Memo

To:	Paul Mourad (City of Windsor)	**Date:**	13 April 2021
From:	Mir Talpur and Nathan Hellinga (Wood)		
CC:	Felix Wong and Andreas Stenzel, (Wood)		
Ref:	Ojibway Parkway Wildlife Crossing – Municipal Class Environmental Assessment - Schedule 'C'		
Re:	Municipal Class EA Phase 3 - Evaluation of Alternative Design Concepts		

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, south of Broadway Boulevard, in the City of Windsor to begin re-establishing an ecological connection between Black Oak Heritage Park and Ojibway Park. The Study Area is shown on **Figure 1**.

The 20 m wide Ojibway Parkway that carries approximately 20,000 vehicles per day contributes to the functional separation of these natural heritage features. Consequently, the Parkway inhibits wildlife movement and ecological linkage functions. The Wildlife Crossing will provide a connection for local tallgrass prairie plant communities and safe passage opportunities for wildlife, including species at risk. The proposed Wildlife Crossing thereby reduces landscape fragmentation through improvement of habitat connectivity in the Ojibway Prairie Complex.

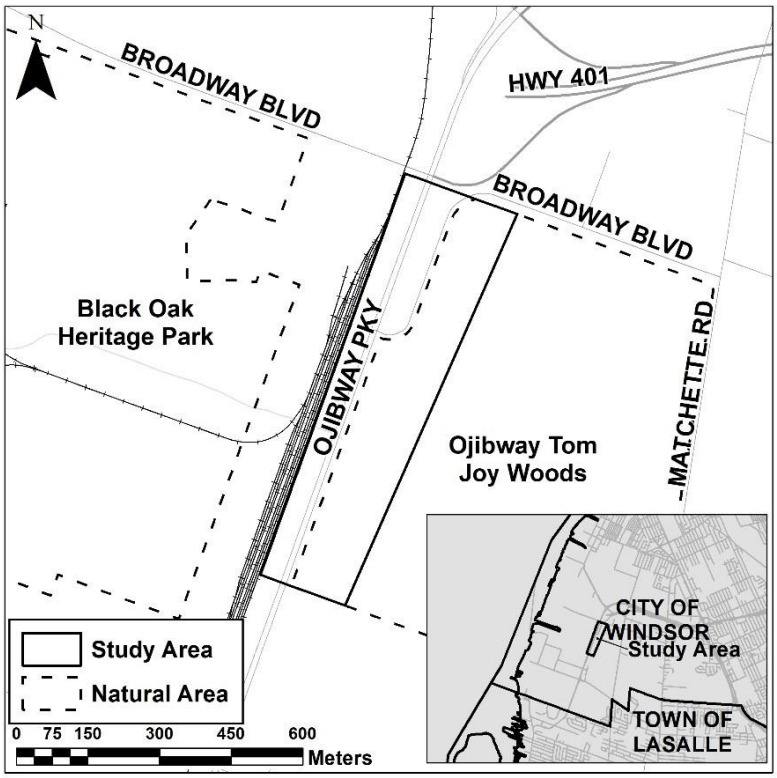
A Class EA is required to consider the potential environmental and social impacts that could result from the Project. The purpose of this Class EA is to analyze various alternative solutions to determine the preferred solution and undertake an assessment to determine the preferred design for the preferred 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).

Phase 1 (Problem and Opportunity Statement) and Phase 2 (Alternative Solutions) for this study were presented to the public at the Public Information Centre (PIC) #1, which was held from November 19, 2020 to December 3, 2020. As part of the Class EA Phase 2,

an Overpass Wildlife Crossing was identified as a Preferred Solution. The purpose of this memo is to discuss Phase 3 of the Class EA process as it relates to this study. It discusses the alternative design concepts, their evaluation and the preferred design concept.

Figure 1: Study Area



2.0 Class EA Phase 3 – Identification and Evaluation of Alternative Design Concepts

Phase 3 of the Class EA process requires identification and evaluation of various reasonable design concepts, based on the preferred solution chosen in Phase 2. The potential alternative design concepts are then evaluated against natural, social and technical and financial factors. Based on the evaluation, the preferred alternative design concept is identified and presented to the public during a Public Information Centre for input and review.

2.1 Identification of Alternative Design Concepts

The following alternatives were identified for the preferred solution (Wildlife Overpass Wildlife Crossing):

- Alternative 1 - Wildlife Overpass (3 Span Bridge)

- Alternative 2 - Wildlife Overpass (4 Span Bridge)
- Alternative 3 - Wildlife Overpass (2 Span Bridge)
- Alternative 4 – Wildlife Overpass (4 Span Arch Culvert)

Each of the alternative utilizes a different type of girder system to support the bridge deck. The height of the girders effects the elevation of the fill placed atop the bridge deck. This ultimately effects the grading of the approaches, especially the western approach along the railway which is constrained by the width of the road right of way, and the existing drainage feature paralleling the railway. The approach grading is anticipated to affect the ability, or willingness, of wildlife to utilize the structure and as such is discussed in detail within the following descriptions of the alternatives.

Alternative 1 - Wildlife Overpass (3 Span Bridge):

Alternative 1 is a 3-span bridge comprised of an approximately 31 m long main span and two shorter approximately 10 m long end spans. The main span will be constructed of NU 1800 concrete girders and the end spans will be precast concrete hollow slabs. The 31 m main span will bridge all lanes of Ojibway Parkway and thus this configuration does not utilize a centre pier. Since this alternative utilizes a single span over the parkway, the top of the overpass will be level.

The approach ramps, including the side slopes of the ramps are graded at 5:1 slopes. A 5:1 slope was identified as recommended maximum slope for approaches build on level ground. There is one exception to the 5:1 grade of the approach ramps. The exception occurs on the western approach near the railway. Along this edge the slope is locally steepened to 2:1 to enable the grading to meet existing ground within the road right of way. This 2:1 slope is approximately 2.4 m high by 4.8 m long (deep) and extends the 50 m width of the overpass structure.

This alternative is shown in **Figure 2** and **Figure 3**. The cross-section for concrete NU girders for 3-Span Bridge (Alternative 1) is shown on **Figure 4**.

