

Additional Assessment in Halton Area

5.1 OVERVIEW OF ADDITIONAL ANALYSIS IN HALTON AREA

5.1.1 Background

As noted in **Section 4.3**, the evaluation of alternative corridors included three evaluation processes that are each documented in this report. The initial evaluation process of Alternatives 3-1, 4-1, 4-2, 4-3, 4-4, and 4-5 as documented in Section 4.4 were presented to the public at Public Information Centre (PIC) #4 in June 2010, including the recommendation to CARRY FORWARD both Alternatives 4-2 and 4-3 for further consideration, as both alternatives resulted in similar benefits and effects in the evaluation. The other alternatives (i.e., Alternatives 3-1, 4-1, 4-4 and 4-5) were eliminated since they were significantly inferior when compared to Alternatives 4-2 and 4-3. Specifically, Alternatives 4-2 and 4-3 both present strong transportation benefits to area communities and the regional economy while avoiding significant effect to the Greenbelt and Niagara Escarpment.

In order to provide a more focused scope for Stage 2 of the EA process and in part based on comments received during PIC #4, additional analysis at a higher level of detail was carried out on Alternatives 4-2 and 4-3 in the summer and fall of 2010 using factors in natural environment, land use / social environment, cultural environment, area economy, transportation, as well as cost and constructability. Findings from the additional analysis were documented in Section 7 of the Draft Transportation Development Strategy Report (February 2011) (Draft Strategy). At the time, findings of the 2010 additional analysis indicated that rather than selecting a single preferred alternative (i.e., either Alternative 4-2 or Alternative 4-3), elements from both alternatives were carried forward in the new corridor. The recommendation for the new corridor as presented in the Draft Strategy (February 2011) included an east-west corridor from Highway 400 to Highway 401 west of the urban area in the Town of Milton (i.e., included in Alternative 4-3), together with a north-south link between the new corridor and the Highway 401 / 407 ETR

interchange (i.e., included in Alternative 4-2), which would address the need for the HP BATS corridor.

Subsequent to the release of the Draft Strategy (February 2011) in March 2011 and during the comment period (between March 2011 and July 2011), several community residents and municipalities in the Halton area strongly expressed concerns regarding the potential impacts to communities and agricultural lands as a result of the east-west corridor through Halton Hills (i.e., the Alternative 4-3 component). A summary of the comments received is described in **Section 5.1.2**.

In response to the input received on the Draft Strategy (February 2011), MTO committed to carrying out additional analysis in the Halton area with a greater level of detail to determine which alternative would be preferred over the other in this geographic area. The additional work in the Halton area was carried out in fall 2011 and winter 2012.

This chapter describes the 2011/2012 additional analysis completed in the Halton area to address the input received on the Draft Strategy (February 2011). The consultation carried out as part of the 2011/2012 additional work in Halton area is documented in Section 7 of this report.

5.1.2 Additional Analysis in Halton Area Consultation

The draft Strategy Report (February 2011) was made available on March 7, 2011 for a minimum of 90 day review period. Due to interest and the volume of comments, the actual review period was extended to over 120 days, ending July 8, 2011; however comments were also accepted beyond the July 8, 2011 deadline. A record of the comments received is documented in **Section 7.7** of this report and Appendix A. The key comments in Halton area were concerns of the potential impact of a new east-west corridor to the agriculture and rural characteristics of the community.

To address the comments received in the Halton area, additional work was carried out in fall 2011 and winter 2012.

5.1.3 Approach to Additional Analysis in Halton Area

The 2011/2012 additional analysis in the Halton area was initiated in the fall of 2011 and extended through the winter 2012 in order to examine the benefits and impacts of the further widening of Highway 401 as an alternative to a new east-west corridor through Halton Hills. While the commitment to carry out the 2011/2012 additional analysis was to address comments by stakeholders and municipalities in the Halton area, MTO also felt that the draft findings may be further enhanced by additional detailed and quantitative data.

Unlike other sections of the overall GTA West study area, findings in the initial evaluation and 2010 additional analysis regarding the new transportation corridor through Halton area were very similar between the Alternatives 4-2 and 4-3 which were carried forward in the Draft Strategy (February 2011). Furthermore, Highway 401 widening alternative (element of Alternative 4-2) and the new east-west corridor alternative through the Halton area (element of Alternative 4-3) are in close proximity to each other (approximately 4 to 7 kilometres apart). The fact that the two alternatives are located geographically close together in the overall transportation network is unique to the Halton area; in other municipalities, the proposed new transportation corridor would be approximately 13 to 15 kilometres north of the next parallel provincial facility.

The work plan developed for the 2011/2012 additional analysis in Halton was designed specifically to address the concerns raised by stakeholders and agencies in the Halton area and included the following activities; much of the 2011/2012 additional analysis work is above and beyond what is typically done during this stage of an EA Study:

- A more detailed agricultural assessment, including consideration of economic and environmental impacts of the proposed transportation corridor as well as the likely loss of farmland that may be expected to follow as a result of urbanization pressures;

- Consideration of compatibility with municipal planning goals and objectives, as set out in Sustainable Halton as well as local municipal land use plans (i.e., Official Plans, etc.);
- A higher level of detail in the assessment of impacts to the natural environment – including consideration of locally significant features (i.e., woodlots, wetlands, etc.);
- A more detailed assessment of how Highway 401 could be incrementally widened (to 10, 12 or 14 lanes) and identification of the impacts of further widening, with mitigation to minimize property impacts;
- A more detailed assessment of how the new GTA West transportation corridor would connect to Highway 401 at new interchanges either east of Milton (at 407 ETR) or west of Milton (west of Tremaine Road, i.e., Milton urban area) including an engineering analysis of how the new interchanges would operate; and
- Improved notification and consultation with residents, agencies, municipalities and stakeholders, during study process.

The work plan was presented to municipal and regulatory agencies, as well as representatives from various stakeholder groups in the study area at the outset of the 2011/2012 additional analysis in early January 2012 to provide stakeholders with an opportunity to comment on and provide input to the additional work as it was initiated. Details of consultation during the 2011/2012 additional analysis are described further in Section 7.8. Input received from these sessions was taken into consideration and adjustments to the work plan and study process were made as appropriate.

Ongoing Highway 401 Environmental Assessment and Preliminary Design Studies

It is noted that MTO is currently undertaking two Class EA / Preliminary Design (Class EA / PD) Studies along Highway 401 which fall within the GTA West project limits – one study is from west of Regional Road 25 to east of Trafalgar Road, and the other is from east of Trafalgar Road to Credit River.

While there is ongoing coordination between the Highway 401 Class EA / PD Studies Study Team and the GTA West

EA Study Study Team, the Highway 401 studies and the GTA West study follow separate processes and have different objectives. The purpose of the Highway 401 EA / PD Studies is to identify long term widening requirements to service the Highway 401 corridor only, whereas the GTA West EA Study is looking at long term needs to service the broader area in the GTA. The evaluation of impacts and the recommendation from the GTA West EA Study will build on the recommended improvements identified in the two Highway 401 EA / PD Studies.

Under the Highway 401 Class EA / PD from west of Regional Road 25 to east of Trafalgar Road, it is proposed that Highway 401 be widened to 12 express-collector lanes east of James Snow Parkway and to 10 lanes west of James Snow Parkway to Regional Road 25. The recommendation was presented at the second Public Information Centre in March 2011.

Under the Highway 401 Class EA / PD from east of Trafalgar Road to the Credit River, it is proposed that Highway 401 be widened to a 12-lane express-collector system between east of Trafalgar Road to the Credit River, with the exception of Highway 401 at the Highway 401/407 ETR interchange area, which will be widened to 10 lanes. The recommended alternative was presented to the public at the second Public Information Centre in October 2012.

2011/2012 Additional Work in Halton Area and Alternatives Considered

The additional analysis focused on the assessment of two significantly different alternatives, descriptively, the “further widening of Highway 401” or a “new corridor” alternative through Halton Hills as shown in Exhibit 5-1.

