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TO:	**CHAIR AND MEMBERS CIVIC WORKS COMMITTEE MEETING ON MAY 6, 2013**
FROM:	**EDWARD SOLDO, P. ENG. DIRECTOR, ROADS AND TRANSPORTATION**
SUBJECT:	**VETERANS MEMORIAL PARKWAY SOUTH EXTENSION AND HIGHWAY 401 INTERCHANGE IMPROVEMENTS TRANSPORTATION ENVIRONMENTAL STUDY REPORT**

RECOMMENDATION

That, on the recommendation of the Director, Roads and Transportation, the following actions **BE TAKEN** with respect to the Veterans Memorial Parkway South Extension and Hwy 401 Interchange Improvements Environmental Assessment (TS1325):

(a) The Veterans Memorial Parkway South Extension and Highway 401 Interchange Improvements Transportation Environmental Study Report **BE ACCEPTED**;

(b) A Notice of Completion **BE FILED** with the Municipal Clerk; and,

(c) The Transportation Environmental Study Report **BE PLACED** on public record for a 30-day review period.

PREVIOUS REPORTS PERTINENT TO THIS MATTER

- Built and Natural Environment Committee – March 28, 2011 – Veterans Memorial Parkway Extension to Wilton Grove Road
- Built and Natural Environment Committee – August 15, 2011 –Class Environmental Assessment for Veterans Memorial Parkway South Extension - Appointment of Consulting Engineer
- Civic Works Committee – April 23, 2012 - Veterans Memorial Parkway South Extension Environmental Assessment - Consultant Assignment Scope Change
- Civic Works Committee – February 4, 2013 – Highway 401 Interchange Projects - Agreement with Ministry of Transportation

BACKGROUND

Purpose:

This report provides Committee and Council with an overview of and seeks approval to finalize the Municipal Schedule ‘C’ and Provincial Group ‘B’ Class Environmental Assessment (EA) for the Veterans Memorial Parkway (VMP) South Extension and Highway 401 Interchange Improvements located within the study area illustrated on Figure 1.

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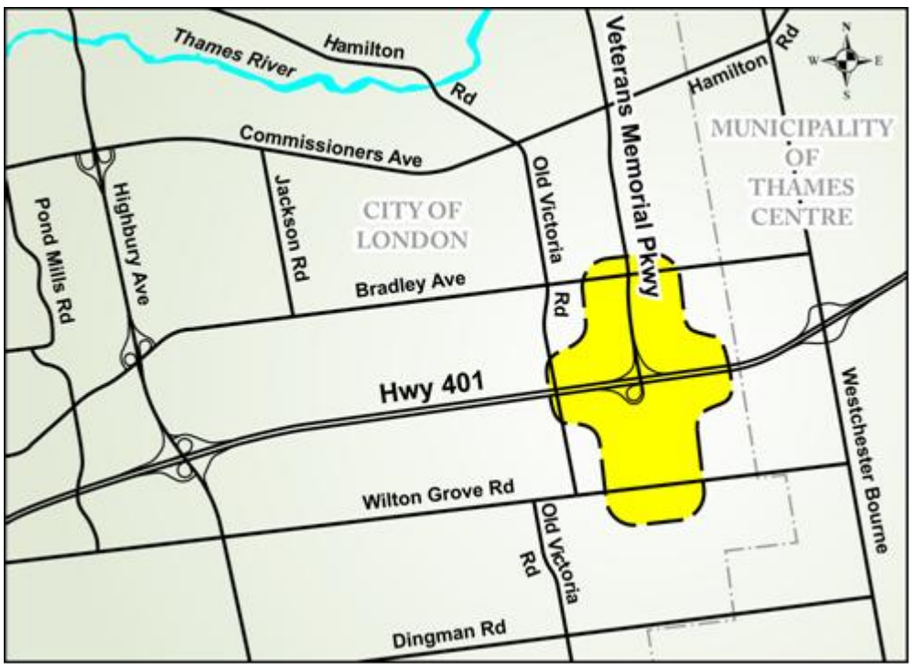
Figure 1 - Study Area



The VMP is a key corridor providing one of five accesses from the provincial highway network to the City of London and providing the main access between Highway 401 and London International Airport. VMP, previously known as Highway 100 and as Airport Road, extends 9.2 km from Highway 401, north to Huron Street. VMP is currently an expressway with at-grade intersections. Long term plans include north and south extensions of VMP and the introduction of grade separated interchanges along its entire length.

The adjacent land use along the east and west sides of VMP, north of Highway 401 is designated Light Industrial. The lands south of Highway 401 are located outside of the current Urban Growth Boundary and are largely designated Agricultural.

A key component of the London Economic Development Strategy is improved freeway access points at strategic locations, in particular, the extension of VMP south to Wilton Grove Road and the associated expansion of the VMP Interchange at Highway 401. This will assist with establishing the City as the trade and transportation hub of Southwestern Ontario. Improved access to this key NAFTA trade corridor will help stimulate the development along Highways 401 and 402 and will further enhance London's ability to recruit leading edge manufacturers.

VMP Extension and Interchange improvements are a key part of the 2030 Smart Moves Transportation Master Plan Recommended Road Network Improvements and are recommended by the Industrial Land Development Strategy Update recommendations.

This project is a cooperative undertaking with the Ministry of Transportation (MTO) with the intention that MTO will implement the construction of the project. The EA was requested by a City of London Council resolution dated April 5, 2011. The project is identified on the MTO Southern Highways Program. A project delivery agreement between the City and the MTO was recently executed that assigns specific responsibilities for the undertaking.

DISCUSSION

Context:

McCormick Rankin Corporation (MRC) was retained by the City of London to conduct a Class Environmental Assessment (EA) and Preliminary Design Study for the extension of VMP from Highway 401, 1 km south to Wilton Grove Road, and the associated reconfiguration and expansion of the Highway 401 Interchange.

The EA assessed and evaluated design alternatives for the preferred planning solution. The primary analysis was related to the analysis and evaluation of the interchange concept design alternatives and the selection of the preferred interchange design.

Once the preferred interchange concept was selected, the alternatives for the VMP Bridge over Highway 401 were assessed and evaluated. This examined bridge expansion versus replacement, and alignment alternatives.

The EA considered many factors during evaluation of the design alternatives, including:

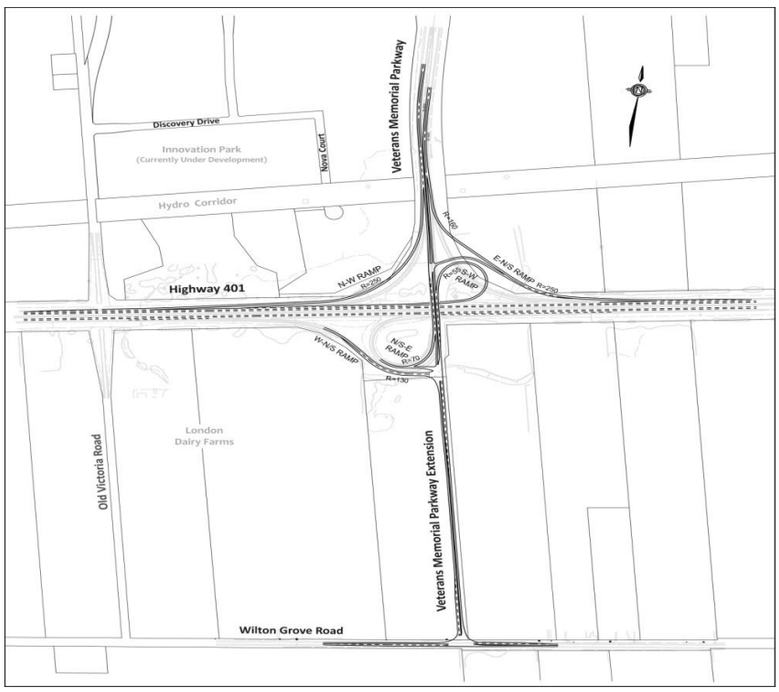
- socio-economic environment;
- cultural environment;
- natural environment;
- technical considerations; and,
- estimated costs.

Recommended Alternative:

The recommended design for VMP Extension and Highway 401 Interchange Improvements incorporates the following:

- extension of VMP as a two-lane expressway with a rural cross section within a 60 m right-of-way (consistent with Official Plan designation);
- interchange improvements to accommodate the VMP Extension as shown on Figure 2;
- a new intersection at Wilton Grove Road and extended VMP with left-turn lanes;
- replacement of the existing VMP Bridge on its current alignment; and,
- two signalized intersections within the interchange.

Figure 2 - Interchange Improvements



Traffic signals at the VMP / Wilton Grove Road intersection are not warranted at this stage but anticipated to meet the warrant based on the forecasted 2032 traffic volumes. Therefore traffic signals at this location are not recommended at this time.

Consultation:

Consultation with the public, agencies, stakeholder groups and First Nations was carried out during this EA. Notices were provided in both English and French to satisfy provincial requirements. All project information was also posted on the City's Transportation Planning website.

The Notice of Study Commencement was distributed and advertised in October and November 2011.

The first of two Public Information Centers (PIC) was held on May 23, 2012 to introduce the project and receive input and concerns. Display boards provided background information on the project. A second PIC was held on December 12, 2012. This meeting provided the alternatives, evaluations and preferred design layout for input and comment.

Presentations were also provided to interested groups including Nature London, UTRCA and the Environmental and Ecological Advisory Planning Committee. This project was also one of several projects reviewed during a meeting with the Chippewa of the Thames First Nation.

