Memo

To: Paul Mourad (City of Windsor) **Date:** **6 November 2020**

From: Mir Talpur and Nathan Hellinga (Wood)

CC: Felix Wong, Andreas Stenzel, and Aniqa Shams (Wood)

Ref: Ojibway Parkway Wildlife Crossing - Municipal Class Environmental Assessment - Schedule 'C'

Re: Municipal Class EA Phases 1 and 2 - Problem and Opportunity Statement and Evaluation of Alternative Solutions

1.0 Introduction

The City of Windsor (the City) is undertaking a Schedule 'C' Municipal Class Environmental Assessment (Class EA) to consider the construction of a Wildlife Crossing at Ojibway Parkway in order to provide an ecological connection between Black Oak Heritage Park and Ojibway Park. Approximately 20,000 vehicles per day travel along the Ojibway Parkway and E.C. Row Expressway, which contributes heavily to wildlife mortality. The Wildlife Crossing will provide landscape connectivity and safe passage for area wildlife and species at risk in the Ojibway Prairie Complex. A Class EA is required to consider the potential environmental and social impacts that could result from the Project. The purpose of this Class EA is to analyze various alternative solutions to determine the preferred solution and undertake an assessment to determine the preferred design for the preferred solution.

The City has retained Wood Environment & Infrastructure Solutions (Wood) to undertake the Study. This study is being conducted in accordance with the Ontario's *Environmental Assessment Act, 1990* requirements for a Schedule 'C' Project (Phases 1-4) as outlined in the Municipal Engineers Association's Class EA document (Municipal Engineers Association, 2000 as amended in 2011 and 2015).

The purpose of this memo is to outline the overall Class EA process, and discuss Phases 1 and 2 of the Class EA process as they relate to this study.

2.0 Environmental Assessment

The Ontario *Environmental Assessment Act, 1990* was put into place to provide for the protection, conservation and wise management of the environment within the province. This Act applies to all projects being undertaken by provincial, municipal or other public

bodies within the province (unless explicitly exempted). It defines the environmental assessment works that must be completed prior to commencement of any undertaking, as well as the proponent's obligations to consult with all affected and/or interested parties.

No undertaking that falls under the scope of the EA Act can proceed until the Minister of the Ministry of the Environment, Conservation and Parks (MECP) provides approval of the submitted EA documentation. This includes resolution of appeals made in accordance with section 7.2(3) of the EA Act and the recently approved Bill 197.

2.1 Municipal Class Environmental Assessment Process

The Class EA process is a mechanism by which planning, and approval of municipal infrastructure is provided in an efficient, timely, economical and environmentally responsible manner. It represents a consistent, streamlined and easily understood process for planning and implementing municipal infrastructure projects. Under the EA Act, projects are classified as approved, subject to screening, subject to an approved Class Environmental Assessment process, or subject to a full Individual Environmental Assessment. This Study is classified as being subject to the Class EA process. It is being carried out according to the requirements outlined in the Municipal Engineers Association document titled Municipal Class Environmental Assessment (October 2000, as amended in 2007, 2011 & 2015).

Consistent with the Class EA, the study approach is designed to meet the following objectives:

- Protection of the environment, including natural, social and economic components of the environment.
- Participation of a broad range of stakeholders in the study process to allow for sharing of ideas, education, testing of creative solutions and developing alternatives.
- Documentation of the study process in compliance with all phases of the Class EA process.

The Class EA process classifies projects according to their level of complexity and potential environmental impacts. These are termed "Schedules" and are summarized below:

Schedules A and A+ includes projects that involve minor modifications to existing facilities. Environmental effects of these projects are generally small. These projects are exempt from the requirements of the *Environmental Assessment Act, 1990*.

Schedule B includes projects that involve improvements and minor expansion to existing facilities. There is a potential for some adverse environmental impacts and, therefore, the proponent is required to proceed through a screening process, including consultation with those affected. Schedule B projects are required to proceed through Phases 1, 2 and 5 of the Class EA process.

Schedule C includes projects that involve construction of new facilities and major expansion of existing facilities. These projects proceed through the environmental assessment planning process outlined in the Class EA document. These projects are required to fulfill the requirements of all five phases of the Class EA process.

As noted above, this study is being carried out in accordance with the requirements of Schedule 'C' Class EA process and it will address Phases 1 – 4. A description of the Class EA planning phases is provided below:

Phase 1 – Identify the problem (deficiency) or opportunity.

Phase 2 – Identify and evaluate alternative solutions to address the problem or opportunity by taking into consideration the existing environment, and establish the preferred solution considering public and review agency input.

Phase 3 – Identify Alternative Design Concepts for the preferred solution implementation by taking into consideration the existing environment and establish the preferred design concept by considering public and review agency input.

Phase 4 – Document the Environmental Assessment including the design and consultation process in an ESR for public review.

Phase 5 – Complete contract drawings and documents and proceed to construction and operation. Monitor construction for adherence to environmental provisions and commitments. Where special conditions dictate, also monitor the operation of the completed facility.

3.0 Class EA Phase 1 - Problem and Opportunity Statement

The City of Windsor is taking this opportunity to construct the Ojibway Parkway Wildlife Crossing in order to accomplish the following:

- Create an ecological connection between Black Oak Heritage Park and Ojibway Park;
- Protect sensitive species from roadway mortality by providing a safe passage for area wildlife and species at risk within the Ojibway Prairie Complex; and,
- Protect the travelling public on Ojibway Parkway from wildlife vehicle interactions.