Figure 2: Alternative 1 - Wildlife Overpass (3-Span Bridge) – Plan View

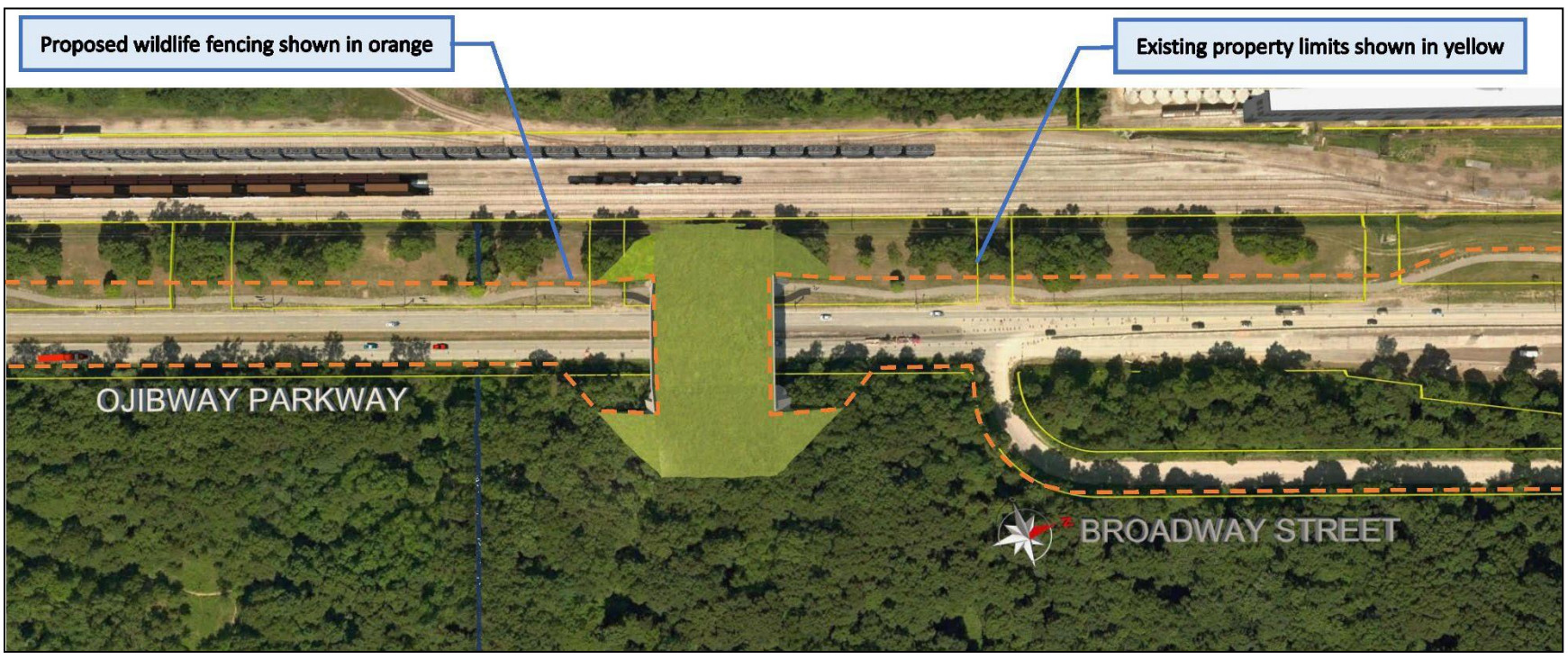
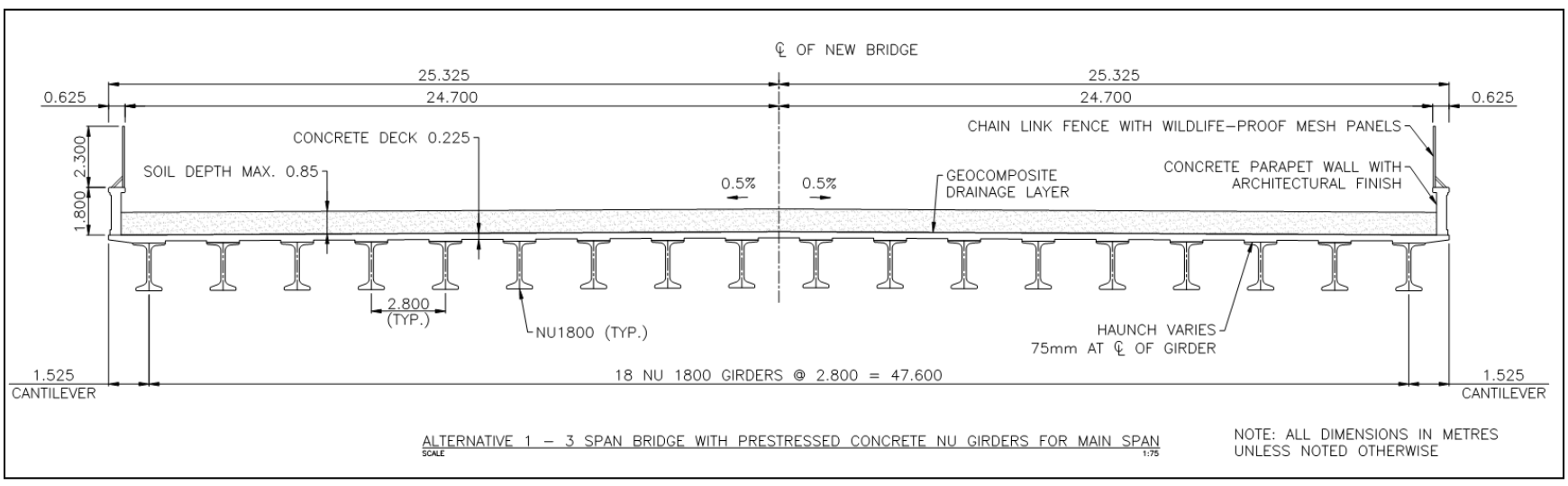


Figure 3: Alternative 1 - Wildlife Overpass (3 Span-Bridge) – Profile View

Figure 4: Concrete NU Girders for 3-Span Bridge (Alternative 1)



Alternative 2 - Wildlife Overpass (4 Span Bridge):

Alternative 2 is a 4-span bridge comprised of two approximately 16 m long middle spans supported by a centre pier and two shorter approximately 10 m long end spans. The 16 m middle spans will be constructed of B700 precast concrete box girders and the 10 m end spans will be precast concrete hollow slabs. The two middle spans will have a slight (0.5%) slope from the end abutments to the centre pier which will create a minor crest in the center of the overpass. This crest will be approximately 0.1 m higher than where the approach ramps meet the structure.

The approach ramps, including the side slopes of the ramps are graded at 5:1 slopes. A 5:1 slope was identified as recommended maximum slope for approaches build on level ground. There is one exception to the 5:1 grade of the approach ramps. The exception occurs on the western approach near the railway. Along this edge the slope is locally steepened to 2:1 to enable the grading to meet existing ground within the road right of way. This 2:1 slope is approximately 0.7 m high by 1.4 m long (deep) and extends the 50 m width of the overpass structure. The relatively short height of this 2:1 slope may allow for further design refinements which could eliminate the need for a 2:1 slope by accepting a grade of slightly steeper than 5:1 along this edge.

This alternative is shown in **Figure 5** and **Figure 6**. The cross-section for precast concrete box girders for 4 Span Bridge (Alternative 2) is shown on **Figure 7**.