It was assumed that initiatives under the Group #1 and Group #2 alternatives, as well as the proposed new transportation corridor between Highway 400 and east of the Halton-Peel boundary as recommended in the Draft Strategy (February 2011), remained unchanged and would be carried forward into Stage 2 of the EA Study.

The criteria used in the initial evaluation and 2010 evaluation

(as documented in Chapter 4) were used as a basis for the evaluation criteria of the 2011/2012 additional analysis in the Halton area. Where possible, additional quantitative measures were introduced to assess the impacts of each alternative.

In order to provide a higher level of detail for the new corridor alternative, a range of quantitative impacts were determined based on representative east-west routes in the analysis area. The representative routes were located in the north, middle and south portions of the analysis area and were generated strictly for the purpose of identifying a quantitative range of impacts for the east/west portion of the corridor. Quantitative impacts in the north-south transportation corridor to Highway 401/407 ETR were measured in a similar manner. The range of impacts is approximate only and will be superseded as the EA study proceeds to Stage 2, where the preferred route of the proposed new transportation corridor will be selected.

The range of impacts associated with the “further widening of Highway 401” alternative were measured based on preliminary cross-sections developed for both a 12 or 14 lane Highway 401 as an express-collector system with provision for HOV lanes.

All impacts were measured to assume completion of the widening that is currently being planned by MTO in the Highway 401 EA / PD studies (i.e., beyond the 12 and 10 lanes as described above). The widening was assumed to be along the existing centerline of Highway 401 (i.e., widening to both the north and south sides of the highway); however, this will also be considered further in subsequent planning for this improvement.

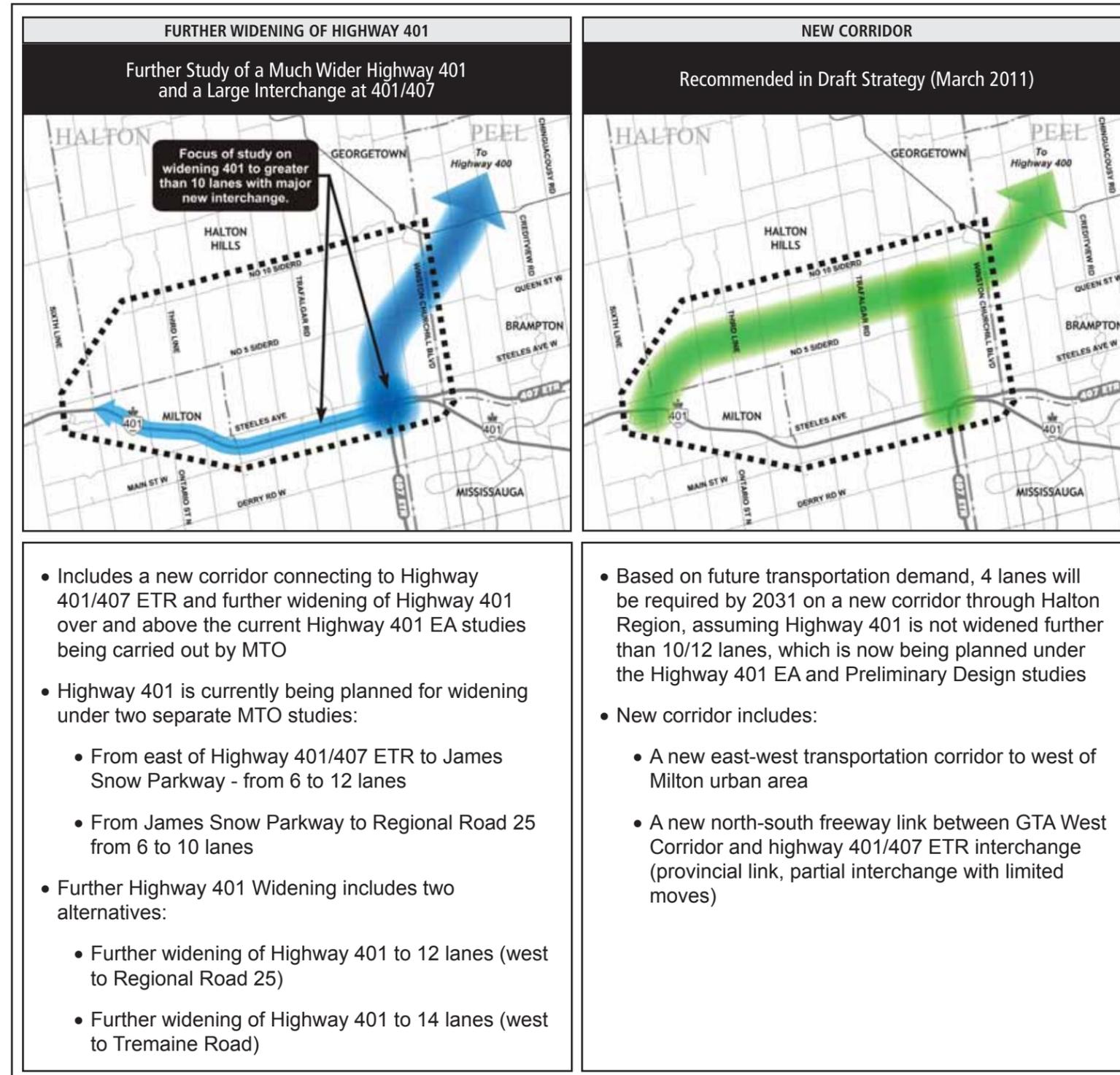


Exhibit 5-1: Further Widening of Highway 401 vs. New Corridor Alternatives as Part of 2011/2012 Additional Analysis in Halton Area

The following sections describe the 2011/2012 methodology and findings for each factor group, including:

- **Section 5.2** – Natural Environment
- **Section 5.3** – Social Environment (Community and Agriculture)
- **Section 5.4** – Cultural Environment
- **Section 5.5** – Economy
- **Section 5.6** – Transportation
- **Section 5.7** – Road Design, Constructability and Cost

5.2 ADDITIONAL ANALYSIS IN THE HALTON AREA – NATURAL ENVIRONMENT

5.2.1 Methodology

With the intent to providing a higher level of detail on the natural environment evaluation, the Study Team identified locally significant features and carried out a roadside reconnaissance within the focused area in Halton, to confirm the secondary source information available. The Study Team used secondary source information (i.e. mapping, aerial photography, documentation, other studies/reports, websites, etc.) obtained from agencies (e.g., Conservation Authorities, Niagara Escarpment Commission), ministries (MNR) and municipalities to map existing natural environment features in accordance with the revised criteria under natural environment. More detailed environmental field work will continue to be carried out during the next stage of the EA process for the selected corridor.

There are several considerations regarding potential challenges and limitations of the data and information used to support this further assessment and evaluation in Halton area:

- The Stage 1 assessment is based on secondary source information, which is appropriate given the broad scale and high-level strategic planning nature of this stage. Field surveys will be a major component during Stage 2 of the EA and this more detailed information will guide the finer levels of route planning and design. As such,

this revised assessment continues to be based on readily available information received from the province and technical agencies.

- Rare species information obtained from the MNR’s Natural Heritage Information Centre (NHIC) database was used to inform the sensitivity and significance of habitats potentially affected by the transportation planning alternatives. However, rare species information has certain limitation for use in the assessment and evaluation. Records of rare species occurrences depend greatly on where surveys are undertaken and particular survey methods. On such a broad / regional scale, high densities of rare species occurrences may be a function of surveys being preferentially targeted in certain areas (e.g. an abundance of information is available for areas of the Niagara Escarpment). The absence of rare species records does not necessarily mean that rare species are not present. Therefore, while rare species information was useful where it was present, a lack of information was not interpreted as an absence of rare species and, as such, caution was applied in using this information. Additionally records of Species at Risk (SAR) sighting locations in the NHIC database are presented in a generalized manner across a large area. Although one area may be recorded as being a potential habitat for SAR, it does not suggest that the whole area is a habitat for that species.

