9 DESCRIPTION OF THE TEPA

The Technically and Environmentally Preferred Alternative (TEPA) has been developed to a concept design level, with sufficient detail as to confirm feasibility of the proposed infrastructure and to identify the property requirements and the environmental impacts. This concept design is intended to provide a sufficient level of detail on which to base a decision regarding approval of the undertaking and to guide the development of more detailed designs during subsequent design phases of the study.

This chapter provides a description of the recommended crossing, international plaza, approach freeway and service road network that together form the Technically and Environmentally Preferred Alternative. The concept design described in this chapter is presented in the concept design plates included in **Appendix A**. Impacts on environmental features as a result of the recommended plan as well as proposed measures for mitigation are described in **Chapter 10**. For further details of the information presented in this chapter, the reader is referred to the following reports:

- *Bridge Conceptual Engineering Report (February 2008) (available);*
- *Draft Practical Alternatives Evaluation – Constructability Report for Access Road Alternatives (May 2008) (available);*
- *Draft Practical Alternatives Evaluation Assessment Report – Stormwater Management Plan (March 2008) (available);*
- *Draft Level 3 Traffic Operations Analysis of Windsor-Essex Parkway (pending); and*
- *Draft Pavement Engineering for Planning Report – Area of Continued Analysis (March 2008) (available).*

9.1 Concept Design Features – Detroit River Crossing

The new river crossing will be constructed to link new inspection plazas on the Canadian and US sides of the Detroit River, and will be a key component of the new end-to-end transportation system that will link existing Highway 401 to the US Interstate system. The crossing will be constructed on the X10-B alignment and will consist of both a main bridge that will span the entire width of the Detroit River, and approaches to the main bridge constructed on piers that will connect to plazas in both Canada and the US. For the purposes of the environmental studies in both Canada and the US, both a suspension bridge and a cable-stayed bridge are being carried forward to subsequent stages for analysis, evaluation and selection of the preferred bridge type. The final bridge type will be recommended at the completion of subsequent stages of the project. **Exhibit 9.1** illustrates the location of the proposed crossing.

EXHIBIT 9.1 – PROPOSED CROSSING LOCATION

9.1.1 Geometrics

GENERAL

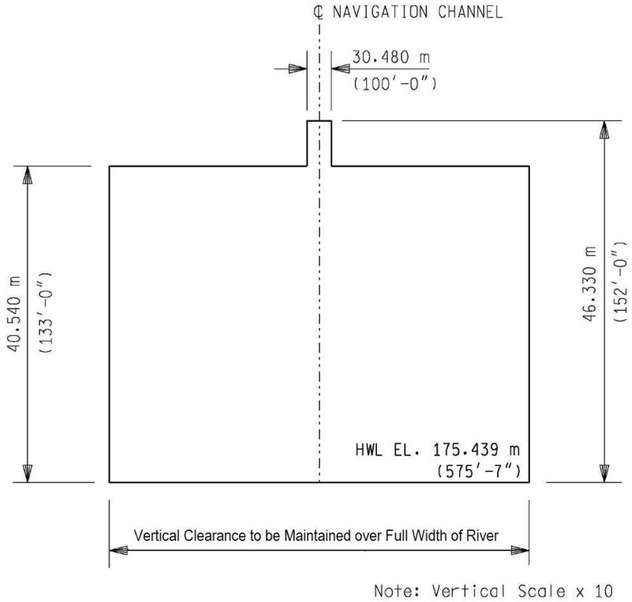
The Detroit River is a major commercial shipping lane and important waterway for marine traffic on the Great Lakes. As such, a navigation clearance box (envelope) of adequate size will be provided so as not to restrict marine traffic along the channel. The navigation envelope shown in **Exhibit 9.2** will be provided by the new crossing, and has been developed based on consultations with the US Coast Guard and Transport Canada, as well as shipping industry representatives. This navigation envelope is intended to provide, at a minimum, the same navigation clearance as that provided by the Ambassador Bridge.

The proposed crossing will avoid the placement of piers in the Detroit River for both the suspension bridge and cable-stayed bridge options. The decision to avoid piers in the river was made based on consultation with US and Canadian government agencies and shipping operators, as piers in this section of the Detroit River were considered to be too hazardous to marine navigation.

The main towers (for the suspension bridge option) or pylons (for the cable-stayed option) will be located near the edge of the river bank. On the Windsor side of the Detroit River, these will be located on land within the Southwestern Sales property. Piers will be spaced between 45 m to 60 m apart along the approach structure between the main span bridge and Canadian inspection plaza, and will be extended until the vertical alignment is within approximately 4 m of the existing ground. The “touch-down” point of the approach will be located directly north of the Canadian plaza.

The proposed main crossing will have a main span length of between 840 m and 855 m, depending on the final bridge type selection. The main span bridge crosses the Detroit River at a skew angle of approximately 69 degrees to the centerline of the navigation channel. On the Canadian side of the river, the crossing is aligned over an existing aggregate operation (Southwestern Sales) and vacant land owned by Ontario Power Generation. The main structure is situated just south of Prospect Avenue, south of the area of known brine wells. The recommended crossing and approach structure avoid the known brine wells area, and avoid major industries such as Brighton Beach Power Station, West Windsor Power Plant and Windsor Salt.

EXHIBIT 9.2– DETROIT RIVER NAVIGATION ENVELOPE



Note: Vertical Scale x 10

DESIGN CRITERIA

Geometric elements of the approach to the main bridge and of the main span bridge itself have been designed to meet the standards set forth in the *Geometric Design Standards for Ontario Highways (GDSOH)*. The details of these geometric design elements are provided in the following paragraphs. Both the approach from the plaza and the main bridge itself will have a posted speed of 60 km/hr and a design speed of 80 km/hr.

The main river crossing structure is subject to the design codes of both the US and Canada and the bridge will be designed using the International System of Units (SI units). The design shall meet the requirements of the *AASHTO LRFD Bridge Design Specifications, SI Units, 4th Edition*, and the *Canadian Highway Bridge Design Code, CAN/CSA S6-06 (S6)*, and in general the more restrictive code shall govern.

A design life of 75 years will be used for statistical assessment of appropriate loads, in accordance with *AASHTO LRFD Bridge Design Specifications Article 1.2 – Definitions*. The service life of the bridge for assessing serviceability of all components will be 120 years. For specific components where it is not practicable to achieve a 120-year life, these components will be designed with the ability to be replaced. Examples of such components include, but are not limited to, stay cables, bearings, expansion joints, deck wearing surface, navigation lighting, and roadway lighting.

CROSS-SECTION

Both the main span bridge and the approach from the plaza to the main bridge will consist of six-lanes, with three lanes in either direction. All six lanes will be 3.75 m in width. Fully paved shoulders 3.0 m wide will be provided on the right side of the travelled lanes in either direction, along with a 1.0 m flush median. The outside shoulder width provides the flexibility to accommodate cyclists, subject to the policies of the border agencies. Concrete barriers will be provided to the outside of the shoulders, and a 1.6 m wide barrier protected sidewalk will be provided on one side of the crossing.

Additional details of the main span bridge and approach cross-sections are provided in **Exhibits 9.3** and **9.4**. It should be noted that the structural depth shown in **Exhibit 9.3** and the girder sizing and spacing shown in **Exhibit 9.4** are conceptual only, and are subject to change during subsequent stages of design.

EXHIBIT 9.3– TYPICAL CROSS-SECTION – MAIN SPAN BRIDGE

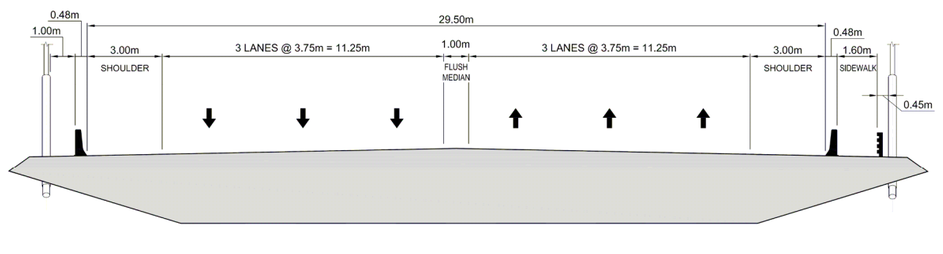
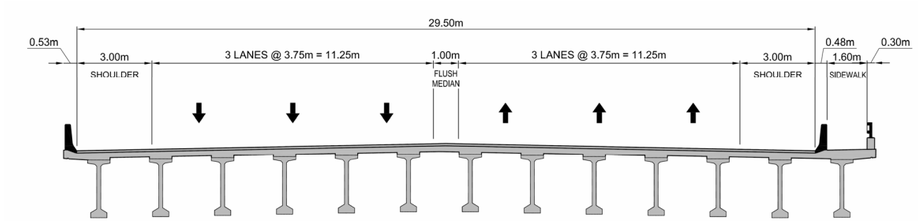


EXHIBIT 9.4– TYPICAL CROSS-SECTION – APPROACH BRIDGE



HORIZONTAL ALIGNMENT

The entire length of the main span bridge will be constructed on a tangent alignment for either the suspension bridge or cable-stayed bridge option. A horizontal curve has been provided between the tangent portion of the main span bridge and the Canadian Plaza. This horizontal curve has a radius of 400 m, which exceeds the minimum radius of 250 m that is required for an 80 km/hr design speed.

The approach to the bridge will cross over McKee Road, which provides private access to local industrial operations. Should the final location of the approach piers interfere with access to McKee Road, a realignment of McKee Road will be provided. A realignment of Sandwich Street will be provided where the approach to the main span bridge connects to the proposed plaza.

VERTICAL ALIGNMENT

The vertical alignment of the main span bridge will exceed the clearance requirements identified in the navigation envelope shown in **Exhibit 9.2**, with a clearance of at least 46 m at the shipping channel defined by Transport Canada – Navigable Waters Division and the US Coast Guard. The maximum grade of the crossing will be 5%. The vertical sag and crest curves will meet or exceed the minimum requirements set forth in the GDSOH for an 80 km/hr design speed. Minimum clearance requirements will be met or exceeded at McKee Road and realigned Sandwich Street.

9.1.2 Design Features

The main span bridge will be either a suspension bridge or a cable-stayed bridge. The final bridge type will be selected during subsequent stages of the project. The primary design features of the two bridge alternatives are described below. Additional details of the two bridge alternatives are provided in the *Bridge Conceptual Engineering Report, February 2008* (refer to List of Supporting Documents). The height of both the suspension bridge towers and cable-stay bridge pylons are a function of the length of the main span, and as such there is little flexibility in this overall height. Schematic illustrations of the two bridge alternatives are included in **Exhibit 9.5**.

SUSPENSION BRIDGE

The suspension bridge alternative consists of an 855 m suspended main span across the Detroit River, with unsuspended backstay spans of approximately 250 m at either end. The main span would be supported at either end by a reinforced concrete tower extending approximately 140 m above their footings. The tower height is a function of the main span bridge length and has been established based on an historically efficient cable span-to-sag ratio of 10:1. Each tower would consist of two tower legs that would rest atop solid pedestals, which in turn would be fixed to a pile-supported footing. The tower legs would have dimensions of approximately 28 m by 18 m at their base, and would be supported by 3.0 m diameter drilled shafts.

The bridge deck would be a steel orthotropic box girder structure approximately 35 m wide and that is continuous from tower to tower. Between the two main towers, the deck would be supported at appropriate intervals by wire rope suspenders connected to the main cables. The main cables would be comprised of galvanized steel wires, while the suspender ropes would be fabricated of galvanized, high-strength wire rope. The suspender ropes would be designed such that they could be removed at isolated locations for inspection, maintenance or replacement without closing the bridge to traffic. Once the full weight of the bridge is hanging from the suspender ropes, both the main cable wires and the suspender ropes would be coated for corrosion protection and waterproofing.

The main cables would be supported at either end of the towers by gravity anchorages. These anchorages would use a combination of self weight, passive soil resistance and direct load transfer to bedrock to resist the pull of the suspension cables. The anchorages at either end of the bridge represent a significant portion of the cost of the suspension bridge alternative, and would have dimensions of approximately 65 m by 56 m. The anchorage on the Windsor side of the river would be constructed on land owned by Ontario Power Generation (OPG).

CABLE-STAYED BRIDGE

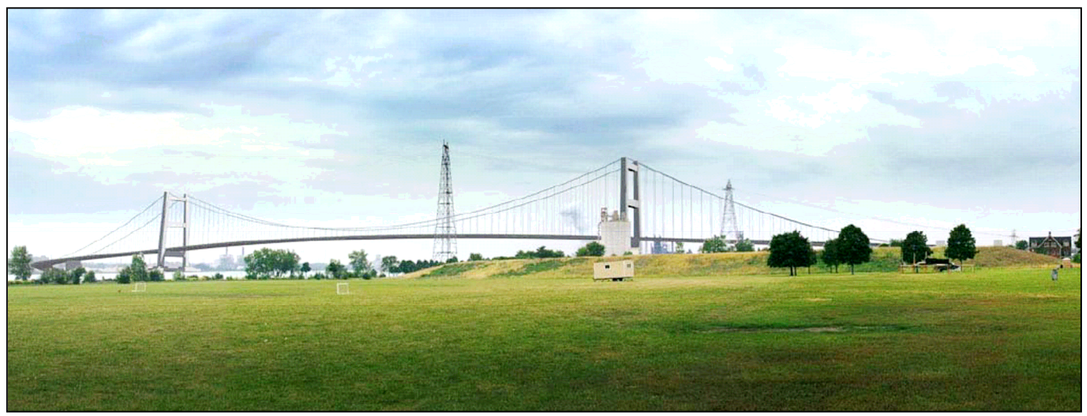
The cable-stayed alternative consists of an 840 m main span and symmetric 320 m side spans. The main span would be supported at either end by reinforced concrete pylons extending approximately 250 m above their footings. The height of the concrete pylons above the bridge deck is a function of the main span bridge length, and has been established as 20-25% of the main span length which correlates to a historically efficient stay angle. Two alternative pylon shapes have been investigated. A-frame and inverted Y shaped pylons were chosen based on structural capacity and wind resistance forces. These options would be reviewed further should the cable-stayed alternative be selected as the preferred bridge option. Each pylon would include two pylon legs that would rest atop a drilled shaft supported footing. The pylon legs would be spaced approximately 60 m apart at their base and have dimensions of approximately 21 m by 21 m. The legs would then be supported by 2.5 m diameter drilled shafts, which would extend down into bedrock. The stay cables would be designed such that they can be removed at isolated locations for inspection, maintenance or replacement without closing the bridge to traffic.