Figure 5: Alternative 2 - Wildlife Overpass (4-Span Bridge) – Plan View

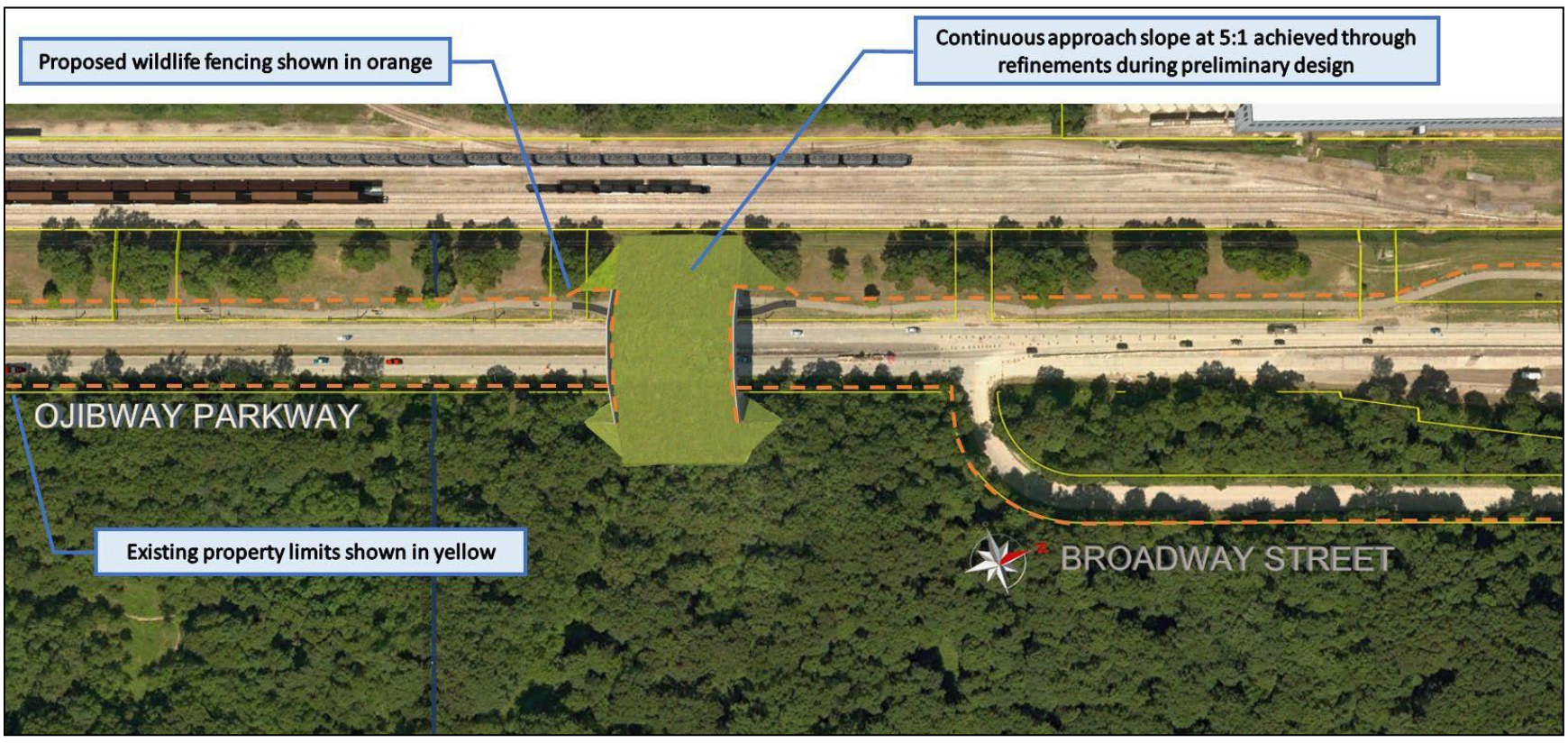
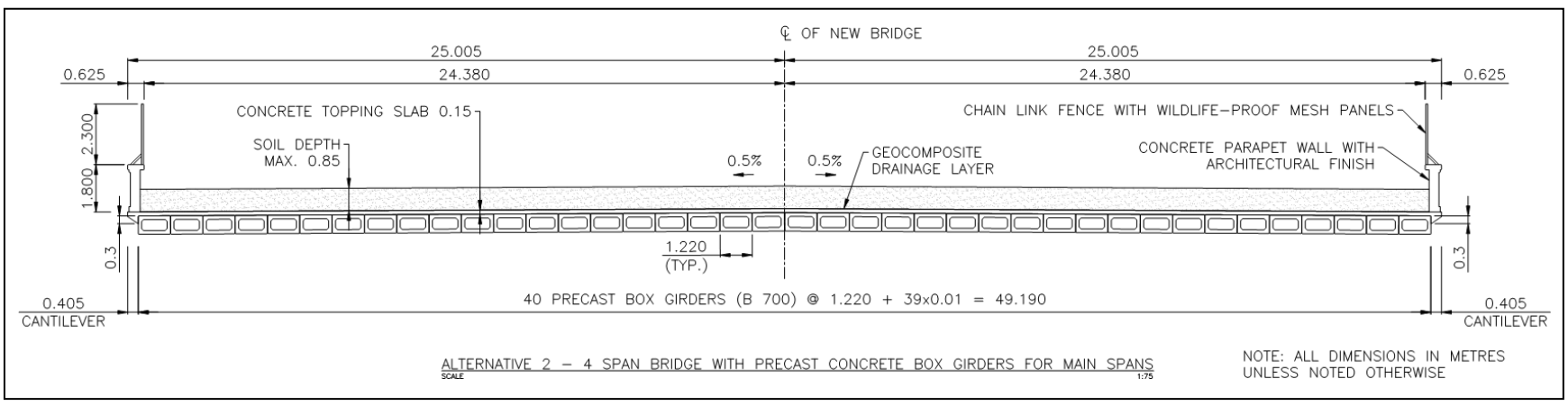


Figure 6: Alternative 2 - Wildlife Overpass (4-Span Bridge) – Profile View

Figure 7: Precast Concrete Box Girders for 4-Span Bridge (Alternative 2)



Alternative 3 - Wildlife Overpass (2 Span Bridge):

Alternative 3 is a 2-span bridge comprised of two approximately 27 m long supported by a centre pier. The 27 m spans will be constructed of B1000 precast concrete box girders. The two spans will have an approximate 7.0% slope rising from the end abutments to the centre pier which will create a crest in the center of the overpass. This crest will be approximately 1.5 m higher than where the approach ramps meet the bridge deck.

The approach ramps, including the side slopes of the ramps are graded at 5:1 slopes. A 5:1 slope was identified as recommended maximum slope for approaches build on level ground. There is one exception to the 5:1 grade of the approach ramps. The exception occurs on the western approach near the railway. Along this edge the slope is locally steepened to 2:1 to enable the grading to meet existing ground within the road right of way. This 2:1 slope is approximately 3.3 m high by 6.6 m long (deep) and extends the 50 m width of the overpass structure.

This alternative is shown in **Figure 8** and **Figure 9**. The cross-section for precast concrete box girders for 2-Span Bridge (Alternative 3) is shown on **Figure 10**.