Recognizing that Stage 1 of the EA process identifies wide corridors (i.e., the new corridor section in this Halton study area is approximately 3 to 4 kilometres wide), the Study Team acknowledges that not every natural feature in the corridor would be impacted by future routes, and that some features could be avoided in the next stage of the EA, when route planning and generation of design alternatives will occur. In other instances, it was apparent that the natural feature was so large that the entire width of the corridor (or study area) crossed it and could not be avoided (i.e. Middle Sixteen Mile Creek). These types of distinctions about the magnitude of potential impacts and the likelihood of avoidance or mitigation were noted in the evaluation tables. Although significant natural features could be named and in some cases counted or “measured” to provide a comparison between the alternatives, other criteria required a qualitative assessment of potential impacts or benefits at a higher level of detail. Names of the most significant / largest features potentially impacted

by each alternative were documented in the evaluation tables. Exhibit 5-2 provides a summary of the natural environment features in the Halton area, and Exhibit 5-3 documents the detailed evaluation findings under natural environment criteria.

5.2.2 Findings

Fish and Fish Habitat

As shown in the table below, the further widening of Highway 401 Alternatives have a higher potential to impact the largest number of watercourse crossings – partly because several watercourses meander through the existing highway corridor and need to be crossed at several locations, including at interchanges. Although differing in the number of watercourse crossings, all alternatives impact the same named watercourses including: the main Sixteen Mile Creek branch, Middle and East Sixteen Mile Creek and Levi’s Creek, in addition to the numerous unnamed tributaries. The New Corridor Alternative potentially impacts a greater number of aquatic SAR inhabited watercourses.

FISH AND FISH HABITAT	FURTHER 401 WIDENING TO 12 LANES	FURTHER 401 WIDENING TO 14 LANES	NEW CORRIDOR
Potential Impact to Watercourses (#)	37	39	27-32
Potential Impact to Aquatic SAR inhabited Watercourses (#)	16	18	16-19

Terrestrial Ecosystems

The table below shows that the further widening of Highway 401 Alternatives have the highest potential to impact a number of evaluated wetland complexes that have been identified by MNR as significant ecological areas. Although all three alternatives potentially impact the same number of provincially significant wetlands, the Highway 401 Widening alternatives each have a potential to impact wetlands of local / regional significance. The New Corridor Alternative will potentially impact one significant woodland, while both Highway 401 Widening Alternatives show no potential impacts to significant woodlands. All alternatives avoid potential impacts to deer wintering areas by avoiding encroachment into the Hilton Falls Conservation Area. Finally, of the three alternatives, the New Corridor Alternative potentially impacts the least number of Fauna SAR habitats. While the New Corridor Alternative possesses the least quantifiable potential impacts to terrestrial ecosystems, it could create a significant barrier to the natural environment and to wildlife movements. As a result, the Highway 401 Widening Alternatives have been determined to have the least potential impact to terrestrial ecosystems.

TERRESTRIAL ECOSYSTEMS	FURTHER 401 WIDENING TO 12 LANES	FURTHER 401 WIDENING TO 14 LANES	NEW CORRIDOR
Potential Impact to Provincially Significant Wetlands (#)	1	1	1
Potential Impact to Locally / Regionally Significant Wetlands (#)	1	1	0
Potential Impact to Significant Woodlands (#)	0	0	1
Potential Impact to Fauna SAR (#)	6	6	4

Groundwater

All three alternatives cross through areas characterized by a moderate level of permeability for groundwater recharge. All alternatives potentially impact the same number of wellhead protection areas located between both the Kelso Lake and Hilton Falls Conservation Areas.

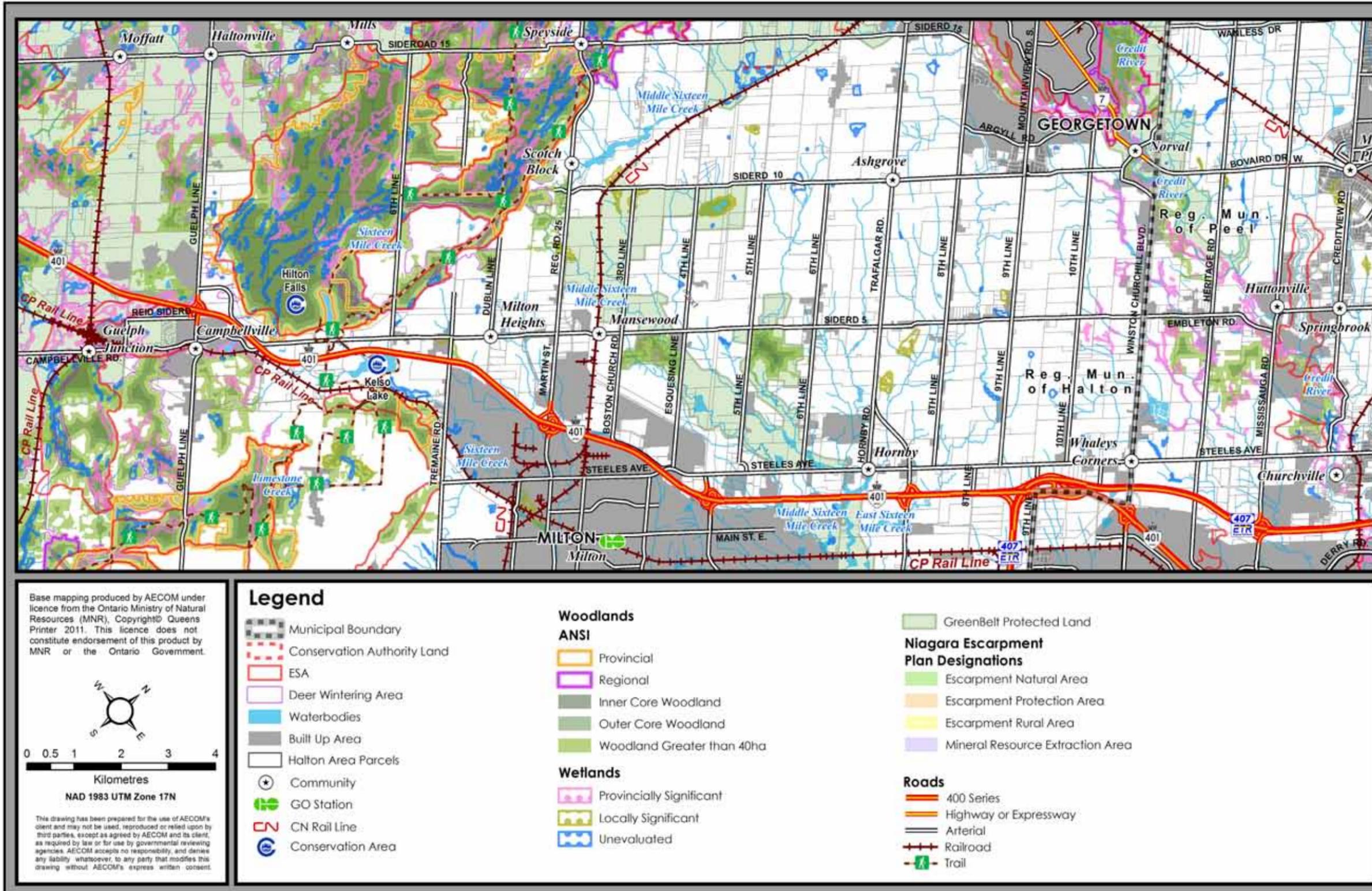
Surface Water

The two Highway 401 Widening Alternatives have a reduced potential impact to surface water in comparison to the New Corridor Alternative. This is due to the reduced amount of new pavement; the 12-Lane Highway 401 Widening Alternative has the least amount of new pavement compared against all alternatives. However, both Highway 401 Widening alternatives present fewer opportunities to integrate natural stormwater management features within the existing highway right-of-way. The New Corridor Alternative has the greatest potential impact to surface water due to the construction of a new highway, but also has the greatest potential to accommodate stormwater management through natural design features (i.e., swales, ponds, etc.) within the highway right-of-way.