4.0 Class EA Phase 2 – Identification and Evaluation of Alternative Solutions

Phase 2 of the Class EA process requires that various reasonable solutions shall be identified to address the problem and opportunity identified in Phase 1. The potential solutions are then evaluated against environment, social and technical factors. Based on the evaluation, the preferred solution is presented to the public during the first Public Information Centre for input and review.

4.1 Identification of Alternative Solutions

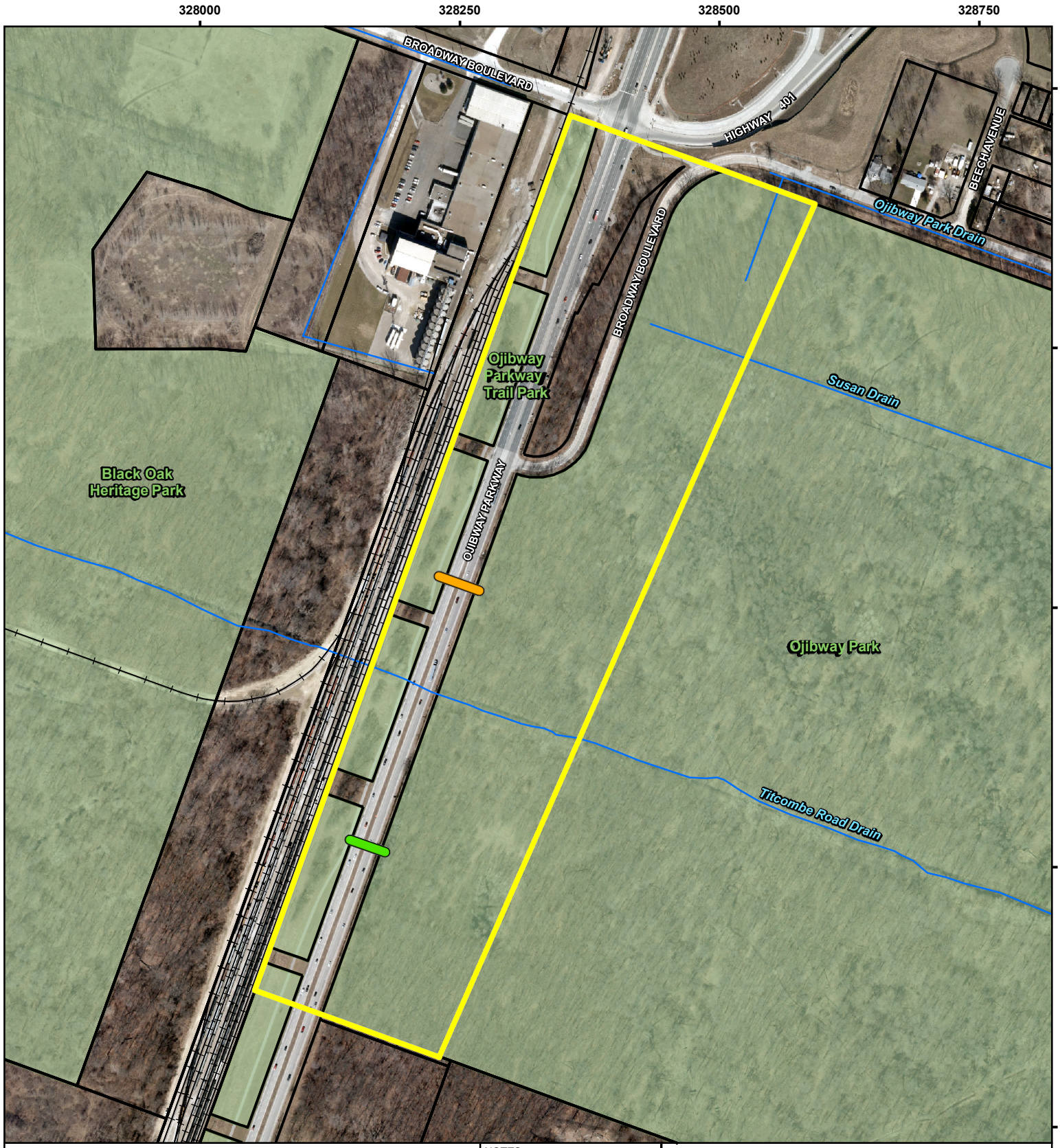
The following alternatives were identified for consideration in addressing the problem and opportunity statement discussed above:

Alternative 1: Do Nothing: The "Do Nothing" alternative maintains existing conditions and does not involve a wildlife crossing. It is used as a baseline against which other alternative solutions are compared.

Alternative 2: Underpass Wildlife Crossing: This alternative would involve construction of a wildlife crossing under the Ojibway Parkway. The underpass would be in the form of a large mammal underpass tunnel 4.0 m in height and 7.0 m in width to allow for the passage of a variety of wildlife. These dimensions were determined in accordance with minimum dimensions required for a large wildlife underpass as outlined in the Wildlife Crossing Structure Handbook Design and Evaluation in North America (U.S. Department of Transportation, 2011). Two sub-alternatives were developed, based on the location of the structure: Alternative 2A (North Option) and Alternative 2B (South Option). The locations of these sub-alternatives are illustrated on **Figure 1.** A conceptual rendering of the Underpass Wildlife Crossing Alternative is illustrated in .