Figure 8: Alternative 3 - Wildlife Overpass (2-Span Bridge) – Plan View

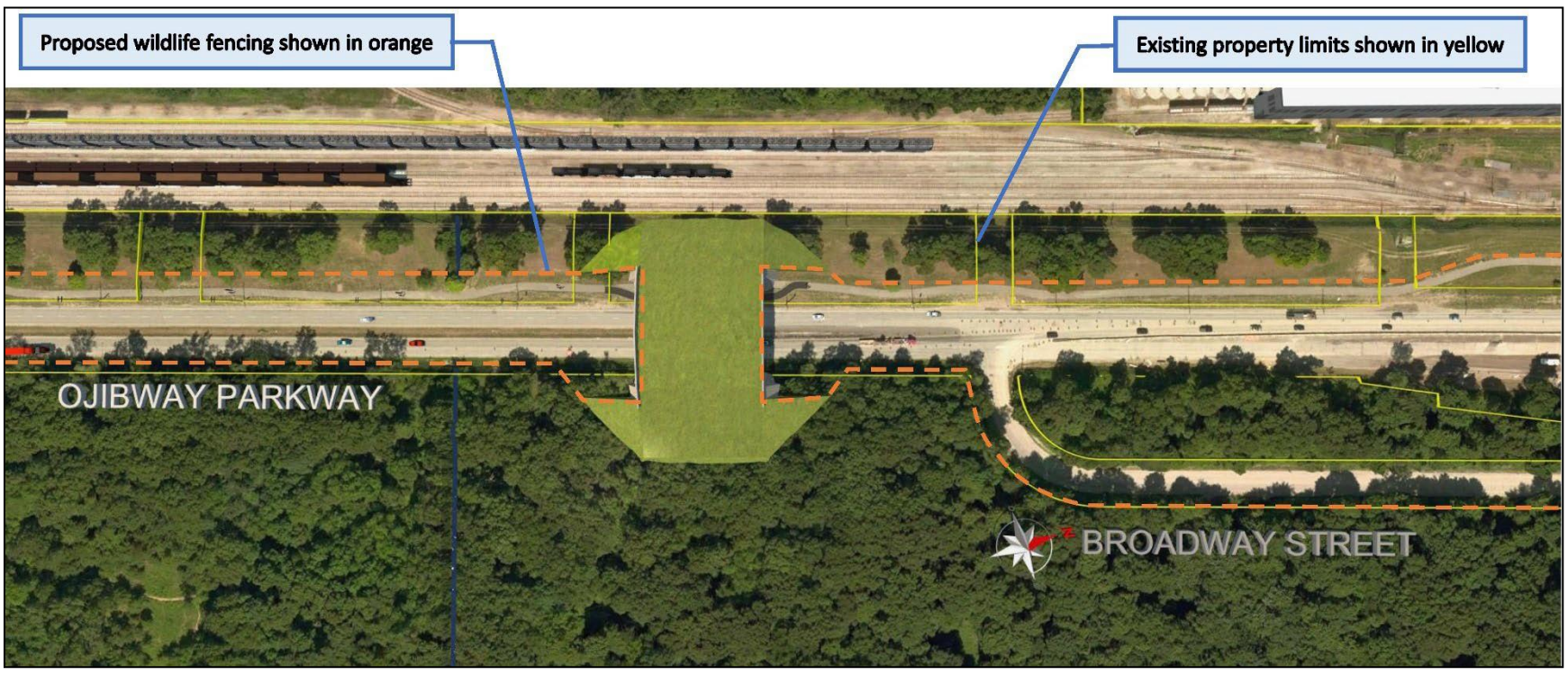
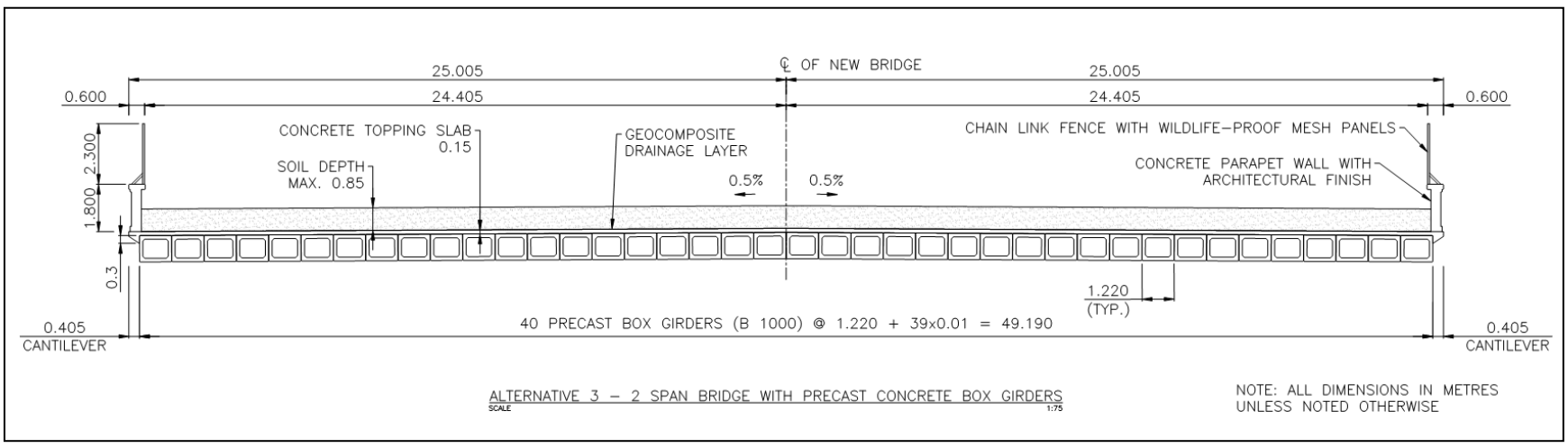


Figure 9: Alternative 3 - Wildlife Overpass (2-Span Bridge) – Profile View

Figure 10: Precast Concrete Box Girders for 2-Span Bridge (Alternative 3)



Alternative 4 - Wildlife Overpass (4 Span Arch Culvert)

Alternative 4 is a four-span precast concrete arch structure consisting of two larger 12.8m middle spans over the north and south bound lanes of Ojibway Parkway, and two shorter 4.3m span arches on the east and west side of Ojibway Parkway. The smaller arch on the west will span across the proposed multi use path, while the arch on the east of the roadway will span a drainage ditch.

The arches will be supported on cast-in-place concrete pedestal footings with one combined footing in the roadway median, and additional pedestal footings at the other outside of the main span and at each side of the smaller outside spans.

The arches will be covered with fill to allow for a minimum of 0.85m deep soil above the crown of the main spans. The surface above the main spans will be level. A concrete facing and parapet wall with an architectural finish will extend between the different arches and retain the fill within the structure.