EA Issues:

The draft Transportation Environmental Study Report Executive Summary is contained in Appendix A. The report identifies and mitigates impacts associated with the project. The following issues are noted:

Construction Traffic Management

The proposed construction staging will minimize the construction duration of the project. It will allow the construction of the VMP extension and the improvements to the Highway 401 Interchange to be completed within a 12-month duration. However the proposed replacement of the VMP Bridge will require closure of the existing bridge and the eastbound Highway 401 ramps for approximately one construction season. Potential detour options were considered and presented to the public, agencies and other stakeholders at PIC #2. Highway 401 access may be provided by the adjacent Highway 401 interchanges at Westchester Bourne (1.8 km east) and Highbury Avenue (4.5 km west). An eastbound / westbound detour may be provided by Commissioners Road / Hamilton Road.

In addition to the closure of the VMP Bridge, short-term single lane closures are anticipated on Highway 401 (for bridge demolition) and on the westbound to northbound off-ramp and southbound to westbound on-ramp to facilitate lane shifts.

Project communications were expanded to target potentially impacted users. Project notices were advertised in the Dorchester Signpost publication. The proposed staging was also communicated to potentially impacted industrial properties via the London Economic Development Corporation. The proposed detour routes were reviewed with and found acceptable to the County of Middlesex.

Detour alternatives and the construction staging plan will be subjected to further study and developed fully during detail design and will be available for public review at that time. The City and MTO will continue to consult further with emergency services in the detail design phase to determine appropriate mitigation measures for the construction phase. No emergency service concerns were identified.

The construction of this project will be scheduled so it is not undertaken at the same time as the proposed Highway 401/Highbury Interchange improvements. This will avoid detouring conflicts and help mitigate road closure impacts.

Property Acquisition

The future VMP Extension will be classified as an Expressway and will have a future right-of-way (ROW) of 60 m consistent with the Official Plan. The recommended plan will impact 5 properties. No residences or business will be directly impacted.

MTO will acquire the land required for the VMP interchange improvements and City forces will acquire the land for the extension of the municipal road as outlined in the project delivery agreement. The unique arrangement for the VMP project is based on which agency is the long-term property owner and may leverage synergies with City industrial land acquisition.

Stormwater Management and Drainage

The overall objective of the stormwater management measures is to ensure that the interchange and southerly extension of the VMP are designed to minimize or eliminate impacts on water quality, erosion and flood risk in the receiving watercourses, and the hydrologic characteristics of adjacent wetlands and woodlots.

The stormwater management and drainage requirements associated with the recommended plan for the extension of the VMP and the modifications to the Highway 401 Interchange includes:

- modifications and additions to the existing culvert network;
- a dry stormwater management facility in the northeast quadrant of the VMP/Highway 401 interchange;
- linear treatment swales along the east and west sides of the southerly extension of the VMP; and,
- realignment of 223 m of the Crinklaw Drain, just south of its existing location along the edge of the interchange to avoid an excessively long culvert crossing.

Natural Environment

Within the study area, the natural vegetation features of interest are the deciduous forest stands on the east side of the interchange and the Crinklaw Drain.

The small (3.3 ha) woodland situated in the southeast quadrant is the primary natural environment constraint in the study area. It is recognized as a Significant Woodland and designated by the City of London as “Environmental Review” and as an ”Unevaluated Vegetation Patch”. The recommended interchange layout avoids an interchange ramp in the southeast quadrant thereby minimizing the impact on this woodland. Additionally, a retaining wall at the base of the VMP road embankment in the SE quadrant is recommended as a design mitigation in order to further restrict any encroachment into the woodland.

The woodland situated in the northeast quadrant is not protected with any designation in the Official Plan and is of lower significance due to its isolated nature. Edge impacts are necessary with the interchange and edge treatment mitigation is proposed to promote the early re-establishment of the forest edge.

The realignment of the Crinklaw Drain identified above provides an opportunity for channel and habitat enhancement through natural channel design. The existing drain has been historically channelized and has not recovered complex geomorphic forms or processes. It will be replaced with a new riparian corridor that is naturalized and stabilized with native species, providing cover for wildlife movement along the watercourse.

The new Crinklaw Drain culvert crossing of VMP will be oversized to allow for wildlife passage through the culvert. This passage could accommodate small to mid-sized mammals, amphibians and reptiles.

Agriculture Operations

The proposed VMP alignment was strategically selected to follow the existing property line between two farms to minimize the impacts on the adjacent agricultural operations. However, the VMP extension will result in some agricultural land being taken out of production. Direct impacts to agricultural lands and related impacts to production will be mitigated and compensated through the property acquisition process.

Aesthetics

Staff is working with the MTO to implement a consistent visual approach that is unique to London at all new Highway 401 interchange locations. The approach is intended to ensure that the appearance of built structures (bridges) and landscaping are all perceived as a set, while

still allowing for each location to be developed with some specific feature or variation that can be applied at each interchange, including this one. This project also includes the reinstatement of the existing City of London gateway feature in the NE quadrant of this interchange.

Staff will provide more information on this initiative in a report to committee as concepts are developed which demonstrate the consistent visual approach.

Cultural Environment

Stage 1 and Stage 2 archaeological assessments were conducted and results are summarized in the Archaeological Assessment Report, which forms a part of the complete Environmental Assessment document. On basis of the archaeological assessment, it is recommended that the study corridor is free from archaeological concern, and no further assessment is required.

Costs:

The preliminary cost estimate for the project is between $25 and 30 Million. This includes engineering, property acquisition, utility relocation and construction. Funding of this project will be as per the project delivery agreement with the Ministry of Transportation.

CONCLUSION

Summary and Next Steps:

1. A Provincial and Municipal Class Environmental Assessment for the VMP South Extension and Highway 401 Interchange Improvements has been undertaken with MTO.

2. The Transportation Environmental Study Report is ready for final public review. It was prepared with public and agency participation, and includes a preliminary design which provides mitigation measures for impacts associated with the proposed improvements.

3. Completion of this phase of the Provincial and Municipal Class Environmental Assessment process requires that the Transportation Environmental Study Report be placed on the public record for a 30-day review period.

    - Stakeholders are encouraged to provide input and comments regarding this study during this time period.
    - Should stakeholders feel that issues have not been adequately addressed, they provide written notification within the 30-day review period to the Minister of the Environment requesting further consideration.
    - Subject to no requests for a Part II Order being received, the project will be in a position to move forward to the design and construction stages in accordance with the recommendations of the study.

4. MTO and the City will undertake the property acquisition to prepare for the construction of the project once the EA is completed.

Acknowledgements:

This report was prepared with assistance from Max Kireev, Technologist II of the Transportation Planning & Design Division.

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REVIEWED & CONCURRED BY:
JOHN BRAAM, P. ENG. **MANAGING DIRECTOR,** **ENVIRONMENTAL & ENGINEERING SERVICES & CITY ENGINEER**

Attachments: Appendix A – Draft Transportation Environmental Study Report, Executive Summary

c: Transportation Advisory Committee c/o Heather Lysynski
McCormick Rankin Corporation - Michael Chiu
Ministry of Transportation – Brian Goudeseune
London Economic Development Corporation - Peter White
Mark Henderson, Director Business Development

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Appendix A

DRAFT TRANSPORTATION ENVIRONMENTAL STUDY REPORT
EXECUTIVE SUMMARY

DRAFT TRANSPORTATION ENVIRONMENTAL STUDY REPORT
EXECUTIVE SUMMARY

Veterans Memorial Parkway (VMP) is a key corridor providing one of five accesses from the provincial highway network to the City of London and providing the main access between Highway 401 and London International Airport.

In April of 2011, Municipal Council requested the commencement of an environmental assessment study for the extension of VMP south to Wilton Grove Road in order to prepare for future development opportunities in that area. The environmental assessment, meeting both municipal and provincial requirements, was commenced in October 2011.

Subject to completion of the study, the VMP extension will be a rural 2-lane road and will necessitate reconstruction of the existing interchange. Property acquisition will be required for both the interchange and road extension. The new Highway 401 bridge structure will accommodate the expansion of Highway 401 to a future 8-lane cross-section.

Construction of the VMP interchange improvements will require the closure of the bridge and eastbound ramps for several months during construction; closures will be communicated and detour routes will be signed.

This study has been undertaken to meet the requirements of the MTO Group 'B' and Municipal Schedule 'C' Class EA processes.

Needs and Opportunities

The Veterans Memorial Parkway Extension and Highway 401 Interchange Improvements Class EA is predicated on four key City of London initiatives:

- Economic Development Strategy (2009);
- Industrial Lands Development Strategy (2011);
- 2030 Transportation Master Plan (2012); and
- Official Plan Review (in progress).

The key economic opportunities and transportation needs can be summarized as follows:

- One of the key components of the City of London's long-term economic development strategy is the concept of "Economic Gateways".
- A key component of these "Economic Gateways" is the employment lands in the Highway 401 corridor.
- The Industrial Lands Development Strategy (ILDS) Update recommends that the Urban Growth Area along the Highway 401 corridor be expanded. This will be considered in the Official Plan review and implemented through Official Plan policy.
- The ILDS Update recommends an extension of VMP to Wilton Grove Road.
- Transportation analysis confirms that future traffic volumes generated by economic growth along the Highway 401 corridor will lead to traffic congestion at the Highbury Avenue/Wilton Grove Road intersection.