Designated Areas

The New Corridor Alternative presents the greatest potential impact to designated areas as it creates new crossings of the Niagara Escarpment and Greenbelt protected lands; however, these crossings will occur at the fringes of those areas. The New Corridor Alternative also results in one new crossing of the Greenbelt at Middle Sixteen Mile Creek. The Highway 401 Widening Alternatives include minor impacts to both the Niagara Escarpment and Greenbelt protected lands. These minor impacts would only be to the lands abutting the existing Highway 401 right-of-way.

Exhibit 5-2 Natural Environment Existing Conditions and Constraints Map in Halton Area



FACTOR	SUB-FACTOR AND MEASURE	FURTHER 401 WIDENING TO 12 LANES 	FURTHER 401 WIDENING TO 14 LANES 	NEW CORRIDOR 
1.0 NATURAL ENVIRONMENT FACTORS*				
Fish and Fish Habitat	Fish Habitat <i>Measure:</i> Quantitative assessment of fisheries and aquatic habitats using the presence and density of watercourses and aquatic Species at Risk (SAR) as indicators.	Total Individual Watercourses Impacted: 26 Total Watercourse Crossings: 37 Watercourse Crossings Possibly Avoided: No crossings can be avoided. Warm Watercourse Crossings: 16 Cold Watercourse Crossings: 1 Cool Watercourse Crossings: 13 Unknown Temperature Watercourse Crossings: 2 Waterbodies Crossed: 5 Additional Fish habitat (Watercourses and Waterbodies) within 50 m (Adjacent lands): 4 Named Watercourses and Waterbodies crossed: <ul style="list-style-type: none"> • Sixteen Mile Creek and its unnamed tributaries • Middle Sixteen Mile Creek and its unnamed tributaries • East Sixteen Mile Creek and its unnamed tributaries • Unnamed tributaries of Levi's Creek • Kelso Lake 	Total Individual Watercourses Impacted: 32 Total Watercourse Crossings: 39 Watercourse Crossings Possibly Avoided: No crossing can be avoided Warm Watercourses Crossings: 17 Cold Watercourses Crossings: 1 Cool Watercourses Crossings: 31 Unknown Temperature Watercourses Crossings: 2 Waterbodies Crossed: 11 Additional Fish habitat (Watercourses and Waterbodies) within 50 m (Adjacent lands): 5 Named Watercourses and Waterbodies crossed: <ul style="list-style-type: none"> • Sixteen Mile Creek and its unnamed tributaries • Middle Sixteen Mile Creek and its unnamed tributaries • East Sixteen Mile Creek and its unnamed tributaries • Unnamed tributaries of Levi's Creek • Kelso Lake 	Total Individual Watercourses: 25 – 28 Total Watercourse Crossings: 27 – 32 Water Crossings Possibly Avoided: 0 – 3 Warm Watercourses Crossings: 8 – 12 Cold Watercourses Crossings: 8 – 10 Cool Watercourses Crossings: 9 Unknown Temperature Watercourses Crossings: 2 Waterbodies Crossed: 3 – 4 Additional Fish habitat (Watercourses and Waterbodies) within 50 m (Adjacent lands): 1 – 3 Named Watercourses and Waterbodies crossed: <ul style="list-style-type: none"> • Unnamed tributaries of Sixteen Mile Creek • Middle Sixteen Mile Creek and its unnamed tributaries • Unnamed tributaries of East Sixteen Mile Creek • Unnamed tributaries of Credit River • Kelso Lake • Levi's Creek and its unnamed tributaries
	Fish Community <i>Measure</i> Quantitative assessment of the presence and density of watercourses and aquatic Species at Risk (SAR) based on DFO Mapping.	Habitats with aquatic SAR presence: 16 Additional aquatic SAR Habitat within 50 m (Adjacent Lands): 2	Habitats with aquatic SAR presence: 18 Additional aquatic SAR Habitat within 50 m (Adjacent Lands): 2	Habitats with aquatic SAR presence: 16 – 19 Additional aquatic SAR Habitat within 50 m (Adjacent Lands): 3 – 4

Exhibit 5-3: Natural Environment Evaluation (2011 / 2012)

FACTOR	SUB-FACTOR AND MEASURE	<p>FURTHER 401 WIDENING TO 12 LANES</p> 	<p>FURTHER 401 WIDENING TO 14 LANES</p> 	<p>NEW CORRIDOR</p> 
Terrestrial Ecosystems	<p>1.2.1 Wetlands</p> <p><u>Measure:</u> Quantitative assessment of the wetland units based on density and classification including qualitative assessment of potential to avoid or mitigate impacts.</p>	<p>Wetland impacts:</p> <ul style="list-style-type: none"> • Provincially Significant: 1 <ul style="list-style-type: none"> • Levi's Creek Wetlands (touches in 2 locations) • Additional PSWs within 120 m: 1 <ul style="list-style-type: none"> • Levi's Creek Wetlands (touches in 2 more locations) • Locally Significant: 1 <ul style="list-style-type: none"> • Milton Heights Marsh • Additional LSWs within 50 m: 0 • Unevaluated: 1 	<p>Wetland impacts:</p> <ul style="list-style-type: none"> • Provincially Significant: 1 <ul style="list-style-type: none"> • Levi's Creek Wetlands (touches in 2 locations) • Additional PSWs within 120 m: 1 <ul style="list-style-type: none"> • Levi's Creek Wetlands (touches in 2 more locations) • Locally Significant: 1 <ul style="list-style-type: none"> • Milton Heights Marsh • Additional LSWs within 50 m: 0 • Unevaluated: 1 	<p>Wetland impacts:</p> <ul style="list-style-type: none"> • Provincially Significant: 1 <ul style="list-style-type: none"> • Levi's Creek Wetlands • Additional PSWs within 120 m: 1 <ul style="list-style-type: none"> • Levi's Creek Wetlands (touches 1-2 additional locations) • Locally Significant: 0 • Additional LSWs within 50 m: 0 • Unevaluated: 2
	<p>1.2.2 Woodlands and Other Vegetated Areas (e.g., forest stands, woodlots, interior forest habitat, and significant woodlands)</p> <p><u>Measure:</u> Quantitative assessment of impacts to woodlots greater than 40 ha in size using linear distance impacts as indicators.</p>	<p>No Woodlands are affected by 4-2 Alt 1.</p> <p>Within 50 m (Adjacent Lands): 0</p>	<p>No Woodlands are affected by 4-2 Alt 2.</p> <p>Within 50 m (Adjacent Lands): 0</p>	<p>Impacted Woodlots Combined:</p> <ul style="list-style-type: none"> • Directly Impacted: 0 – 1 <p>Additional Woodlands Within 50 m (Adjacent Lands): 0</p>
	<p>1.2.3 Wildlife Habitats and Movements (including Species at Risk (SAR))</p> <p><u>Measure:</u> Quantitative assessment of the nature, significance, and sensitivity of impacted significant wildlife habitats and landscape connectivity based on presence and density of SAR known wildlife use (e.g., deer wintering, waterfowl staging, etc.) and landscape – level habitat connectivity.</p>	<p>Deer Wintering Areas: 0</p> <p>Within 50 m (Adjacent Lands): 0m</p> <p>Endangered SAR (S-Rank = 1): 0</p> <p>Threatened SAR (S-Rank = 2): 3</p> <ul style="list-style-type: none"> • Jefferson Salamander • Jefferson X Blue-spotted Salamander • Redside Dace <p>Vulnerable SAR (S-Rank = 3): 3</p> <ul style="list-style-type: none"> • Eastern Ribbonsnake • Milksnake • Snapping Turtle 	<p>Deer Wintering Areas: 0</p> <p>Within 50 m (Adjacent Lands): 0m</p> <p>Endangered SAR (S-Rank = 1): 0</p> <p>Threatened SAR (S-Rank = 2): 3</p> <ul style="list-style-type: none"> • Jefferson Salamander • Jefferson X Blue-spotted Salamander • Redside Dace <p>Vulnerable SAR (S-Rank = 3): 3</p> <ul style="list-style-type: none"> • Eastern Ribbonsnake • Milksnake • Snapping Turtle 	<p>Deer Wintering Areas: 0</p> <p>Within 50 m (Adjacent Lands): 0m</p> <p>Endangered SAR (S-Rank = 1): 0</p> <p>Threatened SAR (S-Rank = 2): 2</p> <ul style="list-style-type: none"> • Jefferson X Blue-spotted Salamander • Redside Dace <p>Vulnerable SAR (S-Rank = 3): 2</p> <ul style="list-style-type: none"> • Milksnake • Snapping Turtle