The main span bridge deck would be approximately 35 m wide and could accommodate both steel and concrete construction. Between the two main pylons, the deck would be supported at 15 m intervals by prestressed stay cables. The side spans of the bridge would be supported by three piers spaced at 80 m intervals, along with a larger main anchor pier. The bridge deck would be developed as a hybrid design with a concrete box girder for the side spans and a portion of the main span near the towers, and with a steel orthotropic box girder for the centre portion of the main span. It is recommended that the side span bridge deck be constructed of concrete to increase the mass of the deck and minimize uplift in the anchor piers.

EXHIBIT 9.5 – CONCEPTUAL ILLUSTRATIONS OF ALTERNATIVE BRIDGE TYPES

CABLE-STAYED BRIDGE

SUSPENSION BRIDGE



9.1.3 Right-of-Way Requirements

The TEPA Crossing will have a standard width right-of-way of 80 m between the Canadian Plaza and the Detroit River. This will accommodate either bridge structure types.

9.1.4 Illumination

Full illumination will be provided along the entire length of the crossing, along both the approach from the plaza to the main span bridge, and on the main span bridge itself. Additional details of illumination along the crossing will be considered during future design stages.

9.1.5 Construction Methods and Staging

The approach from the plaza to the main span bridge and the main span bridge itself can be constructed using typical construction methods. Construction of the approach and main bridge will be completed in such a manner so as to minimize disruption to the surrounding community and to maintain local access to residences and businesses.

A general concept for construction of the main span bridge has been developed for both the suspension bridge and cable-stayed bridge alternatives. Additional details of construction methods to be employed for construction of the main span bridge are included in the *Bridge Conceptual Engineering Report* (refer to List of Supporting Documents).

It should be noted that construction methods and staging are the responsibility of the selected contractor, subject to the provisions and specifications of the contract. The implementing authorities will develop these contract documents to be in accordance with this Environmental Assessment. The following planning level assessment and specifications of methods and staging has been developed to confirm basic feasibility.

UTILITY RELOCATION

The relocation of existing utilities and other municipal services will be required. This utility relocation stage is often completed prior to the primary construction stages. Relocations and approvals will generally take place in the early stages of construction to minimize risk to construction schedules. Numerous utilities are located within the crossing alignment and will require relocation, including hydro, Bell, Union Gas, Cogeco, steam pipes and municipal watermains and sanitary sewers. The approach to the main bridge will impact the overhead hydro connection between the Hydro One Keith Transformer Station and the adjacent hydro tower lines, and the connection will need to be buried beneath the approach structure.

SUSPENSION BRIDGE CONSTRUCTION

For the suspension bridge alternative, it is anticipated that construction would be completed in five major stages, as generally described below.

Tower and Anchorage Foundations

Following mobilization, work would begin on the tower and anchorage foundations. The tower foundations consist primarily of drilled shafts and a footing, and construction methods would involve conventional techniques for drilled shafts and footings of this size. The anchorage foundations have been designed similar to those at the Ambassador Bridge. Further design phases of the project will involve additional subsurface testing to determine soil properties and select the most cost effective foundation type.

Tower and Anchorage Construction

The second primary stage of construction involves construction of both the towers and the anchorages themselves. Reinforcement for the towers can be prefabricated off-site as much as practicable and placed by crane. Concrete can be placed by pump truck for the initial stages of tower construction, though with increasing height during later stages the concrete can be delivered by tower crane. Temporary supports may be required to mitigate problematic wind conditions as the tower legs extend higher. Anchorage construction consists of mass concrete pours, wall construction and slab construction, all of which can be accomplished with conventional construction techniques for the respective methods.

Main Cable and Suspender Installation

When the towers are complete and the anchorage construction advanced far enough to receive suspension system components, construction of the suspension system can begin. To provide access for cable spinning operations, a catwalk can be erected from anchorage to anchorage that follows the free cable profile. The catwalk system is comprised of several support and hand strands, open mesh flooring and sides, frames at regular intervals, and several cross bridges between cables. A storm system is provided to stabilize the catwalk in high winds and provide for profile adjustment as necessary.

Bridge Deck Fabrication

The bridge deck can be fabricated at an off-site location in a number of smaller segments. The size of the segments would be limited by transport methods and equipment available to hoist the segments into place. Once fabricated, the segments could be trial assembled on the ground, either on-site or at a nearby yard.

Bridge Deck Erection and Finishing

After trial assembly of the fabricated deck segments, the segments would be transported to the site, likely by barge. The segments can be hoisted into place by a pair of lifting gantries supported by, and spanning the two main cables. Once lifted into position, the weight of the segments would be transferred to the permanent suspenders and the segments connected to one another. When the deck is complete, operations would begin to install the electrical/mechanical systems, roadway barriers, deck water proofing, and so forth.

CABLE-STAYED BRIDGE CONSTRUCTION

For the cable-stayed bridge alternative, construction would be completed in five major stages, similar to the general stages for construction of the suspension bridge option.

Pylon and Anchor Pier Foundations

Following mobilization, work would begin on the pylon and anchor pier foundations. Construction of both the pylon and anchor pier foundations can be completed in a similar manner as for the tower foundations for the suspension bridge option.

Pylon and Anchor Pier Construction

The second primary stage of construction involves construction of both the pylons and the anchor piers themselves. Construction of the pylons and anchor piers can be completed independent of each other and completed using similar construction methods as for the suspension bridge option.

Bridge Deck Fabrication

As with the suspension bridge option, the bridge deck can be fabricated at an off-site location in a number of smaller segments. The segments would be trial assembled on the ground.

Stay Cable and Bridge Deck Erection

After trial assembly of the fabricated deck segments, the segments can be transported to the site and the main span erected in a cantilever manner from each tower, with a stay cable installed as each segment of the bridge deck is erected. Construction of the side spans can be accomplished concurrent with the tower construction, and completed in advance of the main span construction. Side span stay cable installation would mirror the main span stay cable installation.

Finishing Works

When the main span deck is complete, operations would begin for the finishing works, including construction of the electrical/mechanical systems, roadway barriers, deck water proofing, and so forth.

9.1.6 Considerations for Subsequent Development

Subsequent stages of design of the crossing will involve further investigations regarding bridge materials, foundations, structural monitoring and security, maintenance and durability requirements, a site-specific wind evaluation and additional geotechnical field investigations at anticipated foundation locations. Details of these issues are documented in the *Bridge Conceptual Engineering Report* (refer to List of Supporting Documents).

The Detroit River International Crossing bridge represents a major structure and warrants consideration of the visual attributes and quality of the crossing. While the aesthetic development of the bridge has not been a primary objective during the conceptual development stage, there has been an awareness of the magnitude and importance of the crossing and attention was given to providing a logical and well proportioned structure. Subsequent stages of the bridge design will consider the visual quality and aesthetic development of the design. A series of Context Sensitive Design Workshops have been conducted in parallel with the development of the bridge concepts and the results of those workshops should be reasonably factored into the subsequent visual development of the bridge.

9.2 Concept Design Features – Plaza

The new international plaza on the Canadian side of the Detroit River crossing will be situated within the Brighton Beach Industrial Subdivision. The plaza will be bounded by the Detroit River, Chappus Road, Ojibway Parkway and Broadway Street, and was previously identified as Inspection Plaza B1 in the development and evaluation of practical plaza alternatives (refer to **Chapter 8**).

The plaza is situated west of Ojibway Parkway mostly on lands acquired by the City of Windsor for the purposes of establishing an industrial park. The Brighton Beach Industrial Park is named after the former Brighton Beach neighbourhood which previously occupied these lands. Over time, most of the residences have been acquired and removed so the area is generally vacant. The existing industrial area also includes the Brighton Beach and West Windsor power plants, the Nemak Automotive manufacturing plant, a Hydro One transformer station and aggregate storage facilities. **Exhibit 9.6** illustrates the location of the proposed international plaza.

EXHIBIT 9.6 – PROPOSED PLAZA LOCATION

9.2.1 Layout of Plaza Facilities and Operations

GENERAL

A conceptual layout of the plaza facilities is presented in the concept design plates in **Appendix A**. Although the precise layout of the various facilities within the plaza may be modified during future design phases of the plaza, the type and function of the major facilities within the plaza will remain generally unchanged. The final layout of the plaza will be based on consultation with the Canada Border Services Agency (CBSA). Ultimate ownership and operation of the plaza will be under the direction of the Government of Canada.

The international customs plaza will be built to accommodate projected border traffic to beyond the 2035 design year. The plaza will include 29 inbound primary inspection lanes and 9 toll collection lanes. In addition to providing general traffic lanes for both passenger and commercial vehicles, the plaza will include dedicated NEXUS and FAST lanes to improve border crossing processing capabilities. The plaza layout illustrated in the concept design plates shows a fully developed plaza.

Initial construction of the plaza may not include the fully developed plaza, as the plaza may be developed in stages.

The final design of the plaza will incorporate a local access road along the edge of the plaza that will provide continuity for traffic between Sandwich Street and Broadway Street as well as access for plaza employees. Local access will also be provided at the north end of the plaza from a realigned Sandwich Street to the Brighton Beach Power Station and Keith Transformer Station.

PLAZA FACITILIES

The major facilities that will be included within the plaza include outbound toll booths, an outbound inspection area for occasional use, a primary inspection area for inbound vehicles, and a secondary inspection area for inbound vehicles. Both the primary and secondary inbound inspection areas will be divided into passenger and commercial areas, while some primary inspection lanes will be flexible for use by both cars and trucks. The plaza will also consist of a duty free shop for use by outbound vehicles, a maintenance building, a main building designated for employee use along with employee parking, and drainage facilities including, but not limited to, a stormwater management/retention pond to treat runoff from the plaza. A local service road will also be provided within the plaza for internal use.

In general, vehicles entering the Canadian plaza from The Windsor-Essex Parkway on the Canadian side will pass through the outbound toll booths and outbound inspection area if being utilized. Vehicles will then have the option of stopping at the duty free shop before proceeding to the new international bridge crossing. Primary and secondary inspection for vehicles heading to the US will occur at the new customs plaza to be constructed on the US side of the crossing. Inbound vehicles entering the Canadian plaza from the bridge will be divided between passenger and commercial truck traffic, and will proceed through the primary inspection lanes. If necessary, passenger vehicles will proceed to the secondary inspection area designated for passenger vehicles, and commercial vehicles will proceed to the secondary inspection area designated for commercial vehicles. Vehicles will then proceed through the plaza and to The Windsor-Essex Parkway.

9.2.2 Property Requirements

The plaza will be approximately 55 hectares (137 acres) in size. This area will encompass all primary and secondary inspection areas, toll booths, buildings and parking within the plaza, as well as all stormwater management features. During future design stages of the project, the specific sizing and layout of the plaza may be subject to minor revisions, however the location of the plaza will generally remain unchanged.

9.2.3 Illumination

The international customs plaza will be fully illuminated. Additional details of the proposed illumination within the plaza will be determined during future design stages.

9.2.4 Construction Methods and Staging

Construction of the plaza will primarily involve relocation of utilities, topsoil stripping, placement of fill, construction of drainage components (i.e. sewers and catchbasins) and other utilities, construction of foundations for various plaza structures, plaza buildings, and paving. It is anticipated that each of these components can be constructed using normal construction methods. Construction of the customs plaza will be completed in such a manner so as to minimize disruption to the surrounding community and to maintain local access to residences and businesses.

9.2.5 Utilities

A number of utilities and other municipal services are located in the vicinity of the plaza that will require removal or relocation. The utility relocation stage is generally completed prior to the main construction stage. Relocations are anticipated to take place in the early stages of construction to minimize risk to construction schedules. Utilities in the vicinity of the plaza include hydro, Bell, Union Gas, Cogeco, steam pipes and municipal watermains and sanitary sewers. Significant utilities that will require relocation at the plaza include gas pipelines connecting to the Brighton Beach Power Station and the West Windsor Power Generation Plant, steam lines from the West Windsor Power Plant connecting to Archer Daniel Midland and Windsor Salt, and the various Hydro One transmission and distribution connections from the Keith Transformer Station which includes an international connection. Significant work might also be required at the Keith Transformer Station to accommodate future expansion and to protect the existing station from salt contamination.

9.2.6 Drainage

The proposed plaza will consist primarily of impervious asphalt and building rooftops, which would, if unmitigated, contribute to increased pollutant loadings (oil, coolant, gasoline, etc.), roadside grit and garbage (gravel, sand, cigarette butts), infrequent pollutant spills, and localized increase of overland runoff to the receiving watercourses. Therefore, stormwater management for the plaza will be required to provide quality treatment for the catchment area. As the site is located adjacent to the Detroit River with direct access, no quantity control measures are considered necessary. Enhanced quality treatment will be provided in accordance with the MOE document *Stormwater Management Planning and Design Guidelines*, which requires the removal of a minimum of 80% total suspended solids.