- The Transportation Master Plan indicates that VMP interchange improvements and an extension the Parkway south of Highway 401 to Wilton Grove Road is a key part of the 2030 Recommended Road Network Improvements.

The lands north and south of Highway 401 from east of Veterans Memorial Parkway to Highbury Avenue provide London with a continued economic growth opportunity and take advantage of its strategic location and opportunity on the Highway 401 corridor.

The extension of Veterans Memorial Parkway south to Wilton Grove Road and the associated improvements to the Highway 401 Interchange implements the recommendations of the Transportation Master Plan by improving traffic operations on adjacent roadways and supports the opportunity for future economic growth in southeast London, as identified in the Industrial Lands Development Strategy Update and supported by the Official Plan review.

Alternatives and Evaluation

Under the provisions of the Provincial and Municipal Class Environmental Assessment processes, all reasonable alternatives to the undertaking require consideration to ensure that there is adequate justification to proceed with the improvements and that the need for the project is clearly demonstrated.

The alternative planning solutions that were considered for this study included: do nothing; implement transportation demand management measures/improve transit; limit development; implement improvements to existing infrastructure; and extend Veterans Memorial Parkway and upgrade the Highway 401 Interchange.

Extending VMP and upgrading the Highway 401 Interchange is selected as the preferred alternative planning solution because it is the only alternative that reasonably addresses the identified needs and opportunities by:

- Creating a transportation network that fully supports the future economic growth opportunities in southeast London, as identified in the Industrial Lands Development Strategy Update and supported by the Official Plan review;

- Implementing the recommendations of the Smart Moves by providing additional capacity and improving traffic operations; and ultimately,

- Supporting the realization of City Council's economic growth objectives.

The assessment of design alternatives considered two aspects:

- Highway 401 Interchange – the analysis and evaluation of the interchange concept design alternatives and the selection of the preferred interchange design.

- Veterans Memorial Parkway Bridge – the analysis and evaluation of the bridge alternatives including the bridge expansion alternatives (expand or replace) and the replacement alternatives (how to replace).

Given the high number of constraints around the interchange, a long list of interchange concept design alternatives were developed to explore how various constraints may be avoided or impacts minimized through design. Each of the long list alternatives is described briefly below.

Parclo A4: This concept is based on the “Parclo A” type interchange configuration, which offers high capacity, operational and safety characteristics as it has mostly free-flow moves. With two direct on-ramps for each direction, only the two freeway exit ramps are stop controlled. However, with ramps in the SE and NE quadrants, this alternative has the highest impact to natural environmental features. Also, with 6 ramps in total, this interchange type has a large footprint relative to some of the other alternatives.

Parclo A4-Modified: This concept is similar to the Parclo A4 but has a “modified” northbound to eastbound ramp that is configured to minimize impacts to the significant woodland in the SE quadrant by locating the ramp in the narrowest portion of the woodland (where an existing farm equipment access is located). As a result of the modified ramp, this alternative impacts a greater number of properties.

Parclo A3: This concept was developed to avoid impacts to the significant woodland by avoiding a ramp in the SE quadrant and incorporating a left turn for northbound to eastbound traffic.

Parclo A3-Modified: This concept is similar to the Parlco A3 but has a “modified” westbound to northbound/southbound ramp that is configured to avoid impacts to the undesignated woodland in the NE quadrant.

Parclo AB: This concept was developed to avoid impacts to the significant woodland by avoiding a ramp in the SE quadrant and to minimize impacts to the undesignated woodland by minimizing the ramp realignment in the NE quadrant. However, avoiding impacts to natural features results in a substantial impact to Innovation Park in the NW quadrant.

Parclo A-Diamond: This concept is based on the “Diamond” type configuration north of Highway 401 and Parlco A configuration south of Highway 401. This concept was developed because it largely avoids impacts to the natural features, similar to Parclo AB, but does not have the substantial impact to Innovation Park like the Parclo AB alternative. With no loop ramps north of Highway 401, the configuration of the direct on/off-ramps requires less space than most other interchange types. However, it typically has limitations in handling higher traffic volumes, as left turn moves to the on-ramps and from the off-ramps are required at the ramp terminal intersections.

The long-list of interchange concept design alternatives was screened and two of the concepts were set aside from further consideration due to poor safety and operations, property, and natural environmental impacts:

Parclo A3-Modified: Although this concept minimizes the natural environmental effects, the configuration is highly undesirable with potential reduced operational performance and weaving issues on the northbound Veterans Memorial Parkway due to short distance between the northbound ramp and the future off-ramp at the proposed Bradley Avenue Interchange. Therefore, this concept was not considered a reasonable alternative and was not carried forward for further consideration.

Parclo AB: Although, this concept minimizes the natural environmental effects, the configuration is undesirable from an engineering/technical perspective with potential safety concerns associated with the loop ramps handling high-speed vehicles exiting from Highway 401 and multiple left turns resulting in lower level of service at the ramp terminals and potential for wrong way moves. In addition, this alternative results in significant impacts to an approved, high investment business park development in the NW quadrant. Therefore, this concept was not considered a reasonable alternative and was not carried forward for further consideration.

In consultation with the City of London and MTO, the four remaining concept design alternatives were assessed and evaluated in more detail.

- Alternative 1: Parlco A4
- Alternative 2: Parclo A4-Modified
- Alternative 3: Parlco A3
- Alternative 4: Diamond-Parclo A

The selection process for the preliminary preferred alternatives included two steps:

Step 1 – Assessment of Alternatives: The potential benefits and impacts of each alternative were assessed against a comprehensive set of criteria for socio-economic, cultural, natural and technical factor groups;

Step 2 – Evaluation of Alternatives: A comparative examination of the advantages and disadvantages of the alternatives was undertaken to identify a preliminary preferred alternative.

The impact assessment was based on the existing environmental conditions compiled through field visits and secondary source information.

The evaluation of alternatives was carried out using the Reasoned Argument method, comparing differences in impacts and providing a clear rationale for the selection of the preferred alternative.

Based on the evaluation, the preferred alternative interchange concept design was identified as Alternative 3, the Parclo A3 for the following reasons:

- In Socio-Economic Environment, Alternative 3 is preferred because it avoids impacts to the high investment business currently in development in the NW quadrant, within Innovation Park.
- In Cultural Environment, Alternatives 3 and 4 are slightly preferred since Alternatives 1 and 2 are deemed to have slightly higher risk of archaeological finds since they result in greater footprint impacts (i.e., a larger area impacted).
- In Natural Environment, Alternative 4 is preferred over Alternative 3 because it has less impact to the undesignated NE forest patch. However, both Alternatives 3 and 4 avoid impacts to the designated Natural Heritage System (NHS) in the SE, considered a higher constraint. Alternatives 1 and 2 are least preferred because they impact the designated NHS.
- In Technical Considerations, Alternative 1 is preferred due to its performance in capacity, safety and operations. Alternative 4 is least preferred due to safety reasons; the merging of higher speed southbound to westbound traffic with slower moving northbound to westbound traffic, from the left, is considered highly undesirable. Alternatives 2 and 3 are equally slightly less preferred than Alternative 1 due to shorter weaving distance on Highway 401 (Alt 2) and a left turn at the north to east ramp terminal (Alt 3). In both cases, these aspects are considered acceptable given the low traffic volumes anticipated in the northbound direction.

- In comparing Alternatives 3 and 4, the benefits of avoiding the undesignated forest patch in the NE quadrant, associated with Alternative 4, are far outweighed by safety considerations on the westbound on-ramp.

Therefore, Alternative 3, Parclo A3, is preferred overall.

Once the preliminary Preferred Interchange Concept Design Alternative was selected, the alternatives for the Veterans Memorial Parkway Bridge over Highway 401 were assessed and evaluated.

The bridge alternatives were evaluated independently since they have no bearing on the interchange design.

The evaluation of Bridge Alternatives was a 2-stage process:

Stage 1 – Bridge Expansion Alternatives

Stage 2 – Bridge Replacement Alternatives

The Stage 1 and 2 evaluations were carried out at a high level, comparing only key criteria.

This stage compared the advantages and disadvantages of widening the existing bridge and replacing the bridge with a new structure. Based on the assessment, replacement is the Preferred Bridge Expansion Alternative because it is fully compatible with geometric standards, has high flexibility for future Highway 401 expansion, and has a lower Life-Cycle Cost.

Since bridge replacement was the preferred expansion alternative, based on the analysis carried out in Stage 1, four Bridge Replacement Alternatives were developed and compared.

Three basic bridge replacement alternatives were developed first, based on the replacement of the existing bridge west of its current alignment (West 1), on its current alignment (Central) and east of its current alignment (East). The West 1 option resulted in substantial impacts to Innovation Park and as such, a second west option was developed (West 2) that still proposed a bridge replacement west of the existing bridge, but minimized impacts to Innovation Park.

Based on the assessment, the Central Alternative is the Preferred Bridge Replacement Alternative because, despite requiring a temporary closure of the bridge and the south interchange ramps, the construction staging is most straightforward, with the shortest construction duration and lowest estimated cost and reduced impacts to the Natural Heritage System.

<u>Recommended Plan</u>

The Recommended Plan encompasses the following key components:

- Extension of Veterans Memorial Parkway as a 2-lane expressway with a rural cross section within a 60 m right-of-way (consistent with Official Plan designation);
- A new intersection at Wilton Grove Road and extended Veterans Memorial Parkway;
- Replacement of the existing VMP Bridge on its current alignment;
- Interchange improvements that include:

- Reconfigured southbound to westbound ramp in the NW quadrant ;
- Slightly modified eastbound to northbound ramp, modified southbound to eastbound ramp incorporating a new northbound to eastbound move in the SW quadrant;
- Reconfigured westbound to northbound ramp, new westbound to southbound ramp and new northbound to westbound ramp in the NE quadrant.