FACTOR	SUB-FACTOR AND MEASURE	FURTHER 401 WIDENING TO 12 LANES 	FURTHER 401 WIDENING TO 14 LANES 	NEW CORRIDOR 
1.3 Groundwater	Areas of Groundwater Recharge and Discharge <i>Measure:</i> Qualitative assessment based on soil type and permeability to identify areas of high, moderate, and low groundwater recharge capability including consideration of number and location of groundwater recharge and discharge areas.	Soil types near existing highways in the widening sections are generally characterized by a low to moderate level of permeability. Soils along the new corridor section are characterized by a moderate level of permeability for groundwater recharge capability.	Soil types near existing highways in the widening sections are generally characterized by a low to moderate level of permeability. Soils along the new corridor section are characterized by a moderate level of permeability for groundwater recharge capability.	Soil types near existing highways in the widening sections are generally characterized by a low to moderate level of permeability. Soils along the new corridor section are characterized by a moderate level of permeability for groundwater recharge capability.
1.4 Surface Water	1.3.2 Groundwater Source Areas and Wellhead Protection Areas <i>Measure:</i> Wellhead protection areas that are potentially affected and their location.	Wellhead Protection Areas: <ul style="list-style-type: none"> • 100 Year Milton WPA • 10 Year Milton WPA • 2 Year Milton WPA • 100 Day Milton WPA 	Wellhead Protection Areas: <ul style="list-style-type: none"> • 100 Year Milton WPA • 10 Year Milton WPA • 2 Year Milton WPA • 100 Day Milton WPA 	Wellhead Protection Areas: <ul style="list-style-type: none"> • 100 Year Milton WPA • 10 Year Milton WPA • 2 Year Milton WPA • 100 Day Milton WPA
1.4 Surface Water	1.4.1 Watershed / Sub-Watershed Drainage Features/Patterns <i>Measure:</i> Qualitative assessment of new pavement, based on the total linear centerline length.	Approximate Total CL Linear Length: 26.47 Limited space available for natural SWM design features in existing highway right-of-way.	Approximate Total CL Linear Length: 26.47 Limited space available for natural SWM design features in existing highway right-of-way.	Approximate CL pavement length: 22.04 -24.04 km New corridor has potential to accommodate SWM through natural design features (i.e., swales, ponds, etc.) within highway right-of-way.

Exhibit 5-3: Natural Environment Evaluation (2011 / 2012)

FACTOR	SUB-FACTOR AND MEASURE	FURTHER 401 WIDENING TO 12 LANES 	FURTHER 401 WIDENING TO 14 LANES 	NEW CORRIDOR 
1.5 Designated Areas	<p>1.5.1 Designated Areas are defined by resource agencies, municipalities, the government and/or the public, through legislation, policies, or approved management plans, to have special or unique value. Examples of Designated Areas include:</p> <ul style="list-style-type: none"> • Environmentally Sensitive Areas (ESA); • Provincially Significant Areas of Natural and Scientific Interest (ANSI); • Niagara Escarpment; • Greenbelt; • Bruce Trail. <p><i>Measure:</i> Quantitative assessment of the number, nature, and significance of designated areas potentially impacted including consideration of ability to avoid designated area or mitigate impacts.</p>	<p>ESA: 0</p> <p>Within 50 m (Adjacent Lands): 0</p> <p>ANSI: 0</p> <p>Within 50 m (Adjacent Lands): 0</p> <p>Conservation Holdings: 0</p> <p>Bruce Trail: Potential to impact 415 m (Measured along centre line of affected trail)</p> <p>Greenbelt Lands: 0m (Measured along CL of corridor)</p> <p>Niagara Escarpment Lands</p> <ul style="list-style-type: none"> • Escarpment Rural: 1.27 km • Escarpment Protection: 1.84 km 	<p>ESA: 0</p> <p>Within 50 m (Adjacent Lands): 0</p> <p>ANSI: 0</p> <p>Within 50 m (Adjacent Lands): 0</p> <p>Conservation Holdings: 0</p> <p>Bruce Trail: Potential to impact 415 m (Measured along centre line of affected trail)</p> <p>Greenbelt Lands: 0m (Measured along CL of corridor)</p> <p>Niagara Escarpment Lands</p> <ul style="list-style-type: none"> • Escarpment Rural: 1.27 km • Escarpment Protection: 1.84 km 	<p>ESA: 0</p> <p>Within 50 m (Adjacent Lands): 0</p> <p>ANSI: 0</p> <p>Within 50 m (Adjacent Lands): 0</p> <p>Conservation Holdings: 0</p> <p>Bruce Trail: Potential to impact 515 m (Measured along centre line of affected trail)</p> <p>Greenbelt Lands: 1.72 – 3.76 km (Measured along CL of corridor)</p> <p>Niagara Escarpment Lands</p> <ul style="list-style-type: none"> • Escarpment Rural: 1.03 km • Escarpment Protection: 2.64 – 2.85 km
NATURAL ENVIRONMENT SUMMARY		<p>MOST PREFERRED</p> <p>Impacts along existing Highway 401 can largely be mitigated, but new corridor section still results in some potential barrier impacts.</p>	<p>MODERATELY PREFERRED</p> <p>The built-up areas adjacent to Highway 401 make it difficult to mitigate impacts to watercourses (fisheries etc.) and difficult to manage stormwater / surface water using natural design features.</p>	<p>LESS PREFERRED</p> <p>New corridor potentially acts as a barrier to natural environment, impacts some unevaluated / locally significant wetlands and results in a new crossing of Greenbelt at Middle Sixteen Mile Creek.</p>

* Note: All Natural Environment information is collected from secondary sources (including consultation with agencies, municipalities, and the public, etc.) and will be confirmed through field investigations to be conducted during Stage 2 of the Environmental Assessment.

5.3 ADDITIONAL ANALYSIS IN THE HALTON AREA – SOCIAL ENVIRONMENT (COMMUNITY AND AGRICULTURE)

5.3.1 Methodology

Many of the comments and input received on the Draft Strategy Report (February 2011) are related to potential impacts to communities and agricultural lands. While factors in these areas have previously been included as part of the Social Environment evaluation, there was a desire for additional assessment to be carried out in the Halton area taking into consideration potential impacts to communities and agricultural lands. Therefore, an update of the social environment evaluation in Halton area focused on community features (i.e., residences, businesses and recreational areas / tourist operations). Land use and agriculture was updated through obtaining the most current land use information, as well as consultation with local stakeholders. The air quality and noise assessments were also updated to include quantitative findings.

Land Use

Land use impacts associated with each alternative were discussed and identified with local municipal staff and councillors, residents and stakeholder groups in the Halton area. Sensitive features and existing conditions were confirmed through ongoing dialogue with area stakeholders, as well as through a review of current land use planning documents, aerial photography and field reconnaissance.