The approach ramps, including the side slopes of the ramps are graded at 5:1 slopes. A 5:1 slope was identified as the recommended maximum slope for approaches built on level ground. The configuration of this alternative allows for a continuous 5:1 slope on either approach within the constrained limits.

This alternative is shown in **Figure 11** tot **Figure 14**.

Figure 11: Alternative 4 - Wildlife Overpass (4 Span Arch Culvert) – Plan View

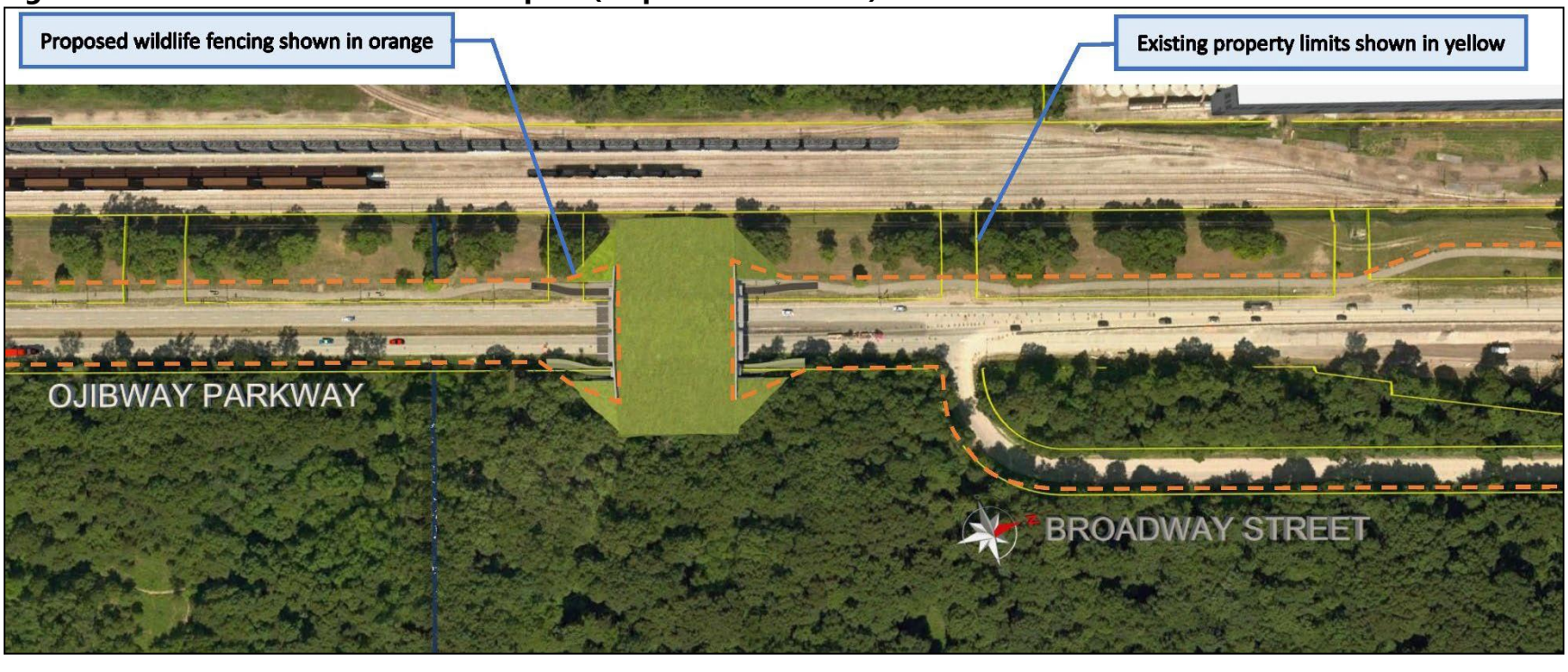


Figure 12: Alternative 4 - Wildlife Overpass (4 Span Arch Culvert) – Profile View

Figure 13: Alternative 4 - Wildlife Overpass (4 Span Arch Culvert)

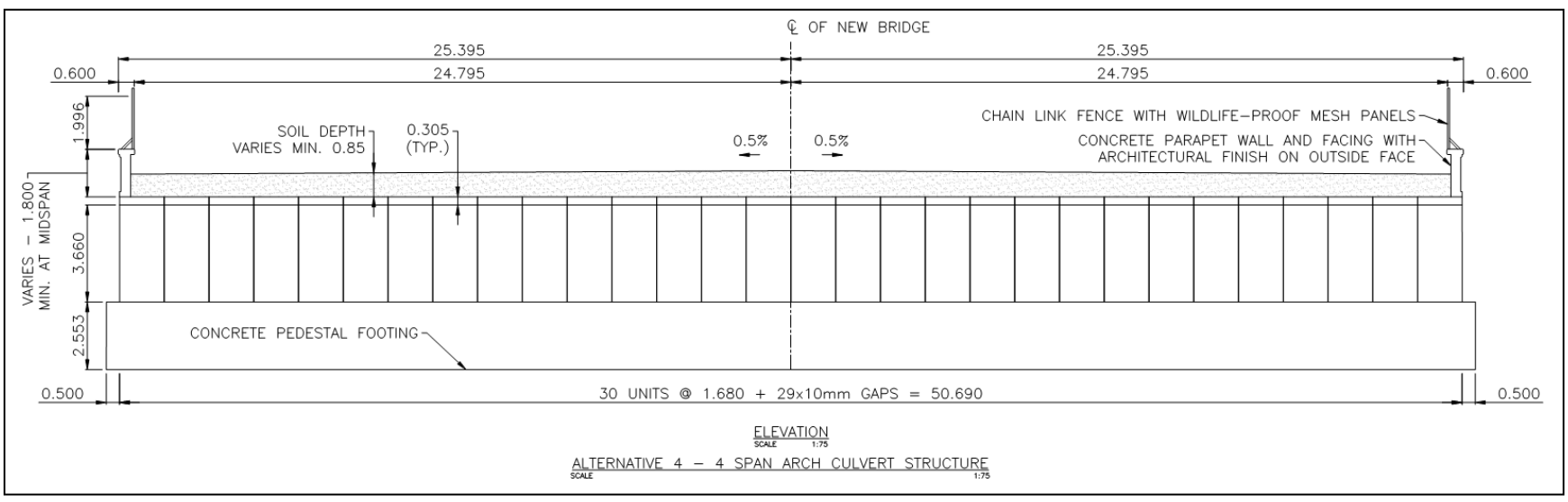
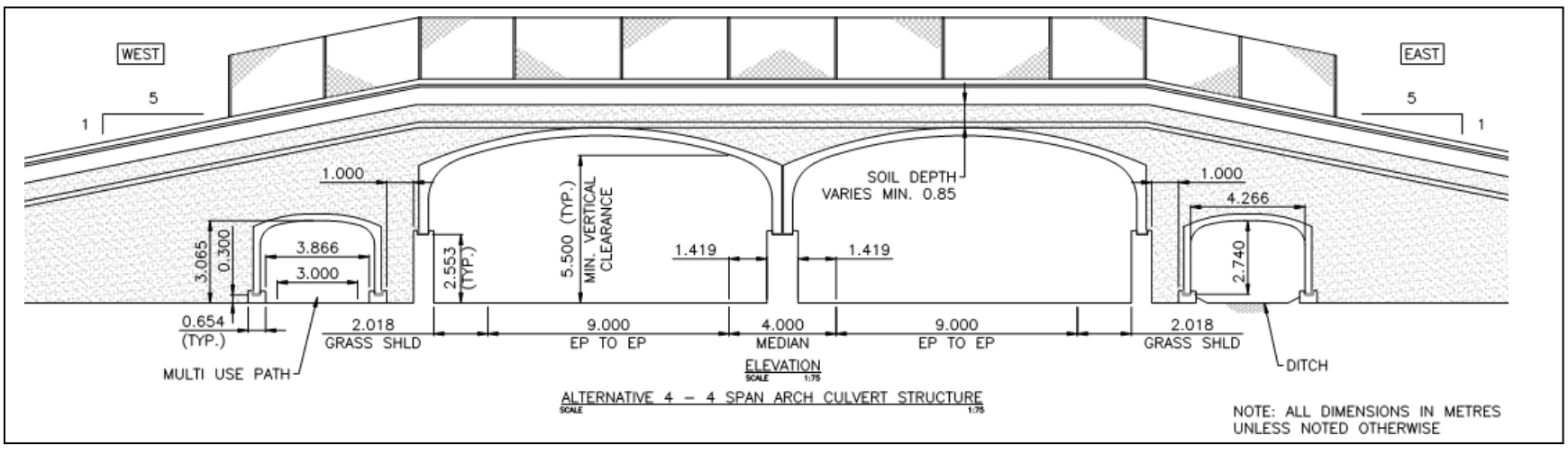