Alternative 3: Overpass Wildlife Crossing: This alternative would involve construction of a wildlife crossing over the Ojibway Parkway. The overpass would be in the form of a large wildlife overpass 5.5 m in height and 50 m in width to allow for the passage of a variety of wildlife (small and large). A 50 m wide overpass structure was considered as the base case scenario as it meets the minimum recommended width for wildlife overpasses based on the Wildlife Crossing Structure Handbook Design and Evaluation in North America (U.S. Department of Transportation, 2011). The height of the wildlife overpass (5.5 m) is slightly over than the 5.0 m vertical clearance required by the Ontario Ministry of Transportation for structures over roads (Ontario Ministry of Transportation, 2020). This dimension was determined based on the input received from the City and is consistent with the vertical clearance of the overpass over Ojibway Parkway that leads to the Gordie Howe Bridge. Detailed design criteria is provided in **Table 1**. Two sub-

alternatives were developed, based on the location of the structure: Alternative 3A (North Option) and Alternative 3B (South Option). The locations of these sub-alternatives are illustrated on **Figure 1**. Detailed design criteria is provided in **Table 1**. A conceptual rendering of the Overpass Wildlife Crossing Alternative is illustrated in .



G:\Ojibway_Wildlife_Overpass_EA\MXD\Alternative_Overpass_Locs_3.mxd

LEGEND

- Approximate Study Area
- Parks
- Watercourse / Drain
- Railway
- Property Boundaries

Alternative Wildlife Crossing Locations

- North Option
- South Option

0 50 100 200 300 400 500 Metres

NOTES:
- Aerial imagery extracted from Essex County interactive map, 2019.

Datum: NAD83
Projection: UTM Zone 17N

2

THE CITY OF WINDSOR ONTARIO, CANADA

wood.

OJIBWAY WILDLIFE CROSSING

Alternative Wildlife Crossing Locations

PROJECT Nº: IM20104013	**FIGURE: 1**
SCALE: 1:5,000	DATE: October 2020

Figure 2: Wildlife Underpass Alternative (Conceptual Rendering)