Land use impacts were assessed based on existing land use and future development areas identified in the Halton Region Official Plan, "Sustainable Halton", Town of Halton Hills Official Plan and Town of Milton Official Plan. Consideration of Provincial policies such as the *Provincial Policy Statement*, *Growth Plan*, *Greenbelt Plan* and *Niagara Escarpment Plan* were included in the policy criteria. Impacts on existing land uses were assessed based on direct property impacts that would result from the three representative east-west routes and connecting link for the new corridor and the potential footprints from the Highway 401 Widening options while using aerial photography and GIS mapping.



Land use impacts were considered having regards to:

- First Nations Reserves
- First Nations Sacred Grounds
- Residential Uses
- Commercial and Industrial Uses
- Tourism Operations
- Community Facilities and Institutions
- Agricultural Uses
- Recreation Uses
- Aggregates and Mines

Noise and Air Quality

The noise and air quality work carried out as part of the additional assessment in Halton area identified "areas of influence" expected based on changes in both local air quality and noise levels using the projected traffic volumes and proposed transportation improvements associated with each alternative. The "areas of influence" represents the approximate area which could be impacted by a change in either air quality or noise levels. A number of qualifiers were used in the air quality assessment. Sensitive receptors (i.e., residences) were counted within each "area of influence" to approximate how many residences may be impacted by each alternative.

Agriculture

The additional analysis for agriculture in the Halton area included the completion of roadside reconnaissance surveys

to document the existing land use (both agricultural and non-agricultural), the location, use and condition of agricultural facilities (barns and ancillary buildings); discussions with local land owners / farm operators to determine the extent / character of agricultural uses in the area; the creation and dispersion of an agricultural information request form to select farm operators; and the assessment of Property Boundaries to document the potential extent of agricultural property fragmentation (severed parcels, land locked parcels).

Further, the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) was contacted to determine the extent of updated information for the Canada Land Inventory (CLI) soil classification ratings, Agricultural Land Use mapping and Artificial Tile Drainage mapping for Halton Region.

5.3.2 Findings

Exhibit 5-4 summarizes the socio-economic existing conditions and constraints in the Halton area, and **Exhibit 5-5** documents the detailed evaluation findings under social environment criteria.

Provincial / Federal / Municipal Land Use Planning / Goals / Objectives

All three alternatives (i.e., Widening of Highway 401 to 12 lanes, Widening of Highway 401 to 14 lanes, and New Corridor Alternatives) are consistent with the provincial goals of promoting growth and connecting communities because they are located close to future growth areas and are capable of supporting projected traffic volumes up to 2031. The New Corridor Alternative is not consistent with "Sustainable



Halton” goals nor is it recognized in local municipal official plans.

Land Use / Community

The New Corridor Alternative crosses through the community of Halton Hills, which has a rural character, with agricultural land uses, scattered residences and built heritage features.

The New Corridor Alternatives would result in a greater number of impacts to residential properties because the rural countryside in Halton Hills is scattered with clusters of rural residential properties adjacent to existing roads. The number of residential impacts is identified based on a representative 200 m wide corridor. The number of direct impacts could be reduced with a narrower corridor as part of the preliminary design stage. The New Corridor Alternatives would also consume more undisturbed land.

The community along Highway 401 in the Town of Milton is becoming increasingly built-up with residential, business and light industrial land uses. In most vacant areas along the highway corridor, future development is planned and developing rapidly.

The Further Widening of Highway 401 alternatives have fewer direct residential impacts; however, widening the existing Highway 401 corridor to 14 lanes impacts a number of existing and proposed businesses adjacent to the highway right-of-way. It also impacts important infrastructure such as storm water management facilities, parking areas and Boston Church Road. The existing Highway 401 corridor is a key economic corridor for the Town of Milton and Halton Region.

The table below summarizes the approximate number of properties impacted by each alternative.

POTENTIAL PROPERTY IMPACTS	FURTHER 401 WIDENING TO 12 LANES	FURTHER 401 WIDENING TO 14 LANES	NEW CORRIDOR
Residential Properties (#)	20	20	26 - 39
Commercial / Industrial Properties (#)	20 - 30	20 - 30	0

Note: Property impacts are approximate and based on preliminary highway widening “footprint” analysis – the number of properties impacted will be updated during route planning stage of the study.

Noise and Air Quality Impacts

Nuisance impacts from increased highway noise may occur in built-up areas along the existing Highway 401 as well as along new corridor sections. The New Corridor Alternative has the greatest potential impact to sensitive noise receptors – especially if it veers far north in the analysis area, near the residential subdivisions in southern Georgetown. Impacts may be reduced by avoiding built-up areas during the route generation and selection process in future stages of the EA. The Highway 401 Widening alternatives will have the greatest potential noise impacts to the built-up areas adjacent to the existing highway; however, some areas have existing or planned noise mitigation features in place.

Preliminary Air Quality assessment concluded that the Highway 401 Widening Alternatives would have the greatest

potential impacts towards local air quality. Specifically the 12-Lane Highway 401 Widening would have a slightly greater area of impact over the 14-Lane Highway 401 Widening due to the slower traffic flow and estimated potential congestion over time. The New Corridor Alternative had the least air quality impacts due to the optimized flow of traffic and an improved baseline for existing conditions.

The table below summarizes the approximate number of properties within the “area of influence” for noise and air quality assessments under each alternative.

POTENTIAL NOISE AND AIR QUALITY IMPACTS	FURTHER 401 WIDENING TO 12 LANES	FURTHER 401 WIDENING TO 14 LANES	NEW CORRIDOR
Potential Sensitive Noise Receptors Impacted within “Area of Influence” (e.g. # Residences)	191	191	191 - 615
Potential Air Quality Sensitive Receptors Impacted within “Area of Influence” (e.g. # Residences, Community Facilities, Recreational Areas)	22	17	0

Agriculture – Soil Impacts

The New Corridor Alternative has the greatest impacts of prime agricultural soils. Although mitigation of potential impacts to prime agricultural soils may be possible through the route generation and selection process, significant potential impacts to agricultural soils would still occur. The Highway 401 Widening Alternatives have the least potential impacts of prime agricultural soil due to the already and planned built-up areas adjacent to the existing Highway 401. The greatest potential impact of prime agricultural soils from either Highway 401 Widening Alternative would occur on the new alignment section east of Trafalgar Road.

POTENTIALLY IMPACTED PRIME AGRICULTURAL SOILS	FURTHER 401 WIDENING TO 12 LANES	FURTHER 401 WIDENING TO 14 LANES	NEW CORRIDOR
# hectares (ha) of impacted Class 1 Soil Lands	119 ha	123 ha	133 - 222 ha
# hectares (ha) of impacted Class 2 Soil Lands	0 ha	1 ha	0 ha
# hectares (ha) of impacted Class 3 Soils Lands	22 ha	23 ha	225 - 233 ha

Agriculture – Property Fragmentation

Similar to prime agricultural soil, the New Corridor Alternative would have the greatest potential impacts to agricultural property fragmentation, as shown in the table below. Although mitigation of some potential impacts may be possible through the route generation and selection process, significant potential impacts to farming due to property fragmentation would still occur. The 12-Lane 401 Widening Alternative would have the least potential impacts of agricultural properties. The impacts to agricultural properties adjacent to the existing Highway 401 would occur on the fringes of farming operations limiting the significance to those potential impacts. The greatest amount of potential farm fragmentation from the Highway 401 Widening Alternatives would occur along the new alignment section east of Trafalgar Road.

POTENTIALLY IMPACTED AGRICULTURAL PROPERTIES	FURTHER 401 WIDENING TO 12 LANES	FURTHER 401 WIDENING TO 14 LANES	NEW CORRIDOR
# Agricultural Properties Directly Impacted by Loss of Land	21	27	42 - 54
# Agricultural Properties Potentially Impacted by Severance	10	10	13 - 19

Agriculture – Facilities / Operations

The New Corridor Alternative would have the greatest number of potential impacts of agricultural facilities and operations. Although mitigation of impacts relating to loss of agricultural land or facilities is possible through the route generation and selection process, significant potential impacts would still occur. The 12-Lane Highway 401 Widening Alternative would have the least potential impacts towards agricultural facilities and operations. Most of the potential impacts to farming facilities and operations from the Highway 401 Widening Alternatives would occur along the new alignment section east of Trafalgar Road.