As illustrated in the plaza layout included in the concept design plates of **Appendix A**, stormwater management retention ponds will be constructed generally along the southern edge of the plaza property, with a smaller facility constructed in the north-east corner of the plaza. The size, location and configuration of these ponds will be refined during future design stages for the plaza. Minor storm runoff will be conveyed to the stormwater management ponds through a series of storm sewers, with the major storm runoff flowing overland to the facilities. The stormwater management ponds will outlet to the Detroit River through a natural channel in the southwest portion of the plaza through an outlet structure controlling the release rate to the Detroit River. Due to the flat topography of the plaza location, portions of the plaza may be elevated to facilitate positive drainage, thereby reducing or eliminating any requirement for pumping stormwater from the plaza.

As the future design of the plaza progresses, opportunities to incorporate acceptable alternative stormwater solutions may be identified. Alternative stormwater solutions for the plaza that may be considered include permeable pavers, perforated storm sewer pipes, Green Roof systems, and infiltration basins. These alternative solutions will be designed to provide additional upstream quality and quantity control of runoff prior to reaching the stormwater management ponds. Additional analysis will be performed during subsequent design stages to assess the effectiveness and feasibility of these

solutions at the plaza location. Measures to reduce the area of impervious surface associated with the new plaza will also be investigated during future design phases.

9.3 Concept Design Features – The Windsor-Essex Parkway

The Windsor-Essex Parkway consists generally of a six-lane freeway portion connecting existing Highway 401 to the new inspection plaza, a four-lane service road connecting existing Highway 3 to existing Huron Church Road, and a multi-use recreational trail network. The conceptual design features of each of these components are presented in this section.

9.3.1 Geometrics

GENERAL

In general, the freeway portion of The Windsor-Essex Parkway is a six-lane urban freeway with paved shoulders and a paved median with Ontario Tall Wall concrete median barrier. The freeway connects the proposed new inspection plaza to the existing alignment of Highway 401 in the vicinity of North Talbot Road. From west to east, The Windsor-Essex Parkway corridor generally follows existing E.C. Row Expressway from Ojibway Parkway easterly to Huron Church Road, and then follows Huron Church Road from E.C. Row Expressway southerly to Highway 3. The corridor then follows Highway 3 easterly to existing Highway 401 and finally follows existing Highway 401 to North Talbot Road. Between Huron Church Road north of Bethlehem Avenue/Labelle Street and existing Highway 3 east of Outer Drive, The Windsor-Essex Parkway includes a four-lane service road. The service road will provide local community connections and access to the freeway, and will replace the existing local function of the Highway 3/Huron Church Road corridor. **Exhibit 9.7** illustrates the full Windsor-Essex Parkway corridor.

Geometric elements of The Windsor-Essex Parkway have been designed to meet or exceed the standards set forth in the *Geometric Design Standards for Ontario Highways* (GDSOH). Details of these geometric design elements are provided in the following paragraphs. Additional information regarding the conceptual design of The Windsor-Essex Parkway is presented in the concept design plates located in **Appendix A**.

EXHIBIT 9.7 – THE WINDSOR-ESSEX PARKWAY CORRIDOR

CROSS-SECTION

All six through-lanes on the freeway portion of The Windsor-Essex Parkway will be 3.75 m in width and shoulders will be fully paved and 3.0 m in width (median and outside). The total width of the paved median will be 6.8 m which allows for two shoulders 3.0 m in width and an Ontario Tall Wall concrete median barrier which is 0.8 m in width. Median shoulder widths may be increased locally at horizontal curves to provide adequate safe stopping sight distances.

Where speed change lanes are required in the vicinity of interchanges and access points, the width of these auxiliary lanes will be 3.5 m and the adjacent outside shoulder will be 2.5 m in width in accordance with GDSOH guidelines.

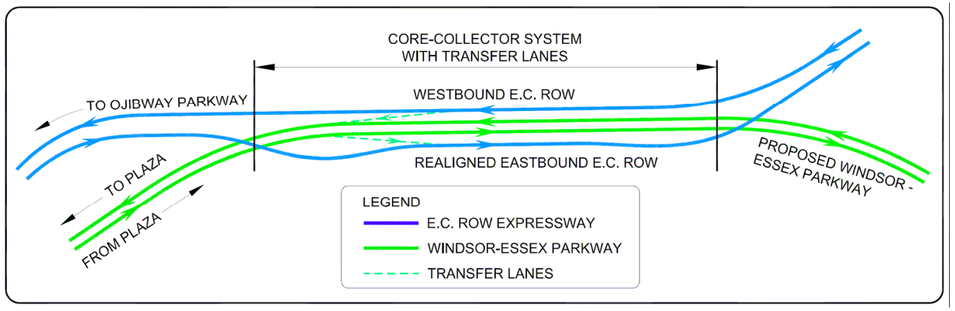
The proposed service road typically consists of four lanes 3.75 m in width with paved outside shoulders 2.5 m wide and a 1 m wide flush median. Right turn lanes 3.5 m in width and left turn lanes 3.0 m in width are provided locally at intersections where projected traffic volumes warrant such auxiliary lanes.

From the proposed customs plaza easterly approximately 1 km to where the freeway portion of The Windsor-Essex Parkway approaches E.C. Row Expressway approximately 0.3 km east of Matchette Road, the proposed freeway is on an earth embankment and situated south of existing E.C. Row Expressway.

From approximately 0.3 km east of Matchette Road to approximately 0.4 km west of Huron Church Road, the freeway portion of The Windsor-Essex Parkway and E.C. Row Expressway are integrated into a core-collector system. In this section, the eastbound and westbound lanes of E.C. Row Expressway diverge and the freeway portion of The Windsor-Essex Parkway is aligned between them.

The eastbound and westbound lanes of E.C. Row Expressway serve as the "collector" lanes of the system and the eastbound and westbound lanes of the freeway portion of The Windsor-Essex Parkway form the "core". Transfer lanes will be provided along the core-collector system to connect the two freeways. Both the core and collector lanes (the proposed freeway and E.C. Row Expressway lanes) in this section will follow the existing profile of E.C. Row Expressway. Although the initial design of The Windsor-Essex Parkway through this section had the freeway beside the E.C. Row Expressway, the core-collector system was developed to reduce impacts to the Spring Garden community and adjacent to natural features. A schematic illustration of the core-collector system is included in **Exhibit 9.8**.

EXHIBIT 9.8 – CORE-COLLECTOR SYSTEM SCHEMATIC



From north of Bethlehem Avenue/Labelle Street to approximately 1.0 km east of Howard Avenue, the proposed freeway is below-grade and will incorporate open cut sections with vegetated side slopes where feasible. Retaining walls, either partial-height or full-height, will be utilized in localized areas to minimize property requirements and associated impacts throughout the corridor. Within this section, the location of the service road relative to the freeway varies. From north of Bethlehem Avenue/Labelle Street to east of Huron Church Line, the proposed service road is adjacent to the proposed freeway on the east/north side. From east of Huron Church Line to approximately 0.7 km west of Howard Avenue, the proposed service road is situated on the south side of the proposed freeway. From 0.7 km west of Howard Avenue to approximately 0.3 km east of Howard Avenue, the proposed service road is once again located adjacent to the proposed freeway on the north side. East of this location, no service road is proposed.

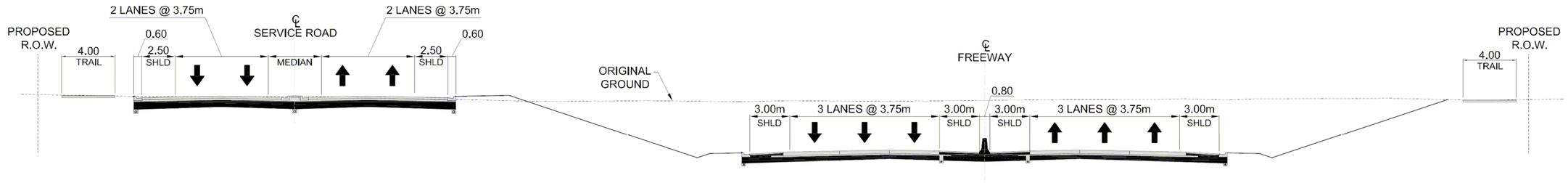
Although the freeway cross-section will incorporate open cut sections where feasible, retaining walls have been utilized in numerous locations to minimize property requirements and associated impacts throughout the corridor. Retaining walls have also been utilized in combination with open cut sections to reduce the depth of open cut, as discussed in **Section 9.3.1**.

From approximately 1.0 km east of Howard Avenue to North Talbot Road, The Windsor-Essex Parkway is predominantly at existing grade. There is no service road proposed through this section.

Exhibits 9.9 and **9.10** include additional details regarding elements of the access road and service road cross-sections. **Exhibit 9.9** includes typical cross-sections of The Windsor-Essex Parkway along the Huron Church Road / Highway 3 corridor, including adjacent service roads. **Exhibit 9.10** includes typical cross-sections of The Windsor-Essex Parkway with no adjacent service roads, including at-grade and above-grade cross-sections along with the core-collector system adjacent to E.C. Row Expressway.

EXHIBIT 9.9 – TYPICAL CROSS-SECTIONS – THE WINDSOR-ESSEX PARKWAY WITH SERVICE ROAD

BELOW-GRADE FREEWAY WITH TWO-WAY SERVICE ROAD ON ONE SIDE



BELOW-GRADE FREEWAY WITH ONE-WAY SERVICE ROAD ON BOTH SIDES

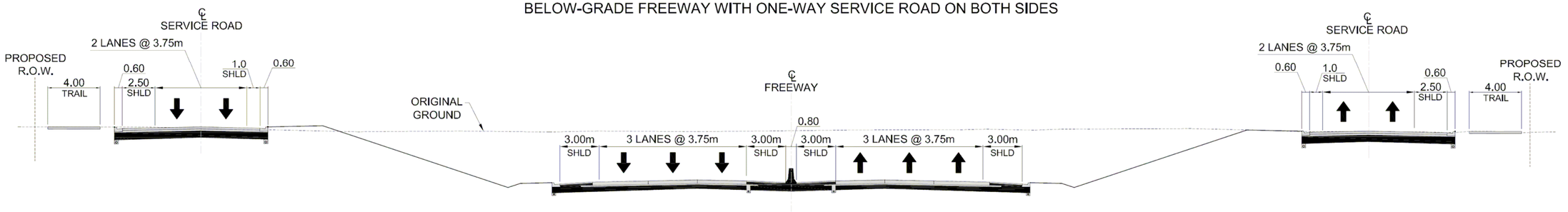
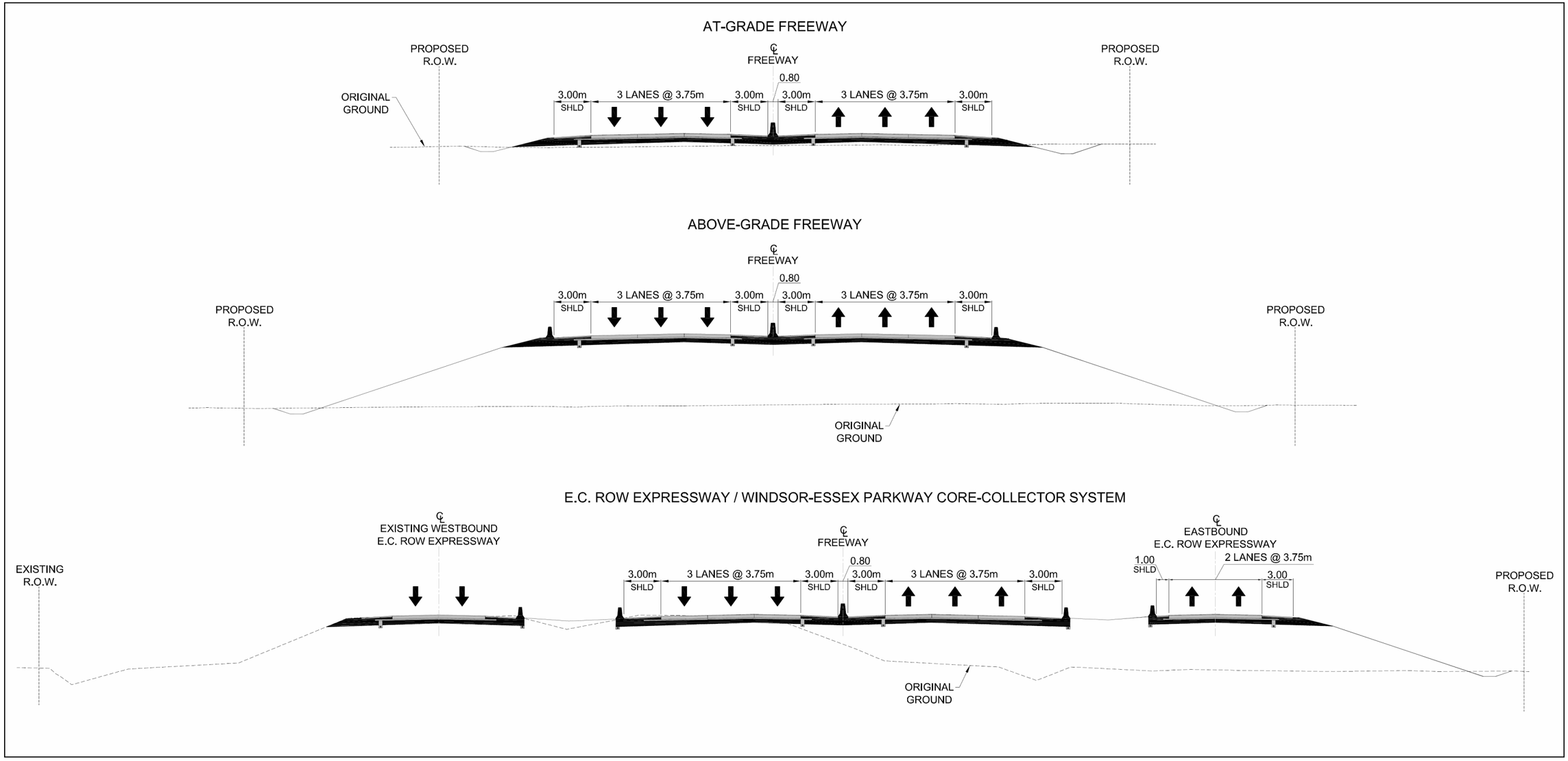


EXHIBIT 9.10 – TYPICAL CROSS-SECTIONS – THE WINDSOR-ESSEX PARKWAY WITH NO SERVICE ROAD



HORIZONTAL ALIGNMENT

Freeway

The horizontal alignment elements of the freeway portion of The Windsor-Essex Parkway were designed to meet or exceed the requirements set forth in the GDSOH.

