower Thames** | | |
| White Bass | *Morone chrysops* | ✓ | ✓ | | |
| White Crappie | *Pomoxis annularis* | ✓ | ✓ | | |
| White Perch | *Morone americana* | ✓ | ✓ | | |
| White Sucker | *Catostomus commersonii* | ✓ | ✓ | | |
| Yellow Bullhead | *Ameiurus natalis* | ✓ | ✓ | | |
| Yellow Perch | *Perca flavescens* | ✓ | ✓ | | |

### Table 3-5: Freshwater Mussel Species at Risk Documented from Background Information in the Study Area (DFO 2019a, MNRF 2020a)

| Mussel Species | | Species at Risk | Species of Conservation Concern |
|---|---|---|---|
| **Common Name** | **Latin Name** | | |
| Fawnsfoot | *Truncilla donaciformis* | ✓ | |
| Kidneyshell | *Ptychobranchus fasciolaris* | ✓ | |
| Lilliput | *Toxolasma parvum* | ✓ | |
| Mapleleaf | *Quadrula quadrula* | | ✓ |
| Northern Riffleshell | *Epioblasma rangiana* | ✓ | |
| Rainbow | *Villosa iris* | | ✓ |
| Rayed Bean | *Villosa fabalis* | ✓ | |
| Round Hickorynut | *Obovaria olivaria* | ✓ | |
| Round Pigtoe | *Pleurobema sintoxia* | ✓ | |
| Salamander Mussel | *Simpsonaias ambigua* | ✓ | |
| Snuffbox | *Epioblasma triquetra* | ✓ | |
| Threehorn Wartyback | *Obliquaria reflexa* | ✓ | |
| Wavy-rayed Lampmussel | *Lampsilis fasciola* | ✓ | |

Aquatic Species of Conservation Concern

There are 7 records of aquatic species of conservation concern (SOCC) in watercourses crossed by the existing route and alternative segment options, including 5 fish species and 2 mussel species (see Table 3-6 and Figure C-4, Appendix C) (DFO 2019a; MNRF 2020a). Special Concern species do not receive habitat or individual protection under species at risk legislation (ESA or SARA).

SOCC fish are known to occur at 13 watercourse crossings, including:

- **Existing Route**: 10 watercourse crossings (WC-01, WC-02, WC-03, WC-05, WC-06, WC-07, WC-08, WC-09, WC-28, WC-29
- **Strathroy Alternate 1**: one watercourse crossing (WC-93)
- **Strathroy Alternate 2**: one watercourse crossing (WC-94)
- **Strathroy Alternate 3**: one watercourse crossing (WC-116)
- **Strathroy Alternate 4**: one watercourse crossing (WC-116)

The Sydenham River is crossed on the Existing/Alternative Route at WC-28 and WC-29; two (SOCC) mussels are known to live in the Sydenham River (Table 3-6).

Aquatic Species at Risk

There are 18 records of aquatic species at risk (SAR) in watercourses crossed by the existing route and alternative segments, including 7 fish species and 11 mussel species (see Table 3-6 and Figure C-4, Appendix C) (DFO 2019; MNRF 2020a). Threatened and Endangered species receive habitat and individual protection under species at risk legislation (ESA or SARA).

SAR fish are known to occur at 7 watercourse crossings, including:

- **Existing Route**: 6 watercourse crossings (WC-01, WC-02, WC-03, WC-28, WC-29, WC-108)
- **Alternative Segments**: one watercourse crossing (WC-107)

The Sydenham River is crossed on the existing route at WC-28 and WC-29; eleven SAR mussels are known to live in the Sydenham River (Table 3-6). Critical Habitat is documented for six mussel species at the Sydenham River crossings (WC-28 and WC-29) (DFO 2019). Critical Habitat is defined under the SARA as “the habitat that is necessary for the survival or recovery of listed extirpated, endangered, or threatened species, and that is identified as Critical Habitat in a recovery strategy or action plan” (Government of Canada 2016).

**Table 3-6: Fish and Mussel SAR and SOCC Documented in Background Data at Watercourse Crossings (DFO 2019a, MNRF 2020a, MNRF 2020b)**

| Animal Group | Common Name | Scientific Name | SAR or SOCC Listing | | Watercourse Crossings with Aquatic Species at Risk (SAR) and Species of Conservation Concern (SOCC) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ESA | SARA | WC-01 | WC-02 | WC-03 | WC-05 | WC-06 | WC-07 | WC-08 | WC-09 | WC-28 | WC-29 | WC-93 | WC-94 | WC-107 | WC-108 | WC-116 |
| Fish | Black Redhorse | *Moxostoma duquesnei* | THR | THR | | | | | | | | | | | | | ✓ | ✓ | |
| | Blackstripe Topminnow | *Fundulus notatus* | SC | SC | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | |
| | Eastern Sand Darter | *Ammocrypta pellucida* | END | THR | | | | | | | | | ✓ | ✓ | | | ✓ | ✓ | |
| | Grass Pickerel | *Esox americanus vermiculatus* | SC | SC | | | | | | | | | ✓ | ✓ | | | | | |
| | Northern Madtom | *Noturus stigmosus* | END | END | | | | | | | | | ✓ | ✓ | | | | | |
| | Northern Sunfish | *Lepomis peltastes* | SC | SC | | | | | | | | | ✓ | ✓ | ✓ | ✓ | | | ✓ |
| | Pugnose Minnow | *Opsopoeodus emiliae* | THR | THR | | | | | | | | | ✓ | ✓ | | | | | |
| | Pugnose Shiner | *Notropis anogenus* | THR | THR | ✓ | ✓ | | | | | | | ✓ | ✓ | | | | | |
| | River Darter | *Percina shumardi* | END | END | | | | | | | | | | | | | | | |
| | Silver Lamprey | *Ichthyomyzon unicuspis* | - | SC | | | | | | | | | ✓ | ✓ | | | | | |
| | Silver Shiner | *Notropis photogenis* | THR | THR | | | | | | | | | | | | | ✓ | ✓ | |
| | Spotted Gar | *Lepisosteus oculatus* | END | END | | | | | | | | | | | | | | | |
| | Spotted Sucker | *Minytrema melanops* | SC | SC | | | ✓ | | | | | | ✓ | ✓ | | | | | |
| Mussel | Fawnsfoot | *Truncilla donaciformis* | END | END | | | | | | | | | ✓ | ✓ | | | | | |
| | Kidneyshell | *Ptychobranchus fasciolaris* | END | END | | | | | | | | | ✓ | ✓ | | | | | |
| | Lilliput | *Toxolasma parvum* | THR | END | | | ✓ | | | | | | ✓ | ✓ | | | | | |
| | Mapleleaf | *Quadrula quadrula* | SC | SC | | | | | | | | | ✓ | ✓ | | | | | |
| | Northern Riffleshell ** | *Epioblasma rangiana* | END | END | | | | | | | | | ✓ | ✓ | | | | | |
| | Rainbow | *Villosa iris* | SC | SC | | | | | | | | | ✓ | ✓ | | | | | |
| | Rayed Bean ** | *Villosa fabalis* | END | END | | | | | | | | | ✓ | ✓ | | | | | |
| | Round Hickorynut ** | *Obovaria olivaria* | END | END | | | | | | | | | ✓ | ✓ | | | | | |
| | Round Pigtoe ** | *Pleurobema sintoxia* | END | END | | | | | | | | | ✓ | ✓ | | | | | |
| | Salamander Mussel ** | *Simpsonaias ambigua* | END | END | | | | | | | | | ✓ | ✓ | | | | | |
| | Snuffbox ** | *Epioblasma triquetra* | END | END | | | | | | | | | ✓ | ✓ | | | | | |
| | Threehorn Wartyback | *Obliquaria reflexa* | THR | THR | | | | | | | | | ✓ | ✓ | | | | | |
| | Wavy-rayed Lampmussel | *Lampsilis fasciola* | THR | SC | | | | | | | | | ✓ | ✓ | | | | | |

** Critical Habitat for the species recorded at the watercourse crossing (DFO 2019)

### 3.3.2 Designated Natural Areas and Vegetation

The background information summarized in this section is based on online data sources. Terrestrial background data were collected from the NHIC database (MNRF 2020a), and Land Information Ontario (LIO) database (MNRF 2020b).

**Existing Conditions**

The Study Area falls within the Niagara section of the Deciduous Forest Region (Rowe 1972). The vegetation communities in the area have been significantly altered by anthropogenic activities (predominantly clearing and draining of land for agricultural purposes). Most of the lands (>90%) have been converted to agricultural use, mainly tile-drained row crop fields.

Although much of the land has historically been altered, in some locations the existing route and alternative segments come in proximity to natural areas including woodlands and wetlands. The length of each pipeline route that is adjacent (within 10 m) to woodlands or wetlands is provided in Table 3-7.

**Table 3-7: Woodland and Wetland in Adjacent (10 m) to the Existing Route and Alternative Segments (MNRF 2020b)**

| Route | Length of Route (m) | |
|---|---|---|
| | Adjacent to Woodland | Adjacent to Wetland |
| Existing Route | 8,540 | 1,305 |
| Alternative Segments | 2,830 | 1,697 |
| Strathroy Alternate 1 | 1,495 | 0 |
| Strathroy Alternate 2 | 0 | 0 |
| Strathroy Alternate 3 | 2,790 | 0 |
| Strathroy Alternate 4 | 3,328 | 0 |

Hayfields, pasture or fallow fields, which may provide habitat for grassland birds, may occur within the Study Area. A map of designated natural areas is provided in Appendix C, Figure C-3.

Wetlands

The Ontario Wetland Evaluation System (OWES) is used to identify Provincially Significant Wetlands (PSW). An evaluated wetland may be one contiguous unit or may be a series of smaller wetlands functioning as a whole. Evaluated wetlands that do not qualify as provincially significant may be designated as locally significant and may be protected through local planning and policy measures. There may also be unevaluated wetlands in an area.

A review of the LIO database (MNRF 2020b) and the NHIC database (MNRF 2020a) indicates that the existing route crosses or is within proximity to six PSW's: (Bobcat Swamp Wetland Complex, Komoka/South Strathroy Creek Wetland, Longwoods Woodlot Wetland Complex, McCready Woods, McPhail Tract, Melbourne Marsh). The Alternative Segments Route is in proximity to two PSW's: Bobcat Swamp Wetland Complex, and Komoka/South Strathroy Creek Wetland. Strathroy Alternative Routes do not cross or come within proximity to a PSW.

Narrow wetland features are presumably present along drains and other watercourse features, but these have not been mapped as unique features. Vegetation and Ecological Land Classification (ELC) surveys will be completed prior to construction to assess presence or absence of wetlands within 120 m of the preferred pipeline route.

Significant Woodlands

A woodland is defined as a treed area, woodlot or forested area. The Natural Heritage Reference Manual notes that the local planning authority has a responsibility for designating significant woodlands (MNR 2010).

The criteria for designating significant woodlands at a provincial level includes: woodland size; ecological function (shape, proximity to other woodlands or natural features, linkages); species diversity; uncommon characteristics; and, economic and social values (MNR 2010). in. The Official Plans of Middlesex County and Lambton County were reviewed for the criteria and identification of significant woodlands that occur within the construction footprint.

The Middlesex County Official Plan (Middlesex County 2014) identifies significant woodlands as important features on the landscape. The Middlesex Natural Heritage Systems Study (MNHSS 2014) identifies a significant woodland as "any woodland vegetation group that is greater than 4 ha and also any woodland vegetation that is within 100 m of a woodland that is greater than 4 ha." The Lambton County Official Plan (Lambton County 2019) states that significant woodlands include any forested area that:

- is 2 hectares or greater in size
- has woodland interior habitat (100 metres from all edges)
- is the largest woodland patch by landform or soil type
- is the largest woodland patch occurring on a particular valleyland
- is 0.5 hectares or greater in size and
  - is located within 30 metres of another natural heritage feature specifically identified in the Map 2 feature inventory;
  - provides linkage (a "stepping stone") between (is in a line between and within 120 metres of) two or more significant woodlands that are separated by more than 120 metres of each other;

- is located on or within 30 metres of a surface water feature, iv) is located above a highly vulnerable aquifer or significant groundwater recharge area;
- has unique woodland diversity - i.e. contains target communities for Ecodistrict 7E-2 that help to conserve the biodiversity of the Great Lakes region of Ontario as identified by The Great Lakes Conservation Blueprint (Henson et al. 2005);
- has uncommon characteristics such as unique species composition; a rare vegetation community (NHIC provincial ranking of S1, S2, or S3); rare, uncommon, or restricted woodland plant species habitat; older woodlands, or larger tree size structure; or
- has high socio-economic, cultural, historic, or educational value as identified in a local official plan

Woodland features have been mapped in Appendix C, Figure C-3, using MNRF LIO data. Field investigations will occur prior to construction to refine woodland mapping and to assess significance of woodlands using the county Official Plans.

Areas of Natural and Scientific Interest (ANSI)

Life science ANSIs are significant representative segments of Ontario's biodiversity and natural landscapes, including specific types of forests, valleys, prairies, savannahs, alvars and wetlands, their native plants and animals, and their supporting environments. They contain relatively undisturbed vegetation and landforms, and their associated species and communities. Provincially significant life science ANSIs include the most significant and best examples of the natural heritage features in the province, and many will correspond to other significant features and areas such as wetlands, valleylands and woodlands (MNR 2010).

A review of MNRF LIO mapping (MNRF 2020a) and the NHIC (MNRF 2020b) showed that there is one life science ANSIs within 120m of the Study Area: The Komoka Provincial Park.

### 3.3.3 Wildlife, Wildlife Habitat and Species at Risk

The background information summarized in this section is based on online data sources. Terrestrial background data were collected from the NHIC database (MNRF 2020a), Land Information Ontario (LIO) database (MNRF 2020b), and various wildlife atlases.

**Significant Wildlife Habitat**

Wildlife habitat is defined as an area where plants, animals and other organisms live, including areas where species concentrate at a vulnerable point in their life cycle, and areas that are important to migratory and non-migratory species (MNR 2000). Significant wildlife habitats are grouped into four categories:

1. Seasonal concentration areas
2. Animal movement corridors
3. Rare vegetation communities or specialized habitats

4. Habitats of species of conservation concern

The presence of Significant Wildlife Habitat (SWH) in the Study Area was determined in two ways. First, publicly available NHIC data was reviewed for SWH (MNRF 2020b). Second, potential SWH was identified using the Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E (MNRF 2015) which provide descriptions of wildlife habitats and guidance on criteria for determining the presence of SWH. Details of the significant wildlife assessment are summarized below.

Seasonal Concentration Areas

Seasonal Concentration Areas are sites where large numbers of a species gather at one time of the year, or where several species congregate. Only the best examples of these concentration areas are typically designated as SWH. Review of the NHIC (MNRF 2020b) database identified a single seasonal concentration area within the Study Area; a deer wintering area (Figure C-3, Appendix C), which is crossed by the Alternative Route. Other potential seasonal concentration areas that may occur in the Study Area are assessed in Table E-1, Appendix E.

Field investigations prior to construction will assess the presence and quality of candidate seasonal concentration areas.

Rare vegetation communities or specialized habitats

Rare vegetation communities or specialized habitats are defined as separate components of SWH. Rare vegetation communities are habitats that are considered rare or uncommon in the ecoregion, as defined in the SWH Criteria Schedules (MNRF 2015). These habitats may support wildlife species that are considered significant. Specialized habitats are microhabitats that are critical to some wildlife species. Review of the NHIC (MNRF 2020b) database did not identify any rare vegetation communities or specialized habitats within the Study Area. Potential rare vegetation communities or specialized habitats based on the SWH Criteria Schedule for Ecoregion 7E (MNRF 2015) are discussed in Table E-1, Appendix E.

Field investigations prior to construction will assess the presence and quality of rare vegetation communities or candidate specialized habitats.

Habitat for Species of Conservation Concern

Habitat for SOCC is habitat which supports provincially-rare (S1-S3 ranked species) and provincially-designated Special Concern species. Status rankings (S-ranks) for wildlife are based on the number of occurrences in Ontario and have the following meanings:

- S1: critically imperiled; often fewer than 5 occurrences
- S2: imperiled; often fewer than 20 occurrences
- S3: vulnerable; often fewer than 80 occurrences

The NHIC database was searched to obtain recent records (2000 - present) of species of conservation concern (S1-S3 ranked species and provincially-designated Special Concern species) in the Study Area.

The Ontario Breeding Bird Atlas (Cadman et al. 2007), the Ontario Reptile and Amphibian Atlas (Ontario Nature 2020), the Ontario Mammal Atlas (Dobbyn, 1994) and the Ministry of Natural Resources and Forestry Species at Risk in Ontario (SARO) list (MNRF 2019) were also searched. The exact location of species occurrences is not available from these atlases; instead, occurrences are recorded within 1 x 1 km or 10 x 10 km squares.

Based on a review of background information, SOCC are known to occur in the vicinity of the Study Area, as shown in Table E-1, Appendix E, including 6 birds, 1 insect, 4 reptiles, and 1 mammal. The potential for SOCC to be present in the Study Area is limited by habitat suitability and availability; therefore, species listed in Table E-1, Appendix E may not occur in the Study Area. An assessment of candidate habitat and/or habitat use for individual SOCC will be completed during field investigations prior to construction.

Animal Movement Corridors

Animal movement corridors are elongated, naturally vegetated parts of the landscape used by animals to move from one habitat to another (MNR 2000). Rivers, creeks, and drains may be used as movement corridors; these features were present within 120 m of the existing route and alternative segments. Hedgerows may also serve as small linkages (MNR 2000). Preliminary vegetation community classification indicates the presence of rivers, drains and linear hedgerows within 120 m of the existing route and alternative segments.

**Species at Risk**

For the purpose of this report, SAR are those species identified as endangered or threatened by provincial (ESA) legislation. The NHIC database was searched to obtain recent records (2000 – present) of SAR from the vicinity of the existing route and alternative segments. The Ontario Breeding Bird Atlas (Cadman et al. 2007), the Ontario Reptile and Amphibian Atlas (Ontario Nature 2020), the Ontario Mammal Atlas (Dobbyn 1994) and the MNRF SARO list (MNRF 2019) were also searched. The exact location of species occurrences is not available from these atlases; instead, occurrences are recorded within 1 x 1 km or 10 x 10 km squares.

Based on a review of background information, 30 SAR are known to occur in the vicinity of the Study Area, as shown in Table E-2, Appendix E, including 13 birds, 8 plants, 5 reptiles, and 4 mammals. An assessment of candidate habitat and/or habitat use for SAR will be completed during 2020 field investigations.

Stantec completed a desktop assessment to evaluate the existing conditions of the existing route and alternative segments. Most of the land along the existing route and alternative segments is municipal road allowance, with adjacent land being used for agricultural row crops. Woodland and wetland is within proximity (10 m) to the existing route and alternative segments as shown in Table 3-7.

# 3.4 SOCIO-ECONOMIC ENVIRONMENT

## 3.4.1 Employment and Business

### Existing Conditions

The most recent economy and employment statistics are provided in the 2016 Census of Population data released by Statistics Canada. Table 3-8 summarizes the total population of persons 15 years and over, the total labour force and of those the persons employed, and the participation, employment and unemployment rates (Statistics Canada, 2017). Unemployment rates are similar between the Municipality of Southwest Middlesex, Municipality of Middlesex Centre and the Municipality of Strathroy-Caradoc and are slightly higher in the Township of Dawn-Euphemia. These rates are all substantially lower than the median Ontario unemployment rate.

**Table 3-8: Labour Characteristics, Ontario, Dawn-Euphemia, Southwest Middlesex, Strathroy-Caradoc and Middlesex Centre, 2016**

| Location | Total Population 15 years and Over | Labour Force | Employed | Participation Rate (percent) | Employment Rate (percent) | Unemployment Rate (percent) |
|---|---|---|---|---|---|---|
| Ontario | 11,038,440 | 7,141,675 | 6,612,150 | 64.7 | 59.9 | 7.4 |
| Dawn-Euphemia (Township) | 1,540 | 1,010 | 950 | 65.4 | 61.5 | 5.9 |
| Southwest Middlesex (Municipality) | 4,675 | 3,000 | 2,865 | 64.2 | 61.3 | 4.5 |
| Strathroy-Caradoc (Municipality) | 11,7005 | 11,235 | 10,695 | 66.1 | 62.9 | 4.8 |
| Middlesex Centre (Municipality) | 13,550 | 9,690 | 9,270 | 71.5 | 68.4 | 4.4 |

Source: Statistics Canada, 2017a.