- Retaining wall in the SE quadrant to minimize encroachment into the designated significant Natural Heritage System;
- Realigned Crinklaw Drain to avoid a long enclosure under the VMP extension and ramp terminals south of Highway 401;
- Enhancement of fish habitat in the Crinklaw Drain through natural channel design; and
- Provision of wildlife passage opportunities at the Crinklaw Drain crossing.

Road Alignment

The VMP extension from Highway 401 to Wilton Grove Road will be constructed as a basic 2-lane road with a centre median, shoulders and rural cross-section (ditch drainage). The proposed right-of-way is 60 m, consistent with the City's expressway designation for VMP. The new road alignment has been designed to accommodate Long Combination Vehicles (LCVs). All interchange ramps, interchange ramp terminals and the new intersection at Wilton grove Road are designed to accommodate LCVs.

Veterans Memorial Parkway Bridge

The proposed replacement structure will be a two-span (38m – 38m) continuous bridge with integral abutments. This configuration requires a pier situated in the median of Highway 401. The abutment locations were selected in order to provide adequate space to not preclude potential future widening of Highway 401 to 5 lanes in each direction. The structure will be constructed with a slight skew angle relative to Highway 401.

Road Cross-Section

The proposed VMP extension is a rural cross-section that includes two 3.75 m travel lanes, a raised 2 m median and a 3 m shoulder. Consistent with the overall designation of VMP as an expressway, there is no provision for sidewalks, multi-use paths or cycle lanes. Highway drainage is conveyed via roadside drainage ditches to appropriate outlets at the Crinklaw Drain.

The cross-section on the bridge will include a 2 m raised median, 3.75 m through lanes and speed change lanes of variable width associated with the highway on and off-ramps, and 2.5 m shoulders.

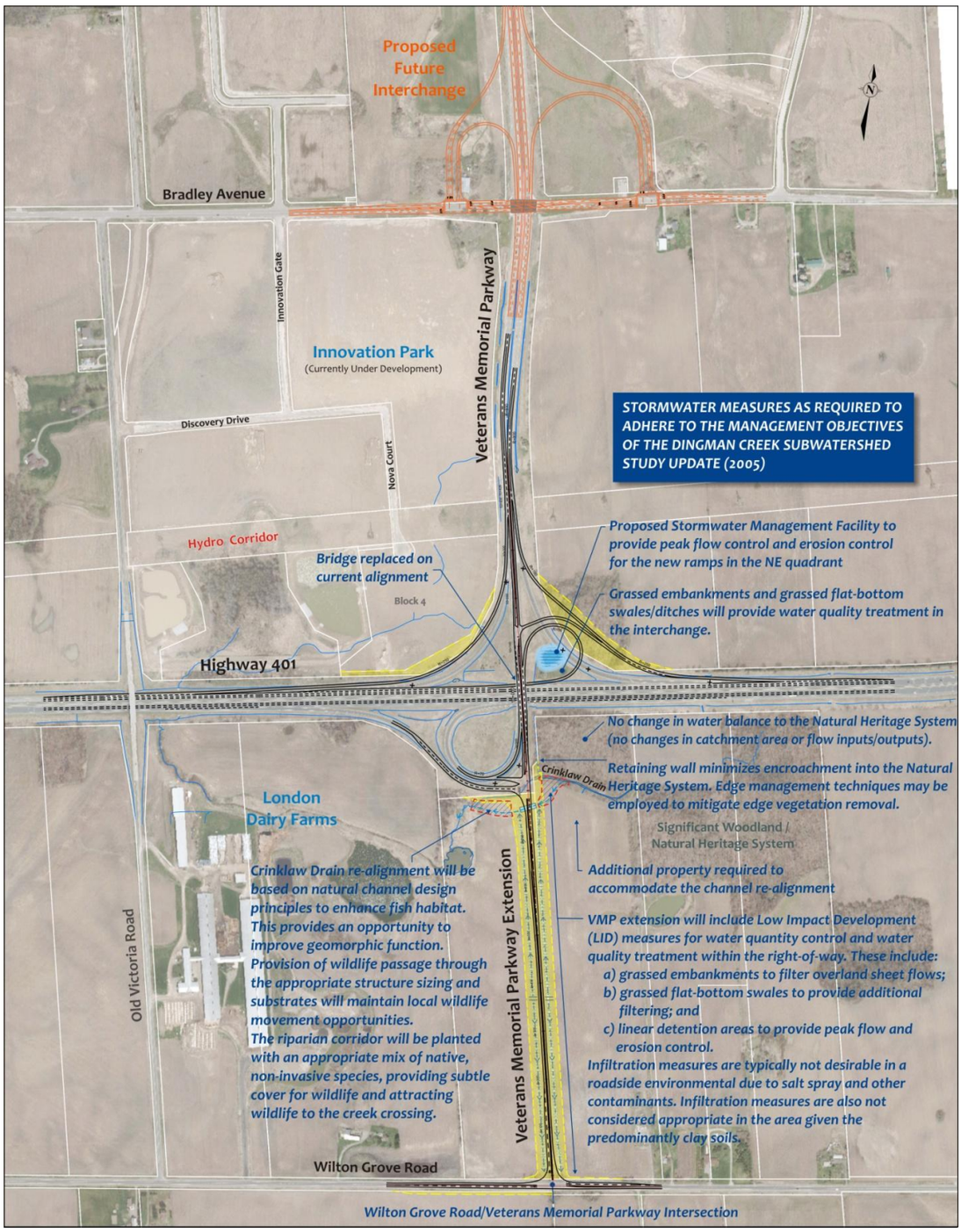
Retaining Wall

A retaining wall at the base of the roadway embankment in the SE quadrant is recommended as a key *design mitigation* in order to restrict encroachment into the woodland and minimize impacts to the natural heritage system; the primary natural environmental constraint in the study area. The retaining wall is intended to largely maintain the existing property line adjacent to the woodland.

The design of the embankment slope and retaining wall will be confirmed and finalized in Detail Design, based on detailed ground topography and site-specific ground stability/foundations information. The embankment/slope and retaining wall will ultimately be compatible with the slope around the bridge abutment.

The retaining wall is the cornerstone of the terrestrial ecosystem mitigation strategy and while the design will be refined in Detail Design, the intent is to avoid, to the greatest extent possible, encroachment into the woodland.

Recommended Plan



Wilton Grove Road Intersection

The VMP extension will terminate at an un-signalized, at-grade "T" intersection at Wilton Grove Road. Wilton Grove Road will be reconstructed at the intersection to include turning lanes. In the vicinity of the VMP intersection, the Wilton Grove Road through lanes will be widened to 3.75 m and the turn lanes will be 3.5 m. The intersection has been designed to accommodate Long Combination Vehicles (LCVs).

Stormwater Management and Drainage

The key aspects of the drainage and stormwater management plan are:

- Modifications and additions to the existing culvert network that will serve the future VMP extension and interchange;
- Dry stormwater management pond in the northeast quadrant of the VMP/401 interchange;
- Linear treatment swales along the east and west sides of the southerly extension of the VMP;
- Realignment of the Crinklaw Drain to allow for modifications of the southwest quadrant of the interchange and the VMP extension, with the realignment including:
    - The realigned channel,
    - A new culvert under the southerly VMP extension with an Openness Ratio no less than 0.25,
    - Wildlife passage through the culvert, and
    - Restoration planting to connect the SW Quadrant Wetland Complex with the SE Quadrant Woodlot.

The Dingman Creek Subwatershed Plan Update (2005) recommends that ponds be designed to achieve MOE Level 2 treatment. Typically this is achieved through the construction of Wet Ponds. However, the MOE guidelines also indicate that the minimum feasible catchment area for maintain a wet pond is 10 ha, whereas the catchment area for the proposed interchange pond is only 5.7 ha. As a result it is proposed that a dry pond be constructed rather than a wet pond. A dry pond will achieve MOE Level 3 treatment. However the grass embankments acting as filter strips and the grassed drainage swales will further enhance treatment. The swale designs also meet the conveyance capacity and velocity criteria for the 100 year storm event.

The available land within the right of way adjacent to the VMP extension is conducive to a linear treatment facility for treating the roadway runoff. The use of flat-bottom swales will provide the necessary water quality treatment and enhancement by improving water quality through the removal of sediment carried by the storm runoff. The proposed swales are able to provide a 25 mm storm runoff velocity conducive to providing water quality treatment. The swale designs also meet the conveyance capacity and velocity criteria for the 100 year storm event.

Additional measures can be explored during Detail Design to provide water quantity control. These options may include grassed swales with rock check dams to attenuate flows, or an enhanced grassed swale with an underdrain system to provide additional treatment, cooling, and a time to peak lag of the VMP extension runoff. These design details are deferred to the

detail design stage pending final grading design for the VMP extension. At that time, a detailed assessment of the operational life and maintenance costs of the ultimate linear feature design will be carried out.

The section of the Crinklaw Municipal Drain proposed for realignment was submitted for re-designation to accommodate the channel realignment design. The section will be abandoned under the Drainage Act and re-designated under the Ontario Water Resources Act.