Due to the termination of the proposed freeway at the new customs plaza, there is a need to slow traffic and change driver expectations as they approach the plaza. As such, the design speed of the proposed freeway varies along its length. Between the customs plaza and Huron Church Road, the design speed is 100 km/h. Between Huron Church Road and Huron Church Line, the design speed is 110 km/h. Between Huron Church Line and North Talbot Road, the design speed is 120 km/h.

There are a total of ten horizontal curves proposed for the alignment of the freeway portion of The Windsor-Essex Parkway. Radii of these curves range between 850 m and 10,000 m and all exceed minimum curve radius requirements for the proposed design speed as per the GDSOH. **Table 9.1** summarizes the horizontal curves for the proposed freeway.

TABLE 9.1 – SUMMARY OF FREEWAY HORIZONTAL CURVES

Horizontal Curve Location	Roadway Design Speed	Minimum Required Radius	Proposed Radius
East of Ojibway Parkway	100 km/h	420 m	850 m
East of Matchette Road	100 km/h	420 m	1,100 m
North of Bethlehem Ave./Labelle St.	110 km/h	525 m	1,200 m
North of Lambton Rd./Grand Marais Rd. W	110 km/h	525 m	3,000 m
Pulford St.	110 km/h	525 m	3,000 m
Todd Lane/Cabana Rd. W	110 km/h	650 m	1,100 m
St. Clair College	120 km/h	650 m	7,000 m
Montgomery Drive	120 km/h	650 m	2,000 m
East of Howard Avenue	120 km/h	650 m	850 m
West of North Talbot Road	120 km/h	650 m	10,000 m

Illustration of the horizontal alignment of the freeway portion of The Windsor-Essex Parkway is presented in the concept design plates in **Appendix A**.

Service Road

The horizontal alignment elements of the service road portion of The Windsor-Essex Parkway were designed to meet or exceed the requirements set forth in the GDSOH. Between existing Highway 3 at the south limit of the proposed improvements and 0.5 km south of Huron Church Line, the service road has been designed for a design speed of 100 km/hr. There are a total of 14 horizontal curves associated with this stretch of the service road alignment. All of these horizontal curves exceed the curve radius requirements for a design speed of 100 km/hr (420 m).

From 0.5 km south of Huron Church Line to the north limit of the proposed improvements, the service road has been designed for a design speed of 80 km/hr. There are a total of 7 horizontal curves associated with this stretch of the service road alignment. All of these horizontal curves meet or exceed the curve radius requirements for a design speed of 80 km/hr (250 m).

Illustration of the horizontal alignment of the service road portion of The Windsor-Essex Parkway is presented in the concept design plates in **Appendix A**.

VERTICAL ALIGNMENT

Freeway

The vertical alignment of the freeway portion of The Windsor-Essex Parkway has been developed to a concept level of detail to allow for future refinements based on more detailed structural design as well as geotechnical and constructability considerations in subsequent phases of design. The vertical alignment of the proposed freeway will adhere to general principles as outlined in this section of the report.

For the purposes of description of the proposed freeway vertical alignment, elevations are described qualitatively using the following terms:

Below-grade – Top of pavement is between 4 - 8 m below the existing ground level;

Shallow Below-grade – Top of pavement is 0 – 4 m below the existing ground level;

At-grade – Top of pavement is between the existing ground level and 2 m above the existing ground level;

Above-grade – Top of pavement is more than 2 m above the existing ground level.

Transition – Profile is transitioning between “Below-grade” and “Above-grade”.

The qualitative description of the freeway portion of The Windsor-Essex Parkway is tabulated section-by-section in **Table 9.2**.

TABLE 9.2 – QUALITATIVE DESCRIPTION OF PROPOSED FREEWAY ELEVATION

Freeway Section	Qualitative Elevation of Freeway Top of Pavement	Comment
From proposed plaza to approx. 0.3 km east of Matchette Road	Above-grade	Proposed freeway crosses over ETR, Ojibway Parkway and Matchette Road
From approx. 0.3 km east of Matchette Road to approx. 0.3 km west of Malden Road	At-grade	Proposed freeway generally follows existing E.C. Row Expressway profile
From approx. 0.3 km west of Malden Road to approx. 0.4 km east of Malden Road	Above-grade	Proposed freeway crosses over Malden Road
From approx. 0.4 km east of Malden Road to approx. 0.8 km east of Malden Road	Transition	Proposed freeway transitions between Above-grade and Below-grade
From approx. 0.8 km east of Malden Road to approx. 0.2 km north of Turkey Creek	Below-grade	Proposed freeway crosses beneath local roads, proposed service road and various tunnel sections
From approx. 0.2 km north of Turkey Creek to approx. 0.3 km south of Turkey Creek	Shallow Below-grade	Proposed freeway crosses above Turkey Creek while remaining as far below existing ground level as possible
From approx. 0.3 km south of Turkey Creek to approx. 0.6 km east of Howard Avenue	Below-grade	Proposed freeway crosses beneath local roads, proposed service road and various tunnel sections
From approx. 0.6 km east of Howard Avenue to existing Highway 3 Underpass	Transition	Proposed freeway transitions from Below-grade to At-grade
From Existing Westbound Highway 3 Underpass to North Talbot Road	At-grade	Proposed freeway matches existing Highway 401 profile

As discussed in the *Horizontal Alignment* section, the design speed of the freeway portion of The Windsor-Essex Parkway varies along its length. All elements of the vertical alignment of the proposed freeway meet or exceed the requirements set forth in the GDSOH for the proposed design speeds.

The minimum grade on the proposed freeway is 0.5 % which meets the requirements of the GDSOH for a freeway with an urban drainage system. The maximum grade of the proposed freeway is 3.0% which meets the GDSOH requirements for freeways.

Illustration of the vertical alignment concept of the proposed freeway is presented in the concept design plates in **Appendix A**.

Service Road

As discussed in the *Horizontal Alignment* section, the design speed of the service road portion of The Windsor-Essex Parkway varies along its length. All elements of the vertical alignment of the service road meet or exceed the requirements set forth in the GDSOH for the proposed design speeds.

The proposed service road is predominantly at-grade throughout the corridor to tie into the existing local road network. However, in two localized areas (north of Todd Lane/Cabana Road West and east of Cousineau Road/Sandwich West Parkway) the proposed service road is below-grade for short distances where they pass beneath tunnel sections.

Illustration of the vertical alignment concept of the proposed service road is presented in the concept design plates in **Appendix A**.

INTERCHANGES AND ACCESS POINTS

Interchanges and access points between the proposed freeway, proposed service road and side roads are included in The Windsor-Essex Parkway design concept to facilitate mobility and local access in the corridor and provide the opportunity for border-bound motorists to choose a border crossing.

Many of the access points of the proposed freeway have been sited to optimize mobility in the corridor and at several locations it is not appropriate to describe the access points as “interchanges”. As such, interchange spacing guidelines set forth in the *Geometric Design Standards for Ontario Highways (GDSOH)* were not applied for site selection but, instead, guidelines for spacing successive entrance and/or exit terminals were employed to ensure suitable operations.

Illustration of access point ramp locations and ramp geometrics is presented in the concept design plates in **Appendix A**.

Modern Roundabout at The Windsor-Essex Parkway/Highway 3/Howard Avenue Diversion

As part of The Windsor-Essex Parkway design concept, a modern roundabout is proposed for the intersection of realigned Highway 3, the proposed Howard Avenue diversion and the proposed freeway on and off-ramps east of Howard Avenue. The conceptual design of this roundabout has been developed in accordance with guidelines in the US Federal Highways Administration (FHWA) document entitled *Roundabouts: An Informational Guide* as well as Section 26 of the *State of Wisconsin Facilities Development Manual* which describes roundabout guidelines. British Colombia and Kansas Department of Transportation standards were also applied. The proposed modern roundabout has an inscribed diameter of 65 metres and a two-lane cross-section. Highway 3 forms the east leg, the proposed service road forms the west leg, an off-ramp and on-ramp from The Windsor-Essex Parkway forms the north leg and the proposed Howard Avenue diversion forms the south leg of the roundabout. Illustration of the proposed roundabout is presented in the concept design plates in **Appendix A**.

CARPOOL LOTS

The Ontario Ministry of Transportation has constructed and operated a network of carpool lots across southern Ontario since 1979. Carpool lots are constructed as a means of encouraging ride sharing and reducing congestion and vehicular emissions. The current Environmental Assessment study has considered the provision of carpool lots within the road network of The Windsor-Essex Parkway, and one site has been identified as a potential carpool lot location. This site is located on the east side of the Howard Avenue diversion, south of the proposed roundabout at realigned Highway 3. Further design stages of the project will include additional study as to the layout and feasibility of providing this carpool lot.

9.3.2 Crossing Roads

Numerous local, collector and arterial crossing roads intersect with The Windsor-Essex Parkway corridor. As part of the concept design of The Windsor-Essex Parkway, it is proposed that some of these crossing roads be provided with interchanges at the proposed freeway, some connected with the proposed service road, some grade separated from the corridor and some closed. These crossing roads are summarized below. Illustration of crossing road treatments as part of the conceptual design of The Windsor-Essex Parkway is presented in the concept design plates in **Appendix A**.

FULL OR PARTIAL INTERCHANGES

Full or partial interchanges at the proposed freeway are proposed for the following crossing roads:

- Ojibway Parkway (full moves interchange)
- Todd Lane/Cabana Road West (partial moves interchange)
- Highway 3 (full moves interchange)

The Highway 3 interchange includes a modern roundabout that also provides access for the proposed Howard Avenue diversion to and from the interchange ramps on the proposed freeway. This configuration effectively provides a full moves interchange for the proposed Howard Avenue diversion south of the corridor.

INTERSECTIONS WITH PROPOSED SERVICE ROAD

Intersections with the proposed service road are proposed for the following crossing roads:

- Labelle Street/Bethlehem Avenue
- Lambton Road/Grand Marais Road West
- Pulford Street
- Todd Lane/Cabana Road West
- Huron Church Line
- Geraedts Drive (St. Clair College)
- Sandwich West Parkway/Cousineau Road
- Montgomery Drive
- Howard Avenue
- Outer Drive

Traffic on the proposed service road will have access to and from the proposed freeway in several locations along the corridor. These access points effectively provide access to and from the proposed freeway for all of the above listed crossing roads.

In addition, the roundabout at the proposed Highway 3 interchange includes a connection to the proposed service road which provides for access to and from the service road for Highway 3 and the proposed Howard Avenue diversion.

GRADE-SEPARATED CROSSINGS

Grade-separated crossings with no access to The Windsor-Essex Parkway are proposed for the following crossing roads:

- Matchette Road (overpass)
- Malden Road (overpass)
- North Talbot Road (underpass)

ROAD CLOSURES

The following roads formerly having access to the Huron Church/Highway 3 corridor are proposed to be closed at the boundary of The Windsor-Essex Parkway corridor:

- Gratiot Street (City of Windsor)
- Lansing Street (City of Windsor)
- Reddock Street (City of Windsor)
- Surrey Drive (Town of LaSalle)
- Grosvenor Drive (Town of LaSalle)

Access from Reddock Street to the proposed service road will be provided via a new road connection between Reddock Street and Todd Lane. Alternatively, a connection may be constructed between Reddock Street and Gratiot Street and connected to the service road at the Pulford Street intersection. The construction of a Pulford Street connection to the Reddock Street to Gratiot Street connection will be dependent on the results of future consultation with the City of Windsor and local property owners, and will consider approved development plans for this area.