Figure 14: Alternative 4 - Wildlife Overpass (4 Span Arch Culvert) – Elevation View



2.2 Design Criteria

A design criteria table was carried forward from Class EA Phase 2 of this study.

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
Maximum Approach Grade	5:1 (20%) or flatter	U.S. Department of Transportation, 2011	5:1 (20%)
Preferred Slide Slopes	5:1	U.S. Department of Transportation, 2011	5:1

2.3 Design Components Independent of Alternative Design

During PIC #1 there were several comments received related to key aspects of the proposed solutions. Specifically, the public expressed interest in the following items which were further considered during the development of the alternative designs:

1. The Alternative Solutions should include an option to also cross the Essex Terminal Railway tracks located immediately to the west of Ojibway Parkway;

2. Fencing should be incorporated into the design to direct wildlife toward the crossing and to prevent them from entering the roadway.

[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

These items were not addressed independently within each of the alternative designs, but instead consideration was given as to how all design alternatives could address these items.

Extension of Crossing Over Tracks

The property along the west side of railway yard is owned by the Essex Terminal Railway. As a result of feedback received from PIC #1, the City of Windsor has consulted with Essex Terminal Railway to understand their interest in the project and property considerations. City of Windsor will evaluate the option of property acquisition on the west side of the railyard.

At this time, the Study will proceed on the assumption that the western slope of the Wildlife Overpass will end at the Ojibway Trail, east of railway yard. Monitoring will be conducted to monitor performance of the Wildlife Overpass and mortality on railway tracks. If the need to extend the Wildlife Overpass across the railway yard, the City of Windsor will consider extending the structure, subject to the availability of funding to support additional studies, design, property acquisition and construction.

The alternative designs presented have all considered that the overpass may be extended in the future to cross the Essex Terminal Railway tracks. It has been determined that regardless of the selected alternative a future overpass can be built and incorporated into the alternative design proposed within this Study. A future expansion of the overpass would most likely be accomplished through construction of an independent structure located immediately to the south of the alternative designs proposed herein. The structures would be joined to one another with additional fill held in place with retaining walls within the existing green space to the east of the tracks. This method for connecting the structures will address the expected height differences of the structures due to the increased clearance requirements for the tracks.

Wildlife Fencing

All design alternatives include the installation of wildlife fencing along Ojibway Parkway and Broadway Street to prevent wildlife from entering onto the parkway and to direct wildlife to the proposed wildlife overpass. Fencing will be a two-part system comprised of an approximately 2 m tall chain-link style fence as well as a shorter, approximately 0.70 m high, reptile exclusion fence. The reptile exclusion fence will be comprised of smooth material and may additionally utilize a barrier at the top, or be cantilevered back on itself to prevent reptiles from climbing it. Reptile exclusion fencing will buried a beneath the ground. Additional specifications regarding the wildlife fencing will be provided during the detailed design of the Project.

2.4 Evaluation Criteria

To identify the impacts and advantages of each alternative design concept, evaluation criteria from Class EA Phase 2 of this study was carried forward and refined. The evaluation criteria are provided in **Table 2**.

Table 2: Evaluation Criteria for Alternative Design Concepts

Component	Evaluation Criteria
Natural Environment	• Anticipated wildlife behaviour / response to the crossing • Potential impact terrestrial species and habitats • Potential drainage and stormwater concerns
Social Environment	• Potential impact to community facilities • Public safety considerations • Potential impact on archaeological and built heritage resources
Technical Considerations	• Potential impacts associated with implementation (complexity of construction) • Grading considerations • Complexity of geotechnical design considerations • Potential traffic impacts from construction • Roadside safety
Financial	• Anticipated capital costs for construction and maintenance

2.5 Evaluation of Alternative Design Concepts

Table 1 provides a description of the evaluation criteria used in the evaluation of alternative design concepts (presented in **Table 3**):