The watercourse realignment was designed to include a low flow channel (approximate 2-year flow) and to include a vegetated riparian zone which was designed to convey the Regulatory (250 year) flows. The proposed channel and VMP culvert were designed to maintain the capacity of the existing hydraulic system. The channel design calculations demonstrate that the 250 year Regulatory flow is contained within the proposed channel design.

The crossing of the watercourse under the proposed VMP extension will be achieved with a 4 m by 3 m concrete culvert. The width of the culvert is sufficiently sized to convey the low flow channel and also provides overbanks beyond the low flow channel for mammal and amphibian crossing. The culvert has adequate capacity to convey the 250 year storm event. The 3 m height of the culvert is more than sufficient from a hydraulic perspective. Additional height was provided to achieve an Openness Ratio (OR) as close to 0.25 as possible to achieve the preferred criteria for mammal and amphibian. The resulting OR of 0.27 was achievable due to the sufficient cover available at the crossing location.

Landscape Design

The Recommended Plan includes a landscape design concept that encompasses roadside / aesthetic plantings; plantings along the Crinklaw Drain realignment to create a riparian zone and enhance wildlife use and movement through this area; and possible relocation and enhancement of gateway features. The City of London Environmental Management Guidelines (Revised January 2007) provides guidance with respect to plant selection for natural heritage areas and buffers. This guide will be used during the further development of the design concept into the Landscape Plan during the completion of the Preliminary Design and the subsequent Detail Design phase.

The proposed VMP extension encroaches on existing agricultural lands, and as such, the proposed roadside landscape design seeks to mitigate this impact on both the existing ecology and the landscape. To retain the rural character of the existing landscape surrounding the highway a naturalized planting scheme is proposed, including an emphasis on important views and plantings that screen the new road from the surrounding lands. New plantings will not only visually enhance the highway by filtering undesirable views, but will also serve as effective slope stabilization, providing erosion control as well as wildlife habitat by planting deep rooted species.

To buffer existing woodlots in the NE and SE quadrants that will be impacted by the construction, plantings will be designed to manage these edge conditions through interplanting with a mix of coniferous and deciduous trees and shrubs. Plantings suitable to be planted adjacent wetlands will also be added to buffer the existing wetland in the southwest. Plant materials will be chosen based on the following criteria: Native/Indigenous species; moderate to high salt tolerance; low maintenance requirements; drought and wind tolerant; moderate to vigorous growth characteristics; and aesthetically appealing.

The Crinklaw Drain riparian corridor will be planted with native species, providing cover for wildlife movement along the watercourse, and also to attract wildlife to the culvert crossing.

Slope stabilization plantings will be added along the channel to help with erosion control, as well as to filter and slow storm water runoff to improve water quality within the channel and adjacent wetland.

The existing City of London Gateway feature in the NE quadrant of the Highway 401 Interchange may require relocation. Relocating the existing gateway provides an opportunity to update and integrate the design with the dry stormwater management pond proposed within the loop ramp. It also provides an opportunity to begin to implement a broader vision for the significant City of London gateways that exist along Highways 401 and 402.

Illumination

The requirements for illumination of the roadways within the entire study area were reviewed. The illumination 'warrant' analysis was undertaken in accordance with Ministry Directive PLNG-B-05 – Ministry Policy for Highway Illumination. Based on the analysis, 'Partial Illumination' at the Highway 401 and Veterans Memorial Parkway Interchange for decision areas and critical points for ramps is warranted in accordance with Ministry Directive PLNG-B-05. Specifically, illumination is recommended along all on and off-ramps as well as the ramp terminals at VMP. A total of 14 conventional poles will be required for this illumination.

'Full Illumination' is not warranted at Highway 401 and Veterans Memorial Parkway Interchange, Highway 401 between Highbury Avenue and Veterans Memorial Parkway, and Veterans Memorial Parkway between Bradley Avenue and Wilton Grove Road.

Traffic Signals

Traffic signals are warranted at both ramp terminals and will be implemented on opening day.

Traffic signals at the VMP / Wilton Grove Road intersection are not warranted for opening day but will be warranted for the 2032 traffic volumes. Therefore traffic signals at this location are not recommended at this time.

Construction Staging and Detours

The proposed construction staging will minimize the construction duration of the project. It will allow the construction of the VMP extension and the improvements to the Highway 401 Interchange to be completed within a 12-month duration.

The construction staging is relatively simple and involves 3 basic stages, identified here for the purposes of Preliminary Design. A Construction Staging Plan will be developed fully during Detail Design and will be available for public review at that time.

Stage 1 involves the following key elements:

- Traffic remains on the existing interchange during Stage 1;
- Construction of Veteran Memorial Parkway from south of Crinklaw Drain to Wilton Grove Road, including the intersection at Wilton Grove Road;
- Construction of new Crinklaw Drain channel and culvert;
- Construction of the modified ramps on the south side of Highway 401; and
- Minor alignment of VMP lanes to tie into existing VMP, north of Highway 401.

Stage 2 involves the following key elements:

- VMP Bridge is closed and access to ramps on south side of Highway 401 is closed;
- Traffic shifts to new ramps on the north side of Highway 401;
- Replacement of VMP Bridge;
- Construction of the ramps on the south side of Highway 401;
- Construction of the new ramp terminal and adjustments to ramps in the SW quadrant and completion of the VMP through the interchange;
- Construction of the retaining wall in SW quadrant; and
- Completion of Wilton Grove Road intersection.

Stage 3 involves the following key elements:

- Traffic shifts to new ramps on the south side of Highway 401;
- Restoration planting along the Crinklaw Drain realignment; and
- Landscape planting along the VMP corridor.

The proposed replacement of the VMP Bridge will require closure of the existing bridge and the south loop ramp for approximately one construction season.

Potential detour options, at a high level, were considered and were presented to the public, agencies and other stakeholders at PIC #2:

- A northbound / southbound detour may be provided by the adjacent Highway 401 interchanges at Westchester Bourne (1.8 km east) and Highbury Avenue (4.5 km west).
- An eastbound / westbound detour may be provided by Commissioners Road / Hamilton Road. Under this scenario, existing intersections may require adjustments to signal timing and some intersections may require temporary signals to facilitate traffic diversion during construction. It was confirmed through discussion with Middlesex County that Bradley Avenue is not an appropriate detour route.

In addition to the closure of the VMP Bridge, short-term single lane closures are anticipated on Highway 401 (for bridge demolition) and on westbound to northbound off-ramp and southbound to westbound on-ramp to facilitate traffic shifts.

Detour alternatives will be subject to further study during Detail Design phases and may, for example, encompass the following aspects:

- Traffic operation and safety aspects of all staging and detour proposals, including consultation with EMS providers regarding Emergency Response;
- Detours that direct traffic onto roads or affect existing traffic on County roads will be assessed in direct consultation with the County to ensure detours are viable;
- Vertical and lateral clearance will be considered and appropriate options developed to address any inadequacies;

- Illumination and traffic signal requirements; and
- Queue and delay analysis for proposed lane closures.

Property and Access

The Recommended Plan and proposed new right-of-way will impact five properties (approximately 7.2 ha) through encroachment. No residences or business will be directly impacted. Property requirements depicted are preliminary in nature and subject to further review during Detail Design. The approximate property requirements are below:

Location	Property Required	Comments
Lot 5 & 6, Con. 2 Block 4, Plan 33M627	0.6 ha	NW Quadrant Owned by City of London
Lots 4 & 5; Con. 2	1.3 ha	NE Quadrant Farm property – portion impacted is woodlot and not under agricultural production
Part Lot 5, Con. 2	3.7 ha	South of Highway 401 Farm Property – portion of which is Crinklaw Drain and floodplain not currently under agricultural production
Part Lot 5, Con. 2 2316 Wilton Grove Road	1.4 ha	South of Highway 401 Developer-owned – portion of which is Crinklaw Drain and floodplain not currently under agricultural production
Part of N ½ of Lot 5 & Part N ½ of Lot 4, Con. 3	0.2 ha	South side of Wilton Grove Road Farm property

Additional property east and west of the VMP extension will be required for the realignment of Crinklaw Drain and its floodplain, just south of its existing location; the property required will be occupied by the watercourse and riparian corridor / floodplain. This will result in a further reduction in arable land that will require compensation to the landowners. However, the realigned watercourse and riparian area need not be incorporated into the proposed VMP right-of-way as is it not directly required for the operation of the facility. There may be interest by the landowners to retain these areas of their property (with appropriate compensation for lost use).

Two farm accesses exist from Wilton Grove Road, just west of the proposed intersection with VMP; one access to the north field and one access to the south field. These accesses can likely remain in their current location since a raised median on Wilton Grove Road is not proposed.

Access to a driveway located at 2316 Wilton Grove Road, just east of intersection will not be affected.

Consultation

External agencies, utilities, emergency service providers, municipalities and other stakeholders, as well as property owners in proximity to the study area were contacted during the study and requested to provide input and to comment on the study findings. Members of the general public were notified of the study through notifications in local newspapers, and invited contact the project team to join the project mailing list.

Mitigation Measures

Mitigation measures as well as environmental protection and enhancement measures will be employed during implementation of the Recommended Plan to reduce or avoid environmental impacts. The table below summarizes the concerns identified to date, the mitigation measures based on the identified environmental sensitivities and commitments to future work.