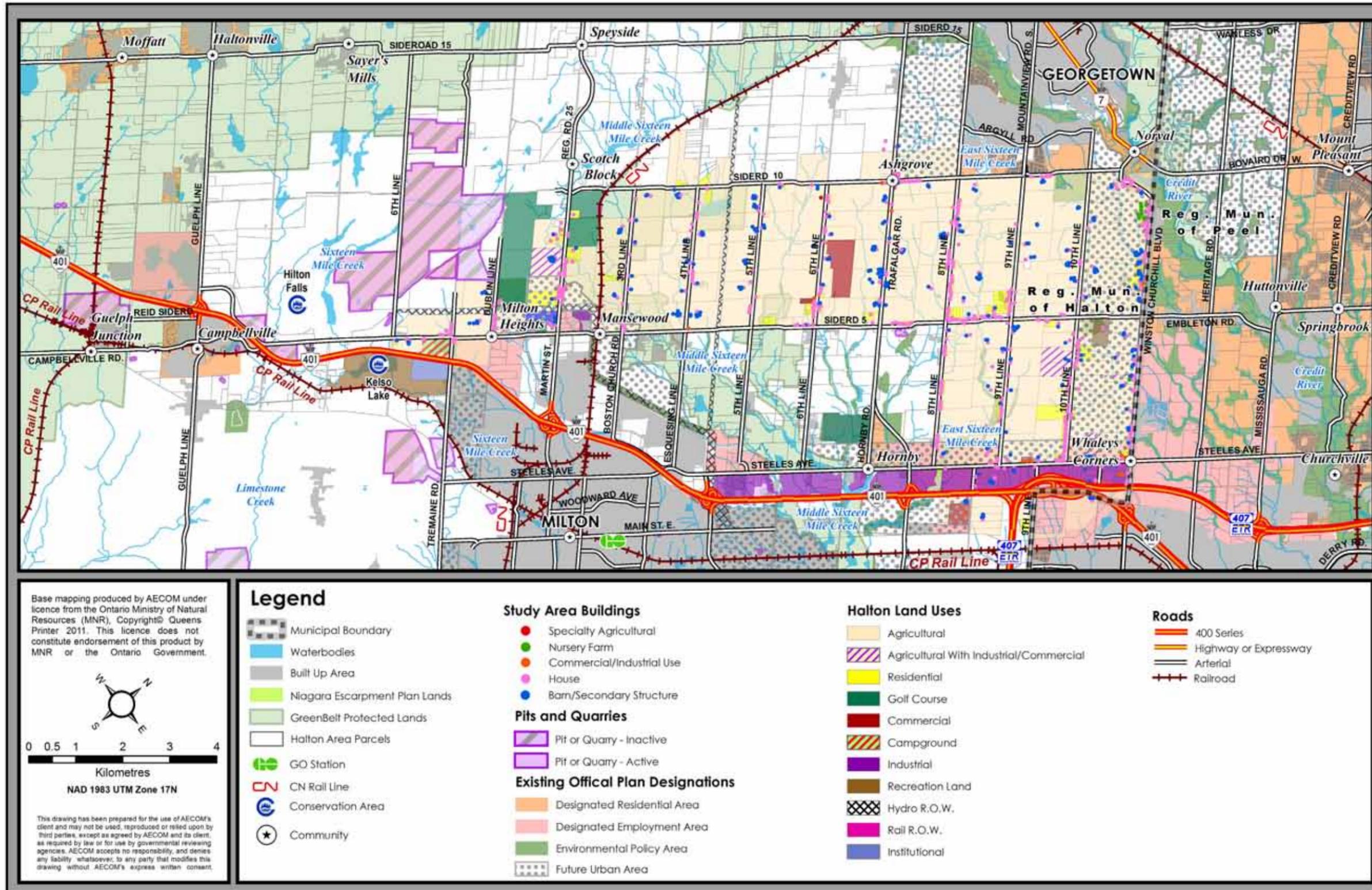
POTENTIALLY IMPACTED AGRICULTURAL FACILITIES / OPERATIONS	FURTHER 401 WIDENING TO 12 LANES	FURTHER 401 WIDENING TO 14 LANES	NEW CORRIDOR
Number of Agricultural Facilities Directly Impacted (i.e. facilities and structures)	Beef/Horse: 1 Horse: 2 Storage: 1	Beef/Horse: 1 Horse: 2 Storage: 1	Beef Feedlot: 0 – 1 Cash Crop: 1 – 2 Dairy: 0 – 2 Hobby Horse: 0 – 1 Horse: 0 – 2 Not used/derelict: 0 – 2 Poultry: 0 – 1
# hectares (ha) of Agricultural Land Use Potentially Lost	Built Up: 4.6 ha Corn: 34.5 ha Forage: 14.5 ha Grains: 8.5 ha Pasture: 9.3 ha Ploughed: 11.0 ha Unknown use: 13.7 ha Winter Wheat: 8.9 ha Woods: 1.4 ha	Built Up: 4.6 ha Corn: 37.6 ha Forage: 14.5 ha Grains: 8.5 ha Pasture: 10.4 ha Ploughed: 11.0 ha Scrubland: 0.3 ha Soybean: 0.5 ha Unknown use: 13.7 ha Winter Wheat: 8.9 ha Woods: 1.4 ha	Built Up: 10.3 – 21.5 ha Corn: 33.6 – 88.4 ha Forage: 4.1 – 70.1 ha Grains: 35.0 – 52.3 ha Open Field/scrubland: 3.0 – 24.4 ha Market Garden – Cabbage: 0 – 3.9 ha Pasture: 18.6 – 33.0 ha Ploughed: 26.3 – 54.9 ha Soybean: 35.3 – 46.0 ha Special Crop – Garden Stock: 0 – 1.4 ha Unknown use: 7.6 – 72.6 ha Winter Wheat: 7.6 – 40.3 ha Woods: 25.9 – 55.1 ha

Recreational Lands

The New Corridor Alternative impacts several private recreational areas including a golf course, and campground on the west side of Milton.

All three alternatives would potentially impact adjacent conservation lands (e.g., Kelso Lake Conservation Area, Country Heritage Park, Bruce Trail) with the New Corridor Alternative having slightly greater potential impacts of these facilities.

Exhibit 5-4: Socio-Economic Existing Conditions and Constraints Map in Halton Area