ADDITIONAL ROAD IMPROVEMENTS

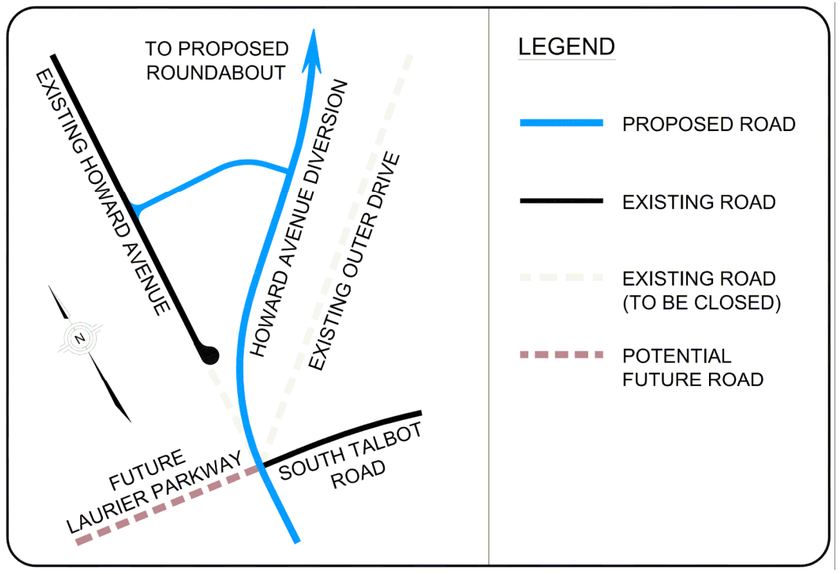
The concept design of The Windsor-Essex Parkway includes the addition of a double left turn lane for the northbound approach of Ojibway Parkway at the existing intersection with the E.C. Row Expressway. The second left turn lane is required based on anticipated traffic operational concerns at the intersection. A second receiving lane will also be added to the northwest approach of the intersection to handle the additional left turn lane.

The concept design of The Windsor-Essex Parkway includes a realignment of existing Highway 3 east of Outer Drive, east of the freeway portion of The Windsor-Essex Parkway. The existing Highway 3 /

Outer Drive intersection will be removed, and the connection from Outer Drive to Highway 3 will be provided via a new connecting road.

Howard Avenue will be realigned to the east to connect to the Howard Avenue diversion near South Talbot Road. This Howard Avenue diversion will replace Outer Drive and will form the south leg of the proposed roundabout described in Section 9.2.1. A schematic illustration of the proposed improvements at the Howard Avenue diversion is provided in **Exhibit 9.11**.

EXHIBIT 9.11 – HOWARD AVENUE DIVERSION SCHEMATIC



9.3.3 Right-of-Way Requirements

The property requirements for The Windsor-Essex Parkway are dependent upon the location of the service road, the proposed trail network, stormwater management ponds and watercourse realignments, and utility corridors. Where possible, existing rights-of-way have been utilized to minimize the impact to the surrounding environment and property owners. Property requirements are also dependent on providing buffering for surrounding communities and for protection of environmental features. Opportunities will be sought to forge partnerships with parties to restore and enhance required property with native and endangered species, and to transfer lands within The Windsor-Essex Parkway to parties that can best protect sensitive areas.

From the proposed customs plaza easterly to Huron Church Road, the freeway portion of The Windsor-Essex Parkway will be integrated with the E.C. Row Expressway. This integration maximizes use of the existing E.C. Row Expressway right-of-way to minimize impact to the Spring Garden community and to adjacent natural features. Additional property required for The Windsor-Essex Parkway through this area will include property obtained for environmental mitigation and wildlife buffering purposes, for stormwater management ponds and for provision of the trail network. Through this section, the typical right-of-way to be required beyond the existing E.C. Row Expressway right-of-way is approximately 200 m (290 m total) with the maximum additional requirement being approximately 300 m (390 m total).

From north of Bethlehem Avenue/Labelle Street southerly to Todd Lane/Cabana Road West, The Windsor-Essex Parkway freeway and adjacent service road utilize the existing right-of-way of Huron Church Road. In addition to obtaining property for the freeway, service road and realigned crossing roads, additional property required through this section will include property required for stormwater management ponds, the proposed interchange at Todd Lane/Cabana Road West, environmental mitigation features, the proposed trail network and for utility corridors. Although the property requirement through this section is highly variable, the additional right-of-way requirement beyond the existing Huron Church Road right-of-way averages approximately 185 m (240 m total) with the maximum additional requirement being approximately 265 m (total width of 320 m).

From Todd Lane/Cabana Road West easterly to existing Highway 3, The Windsor-Essex Parkway freeway and adjacent service road utilize the existing right-of-way of Highway 3 to minimize impacts to adjacent properties. In addition to obtaining property for the freeway, service road and realigned crossing roads, additional property required through this section will include property obtained for stormwater management ponds, the proposed interchange west of Howard Avenue, environmental mitigation features, the proposed trail network and for utility corridors. Through this section, the additional right-of-way requirement beyond the existing Highway 3 right-of-way averages approximately 200 m (240 m total) with the maximum additional requirement being approximately 280 m (total width of 320 m).

From existing Highway 3 easterly to North Talbot Road, the freeway utilizes the existing Highway 401 right-of-way. No additional right-of-way is required in this section.

The property requirements described above are based on the concept design as it has been developed for the Environmental Assessment Study. The concept design is subject to more detailed study, which may change some elements of the concept design, and therefore the property requirements may also change.

Additional details of the right-of-way requirements of The Windsor-Essex Parkway are presented in the concept design plates in **Appendix A**.

9.3.4 Construction Methods and Staging

A general concept for construction staging of the freeway, service road and sideroad crossings has been developed as part of this Environmental Assessment Study to ensure that The Windsor-Essex Parkway can be constructed in a feasible manner while minimizing disruption to the surrounding communities and local traffic patterns as much as possible. In order to ensure minimal disruption, maintaining four lanes of traffic in the Highway 3/Huron Church Road corridor as well as the E.C. Row Expressway corridor has been established as a principle for development of the staging concept. This principle will be a key requirement in the development of detailed staging plans in future design phases. Additional details of the conceptual construction staging plan are included in the *"Draft Practical Alternatives Evaluation – Constructability Report for Access Road Alternatives"* (refer to List of Supporting Documents). The general construction staging concept outlined below and presented in the report will be subject to refinement during future design stages of the project.

It should be noted that construction methods and staging are the responsibility of the selected contractor, subject to the provisions and specifications of the contract. The implementing authorities will develop these contract documents to be in accordance with this Environmental Assessment. The following planning level assessment and specifications of methods and staging has been developed to confirm basic feasibility.

HURON CHURCH ROAD/HIGHWAY 3 CORRIDOR

The general construction staging concept for the freeway and service road consists of four primary stages preceded by an initial utility relocation stage. This preliminary staging concept is described generally below.

Utility Relocation

Early work would likely focus on the relocation of utilities and other municipal services. There are numerous utilities located within the corridor, including hydro, Bell, Union Gas, communication, cable television as well as municipal services such as watermains, storm sewers, municipal drains and sanitary sewers. These existing utilities within The Windsor-Essex Parkway corridor are discussed in **Section 7.6** and are illustrated in the concept design plates in **Appendix A**. Further details regarding utility relocation are included in **Section 9.3.12**.

Stage 1

This first primary construction stage would focus on building the proposed service road, the realignment of the existing municipal roadways (where necessary), and the construction of any temporary staging roads. During this stage, traffic will remain primarily on the existing Highway 3 / Huron Church Road with some routing onto localized temporary staging roads within the corridor.

Stage 2

The second primary construction stage involves shifting local traffic to the new service road and temporary staging roads to allow for the excavation of the proposed freeway and construction of associated retaining walls, underpasses and tunnel sections. Construction of the remainder of the service road will be completed during this stage.

Stage 3

During the third primary construction stage, traffic will be fully relocated onto the service road while construction would focus on completion of the freeway portion of The Windsor-Essex Parkway.

Stage 4

During the fourth and final primary construction stage, the new freeway and service road facilities will be fully opened to traffic while efforts would focus on final construction details in the corridor, including the connection to Howard Avenue.

E.C. ROW EXPRESSWAY CORRIDOR

The general construction staging concept for The Windsor-Essex Parkway within the E.C. Row Expressway corridor will consist of two primary construction stages preceded by an initial utility relocation stage.

Utility Relocation

Early work would likely focus on the relocation of utilities and other municipal services. There are numerous utilities located within the corridor, including hydro, Bell, Union Gas, cable television as well as municipal services such as watermains, municipal drains and sanitary sewers.

Stage 1

This first primary construction stage would focus on construction of the realigned eastbound lanes of E.C. Row Expressway and associated structure, creating space between eastbound and westbound lanes for the proposed freeway portion of The Windsor-Essex Parkway which forms the core lanes of this core-collector system. During this stage, traffic will remain on the existing E.C. Row Expressway lanes.

Stage 2

The second primary construction stage involves shifting eastbound E.C. Row Expressway traffic to the newly constructed realignment of eastbound E.C. Row Expressway lanes (eastbound collectors). This will allow for construction of the freeway portion of The Windsor-Essex Parkway (core lanes) and associated structures.

9.3.5 Structures

TUNNEL SECTIONS

There are 11 tunnels proposed as part of The Windsor-Essex Parkway, ranging in length between 120 m and 240 m. These tunnels have been strategically located to maintain and enhance existing access along the corridor, as well as to provide new connections for roads, trails and wildlife linkages. In addition to providing local connections across the freeway portion of The Windsor-Essex Parkway, landscaping/public space will be provided on top of the tunnels so as to lessen any 'barrier effect' of the freeway for the neighbourhoods on either side of The Windsor-Essex Parkway.

Design details of each of the 11 individual tunnels will be confirmed during the future design phase of this project, including structural type and abutment selection. The provision of landscaping on top of each of the tunnels will include the placement of up to 1 m of topsoil along the entire tunnel area. The structural implications of providing this additional weight on each of the structures will be finalized during future stages of design. In addition, the precise location and length of these tunnels may be subject to further refinement during these future stages of design.

The general location, length and rationale/benefits of providing each of the 11 tunnels included as part of The Windsor-Essex Parkway are summarized in **Table 9.3**. The 11 tunnels are also identified on the concept design plates in **Appendix A**.

TABLE 9.3 – SUMMARY OF THE WINDSOR-ESSEX PARKWAY TUNNELS

Tunnel Name	General Location	Length	Rationale for tunnel location/length
Spring Garden	Spring Garden Road	200 m	Maintains connection between Spring Garden residential area and vacant natural area adjacent to E.C. Row Expressway. Tunnel length of 200 m provides opportunities for public space and Gateway features to be incorporated in this area; this tunnel is the first tunnel along The Windsor-Essex Parkway as viewed by motorists entering Canada via the new crossing. The location and length of this tunnel is constrained by the freeway profile at the west end (profile begins rising from below-grade to above-grade) and the proximity of the Labelle/Bethlehem tunnel to the south.
Labelle	Bethlehem Avenue / Labelle Street	240 m	Maintains existing road crossing at Labelle Street/Bethlehem Street. Provides improved connection between Bellewood neighbourhood/Bellewood Park/Bellewood School and Spring Garden/Bethlehem neighbourhoods/Spring Garden Forest/Windsor community trails. Tunnel length of 240 m provides opportunities for public space and Gateway features to be incorporated in this area; this tunnel is situated at junction of The Windsor-Essex Parkway and Huron Church Road and will be viewed by motorists entering Canada via both the new bridge / The Windsor-Essex Parkway and the Ambassador Bridge / Huron Church Road.
Grand Marais	Grand Marais Road/ Lambton Road	120 m	Maintains existing road crossing at Grand Marais/Lambton. Provides improved connection between Bellewood neighbourhood/Bellewood Park/Bellewood School and Huron Estates neighbourhood and Spring Garden Forest. Tunnel also provides improved connection for existing West Windsor Recreationway trail; presently this trail passes under Huron Church Road at Grand Marais Drain; in times of high water flows in the drain, this trail is presently closed. With The Windsor-Essex Parkway, this trail will be relocated to allow crossing of the freeway and service road via either the Grand Marais or Pulford Avenue tunnels. The tunnel length is constrained by the freeway profile at the south end (freeway is not as deep at the Grand Marais drain crossing as other locations) and distance between the exit ramp and the service road as well as the service road structure at north end.
Pulford	Pulford Street	120 m	Provides improved connection between the residential area on the east side of Huron Church Road/South Windsor Recreation Complex and Huron Estates neighbourhood/Spring Garden Forest. Tunnel also provides improved connection for existing West Windsor Recreationway trail; the existing trail passes under Huron Church Road at Grand Marais Drain; in times of high water flows in the drain, this trail is presently closed. With The Windsor-Essex Parkway, this trail will be relocated to allow crossing of the freeway and service road via either the Grand Marais or Pulford Avenue tunnels. The tunnel length is constrained by the freeway profile at the north end (freeway is not as deep at Grand Marais drain crossing as other locations) and distance between the entrance ramp and the service road at the south end.
Oakwood	0.3 km north of Todd Lane / Cabana Rd. W	120 m	Provides improved wildlife linkage and new community connection between Oakwood Bush/Oakwood School/Windsor community trails and Spring Garden Forest. Both the freeway and service road pass through this tunnel leaving a road-free connection at the ground surface. Tunnel length is constrained by service road profile at north and south ends (service road profile rises from below-grade to at-grade at intersections on both sides of tunnel).
Todd / Cabana	Todd Lane / Cabana Rd. W	120 m	Maintains existing road crossing at Todd Lane/Cabana Road. Provides improved connection between Villa Borghese neighbourhood/Oakwood Bush/Oakwood School and Todd Lane neighbourhood/Spring Garden Forest. Tunnel length constrained by the service road profile at the north end and proximity of tunnel to the south.
Villa Borghese	Huron Church Line	240 m	Maintains an existing road connection for Huron Church Line and the service road. Provides improved wildlife linkage and improved community connection between Lennon Drain/St. Clair College environmentally sensitive area and Cahill Drain candidate natural heritage site lands/LaSalle Woods/LaSalle community trails.
St. Clair College	St. Clair College Entrance	120 m	Maintains an existing road connection for the main entrance to the college and the service road. Provides improved wildlife linkage and improved community connection between St. Clair College environmentally sensitive area and athletic fields, Cahill Drain candidate natural heritage site lands, Windsor Crossing commercial area, LaSalle community trails and future residential development in LaSalle. No existing residential neighbourhood in this immediate area, but as the main entrance to the college, this area is expected to have a relatively high volume of pedestrian and cyclist traffic. A length of 120 m was considered adequate for meeting the connectivity requirements at this location.