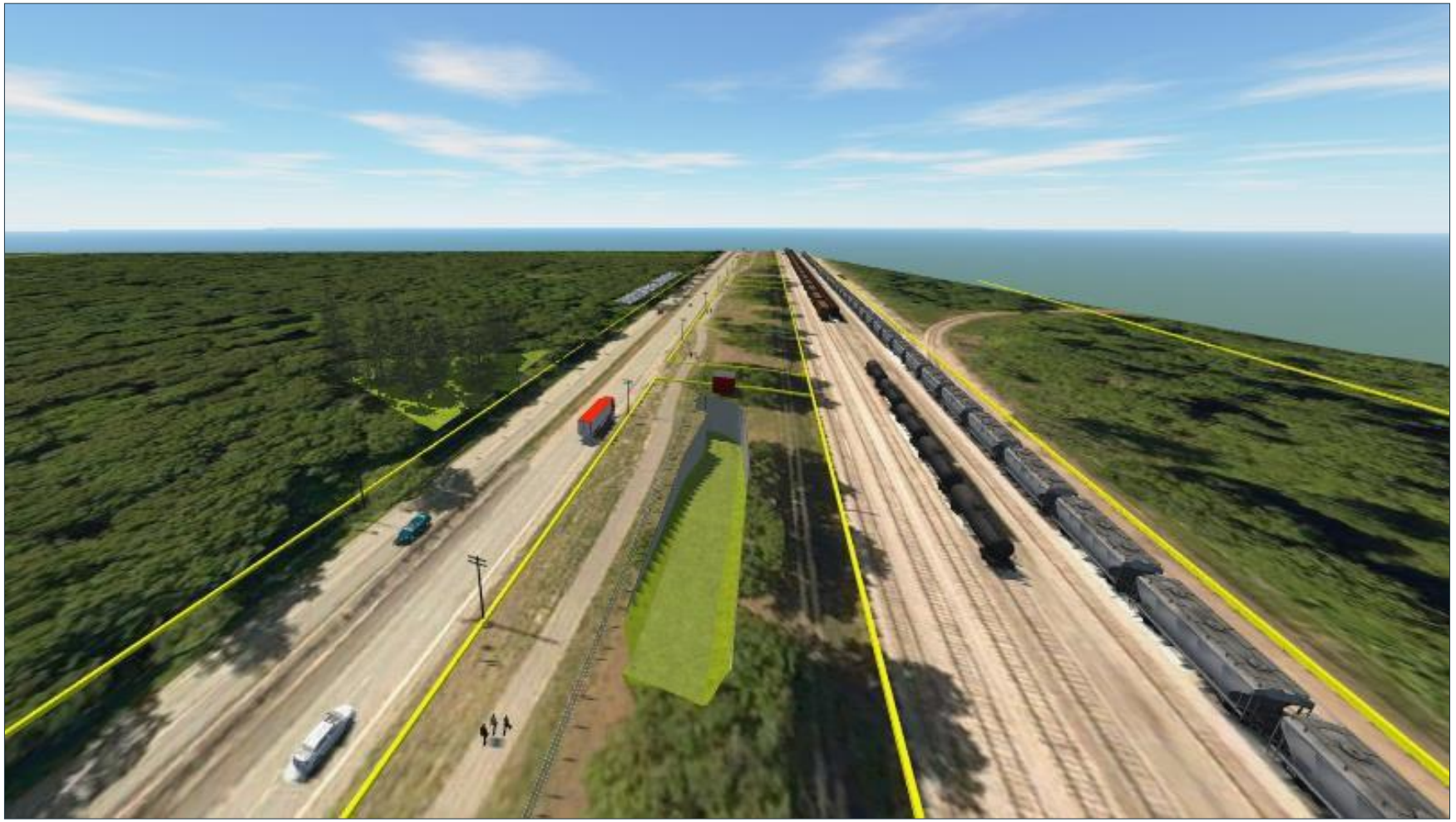
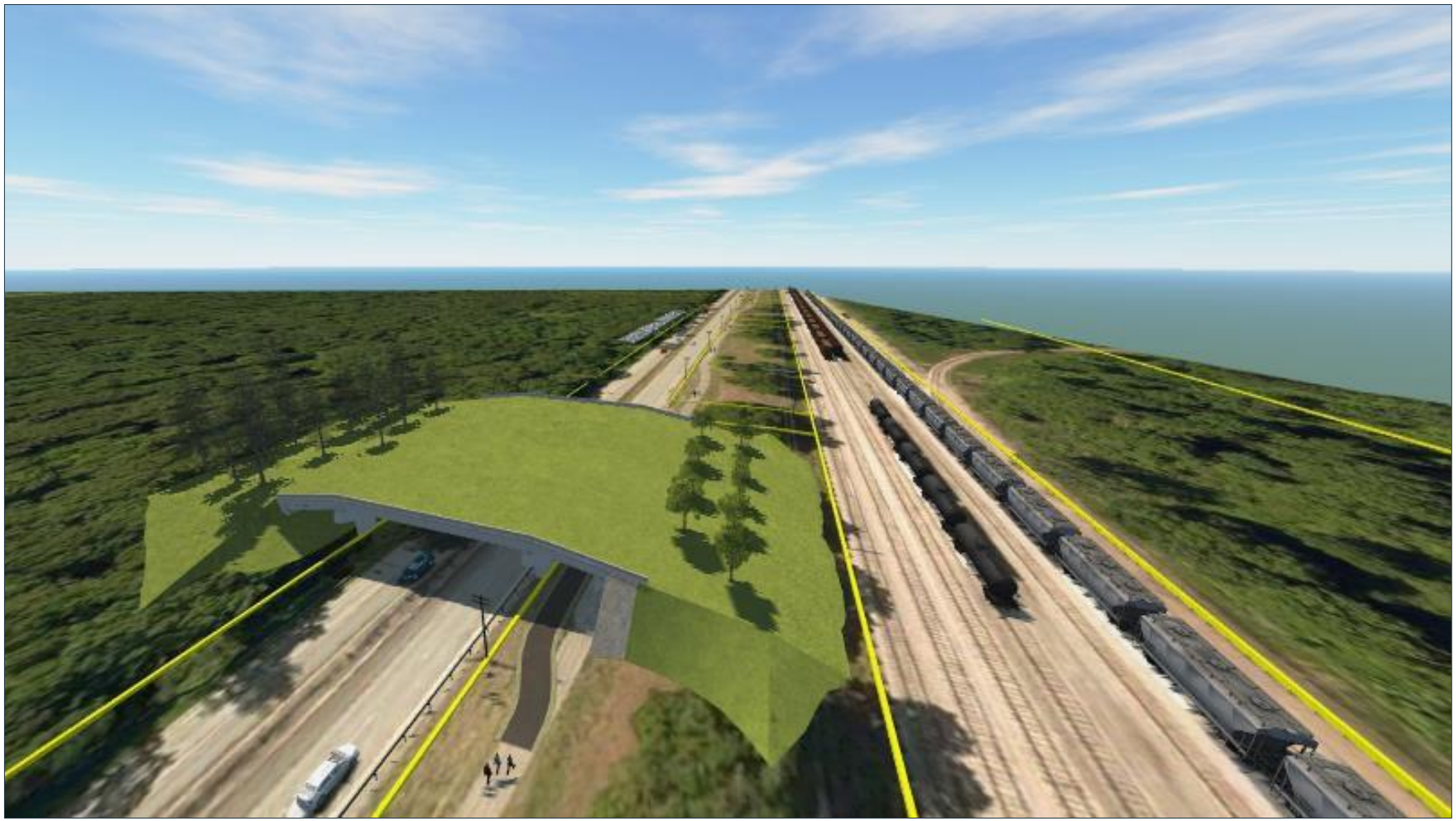


Figure 3: Wildlife Overpass Alternative (Conceptual)



4.2 Design Criteria

A design criteria table was developed for the underpass and overpass alternatives in accordance with the Wildlife Crossing Structure Handbook Design and Evaluation in North America (U.S. Department of Transportation, 2011) and MTO Design Supplement for TAC Geometric Design Guide (GDG) for Canadian Roads (Ontario Ministry of Transportation, 2020), and input from the City staff (**Table 1**).