The median income for all census households in Dawn-Euphemia, Southwest Middlesex, and Strathroy-Caradoc in 2016 were similar, $70,571, $64,000, and $71,582 respectively, which are comparable to the Ontario median income for all census households which was $74,287. The median income for Middlesex Centre was $108,971, which is significantly higher than the other communities and Ontario. The median income for individuals aged 15 years and over followed a similar trend (Table 3-9).

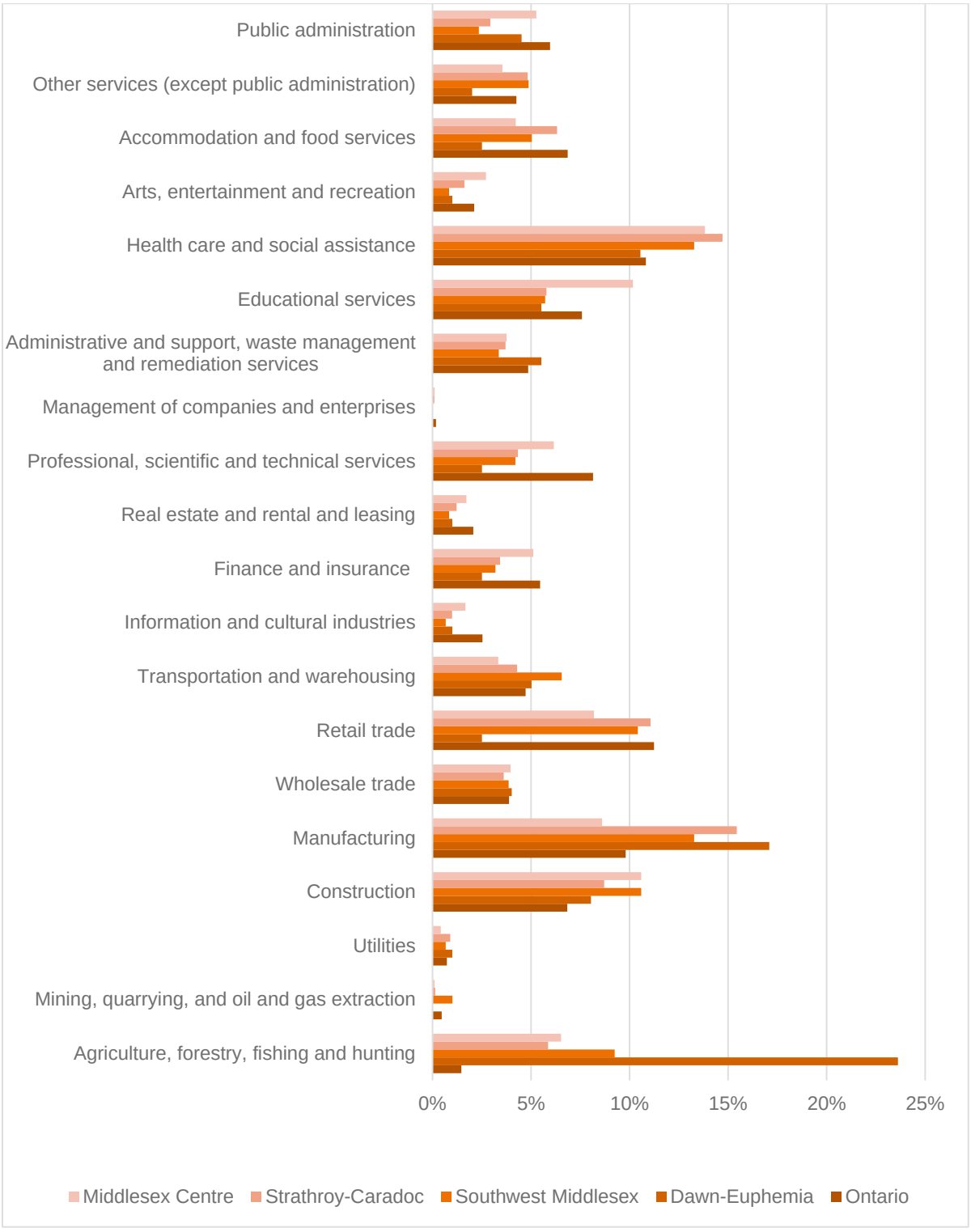
### Table 3-9: Median Income, Ontario, Dawn-Euphemia, Southwest Middlesex, Strathroy-Caradoc and Middlesex Centre, 2015

| Location | Median Household Total Income | Median Total Income of individuals - 15 Years and Over | | |
|---|---|---|---|---|
| | | All individuals | Male | Female |
| Ontario | $74,287 | $33,539 | $39,889 | $28,676 |
| Dawn-Euphemia (Township) | $70,571 | $30,784 | $37,888 | $23,731 |
| Southwest Middlesex (Municipality) | $64,000 | $32,483 | $38,997 | $26,944 |
| Strathroy-Caradoc (Municipality) | $71,582 | $35,032 | $42,192 | $28,872 |
| Middlesex Centre (Municipality) | $108,971 | $45,800 | $54,946 | $38,694 |

Source: Statistics Canada, 2017a, 2017b.

Figure 3-1 shows the percentage of the employed population by industry in 2012, as released by Statistics Canada (2016).

## Figure 3-1: Distribution of Workforce by Percentage (2012)



## 3.4.2 Community Services and Infrastructure

### Existing Conditions

Demographics

In 2016, the Township of Dawn-Euphemia had a population of 1,970, the Municipality of Southwest Middlesex had a population of 5,720, the Municipality of Strathroy-Caradoc had a population of 20,870 and the Municipality of Middlesex Centre had a population of 17,265 (Statistics Canada, 2017a). Middlesex Centre experienced a modest population increase between 2011 and 2016, slightly above the population growth in Ontario. Dawn-Euphemia, Southwest Middlesex and Strathroy-Caradoc experienced modest decreases in population between 2011 and 2016 (Table 3-10).

**Table 3-10: Population by Gender, Dawn-Euphemia, Southwest Middlesex, Strathroy-Caradoc, Middlesex Centre and Province, 2016**

| Location | Total Population | Male* | Female* | Percent Change from 2011 |
|---|---|---|---|---|
| Ontario | 13,448,494 | 6,559,390 | 6,889,105 | 4.6 |
| Dawn-Euphemia | 1,970 | 1,065 | 910 | -4.0 |
| Southwest Middlesex | 5,720 | 2,845 | 2,880 | -2.3 |
| Strathroy-Caradoc | 20,870 | 10,175 | 10,690 | -0.5 |
| Middlesex Centre | 17,265 | 8,605 | 8,655 | 4.7 |

*Numbers are rounded by Statistics Canada and are reported herein exactly as they are reported by Statistics Canada. Totals may not necessarily add up as a result of rounding.

Source: Statistics Canada, 2017a; 2017c.

In 2016, the average age of the population of Dawn-Euphemia was 41.4 years, Southwest Middlesex was 43.0, Strathroy-Caradoc was 42.3 and Middlesex Centre was 41.1 while the average age of the Ontario population was 41.0.

In 2016, 15 residents of Dawn-Euphemia, 160 residents of Southwest Middlesex, 520 residents of Strathroy-Caradoc, and 195 residents of Middlesex Centre identified themselves as Indigenous. Together this represents approximately 0.2% of the provincial Aboriginal population (374,395; Statistics Canada, 2017a).

Permanent and Temporary Accommodations

In 2016, there were 767 occupied private dwellings in the Township of Dawn-Euphemia. The majority (98%) of homes were single-detached houses. In the Municipality of Southwest Middlesex there were 2,354 occupied private dwellings, and the majority (87%) of homes were single-detached houses. In the Municipality of Strathroy-Caradoc, there were 8,294 occupied private dwellings, and the majority (74%) were single-detached houses. In the Municipality of Middlesex Centre there were 5,983 occupied private dwellings, and the majority (94%) of homes were single-detached houses. In 2016, there were 10 rental households in Dawn-Euphemia, 25 in Southwest-Middlesex, 135 in Strathroy-Caradoc and 675 in Middlesex Centre (Statistics Canada 2017a).

The Township of Dawn-Euphemia, the municipalities of Southwest Middlesex, Strathroy-Caradoc and Middlesex Centre are in Provincial Tourism Region 1 (Southwest Ontario). In 2018, the occupancy rate at temporary accommodations in Region 1 was 64.2%, an increase from 50.6% in 2008 and the highest since 2008 (MTCS, 2016). In 2018 there was a total of 376 temporary accommodations within the Provincial Tourism Region 1, the majority of which being classified as hotels, motels and RV parks accounting for 23%, 21% and 22% of the total accommodations, respectively (MHSTCI, 2018).

Temporary accommodations within and adjacent to the Study Area are limited to small bed-and-breakfasts and one Motel in the Municipality of Strathroy-Caradoc, as well as one SCRCA campground (Shetland Conservation Area) located near the western extent of the preferred route, and one private campground (Trout Haven Park) located in the Municipality of Strathroy-Caradoc in the north-eastern extent of the preferred route.

Municipal Services and Infrastructure

The Township of Dawn-Euphemia is supplied water services through the Township of Enniskillen who in turn receives water from the Town of Petrolia's water treatment plant located in Brights Grove on Lake Huron. The Township of Dawn-Euphemia's Public Works Department is responsible for the operation, repair and maintenance of the distribution system, the repairs and replacement of water meters the flushing of water mains and reading the water meters (Dawn-Euphemia, n.d.).

Southwest Middlesex Utilities operates the municipal water system in the Municipality of Southwest Middlesex. This includes the Village of Glencoe, Appin, Melbourne and Wardsville and all of the rural water mains. Southwest Middlesex Utilities also operates the Glencoe Sanitary System and the Wardsville Sanitary Sewer System (Southwest Middlesex, n.d.).

The Municipality of Strathroy-Caradoc and the Municipality of Middlesex Centre are supplied water services through the Lake Huron Primary Water Supply System (LHPWSS). The LHPWSS also supplies water services to the Municipalities of London, Lambton Shores, North Middlesex, South Huron, Bluewater and Lucan-Biddulph from a water treatment plant located north of the Village of Grand Bend in South Huron. The plant has a current treatment capacity of 340 million liters per day and serves a population of approximately 375,000 people (LHPWSS, n.d.).

Health and Education Services and Infrastructure

The Township of Dawn-Euphemia is located within the Lambton Health Unit and the Municipalities of Southwest Middlesex, Middlesex Centre and Strathroy-Caradoc are located within the Middlesex-London Health Unit. In 2013 the Lambton Health Unit serviced 126,200 individuals while the Middlesex-London Health Unit serviced 439,150 individuals (Statistics Canada, 2012). There are currently two hospitals in the in or adjacent to the Study Area: The Four Counties Health Services and the Strathroy Middlesex General Hospital, both of which are part of the Middlesex Hospital Alliance.

There is one public primary school in the Township of Dawn-Euphemia (Dawn-Euphemia Public School), which is part of the Lambton Kent District School Board. The schools in the Municipalities of Southwest Middlesex, Strathroy-Caradoc and Middlesex Centre are all apart of either the Thames Valley District School Board or the London District Catholic School board. In the Municipality of Southwest Middlesex there is one public high school and two public elementary schools (Glencoe District High School, Ekcoe Central Public School and Mosa Central Public School) and one Catholic elementary school (St. Charles Catholic School). In the Municipality of Strathroy-Caradoc there are five public elementary schools (Caradoc Public School, Caradoc North Public School, Mary Wright Public School, J.S. Buchanen French Immersion, and North Meadows Public School), one public high school (Strathroy District Collegiate Institute), two Catholic elementary schools (St. Vincent de Paul and Our Lady Immaculate), and one Catholic high school (Holy Cross). In the Municipality of Middlesex Centre there are five public elementary schools (Delaware Central Public School, Parkview Public School, Valleyview Central Public School, Oxbow Public School and Centennial Central Public School), one public high school (Medway High School) and one Catholic elementary school (Our Lady of Lourdes).

There is one school located adjacent to the existing route, Dawn-Euphemia Public School, located in Dawn Euphemia. No other schools were identified within 500m of the existing route or alternative segments.

Roads, Highways and Culverts

The Public Works department of the County of Lambton is responsible for managing the County of Lambton Road system, which includes almost 650 km of roadway and over 190 bridges and major culverts. The County of Lambton is responsible for managing Bentpath Line which parallels approximately 15 km of the preferred route. The Roads Division of the Public Works department of the Township of Dawn-Euphemia is responsible for road and culvert maintenance for approximately 40 km of paved roads and 480 km of gravel roads. The Public Works Department of the Municipality of Southwest Middlesex oversees approximately 59 km of hard surface roads and over 360 km of gravel roads, 14 bridges and 67 road culverts. The Engineering and Public Works Department of the Municipality of Strathroy-Caradoc is responsible for all roads, sidewalks and storm sewers within the municipality boundaries. The road network of the Strathroy-Caradoc municipal boundary includes 323 km of roadways comprised of collector, arterial and local roads.

Policing, Fire and Emergency Response Services

The Township of Dawn-Euphemia, the Municipality of Southwest Middlesex and the Municipality of Middlesex Centre have contracted their Police Services with the Ontario Provincial Police. There are three detachments near the preferred route within Middlesex County located in Glencoe, Delaware and Strathroy (OPP, 2020). The Municipality of Strathroy-Caradoc has its own Police Service which employees 31 police officers and 13 civilian staff (Strathroy-Caradoc Police Services, n.d).

Fire Services are provided by trained volunteers in the Municipality of Southwest Middlesex, the Municipality of Strathroy-Caradoc and the Township of Dawn-Euphemia. The Strathroy-Caradoc Fire Department operates three fire stations located in Strathroy, Mount Brydges and Melbourne. The Municipality of Southwest Middlesex operates two stations, one located in Glencoe and the other in Wardsville. The Township of Dawn-Euphemia operates four fire stations, located in Dawn-Euphemia (servicing the former Dawn portion of the Township), Bothwell (servicing the southern part of the former Township of Euphemia), Inwood (servicing the westerly portion of the former Township of Euphemia) and Alvinston (servicing the eastern portion of the former Township of Euphemia). The County of Middlesex provides coordination and dispatching of fire services in these communities via 9-1-1 fire dispatch technology and a county-wide two-way radio communication system. The Municipality of Middlesex Centre maintains a fire services department which consists of five fire stations, staffed full-time by paid, professionally trained, on-call firefighters.

The County of Middlesex is responsible for providing land ambulance services to all residents of the County of Middlesex, including those in the City of London, and Lambton County is responsible for providing land ambulance services to all residents of Lambton County.

### 3.4.3 Culture, Tourism and Recreational Facilities

**Existing Conditions**

The Study Area contains numerous cultural, tourism and recreational facilities including parks and trails, golf courses, museums, community centres and agricultural halls. The Study Area contains several conservation areas and green spaces including Komoka Provincial Park, Lions Park (located in Mount Brydges), Clark Wright Conservation Area and Shetland Conservation Area, access to fishing along the Sydenham River, the Thames River and commercial fishing areas such as Komoka Spring Trout Farm and Trout Haven Park. A local tourist attraction in the area is Kustermans Family Farm, which offers pick-your-own activities for seasonal agricultural products including blueberries, strawberries, raspberries and pumpkins. Kustermans Family farm also operates a farm market, bakery, and adventure farm.

Mapped culture, tourism and recreational facilities within the Study Area are in Appendix C, Figure C-2.

### 3.4.4 Infrastructure

**Existing Conditions**

Infrastructure crossed by the existing route and alternative segments route includes roads/highways, access roads/driveways, hydroelectric lines, a railway (Canadian Pacific Railway), constructed drains and utilities. Existing conditions for roads and highways are outlined in Section 4.4.2. The existing route and alternative segments intersect and run parallel to existing overhead hydro and telecommunications utilities.

The existing route crosses an active CP railway line near CPR Drive, approximately 3 km west of the Municipality of Southwest Middlesex, at Falconbridge Drive leading into the Hydro One Networks Inc. (HONI) facility, also in the Municipality of Southwest Middlesex, at Amiens Road in the Municipality of Middlesex Centre and at Sutherland Road in the Municipality of Strathroy-Caradoc.

A variety of buried utilities such as telecommunication cables, low-voltage hydroelectric lines and watermains are located in road RoWs.

Mapped infrastructure crossed by the existing route and alternative segments route is in Appendix C, Figure C-2.

### 3.4.5 Air Quality and Noise

**Existing Conditions**

Except for the eastern end of the Study Area, which encompasses residential land within Strathroy, the landscape within and adjacent to the Study Area is almost entirely agricultural, open space or natural heritage. Agricultural operations have the potential to expel air emissions. Although the Study Area does not have a high population density, air emissions will be released through automobile use.

According to Environmental Noise Guideline (MECP 2019), the majority of the landscape within and adjacent to the Study Area would be categorized as a Class 3 area, meaning “a rural area with an acoustical environment that is dominated by natural sounds having little or no road traffic, such as a small community; agricultural area; a rural recreational area such as a cottage or a resort area; or a wilderness area.” Portions of the landscape within the Study Area in proximity to town centers and sub-urban areas would be categorized as a Class 2 area, meaning “an area with an acoustical environment that has qualities representative of both Class 1 and Class 3 areas” with an acoustical environmental dominated by the activities of people, usually road traffic during the day, and evening and night background sound defined by natural environment and infrequent human activity.

The area experiences a low traffic volume that represents a minimal source of noise for the majority of the existing route and alternative segments, with increased traffic volume in the vicinity of Enbridge’s Dawn Centre, southwest of the Municipality of Strathroy-Caradoc along Christina Road and Adelaide Road and north east of Mount Brydges. Other minor noise sources within the Study Area include occasional sounds due to anthropogenic agricultural activities and occasional sounds due to anthropogenic domestic activities such as property maintenance and recreation.

### 3.4.6 Contaminated Sites

**Existing Conditions**

According to MECP records, there are no landfills, contaminated sites or hazardous waste sites within 500 m of the existing route or alternative segments.

There are no contaminated sites within the Study Area according to the Federal Contaminated Sites Inventory. The closest known contaminated site is located along Side Road 4, approximately 10 km southeast of the Study Area boundary, within the Munsee-Delaware Nation. At this location contaminated media recorded included petroleum hydrocarbons (PHCs), polycyclic aromatic hydrocarbon (PAHs), and other inorganics found in the soil and inorganics present in the groundwater as well.

Potentially contaminated sites, as identified by the Hazardous Waste Information Network (HWIN), located outside of the Study Area boundary but within the general Project area are noted in Figure C-2, Appendix C.

### 3.4.7 Waste Management

**Existing Conditions**

The County of Lambton currently operates a single landfill within its County boundaries: the Dawn Landfill Site, located approximately 2.5 km west of Oil Heritage Road at 4084 Langbank Line in the Township of Dawn-Euphemia. Middlesex County currently operates two Enviro Depot's; the Denfield Road Enviro Depot located at 23053 Denfeld Road, which accepts yard waste, e-waste, tires, recycling, mixed construction and demolition waste, mixed solid waste, white goods metal, large bulky items and household waste, and the Longwoods Road Enviro Depot located at 10191 Longwoods Road, which accepts yard waste, e-waste, tires and recycling. Middlesex County operates a Recycling Depot, Try Recycling Depot located at 21463 Clarke Road, which accepts yard waste, e-waste, tires, mixed construction and demolition waste, white goods, metal and large bulky items.

The Municipality of Southwest Middlesex operates a transfer station at the site of the former Trillium Landfill, closed in 2018, located at 3945 Trillium Drive. Accepted materials at the Southwest Middlesex transfer station include large household waste, whitegoods, bulk recyclables and clean wood and brush.

Active and closed landfills located outside of the Study Area but within the general Project area are noted in Figure C-2, Appendix C.

### 3.4.8 Land Use

**Existing Conditions**

The Study Area is in the Township of Dawn-Euphemia, the Municipalities of Southwest Middlesex, Strathroy-Caradoc and Middlesex Centre, and in portions of the County of Lambton and County of Middlesex. While most of the preferred pipeline is proposed to be constructed within existing RoWs, some sections cross public and private lands with various designations.

<u>Township of Dawn-Euphemia</u>

According to the Official Plan for the Township of Dawn-Euphemia (2015) lands that are crossed by the Study Area are designated as primarily agricultural and agricultural – no farm dwelling. The remainder of the Study Area in the Township boundary is designated as environmental protection – significant woodlot and institutional. Under Section 12.1.1 (Public Uses and Utilities) "…the following public services and facilities are permitted in all land use categories, subject to the development policies of this Plan…pipelines for the transmission of oil, gas, brine or other liquid products of the oil and gas industry, including any appurtenances thereto".