Tunnel Name	General Location	Length	Rationale for tunnel location/length
Cousineau	Cousineau Road	170 m	Maintains existing road crossing at Cousineau Rd/Sandwich West Parkway. Provides improved community connection between St. Clair College and athletic fields/Our Lady of Mt. Carmel School, and Villa Paradiso neighbourhoods with Heritage Estates neighbourhood/Windsor Crossing commercial area/LaSalle community trails. When The Windsor-Essex Parkway was introduced in 2008, this tunnel was shortened by 50 m from the previous version, to enable the extension of the Hearthwood Place tunnel section. However, based on further consideration, public feedback, and the decision to purchase additional properties on Homestead Lane and Kendleton Court to provide additional buffer spacing, the tunnel is now proposed to be 170 m long. Length of tunnel in this area is constrained by the service road profile at the east end (service road profile rises from below grade to at-grade at intersection of Cousineau/Sandwich West Pkwy), and proximity to Hearthwood Place tunnel.
Hearthwood	Hearthwood Place	165 m	Provides improved wildlife linkage and new community connection between Villa Paradiso neighbourhood/Matthew Rodzik Park/new green space north of corridor and Heritage Estates neighbourhood/Windsor Crossing commercial area/LaSalle community trails. Both the freeway and service road pass through this tunnel leaving a road-free connection at the ground surface. When The Windsor-Essex Parkway was introduced in 2008, the freeway portion of this tunnel was proposed to be 220 m long. However, based on difficulties associated with the construction of an "L-shaped" tunnel, public feedback, and the decision to provide additional buffer on both sides of the freeway in this area, the tunnel length has been adjusted downwards to 165 m. (Note: In order to provide additional buffer in this area, additional properties on Homestead Lane and Kendleton Court will be purchased). Length of tunnel section is constrained by service road profile at the west end (service road profile rises from below grade to at-grade at intersection of Cousineau/Sandwich West Pkwy), and the proximity to Cousineau tunnel. East limit of tunnel constrained by proximity of at-grade intersection at Montgomery Dr. and entrance ramp to freeway.
Oliver Estates	0.3 km west of Howard Avenue	240 m	Provides improved community connection between Shadetree neighbourhood /Matthew Rodzik Park/new green space north of corridor and Oliver Estates neighbourhood/ LaSalle community trails. Tunnel length of 240 m provides opportunities for landscaping/public space and Gateway features to be incorporated in this area; this is the first tunnel along The Windsor-Essex Parkway as viewed by motorists entering Windsor/LaSalle via Highway 401 or Highway 3.

ROADWAY UNDERPASSES/OVERPASSES

In addition to the 11 tunnel sections described above, there are 14 underpass and overpass structures proposed as part of The Windsor-Essex Parkway allowing grade-separation between the freeway, service road, ramps and side roads. The general location and function of these underpass and overpass structures are summarized in **Table 9.4**. These underpass and overpass structures are also included on the design plates in **Appendix A**.

TABLE 9.4 – SUMMARY OF THE WINDSOR-ESSEX PARKWAY UNDERPASS AND OVERPASS STRUCTURES

Name and General Location	Description and Function
Ojibway Parkway / ETR Overpass at The Windsor-Essex Parkway, east of plaza	Eight-lane overpass structure (six general purpose lanes and two auxillary lanes) providing grade-separation between existing Ojibway Parkway/ETR and freeway portion of The Windsor-Essex Parkway, directly east of the new plaza.
Matchette Road Overpass at The Windsor-Essex Parkway	Eight-lane overpass structure (six general purpose lanes and two auxillary lanes) providing grade-separation between existing Matchette Road and freeway portion of The Windsor-Essex Parkway, south of existing E.C. Row Expressway.
Eastbound E.C. Row Expressway Overpass, east of Matchette Road	Three-lane overpass structure providing grade-separation between realigned eastbound E.C. Row Expressway and freeway portion of The Windsor-Essex Parkway, east of Matchette Road.
Malden Road Overpass at The Windsor-Essex Parkway	Overpass structure providing grade-separation between existing Malden Road and realigned E.C. Row Expressway/freeway portion of The Windsor-Essex Parkway. Depending on the final separation between The Windsor-Essex Parkway and both eastbound and westbound E.C. Row Expressway, separate structures may be constructed for the freeway and for E.C. Row Expressway. Removal of the existing Malden Road structure at eastbound E.C. Row Expressway may also be required as part of construction of this structure.
Eastbound E.C. Row Expressway Overpass, west of Spring Garden Tunnel	Three-lane overpass structure providing grade-separation between realigned eastbound E.C. Row Expressway and freeway portion of The Windsor-Essex Parkway, west of Spring Garden Tunnel.
Eastbound Service Road Underpass, west of Grand Marais Road/Lambton Street	Two-lane underpass structure providing grade-separation between eastbound service road and freeway portion of The Windsor-Essex Parkway, west of Grand Marais Road/Lambton Street.
Service Road Overpass, east of Pulford Street	One-lane overpass structure providing grade-separation between westbound service road and vehicles entering westbound freeway portion of The Windsor-Essex Parkway, east of Pulford Street.
Eastbound Service Road Underpass, east of Huron Church Line	Two-lane underpass structure providing grade-separation between eastbound service road and freeway portion of The Windsor-Essex Parkway, east of Huron Church Line.
Westbound Service Road Underpass, east of Cahill Drain	Two-lane underpass structure providing grade-separation between westbound service road and freeway portion of The Windsor-Essex Parkway, east of Cahill Drain and west of St. Clair College Tunnel.

Name and General Location	Description and Function
Service Road Underpass near Montgomery Street	Four-lane underpass structure providing grade-separation between service road and freeway portion of The Windsor-Essex Parkway, west of Howard Avenue.
Howard Avenue Underpass at The Windsor-Essex Parkway	Two/Three-lane underpass structure providing grade-separation of Howard Avenue and freeway portion of The Windsor-Essex Parkway.
Highway 3 Underpass at East of Howard Avenue	Four/Five-lane underpass structure providing grade-separation between realigned Highway 3 and freeway portion of The Windsor-Essex Parkway, east of Howard Avenue.
Ramp E-E/W Underpass, south of existing Highway 3 and east of Howard Avenue	One-lane underpass structure providing grade-separation over freeway portion of The Windsor-Essex Parkway for vehicles exiting from westbound freeway.
North Talbot Road Underpass at existing Highway 401	Two-lane underpass structure providing grade-separation for North Talbot Road across Highway 401. New structure required to replace existing North Talbot Road structure due to widening of Highway 401 to six-lanes at this location.

RETAINING WALLS

A significant portion of the freeway section of The Windsor-Essex Parkway is below grade, while the service road and crossing roads are at (or close to) existing ground level. Although the freeway cross-section will incorporate open cut sections with vegetated side slopes where feasible, retaining walls will be utilized in numerous locations to accommodate roadway geometrics and to minimize property requirements and other associated impacts throughout the corridor. Retaining walls have also been utilized in combination with open cut sections to ensure side slope stability, as discussed in **Section 9.3.1**. Further details regarding the height and locations of retaining walls along the corridor will be determined during future design stages of the project.

PEDESTRIAN/CYCLIST OVERPASSES

As discussed in **Section 9.3.6**, a multi-use trail network will be incorporated into The Windsor-Essex Parkway to provide safe and continuous recreational travel along the length of the corridor for cyclists and pedestrians. The trail network will consist of 8 grade separations, or pedestrian overpasses, at locations where the trail system crosses side roads or the proposed service road. Although the trail network is subject to refinement during future design phases, the concept presented in this Environmental Assessment Report provides for a continuous pathway throughout the corridor that is grade separated at locations where a roadway is encountered. The locations of the pedestrian overpasses along The Windsor-Essex Parkway are presented in the concept design plates in **Appendix A**. It is recognized that further design work on the trail system may alter the location of the pedestrian overpasses identified in the report, along with the pedestrian overpasses identified in the concept design plates. Future decisions regarding the trail network will involve additional consultation with the public and local municipalities.

9.3.6 Multi-use Trail Network

The concept design of The Windsor-Essex Parkway includes an extensive multi-use trail network along the length of the corridor. The conceptual trail network design was developed in part based on feedback received at various Context Sensitive Design workshops held during the study. The trail network provides for a continuous path between the existing trail at the Malden Road/E.C. Row Expressway underpass and the Howard Avenue diversion, with grade separated trail crossings allowing cyclists and pedestrians to travel the length of the corridor without encountering a motor vehicle. The proposed trail network concept also includes numerous alternate paths through the corridor with at-grade crossings of roadways allowing access to the continuous trail network from several locations outside The Windsor-Essex Parkway. Cyclists and pedestrians will be able to choose between the continuous trail, with overpasses, or an alternate route, with at-grade intersections.

Grade-separated trail crossings of roadways will be typically achieved using conventional bridges and approaches on earth embankments in such a way as to ensure grade separations are not seen as a "barrier" to potential users. Vertical grades on the trail throughout the network (including approaches to grade separations) will be limited to a maximum of 5% to ensure all grades are easily negotiated by cyclists and pedestrians.

At-grade trail crossings of roadways will be designed in accordance with appropriate standards for pedestrian and cyclist crossings to ensure safe and efficient use of the trail network. The typical width of the multi-use trail is 4 m to allow for use by both pedestrians and cyclists.

Future design and consultation stages of The Windsor-Essex Parkway will include a consideration of issues such as winter maintenance of the trail system and the surface treatment to be provided along the trail.

Illustration of the proposed concept for the multi-use trail network of The Windsor-Essex Parkway is presented within the concept design plates in **Appendix A**. Further design work on the trail system may alter the location of the pedestrian overpasses identified in the report, along with the pedestrian overpasses identified in the concept design plates. Future decisions regarding the trail network will involve additional consultation with the public and local municipalities.

9.3.7 Drainage and Stormwater Management

This section generally describes the proposed drainage components of The Windsor-Essex Parkway including watercourses/drains adjacent to and crossing the corridor as well as the proposed stormwater management plan. Illustration of the proposed drainage system is presented within the concept design plates in **Appendix A** of this document, and additional details of the proposed drainage system and assessment methodology are included in the *Draft Practical Alternatives Evaluation Assessment Report – Stormwater Management Plan* (refer to List of Supporting Documents). Additional information pertaining to proposed drainage and fisheries impacts as well as potential mitigation measures are presented in **Section 10.4.5**.

ASSESSING DRAINAGE AND STORMWATER MANAGEMENT IMPACTS

The Ontario Ministries of Transportation (MTO) and Environment (MOE) have developed specific protocols for assessing drainage impacts which must be applied to all transportation projects in the province. In general terms, the drainage impact is determined by comparing the existing condition runoff effects within the study area to the proposed condition runoff effects.

For all development projects, quality and quantity treatment of runoff is necessary. Stormwater quality is degraded by increased pollutant loadings (oil, gravel, garbage, etc), measured based on the total impervious percentage increase over the existing condition. The MOE document "Stormwater

Management Planning and Design Manual" outlines the increase in pollutants over the development area, as well as providing guidelines for potential mitigations. Increases to surface runoff which exceed the existing peak flows to the watercourse will negatively impact the watercourse floodline and erosion condition. This can be mitigated by providing stormwater management practices which provide quantity control and erosion treatment to runoff from the study area, or resizing impacted crossing structures in order to prevent increases in floodlines. However, additional mitigation may also be required in specific circumstances.

Roadway drainage impact is determined by the number and frequency of flooding within the travel lanes. Flooding of the travel lanes can result in lane closures, traffic delays, or even accidents associated with hydroplaning.

ADJACENT WATERCOURSES AND CROSSINGS

There are numerous existing watercourses adjacent to and crossing The Windsor-Essex Parkway corridor. These primarily include the Wolfe Drain, Cahill Drain, Lennon Drain, Grand Marais Drain, Basin Drain, Youngstown Drain, Titcombe Drain and McKee Drain. Where watercourses cross the proposed freeway, culverts/structures have been designed to convey the 100-year storm without negatively impacting the upstream flood elevations. Where watercourses cross local roads, culverts/structures are designed to convey the 10-year and 25-year storms for spans less than 6 m and greater than 6 m respectively. The following paragraphs describe the manner in which flows in these watercourses will be conveyed as part of The Windsor-Essex Parkway conceptual design.

Wolfe and Cahill Drains

Wolfe and Cahill Drains currently run parallel to Highway 3 conveying runoff from the developed area north of the corridor and crossing The Windsor-Essex Parkway in the vicinity of St. Clair College. The drains have been sized to convey between the 10 and 25-year storm before overtopping Highway 3, with overland flows spilling to the south. Proposed construction of The Windsor-Essex Parkway will require improvements to the conveyance capacity of the drain channels, as well as the drain alignments.

Between Howard Avenue and St. Clair College, the Wolfe/Cahill Drain is re-aligned to the north of the proposed service road in a naturalized channel containing meanderings, vegetation and other measures to enhance the fish habitat. The channel is designed to convey the 100-year storm peak flows without impacting the proposed freeway or upstream floodlines. Due to the below-grade section of the freeway in this area, this Wolfe/Cahill Drain flow will be conveyed to the south side of the corridor through a submerged concrete culvert. The culvert will consist of three 2.0 m diameter concrete pipes, with one pipe acting as a low-flow conveyance pipe, and the remaining two pipes conveying higher storm events.