Table 1: Design Criteria

Design Criteria	Recommended Dimension and Source		Proposed
Overpass - Width	Minimum width: 40-50 m Recommended width: 50-70 m	U.S. Department of Transportation, 2011[1]	50 m
Overpass - Minimum Vertical Clearance	5.0 m vertical clearance for structures over roads	Ontario Ministry of Transportation, 2020[2]	5.5 m
Underpass - Width	Minimum width: 7.0 m Recommended width: >10 m	U.S. Department of Transportation, 2011	7.0 m
Underpass - Minimum Vertical Clearance	Minimum Height: 4.0 m Recommended Height: >4.0 m	U.S. Department of Transportation, 2011	4.0 m
Maximum Approach Grade	5:1 (17%) or flatter	U.S. Department of Transportation, 2011	5:1 (17%)
Preferred Slide Slopes	3:1	N/A	3:1

[1] Wildlife Crossing Structure Handbook Design and Evaluation in North America, March 2011

[2] MTO Design Supplement for TAC Geometric Design Guide (GDG) for Canadian Roads, April 2020

4.3 Evaluation Criteria

To identify the impacts and advantages of each alternative solution, evaluation criteria were developed within each of the categories related to natural, social and technical environments and construction and cost. The evaluation criteria provided in **Table 2** were developed based on the existing characteristics/features within the study area. These criteria were chosen based on their ability to identify potential environmental effects of each alternative and distinguish the advantages and disadvantages between them.

Table 2: Evaluation Criteria for Alternative Solutions

Component	Evaluation Criteria
Natural Environment	• Landscape connectivity • Wildlife behaviour / response to the crossing • Potential impact to natural environment • Potential drainage and stormwater concerns
Social Environment	• Potential impact to community facilities and public parks • Potential impact on archaeological and built heritage resources • Visual appearance of the crossing and potential to provide as a gateway feature to add to the "Civic Image" of the City • Opportunities to incorporate Urban Design guidelines
Technical	• Continued bridge inspection requirements and ongoing maintenance
	• Potential impacts associated with implementation, construction access and staging
Financial	• Anticipated capital costs for construction and rehabilitation

4.1 Evaluation of Alternative Solutions

Table 2 provides a description of the evaluation criteria used in the evaluation of alternative solutions (Presented in **Table 3**):

Table 3: Evaluation of Alternative Solutions

Category & Criteria		Indicators		Alternative Solution 1: Do Nothing	Alternative Solution 2: Underpass Wildlife Crossing		Alternative Solution 3: Overpass Wildlife Crossing	
					Alternative Solution 2A (North Option)	Alternative Solution 2B (South Option)	Alternative Solution 3A (North Option)	Alternative Solution 3B (South Option)
Natural Environment	Landscape connectivity	Preferred	Provides excellent conditions for landscape connectivity	• Do nothing alternative does not provide landscape connectivity.	• These structures provide limited landscape connectivity. • Underpass Crossing Alternative presents closed conditions which do not allow the same air flow, moisture, and light conditions as larger more open structures, resulting in limited vegetation growth. • These structures allow opportunity to improve passage of small animals by incorporating microhabitat features, such as small stumps and vernal pools. • Flooding and winter ice formation in closed bottom tunnels with water pools may discourage use by certain animals.	• These structures provide limited landscape connectivity. • Underpass Crossing Alternative presents closed conditions which do not allow the same air flow, moisture, and light conditions as larger more open structures, resulting in limited vegetation growth. • These structures allow opportunity to improve passage of small animals by incorporating microhabitat features, such as small stumps and vernal pools. • Flooding and winter ice formation in closed bottom tunnels with water pools may discourage use by certain animals.	• Overpass Crossing Alternative allows 100% openness. Greater openness may facilitate use by wildlife species that are not tolerant (or less tolerant) of confined areas for movement (the tunnel effect). • These structures have been successful improving passage for multiple species (large mammals, birds, amphibians, and reptiles) and allow growth of brush, shrub and grass plantings along entire length of structure.	• Overpass Crossing Alternative allows 100% openness. Greater openness may facilitate use by wildlife species that are not tolerant (or less tolerant) of confined areas for movement (the tunnel effect). • These structures have been successful improving passage for multiple species (large mammals, birds, amphibians, and reptiles) and allow growth of brush, shrub and grass plantings along entire length of structure.
		Moderately Preferred	Provides landscape connectivity with certain limitations					
		Not Preferred	Does not provide landscape connectivity					
	Wildlife behaviour / response to the crossing	Preferred	Wildlife responds positively to the crossing with significant usage	• Do nothing alternative does not provide a crossing structure for safe passage of wildlife.	• Although wildlife does utilize underpass crossings, studies show that majority of wildlife prefer overpass crossings than underpass crossings (Ministry of Transportation, 2016; Eco-Kare International, 2017).	• Although wildlife does utilize underpass crossings, studies show that majority of wildlife prefer overpass crossings than underpass crossings (Ministry of Transportation, 2016; Eco-Kare International, 2017).	• Studies show that majority of wildlife prefer overpass crossings than underpass crossings (Ministry of Transportation, 2016; Eco-Kare International, 2017).	• Studies show that majority of wildlife prefer overpass crossings than underpass crossings (Ministry of Transportation, 2016; Eco-Kare International, 2017).
		Moderately Preferred	Wildlife responds positively to the crossing with regular usage					
		Not Preferred	Wildlife does not utilize the crossing					