ENVIRONMENTAL ISSUE/CONCERN	CONCERNED AGENCIES	PROPOSED MITIGATION / COMMITMENT TO FURTHER WORK
Property and Access (Chapter 8.1.2 of TESR)		
• The Recommended Plan will impact five properties through encroachment. • No residences or business will be directly impacted. • Two farm accesses exist from Wilton Grove Road, just west of the proposed intersection with VMP; one access to the north field and one access to the south field. These accesses can likely remain in their current location since a raised median on Wilton Grove Road is not proposed. • Access to a driveway located at 2316 Wilton Grove Road, just east of intersection will not be affected.	MTO City of London Property Owners	• MTO / City of London will negotiate with individual property owners to provide fair market value for the required property. • Potential impacts to farm access locations and driveways on Wilton Grove Road will continue to be assessed during Detail Design. If impacts are deemed to occur at that time, appropriate access mitigation will be developed in consultation with the landowners.
Agriculture (Chapter 8.1.3 of TESR)		
• The VMP extension will result in some Class II farm land being taken out of production. Direct impacts to agricultural lands and related impacts to production will be mitigated / compensated through the property acquisition process. • Any indirect impacts to agricultural operations would be temporary in nature (construction vehicles on side roads).	MTO City of London OMFRA Property Owners	• Impacts to Class I to Class II agricultural lands will be minimized where possible. • Contractors will be required to allow farm equipment movement. Access to farm properties will be maintained during and after construction. • Tile drainage systems within and adjacent to the proposed new right-of-way will be identified in consultation with property owners, during Detail Design. Tile drains will be avoided where possible and the tile drain network will be modified, as required, to ensure that impacted tiles are removed / closed and that remaining tiles continue to function. Given landowner concerns about drainage, it will be important to demonstrate to landowners that farm drainage will continue to function.
Noise (Chapter 8.1.4 of TESR)		
• There are no anticipated increases in noise levels at the three receiver locations as a result of the proposed Veterans Memorial Parkway extension, since the Veterans Memorial Parkway extension is expected to alleviate some of the traffic demand off of Wilton Grove Road, which is the main noise source at all receiver locations. • Construction noise issues.	MTO City of London Property Owners	• Since there are no increases in the projected noise levels greater than 5 dBA, the consideration of noise mitigation based on MTO/MOE Noise Protocol criteria is not warranted. • The Contractor will be required to abide by the Contract Operational Constraints and municipal noise control by-laws. • The Contractor will be required to keep idling of construction equipment to a minimum and to maintain equipment in good working order to reduce noise from construction activities. • If construction work occurs outside of normal working hours and on weekends, such work will be carried out in compliance with local noise by-laws or Noise By-Law exemptions will be obtained. • Complaints from construction will be investigated according to the provisions of the existing MTO / MOE Noise Protocol.
Air Quality (Chapter 8.1.5 of TESR)		
• Construction air quality issues.	MTO City of London Property Owners	• Construction activities that generate emissions and dust will be temporary in nature and will highly variable, depending on the specific activities that are taking place. • Standard construction practices will be employed to minimize dust emissions. • Emissions management based on established best practices will be implemented during construction and may include: o Dust suppressants o Reduced travel speeds o Efficient staging of activities o Minimization of haul distances o Covering stockpiles
Management of Excess Material and Property Contamination (Chapter 8.1.6 of TESR)		
• Excess materials may be encountered during construction and require proper management/disposal. • Property contamination may	MTO City of London MOE	• A Preliminary Site Screening will be carried out on impacted properties (or portions of the impacted properties) deemed to have a moderate potential as Areas of Potential Environmental Concern (APEC). • Excess materials generated during construction will be managed by the Contractor in accordance with OPSS 180. • Opportunities to minimize excess material generation through salvage and

ENVIRONMENTAL ISSUE/CONCERN	CONCERNED AGENCIES	PROPOSED MITIGATION / COMMITMENT TO FURTHER WORK
be encountered during construction and require proper management/disposal. • APECs where there is moderate potential for contamination have been identified, including: o Cultivated fields where pesticides / chemical fertilizers may be applied on agricultural properties to the south and north of Highway 401, as well as areas of earth fill; o Road allowances along major highways, where road salt laden runoff occurs, and historical spills may have occurred; and o Agricultural fields which may have tile drainage, whereby land acquisition may require removal and / or modifications to existing drainage works.		reuse (such as earth material for slope flattening) will be identified during subsequent design phases. • Any placement of materials beyond the highway right-of-way should involve review by the project ecologist and consultation with appropriate agencies and property owners. • Ensure proper containment, filtering and proper release away from sensitive features of sediment from all construction-generated dewatering discharge. • Employ proper handling of potentially toxic construction materials and ensure proper spills management. The Contractor will have a Spills Prevention and Management Plan, and all required materials on site.
Archaeology (Chapter 8.2.1 of TESR)		
• A Stage 2 Archaeological Assessment was undertaken for the Recommended Plan and the results are summarized below. • During the Stage 2 archaeological assessment, two projectile points were collected from the southern end of the study area.	MTO City of London MTCS	• Due to the isolated nature of each Findspot, it is recommended to the Ministry of Tourism, Culture and Sport and the Ministry of Transportation that the study corridor is free from archaeological concern, and no further assessment is required. • Should the boundaries of the current plan change beyond the current plan and go outside of the current right-of-way, further Stage 2 assessment is required. • Development should not proceed before receiving confirmation that the Ministry of Tourism, Culture and Sport has entered the report into the provincial register of reports. • Should previously unknown or unassessed deeply buried archaeological resources be uncovered during development, they may be a new archaeological site and therefore subject to Section 48 (1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the Ontario Heritage Act. • Any person discovering human remains must immediately notify the police or coroner and the Registrar of Cemeteries, Ministry of Government Services.
Heritage Resources (Chapter 8.2.2 of TESR)		
• No direct impacts to built heritage resources were identified as a result of the Recommended Plan. Indirect impacts were identified as a result of the Recommended Plan; the proposed extension of the VMP southward to Wilton Grove Road will result in the visual disruption of the existing setting and character of the two cultural heritage landscapes and the two built heritage resources.	MTO City of London MTCS	• No mitigation actions are recommended for the indirect impacts.

ENVIRONMENTAL ISSUE/CONCERN	CONCERNED AGENCIES	PROPOSED MITIGATION / COMMITMENT TO FURTHER WORK
Vegetation (Chapter 8.3.1 of TESR)		

• Removal of vegetation in the NE quadrant to accommodate Recommended Plan
• Minimizing vegetation removal and edge impacts to the woodland in the SE quadrant
• Removal of species of conservation concern
	MTO
	City of London
	UTRCA
	MNR
	Nature London
		Site Specific Mitigation Measures
		• NE Quadrant
		  • Following forest clearing, and in consultation with a qualified Arborist, apply an edge treatment to promote the early re-establishment of the forest edge, including the use of buffer plantings which may include tall, fast-growing shrubs and early successional trees.
		  • Opportunities for the transplantation of displaced populations of Rough Avens and Arrow-leaved Aster into suitable habitat in the residual forest stand will be considered where timing and logistics are favorable. These species do not occur elsewhere in the study area and the City may have an interest in relocating these plants prior to construction.
		  • The stand of invasive Common Reed (Phragmites australis ssp. australis) that is present at the south end of the forest patch is located within the future roadbed for the newly aligned off-ramp and associated ditching, and will be removed in whole or in part during construction. If excavation and removal of plants or rhizomes beyond the future ditch line is required, then excavated areas may be restored through application of a standard MTO meadow mix.
		• SE Quadrant
		  • As described in Chapter 7.5, a retaining wall at the base of the roadway embankment in the SE quadrant is recommended as a key design mitigation in order to restrict encroachment into the woodland and minimize impacts to the natural heritage system. The design of the embankment slope and retaining wall will be finalized in Detail Design, based on site-specific ground stability/foundations information.
		  • Following construction of the retaining wall, apply an edge treatment to promote the early re-establishment of the forest edge, in consultation with a qualified Arborist.
		  • During Detail Design, assess the feasibility of a pre-stress treatment of trees that will be retained on the periphery of the work space for construction of the retaining wall, in consultation with a qualified Arborist;
		  • During construction, apply measures to reduce/avoid rutting and compaction of forest soils within the work space to minimize stress to adjacent trees. The measures should be identified in consultation with a qualified Arborist.
		