The West Cahill Drain Tributary currently crosses Highway 3 west of the primary Cahill Drain Crossing at St. Clair College. In an effort to limit the number of submerged culvert crossings under the highway, the tributary will be diverted along the north side of the proposed service road to a confluence with the main Cahill Drain before crossing the service road and freeway at a single location. As the existing tributary connects with the Cahill Drain immediately downstream of Highway 3, this diversion is not considered significant.

Fish passage systems will be provided at the Cahill Drain to provide safe fish passage across the below-grade freeway portion of The Windsor-Essex Parkway. Fish locks are being proposed to raise and lower migrating fish across The Windsor-Essex Parkway thereby maintaining access to upstream spawning areas. This method has proven to be effective in other applications.

Lennon Drain

Lennon Drain currently provides drainage to the residential community east and west of the drain. An existing on-line stormwater management pond is located immediately upstream of the existing Highway 3 crossing, providing quantity storage to the drain and decreasing the overall size requirements for the current crossing structure. To be conservative, this existing stormwater management pond was not considered when sizing the crossing associated with The Windsor-Essex Parkway.

Due to the below-grade section of the freeway in this area, the Lennon Drain will also be conveyed to the south side of the corridor within a submerged concrete culvert. The culvert will consist of a 3.0 m x 1.5 m concrete box culvert structure. The structure has been sized to convey peak flows associated with the 100-year storm without impacting the upstream flood elevations.

As with the Cahill Drain crossing, fish locks are being proposed at the Lennon Drain to raise and lower migrating fish across The Windsor-Essex Parkway thereby maintaining access to upstream spawning areas.

Grand Marais Drain

Grand Marais Drain currently provides drainage for approximately 2800 ha of upstream drainage area. This drain is conveyed under Highway 3 in a concrete lined channel approximately 7 m below existing grade. The concrete lined channel includes a concrete lined low flow channel with concrete lined flood banks.

The low existing elevation of the Grand Marais Drain channel provides the opportunity for the freeway to cross above the channel while still remaining below the existing ground level. As such, the Grand Marais Drain flow will be conveyed below the proposed service road and access road within a three-cell 10.0 m x 2.0 m concrete box culvert. The structure has been sized to convey peak flows associated with the 100-year storm without impacting the upstream flood elevations.

Basin Drain

Basin Drain begins at the outlet of the existing 2.1 m x 1.5 m box culvert on the south side of the E.C. Row Expressway. The box culvert is an outfall for a storm sewer system providing drainage for the upstream industrial development.

The vertical alignment of the freeway portion of The Windsor-Essex Parkway rises from below-grade to above-grade between the Spring Garden tunnel and Malden Road in such a manner that the access road is approximately at-grade where it crosses the Basin Drain. As such, the existing Basin Drain storm sewer outfall can be extended or re-aligned to provide conveyance beneath the proposed freeway.

Youngstown Drain

The existing alignment of the Youngstown Drain, which originates within the loop ramp in the southwest quadrant of the existing E.C. Row Expressway/Huron Church Road interchange, currently crosses the proposed freeway alignment where the freeway is proposed to be below-grade. In an effort to limit the need for submerged culvert crossings, the runoff originating within the loop ramp will be realigned to the drainage channel flowing on the north side of the E.C. Row Expressway, connecting to Basin Drain

upstream of the proposed culvert. Since the existing drain connects with Basin Drain approximately 200 m downstream of the proposed realignment, the diversion is not considered significant.

Titcombe Drain

Titcombe Drain is a small conveyance channel beginning immediately south of the E.C. Row Expressway. The drain currently conveys a small area from Malden Road to Titcombe Drain southerly.

In the vicinity of Titcombe Drain, the freeway portion of The Windsor-Essex Parkway (core lanes) and realigned E.C. Row Expressway (collector lanes) are above-grade. The proposed freeway (core and collectors) does not impact the drain itself, but will have a minor impact on the drainage area of the drain. Therefore, an analysis will be completed during subsequent design phases to confirm that the existing (pre-construction) peak flow rates of Titcombe Drain will be the same after construction of The Windsor-Essex Parkway.

McKee Drain

McKee Drain currently conveys runoff from an area immediately south of E.C. Row Expressway and west of Titcombe Drain, ultimately discharging to the Detroit River. The existing drain runs parallel to E.C. Row Expressway to west of Matchette Road, where it crosses E.C. Row Expressway. The location of the freeway portion of The Windsor-Essex Parkway will require minor realignments to McKee Drain.

East of Matchette Road, the McKee Drain will be realigned along the south side of the proposed freeway. The existing crossing at Matchette Road will be replaced with a new concrete box culvert, discharging to the existing downstream portion of McKee Drain on the north side of the proposed freeway. Between Matchette Road and the E.C. Row Expressway crossing, McKee Drain will be realigned to the north in an effort to maximize the area available for a proposed stormwater management facility. Downstream of the E.C. Row Expressway, McKee Drain will follow the existing flow route to the Detroit River.

STORMWATER MANAGEMENT PLAN

Runoff Conveyance

Runoff from the service road portion of The Windsor-Essex Parkway and below-grade sections of the freeway portion of The Windsor-Essex Parkway (generally within the Highway 3/Huron Church Road corridor) will be captured and conveyed within an urban drainage system consisting of catch basins and storm sewers. The storm sewer system for the proposed freeway will be designed to accommodate the 100-year storm in order to prevent flooding into the driving lanes. The storm sewer system for the proposed service road will be designed to accommodate the 10-year storm.

In below-grade sections of the proposed freeway, several pumping stations are required at the various low points in order to pump stormwater runoff that has been collected in the storm sewer system to the stormwater management ponds at ground-level. Three individual pumps will be provided at each pumping station, with each individual pump capable of handling 50% of the runoff from the 100-year storm. Storage facilities will also be provided at each pumping station for excess runoff volumes. Additional details of the pumping stations will be confirmed during subsequent design phases.

Where the proposed freeway is above-grade along The Windsor-Essex Parkway/E.C. Row Expressway core-collector system, runoff will be captured and conveyed within a median storm sewer system discharging to right-of-way ditching consisting of enhanced grassed swales and roadside ditches. Where the proposed freeway is at-grade east of existing Highway 3, runoff from the proposed freeway will be captured and conveyed within a rural-type drainage system consisting of enhanced grassed swales and roadside ditches.

Stormwater Management

The existing section of Highway 3 in the vicinity of The Windsor-Essex Parkway does not currently provide either quality or quantity treatment for runoff from the highway. Therefore, in the existing condition, all pollutant loadings from Highway 3 are discharged directly to the receiving watercourses. In an effort to improve this existing situation, stormwater management providing quality, quantity and erosion treatment will be provided for both the freeway and service road portions of The Windsor-Essex Parkway prior to being discharged to downstream watercourses. To achieve this, stormwater management wetponds are proposed throughout The Windsor-Essex Parkway that are designed to provide *Enhanced Protection Level* treatment as outlined in the Ministry of the Environment (MOE) document entitled *Stormwater Management Planning and Design Manual*. In addition, as part of the concept design, oil/grit separators are proposed at various locations along the proposed service road to provide additional quality treatment for runoff.

A total of 9 stormwater management wetponds are proposed within the corridor as part of The Windsor-Essex Parkway concept design to provide quality, quantity and erosion treatment of roadway runoff before being discharged to existing watercourses. The wetponds will provide removal of 80% of total suspended solids (TSS), as well as providing erosion attenuation of the 25mm storm for 24 hours. In addition, the stormwater management ponds will provide quantity storage to control peak flows in receiving watercourses during rainfall events up to and including the 100-year storm.

9.3.8 Traffic Operations

A detailed traffic analysis (micro-simulation analysis) of the traffic operations for the freeway portion of The Windsor-Essex Parkway between the new customs plaza and North Talbot Road has been undertaken using a VISSIM model. This VISSIM model also incorporated the service road portion of The Windsor-Essex Parkway as well as all key intersections and ramp terminals for the purpose of obtaining travel times, anticipated speeds, delays and traffic queues. The 95th percentile queue lengths (which are the queue lengths expected to occur only 5% of the time) at signalized intersections were used to determine required storage lengths at intersections to accommodate the anticipated demand. It should be noted that the micro-simulation analysis was performed for both year 2035 AM and year 2035 PM peak hours.

Results of the traffic analysis are summarized in this section. Additional information regarding the results of the traffic analysis completed as part of this study can be found in the *Draft Level 3 Traffic Operations Analysis of Windsor-Essex Parkway* (refer to List of Supporting Documents).

TRAFFIC VOLUMES

The section of the proposed freeway that carries the most traffic is between Labelle Street and Grand Marais Road in the southbound direction, just downstream from the first on-ramp from the proposed service road. This section carries approximately 3,000 vehicles per hour during the PM peak hour (2035), which corresponds to Level of Service (LOS) “C” operations, with 23% commercial vehicles in the traffic flow. Traffic flow will be at or near the free-flow speed of the freeway, although freedom to manoeuvre within the traffic stream will be somewhat restricted. All other mainline segments operate

at LOS "C" or better, and it is expected that traffic on the freeway will operate at free-flow speeds through the 2035 horizon year.

TRAVEL TIME

As previously mentioned, the proposed freeway facility is expected to operate at free-flow conditions between Howard Avenue and the new plaza. The VISSIM analysis (year 2035) demonstrated that travel times to the new crossing from Highway 401 east of the Highway 3 interchange in both AM and PM peak hours would be in the 6 to 7-minute range. Travel times to the Ambassador Bridge (with the new crossing in place) are anticipated to be in the 10-minute range during both AM and PM peak hours. The Base Case (future no-build) microsimulation analysis (year 2035) showed travel times to the Ambassador Bridge in the 18-minute range during the AM peak hour, while inbound traffic (Canada-bound) was found to take over 25 minutes to travel between the Ambassador Bridge and east of the Highway 401/Highway 3 interchange during the PM peak hour. **Exhibits 9.12** and **9.13** summarize a comparison of travel times between The Windsor-Essex Parkway and Base Case scenarios.

EXHIBIT 9.12 – TRAVEL TIME COMPARISON: WESTBOUND/NORTHBOUND FROM EAST OF HIGHWAY 3/HIGHWAY 401 I/C TO THE NEW CROSSING AND THE AMBASSADOR BRIDGE

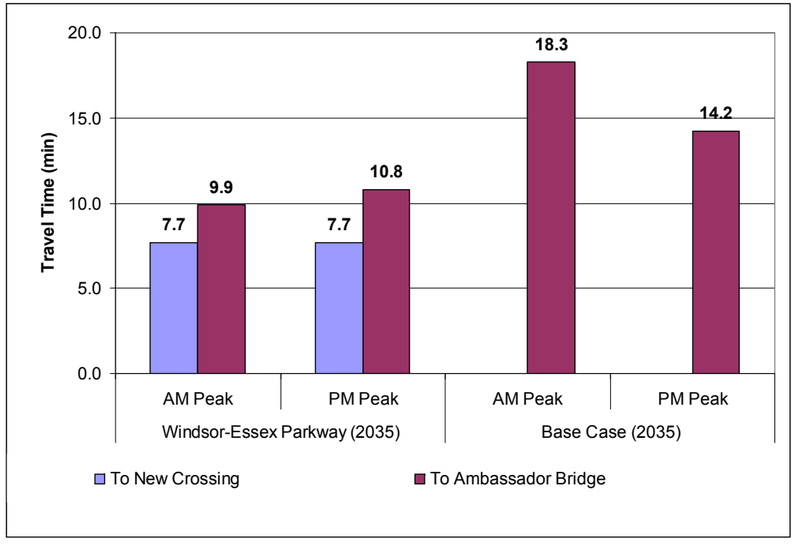
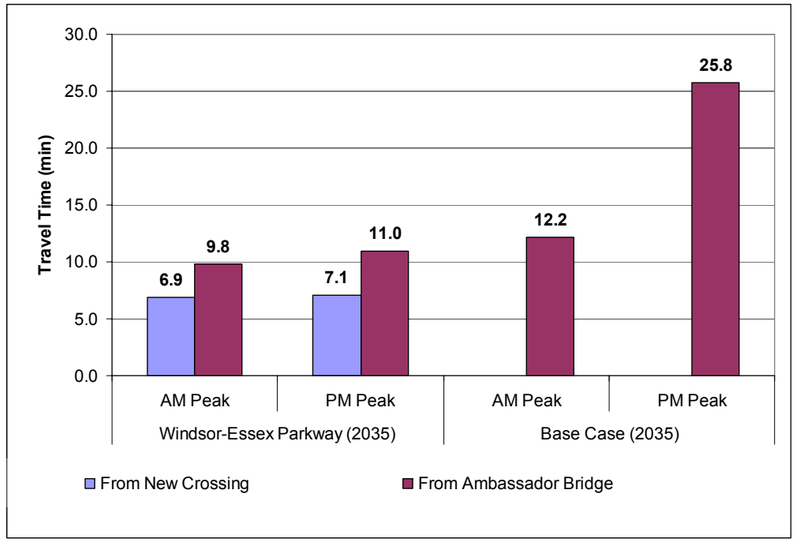


EXHIBIT 9.13 – TRAVEL TIME COMPARISON: EASTBOUND/SOUTHBOUND FROM THE NEW CROSSING AND THE AMBASSADOR BRIDGE TO EAST OF HIGHWAY 3/HIGHWAY 401 I/C



INTERCHANGES AND ACCESS POINTS

As discussed in Sections **9.3.1** and **9.3.2**, numerous interchanges and access points between the proposed freeway, proposed service road and crossing roads are included in the concept design of The Windsor-Essex Parkway to facilitate mobility and local access in the corridor and maximize the opportunity for cross-border motorists to choose a border crossing. The following ramps to and from the proposed freeway are proposed as part of The Windsor-Essex Parkway:

Northbound/westbound:

1. To Howard Avenue/Highway 3/Laurier Parkway extension/proposed service road (off-ramp);
2. From Highway 3/Laurier Parkway extension, east of Howard Avenue (on-ramp);
3. From proposed service road, west of Howard Avenue (on-ramp);
4. To proposed service road, west of St Clair College (off-ramp);
5. From proposed service road, north of Cabana Road (on-ramp);
6. To proposed service road, south of Labelle Street (off-ramp);
7. From westbound collector lanes (E.C. Row Expressway), west of Malden Road;
8. To Ojibway Parkway (off-ramp); and
9. From Ojibway Parkway (on-ramp).