Table 3: Evaluation of Alternative Solutions

Category & Criteria		Indicators		Alternative Solution 1: Do Nothing	Alternative Solution 2: Underpass Wildlife Crossing		Alternative Solution 3: Overpass Wildlife Crossing	
					Alternative Solution 2A (North Option)	Alternative Solution 2B (South Option)	Alternative Solution 3A (North Option)	Alternative Solution 3B (South Option)
Natural Environment (Continued)	Potential impacts on terrestrial species and habitats	Preferred	No impacts to terrestrial species or habitats	• No construction-related impacts to terrestrial species or habitat.	• No impacts to species at risk or their protected habitat; • Minor construction-related impacts to terrestrial species and habitat at tunnel entrance/exit. • Construction-related impacts will be mitigated by restoring these areas post-construction.	• Location of underpass entrance/exit and associated grading conflict with existing species at risk plants and their associated habitat. • Construction of underpass will result in direct negative impacts to species at risk plants and their protected habitat	• No impacts to species at risk or their protected habitat; • Minor construction-related impacts to terrestrial species and habitat within the footprint of the overpass approaches (ramps). • Construction-related impacts will be mitigated by restoring these areas post-construction.	• Location of overpass approaches (ramps) and associated grading conflict with existing species at risk plants and their associated habitat. • Construction of overpass will result in direct negative impacts to species at risk plants and their protected habitat
		Moderately Preferred	Potential impacts to terrestrial species and habitats which can be mitigated					
		Not Preferred	Direct negative impacts to terrestrial species and habitats					
	Potential drainage and stormwater concerns	Preferred	Alternative does not require measures to address stormwater management	• Alternative does not require any measures to address stormwater management	• Pumping likely required as there is no local receiver available for gravity drainage. • Pumping, if required, will be necessary throughout the life of the structure.	• Pumping likely required as there is no local receiver available for gravity drainage. • Pumping, if required, will be necessary throughout the life of the structure.	• Drainage by gravity available. • Opportunities available to integrate stormwater management requirements within adjacent lands. • Stormwater can be managed through design and initial construction and will not require active management throughout the life of the structure.	• Drainage by gravity available. • Opportunities available to integrate stormwater management requirements within adjacent lands. • Stormwater can be managed through design and initial construction and will not require active management throughout the life of the structure.
		Moderately Preferred	Alternative requires minimal additional measures to address stormwater management.					
		Not Preferred	Alternative requires significant measures to address stormwater management					
Social Environment	Potential impact to community facilities	Preferred	No impacts or displacement to community facilities	• No impacts to the multi-use trail in the Ojibway Parkway Trail Park and the passive recreation trails within Ojibway Park.	• Slight permanent displacement of the existing multi-use trail closer to the road, however the trail will still be maintained.	• Slight permanent displacement of the existing multi-use trail closer to the road, however the trail will still be maintained.	• Slight permanent displacement of the existing multi-use trail closer to the road, however the trail will still be maintained.	• Slight permanent displacement of the existing multi-use trail closer to the road, however the trail will still be maintained.
		Moderately Preferred	Temporary impacts to community facilities					

Table 3: Evaluation of Alternative Solutions

Category & Criteria		Indicators		Alternative Solution 1: Do Nothing	Alternative Solution 2: Underpass Wildlife Crossing		Alternative Solution 3: Overpass Wildlife Crossing	
					Alternative Solution 2A (North Option)	Alternative Solution 2B (South Option)	Alternative Solution 3A (North Option)	Alternative Solution 3B (South Option)
Social Environment (Continued)	Potential impacts on archaeological resources	Preferred	No disturbance to archaeological sites or lands with archaeological potential	• No archaeological impacts.	• Potential impacts to lands identified to retain potential archaeological resources depending on the location of the structure. Stage 2 archaeological assessment will be required to determine impacts and potential mitigation measures.	• Potential impacts to lands identified to retain potential archaeological resources depending on the location of the structure. Stage 2 archaeological assessment will be required to determine impacts and potential mitigation measures.	• Potential impacts to lands identified to retain potential archaeological resources depending on the location of the structure. Stage 2 archaeological assessment will be required to determine impacts and potential mitigation measures.	• Potential impacts to lands identified to retain potential archaeological resources depending on the location of the structure. Stage 2 archaeological assessment will be required to determine impacts and potential mitigation measures.
		Moderately Preferred	Disturbance to archaeological sites or lands with archaeological potential					
	Potential impacts on built heritage resources and cultural heritage landscapes	Preferred	No impacts to built/cultural heritage resources	• No impacts are anticipated as there are no built heritage resources and cultural heritage landscapes.	• No impacts are anticipated as there are no built heritage resources and cultural heritage landscapes.	• No impacts are anticipated as there are no built heritage resources and cultural heritage landscapes.	• No impacts are anticipated as there are no built heritage resources and cultural heritage landscapes.	• No impacts are anticipated as there are no built heritage resources and cultural heritage landscapes.
		Moderately Preferred	Minor impacts to built/cultural heritage resources					
	Potential to provide as a gateway feature to add to the "Civic Image" of the City	Preferred	Potential to provide as a gateway feature	• Does not have potential to provide as a gateway feature.	• Does not have potential to provide as a gateway feature.	• Does not have potential to provide as a gateway feature.	• Potential to provide as a gateway feature.	• Potential to provide as a gateway feature.
		Not Preferred	No potential to provide a gateway feature					
	Opportunities to incorporate Urban Design guidelines	Preferred	Opportunities to incorporate Urban Design guidelines	• Does not provide opportunities to incorporate Urban Design guidelines.	• Does not provide opportunities to incorporate Urban Design guidelines.	• Does not provide opportunities to incorporate Urban Design guidelines.	• Provides opportunities to incorporate City of Windsor's Urban Design guidelines (Windsor SEEN - A Municipal Urban Design Agenda for The Windsor Community).	• Provides opportunities to incorporate City of Windsor's Urban Design guidelines (Windsor SEEN - A Municipal Urban Design Agenda for The Windsor Community).
		Not Preferred	No opportunities to incorporate Urban Design guidelines					