		Standard Construction Mitigation Measures
		• Delineate “Environmental Sensitive Areas” in Contract Drawings and Specifications and in the field use temporary vegetation protection fencing or other appropriate fencing or other appropriate measures to prevent encroachment into sensitive areas.
		• Install temporary erosion and sediment control measures on the margins of woodlands and wetlands prior to construction, and maintain throughout construction per Ontario Provincial Standard Specification (OPSS) 805.
		• Per OPSS 805, maintain all temporary erosion and sediment control measures in an effective, functioning, stable condition. This will require routine inspections, including after storm events, and repair as required.
		• Re-stabilize and re-vegetate exposed soil surfaces as soon as possible, using MTO approved Old Field seed mix per OPSS 804, or other suitable field mix identified by the Landscape Architect during detail design.
		• The Contractor shall not be permitted to enter, or temporarily use for any purpose, any areas within the VMP ROW not affected by construction requirements without prior approval of the Contract Administrator.
		• The Contractor shall not be permitted to reuse or dispose of any excess materials (including earth) within the VMP ROW unless specified in the contract.
		• All vegetation cover not specified for removal shall be preserved in order to minimize erosion and sedimentation.
		• Dust control shall be completed using water, or approved dust suppressants, in accordance with OPSS 506.
		• All activities, including equipment maintenance and refueling, shall be controlled to prevent entry of petroleum products or other deleterious substances, including any debris, waste, rubble, or concrete material, into the natural environment.
		• Waste management shall be completed in accordance with OPSS 180.
		• Implement environmental inspection during construction, using a qualified Biologist/Ecologist at sensitive times/locations during the works (such as creek realignment, retaining wall construction, wildlife structure installation). This is recommended to ensure that protection measures are implemented, maintained, and repaired, and that remedial measures are initiated where warranted.
		• Abandoned portions of the roadway will be removed and the underlying road bed materials at least re-graded and scarified to enable re-colonization of

ENVIRONMENTAL ISSUE/CONCERN	CONCERNED AGENCIES	PROPOSED MITIGATION / COMMITMENT TO FURTHER WORK
		• natural vegetative cover. If desirable, or in particular locations, this are could be restored to natural vegetative cover using a combination of native plantings and the application of an appropriate native seed mix. • Carry out additional consultation with the City, UTRCA and MNR during the subsequent detail design phase to discuss the above the activities.
Wildlife Habitat (Chapter 8.3.1 of TESR)		
• Loss of wildlife during construction • Localized impacts due to removal of vegetation/habitat. • Localized potential for nesting by some species in adjacent vegetation that may be disturbed by the construction activities. • Wildlife passage and maintenance of the amphibian movement corridor.	MTO City of London UTRCA MNR Nature London	**Amphibian Movement Corridor** • During construction of the realigned Crinklaw Drain, install silt fencing along the edge of the work zone to prevent amphibians and reptiles from moving into the work space. • The culvert will be designed to facilitate passage by a variety of small to mid-sized mammals, as well as amphibians and reptiles, including Snapping Turtle, a species of Special Concern. These are species that are most vulnerable to road mortality and that have been historically overlooked in Road Ecology design. A minimum OR sizing index of 0.25 is recommended (OR = cross-sectional area of structure /wildlife travel distance through structure), based on discussions with Road Ecology researchers and project applications elsewhere. The proposed structure meets and exceeds this guideline, with an OR index of 0.27. • The proposed culvert will accommodate 1 m wide terrestrial wildlife "benches" on either side. The benches will be tied into the existing ground at the culvert entrance/exit to provide a seamless transition for wildlife to and from the riparian corridor. Wingwalls will be incorporated to minimize the length of the structure (and therefore wildlife travel distance) to the extent possible. • It is also recommended that the wildlife mitigation elements include wildlife funnel fencing extending from 200 m to 300 m from the culvert, along on both sides of the VMP and the interchange ramps. The fencing should be sturdy, impermeable, and 0.6 m to 0.9 m high with a horizontal lip on the tip (15 cm length, extending to habitat side to discourage wildlife from climbing over). The fencing should also be extended underground to discourage wildlife digging. Road Ecology research has emphasized the importance of providing funnel fencing for wildlife structures to be effective (see review in Forman et al. 2003). The fence ends should ideally be tied into some other structure, or at a minimum angled back away from the roadway, to discourage wildlife "end run" movement around the fence ends. Wildlife crossing signs are recommended at the fence ends to alert motorists of the risk of wildlife on the roadway at these locations. **Migratory Birds** • Nesting migratory birds are protected under the MBCA. No work is permitted to proceed that would result in the destruction of active nests (nests with eggs or young birds), or the wounding or killing of birds, of species protected under the Migratory Birds Convention Act, 1994 and/or Regulations under that Act. • It is our understanding that removal of inactive nests may not be permitted by MNR for newly-listed SAR such as Barn Swallow, which are known to re-nest in nests from previous years. • In order to protect nesting migratory birds, in accordance with the MBCA, the following mitigation measures should be implemented: • Ensure that timing constraints are applied to avoid vegetation clearing (including grubbing) during the breeding bird season (approximately May 1st to August 8th). It should be noted that occasionally bird species will precede or exceed the approximate breeding bird season window. • Migratory bird species that use structures for nesting often commence nesting earlier, and may continue nesting beyond, the above period. For this reason, MTO Southwest District has adopted an April 1 – August 31 nesting period constraint to guide structure maintenance activities and mitigation. • No Barn Swallow nests were observed on either the VMP Bridge or the Old Victoria Road Bridge during the 2012 surveys. The nests observed on these structures in 2012 were those of Cliff Swallow. • Targeted surveys for Barn Swallow will need to be undertaken by a qualified biologist prior to the commencement of physical work on the existing bridge to confirm the presence / absence of nests for this species. • The Contractor shall not destroy active nests (nests with eggs or young birds) of protected migratory birds, including SAR protected under the ESA (2007). When these nests are encountered the Contractor Administrator must be contacted. • If a nesting migratory bird is identified within or adjacent to the construction site, and the construction activities are such that continuing construction in that area would result in a contravention of the MBCA or ESA (2007), then all activities will stop and MNR and Environment Canada will be contacted to discuss mitigation options, and/or, to obtain a Letter of Advice from MNR to follow for species listed under the ESA (2007). **Other Wildlife Species** • The following measures are recommended for the protection of wildlife in

ENVIRONMENTAL ISSUE/CONCERN	CONCERNED AGENCIES	PROPOSED MITIGATION / COMMITMENT TO FURTHER WORK
		general: • In the event that an animal encountered during construction does not move from the construction zone and construction activities are such that continuing construction in the area would result in harm to the animal, all activities will stop and the Contract Administrator will be notified. • In the event that a SAR or possible SAR is found in the construction area, all construction that could potentially harm the animal will cease immediately and the Contract Administrator will be notified. The Contract Administrator will then contact the MNR SAR Biologist for direction, as these animals are protected under the ESA (2007).
Fisheries & Aquatic Habitat (Chapter 8.3.2 of TESR)		
• Impact on fish habitat due the proposed realignment and culvert crossing of Crinklaw Drain. The proposed works include realignment/removal of an approximately 223 m long section of Crinklaw Drain and replacement with a 224 m long section of channel and installation of a new 34 m long concrete box culvert along the new channel section. Crinklaw Drain is managed as a municipal drain with intermittent flows while supporting seasonal warmwater baitfish habitat. This drain has been previously channelized and subject to periodic clean-out. • Overall risk to fish and fish habitat is Low given that, despite the removal of a reach level section of the drain, the sensitivity of the fish and fish habitat in this intermittent warmwater system is low.	MTO City of London UTRCA MNR Nature London	• All of the recommended mitigation and enhancement measures will be further refined at Detail Design and will be incorporated into the Contract Documents, to ensure that they are implemented throughout construction. Related commitments to future work are summarized below: • The assessment of impacts on fish and fish habitat will be refined based on the Detail Design, as will the assessment of the risk of works to fish and fish habitat, based on the criteria outlined in the Fish Guide. The final risk assessment will be submitted to DFO with supporting documentation, including the appropriate DFO Notification Form (Form 1/ "no-HADD"). • Fish and fluvial geomorphic input into the design will be maintained throughout the Detail Design phase. • MTO, the City of London, and its consultants will consult with agencies (DFO, MNR) during the process of refining and documenting the site-specific impacts and mitigation measures during Detail Design. • The mitigation measures and specification of detailed design aspects will be refined and finalized, and incorporated into the Contract Documents. General construction mitigation measures to minimize potential impacts during and following construction activities, including for example: – For all in-water works, which includes the transfer of flow from the old to new channel, a warmwater timing window permitting in-water work from July 1 through to March 15 will be employed. – A comprehensive erosion and sediment control strategy to prevent migration of sediment laden runoff from the construction zones to the watercourse will be developed. Inspection and maintenance will occur until the site is stable and final cover is established. These measures will include, but not be limited to, isolation of all near-water construction zones that drain to the watercourse using properly installed, inspected and maintained perimeter silt fencing (or appropriate alternative). – Prior to transferring flow to the new channel section, fish will be rescued from the existing channel section to be abandoned and relocated to appropriate habitat away from the works by qualified fish biologists under Scientific Collector's Permit obtained in advance of construction from MNR. – All activity will be controlled so as to prevent entry of any petroleum products, debris and sediment or other potential contaminants/deleterious substances to the watercourse. Storage, maintenance or refuelling of equipment will be conducted well away from the watercourse in properly sited and contained areas. A Spills Prevention and Response Plan will be developed by the Contractor and kept on site at all times. All materials necessary for containment, including a supply of silt control fabric, will be readily available on the site. – Any temporarily stockpiled material, construction or related materials and debris will be properly sited and contained (e.g. within silt fencing) on level ground separated at least 30 m from the watercourse. All construction materials and debris will be removed and appropriately disposed of following construction. – No equipment shall ford or otherwise enter the watercourse unless authorized by MNR. – The area disturbed for construction will be returned to its pre-construction conditions, re-stabilized and re-vegetated. – An environmental inspector experienced in working around watercourses will be responsible for ensuring the sediment and erosion control measures are functioning effectively and being maintained, and all of the other general mitigation measures are being implemented as intended. The inspector will ensure all environmental mitigation and design measures are properly installed/constructed and maintained, and appropriate contingency and response plans are in place and implemented if required. Appropriate support from a fish biologist, landscape architect and channel specialist/fluvial geomorphologist will be obtained during