Southbound/eastbound:

1. To Ojibway Parkway (off-ramp);
2. From Ojibway Parkway (on-ramp);

3. To eastbound collector lanes (E.C. Row Expressway), west of Malden Road
4. From proposed service road, south of Labelle Street (on-ramp);
5. To Cabana Road West/ Todd Lane (off-ramp);
6. From Cabana Road West / Todd Lane (on-ramp);
7. To proposed service road, east of Huron Church Line (off-ramp);
8. From proposed service road, west of St Clair College (on-ramp);
9. From proposed service road, west of Howard Avenue (on-ramp);
10. To Highway 3/Laurier Parkway extension, east of Howard Avenue (off-ramp); and
11. From Highway 3/Laurier Parkway extension/proposed service road (on-ramp).

INTERSECTIONS/RAMP TERMINALS

All key intersection operations including ramp terminals were analyzed using the VISSIM software package. All intersections are expected to operate at LOS "C" or better through the year 2035, which corresponds to an average delay per vehicle of between 20 to 35 seconds.

Additionally, the 95th percentile traffic queues at the study area intersections were calculated. Results of this queue-length analysis indicate that queues are not anticipated to extend to the upstream intersections.

Windsor-Essex Parkway/Highway 3/Howard Avenue Diversion Roundabout

Analysis of the proposed roundabout at The Windsor-Essex Parkway/Highway 3/Howard Avenue Diversion was performed using both VISSIM (micro-simulation) and ARCADY (Assessment of Roundabout Capacity and Delay) – a static analysis software for roundabout assessments. The following provides a brief summary of the analysis results.

The VISSIM analysis indicate that the roundabout is anticipated to operate well with an overall Level of Service "B" during the year 2035 PM peak hour, which corresponds to an average delay per vehicle of between 10 to 20 seconds.

Results of the ARCADY analysis indicate similar anticipated operation performance measures such as queue lengths and delays during the year 2035 PM peak hour in comparison with the results from VISSIM.

As such, both the VISSIM and ARCADY analyses confirmed that the roundabout will be operating below capacity in the 2035 horizon year.

EMERGENCY SERVICES ACCESS

The study team met with municipal staff and the municipal emergency services representatives to identify access requirements for local emergency services. These discussions identified that:

- A means of accessing the proposed freeway eastbound and westbound at Todd Lane/Cabana Road West is very important. Windsor Fire has a station just east of Huron Church Road on Cabana Road West and LaSalle Municipal Emergency Services has a facility at Malden Road/Normandy Road. Services based at these facilities would require access to the new freeway primarily via Todd Lane/Cabana Road West to best respond to incidents on the freeway.
- A means of accessing the proposed freeway westbound at Howard Avenue is also desirable. Such a connection would facilitate access to incidents in the westbound lanes between Howard Avenue and Cousineau Road/Sandwich West Parkway.

The Windsor-Essex Parkway has been developed to accommodate the requested access by inclusion of an eastbound on-ramp at Todd Lane/Cabana Road West, a westbound on-ramp from the proposed service road west of Todd Lane/Cabana Road West and a westbound on-ramp from the proposed service road west of Howard Avenue.

9.3.9 Illumination

Full illumination will be provided along the median of the freeway portion of The Windsor-Essex Parkway, between North Talbot Road and the customs plaza. Conventional illumination systems will be provided on the outside of the service roads and side roads, and throughout some sections of the trail system. Interchanges and intersections within The Windsor-Essex Parkway will also be adequately illuminated. Illumination will be designed to provide sufficient lighting for the roadways while limiting light trespass beyond the roadways.

Illumination within the tunnel sections of the freeway will be designed to ensure driver's eyes can adjust to the changing lighting conditions between the tunnel and open sections of the freeway. Adaptive lighting will be provided that varies the strength of illumination depending on the time of day and lighting conditions outside the tunnel, and illumination density may be gradually reduced from the portal to the interior of the tunnels.

Additional details of the illumination system will be determined during subsequent stages of design of The Windsor-Essex Parkway. Further stages of design will also include the consideration of renewable energy sources to power portions of the illumination system, including the use of solar panels to power lighting along the trail system.

9.3.10 Advanced Traffic Management System (ATMS)

The Windsor-Essex Parkway will include an Advanced Traffic Management System (ATMS). In keeping with the concept of creating an Intelligent Border Crossing, the ATMS system will help to reduce travel delay and travel time uncertainty, enhance safety, reduce the costs associated with cross-border travel, and reduce the negative impacts of the border crossing to surrounding communities. The ATMS system will assist in the rapid detection and response to incidents and dissemination of incident, roadway condition, and travel time information to motorists and other stakeholders including, but not limited to, border services agencies, local communities, law enforcement and public safety agencies, commercial fleets, and broadcast media.

OVERVIEW OF ATMS ELEMENTS

The ATMS elements of the TEPA include the following:

- Variable Message Signs (VMS)
- Closed Circuit Television (CCTV)
- Vehicle Detection
- Communications System

- Queue Warning System (QWS)

Variable Message Signs (VMS)

VMS will be placed on the mainline and adjacent arterials at decision points, and at key locations for travel times. All VMS will be mounted over the roadway except for arterial signs which will be on the side of the road. VMS will be used to inform motorists of potential diversion routes, slow traffic ahead, incidents ahead, lane designations for customs and maintenance activities, etc. VMS can also be used to inform motorists of travel times to key destinations such as customs and toll booths.

Closed Circuit Television (CCTV)

CCTV will be used to monitor the roadway operations. Cameras will be positioned to provide full coverage of the roadway and all tunnel sections, and each VMS will also be visible from a camera. Cameras will provide full pan/tilt/zoom capability, and, as a secondary consideration, will provide viewing of ramps and cross streets. One camera will be placed in each direction of travel at all tunnel sections in order to provide full viewing in both directions. Cameras at tunnel sections will be positioned such that the cameras will monitor traffic in the tunnel from behind the vehicles in order to eliminate the blooming effect created by vehicle headlights and thus ensure a clear view of traffic in the tunnel.

Vehicle Detection

Vehicle detectors will be placed at regular intervals along the freeway and the ramps using minimally invasive detectors in each traveled lane of both directions of travel. These detectors will have closer spacing in tunnel sections to enhance detection capability. The vehicle detectors will be monitored to determine congestion levels and the occurrence of incidents. The vehicle detection system will be capable of providing speed, volume, occupancy, and vehicle length classifications by using dual detectors in each lane at every detector location on the mainline. Presence detectors will be provided on on-ramps at future ramp metering locations; ramp metering will eventually allow for the management of congestion that occurs as a result of incidents, border crossing delays, and demand exceeding capacity of the roadway.

Communications System

Communications will consist of a single mode fiber optics system within the project area. The communications system shall connect all ATMS elements within the project area and connect these elements to a hub that will be located near the Highway 401/Highway 3 interchange to the Western Region Traffic Operations Centre (London TOC). Connections to other systems and users are expected to be made from the London TOC. The communications network will provide sufficient bandwidth to support full motion video at 30 frames per second from each camera simultaneously as well as data from all field devices and provide a two-way path for command and monitoring of all field devices. The connection from the hub to the London TOC will be via leased media. A repeater system will also be required in the tunnel sections for use by emergency personnel.

Queue Warning System (QWS)

The purpose of the QWS is to alert drivers of downstream congestion, in the rare event of traffic queues caused by delays at the border crossing. The goal of the QWS is to reduce rear end collisions that typically occur at the back of the queue. The QWS will be fully automated and does not require operator input. As part of the QWS, certain vehicle detectors approaching the border crossing in the westbound direction will be designated as queue detectors to detect in real time when traffic queues have developed. An overhead VMS will positioned at each queue detection station. The QWS will display a queue message at the overhead VMS immediately upstream of where the queue is detected so that vehicles have time to reduce their speed and be prepared to stop when they reach the back of the queue. The QWS will also inform London TOC operators of when traffic is starting to queue.

9.3.11 Pavement

Existing roadways of all classification within the Study Area are currently surfaced with either rigid (concrete) or flexible (asphaltic concrete) pavements. Current improvements to Highway 401 east of the Study Area are mostly being completed using concrete pavements. Preliminary pavement designs have been completed as part of this study for the purposes of preliminary cost estimating and identifying feasible rigid and flexible pavement designs to be carried forward to subsequent design phases. Additional details of the preliminary pavement designs are included in the *Draft Pavement Engineering for Planning Report – Area of Continued Analysis* (refer to List of Supporting Documents).

Pavement surface has significant influence on the generation of noise from the roadway and therefore must be considered carefully during subsequent design phases. Design of the pavement surfaces to be used for all elements of The Windsor-Essex Parkway will be carried out in such a way that the generation of noise from roadway elements does not exceed the noise levels assumed within the acoustic modelling carried out within this Environmental Assessment for the purposes of identifying impacts to surrounding communities and mitigation strategies.

9.3.12 Utilities

There are numerous utilities located along The Windsor-Essex Parkway corridor that will require protection, relocation or abandonment as a result of the proposed plan. Utilities within the corridor include, but are not limited to the following:

- City of Windsor – water mains
- City of Windsor – sanitary sewers
- Town of LaSalle – water mains
- Town of LaSalle – sanitary sewers
- Town of Tecumseh – water mains
- Hydro One – aerial transmission lines
- Hydro One – aerial distribution lines
- Enwin – aerial and buried distribution lines
- Essex Powerlines – aerial and buried distribution lines
- Union Gas – various pressures and distribution lines
- Union Gas – Union Gas Panhandle Pipeline
- BP Canada – Liquid Petroleum Gas (LPG) lines
- Bell Canada – telephone and communications, aerial lines and buried duct

- Cogeco – cable TV and communications

It is anticipated that utility relocation will generally be completed prior to the primary stages of construction, as described in **Section 9.3.4**, but may be included within a design-build contract. Any existing utilities along the proposed Windsor-Essex Parkway corridor that are no longer required as a result of property acquisitions will be removed. Utilities that must be maintained parallel to The Windsor-Essex Parkway will be relocated to utility corridors running on either side of the service road, where possible and as required. Where design requirements or grading limits are such that the utility corridors cannot be located adjacent to the service roads, utility corridors will be located either along the proposed trail system or along the new limits of the right-of-way. In these situations, the trail system will be designed to allow access to the utility corridors for maintenance purposes. Where the utility corridors are located at the limits of the proposed right-of-way, a maintenance access road will be provided above the utility corridor. This access road could be constructed with either granular or geo-textile material, in order that vegetation be allowed to grow while still providing a stable driving surface for vehicles accessing the corridor.

It is anticipated that utilities that are required to cross The Windsor-Essex Parkway will be located within the tunnel sections, where available. These utilities will be located above the roof of the tunnel, within the topsoil that will be placed for landscaping purposes. Special insulation or heating will be required for water mains crossing the tunnels to protect them from freezing. In areas where utilities that are required to cross the freeway and service road cannot make use of the tunnels, separate utility bridges may be required.

Where the freeway will be constructed at or above existing ground between Ojibway Parkway and west of Huron Church Road, existing aerial plant will be relocated below ground. It is not anticipated that any existing buried plant will require relocation along either Malden Road or Matchette Road. Relocations for buried plant will be required along Ojibway Parkway and Chappus Street. At the east end of The Windsor-Essex Parkway east of Howard Avenue, utilities running along existing Highway 3 and Outer Drive will be relocated to follow the realigned roadways.

The following is a list of some of the major utilities to be impacted by The Windsor-Essex Parkway, along with the potential strategy for relocation. Complete details of the proposed utility relocation strategy will be confirmed during future design stages of the project.

- 500mm water main connecting the City of Windsor to the Towns of LaSalle and Tecumseh. This water main may be relocated to a utility bridge crossing the freeway near Howard Avenue. The metering station connections to the Towns of LaSalle and Tecumseh can be relocated to the south side of the freeway.
- 300mm sanitary sewer force main connecting the Town of LaSalle to the City of Windsor. This force main may be relocated to cross under the freeway in the vicinity of St. Clair College. This work may also require crossing under the relocated Cahill Drain.
- Existing sanitary sewers at Lambton Road and Spring Garden Road will require redirection to eliminate existing crossings across the future below-grade freeway. These sanitary sewers may be redirected to connect to an existing sanitary sewer in the Second Avenue road allowance.
- The Union Gas Panhandle Pipeline runs underneath Lambton Road and Grand Marais Road and is a major pipeline connection between the United States and Canada. This pipeline will likely require relocation due to construction of the Grand Marais Tunnel. The relocated pipeline will likely be relocated near the Turkey Creek/Grand Marais Drain to minimize the depth required to cross below the freeway.
- Hydro One transmission lines in the vicinity of Ojibway Parkway and Matchette Road at the proposed freeway. The elevation of these lines will be increased at this location to meet the clearance requirements between the lines and the above-grade freeway.
- Three BP Canada LPG lines between Ojibway Parkway and Matchette Road will cross the proposed freeway. The impacts of the freeway crossing these pipelines in fill will require further review.