Municipality of Middlesex Centre

Within the Municipality of Middlesex Centre, the land use designations within the Study Area boundary is primarily agriculture according to the Official Plan (2018), with floodplains occurring in the area of Glendon Drive. The land use designations in the Study Area along Amiens Road, Glendon Drive and Komoka Road include parks and recreation, natural environment, settlement employment, rural commercial, settlement commercial, medium density residential and natural heritage enhancement area. Section 4.11 (Gathering Lines and Works) of the Official Plan states that "subject to consultation with the Municipality or the appropriate road authority, the routing of field or gathering pipelines along road rights-of-ways where it does not impact road safety and maintenance needs" may be allowed by council. As per Section 9.4.5 of the Plan "the construction of major electric power lines, gas or oil pipelines, and other utility lines or services should be located so as to minimize their impact on people, adjacent land uses, and the environment".

Municipality of Strathroy-Caradoc

Within the Study Area in the Municipality of Strathroy-Caradoc boundary, the primary land use designation is agricultural. A section of the Study Area, north of Mount Brydges, is designated as residential. Section 7.1 (Public Utilities and Infrastructure) of the Plan states that "the use land for the provision and maintenance of public utilities and infrastructure (e.g. water supply, sanitary sewage disposal, roads, electricity, natural gas, telecommunications) and any buildings, structures or appurtenances thereto shall be permitted in all land use designations in accordance with any and all environmental requirements and approvals without an amendment to this Plan or the Zoning By-Law".

Municipality of Southwest Middlesex

In the Municipality of Southwest Middlesex, the land use designation in the Study Area is entirely agricultural according to the Official Plan (2019). As per Section 6 (Infrastructure) of the Plan "the use of land for the provision and maintenance of public utilities and infrastructure (e.g., water supply, sanitary sewage disposal, roads, electricity, natural gas, telecommunications) and any buildings, structures or appurtenances thereto shall be permitted in all land use designations in accordance with any and all environmental requirements and approvals without an amendment to this Plan".

### 3.4.9 Archaeological Resources

**Existing Conditions**

A Stage 1 Archaeological Assessment (AA) (Appendix F) has been conducted for the route evaluation Study Area. The Stage 1 AA was completed in accordance with the Ministry of Heritage, Sport, Tourism and Culture Industries' (MHSTCI) 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario, 2011). A copy of the completed Stage 1 AA report will be submitted to the MHSTCI for review and inclusion into the *Ontario Public Register of Archaeological Reports*.

Initial background research compiled information concerning registered archaeological resources and sites within the Study Area. A query of the *Ontario Archaeological Sites Database* identified 100 registered archaeological sites within one (1) kilometre of the Study Area, with five (5) of these sites either within, or within 50 metres, of the Study Area. Background research through a query of the *Ontario Public*

*Register of Archaeological Reports* identified 23 previous archaeological assessments which may document work within the broad Stage 1 AA study area or within 50 metres of it. An inspection of the study area by a licensed archaeological was completed between November 25, 2019 and June 19, 2020.

The Stage 1 AA determined that portions of Study Area retain potential for the identification and documentation of archaeological resources. Figure 17 in Appendix F provides an illustration of archaeological potential for the project.

### 3.4.10 Heritage Resources and Cultural Heritage Landscapes

**Existing Conditions**

The MHSTCI *Criteria for Evaluation Potential for Built Heritage Resources and Cultural Heritage Landscapes Checklist* (the Checklist) was completed for the Study Area. The Checklist is used to identify protected and potential heritage properties within the study area and make recommendations for future work, as appropriate.

In order to identify heritage resources, the MHSTCI, Ontario Heritage Trust (OHT), Township of Dawn Euphemia, Municipality of Southwest Middlesex, Municipality of Strathroy-Caradoc, and Municipality of Middlesex Centre were consulted. As a result of the consultation, no protected properties or heritage interests were identified. At the provincial level, Karla Barboza, Team Lead, Heritage with MHSTCI confirmed that there are no provincial heritage properties or properties designated by the Minister within or adjacent to the Study Area. Kevin De Mille, Heritage Planner with OHT, reported that there are no OHT conservation easements or Trust owned properties within or adjacent to the Study Area.

At the municipal level, Terri Towstiuc, Deputy Clerk, with the Township of Dawn Euphemia, provided a Council resolution from their regular meeting held on March 2, 2020, that the Council is to advise Stantec that to the best of their knowledge there are no municipal heritage interests within or adjacent to the study area. Shelia McCahon, Deputy Clerk, with the Municipality of Southwest Middlesex provided a link to the Middlesex County interactive map, which provides information on Significant Woodlands, Natural Heritage, SAR, Wetlands and Conservation Areas. The Municipality of Southwest Middlesex does not have any listed or designated heritage properties. Jennifer Huff, Planner, with the Municipality of Strathroy-Caradoc, confirmed that there are no protected heritage resources within or adjacent to the study area. Jake Strauss, Transportation Manager, with the Municipality of Middlesex Centre, confirmed that the municipality does not have any heritage municipal properties or interests in the study area.

The Checklist was completed for the Study Area based on the results of the background research, agency consultation, and review of historic mapping. Overall, five indicators of cultural heritage value or interest (CHVI) were identified in the Study Area. Results of the Checklist are included in Table 3-11 and the completed checklist is included in Appendix G.

**Table 3-11: Screening for Known (or recognized) Cultural Heritage Value According to the MHSTCI Checklist**

| Indicators of Cultural Heritage Value or Interest | Identified within the Study Area |
|---|---|
| Property identified, designated or otherwise protected under the OHA as being of cultural heritage value | Not identified |
| A National Historic Site (or part of) | Not identified |
| Designated under the *Heritage Railway Stations Protection Act* | Not identified |
| Designated under the *Heritage Lighthouse Protection Act* | Not identified |
| Identified as a Federal Heritage Building by the Federal Heritage Buildings Review Office | Not identified |
| Located within a United Nations Educational, Scientific and Cultural Organization World Heritage Site | Not identified |
| Is subject of a municipal, provincial or federal commemorative or interpretative plaque | Not identified |
| Has or is adjacent to a known burial site and/or cemetery | Identified |
| Is in a Canadian Heritage River watershed | Identified |
| Contains buildings or structures that are 40 or more years old | Identified |
| Is considered a landmark in the local community or contains any structures or sites that are important in defining the character of the area | Identified |
| Has a special association with a community, person or historical event | Not identified |
| Contains or is part of a cultural heritage landscape | Identified |

## 3.4.11 Indigenous Interests

### Existing Conditions

There are no Indigenous communities located within the Study Area, however, the MENDM identified the potential for impacts to the following Indigenous communities:

- Aamjiwnaang First Nation;
- Caldwell First Nation;
- Chippewas of Kettle and Stoney Point;
- Chippewas of the Thames First Nation;
- Oneida Nation of the Thames; and,
- Walpole Island First Nation.

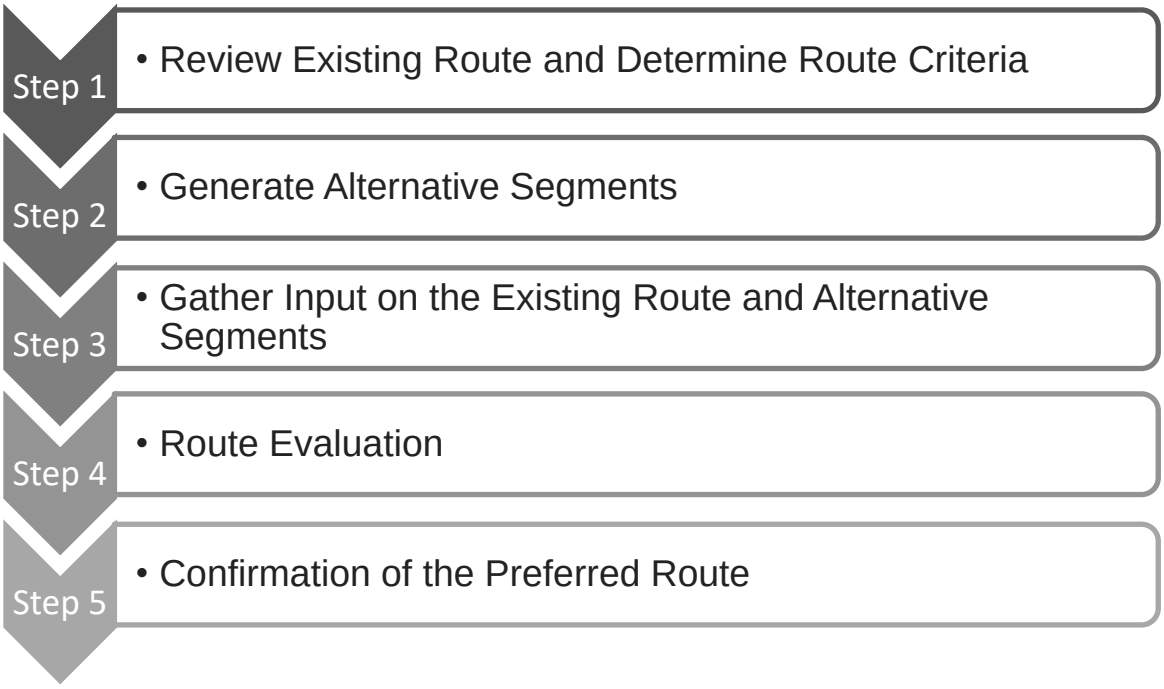
Ontario, as the Crown, has a legal duty to consult with Indigenous peoples regarding projects or decisions that may adversely impact constitutionally protected Indigenous or treaty rights.

# 4.0 ROUTE EVALUATION AND SELECTION

## 4.1 THE PROCESS

The route evaluation process was undertaken as per the *OEB Environmental Guidelines* (2016), which identify the environmental and socio-economic features to take into consideration and the principles to be considered during the route evaluation. The preferred route for the proposed project was confirmed through a five-step process, as illustrated in Figure 4-1.

**Figure 4-1: Route Evaluation Methodology**




## 4.2 STUDY AREA

The Study Area (Figure A-1, Appendix A) encompasses an area of approximately 11,921 hectares (ha) within the Township of Dawn-Euphemia, Municipalities of Southwest Middlesex, Middlesex Centre, Strathroy-Caradoc and in the Counties of Lambton and Middlesex. The Study Area is the area within which direct interactions with the socio-economic and natural environment could occur and allow for a reasonable number of alternative segments to be considered. Alternative route segments were located within the existing municipal road allowances, where possible. As such, the Study Area was established extending 500 m on either side of the existing route and alternative segments. It is within this area that desktop information on socio-economic and environmental features has been collected for assessing the potential impacts of the Project.

# 4.3 STEP 1: DETERMINE ROUTE CRITERIA

## 4.3.1 Routing Objectives

The routing methodology is influenced by Enbridge's preference to utilize existing municipal road allowance to locate the preferred pipeline route (Figure A-2, Appendix A). Stantec's role was to determine through qualitative and quantitative assessment the environmentally preferred route for the Project.

The process of developing alternative routes commenced with the identification of routing objectives. These include:

- Routes should follow a reasonably direct path between end-points from connections to existing infrastructure, thus reducing length as well as potential for socio-economic and environmental and effect.
- Routes should avoid sensitive socio-economic and environmental features to the extent possible; where they cannot be avoided routes should be located to reduce effects.
- If road allowance cannot be followed, existing linear infrastructure should be utilized to the greatest extent possible to reduce effects to previously undisturbed land and/or constrain future land development.
- Where new easements are required, existing lot/property lines should be followed to the extent possible within the Study Area.

## 4.3.2 Environmental and Socio-Economic Opportunities and Constraints

The route selection process was completed with consideration of the *OEB Environmental Guidelines* (2016). Chapter 4 of the *OEB Environmental Guidelines* (2016), 'Route or Site Selection', outlines the socio-economic and environmental features that should be considered during route evaluation.

A geographical information system (GIS)-based environmental inventory was compiled to identify existing features in the Study Area. Once the inventory was complete, Stantec classified the features as either pipeline routing constraints or opportunities.

Socio-economic and environmental constraints are existing features that meet the following criteria:

- The feature would require site-specific mitigation measures to reduce potential effects.
- The feature has been selected or designated for protection.
- The feature has been recognized through local, regional, provincial, or federal policy, plan, or statute, or is otherwise valued as an environmental or socio-economic resource.

Socio-economic opportunities are existing features, such as property lines or existing linear infrastructure, which provide a suitable location for the alignment of the pipeline.

Existing features were identified using published literature, maps and digital data, and discussions with agencies and the Municipalities of Strathroy-Caradoc, Middlesex Centre, Southwest Middlesex, the Township of Dawn-Euphemia, and the Counties of Lambton and Middlesex, and confirmed through field visits. The location and extent of socio-economic and environmental features are outlined in Section 3 of this ER and illustrated in Figure C-2, C-3, C-4 and C-5, Appendix C.

## 4.4 STEP 2: GENERATE ROUTE OPTIONS

Generation of route alternatives was based on the routing objectives, Study Area, and environmental and socio-economic constraints and opportunities identified in Step 1. Alternative route generation was conducted by staff from Stantec and Enbridge, using aerial photography interpretation, and mapping of existing environmental and socio-economic constraints and opportunities. Alternative segments were selected to follow roadways where possible, and were assigned letters to selected route sections, as shown in Appendix A, Figure A-2.

The existing route sections are comprised of sections: A through G.

The alternative route segments are comprised of segments H through Z and segment AA. These route segments were grouped into four sections, based on relative location, as described below in Sections 4.4.2 – 4.4.5.

### 4.4.1 Existing Route

The existing route follows the road RoWs and pipeline easements where the London Lines pipeline sections are currently located, and includes route sections A through G:

- Route section A commences at the Enbridge Dawn Centre located at 3012 Bentpath Line, proceeding along Bentpath Line, and ends at the point on Bentpath Line where the pipeline leaves the road RoW and begins to travel along the pipeline easement.
- Route section B extends from the point on Benthpath Line, extending along the pipeline easement and ending at the intersection of Mosside Line and McAuslan Road.
- Route section C beings at the intersection of Mosside Line and McAuslan Road, continuing along Mosside Line ending at the intersection of Mosside Line and Watterworth Road.
- Route section D beings at the intersection of Mosside Line and Watterworth Road and then travels along the existing pipeline easement, ending at the intersection of Falconbridge Drive and Dundonald Road.
- Route section E1 beings at the intersection of Falconbridge Drive and Dundonald Road, travelling along Falconbridge Drive and ends southeast of the intersection of Falconbridge Drive and Adelaide Road.

- Route section E2 beings southeast of the intersection of Falconbridge Drive and Adelaide Road, travelling across the pipeline easement, across Springwell Road, under Highway 402 and ending at the intersection of Amiens Road and the CN line to Amiens Road.
- Route section F extends southeast along Amiens Road then northeast along Glendon Drive, ending at the point where the pipeline easement leaves the road RoW.
- Route section G extends from Glendon Drive, along the existing pipeline easement and ending at the intersection with Komoka Road.

### 4.4.2 Alternative Segment 1 – Florence (F1)

Segment 1 was developed as an alternative to route section B of the existing route. Segment 1 (F1) includes route segment H:

- F1 (Route segment H) extends from the segment of Bentpath Line where the existing route begins to cross the pipeline easement, proceeding north along Forest Road then east along Mosside Line to the segment of the existing route reaches Mosside Line.

### 4.4.3 Alternative Segment 2 – Glencoe

Segment 2 was developed as an alternative to route section D of the existing route. Within Segment 2, three distinct routes were developed.

#### 4.4.3.1 Glencoe 1 (G1)

The first of three distinct routes within Segment 2 (G1), includes route segments I, K, L, N, O and Q:

- Route segment I extends from the segment of Mosside Line where the existing route beings to cross the pipeline easement, proceeding south along Watterworth Road, then northeast along Oilfield Drive at the intersection with Big Bend Road.
- Route segment K extends from the intersection of Big Bend Road and Oil Field Drive, travelling along Oil Field Drive then proceeding southeast along Pratt Siding Road to the intersection with Knapdale Drive.
- Route segment L extends from the intersection of Pratt Siding Road and Knapdale Drive, travelling southeast along Pratt Siding Road then proceeding northeast along CPR Drive to the intersection with Old Airport Road.
- Route segment N extends from the intersection of Knapdale Drive and Old Airport Road, travelling southeast along Old Airport Road to the intersection with CPR Drive.
- Route segment O extends from the intersection of Knapdale Drive and Old Airport Road, travelling northeast along Knapdale Drive then at the intersection of Knapdale Drive and Dundonald Road travelling southeast to the intersection of CPR Drive and Dundonald Road.

- Route segment Q extends from the intersection of Dundonald Road and CPR Drive to the segment of the existing route at the intersection of Dundonald Road and Falconbridge Drive.

#### 4.4.3.2 Glencoe 2 (G2)

The second of three distinct routes within Segment 2 (G2), includes route segments J, K, L, P and Q:

- Route segments J extends from the segment of Mosside Line where the existing route begins to cross the pipeline easement, proceeding north along Watterworth Road, then northeast along Argyll Drive, then south along Big Bend Road to the intersection with Oil Field Drive.
- Route segments K extends from the intersection of Big Bend Road and Oilfield Drive, travelling along Oilfield Drive then proceeding southeast along Pratt Siding Road to the intersection with Knapdale Drive.
- Route segments L extends from the intersection of Pratt Siding Road and Knapdale Drive, travelling southeast along Pratt Siding Road then proceeding northeast along CPR Drive to the intersection with Old Airport Road.
- Route segments P extends from the intersection of CPR Drive and Old Airport Road, travelling northeast along CPR Drive to the intersection with Dundonald Road.
- Route segments Q extends from the intersection of Dundonald Road and CPR Drive to the segment of the existing route at the intersection of Dundonald Road and Falconbridge Drive.

#### 4.4.3.3 Glencoe 3 (G3)

The third distinct route within Segment 2 (G3), includes route segments I, K, M, N, P and Q:

- Route segment I extends from the segment of Mosside Line where the existing route beings to cross the pipeline easement, proceeding south along Watterworth Road, then northeast along Oil Field Drive at the intersection with Big Bend Road.
- Route segment K extends from the intersection of Big Bend Road and Oil Field Drive, travelling along Oil Field Drive then proceeding southeast along Pratt Siding Road to the intersection with Knapdale Drive.
- Route segment M extends from the intersection of Knapdale Drive and Pratt Siding Road, travelling northeast along Knapdale Drive to the intersection with Old Airport Road
- Route segment N extends from the intersection of Knapdale Drive and Old Airport Road, travelling southeast along Old Airport Road to the intersection with CPR Drive.
- Route segment P extends from the intersection of CPR Drive and Old Airport Road, travelling northeast along CPR Drive to the intersection with Dundonald Road.

- Route segment Q extends from the intersection of Dundonald Road and CPR Drive to the segment of the existing route at the intersection of Dundonald Road and Falconbridge Drive.

### 4.4.4 Alternative Segment 3 – Komoka (K1)

Segment 3 was developed as an alternative to route sections E2, F and G of the existing route. Segment 3 (K1) includes route segments R and S:

- Route segment R extends from the segment of Falconbridge Drive, south of Adelaide Road, where the existing route begins to cross the pipeline easement, then proceeds northeast along Falconbridge Drive, travelling under Highway 402, then proceeding along Avro Drive, then southeast along Amiens Road to the segment of the existing route at the intersection of Amiens Road and the Canadian National Railway line.
- Route segment S extends from the segment of Glendon Drive where the existing route beings to cross the pipeline easement, continuing northeast along Glendon Drive, then travelling southeast along Komoka Road to the intersection of Komoka Road and the existing route segment.

### 4.4.5 Alternative Segment 4 – Strathroy Extension

Three alternatives were proposed for the pipeline extension from the existing pipeline route to the Municipality of Strathroy-Caradoc.

#### 4.4.5.1 Strathroy Extension 1 (S1)

The first of the three alternatives, Strathroy Extension 1 (S1), includes route segments U, V, Z and AA:

- Route segment U extends from the intersection of Adelaide Road and Christina Road, travelling west along Adelaide Road, then southeast along Walkers Drive to the intersection with Sutherland Road.
- Route segment V extends from the intersection of Walkers Drive and Sutherland Road, travelling northwest along Sutherland Road and then northeast along Calvert Drive.
- Route segment Z extends from the intersection of Christina Road and Olde Drive, travelling northwest along Christina Road to the intersection of Christina Road and Adelaide Road.
- Route segment AA extends from the segment of the existing route at the intersection of Falconbridge Drive and Christina Road, travelling northwest along Christina Road to the intersection of Olde Drive and Christina Road.