Table 3: Evaluation of Alternative Design Concepts

Category & Criteria	Alternative 1 – Wildlife Overpass (3 Span Bridge)	Alternative 2 – Wildlife Overpass (4 Span Bridge)	Alternative 3 - Wildlife Overpass (2 Span Bridge)	Alternative 4 – Wildlife Overpass (4 Span Arch Culvert)
Natural Environment				
Wildlife movement deterrent – abrupt grade change	• The 2.4 m high 2:1 slope may deter some wildlife from utilizing the crossing when approaching from the west. • 55% of the western approach ramp is at a 2:1 slope.	• The 0.7 m high 2:1 slope may deter some wildlife from utilizing the crossing when approaching from the west. • 50% of the western approach ramp is currently at a 2:1 slope. • The 2:1 slope can be eliminated by increasing the grade of the entire slope to slightly steeper (21%) than the current design criteria's maximum approach grade of 20% (5:1 slope).	• The 3.3 m high 2:1 slope may deter some wildlife from utilizing the crossing when approaching from the west. • 63% of the western approach ramp is at a 2:1 slope.	• No specialized grading or deviations from the current design criteria's maximum approach slope is required on the western approach, which is anticipated to be optimal for wildlife.
Wildlife movement deterrent – sightlines	• The bridge has a level deck over the road which will not impede the line of sight of medium sized mammals. • Sightline of white-tailed deer nearing top of approach ramp is estimated to be 37 m.	• The bridge has a nearly level deck over the road with a minor crest at the center pier which will not impede the line of sight of medium sized mammals. • Sightline of white-tailed deer nearing top of approach ramp is estimated to be 34 m.	• The bridge has a crest formed by the taller center pier. This crest will be approximately 1.5 m higher than where the approach ramps meet the bridge deck which will impede the line of sight of medium sized mammals. • Sightline of white-tailed deer nearing the crest is estimated to be 14 m.	• The fill atop the arch culvert will be nearly level with a minor crest at the center pier which will not impede the line of sight of medium sized mammals. • Sightline of white-tailed deer nearing top of approach ramp is estimated to be 28 m.
Direct impacts on terrestrial species and habitats	• No impacts to species at risk or their protected habitat are anticipated. • Direct footprint impact to approximately 5,300 sq m of terrestrial habitat.	• No impacts to species at risk or their protected habitat are anticipated. • Direct footprint impact to approximately 4,100 sq m of terrestrial habitat.	• No impacts to species at risk or their protected habitat are anticipated. • Direct footprint impact to approximately 5,000 sq m of terrestrial habitat.	• No impacts to species at risk or their protected habitat are anticipated. • Direct footprint impact to approximately 3,900 sq m of terrestrial habitat.

Category & Criteria	Alternative 1 – Wildlife Overpass (3 Span Bridge)	Alternative 2 – Wildlife Overpass (4 Span Bridge)	Alternative 3 - Wildlife Overpass (2 Span Bridge)	Alternative 4 – Wildlife Overpass (4 Span Arch Culvert)
Social Environment				
Potential impact to community facilities	• This alternative will require slight permanent displacement of the existing multi-use trail closer to the road, however the trail will still be maintained.	• This alternative will require slight permanent displacement of the existing multi-use trail closer to the road, however the trail will still be maintained.	• This alternative will require slight permanent displacement of the existing multi-use trail closer to the road, however the trail will still be maintained.	• This alternative will require slight permanent displacement of the existing multi-use trail closer to the road, however the trail will still be maintained.
Safety Considerations	• Wide and open configuration and orientation will optimize ongoing visibility of multi-use trail to guard against the prospect of suspicious behaviour/use to occur. • Emergency responders can access the Ojibway Parkway from either direction. • The multi-use trail will be easily accessible to emergency responders. • The open nature will make ongoing access for monitoring and maintenance activities easier. This will assist the City staff to more easily identify any unlawful activity that may be occurring – allowing for potential problems to be identified and mitigated more efficiently.	• Wide and open configuration and orientation will optimize ongoing visibility of multi-use trail to guard against the prospect of suspicious behaviour/use to occur. • Emergency responders can access the Ojibway Parkway from either direction. • The multi-use trail will be easily accessible to emergency responders. • The open nature will make ongoing access for monitoring and maintenance activities easier. This will assist the City staff to more easily identify any unlawful activity that may be occurring – allowing for potential problems to be identified and mitigated more efficiently.	• Wide and open configuration and orientation will optimize ongoing visibility of multi-use trail to guard against the prospect of suspicious behaviour/use to occur. • Emergency responders can access the Ojibway Parkway from either direction. • The multi-use trail will be easily accessible to emergency responders. • The open nature will make ongoing access for monitoring and maintenance activities easier. This will assist the City staff to more easily identify any unlawful activity that may be occurring – allowing for potential problems to be identified and mitigated more efficiently.	• The 50m long section of the adjacent multi-use trail will be completely closed off visually from the adjacent roadway. This will greatly restrict ongoing natural surveillance capability and thus increase susceptibility to the occurrence of unlawful behaviour without easy detection. • Emergency access to northbound and southbound lanes, as well as to the multi-use trail will be restricted. • Emergency access and fire-fighting requirements to be determined during detailed design. • An air quality assessment may be considered during detailed design to confirm the air quality within the tunnel will meet guidelines. • Dedicated lighting and crime deterrent measures for the multi-use trail will be required.
Potential impacts on archaeological resources	• 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.

Category & Criteria	Alternative 1 – Wildlife Overpass (3 Span Bridge)	Alternative 2 – Wildlife Overpass (4 Span Bridge)	Alternative 3 - Wildlife Overpass (2 Span Bridge)	Alternative 4 – Wildlife Overpass (4 Span Arch Culvert)
Potential impacts on 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.
Technical Considerations				
Potential drainage and stormwater concerns	• This alternative has a 0.5% longitudinal grade and 0.5% cross-grade of the proposed surface atop the bridge deck.	• This alternative has a 0.5% longitudinal grade and 0.5% cross-grade of the proposed surface atop the bridge deck.	• This alternative has a 7% longitudinal grade from the center pier in the bridge as well as a 0.5% cross-grade of the proposed surface atop the bridge deck.	• This alternative has a 0.5% longitudinal grade and 0.5% cross-grade of the proposed surface atop the arch culverts. • The areas between the culvert walls will be prone to collecting water. • Drainage design is higher complexity than the other alternatives.
Potential impacts associated with implementation (complexity of construction)	• Construction sequence includes construction of substructure, placement of bearings and girders, constructing deck and parapet walls, backfilling and grading approach ramps. • Main girder placement would require heavy duty cranes and precise bearing placement for the main span. • Substructure construction includes abutments and outside piers. • Girders will be installed separately for each span, once they are in place, deck and parapet wall can be constructed in a continuous manner.	• Construction sequence includes construction of substructure, placement of bearings and girders, constructing deck and parapet walls, backfilling and grading approach ramps. • Girder placement would require heavy-duty cranes and precise bearing placement for two middle spans. • Substructure construction includes abutments, central pier, and middle pier. • Girders will be installed separately for each span, once they are in place, deck topping slab and parapet wall can be constructed in a continuous manner.	• Construction sequence includes construction of substructure, placement of bearings and girders, constructing deck and parapet walls, backfilling and grading approach ramps. • Girder placement would require heavy-duty cranes and precise bearing placement for both spans. • Substructure construction includes abutments and middle pier. • Girders will be installed separately for each span, once they are in place, deck topping slab and parapet wall can be constructed in a continuous manner.	• Construction sequence includes construction of pedestal footings, placement of precast arch sections, construction of facing and parapet, backfilling over arches and grading approach ramps. • No bearings are required, however heavy-duty cranes required to place main span arches. • Some added complexity in forming and pouring concrete facing with architectural finish. • Arches will be installed separately for each span, once they are in place, facing and parapet wall can be constructed in a continuous manner.