ENVIRONMENTAL ISSUE/CONCERN	CONCERNED AGENCIES	PROPOSED MITIGATION / COMMITMENT TO FURTHER WORK
		specific aspects of the works (e.g., fish rescue, low flow channel installation, channel construction, landscaping).
Erosion and Sediment Control (Chapter 8.3.3 of TESR)		
• Excavation and grading may result in erosion of exposed soils that can be carried to the via overland flow and drainage channels to the Crinklaw Drain and downstream receiving waters during storm events. • Given the erosion issues and concerns within the Dingman Creek subwatershed generally, a high level of diligence with respect to managing erosion and sedimentation and maintaining fully functioning control systems will be expected by the City, MOE, UTRCA and MTO.	MTO City of London MOE MNR UTRCA	Relevant mitigation measures will include the following, many of which are also identified in Chapters 8.3.1 and 8.3.2 since they contribute to the protection of terrestrial and aquatic habitats: • Vegetation removal will be limited to only what is required for grading and ditching operations, and will be clearly identified on the drawings. • Erosion and sediment control practices will be implemented throughout construction to prevent migration of sediment to the watercourses/municipal drains within the study area and all other natural features. • Any works in the watercourse or along the banks will be isolated from the main flow and conducted 'in the dry' using flow passage systems of cofferdams. Any dewatering operations will be directed onto a suitable vegetated area at least 30 m away from Crinklaw Drain, or into a sediment settling basin or filter bag which will allow sediments to settle out prior to discharging to the watercourse. The discharge point for dewatering activities shall be suitable so as not to create additional erosion or sediment related impacts. • All appropriate temporary erosion and sediment control measures such as: silt fence barriers, erosion control blanket, and rock flow checks will be used to contain the construction area and prevent any migration of sediment. The silt fencing and other containment measures will be regularly inspected and maintained as necessary. • New or re-constructed ditches will be properly stabilized using vegetation or rock protection depending on slope. Rip rap / riverstone or other clean granular stabilizing systems free of fines, will be installed at outlets and spillways. • All disturbed or exposed surfaces will be stabilized with the most appropriate treatments available. • Stabilization and re-vegetation of all disturbed surfaces will be established as soon as possible following excavation and construction to protect against erosion and sedimentation of local drainage. • An environmental inspector will be employed throughout construction to ensure the sediment and erosion control measures are functioning properly and all of the mitigation measures are being implemented.
Surface Water (Chapter 8.3.4 of TESR)		

• Runoff from Highway 401 and crossing roads could impact water quality if not properly handled.
• Erosion and flood risk in the receiving watercourses.
• Changes to the hydrologic characteristics of adjacent wetlands and woodlots.
	MTO
	City of London
	MOE
	UTRCA
	Nature London
	Property Owners
		• The proposed storm water management strategy will provide stormwater quality and quantity control. The key elements are:
		  • Dry stormwater management pond in the northeast quadrant of the VMP/401 interchange for stormwater quantity and quality control.
		  • Linear treatment swales along the east and west sides of the southerly extension of the VMP for stormwater quality control.
		• The Detail Design for the VMP will be undertaken in a manner that minimizes any impact on the hydrologic characteristics of the adjacent wetlands and woodlots; design and construction of the drainage works will be such that road runoff is not directed to the woodland/wetlands and that local groundwater table is not permanently altered by grading and excavation.
		• Relevant standard construction mitigation measures will ensure that surface water quality is protected during construction. These measures have been outlined above, in Chapters 8.3.1, 8.3.2 and 8.3.3 since they contribute to the protection of terrestrial and aquatic habitats and focus mainly on erosion and sediment control.

ENVIRONMENTAL ISSUE/CONCERN	CONCERNED AGENCIES	PROPOSED MITIGATION / COMMITMENT TO FURTHER WORK
Groundwater Resources (Chapter 8.3.5 of TESR)		

• Impacts to existing wells and groundwater resources.	MTO
	City of London
	MOE
	UTRCA
	Nature London
		• Confirm localized geotechnical conditions to identify presence of groundwater and determine dewatering requirements.
		• Any potential future dewatering activities should be conducted in accordance with the specified control procedures. A Permit to Take Water (PTTW) must be obtained from MOE if the amount of water taken exceeds 50,000 L/day as per the Ontario's Water Taking Regulation (O. Reg. 387/04 made under the Ontario Water Resources Act).
		• A PTTW will also be required in the event that surface water is to be moved or diverted utilizing active pumping methods, in excess of 50,000 L/day, however such is not required if the creek is diverted through passive (fluming) methods only. Permission will also need to be secured from the Upper Thames River Conservation Authority, acting on behalf of the Department of Fisheries and Oceans Canada, regarding work within or near a watercourse that is potentially providing fish habitat, and work must be conducted in accordance to their direction.
		• A pre-construction water well survey has been conducted as part of this study, which indicated that shallow water wells are not present within 300 meters of lands where construction dewatering activities may be required. Shallow water wells may however be present within 300 meters of areas where surficial road works are to be constructed, including the intersection of the proposed Veterans Memorial Parkway and Wilton Grove Road, however such works are not anticipated to affect shallow wells, and confirmatory water well surveys should be conducted as part of Detail Design work.
		• Unused and unreported water wells may be encountered during construction, and any unused water wells within the construction footprint must be abandoned as per O. Reg. 903, as amended by O. Reg. 372/07, prior to any further work where they are located. In addition, a well monitoring program should be undertaken, as appropriate, to monitor the impacts to the wells that will be potentially affected by the VMP Bridge, prior to, during and after the construction activities.
		• The Stormwater Management Plan discussed in Chapter 7.7 will ensure that all road runoff from the VMP and the interchange ramps will be controlled for quantity and quality to mitigate potential impacts (i.e., interrupt contaminant pathways) to groundwater.
		• MTO's 'best management practices' will be implemented by the Contractor to prevent fuel lubricants and fluid spills resulting from construction activities, and manage any unanticipated occurrences. The plan will identify appropriate response measures, materials and instructions, including maintenance of materials on-site or otherwise available for immediate use, and appropriate notification procedures. The Contractor, Contractor Administrator and all personnel will be aware of the practices and educated in its implementation. These practices include:
		  • Containment of the construction zone with appropriately installed silt fencing throughout construction;
		  • Use of additional sediment and erosion control measures as necessary to minimize erosion of exposed soils, and prevent sediment from entering natural watercourses in the vicinity, or from negatively impacting drainage works in the vicinity;
		  • Monitoring and regular maintenance of sediment and erosion control measures as required throughout the construction period;
		  • Stabilization of all disturbed surfaces prior to removal of the construction-related measures;
		  • No storage, maintenance or refuelling of equipment will be permitted near any sensitive areas including the drainage routes within the study area;
		  • Appropriate dewatering measures will be implemented to manage any groundwater encountered during grading activities, and dewatering discharge water will be filtered as necessary to prevent transport of sediment to natural surface water receptors;
		  • Any dewatering measures that are required will not pump more than 50,000 L/day, unless under authority of an MOE Permit-to-Take-Water, in which case dewatering rates are to be measured daily and all dewatering activities shall occur in accordance to the terms and conditions of the applicable Permit-to-Take-Water; and
		  • Any claims of interference with surrounding lands, natural features, properties, or property owners, which is related to construction activities, sediment and erosion control, and construction dewatering, shall be investigated and addressed promptly, to the satisfaction of the affected land owner or agency.

Emergency Response (Chapter 8.4 of TESR)		
• Proposed closure of the VMP Bridge and ramps south of Highway 401 during	MTO City of London	• Consultation with emergency service providers will continue during the subsequent Detail Design phase to determine appropriate mitigation measures (e.g. detours) for the construction phase.

ENVIRONMENTAL ISSUE/CONCERN	CONCERNED AGENCIES	PROPOSED MITIGATION / COMMITMENT TO FURTHER WORK
construction will restrict access to and from Highway 401 eastbound at the VMP interchange for approximately one construction season. • Short-duration temporary closures of other ramps and/or Highway 401 single lanes may also impact response times.	Emergency Service Providers	
Utilities (Chapter 8.5 of TESR)		
• Existing Union Gas pipeline, Bell underground plant and London Hydro distribution lines may be impacted by the Recommended Plan and may require relocation or mitigation. • Based on Preliminary Design, no impacts/conflicts are anticipated at the Hydro One 500 kV corridor that crosses VMP north of Highway 401. • The utilities information noted is based on mark-ups / information received from the agencies. Therefore, the location of all plant and specific relocation strategies must be established during Detail Design.	MTO City of London Union Gas Bell Canada London Hydro	• Relocation or mitigation of affected utilities will occur through consultation with the affected utility providers in the subsequent detail design phase. • Confirm with Hydro One that no impacts to 500 kV corridor will occur as a result of proposed design.
Construction Staging (Chapter 8.6 of TESR)		
• Proposed closure of the VMP Bridge and ramps south of Highway 401 during construction will restrict access to and from Highway 401 eastbound at the VMP interchange for approximately one construction season. • Short-duration temporary closures of other ramps and/or Highway 401 single lanes may also impact response times. • Potential out of way travel and inconvenience for Innovation Park businesses. • Motorists may experience minor delays and disruption during construction.	MTO City of London Middlesex County Municipality of Thames Centre	• The proposed construction staging will minimize the construction duration of the project. It will allow the construction of the VMP extension and the improvements to the Highway 401 Interchange to be completed within a 12-month duration. • A Construction Staging Plan will be developed fully during Detail Design and will be available for public review at that time. • Detour alternatives will be subject to further study during Detail Design in consultation with Middlesex County and the Municipality of Thames Centre. • Advance signing of construction and detours will be provided.