### 4.4.5.2 Strathroy Extension 2 (S2)

The second of the three alternatives, Strathroy Extension 2 (S2) includes route segments T, U and V:

- Route segment T extends from the segment of the existing route at the intersection of Adelaide Road and Falconbridge Drive, travelling west along Adelaide Road to the intersection with Christina Road.
- Route segment U extends from the intersection of Adelaide Road and Christina Road, travelling west along Adelaide Road, then southeast along Walkers Drive to the intersection with Sutherland Road.
- Route segment V extends from the intersection of Walkers Drive and Sutherland Road, travelling northwest along Sutherland Road and then northeast along Calvert Drive.

### 4.4.5.3 Strathroy Extension 3 (S3)

The third of three alternatives, Strathroy Extension 3 (S3), includes route segments AA, X, W and V:

- Route segment AA extends from the segment of the existing route at the intersection of Falconbridge Drive and Christina Road, travelling northwest along Christina Road to the intersection of Olde Drive and Christina Road.
- Route segment X extends from Christina Road along Olde Drive, to the intersection with Sutherland Road.
- Route segment W extends from the intersection of Sutherland Road and Olde Drive, proceeding northwest along Sutherland Road to the intersection of Sutherland Road and Walkers Drive.
- Route segment V extends from the intersection of Walkers Drive and Sutherland Road, travelling northwest along Sutherland Road and then northeast along Calvert Drive.

### 4.4.5.4 Strathroy Extension 4 (S4)

Through consultation with the Municipality of Strathroy-Caradoc, further alternative segments were added along Sutherland Road and Olde Drive. The routes were reviewed internally by Enbridge's Engineering and Operations groups and the routes were determined to be feasible. These alternative segments, collectively called S4, were identified as route segments W, X and Y:

- Route segment W extends from the intersection of Sutherland Road and Olde Drive, proceeding northwest along Sutherland Road to the intersection of Sutherland Road and Walkers Drive.
- Route segment X extends from the intersection of Olde Drive and Sutherland Road, travelling northeast along Olde Drive to the intersection of Olde Drive and Christina Road.
- Route segment Y extends from the segment of the existing route at the intersection of Falconbridge Drive and Sutherland Road, travelling northwest along Sutherland Road to the intersection of Sutherland Road and Olde Drive.

No feasible alternatives were determined for route sections A, C or E1. These three route sections were carried forward when developing the preferred route and were therefore not included in the route evaluation in Section 4.5 below.

# 4.5 STEP 3: ROUTE EVALUATION

## 4.5.1 Evaluation Methodology

The existing route and alternative segments underwent a comparative evaluation to predict the potential environmental and socio-economic effects of constructing and operating each route section and to determine which route was preferred from both an environmental and socio-economic perspective. The following are criteria were included in the comparative evaluation:

- **Agricultural:** Length of prime agricultural land and artificial agricultural drainage traversed. While the pipeline will be largely constructed within the road allowance there may be instances where TWS may affect agricultural land adjacent to the route section.
- **Route Length:** Length (m).
- **Aquatic:** Number of watercourses crossed.
- **Registered Archeological Sites:** Number of registered archaeological sites within 500 m.
- **Groundwater Resources:** Number of water wells (domestic and livestock wells only) within 150 m of the route sections.
- **Socio-Economic – Infrastructure:** Infrastructure traversed (roads and utility lines).
- **Oil and Gas Wells:** Oil and Gas wells within 100 m of the route sections.
- **Terrestrial Resources:** Total length of PSWs traversed (within 10 m) and total length of CA regulated areas (m).

The buffers that were used were chosen based on the likelihood of the Project to impact these features. The route evaluation features selected to determine the preferred route from the existing route and alterative segments are summarized in the table below.

### 4.5.2 Agricultural

The soils in the Study Area are classified by the CLI as predominantly Class 2. Soils in Class 2 have moderate limitations that reduce the choice of crops or require moderate conservation practices. For this evaluation criteria, soils classified in CLI 1, CLI 2 and CLI 3 were considered as prime agricultural lands.

**Table 4-1: Agricultural Summary Table**

| Route Sections and Route Segments | Prime Agricultural Land (km) |
|---|---|
| **Segment 1 – Florence** | |
| Existing Route (ER) (section B) | **4.4** |
| F1 (segment H) | 5.5 |
| **Segment 2 – Glencoe** | |
| ER (section D) | **9.4** |
| G1 (segments I, K, L, N, O, Q) | 15.9 |
| G2 (segments J, K, L, P, Q) | 13.2 |
| G3 (segments I, K, M, N, P, Q) | 14.4 |
| **Segment 3 – Komoka** | |
| ER (sections E2, F, and G) | 7.7 |
| K1 (segments R and S) | **6.6** |
| **Segment 4 – Strathroy Extension** | |
| S1 (segments U, V, Z, AA) | 9.6 |
| S2 (segments T, U, V) | 11.4 |
| S3 (segments AA, X, W, V) | 9.7 |
| S4 (segments V, W, Y) | **8.3** |

Note: Bolded numbers indicate the preferred option.

The length of prime agricultural land along route sections B and D is less than the alternatives in Segment 1 – Florence and Segment 2 – Glencoe. In Segment 3 – Komoka and in Segment 4 – Strathroy Extension K1 and S4, respectively, parallel the least amount of prime agricultural land.

### 4.5.3 Route Length

Comparing the total length of route sections and route segments is appropriate as a broad scoping tool that yields a measurement relating to total disturbed area. Typically, shorter routes have fewer environmental and socio-economic impacts. The following table compares the route lengths of the existing route sections and alternative segments in Segments 1 through 4:

**Table 4-2: Route Length Summary Table**

| Route Sections and Route Segments | Route Length (km) |
|---|---|
| **Segment 1 – Florence** | |
| ER (section B) | **4.4** |
| F1 (segment H) | 5.5 |
| **Segment 2 – Glencoe** | |
| ER (section D) | **3.1** |
| G1 (segments I, K, L, N, O, Q) | 17.5 |
| G2 (segments J, K, L, P, Q) | 13.4 |
| G3 (segments I, K, M, N, P, Q) | 14.7 |
| **Segment 3 – Komoka** | |
| ER (sections E2, F, and G) | **8.4** |
| K1 (segments R and S) | 9 |
| **Segment 4 – Strathroy Extension** | |
| S1 (segments U, V, Z, AA) | 10.4 |
| S2 (segments T, U, V) | 11.4 |
| S3 (segments AA, X, W, V) | 10.9 |
| S4 (segments V, W, Y) | **8.5** |

Note: Bolded numbers indicate the preferred option.

The distance of the route sections in Segment 1 – Florence, Segment 2 – Glencoe and Segment 3 – Komoka is less than their respective alternatives. In Segment 4 – Strathroy Extension, S4 is the shortest route out of the four alternatives.

### 4.5.4 Aquatic Characteristics

Minimizing the number of watercourse crossings along the preferred route reduces the potential impact of pipeline construction on watercourse features. A comparative summary of the route section and route segments is provided in Table 4-3 below.

**Table 4-3: Aquatic Characteristics Summary Table**

| Route Sections and Route Segments | Watercourses Crossed (#) |
|---|---|
| **Segment 1 – Florence** | |
| PPR (section B) | **4** |
| F1 (segment H) | 6 |
| **Segment 2 – Glencoe** | |
| PPR (section D) | **8** |
| G1 (segments I, K, L, N, O, Q) | 11 |
| G2 (segments J, K, L, P, Q) | 9 |
| G3 (segments I, K, M, N, P, Q) | 10 |
| **Segment 3 – Komoka** | |
| PPR (sections E2, F, and G) | **4** |
| K1 (segments R and S) | 6 |
| **Segment 4 – Strathroy Extension** | |
| S1 (segments U, V, Z, AA) | 5 |
| S2 (segments T, U, V) | **4** |
| S3 (segments AA, X, W, V) | 7 |
| S4 (segments V, W, Y) | 5 |

Note: Bolded numbers indicate the preferred option.

In Segment 1 – Florence, Segment 2 – Glencoe, and Segment 3 – Komoka, the route sections cross fewer watercourses than the respective alternatives. In Segment 4 – Strathroy Extension, S2 crosses the least number of watercourses in comparison to the other alternatives.

### 4.5.5 Registered Archaeological Sites

**Table 4-4: Registered Archaeological Sites Summary Table**

| Route Sections and Route Segments | Registered Archaeological Sites (#) within 500 m |
|---|---|
| **Segment 1 – Florence** | |
| PPR (section B) | 0 |
| F1 (segment H) | 0 |
| **Segment 2 – Glencoe** | |
| PPR (section D) | 0 |
| G1 (segments I, K, L, N, O, Q) | 0 |
| G2 (segments J, K, L, P, Q) | 0 |
| G3 (segments I, K, M, N, P, Q) | 0 |
| **Segment 3 – Komoka** | |
| PPR (sections E2, F, and G) | 21 |
| K1 (segments R and S) | **14** |
| **Segment 4 – Strathroy Extension** | |
| S1 (segments U, V, Z, AA) | 5 |
| S2 (segments T, U, V) | 5 |
| S3 (segments AA, X, W, V) | 6 |
| S4 (segments V, W, Y) | **3** |

Note: Bolded numbers indicate the preferred option.

While no registered archaeological sites exist within 500 m of the route sections in Segment 1 – Florence and Segment 2 – Glencoe, there are sites present within Segment 3 – Komoka and Segment 4 – Strathroy Extension. In Segment 3 – Komoka, K1 in the contains less registered archaeological sites than the route sections, while S4 in Segment 4 – Strathroy Extension contains less registered archaeological sites than the other alternatives.

### 4.5.6 Groundwater Resources

The number of water wells within 150 m of the route sections and route segments was determined using data provided by the MECP. A number of abandoned, test or wells with an unknown classification are present within the Study Area. For this reason, only domestic and livestock wells were considered in this evaluation. The 150 m buffer was used as this is considered a maximum zone of influence from construction dewatering and possible blasting activities that could potentially impact water wells. It is very unlikely that impacts to water well beyond this distance would be expected. Table 4-5 below provides a comparison of the number of groundwater wells within 150 m of each of the alternatives.

### Table 4-5: Groundwater Resources Summary Table

| Route Sections and Route Segments | Water Wells Within (#) within 150 m |
|---|---|
| **Segment 1 – Florence** | |
| PPR (section B) | 9 |
| F1 (segment H) | **6** |
| **Segment 2 – Glencoe** | |
| PPR (section D) | **4** |
| G1 (segments I, K, L, N, O, Q) | 18 |
| G2 (segments J, K, L, P, Q) | 14 |
| G3 (segments I, K, M, N, P, Q) | 18 |
| **Segment 3 – Komoka** | |
| PPR (sections E2, F, and G) | **7** |
| K1 (segments R and S) | 26 |
| **Segment 4 – Strathroy Extension** | |
| S1 (segments U, V, Z, AA) | 37 |
| S2 (segments T, U, V) | 49 |
| S3 (segments AA, X, W, V) | 30 |
| S4 (segments V, W, Y) | **16** |

Note: Bolded numbers indicate the preferred option.

There were fewer groundwater wells present within the 150 m of the route sections in Segment 2 – Glencoe and Segment 3 – Komoka, while in the Segment 1 – Florence the route segment contained fewer groundwater wells. In the Segment 4 – Strathroy Extension S4 contained fewer groundwater wells than the other alternatives.

### 4.5.7 Socio-Economic – Infrastructure

Table 4-6 below provides a comparison of the number of roads traversed and utility lines crossed by the route sections and the route segments.

**Table 4-6: Socio-Economic – Infrastructure Summary Table**

| Route Sections and Route Segments | Roads Traversed (#) | Utility Lines (#) |
|---|---|---|
| **Segment 1 – Florence** | | |
| PPR (section B) | 3 | **0** |
| F1 (segment H) | **2** | **0** |
| **Segment 2 – Glencoe** | | |
| PPR (section D) | **7** | **0** |
| G1 (segments I, K, L, N, O, Q) | 10 | **0** |
| G2 (segments J, K, L, P, Q) | 11 | **0** |
| G3 (segments I, K, M, N, P, Q) | **7** | **0** |
| **Segment 3 – Komoka** | | |
| PPR (sections E2, F, and G) | **8** | **0** |
| K1 (segments R and S) | 10 | **0** |
| **Segment 4 – Strathroy Extension** | | |
| S1 (segments U, V, Z, AA) | 23 | **1** |
| S2 (segments T, U, V) | **17** | **1** |
| S3 (segments AA, X, W, V) | 35 | **1** |
| S4 (segments V, W, Y) | 27 | 3 |

Note: Bolded numbers indicate the preferred option.

The total number of roads crossed along the route sections and route segments in Segment 1 – Florence, Segment 2 – Glencoe and Segment 3 – Komoka were all very similar. In Segment 4 – Strathroy Extension S2 crossed only 17 roads while alternatives S1, S3 and S4 crossed between 23-35 roads. No utility lines appear to be crossed in Segment 1 – Florence, Segment 2 – Glencoe or Segment 3 – Komoka, while Segment 4 – Strathroy Extension alternatives S1, S2 and S3 all cross a single utility line and alternative S4 crosses 3 utility lines.

### 4.5.8 Oil and Gas Wells

Table 4-7 below provides a comparison of the number of oil and gas wells within 100 m of each of the route sections and route segments.

**Table 4-7: Petroleum Wells Summary Table**

| Route Sections and Route Segments | Petroleum Wells Within (#) 100 m |
|---|---|
| **Segment 1 – Florence** | |
| PPR (section B) | **0** |
| F1 (segment H) | 2 |
| **Segment 2 – Glencoe** | |
| PPR (section D) | 6 |
| G1 (segments I, K, L, N, O, Q) | **4** |
| G2 (segments J, K, L, P, Q) | 7 |
| G3 (segments I, K, M, N, P, Q) | 7 |
| **Segment 3 – Komoka** | |
| PPR (sections E2, F, and G) | **0** |
| K1 (segments R and S) | 1 |
| **Segment 4 – Strathroy Extension** | |
| S1 (segments U, V, Z, AA) | **0** |
| S2 (segments T, U, V) | **0** |
| S3 (segments AA, X, W, V) | 2 |
| S4 (segments V, W, Y) | **0** |

Note: Bolded numbers indicate the preferred option.

### 4.5.9 Terrestrial Characteristics

Table 4-8 below provides a comparison of the length of CA regulated areas crossed and the length of PSWs within 10 m of each of the route sections and route segments.

**Table 4-8: Terrestrial Characteristics Summary Table**

| Route Sections and Route Segments | CA Regulated Areas (m) | Wetlands (m) |
|---|---|---|
| **Segment 1 – Florence** | | |
| PPR (section B) | **1,503.7** | n/a |
| F1 (segment H) | 3,665.2 | n/a |
| **Segment 2 – Glencoe** | | |
| PPR (section D) | 3,074.5 | 271 |
| G1 (segments I, K, L, N, O, Q) | 3,505 | 298 |
| G2 (segments J, K, L, P, Q) | 2,670.2 | **137** |
| G3 (segments I, K, M, N, P, Q) | **2,631.3** | 298 |
| **Segment 3 – Komoka** | | |
| PPR (sections E2, F, and G) | **2,565.3** | **511** |
| K1 (segments R and S) | 4,283.7 | 1,262 |
| **Segment 4 – Strathroy Extension** | | |
| S1 (segments U, V, Z, AA) | 1,918.4 | n/a |
| S2 (segments T, U, V) | **1,156.4** | n/a |
| S3 (segments AA, X, W, V) | 1,801 | m/a |
| S4 (segments V, W, Y) | 1,403.4 | n/a |

Note: Bolded numbers indicate the preferred option.

### 4.5.10 Discussion of Assessment

A review of potential impacts along all existing route sections and alternative segments was conducted on the criteria of eight (8) environmental and socio-economic components. Within Segments 1-4, each route section and route segment were compared and ranked for the features assessed. The rankings were then totaled with the lowest number given as 1 and highest number given as a 2, 3 or 4 if there are three or four alternatives. For example, when comparing the total length of the route section and the route segment in Segment 1 – Florence, the route section (section B, 4.4 km) would receive a score of 1 and the route segment (segment H, 5.5 km) would receive a score of 2 as the section B is 1.1 km shorter than segment H.

Table 4-9 shows the results of the evaluation for the segments.

### Table 4-9: Assessment Summary Table

| Evaluation Feature | Ranking of Sections and Segments | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Segment 1 – Florence | | Segment 2 – Glencoe | | | | Segment 3 – Komoka | | Segment 4 – Strathroy Extension | | | |
| | PPR | S1 | PPR | G1 | G2 | G3 | PPR | K1 | S1 | S2 | S3 | S4 |
| Agricultural | 1 | 2 | 1 | 4 | 2 | 3 | 2 | 1 | 2 | 4 | 3 | 1 |
| Route Length | 1 | 2 | 1 | 4 | 2 | 3 | 1 | 2 | 2 | 4 | 3 | 1 |
| Aquatic Characteristics | 1 | 2 | 1 | 4 | 2 | 3 | 1 | 2 | 2 | 1 | 3 | 2 |
| Registered Archaeological Sites | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 2 | 3 | 1 |
| Groundwater Resources | 2 | 1 | 1 | 3 | 2 | 3 | 1 | 2 | 3 | 4 | 2 | 1 |
| Infrastructure - Roads | 2 | 1 | 1 | 2 | 3 | 1 | 1 | 2 | 2 | 1 | 4 | 3 |
| Infrastructure – Utility Lines | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| Petroleum Wells | 1 | 2 | 2 | 1 | 3 | 3 | 1 | 2 | 1 | 1 | 2 | 1 |
| Terrestrial Characteristics – CA Area | 1 | 2 | 3 | 4 | 2 | 1 | 1 | 2 | 4 | 1 | 3 | 2 |
| Terrestrial Characteristics - Wetlands | 1 | 1 | 2 | 3 | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 1 |
| **TOTALS** | **12** | 15 | **14** | 27 | 19 | 22 | **13** | 16 | 20 | 20 | 25 | **15** |

Note: Bolded numbers indicate the preferred option.

Based on the route ranking results, as noted above, the preferred route should consist of route sections A, B, C, D, E1, F and G and route segments Y, W, and V. As a result of consultation with the municipalities and conservation authorities, responses provided during the Virtual Open House, and internal review by the Enbridge Engineering and Operations groups, it was determined that sections C, D, F and G were not viable. These results are discussed in Section 4.6 below.

## 4.6 STEP 4: INPUT ON THE EXISTING ROUTE AND ALTERNATIVE SEGMENTS

During pre-consultation for the Project, the Municipality of Strathroy-Caradoc proposed route alternatives to those initially established by Enbridge and Stantec. The route alternatives (route segments Y, W and V) were added to the Project.

During a meeting with the County of Middlesex and the Municipality of Middlesex Centre, discussions were held regarding a recent Environmental Study for road improvement work along Glendon, including the intersection at Komoka. At the intersection of Glendon and Komoka, the County noted they are planning for a road widening, increasing to four lanes, and adding a boulevard, as well as a 2-lane entry roundabout. To avoid a future request from the County that the pipeline be relocated so that the planned municipal road work could occur, Enbridge will pursue obtaining easements in this specific intersection to install the pipeline, therefore for Segment 3 – Komoka the alternative segment K1 will be included in the preferred route instead of the existing route sections F and G.

At the intersection of Bentpath Line and Oakdale Road intermediate pressure gas mains run on the north and south side of Bentpath Line, from west of 5669 Bentpath through the intersection of Oakdale Road and into the pressure regulating station on the east side of the intersection. Both the north and south side of the road allowance have existing gas mains installed to maintain safe proximity from the existing intermediate pressure mains and to avoid proposing to install under the travelled road way for this length, it was decided that the new pipeline would follow the route of the existing pipeline in easement.

Although the analysis of the route sections and the route segments determined that the route section in Segment 1 – Florence, and the route section in Segment 2 – Glencoe were the preferred choices, Enbridge will proceed with the option to construct the pipeline along the alternative segments, through the road RoW as this will reduce the potential impacts to prime agricultural land, groundwater resources, roadways and potential negative impacts to landowners and residents.

From a distribution operations perspective, installing the pipeline in the road RoW is preferred, as providing customer connections and future maintenance will be easier, and significantly less maintenance such as tree clearing is involved,  in comparison to installing the pipeline in the easements. Pipeline installation in the road RoW also lessens the potential for impacts on landowners and adjacent agricultural fields. Locating the pipeline in the road RoW also provides access to natural gas for additional customers.

The analysis of the route sections and route segments for Segment 1 – Florence deemed that the scoring for the alternative segment was very close to the result for the route section (15 vs. 12, respectively). The analysis of the route sections and route segments for Segment 2 – Glencoe deemed that the scoring for alternative G2 was very close to the route section result (19 vs. 14, respectively). Therefore, the preferred route includes F1 in Segment 1 – Florence, and G2 in Segment 2 – Glencoe.