Category & Criteria	Alternative 1 – Wildlife Overpass (3 Span Bridge)	Alternative 2 – Wildlife Overpass (4 Span Bridge)	Alternative 3 - Wildlife Overpass (2 Span Bridge)	Alternative 4 – Wildlife Overpass (4 Span Arch Culvert)
Complexity of geotechnical design considerations	• While design and construction of the substructure (deep foundations, temporary shoring and dewatering) is considered generally to be straightforward, some moderately complex settlement mitigation may be required for the embankments, particularly on the west side to protect the railway and limit any potential impacts to buried infrastructure along Ojibway Parkway.	• While design and construction of the substructure (deep foundations, temporary shoring and dewatering) is considered generally to be straightforward, some moderately complex settlement mitigation may be required for the embankments, particularly on the west side to protect the railway and limit any potential impacts to buried infrastructure along Ojibway Parkway.	• While design and construction of the substructure (deep foundations, temporary shoring and dewatering) is considered generally to be straightforward, some moderately complex settlement mitigation may be required for the embankments, particularly on the west side to protect the railway and limit any potential impacts to buried infrastructure along Ojibway Parkway.	• While design and construction of the substructure (shallow foundations, temporary shoring and dewatering) is considered generally to be straightforward, some moderately complex settlement mitigation may be required for the embankments, particularly on the west side to protect the railway and limit any potential impacts to buried infrastructure along Ojibway Parkway. • Shallow foundations (concrete pedestal footings) may not be feasible unless site specific boreholes reveal overconsolidated crust.
Potential traffic impacts from construction	• Construction of the bridge structure to be completed in a staged approach. • Temporary traffic impacts are anticipated with potential for lane shifts, shoulder closures or lane closures for construction of outside piers. • Full roadway closure (northbound and southbound) is required for main span girder placement.	• Construction of the bridge structure to be completed in a staged approach. • Temporary traffic impacts are anticipated including long term lane closures or lane shifts are required for construction of center and outside piers. • Placement of main span girders can be completed utilizing full roadway closure, closure of northbound and southbound separately, or potentially with a temporary traffic diversion using median crossovers, which would maintain single lane of traffic each direction along Ojibway Parkway.	• Construction of the bridge structure to be completed in a staged approach. • Traffic impact not anticipated for outside abutments construction. • Temporary traffic impacts are anticipated including long term lane closures or lane shifts are required for construction of center piers only. • Placement of main span girders can be completed utilizing full roadway closure, closure of northbound and southbound separately, or potentially with a temporary traffic diversion using median crossovers, which would maintain single lane of traffic each direction along Ojibway Parkway.	• Construction of the bridge structure to be completed in a staged approach. • Temporary traffic impacts are anticipated including long term lane closures or lane shifts are required for construction of arch footing. • Placement of main span arches can be completed utilizing full roadway closure, closure of northbound and southbound separately, or potentially with a temporary traffic diversion using median crossovers, which would maintain single lane of traffic each direction along Ojibway Parkway.

Category & Criteria	Alternative 1 – Wildlife Overpass (3 Span Bridge)	Alternative 2 – Wildlife Overpass (4 Span Bridge)	Alternative 3 - Wildlife Overpass (2 Span Bridge)	Alternative 4 – Wildlife Overpass (4 Span Arch Culvert)
Roadside Safety	• No median pier required for protection. • Outside piers placed adjacent to travel lanes will require protection. • No impacts to turning sight lines from Broadway Boulevard are anticipated due to absence of median piers (to be confirmed during detailed design).	• Protection of median pier will be required. • Outside piers placed adjacent to travel lanes will require protection. • Potential sight line impacts for turning movements from Broadway Boulevard due to median piers. Sight lines to be reviewed during detailed design.	• Protection of median pier will be required. • Outside piers will be placed well away from outside travel lanes. • Less roadside protection is anticipated to be required. • Potential sight line impacts for turning movements from Broadway Boulevard due to median piers. Sight lines to be reviewed during detailed design.	• Protection of median footing will be required. • Outside footings and walls adjacent to travel lanes will require protection. • Potential sight line impacts for turning movements from Broadway Boulevard due to culvert sidewalls. Sight lines to be reviewed during detailed design.
Financial Considerations				
Construction Cost	• Initial construction cost is estimated to be $11.1 M.	• Initial construction cost is estimated to be $13.4 M.	• Initial construction cost is estimated to be $12.5 M.	• Initial construction cost is estimated to be $9.3 M.
Maintenance and Rehabilitation Costs	• Minor rehabilitation will be required at 25-year and 75-year points, consisting of concrete patch repair, crack injection, railing repairs. • Major rehabilitation will be required at 50-year point with bearing replacement, concrete repairs, railing replacement. • Estimated maintenance and rehabilitation cost comparable with most other alternatives.	• Minor rehabilitation will be required at 25-year and 75-year points, consisting of concrete patch repair, crack injection, railing repairs. • Major rehabilitation will be required at 50-year point with bearing replacement, concrete repairs, railing replacement. • Estimated maintenance and rehabilitation cost comparable with most other alternatives.	• Minor rehabilitation will be required at 25-year and 75-year points, consisting of concrete patch repair, crack injection, railing repairs. • Major rehabilitation will be required at 50-year point with bearing replacement, concrete repairs, railing replacement. • Estimated maintenance and rehabilitation cost anticipated to be lower than other alternatives due to reduced substructure.	• Minor rehabilitation will be required for this alternative at 25-year and 75-year points, consisting of concrete patch repair, crack injection and railing repairs. • Major rehabilitation will be required at 50-year point with joint repair/reconstruction, concrete repairs, railing replacement. • This alternative's increased exposure to salt and chlorides, as well as greater quantity of joints is anticipated to offset maintenance savings associated with the lack of a bridge deck. • Estimated maintenance and rehabilitation cost comparable with most other alternatives
Recommendation	**Not Recommended**	**Recommended**	**Not Recommended**	**Not Recommended**

Legend

Preferred		Moderately Preferred		Not Preferred	

2.6 Preferred Design Concept

The Alternative Design Concepts were comparatively and qualitatively evaluated in **Table 3** based on the criteria related to the four main categories (Natural and Social Environments, and Technical and Financial considerations). Alternative 2 - Wildlife Overpass (4 Span Bridge) was selected as the Preferred Design Concept due to a number of advantages compared to the other alternatives. A summary of the key impacts and benefits of Alternative 2 - Wildlife Overpass (4 Span Bridge) is provided below:

- With slight modifications to approach grading this alternative is not anticipated to have features which would deter wildlife from utilizing the crossing.
- Impacts to terrestrial habitat associated with the direct footprint impacts are limited to approximately 4,100 sq m.
- The alternative provides positive drainage across the top and down the slopes and the drainage design is not considered complex.
- Wide and open configuration and orientation will optimize ongoing visibility of multi-use trail to guard against the prospect of suspicious behaviour/use to occur.
- Emergency responders can access the Ojibway Parkway from either direction and additionally, the multi-use trail will be easily accessible to emergency responders.

3.0 Conclusion

This memo presented the four alternative design concepts for the Wildlife Overpass, their evaluation, and the preferred design concept. In accordance with Phase 3 of the Class EA process, consultation will be undertaken to obtain input on the preferred design concept.

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