Table 3: Evaluation of Alternative Solutions

Category & Criteria		Indicators		Alternative Solution 1: Do Nothing	Alternative Solution 2: Underpass Wildlife Crossing		Alternative Solution 3: Overpass Wildlife Crossing	
					Alternative Solution 2A (North Option)	Alternative Solution 2B (South Option)	Alternative Solution 3A (North Option)	Alternative Solution 3B (South Option)
Technical	Continued bridge inspection requirements and ongoing maintenance	Preferred	No impacts as a result of maintenance	• No Impacts	• Inspection of underpass could be completed from below parkway, with no disturbance to traffic. If properly waterproofed, maintenance can be completed from below parkway, with little disturbance to traffic. • Major rehabilitation work would be expected approximately three times during lifetime of 75 years.	• Inspection of underpass could be completed from below parkway, with no disturbance to traffic. If properly waterproofed, maintenance can be completed from below parkway, with little disturbance to traffic. • Major rehabilitation work would be expected approximately three times during lifetime of 75 years.	• Inspection could be completed from the top of the bridge and from edges of parkway, however close up inspections would need to be completed from parkway and may require short duration full lane closures. • Similarly, maintenance or rehabilitation of the bridge would likely require full lane closures. • Major rehabilitation work would be expected approximately two times during the lifetime of 75 years.	• Inspection could be completed from the top of the bridge and from edges of parkway, however close up inspections would need to be completed from parkway and may require short duration full lane closures. • Similarly, maintenance or rehabilitation of the bridge would likely require full lane closures. • Major rehabilitation work would be expected approximately two times during the lifetime of 75 years.
		Moderately Preferred	Minimal, short-term impacts as a result of maintenance					
	Potential impacts associated with implementation (complexity of construction)	Preferred	Straightforward construction	• No Impacts	• This could be completed either as a cast-in-place rigid frame structure or precast structure, both of which are standard construction methods with no unusual complexity. • There would be additional consideration to be given to extensive excavation, shoring system, dewatering, underground utilities (2 Sanitary Sewers, 1 force main and 1 gravity and a watermain under the road), and material removal and disposal that would not be required to the same extent for the overpass.	• This could be completed either as a cast-in-place rigid frame structure or precast structure, both of which are standard construction methods with no unusual complexity. • There would be additional consideration to be given to extensive excavation, shoring system, dewatering, underground utilities (2 Sanitary Sewers, 1 force main and 1 gravity and a watermain under the road), and material removal and disposal that would not be required to the same extent for the overpass.	• Can be completed with a precast concrete box girder bridge, or steel girders. These are not unusually complex superstructure types but are more complicated structure than a culvert/tunnel, with some work (girder fabrication) completed off site and delivered to site, and the level of precision required is somewhat higher.	• Can be completed with a precast concrete box girder bridge, or steel girders. These are not unusually complex superstructure types but are more complicated structure than a culvert/tunnel, with some work (girder fabrication) completed off site and delivered to site, and the level of precision required is somewhat higher.
		Moderately Preferred	Moderate construction constraints and complexity but can be easily mitigated					
		Not Preferred	Significant construction constraints and complexity					

Table 3: Evaluation of Alternative Solutions

Category & Criteria		Indicators		Alternative Solution 1: Do Nothing	Alternative Solution 2: Underpass Wildlife Crossing		Alternative Solution 3: Overpass Wildlife Crossing	
					Alternative Solution 2A (North Option)	Alternative Solution 2B (South Option)	Alternative Solution 3A (North Option)	Alternative Solution 3B (South Option)
Technical (Continued)	Potential impacts associated with construction access	Preferred	No impacts associated with construction access	• No Impacts	• Advanced construction staging will be required which may impact the traffic flow.	• Advanced construction staging will be required which may impact the traffic flow.	• Construction of the bridge will not significantly affect the traffic flow.	• Construction of the bridge will not significantly affect the traffic flow.
		Moderately Preferred	Potential impacts associated with construction access, however, can be mitigated					
		Not Preferred	Significant impacts associated with construction access					
	Potential impacts associated with construction staging	Preferred	No impacts associated with construction staging	• No impacts	• Advanced construction staging required to move traffic lanes around portions of structure under construction. • Several construction stages are likely required.	• Advanced construction staging required to move traffic lanes around portions of structure under construction. • Several construction stages are likely required.	• Construction of the bridge will not significantly affect the traffic flow for the most part, however, short term full lane closure(s) may be needed during nights to erect girders.	• Construction of the bridge will not significantly affect the traffic flow for the most part, however, short term full lane closure(s) may be needed during nights to erect girders.
		Moderately Preferred	Some potential impacts associated with construction staging					
		Not Preferred	Significant impacts associated with construction staging					
Financial	Construction Cost	Preferred	Lowest Cost	• No cost	• Approximately $3.0 million construction cost for structure 7.0 m wide and 4.0 m high. • Additional cost associated with the construction of pumping station for this alternative.	• Approximately $3.0 million construction cost for structure 7.0 m wide and 4.0 m high. • Additional cost associated with the construction of pumping station for this alternative.	• Approximately $7.8 million construction cost for structure 50 m wide and 5.5 m high.	• Approximately $7.8 million construction cost for structure 50 m wide and 5.5 m high.
		Moderately Preferred	Medium Cost					
		Not Preferred	Highest Cost					