A Virtual Open House was held between April 20, 2020 to May 1, 2020 to provide details on the Project and to receive feedback on the existing route and alternative segments. Comments and/or concerns submitted on the routing included the following:

- Concerns regarding the existing London Lines, and if these sections of pipeline will be abandoned in place or removed.
- Concerns regarding impact to high value crops, depth of the pipeline and how this will impact tilling and other agricultural activities if the final preferred pipeline route travels across agricultural fields instead of within existing road RoWs.

## 4.7 STEP 5: CONFIRMATION OF THE PREFERRED ROUTE

Following the comparative evaluation (Section 4.5) and based on input received (Section 4.6), the route sections and route segments in the preferred route include:

- Route section A
- Route segment H
- Route section C
- Route segment J
- Route segment K
- Route segment L
- Route segment P
- Route segment Q
- Route section E1
- Route segment R
- Route segment S
- Route segment Y
- Route segment W
- Route segment V

The confirmed preferred route is shown in Appendix D, Figure D-1.

The preferred route is currently illustrated within existing route easements and road RoWs; Enbridge will undertake detailed design to determine the exact location of the pipeline within and adjacent to the road allowances. Detailed design will also be influenced by supplemental studies (i.e., geotechnical investigations, etc.) and site-specific requests from landowners, businesses, the municipalities and agencies. This information will be used to locate the pipeline to further minimize environmental and socio-economic impacts to the extent possible. Information on the detailed design to that point will be provided in the application to the OEB.

# 5.0 POTENTIAL IMPACTS, MITIGATION AND PROTECTIVE MEASURES AND NET IMPACTS

## 5.1 METHODOLOGY

The potential effects and impacts of the project on physical, biophysical and socio-economic features have been assessed within the Study Area upon review of the existing conditions as noted in Sections 3.2 - 3.4.

This assessment:

- Predicts the effects and associated impacts of pipeline construction and operation activities
- Recommends supplemental studies, mitigation and protective measures (including pipeline construction methods and timing, site-specific mitigation, environmental protection measures, and compensation measures)
- Outlines the remaining net impacts

The determination of effects, impacts, and mitigation and protective measures considered:

- Comments expressed during the consultation program
- Information available from published and unpublished literature
- Maps and digital data
- Mitigation guidance documents
- Field assessments conducted by Stantec technical staff
- The pipeline development experience of Enbridge and Stantec

There are instances where field investigations are recommended along the preferred pipeline route before construction, as noted below in Table 5-1. Given the location of the project components and experience of Stantec in providing environmental services for natural gas pipelines, these supplemental studies are not expected to change the conclusions regarding potential adverse residual impacts.

Table 5-1 below notes the potential impacts, mitigation and protective measures, including recommended supplemental studies, and net impacts for the existing conditions as described in Sections 3.2 - 3.4.

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| **PHYSICAL FEATURES** | | | |
| Bedrock Geology and Drift Thickness<br>*Section 3.2.1* | The planned excavation depth of the project is approximately 1 m below grade, with the potential to exceed this depth for watercourse, road crossings and other sensitive features. Based on the shallow nature of the excavations and the depth to bedrock, bedrock is not expected to be encountered. As such, no potential impacts are anticipated. | N/A | No significant adverse residual impacts to bedrock geology and drift thickness are anticipated. |
| Surficial Geology and Physiography<br>*Section 3.2.2* | Disturbance to the overburden within the Study Area may cause surface soil erosion and trench slumping during construction or post-construction at areas that may require further rehabilitation. | Surface soil erosion can occur in the absence of vegetative cover. Where there is potential for soil erosion, the need for and location of erosion and sediment control (ESC) measures should be determined by an inspector with appropriate qualifications and installed prior to the commencement of work in the area.<br>When land is exposed, the exposure should be kept to the shortest practical period. Natural features should be preserved to the extent practical. Temporary vegetation and mulching should be used to protect areas as appropriate. Where required, natural vegetation should be re-established as soon as practical.<br>The contractor must obtain adequate quantities of materials to control erosion. Additional supplies should be maintained in a readily accessible location for maintenance and contingency purposes. ESC structures should be monitored to maintain their effectiveness through the life of construction and post-construction rehabilitation.<br>Even with ESC measures, extreme precipitation events could result in collapse of silt fencing, overflow or bypass of barriers, and other situations which could | With the implementation of the mitigation and protective measures, no significant adverse residual impacts to or from the overburden material are anticipated. |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | | lead to erosion. When site conditions permit, permanent protection measures should be installed on erosion susceptible surfaces. If the erosion is resulting from a construction-related activity, the activity should be halted immediately until the situation is rectified.<br>To avoid the trench from slumping, trench walls should be sloped and should be monitored during wet conditions for the potential to slump.<br>Slope stability should be reviewed at watercourse crossing locations. Watercourse banks should be seeded and stabilized immediately following crossing. ESC and stabilization measures should be maintained during construction, restoration, and rehabilitation until vegetative cover is established. Where evidence of erosion exists, corrective control measures should be implemented as soon as conditions permit. Permits obtained under O. Reg. 152/06 from LTVCA, O. Reg. 157/06 from UTRCA or O. Reg. 171/06 from SCRCA may contain conditions pertaining to ESC. | |
| Hydrogeology<br>*Section 3.2.3* | <u>Hydrostatic Testing and Dewatering/Sand-Pointing</u><br>The pipeline will be hydrostatically tested before commissioning. Select sections of pipe may also be pre-tested, such as at road crossings. Water required for the testing may be obtained from a municipal or natural source. Before the withdrawal of water from a municipal source, the municipality will be contacted to confirm the maximum rate of withdrawal.<br>Where trenches encounter shallow groundwater conditions or following a large precipitation event, removing water | <u>Hydrostatic Testing and Dewatering/Sand-pointing</u><br>For groundwater dewatering, the MECP allows registration under the EASR for construction dewatering projects where groundwater takings will be greater than 50,000 L/day and less than 400,000 L/day; however, should groundwater takings exceed 400,000 L/day, a PTTW may be required from the MECP.<br>If surface water is used as the source water for the hydrostatic test, a PTTW application would be required and would include an assessment of the capacity of the source to provide the required water without impacting the ecosystem, and recommendations for mitigation measures such as screened water intakes to limit intake of debris and organisms and energy | With the implementation of the mitigation and protective measures, no significant adverse residual impacts on groundwater are anticipated. |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | from the trench (known as dewatering) may be necessary. It is also anticipated that sand-pointing (temporarily lower the water table during construction) may be necessary in select locations where shallow groundwater may be encountered. During trench dewatering, discharge water will be released to the environment. An uncontrolled discharge of water could cause downstream flooding, erosion, sedimentation, or contamination. Other potential effects of uncontrolled discharge may include introduction of foreign aquatic organism to a drainage basin and introduction of hazardous materials or pollutants to soils or bodies of water.<br><br><u>Private Water Wells</u><br><br>There are approximately 600 water supply wells within 500 m of the existing route and alternative segments, 370 of which are domestic. Of the 160 WWR mapped within a 50-m radius, which have the most potential to be impacted by the pipeline installation, 110 were screened within the overburden at depths ranging from 4 m BGS to 44 m BGS. Depending on the proximity to wells, the depth of the well installation and the groundwater levels encountered during excavation, trench dewatering has the potential to impact water well quality or quantity at some of the overburden supply wells.<br><br><u>Municipal Water Supply</u> | dissipation/erosion control measures during discharge to limit erosion and sedimentation.<br><br>To reduce the potential for erosion and scouring at discharge locations during construction dewatering/sand-pointing and/or hydrostatic testing, energy dissipation techniques should be used. Discharge piping should be free of leaks and should be properly anchored to prevent bouncing or snaking during surging. Protective measures may include dewatering at low velocities, dissipating water energy by discharging into a filter bag or diffuser and utilizing protective riprap or equivalent. If energy dissipation measures are found to be inadequate, the rate of dewatering should be reduced or dewatering discontinued until satisfactory mitigation measures are in place. Discharge should be monitored to make sure that no erosion or flooding occurs.<br><br>To assess the potential for introduction of contaminated water to soils or bodies of water, testing of hydrostatic and trench dewatering discharge water should be considered. Testing requirements can be influenced by the nature and quality of the source water used, any additives to the test water, the nature of the pipeline, and pipeline contents. An environmental consultant should be consulted to determine what testing is necessary for the discharge water.<br><br><u>Private Water Wells</u><br><br>A private well survey should be conducted to assess domestic groundwater use near the pipeline route and a private well monitoring program may be recommended for residents who rely on overburden groundwater supply for domestic use. This monitoring program may include pre--construction water quality monitoring as well as water level monitoring, if | |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | The Study Area does not extend through any WHPAs associated with any municipal groundwater supply system or any IPZ associated with any municipal surface water supply systems. Based on the Clean Water Act (2006), the construction activities related to the installation of the preferred pipeline route do not pose a threat to the drinking water supply. | available. Should a private water well be affected by project construction, a potable water supply should be provided, and the water well should be repaired or restored as required.<br><u>Municipal Water Supply</u><br>There are no nearby municipal supply wells, and therefore additional mitigation measures are not required to protect groundwater drinking supply sources.<br>During construction, the primary concern to surface water quality is the potential for a contaminant spill during a large storm event. To address this concern, the following mitigation measures are proposed:<br>• Refueling of equipment should be undertaken 100 m from wetlands and watercourses to reduce potential impacts to surface water and groundwater quality if an accidental spill occurs. If a 100 m refueling distance is not possible, under approval from on-site environmental personnel, special refueling procedures for sensitive areas should be undertaken that include, at a minimum, using a two-person refueling system with one worker at each end of the hose.<br>• To reduce the impact of potential contaminant spills, the contractor should implement spill management protocols such as secondary containment of any temporary fuel storage and preparation of a spill response plan.<br>• Work should be limited or stopped during and immediately following significant precipitation events (i.e. 100-year storm event), at the discretion of on-site environmental personnel. | |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| Extractive Resources: Aggregates and Petroleum Pools<br>*Section 3.2.4* | No impacts anticipated. | N/A | No significant adverse residual impacts on extractive resources are anticipated. |
| Soil and Soil Capability<br>*Section 3.2.5* | The preferred pipeline will be primarily constructed within existing municipal road allowances and existing easement, with some temporary lands required for construction purposes. Where temporary lands are required limited impacts to agricultural lands may occur. Where there is interaction with agricultural land, there are potential impacts to topsoil as a result of construction including compaction, loss of organic matter and degraded soil structure. Where feasible, topsoil will not be removed from the site. Excess subsoil may be removed from the site.<br>Trenching and construction activities across agricultural land have the potential to affect soil quality and agricultural capability. The movement of heavy machinery on wet soil may cause rutting, compaction, and mixing of topsoil with subsoil. When exposed, soils are more prone to erosion due to the loss of vegetative cover. Improperly salvaged topsoil can result in topsoil and subsoil mixing, compaction, rutting, and erosion, which can potentially decrease crop yields.<br>Where equipment is moving from one agricultural field to another there is the | <u>Excess Soil</u><br>Should excess soil be generated on-site during construction activities that will require off-site management, or if contaminated soils are suspected (e.g., if observed material contains anthropogenic substances, petroleum hydrocarbons odours/staining, and debris/waste), representative soil samples should be collected in accordance with O. Reg. 406 /19, and submitted for chemical analysis to determine management options and appropriate handling and health and safety guidelines.<br>Soils that cannot be reused on site may be reused off-site in accordance with O. Reg. 406/19.<br><u>Wet Soil Shutdown</u><br>To the extent feasible, construction activities should occur during drier times of the year. Agricultural lands affected by heavy rainfall events should be monitored for wet soil conditions, to avoid the potential for topsoil and subsoil mixing and loss of structure. Construction activities should be temporarily halted on lands where excessively wet soil conditions are encountered. Enbridge's on-site inspection team should determine when construction activities may be resumed.<br>If a situation develops that necessitates construction during wet soil conditions, soil protection measures should be implemented, such as confining construction activity to the narrowest area practical, installing surface protection measures, and using wide tracked or low ground pressure vehicles. | With the implementation of the mitigation and protective measures, no significant adverse residual impacts on soil or soil capability are anticipated. |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | potential for the spread of soil pests/diseases to previously unimpacted fields. | <u>High Winds</u><br>During construction activities, weather should be monitored to identify the potential onset of high wind conditions and to preserve topsoil. In the event that high winds occur, the contractor should implement protective measures such as:<br>• Suspend earth moving operations<br>• Apply dust suppressants or vegetate the piles<br>• Protect soil stockpiles with a barrier or windscreen<br>In conjunction with the above measures, all required materials and equipment should be readily accessible and available for use as required.<br><u>Soil Stripping</u><br>Within agricultural lands Enbridge should discuss with the landowner the proposed method of handling topsoil on their property. Landowner requests, and preferences for additional stripping or no stripping, should be accommodated where practicable. Topsoil depths should be measured prior to stripping so that the proper depth of topsoil is removed and replaced. Where stripping is undertaken on agricultural lands, topsoil and subsoil should be stripped and stockpiled separately to avoid mixing. Where the pipeline crosses woodlands the organic and duff layer should be stripped where feasible, given local substrate conditions. Where stripping is undertaken in woodlots, organic material and subsoil should be stripped and stockpiled separately to avoid mixing.<br>If clean-up is not practical during the construction year, it should be undertaken in the year following construction, starting once the soils have sufficiently dried. Interim soil protection measures should be | |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | | implemented in sensitive areas to stabilize the RoW for over-wintering.<br><br>Soil Compaction<br><br>Within agricultural lands where soil has been compacted by the construction process, an agrologist should determine where decompaction may be necessary. Compaction can be alleviated by using farm equipment such as an agricultural subsoiler prior to replacing the topsoil. Sub-soiling with an agricultural subsoiler, followed by discing, chisel ploughing and cultivating, to smooth the surface, should be considered on agricultural lands. In high traffic areas of the RoW where deep compaction persists, additional deep tillage or subsoiling may be required on a site-specific basis. Soil density and/or penetrometer measurements on and off the easement may be used as a means of assessing the relative degree of soil compaction caused by construction along the RoW as well as determining that the RoW has been sufficiently decompacted.<br><br>Soil Pests/Diseases<br><br>In consultation with the landowner and an agrologist, Enbridge will develop and implement an agricultural soil sampling plan for potential pests and/or diseases that are known to the area. If the results indicate an issue or concern, in consultation with the landowner, Enbridge will work with the agrologist to develop a best practice protocol.<br><br>Any imported topsoil used for rehabilitation will also have a composite sample analyzed for identified concerns before it is placed on the easement. | |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| Agricultural Tile Drains<br>*Section 3.2.6* | The preferred pipeline will be constructed within existing municipal road allowances and existing easements, with some temporary lands required for construction purposes. Where temporary lands are required limited impacts to agricultural lands may occur. Where there is interaction with agricultural land, construction activities, including trenching and the movement of heavy machinery, have the potential to crush and/or sever agricultural tile drains. | Enbridge should undertake consultation with landowners of agricultural fields to confirm where systematic tile drainage is present. If tile drainage is present, Enbridge should undertake standard mitigation during trenching, including:<br>• Develop site specific tile plans with an independent tile contractor<br>• Conduct pre-tiling, and install header tile to maintain tile system function<br>• Excavate the pipeline trench to a depth that allows clearance between the top of the pipeline and the bottom of existing drainage systems<br>• Record and flag severed or crushed tile drains<br>• If a main drain, header drain, or large diameter drain is severed, maintain field drainage and prevent flooding of the work area and adjacent lands through temporary repairs<br>• Cap the downstream side of severed drains that cross the trench to prevent the entry of soil, debris and rodents, as required<br>• Repair damaged and severed drains following construction<br>• After repair and before backfilling, invite the landowner to inspect and approve the repair | With the implementation of the mitigation and protective measures, no significant adverse residual impacts on agricultural tile drains are anticipated. |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| Natural Hazards<br>*Section 3.2.7* | The probability of significant seismic activity in the Study Area is low; therefore, no potential impacts are anticipated.<br>The likelihood of a flooding event interfering with pipeline construction is reduced by construction occurring outside of the spring freshet. A flooding event during construction could result in construction delays, soil erosion, sedimentation of a watercourse, trench slumping, and damage or loss of construction equipment and contamination of a watercourse as a result of equipment entering a watercourse. The nature of these impacts would depend on the spatial extent, duration, and magnitude of the flooding event. | If flooding necessitates a change in the construction schedule, affected landowners and regulatory agencies should be notified and construction should continue at non-affected locations. Temporary workspaces should be located above the floodplain to the extent practical, unless necessary for watercourse crossings. All work in the floodplains will be subject to a permit under O. Reg.157/06 from UTRCA, O. Reg.152/06 from LTVCA or O. Reg. 171/06 from SCRCA. | With the implementation of the mitigation and protective measures, no significant adverse residual impacts from natural hazards are anticipated. |
| **BIOPHYSICAL FEATURES** | | | |
| Aquatic Features<br>*Section 3.3.1* | The existing route and alternative segments cross 115 watercourses, including 7 watercourses that support habitat for fish and mussel species at risk. Industry standard watercourse crossing methods that meet the requirements of DFO for fish and fish habitat protection will be used during construction. These plans include "isolated" watercourse crossing methods such as the Dam and Pump crossing method, and trenchless crossing methods such as the HDD method.<br><u>Dam and Pump Crossing</u> | Mitigation and protective measures for erosion and sediment control are outlined in this table in *Surficial Geology and Physiography* and for accidental spills in *Hydrogeology.*<br>Temporary vehicle crossings and dam and pump pipeline crossings should be completed following the measures outlined in industry standards and company specifications for construction.<br>The following general mitigation measures, or equivalent, are recommended at watercourse crossings along the preferred pipeline route. Additional, activity-specific measures related to the crossing methods are provided following the general mitigation measures. All measures presented are intended to be | With the implementation of the mitigation and protective measures, no significant adverse residual impacts to aquatic features are anticipated. |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | The Dam and Pump Crossing method isolates water flow from the construction area and also avoids the majority of the technical risks inherent in other crossing techniques, such as damage to pipe integrity, achieving good cathodic protection, being accessible for maintenance, and increased cost and schedule. Construction of an open cut crossing has the potential to affect fish directly through impacts on water quality (erosion, sedimentation, and accidental spills), disruption/harassment (vibration and noise) and loss of habitat. Indirect impacts include restrictions to habitat use and fish passage. Long term impacts can include changes to habitat such as substrate, increased erosion potential, loss of in-stream cover and riparian shading.<br><u>Horizontal Directional Drilling</u><br>HDD may be utilized to install the preferred pipeline underneath a watercourse at select crossing locations. The HDD process involves drilling a pilot bore hole underneath the watercourse and<br>back-reaming the bore hole to the drill rig while pulling the pipe along through the hole. This process typically uses the freshwater gel mud system composed of a mixture of freshwater as the base, bentonite (clay-based drilling lubricant) as the viscosifier, and synthetic polymers. Potential impacts that may result from HDD include the escape of | consistent with DFO's measures to protect fish and fish habitat (DFO 2019b), but DFO's website (https://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures-eng.html) should be consulted immediately prior to construction to confirm that the construction plan is consistent with the most up-to-date list of DFO avoidance measures.<br><u>General Mitigation Measures</u><br>• In-water work for warmwater habitats is typically permitted from July 1 to March 15 (no work from March 16 to June 30) (MNRF 2013). Warmwater habitats are documented at 17 watercourse crossings. In-water work for coldwater habitats is typically permitted from June 1 to September 30 (restricted from October 1 – May 31) (MNRF 2013). Coldwater habitats are documented from background data at 30 watercourse crossings (WC-105, WC-106, WC-107, WC-108). The remaining 68 watercourse crossings in the Study Area did not have a documented thermal regime.<br>• Watercourses should not be obstructed in a way that impedes the free movement of water and fish.<br>• Prior to removal of the vegetation cover, effective mitigation techniques for erosion and sedimentation should be in place to protect water quality. Disturbance to the area during construction should be limited and grubbing activities should be delayed until immediately prior to grading operations.<br>• Soil exposure should be reduced prior to commencing construction, and the period that soil remains exposed for grading should be limited. Exposed soils surrounding watercourses should be seeded immediately following construction. | |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | drilling mud into the environment, tunnel collapse, or the inadvertent release of fluid to the surface. HDD may also result in excessive disturbance of riparian vegetation and sedimentation and erosion due to operation of equipment on the shoreline. | • Temporary erosion and sediment control measures should be maintained and kept in place until work within or near a watercourse has been completed and stabilized. Temporary sediment control measures should be removed at the completion of the work but not until permanent erosion control measures have been established.<br>• Construction material, excess material, construction debris and empty containers should be stored a minimum of 30 m from watercourses and watercourse banks.<br>• Equipment maintenance and refueling should be controlled to prevent entry of petroleum products or other deleterious substances, including any debris, waste, rubble or concrete material, into a watercourse, unless otherwise specified in the contract.<br>• Deleterious substances (fuel, oil, spoil) should be stored >30 m from the watercourse. Any such material that inadvertently enters a watercourse should be removed in a manner satisfactory to the environmental inspector.<br>• In the unlikely event of a spill, spills containment and clean-up procedures should be implemented immediately. Enbridge will contact the MECP Spills Action Centre. The MECP Spills Action Centre is the first point of contact for spills at the provincial and federal level.<br>• Conditions of water crossing permit(s), if applicable, will be adhered to.<br>• Additional supplies should be maintained on-site, in a readily accessible location, for maintenance and contingency purposes. Prior to construction, adequate quantities of the materials listed below, or comparable substitutions, should be on site to control erosion and sediment deposition: | |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | | – Sediment control fencing<br>– Sediment control logs (i.e., SiltSoxx™)<br>– Straw bales<br>– Wooden stakes<br>– Sand bags<br>– Water energy dissipater<br>– Filter cloth<br>– Water pumps (including stand-by pumps and sufficient lengths of hose)<br>– Culvert<br><br><u>Horizontal Directional Drill Mitigation Measures</u><br><br>HDD construction methods for pipeline water crossings that do not support habitat for fish or mussel species at risk will not require DFO review or Authorization under the *Fisheries Act* provided measures to protect fish and fish habitat are followed during construction. These measures include locating entry and exit points at sufficient distance to avoid disturbance to the bed and banks, locating the drill path at an appropriate depth below the channel and installation of appropriate sediment and erosion control measures (i.e., silt fencing around disturbed areas, development of a contingency plan, etc.). If these measures are followed, a project of this nature is low risk to fish and can proceed without DFO review.<br><br>Mitigation measures as they relate to employing the HDD method are as follows:<br><br>• Standard erosion and sediment control measures should be implemented around drill and pipe staging areas.<br>• Prior to initiating an HDD, appropriate geotechnical data should be obtained to assist in determining the drill path. | |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | | • Drilling equipment (e.g., drill rig, support equipment, sump) should be set up a minimum of 30 m from the edge of watercourses, where possible.<br>• Clearing of vegetation or grading of watercourse banks should not occur within 30 m from the edge of watercourses, if possible.<br>• A drilling mud release contingency plan should be prepared and kept on-site.<br>• Environmental inspectors should be present during crossing of the seven watercourses supporting aquatic species at risk. The Environmental inspectors will be present to monitor for accidental mud release into these watercourses during HDD activities.<br>• Suitable drilling mud tanks or sumps should be installed to prevent contamination of watercourses.<br>• Berms or check dams should be installed downslope from drill entry and anticipated exit points to contain the release of any drilling mud.<br>• Drilling mud should be disposed in accordance with the appropriate regulatory authority requirements.<br><u>Bore Path Collapse Mitigation Measures</u><br>The following mitigation measures should be applied as recommended by geotechnical studies to prevent HDD borehole collapse from occurring in susceptible soils:<br>• Fluid volumes, annular pressure and cutting returns should be strictly monitored to ensure bore hole plugging and fluid losses are detected and addressed immediately.<br>• Alternative drill paths should be evaluated to minimize exposure to challenging soil materials. | |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | | • Drilling mud should be maintained in the borehole until the pipeline is installed. This can be facilitated by positioning the entry and exit points in areas with cohesion less soils (e.g., silt-sand zones).<br><br><u>Drilling Mud Release (Inadvertent Returns) Mitigation Measures</u><br><br>The following mitigation measures should be employed to reduce the risk of lost drilling mud circulation:<br><br>• Install appropriate berms, silt fencing and secondary containment measures (i.e., plastic tarp) around drilling and drilling mud management equipment at both bore entry and bore exit locations to contain operational spills.<br>• Clean up operational spills daily to prevent mobilization of drilling mud off site during rain events.<br>• Design the directional drill so that drilling slurry pressure is minimized, and the drilling rate is reduced in porous materials to minimize the chance of loss of circulation of the drilling slurry.<br>• Maintain smooth operation of the drilling string and slurry pumping systems to avoid pressure surges.<br>• Reduce slurry viscosity through appropriate filtering of drilled material to reduce the pressure gradient along the drill path due to frictional effects.<br>• Continually monitor slurry volumes to enable a quick response to any indications of lost circulation.<br>• Immediately contain any drilling mud that escapes onto land and transfer it into an on-site containment system.<br><br>The following materials should readily available during drilling operations and prepared to employ them in the | |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | | event of a drilling mud spill or inadvertent return: sandbags, straw bales, silt fencing and a hydrovac truck.<br><u>Additional Measures</u><br>The following measures are applicable to trenched crossings:<br><u>*Flow Diversion/Dewatering*</u><br>If in-water works are required, the work area should be isolated from the remainder of the surface water feature. Downstream flows should be maintained using dam and pump techniques. When dewatering the work area, dewatering operations should be managed to prevent erosion and/or release of sediment laden or contaminated water to the waterbody (e.g. settling basin, filter bag, energy dispersion measures). An isolation/contamination plan should be designed and implemented to isolate temporary in-water work zones and maintain flow around the work zone. Maintenance of downstream flow should avoid potential upstream flooding and desiccation of downstream aquatic habitat and organisms.<br><u>*Fish Rescue Plan*</u><br>Prior to dewatering the work zone, fish trapped in the construction area should be collected and moved using capture, handling, and release techniques to reduce harm and stress. The intakes of pumping hoses should be equipped with an appropriate device to avoid entraining and impinging fish (see Interim code of practice: End of pipe fish protection screens for small water intakes in freshwater at the following DFO website https://www.dfo-mpo.gc.ca/pnw-ppe/codes/screen-ecran-eng.html). Fish rescue plans should be developed on a site-specific basis and implemented by qualified professionals with the | |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | | appropriate licence in place (i.e. MNRF Licence to Collect Fish for Scientific Purposes).<br><br>*Site Restoration and Riparian Planting*<br><br>Following construction, the bed and banks of the crossing locations should be restored to pre-construction conditions to the extent possible in accordance with environmental permits. Bank slopes should be restored to match existing grades; however, alterations may be made to maintain slope stability and limit future erosion. Exposed banks should be re-vegetated with native plants to provide riparian cover and aid in erosion and sediment control. Stream beds should be restored to maintain slopes and tie in with existing grades. Bed material should be replaced to match pre-construction conditions.<br><br>*Permitting*<br><br>On August 28, 2019 provisions of the amended Fisheries Act came into force including new protections for fish and fish habitat. The Fisheries Act prohibits causing death of fish or the HADD of fish habitat unless authorized by the DFO. This applies to work being conducted in or near watercourses and water bodies that support fish or fish habitat. If potential impacts can be mitigated, then a review by DFO is not required. If impacts cannot be fully mitigated and/or where aquatic species at risk habitat is identified, a Request for Project Review will need to be submitted to DFO for their review and approval, and comment on whether construction of the pipeline will result in a HADD of fish habitat.<br><br>The pipeline route will be located within the regulated boundary of the LTVCA, UTRCA, and SCRCA. Permits under Ontario Regulation 152/06, 157/06 and 169/06 and 171/06, respectively, will be required prior to | |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | | construction activities in the regulated boundaries. Due to the presence of endangered and threatened aquatic SAR at WC-01, WC-02, WC-03, WC-28, WC-29, WC-107 and WC-108, the HDD drill entry and exit pits must be located at least 30 m from bankfull width to avoid requiring a permit under the SARA. If activities are required below the normal highwater mark, then the DFO must be contacted to determine if a SARA Permit is required. If crossings supporting aquatic SAR cannot be crossed using HDD, then the alternative crossing methods should be reviewed by DFO to determine if a permit under SARA is required. | |
| Designated Natural Areas and Vegetation<br>*Section 3.3.2* | The existing route and alternative segments occur primarily in municipal road allowance, however the routes cross or come in proximity to woodlands and wetlands, including six and two provincially significant wetlands along the Existing/Alternative and Alternative Segments Routes, respectively. Field surveys will be conducted prior to construction to refine the mapping of wetlands. ELC and botanical surveys will be conducted prior to construction to assess the significance and boundaries of vegetation communities and to identify vascular plant species, including plant species of concern. The results of the surveys will be used to confirm mitigation and protection measures.<br>Where there is natural vegetation within or adjacent to the existing routes and alternative segments, potential impacts include the removal of native vegetation, introduction or spread of invasive | Environmental mitigation and protective measures during construction include the following:<br>• Provide notice to the Counties and UTRCA, LTVCA and SCRCA prior to clearing.<br>• Clearing should be minimized to the extent possible in sensitive areas such as woodlots, along watercourses, and in areas of significant groundwater recharge.<br>• The limits of clearing should be surveyed and staked in the field, to allow for the protection of off-site natural areas and vegetation.<br>• Brush and trees should be felled within the project footprint.<br>• Clearing should be done during dry soil conditions to the extent practical to limit disturbance to vegetation and terrain.<br>• A screening field program of wetlands and riparian areas should be undertaken prior to construction, to determine where precautionary measures (e.g. equipment washing before site access) may be necessary to mitigate for the spread of non-native species. | With the implementation of the mitigation and protective measures, no significant adverse residual impacts on designated natural areas and vegetation are anticipated. |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | species, and indirect effects such as dust, erosion, and accidental spills. | • A re-vegetation program should be initiated for all vegetated temporary work areas. Enbridge should consult with landowners, UTRCA, LTVCA and SCRCA to confirm replanting plans.<br>• All applicable municipal and county tree clearing, and re-vegetation by-laws will be followed<br>• Seeding of the disturbed temporary work areas and permanent easement should be done with a native seed mix reviewed by UTRCA, LTVCA or SCRCA. Replaced soils containing native seed bank, assisting in successful revegetation.<br>• One year following construction, planted vegetation should be inspected for survival; in areas of severe dieback, dead and diseased planted vegetation should be replaced.<br>Mitigation and protective measures for dust are outlined in *Soil and Soil Capability*, for erosion in *Surficial Geology and Physiography*, and for accidental spills in *Hydrogeology*. | |
| Wildlife, Wildlife Habitat and Species at Risk<br>*Section 3.3.3* | Due to the presence of woodlots, wetlands, hedgerows, watercourses and open fields in proximity to the existing route and alternative segments, field surveys will be undertaken before construction to assess the presence or absence of wildlife and wildlife habitat, including SAR. Planned surveys include a botanical inventory, mammal surveys (bat habitat assessment), breeding bird surveys and SAR habitat assessments. The results of all surveys, including any additional appropriate mitigation or protection measures, will be summarized in a report and shared with | Environmental mitigation and protective measures during construction include the following:<br>• Detailed design of the preferred pipeline should be reviewed to avoid and reduce the likelihood of impact upon wildlife habitat to the extent possible, and in particular habitats of endangered, threatened, special concern and rare species.<br>• Equipment and vehicles should yield the RoW to wildlife.<br>• Trench operations should be followed as closely as practical with backfill operations, to facilitate the movement of wildlife across the trench.<br>• Gaps in stockpiles should be created, in consultation with a biologist, to allow for the potential movement of wildlife across the RoW. | With the implementation of the mitigation and protective measures, no significant adverse residual impacts on wildlife, wildlife habitat and SAR are anticipated. |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | the MECP to determine any regulatory requirements.<br><br>Potential impacts on wildlife and wildlife habitat from construction include direct mortality from construction vehicles, habitat damage through vegetation removal, habitat degradation through spills and sensory disturbance of wildlife during construction. | • Fencing should be erected around deep excavations to prevent wildlife entrapment.<br>• The contractor should inform their personnel to not threaten, harass or injure wildlife.<br>• If wildlife are encountered during construction, personnel are required to move away from the animal and wait for the animal to move off the construction site.<br>• Where practical, avoid construction in the vicinity of areas that may provide habitat for amphibians during the amphibian breeding season (March 1 – June 30).<br>• Habitat assessments and species occurrence surveys will be conducted for SAR. A report will be prepared to document results and recommend mitigation measures.<br>• Areas of potential bat maternity roosting habitat will be identified during field investigations. Tree removal in identified areas should be limited to the extent possible and will avoid the active season for bats (mid-April to mid-September). Mitigation recommendations for SAR bats will be prepared upon consultation with MECP.<br>• Construction activities with the potential to remove migratory bird habitat, such as vegetation clearing, should be avoided during the breeding season which is generally from April 1- August 31 in southern Ontario (Environment Canada, 2017). Should vegetation clearing activities be unavoidable during this window, a mitigation program should be developed, which includes measures to reduce and avoid impacts to migratory birds and their nests (Government of Canada, 2018). This program should include preventative and mitigation measures but may | |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | | also include avoidance of clearing during key sensitive periods and in key locations.<br>• If SAR are found along the preferred pipeline route Enbridge will undertake consultation with the MECP regarding the potential need for a permit under the ESA and/or species-specific mitigation.<br>Mitigation and protective measures are outlined in Section 4.3.2 for vegetation removal and Section 4.2.3 for accidental spills. | |
| **SOCIO-ECONOMIC ENVIRONMENT** | | | |
| Employment and Business<br>*Section 3.4.1* | Project demands for labour and goods and services can result in both beneficial and adverse effects. Positive effects may not be evenly distributed among populations, with some residents in a better position to receive economic benefits than others. Similarly, adverse effects may affect some residents more than others. Residual effects on employment are related to the project's labour demand compared to the labour supply. Three types of employment are considered:<br>• Direct employment: labour that is hired directly for the project<br>• Indirect employment: labour hired by companies in order to produce and provide goods and services needed for the project<br>• Induced employment: labour hired by industries that produce and provide consumer items and services purchased by people who | It is expected that the project will generally result in positive effects on employment by employing local and Indigenous people, and by reducing the unemployment rate in the region. These positive effects do not require mitigation, but Enbridge will identify and implement various mechanisms to enhance project benefits.<br>The potential effects of the project as a result of purchasing labour, goods and services is expected to be positive during construction and operation, so no mitigation will be required. However, Enbridge has and will continue to work with local and Indigenous businesses to enhance their potential for successfully bidding on project contracts regarding the supply of goods and services, particularly for the operation phase. One initiative to help encourage further local and Indigenous content on the project is to post project purchasing requirements in advance, so that businesses can position themselves to effectively bid to supply goods and services needed for construction and operation. Increased participation of local and Indigenous businesses will enhance positive local economic effects.<br>With respect to potential adverse effects on agricultural and non-agricultural businesses, Enbridge will engage | With the above initiatives to encourage local and Indigenous participation on the Project, it is anticipated that the effects from project on employment and business will be positive, including creating positive economic activity through new direct, indirect, and induced employment. Project expenditures on local businesses and suppliers also have the potential to positively affect the local economies.<br>Consultation with residents, businesses and landowners will address any concerns to their operations.<br>With the implementation of the mitigation and protective measures, no significant |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | are directly or indirectly employed by the project<br>Labour conditions will be affected by direct, indirect and induced employment during all project phases.<br>The project could affect business through purchases of labour, goods and services from local businesses, including businesses owned by Indigenous peoples, and will result in increased local employment income and municipal government revenue. Local businesses will likely benefit from supplying the project with goods and services.<br>Land clearing and other construction-related project activities could adversely affect agricultural productivity. Other potential adverse effects on industries include impairment to the use and enjoyment of property, disruption of livestock production and issues with farm machinery and other vehicular movement. | with landowners and municipalities to address access to the project area, the portion of land that will be altered as part of site preparation, and long-term changes to agricultural and non-agricultural land. | adverse residual impacts on Employment and Business are anticipated. |
| Community Services and Infrastructure<br>*Section 3.4.2* | The presence of temporary workers in the local communities during the construction period has the potential to increase the demand for housing and local community services and infrastructure. Non-local project workers are expected to stay in temporary accommodations, including hotels, motels, and campgrounds. As there are limited temporary accommodations | Project employees might require medical attention while staying in the area. The contractor and Enbridge will have emergency response equipment and trained personnel on-site during construction. In addition, an Emergency Response Plan will be developed and implemented, which will address field health services, emergency call-out procedures and fire response plans. Safety fencing will be used where necessary to separate the work area. | Community services and infrastructure appear to have additional capacity to absorb potential increased temporary demands that may result from the project. Adverse effects on traffic will be minimal because the preferred pipeline route intersects mainly rural communities where roads |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | available within or adjacent to the Study Area, it is anticipated that non-local project workers will stay in accommodations closer to larger towns and cities, such as the City of London. Non-local project workers may also choose to rent cottages or apartments. The vacancy rate for temporary rentals will likely be able to accommodate the temporary increase. The short duration that the workers will reside near any one community, as well as the structure of the work shifts, will limit the need for workers to use the services and infrastructure in local communities.<br><br>The transportation of project goods, services and workers has the potential to lead to increased use of existing transportation infrastructure. Also, increased traffic volumes along local road networks could increase travel times and reduce road safety, which might lead to increased use of local emergency services due to potential vehicle accidents and workplace accidents. In addition, the production of project-related waste could place additional stress on the capacity of local landfills.<br><br>During operation, the workforce will remain the same as current operations with no planned changes as the project is a replacement of the existing pipeline. Some operation workers might already reside in the local area; however, some might need to come from outside | Environmental mitigation will be in place to reduce the likelihood of emergency events and to prepare for the management of emergency events on site. If an emergency incident were to occur, it is anticipated that the comprehensive mitigation, contingency plans, and safety strategies will result in a localized and low-intensity response.<br><br>A Traffic Management Plan will be in place for all roads affected by construction, which at a minimum outlines measures to:<br>• Control the movement of materials and personnel to and from the construction site<br>• Post signs to warn oncoming motorists of construction activity<br>• Control traffic at road crossings<br>• Reduce on-road disturbance and land closures<br>• Store equipment as far from the edge of the road as practical<br>• Install construction barricades at road crossings<br><br>Traffic disruptions during construction will be reduced by adherence to the Traffic Management Plan. Guidelines will be developed for vehicular use on the RoW and associated access roads to avoid traffic congestion and accidents. Access to existing transportation infrastructure will be addressed through standard mitigation and will be reversible once the construction phase ends.<br><br>The capacity of waste disposal sites will be considered and if project needs are not easily accommodated, alternative disposal locations will be considered.<br><br>Enbridge will provide project information to local communities and service providers so that they are prepared for any possible demand on community services and infrastructure related to a temporary | currently have low levels of traffic and alternative routes are readily accessible.<br><br>Given the available capacity of the local community services and infrastructure, along with the implementation of the mitigation and protective measures, no significant adverse residual impacts on community services and infrastructure are anticipated. |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | communities and may use local community and emergency services. | population increase. Additional consultation with residents and businesses adjacent to the preferred pipeline route will be held in advance of construction commencement to discuss potential specific impacts to the property or business. Contact information for a designated Enbridge representative will be available to address questions and concerns during construction. Consultation has been initiated and will continue with municipal personnel. | |
| Culture, Tourism and Recreational Facilities<br>*Section 3.4.3* | Cultural, tourism, and recreational facilities may experience noise, dust, and equipment exhaust associated with construction activity. Construction activities will temporarily affect the aesthetic landscape of the construction area and could impede property access. Potential safety concerns also exist at locations where properties, visitors, and vehicles come close to construction activities. | It is recommended additional consultation with residents and businesses adjacent to the preferred pipeline route occur in advance of construction commencement. Contact information for a designated Enbridge representative should be available prior to and during construction to address questions and concerns.<br>While pipeline construction activities and machinery have the potential to temporarily affect street aesthetics, restoration of the construction area will leave little evidence that a pipeline exists. Construction should be conducted as expeditiously as possible, to reduce duration of activities. Vegetative buffers at watercourse and road crossings should be restored where feasible.<br>Access to businesses and residential properties should be maintained always. If required, signs will be used to direct people to correct access.<br>Safety fence should be installed at the edge of the construction area where public safety considerations are required. A traffic management plan should be implemented for all roads affected by construction, which at a minimum outlines measures to:<br>• control the movement of materials and personnel to and from the construction site | With the implementation of the mitigation and protective measures, no significant adverse residual impacts on cultural, tourism, and recreational facilities are anticipated. |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | | • post signs to warn oncoming motorists of construction activity<br>• control traffic at road crossings<br>• reduce on-road disturbance and land closures<br>• store equipment as far from the edge of the road as practical<br>• install construction barricades at road crossings | |
| Infrastructure<br>*Section 3.4.4* | The preferred pipeline will be constructed within existing municipal road allowances and existing easement, with some temporary lands required for construction purposes. Where temporary lands are required limited impacts to agricultural lands may occur. The existing route and alternative segments have the potential to interact with buildings, roads/highways, hydroelectric lines, and buried and overhead utilities. Potential impacts include damage to the infrastructure and harm to personnel. | Mitigation and protective measures for roads and railways are outlined in this table under *Community Services and Infrastructure.* Consultation is ongoing with Infrastructure Ontario, Hydro One and CN and CP Railways regarding easements to cross the existing overhead hydroelectric lines and railways.<br>The contractor will be responsible for locating and exposing existing pipelines and utilities on lands that will be affected by construction activities. During construction, machine operators will be informed where electrical transmission lines are present overhead. Lines that may interfere with the operation of construction equipment will be identified with warning poles and red flags. | With the implementation of the mitigation and protective measures, no significant adverse residual impacts on infrastructure are anticipated. |
| Air Quality and Noise<br>*Section 3.4.5* | Residential and business properties may experience noise, dust and equipment exhaust associated with construction activity. During operation, no substantial air or noise emissions are anticipated to occur. | During construction, motorized construction equipment should be equipped with appropriate mufflers and silencers as available. Company and construction personnel should avoid excessive idling of vehicles; vehicles and equipment should be turned off when not in use unless required for operation. To the greatest extent practical, activities that could create noise should be restricted to daylight hours and adhere to local noise by-laws. Sources of continuous noise, such as portable generators, should be shielded or located so as to reduce disturbance to residents and businesses. | With the implementation of the mitigation and protective measures, no significant adverse residual impacts from air quality and noise are anticipated. |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | | The contractor should implement site practices during construction that are in line with the Environment Canada document 'Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities' (Cheminfo Services Inc., 2005), which may include:<br>• Maintaining equipment in compliance with regulatory requirements<br>• Protecting stockpiles of friable material with a barrier or windscreen in the event of dry conditions and dust<br>• Dust suppression of source areas<br>• Covering loads of friable materials during transport<br>Watering for dust control must not result in the formation of puddles, rutting by equipment or vehicles, the tracking of mud onto roads or the siltation of watercourses. | |
| Contaminated Sites<br>*Section 3.4.6* | The existing route and alternative segments are not expected to cross or be in the vicinity of lands that may have contaminants of concern, however the application of road salt for de-icing activities along the roadways within the Study Area represent a potential source of contamination.<br>The removal of structures during construction is not anticipated, therefore, the potential presence of building materials of concern, such as asbestos, lead, and silica, related to structures in the investigated area (i.e., within privately owned buildings, concrete culverts, bridge decks, etc.) was not | Based on the findings, the following recommendations are provided:<br>• Should contaminated soils be encountered during construction, Enbridge should implement their Suspect Soils Program (sew LUG C&M 2020 for further details).<br>• Should excess soil be generated on-site during construction activities that will require off-site management, or if contaminated soils are suspected (e.g., if observed material contains anthropogenic substances, petroleum hydrocarbons odours/staining, and debris/waste), representative soil samples should be collected in accordance with O. Reg. 406 /19, and submitted for chemical analysis to determine management options and appropriate handling and health and safety guidelines. | With the implementation of the mitigation and protective measures, no significant adverse residual impacts from contamination are anticipated. |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | confirmed, as an assessment of structures was not completed. | • Soils that cannot be reused on site may be reused off-site in accordance with O. Reg. 406/19.<br>• A Phase I ESA, and Phase II ESA (if recommended as part of the Phase I ESA) should be considered for any property that will be acquired by Enbridge and a site-specific evaluation of PSOCs should be completed. If building demolition will be required, designated substance surveys should be completed for buildings or structures prior to demolition. | |
| Waste Management<br>*Section 3.4.7* | Improper disposal of waste material generated during construction may result in contamination to soil, groundwater, and/or surface water resources on and off the construction RoW. Litter generated during construction may also become a nuisance to landowners and/or surrounding residents if not contained. | All construction wastes should be disposed of in accordance with LUG C&M 2020. Additionally, Enbridge should undertake responsible management of excess fill. When details on excess fill volumes are known, disposal locations should be determined, and appropriate permitting obtained.<br>A site-specific waste collection and disposal management plan should be implemented, which may include:<br>• Waste materials, sanitary waste, and recycling transported off-site by private waste contractors licensed by the MECP.<br>• Contractors required to remove their excess materials from the site.<br>• Labelling and storage of hazardous and liquid wastes in a secure area that would contain material in the event of a spill.<br>• Implementation of a waste management program consisting of reduction, reuse, and recycling of materials. | With the implementation of the mitigation and protective measures, no significant adverse residual impacts from waste management are anticipated. |
| Land Use<br>*Section 3.4.8* | As noted above, natural gas pipelines are permitted facilities in the various municipal land uses, and thus no | Mitigation and protective measures for agricultural soils, agricultural tile drains and for employment and businesses are discussed in this table under *Soil and* | With the implementation of the mitigation and protective measures, no significant |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | impacts to municipal land use designations will occur.<br><br>Potential impacts on agricultural land is discussed in Section 3.2.5 (Soil and Soil Capability) and 3.2.6 (Agricultural Tile Drains). Potential impacts on employment and businesses are discussed in Section 3.4.1. Potential impacts on uses of land will be interruption to access or use. | *Soil Capability*, *Agricultural Tile Drains* and *Employment and Business.*<br><br>Consultation has been initiated, and will continue, with municipalities and counties as well as landowners within the Study Area in order to identify methods of minimizing disturbance to property and maintaining access to lands, to the extent possible. Enbridge should incorporate feedback from landowners when determining whether to abandon the existing pipeline by removing the pipe or abandoning the pipe in place, where feasible. Where work is to occur within conservation authority regulated areas, permits will be obtained from the UTRCA as per O. Reg. 157/06, LTVCA as per O. Reg. 152/06 and SCRCA as per O. Reg. 171/06. | adverse residual impacts on land use are anticipated. |
| Archaeological Resources<br>*Section 3.4.9* | The Stage 1 AA has determined that portions of the Study Area retain potential for the identification and documentation of Indigenous and Euro-Canadian archaeological resources. | Based on the findings of the Stage 1 AA, further necessary stages of archaeological assessment, i.e., Stage 2 AA, are required. The objective of Stage 2 AA is to identify archaeological resources within the Study Area to be impacted by the project. The results of the Stage 2 AA will provide recommendations for further assessment, protection, and mitigation of archaeological resources which retain further cultural heritage value or interest based on MHSTCI standards. Where feasible for the project, archaeological sites that are determined to retain further cultural heritage value and interest should be mitigated in whole or in part by avoidance and protection/preservation measures. Where avoidance and protection/preservation measures are not feasible, archaeological resources may be mitigated in whole or in part by excavation. For Indigenous archaeological resources retaining further cultural heritage value or interest and which may be subject to impact by the project, Stage 3 AA and Stage 4 archaeological mitigation options will be evaluated in | With the implementation of the archaeological assessment and mitigation measures, including avoidance and protection/preservation (where feasible) and excavation, no significant adverse residual impacts on archaeological resources are anticipated. |