Table 3: Evaluation of Alternative Solutions

Category & Criteria		Indicators		Alternative Solution 1: Do Nothing	Alternative Solution 2: Underpass Wildlife Crossing		Alternative Solution 3: Overpass Wildlife Crossing	
					Alternative Solution 2A (North Option)	Alternative Solution 2B (South Option)	Alternative Solution 3A (North Option)	Alternative Solution 3B (South Option)
Financial (Continued)	Rehabilitation Cost	Preferred	Lowest Cost	• No cost	• Approximately $500,000 rehabilitation cost during the lifetime of 75 years. Rehabilitation will be required three times during lifetime of 75 years. • Additional costs associated with the maintenance of pumping station.	• Approximately $500,000 rehabilitation cost during the lifetime of 75 years. Rehabilitation will be required three times during lifetime of 75 years. • Additional costs associated with the maintenance of pumping station.	• Approximately $3,000,000 rehabilitation cost during the lifetime of 75 years. Rehabilitation will be required two times during the lifetime of 75 years.	• Approximately $3,000,000 rehabilitation cost during the lifetime of 75 years. Rehabilitation will be required two times during the lifetime of 75 years.
		Moderately Preferred	Medium Cost					
		Not Preferred	Highest Cost					
Recommendation				**Not Preferred**	**Not Preferred**	**Not Preferred**	**Preferred**	**Not Preferred**

4.2 Preferred Solution

The Alternative Solutions were comparatively and qualitatively evaluated in **Table 3** based on criteria developed within four main categories (Natural and Social Environments, and Technical and Financial considerations). Alternative 3A - Overpass Wildlife Crossing (North Option) was selected as the Preferred Solution due to a number of advantages compared to the other alternatives. A summary of the key impacts and benefits of Alternative 3A is provided below:

- This alternative allows 100% openness. Greater openness may facilitate use by wildlife species that are not tolerant (or less tolerant) of confined areas for movement (the tunnel effect).
- Overpass structures been successful as a multi-species strategy (large mammals, birds, amphibians, and reptiles) and allow growth of brush, shrub and grass plantings along entire length of structure.
- The location of Alternative 3A has been carefully selected in order to avoid impacts to Species at Risk Plants and Protected Habitat.
- There are opportunities available to integrate stormwater associated with this structure within the adjacent lands and there will be no requirement for active stormwater management during operation.
- Being an above grade structure, this alternative can provide as a gateway feature, with opportunities to incorporate urban design elements.
- The construction of the Overpass structure will not significantly affect the traffic flow compared to the construction of an Underpass structure.
- Although an Overpass structure will be more costly than an Underpass structure, it will provide sufficient space for landscape connectivity while allowing for safe passage of a wide variety of wildlife.

Should you have any questions regarding this memo, please do not hesitate to contact the undersigned.

Sincerely,

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Mir Ahsan Talpur, M.Env.Sc., EP
Environmental Planner
Email: mir.talpur@woodplc.com
Mobile: (647) 545 8974

Nathan Hellinga, B.Sc., CAN-CISEC, CPESC
Project Manager; Habitat Restoration Specialist
Email: nathan.hellinga@woodplc.com
Mobile: (647) 294-8986

5.0 References

Eco-Kare International. (2017). *Effectiveness of wildlife mitigation measures for large- to mid ized animals on Highway 69 in Northeastern Ontario: September 2011 to September 2016*.

Ministry of Transportation. (2016). *Environmental Guide for Mitigating Road Impacts to Wildlife*. Retrieved from https://roadecology.ucdavis.edu/files/content/projects/Ontario%20Environmental%20Guide%20for%20Mitigating%20Road%20Impacts%20to%20Wildlife_2017.pdf

Ontario Ministry of Transportation. (2020). *MTO Design Supplement for TAC Geometric Design Guide (GDG) For Canadian Roads (April 2020)*. St. Catharine's, ON : Ontario Ministry of Transportation, Transportation Infrastructure Management Division, Standards & Specifications Branch, Design Standards & Specifications Office. Retrieved from https://www.library.mto.gov.on.ca/SydneyPLUS/Sydney/Portal/default.aspx?lang=en-US

U.S. Department of Transportation. (2011). *Wildlife Crossing Structure Handbook Design and Evaluation in North America (March 2011)*. U.S. Department of Transportation, Federal Highway Administration, Washington D.C., USA. Retrieved from https://roadecology.ucdavis.edu/files/content/projects/DOT-FHWA_Wildlife_Crossing_Structures_Handbook.pdf