## Table 5-1: Potential Impacts and Recommended Mitigation and Protective Measures

| Environmental Feature(s) | Potential Impact(s) | Mitigation and Protective Measures | Net Impacts |
|---|---|---|---|
| | | discussions with the appropriate Indigenous communities. | |
| Heritage Resources and Cultural Heritage Landscapes<br>*Section 3.4.10* | The completion of the Checklist included the identification of five indicators of CHVI. Given the findings of the Checklist, it is recommended that additional technical studies are required. Specifically, a Cultural Heritage Assessment Report (CHAR) is required prior to Project construction. | If required, prior to construction, the above-referenced CHAR will be undertaken and submitted to the MHSTCI for their review and comment. The CHAR will contain mitigation measures for potential impacts, if required. | With the implementation of the mitigation and protective measures, no significant adverse residual impacts on heritage resources or cultural heritage landscapes are anticipated. |
| Indigenous Interests<br>*Section 3.4.11* | Although not known to occur, the project may affect traditional territories of Indigenous communities and during construction harvesting and hunting in the construction RoW could be impeded. A Stage 2 Archaeological Assessment may result in the identification of Indigenous archaeological resources. | Enbridge has sought input from the identified Indigenous communities and will continue engaging with Indigenous communities as the project moves forward. Enbridge will also continue to work with their respective Economic Development departments and Enbridge's contractors to find opportunities for their participation in providing goods and services during construction. Information on the current state of Indigenous engagement will be provided in the application to the OEB.<br>Mitigation and protective measures for archaeology are discussed in this table under *Archaeological Resources.* | By undertaking the engagement and archaeological assessments, no significant adverse residual impacts on Indigenous interests are anticipated. |

# 6.0 CUMULATIVE EFFECTS ASSESSMENT

The recognition of cumulative effects assessment as a best practice is reflected in many regulatory and guidance documents. Regarding the development of hydrocarbon pipelines in Ontario, the *OEB Environmental Guidelines* (2016) note that cumulative effects of pipeline construction should be identified and discussed in the ER as an integral part of the assessment.

Building upon the intent of the *OEB Environmental Guidelines* (2016), the OEB has specified that only those effects that are additive or that interact with effects that have already been identified as resulting from the Project are to be considered under cumulative effects. In such cases, it will be necessary to determine whether these effects warrant mitigation measures such as alterations in routing, timing of construction, or other measures that can address the cumulative effects. The cumulative effects assessment (CEA) has been prepared with consideration of this direction from the OEB.

## 6.1 METHODOLOGY

This assessment describes the potential cumulative effects resulting from the interaction of residual effects of the construction and operation of the preferred pipeline with the effects of other unrelated projects. The other projects assessed are those that are either existing or approved and that have a high likelihood of proceeding.

Cumulative effects include the temporal and spatial accumulations of change that occur within an area or system due to past, present, and future activities. Change can accumulate within systems by either an additive (i.e., cumulative) or interactive (i.e., synergistic) manner. Positive residual effects, such as an increase in the supply of natural gas, employment or in property taxes, have not been assessed in the CEA.

By applying the principles of avoidance, minimization, and compensation to limit project-specific effects, potential adverse residual effects on environmental and socio-economic features have been greatly limited before accounting for the effects of other unrelated projects.

The cumulative effects assessment methodology is designed to evaluate and manage the additive and interactive effects from the following sources:

- Existing infrastructure, facilities, and activities as determined from available data sets
- The preferred pipeline
- Future activities where the undertaking will proceed, or has a high probability of proceeding

Although rare in occurrence, it is plausible that accidents or emergency events may arise due to an unforeseen chain of events during the project's construction or operational life. Due to the rarity and magnitude of such events, they have not been assessed here, as they are extreme in nature when compared to the effects of normal construction and operation activities and require separate response

plans. The decommissioning and abandonment of the preferred pipeline is another event that is beyond the temporal boundaries of the cumulative effects assessment and therefore has not been assessed.

## 6.2 STUDY BOUNDARIES

### Spatial

The spatial study boundaries discussed in this ER were contained within the Study Area. These boundaries are appropriate when considering the surrounding land uses and the preferred pipeline. The CEA used the same boundaries to identify potential effects from the Project.

The Study Area boundary is beyond the zone of influence of Project construction and operation activities (e.g., dust and noise) for the preferred pipeline, and consequently, the identified effects will have diminished to background levels at the edges of the Study Area. The Study Area is also considered conservative in terms of managing both effects and risks in that it considers all those features and areas that could be affected by construction.

### Temporal

The temporal boundaries for the cumulative effects assessment reflect the nature and timing of project activities, and the availability of information surrounding future projects with a high probability of proceeding. The project schedule identifies three key milestone activities:

1. ER and technical design – 2020
2. Construction – 2021/2022
3. Operation and Maintenance – 2023 to 2073*

**Fifty years of operation is used as an assumption, although the pipeline may be operational beyond fifty years.*

Based upon these milestone activities, two time periods were selected for evaluation: 2021/2022 and 2025. The year 2021/2022 was selected to represent the construction period, and the year 2025 was selected to represent the operation and maintenance period. Forecasting beyond 2025 increases the uncertainty in predicting whether projects will proceed, and the effects associated with these projects.

## 6.3 PROJECT INCLUSION LIST

The Project inclusion list was developed by reviewing publicly available information for projects and activities with the potential for effects to interact with the identified effects of the preferred pipeline within the spatial and temporal study boundaries. The following resources were reviewed:

- Impact Assessment Agency of Canada, Canadian Impact Assessment Registry (IAAC, 2020)
- Government of Ontario, Environmental Assessment Projects by Category (Government of Ontario, 2020)

- Government of Ontario, Infrastructure Ontario Projects (Infrastructure Ontario, n.d.)
- MTO, Southern Highways Program (2017-2021) (MTO, n.d.)
- Canada Energy Regulator, Major Facilities Applications (CER, 2020)
- OEB Applications Currently Before the Board (facilities applications only) (OEB, 2020)

Based on the review of publicly available resources, the project inclusion list in Table 6-1 included the following project for consideration of cumulative effects:

**Table 6-1: Project Inclusion List for Cumulative Effects**

| Project Name | Project Location | Proponent | Schedule | Project Description | Interaction with the Preferred Pipeline |
|---|---|---|---|---|---|
| Improvements to Glendon Drive Corridor[1] | City of London boundary at the Thames River to the 402 Highway interchange | County of Middlesex, Municipality of Middlesex Centre | 2018 - 2038 | Capital planning project for the Glendon Drive Corridor in the Municipality of Middlesex Centre. The Environmental Assessment, completed by Stantec, recommended that sections of the roadway be expanded to 4 or 5 lanes, a roundabout be installed at the Komoka Road intersection, and the installation of bicycle lanes and other pedestrian facilities. | Intersection of Amiens Road and Glendon Drive, along Glendon Drive to the intersection with Komoka Road, along Komoka Road (all within the Municipality of Middlesex Centre). |

1. Glendon Drive Streetscape Schedule C Municipal Class Environmental Assessment, 2018

In addition to the above, it is assumed that on-going improvements, upgrades and maintenance to municipal infrastructure such as bridges, culverts, drains or roads will occur within the spatial and temporal study boundaries.

## 6.4 ANALYSIS OF CUMULATIVE EFFECTS

Sections 3.2-3.4 of the ER consider the potential impacts of the project on specific features and conditions and propose mitigation and protective measures to eliminate or reduce the potential impacts. The cumulative effects assessment evaluates the significance of residual impacts (after mitigation) of the project along with the effects of other unrelated projects.

### 6.4.1 Construction – Year 2021/2022

Residual project impacts which may occur during project construction are outlined in Sections 3.2 - 3.4. To consider the additive and interactive effects at their maximum intensity, the cumulative effects assessment assumes that construction of other unrelated projects and the proposed pipeline construction will occur concurrently.

Potential cumulative effects resulting from the proposed pipeline construction and the concurrent projects are additive effects on soil, vegetation, wildlife and wildlife habitat, air quality and the acoustic environment.

**Soil**

Soil erosion and reduced soil capability is a potential residual effect associated with construction of the project. Mitigation and protective measures for soil are outlined in Section 3.2.2. Provided that concurrent projects follow mitigation measures like those outlined in this report, the probability of erosion control failure occurring concurrently is low and based on the nature of the proposed projects the magnitude of such an event would be low. As such, adverse cumulative residual effects on the natural environment from erosion are not anticipated to be significant, and cumulative effects on soil capability are not anticipated to occur.

**Vegetation**

Where there is natural vegetation within or adjacent to the proposed pipeline route, potential impacts include the removal of native vegetation, and indirect effects such as dust, erosion, and accidental spills. However, with the implementation of the mitigation and protective measures outlined in this report, such as following any applicable tree clearing and/or re-vegetation by-laws, and provided that concurrent projects follow mitigation measures similar to those outlined in this report, adverse cumulative residual effects on vegetation are not anticipated to be significant.

**Wildlife and Wildlife Habitat**

Potential residual effects on wildlife and wildlife habitat associated with construction of the project are accidental direct mortality, habitat removal and sensory disturbance. Mitigation and protective measures for wildlife and wildlife habitat are outlined in Section 3.3.3. In the event of project-related wildlife deaths, the MNRF will be contacted. If mortality occurs between concurrent projects for similar species, the Ministry will be able to note the occurrences and coordinate with Enbridge to adjust construction activities. Potential cumulative effects resulting from sensory disturbance (i.e., noise, air pollution and dust) are discussed below.

Provided that the above measures are undertaken, and provided that concurrent projects follow mitigation measures similar to those outlined in this report, adverse cumulative residual effects on wildlife and wildlife habitat will be of low probability and will be mitigated as coordinated through the MNRF, and therefore are not anticipated to be significant.

**Air Quality and Acoustic Environment**

Potential residual effects on air quality associated with construction of the project and concurrent projects are an increase in noise and air pollutants from operation of vehicles and equipment, and an increase in dust from construction activities. Mitigation and protective measures for air quality and the acoustic environment are outlined in Section 3.4.5. Provided that the concurrent projects follow mitigation measures like those outlined in this report, cumulative effects will be of low magnitude and reversible. Therefore, adverse residual cumulative effects on air quality and the acoustic environment are not anticipated to be significant.

### 6.4.2 Operation and Maintenance – Year 2025

Development and maintenance activities which have a probability of proceeding during operation and maintenance of the project include:

- Road works: Future road rehabilitation and resurfacing, including the Glendon Drive corridor capital program
- Water works: Future installation of water and wastewater pipelines
- Pipeline construction and maintenance: Future pipeline construction and maintenance of existing hydrocarbon pipelines

Operation and maintenance activities undertaken by Enbridge will be completed in co-ordination with the Enbridge Environmental Planning Team and will consider potential impacts on natural heritage and socio-economic environment. Appropriate mitigation measures will be developed and implemented based on the proposed maintenance work. Enbridge will obtain all necessary agency permits and approvals, as required. Given the limited scale of impact of any potential operation and maintenance activities, it is anticipated that residual impacts will be minimal and that should any interaction occur with other projects, significant adverse residual effects are not anticipated to be significant.

## 6.5 SUMMARY OF CUMULATIVE EFFECTS

The potential cumulative effects of the project were assessed by considering development that has a high probability of proceeding just prior to or concurrent with construction of the project. A 100 m boundary around the project site was used to assess the potential for additive and interactive effects of the project and other developments on environmental and socio-economic features.

Municipal projects may contribute to cumulative effects within the study boundaries. Improvements to municipal infrastructure such as bridges, culverts, drains or roads may occur during the operational phase of the project. The cumulative effects assessment determined that, provided the mitigation and protective measures outlined in this report are implemented and that concurrent projects implement similar mitigation and protective measures, potential cumulative effects are not anticipated to occur, or if they do occur are not anticipated to be significant.

# 7.0 MONITORING AND CONTINGENCY PLANS

## 7.1 MONITORING

The primary objective of compliance and effects monitoring is to check that mitigation and protective measures are effectively implemented and to measure the impacts of activities associated with construction on environmental and socio-economic features. Ultimately, the knowledge gained from monitoring is used to avoid or reduce issues which may arise during construction of subsequent pipeline projects.

Previous pipeline construction experience, and a review of post-construction monitoring reports from other projects, indicates that impacts from pipeline construction are for the most part temporary. The mitigation and protective measures to eliminate or reduce impacts are well known and have been shown to be effective. Accordingly, Enbridge should adhere to the following general monitoring practices:

- Trained personnel should be on-site to monitor construction and should be responsible for checking that the mitigation and protective measures and monitoring requirements within the ER are executed. Enbridge should implement an orientation program for inspectors and contractor personnel to provide information regarding Enbridge's environmental program and commitments, as well as safety measures.
- An Environmental Protection Plan (EPP) will be developed that provides site and feature specific mitigation for the construction of the Project. This document should become part of the construction specification as noted in section 5.8.4 of the OEB Guidelines.
- Recommendations and commitments made in this ER and other applicable permits and reports should be incorporated into construction activities.
- A walking inspection of the entire pipeline route should be done approximately one year after construction to determine whether areas require further rehabilitation or as required by OEB Conditions of Approval.

The following sections list specific environmental monitoring activities recommended for the Project.

### 7.1.1 Exposed Soils

Where soils are exposed for construction activities, potential effects may include surface soil erosion, trench slumping, and sedimentation of watercourses. The movement of heavy machinery on wet soil may cause excessive rutting, compaction, and mixing of topsoil and subsoil. Improperly salvaged topsoil can result in mixing topsoil with subsoil, compaction, rutting and erosion, which can potentially decrease crop yields. Improper water discharge can lead to erosion, sedimentation or flooding. Monitoring of potential effects on exposed soils should occur during construction by Enbridge's on-site inspection team. Restored bank slopes should be inspected one year after construction for erosion, and restoration measures should be implemented as necessary.

### 7.1.2 Water Wells

Before construction, a private water well survey should take place to assess domestic groundwater use near the proposed pipeline route and determine the need for a water well monitoring program, as outlined in Section 5.1.

### 7.1.3 Watercourse Crossings

Watercourse crossings have the potential to affect fish, fish habitat, and water quality. Enbridge's on-site inspection team should oversee all watercourse crossings and confirm that work is conducted as outlined in Section 2.3.1, and as per the conditions of relevant permits (see Section 1.2.5).

### 7.1.4 Vegetation and Wetlands

For at least one year after construction, planted vegetation should be inspected for survival. Dead and diseased vegetation should be replaced in areas of severe dieback or in areas with important environmental functions (e.g., riparian or slope cover).

### 7.1.5 Species at Risk

Should SAR be identified during vegetation, wildlife, and/or wildlife habitat field surveys, construction monitoring may need to be undertaken. The exact nature of monitoring will be determined in consultation with the MECP and DFO and will depend on the species present.

### 7.1.6 Cultural Heritage Resources

Any cultural heritage resources within 40 m of the proposed pipeline route will require site plan controls that will need monitoring. In addition, if a vibration mitigation measures are recommended, these will need to be monitored. Further details are provided in Section 3.4.10.

### 7.1.7 Residents and Businesses

Construction activities may impact directly affected landowners and surrounding residents and businesses. During construction, a designated Enbridge representative should be available to monitor and respond to requests and concerns voiced by residents and business owners. Landowners affected by construction should be notified in advance of construction activities in their area, as feasible. The notification should provide the contact information for a designated Enbridge representative. Enbridge should incorporate feedback from landowners when determining whether to abandon the existing pipeline by removing the pipe or abandoning the pipe in place, where feasible.

Enbridge's on-site inspection team should also monitor the contractors' implementation of the TMP, to see that site access to residences and businesses has been maintained and that traffic is not being unnecessarily interrupted.

While efforts should be undertaken to reduce impacts, a comment tracking system should also be implemented. An Enbridge representative should record the time and date of calls, the nature of the concern, the corrective action taken, and the time and date of follow-up contact.

Following completion of construction, Enbridge should contact residents and businesses along the easement to continue ongoing communications where necessary. During the first two years, attention should be paid to monitoring and documenting impacts associated with construction of the proposed pipeline to residents and businesses.

### 7.1.8 Municipal Roads

Municipal roads affected by pipeline construction should be restored to their pre-construction condition as per applicable permits and/or agreements. For a period of one year after construction (i.e., first year of operation), roads should be monitored following spring runoff to check if erosion, bank slumping, road subsidence or rutting has occurred as a result of construction activities. Affected roadside ditches and drains should also be monitored to check that they are functioning properly. Further restoration activities and subsequent monitoring should be conducted, as necessary.

## 7.2 CONTINGENCY

Contingency planning is necessary to prevent a delayed or ineffective response to unexpected events or conditions that may occur during construction of the proposed pipeline. An essential element of contingency planning is the preparation of plans and procedures that can be implemented if unexpected events occur. The absence of contingency plans may result in short or long term environmental or socio-economic impacts and possibly threaten public safety.

The following unexpected events require contingency planning during construction: adverse weather causing watercourse sedimentation, human error causing accidental spills, subsurface conditions causing a release of drilling fluids, and the discovery of unexpected finds. Although unexpected problems are not anticipated to occur during construction, Enbridge and the pipeline contractor should be prepared to act when unexpected events occur. Construction personnel should be made aware of and know how to implement contingency measures.

### 7.2.1 Inadvertent Returns during HDD

For watercourses crossed by HDD, operations should be monitored continuously by qualified personnel. An emergency response and contingency plan for inadvertent fluid release should be developed by the contractor and implemented during construction. At the very least, the plan should address containment, clean-up and remediation, alternative drilling/crossing plans, disposal of waste materials, monitoring and reporting.

### 7.2.2 Watercourse Sedimentation

Even with properly installed ESC measures, extreme runoff events could result in collapse of silt fencing, overflow or bypass of barriers, slope or trench failures, and other problems which could lead to sedimentation of watercourses.

If sedimentation occurs, immediate action should be taken to repair dysfunctional ESC features or install temporary measures that will contain the erosion as quickly as practical. When site conditions permit, permanent protection measures should be installed on erosion-susceptible surfaces. If the erosion and sedimentation results from a construction-related activity, the activity should be halted immediately until the situation is rectified.

### 7.2.3 Accidental Spills

During construction, an accidental spill of fluids may occur. The impact of the spill will depend upon the magnitude, extent, and nature of the spill and the environmental and socio-economic conditions in which it takes place. Upon release of a hydrocarbon-based construction fluid, Enbridge should immediately determine the magnitude and extent of the spill and rapidly take measures to contain it. Release of sediment should also be treated as a spill depending on the magnitude and extent. Spills should be immediately reported to Enbridge's on-site inspection team. If necessary, the MECP Spills Action Centre should be notified at 1-800-268-6060.

A Spills Response Plan should be developed, reviewed with personnel, and posted in site trailers. Spill containment equipment should be readily available, especially near watercourses. Personnel should be trained in the use of spill containment equipment.

Should a spill occur in the project area the spill response contingency plan should be implemented. Specifics of the contingency plan will be documented on site.

### 7.2.4 Unexpected Finds: Archaeological or Heritage Resources and Unknown Contaminated Soils

Should previously unidentified archaeological or heritage resources be uncovered or suspected of being uncovered during construction, ground disturbance in the find location should cease immediately. An archaeologist licensed in the Province of Ontario should be notified immediately. As needed, the licensed archaeologist will consult with the MHSTCI, and other relevant stakeholders, i.e., Indigenous communities, to develop a site-specific response plan. A site-specific response plan for the newly identified archaeological or heritage resource should then be employed following further investigation of the specific find. The response plan would indicate under which conditions the ground disturbance activity in the find location may resume.

In the event that human remains are uncovered or suspected of being uncovered during ground disturbance, the above measures should be implemented along with notifying local police, the coroner's office, and the Cemeteries Regulation Unit of the Ontario Ministry of Government and Consumer Services (1-800-889-9768).

If previously unknown materials or contaminated soils are uncovered or suspected of being uncovered, construction in the find location should cease immediately. In such an instance, Enbridge should retain expert advice on assessing and developing a plan to include soil sampling, handling, disposal and remediation.

# 8.0 CONCLUSION

The environmental study investigated data on the physical, biophysical, and socio-economic environment within the Study Area. In the opinion of Stantec, the recommended program of supplemental studies, mitigation and protective measures, and contingency measures are considered appropriate to protect the features encountered. Monitoring will assess whether mitigation and protective measures were effective in both the short and long term.

With the implementation of the recommendations in this report, on-going communication and consultation, and adherence to permit, regulatory and legislative requirements, potential adverse residual environmental and socio-economic impacts of the Project are not anticipated to be significant.

# 9.0 REFERENCES

Armstrong, D.K. and Dodge, J.E.P. 2007. Paleozoic geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 219.

AAFC [Agriculture and Agri-Food Canada], 2005. CLI Classes – Definitions. Available at: http://sis.agr.gc.ca/cansis/nsdb/cliclass.html.

Cadman, M. D., Sutherland, D.A., Beck, G.G., Lepage, D., and A.R. Couturier, 2007. Atlas of the Breeding Birds of Ontario, 2001-2005. (eds) Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature, Toronto, xxii + 706pp. Available at: http://www.birdsontario.org/atlas/index.jsp.

Chapman, L.J. and Putnam, D.F. 2007. Physiography of southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 228.

Cheminfo Services Inc., 2005. Best Practices for the Reduction of Air Emissions From Construction and Demolition Activities. Prepared by Cheminfo Services for Environment Canada. Available online: http://www.bieapfremp.org/Toolbox%20pdfs/EC%20-%20Final%20Code%20of%20Practice%20-%20Construction%20%20Demolition.pdf.

County of Middlesex, 2006. County of Middlesex Official Plan. Available at: https://www.middlesex.ca/sites/default/files/Complete%20OP%20for%20Web.pdf. Accessed: June 17, 2020.

DFO, 2019a. Aquatic Species at Risk Map. Accessed May 15, 2020. Online: https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html

DFO, 2019b. Measures to Protect Fish and Fish Habitat. Online: https://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures-eng.html

Dobbyn, J., 1994. Atlas of the Mammals of Ontario. Federation of Ontario Naturalists.

Environment and Climate Change Canada, 2017. General nesting periods of migratory birds. https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods.html.

Government of Canada, 1985. Fisheries Act. R.S.C. 1985, c. F-14. Last amendment 2017. Electronic document. http://laws-lois.justice.gc.ca/eng/acts/F-14/

Government of Canada, 1994. Migratory Birds Convention Act, S.C. 1994, c. 22. Last amendment 2017. Electronic document. http://laws-lois.justice.gc.ca/eng/acts/m-7.01/

Government of Canada, 2002. Species at Risk Act. S.C. 2002, c. 29. Last amendment 2017. Electronic document. http://laws.justice.gc.ca/eng/acts/S-15.3/

Government of Canada. 2016. Critical Habitat Identification Toolbox: Species at Risk Act Guidance. Environment Canada and Climate Change, Canadian Wildlife Service. Online: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/critical-habitat-descriptions/identification-toolbox-guidance.html

Government of Ontario, 1990. Conservation Authorities Act, R.S. O. 1990, c. C.27. *O. Reg. 152/06: Lower Thames Valley Conservation Authority: Regulation of Development, Interference with Wetlands, and Alteration to Shorelines and Watercourses*.

Government of Ontario, 1990. Conservation Authorities Act, R.S. O. 1990, c. C.27. *O. Reg. 157/06: Upper Thames River Conservation Authority: Regulation of Development, Interference with Wetlands, and Alteration to Shorelines and Watercourses*.

Government of Ontario, 1990. Conservation Authorities Act, R.S. O. 1990, c. C.27. *O. Reg. 171/06: St. Clair Region Conservation Authority: Regulation of Development, Interference with Wetlands, and Alteration to Shorelines and Watercourses*.

Government of Ontario, 1990. Ontario Heritage Act. R.S.O. 1990, c. O.18. Last amendment 2017. C. 20, Sched. 8, s. 112. Electronic document: https://www.ontario.ca/laws/statute/90o18.

Government of Ontario, 1990. Highway Traffic Act, R.S.O. 1990, c. H.8. Last amendment 2019, C.18. Electronic document: https://www.ontario.ca/laws/statute/90h08

Government of Ontario, 1990. Public Transportation and Highway Improvement Act, R.S.O. 1990, C. P.50. Last amendment: 2019, c.8, Sched.5. Electronic document: https://www.ontario.ca/laws/statute/90p50

Government of Ontario, 1990. Ontario Water Resources Act, R.S.O. 1990, c. O.40. Last amendment: 2017, c. 2, Sched. 11, s. 4. Electronic document: https://www.ontario.ca/laws/statute/90o40#top.

Government of Ontario, 2006. Clean Water Act. S.O. 2006, c. 22. Last amendment: 2017, c. 2, Sched.11, s.1. Electronic document: https://www.ontario.ca/laws/statute/06c22.

Government of Ontario, 2007. Endangered Species Act. S.O. 2007, c.6. Electronic document: https://www.ontario.ca/laws/statute/07e06.

Government of Ontario, 2011. Standards and Guidelines of Consultant Archaeologists. Toronto: Ministry of Heritage, Sport, Tourism and Culture Industries.

Government of Ontario, 2020. Environmental assessment projects by category. Available online: https://www.ontario.ca/page/environmental_assessment-projects-category#section-0. Accessed: June 10, 2020.

Henson, B.L., K.E. Brodribb, and J.L. Riley. 2005. The Great Lakes Conservation Blueprint for Terrestrial Biodiversity. Nature Conservancy of Canada and Ontario Ministry of Natural Resources.

LHPWSS, n.d. About Us. Available online: https://huronelginwater.ca/about-us/. Accessed: June 17, 2020.

Lambton County. 2019. County of Lambton Official Plan. Available online: https://www.lambtononline.ca/home/residents/planninganddevelopment/Pages/OfficialPlan.aspx. Accessed: June 17, 2020.

Legacy Union Gas: Construction and Maintenance Manual. 2020.

Ministry of Environment, Conservation and Parks, 2020a. Ministry of Environment and Climate Change Water Well Resources Database. Accessed May 27, 2020.

Ministry of the Environment, Conservation and Parks (MECP). 2020b. Source Protection Information Atlas. Available online: www.gisapplication.lrc.gov.on.ca/SourceWaterProtection/Index.html?site=SourceWaterProtection&viewer=SWPViewer&locale=en-US. Accessed May 22, 2020

Middlesex County. 2014. Middlesex County Official Plan. Online: https://www.middlesex.ca/sites/default/files/Complete%20OP%20for%20Web.pdf

MNHSS. 2014. Middlesex Natural Heritage Systems Study. Upper Thames River Conservation Authority.

MNRF, 2000. Significant wildlife habitat technical guide. Fish and Wildlife Branch, Wildlife Section, Science Development and Transfer Branch, South Central Sciences Branch. pp.151.

MNRF 2010. Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Second Edition. Toronto: Queen's Printer for Ontario. 248 pp.

MNRF, 2013. In-water Work Timing Window Guidelines. March 11, 2013. Online: https://docs.ontario.ca/documents/2579/stdprod-109170.pdf

MNRF, 2015. Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E. January 2015. 41 pp.

MNRF, 2020a. Natural Heritage Information Centre. Make a Map: Natural Heritage Areas. Accessed May 2020. Online: https://www.gisapplication.lrc.gov.on.ca/mamnh/Index.html?site=MNR_NHLUPS_NaturalHeritage&viewer=NaturalHeritage&locale=en-US

MNRF, 2020b. Land Information Ontario. Accessed May 2020. Online: https://www.ontario.ca/page/land-information-ontario

MNRF [Ministry of Natural Resources and Forestry]. 2019. Species at Risk in Ontario List. Online: https://www.ontario.ca/page/species-risk-ontario

MECP, 2019. Environmental Noise Guideline - Stationery and Transportation Sources Approval and Planning. Available at: https://www.ontario.ca/page/environmental-noise-guideline-stationary-and-transportation-sources-approval-and-planning.

MNHSS. 2014. Middlesex Natural Heritage Systems Study. Upper Thames River Conservation Authority.

MNR [Ontario Ministry of Natural Resources], 2000. Significant wildlife habitat technical guide. Fish and Wildlife Branch, Wildlife Section, Science Development and Transfer Branch, South Central Sciences Branch. pp.151.

MNR. 2010. Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Second Edition. Toronto: Queen's Printer for Ontario. 248 pp.

MNRF [Ministry of Natural Resources and Forestry]. 2015. Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E. January 2015. 41 pp.

MNRF [Ministry of Natural Resources and Forestry]. 2019. Species at Risk in Ontario List. Online: https://www.ontario.ca/page/species-risk-ontario

MNRF. 2020a. Land Information Ontario. Available at: http://www.mnr.gov.on.ca/en/Business/LIO/index.html. Last accessed: March 2020.

MNRF, 2020b. Natural Heritage Information Centre (NHIC) Database. Available at: http://nhic.mnr.gov.on.ca. Last accessed: March 2020.

MHSTCI [Ministry of Heritage, Sport, Tourism, Culture Industries], 2018. Regional Tourism Profiles, Available at: http://www.mtc.gov.on.ca/en/research/rtp/rtp.shtml.

Ministry of Transportation [MTO], No Date. Southern Highways Program, 2017-2021. Available online: http://www.mto.gov.on.ca/english/highway-bridges/pdfs/southern-highways-program-2017-2021.pdf. Accessed: June 2, 2020.

Municipality of Middlesex Centre, 2018. Official Plan of the Municipality of Middlesex Centre. Available at: https://www.middlesexcentre.on.ca/sites/default/files/2019-04/37_op_july_2018_consolidation.pdf. Accessed: June 17, 2020.

Municipality of Southwest Middlesex, n.d. Water and Sewer. Available at: https://southwestmiddlesex.ca/Public/Water-and-Sewer. Accessed: June 17, 2020.

Municipality of Southwest Middlesex, 2019. Corporation of the Municipality of Southwest Middlesex: Official Plan 2006 – 2026. Available at: https://www.southwestmiddlesex.ca/Public/Page/Files/52_SWM%20OfficialPlan%20consolidated%202019.pdf. Accessed: June 17, 2020.

Municipality of Stathroy-Caradoc, 2018. Municipality of Strathroy-Caradoc Official Plan. Available at: https://www.strathroy-caradoc.ca/en/resourcesGeneral/SC-OP-10MAY2019.pdf. Accessed: June 17, 2020.

Natural Resources Canada, 2019. Earthquake zones in Eastern Canada. Available at: https://earthquakescanada.nrcan.gc.ca/zones/eastcan-en.php. Last accessed: June 2, 2020.

OEB [Ontario Energy Board], 2016. *Environmental Guidelines for the Location, Construction and Operation of Hydrocarbon Pipelines in Ontario, 7th Edition*.

OEB, 2020. Applications before the OEB. Available at: https://www.oeb.ca/industry/applications-oeb. Accessed: June 17, 2020.

OGS, 2010. Surficial geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 128-REV.

OMAFRA, 2019. LIO Tile Drainage Area [shapefile]. Available at: https://data.ontario.ca/dataset/tile-drainage-area/resource/fdd24b26-c573-47f8-b351-e6371c19bb18. Data acquired March 2020.

Ontario Nature. 2020. Ontario Reptile and Amphibian Atlas. Available online: http://www.ontarionature.org/protect/species/herpetofaunal_atlas.php. Accessed: April 2020.

OPP, 2020. Detachment Finder. Available online: https://www.opp.ca/index.php?id=119&lng=en. Accessed: June 2, 2020.

Matthews, B.C., Richards, N.R., and Wicklund, R.E. 1957. Soil Survey of Lambton County. Report number 22. Experimental Farm Service, Ontario Agricultural College. 72 pg.

Hagerty, T.P., and Kingston, M.S. 1982. The Soils of Middlesex County: Volume 1. Report number 56. Experimental Farm Service, Canada Department of Agriculture and the Ontario Agricultural College. 183 pg.

IAAC, 2020. Canadian Impact Assessment Registry. Available online: https://iaac-aeic.gc.ca/050/evaluations/exploration?active=true&showMap=false&document_type=project. Accessed: June 10, 2020.

Rowe, J.S., 1972. Forest Regions of Canada. Canadian Forestry Service Publication. No. 1300: 172pp.

Statistics Canada, 2012. Middlesex-London Health Unit, Ontario (Code 3544) and Lambton Health Unit, Ontario (Code 3542) (table). Census Profile. 2011 Census. Statistics Canada Catalogue no. 98-316-XWE. Ottawa. Released October 24, 2012. Available at: http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/prof/index.cfm?Lang=E (accessed June 16, 2020)

Statistics Canada, 2017a. *Focus on Geography Series, 2016 Census*. Statistics Canada Catalogue no. 98-404-X2016001. Ottawa, Ontario. Data products, 2016 Census. Available at: https://www12.statcan.gc.ca/census-recensement/2016/as-sa/fogs-spg/Index-eng.cfm. Accessed May 6, 2020.

Statistics Canada, 2017b. Income Highlight Tables. 2016 Census. Statistics Canada Catalogue no. 98-402-X2016006 Ottawa. Released September 13, 2017. Available at: http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/inc-rev/index-eng.cfm. Accessed May 6, 2020.

Statistics Canada, 2017c. Age and Sex Highlight Tables. 2016 Census. Statistics Canada Catalogue no. 98-402-X2016002. Ottawa. Released May 3, 2017. Available at:

http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/as/index-eng.cfm. Accessed May 6, 2020.

TSRCPC [Thames-Sydenham Region Source Protection Committee], 2015. Thames-Sydenham and Region, Source Protection Plan. Electronic document: http://www.sourcewaterprotection.on.ca/wp-content/uploads/sp_plan3/Vol%201/SPPvI.pdf.

Township of Dawn-Euphemia, n.d. Water Services. Available at: http://www.dawneuphemia.ca/municipalservices/Pages/WaterServices.aspx. Accessed June 17, 2020.

Township of Dawn-Euphemia, 2015. The Corporation of the Township of Dawn-Euphemia: Official Plan. Available online: http://www.dawneuphemia.ca/council/Documents/D-E%20Official%20Plan%20(2014).pdf. Accessed June 17, 2020.

Waterloo Hydrogeologic Inc. (WHI) A Schlumberger Company, 2007. Six Conservation Authorities FEFLOW Groundwater Modeling Project, Final Report. Prepared for the Upper Thames Conservation Authority. July 2007.