FACTOR	SUB-FACTOR AND MEASURE	FURTHER 401 WIDENING TO 12 LANES 	FURTHER 401 WIDENING TO 14 LANES 	NEW CORRIDOR 
2.0 SOCIO-ECONOMIC ENVIRONMENT FACTORS (COMMUNITY, AGRICULTURE AND LAND USE) *				
2.1 Land Use Planning Policies	2.1.1 Provincial / Federal land use planning / goals / objectives <u>Measures:</u> <i>Qualitative assessment of ability to support federal/provincial land use policies, plans, goals and objectives.</i>	Consistent with <i>Growth Plan</i> – connecting Growth Areas and providing infrastructure up to 2031, however this alternative will be unable to support growth beyond 2031. Consistent with PPS – Ensuring efficient use of existing and planned infrastructure (1.6.5.2). Ensuring that necessary infrastructure will be available to meet existing needs, however it will not be able to meet projected future needs (1.6.6.1). Impact of agricultural resources considered within Economic Prosperity (1.7).	Consistent with <i>Growth Plan</i> – connecting Growth Areas and providing infrastructure up to and beyond 2031. Consistent with PPS – Ensuring efficient use of existing and planned infrastructure (1.6.5.2). Ensuring that necessary infrastructure will be available to meet current and future needs (1.6.6.1). Impact of agricultural resources considered within Economic Prosperity (1.7).	Consistent with <i>Growth Plan</i> – connecting Growth Areas and providing infrastructure beyond 2031. Consistent with PPS – ensuring that necessary infrastructure will be available to meet future needs, planned corridor (1.6.6.1). Impact of agricultural resources considered within Economic Prosperity (1.7).
	2.1.2 Municipal land use planning policies / goals / objectives <u>Measures:</u> <i>Qualitative assessment of potential to support municipal Official Plans.</i>	Regional and Local Plans protect agriculture but recognize future growth needs. Focus on 'landscape permanence' deals primary with 'landscape character'. Infrastructure is permitted in Agricultural Area. Consistent with Sustainable Halton goals in preserving agricultural lands, potential aggregate sites, and planned employment areas. Although not directly mentioned in local municipal plans, expectations of an expanded Highway 401 are recognized.	Regional and Local Plans protect agriculture but recognize future growth needs. Focus on 'landscape permanence' deals primary with 'landscape character'. Infrastructure is permitted in Agricultural Area. Consistent with Sustainable Halton goals in preserving agricultural lands, potential aggregate sites, and planned employment areas. Although not directly mentioned in local municipal plans, expectations of an expanded Highway 401 are recognized.	Regional and Local Plans protect agriculture but recognize future growth needs. Focus on 'landscape permanence' deals primary with 'landscape character'. Infrastructure is permitted in Agricultural Area. Not consistent with Sustainable Halton goals and new GTA West transportation corridor is not recognized in local municipal Official Plans.
2.2 Land Use / Community	2.2.1 Indian Reserves <u>Measures:</u> <i>Qualitative assessment of potential to avoid Indian Reserves.</i>	Potential impacts to First Nation Native reserves will be identified through discussions with First Nations as the study progresses. No First Nations reserves within study area.	Potential impacts to First Nation Native reserves will be identified through discussions with First Nations as the study progresses. No First Nations reserves within study area.	Potential impacts to First Nation Native reserves will be identified through discussions with First Nations as the study progresses. No First Nations reserves within study area.
	2.2.2 First Nations Sacred Grounds <u>Measure:</u> <i>Qualitative assessment of potential to avoid First Nation Sacred grounds.</i>	Potential impact to First Nation Sacred Grounds will be identified through discussions with First Nations as the study progresses. Secondary source information indicates potential for First Nations Sacred Grounds.	Potential impact to First Nation Sacred Grounds will be identified through discussions with First Nations as the study progresses. Secondary source information indicates potential for First Nations Sacred Grounds.	Potential impact to First Nation Sacred Grounds will be identified through discussions with First Nations as the study progresses. Secondary source information indicates high potential for First Nations Sacred Grounds.
	2.2.3 Residential (Urban and Rural) <u>Measure:</u> <i>Quantitative assessment of potential impacts to urban and rural residential areas, using number of areas affected and potential to avoid or mitigate impacts.</i>	Residential Properties (direct impact): 20	Residential Properties (direct impact): 20	Residential Properties (direct impact): 26 – 39

Exhibit 5-5: Socio-Economic Environment Evaluation (2011 / 2012)

FACTOR	SUB-FACTOR AND MEASURE	FURTHER 401 WIDENING TO 12 LANES 	FURTHER 401 WIDENING TO 14 LANES 	NEW CORRIDOR 
	2.2.4 Commercial / Industrial <i>Measure:</i> Quantitative assessment of potential to impact commercial and industrial areas using estimated number of properties/industrial parks potentially impacted as indicator.	Commercial/Industrial Properties (direct impact): 20 - 30	Commercial/Industrial Properties (direct impact): 20 - 30	No/Minor Impacts to existing Commercial & Industrial (see tourist operations). Would impact future commercial development at Dublin Line (on north side of Highway 401).
	2.2.5 Tourism Operations <i>Measure:</i> Quantitative assessment of potential impacts or ways to support tourist areas and attractions in the study area. The number of tourist areas and attractions impacted.	Tourism Operations: 3 <ul style="list-style-type: none"> Country Heritage Park Commercial Campground Kelso Lake Conservation Area 	Tourism Operations: 3 <ul style="list-style-type: none"> Country Heritage Park Commercial Campground Kelso Lake Conservation Area 	Tourism Operations: 5 <ul style="list-style-type: none"> Golf Course Sport's Club Country Heritage Park Campground Kelso Lake Conservation Area
	2.2.6 Community Facilities / Institutions <i>Measure:</i> Quantitative assessment of potential impacts to major community facilities and institutions using approximate number and type.	Community Facilities: 0	Community Facilities: 1 <ul style="list-style-type: none"> Kingdom Hall of Jehovah's Witnesses (indirectly impacted from changes to Boston Church Road) 	Community Facilities/Institutions: 0 - 1 <ul style="list-style-type: none"> Modern Church
2.3 Noise	2.3.1 Transportation Noise <i>Measure:</i> Quantitative description of impacted noise receptors, locations of increased noise, and the magnitude / severity of impacts.	Potential Sensitive Noise Receptors: 191	Potential Sensitive Noise Receptors: 191	Potential number of sensitive noise receptors impacted: 191 - 615
2.4 Air	2.4.1 Local and Regional air quality impacts; greenhouse gas emissions. <i>Measure:</i> Quantitative assessment of potentially impacted sensitive receptors to various levels of air pollution.	Potential Air Quality Sensitive Receptors: 22	Potential Air Quality Sensitive Receptors: 17 Wider Highway 401 provides better traffic flow, which reduces air quality impacts slightly.	Sensitive air receptors are not impacted by this alternative.
	2.4.2 Incremental annual amounts of air pollutants (air contaminants emitted into the region for the horizon year).	Slight increase in network-wide, peak hour VKT and pollutant emissions in overall region for horizon year.	Slight increase in network-wide, peak hour VKT and pollutant emissions in overall region for horizon year.	Slight increase in network-wide, peak hour VKT and pollutant emissions in overall region for horizon year.
	2.4.3 Incremental annual amounts of greenhouse gases emitted per annum for the horizon year.	Slight increase in network-wide, peak hour VKT and GHG emissions per annum and for horizon year.	Slight increase in network-wide, peak hour VKT and GHG emissions per annum and for horizon year.	Slight increase in network-wide, peak hour VKT and GHG emissions, per annum and for horizon year.

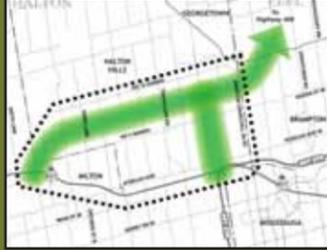
FACTOR	SUB-FACTOR AND MEASURE	<p>FURTHER 401 WIDENING TO 12 LANES</p> 	<p>FURTHER 401 WIDENING TO 14 LANES</p> 	<p>NEW CORRIDOR</p> 
2.5 Land Use / Resources	<p>2.5.1 First Nations Treaty Rights and Interests or Use of Land and Resources for Traditional Purposes.</p> <p><u>Measure:</u> Potential to impact FN Treaty rights and interests or use of land and resources for traditional purposes (e.g., hunting fishing, harvesting food and medicinal plants, etc.).</p>	<p>The potential to impact First Nations Treaty Rights and Interests or use of land and resources for traditional purposes will be confirmed through discussions with First Nations as part of the EA process.</p>	<p>The potential to impact First Nations Treaty Rights and Interests or use of land and resources for traditional purposes will be confirmed through discussions with First Nations as part of the EA process.</p>	<p>The potential to impact First Nations Treaty Rights and Interests or use of land and resources for traditional purposes will be confirmed through discussions with First Nations as part of the EA process.</p>
	<p>2.5.2 Agriculture</p> <p><u>Measure:</u> Quantitative assessment of potential impacts to prime agricultural lands outside of future development areas and woodlots, measured by GIS calculated area of CLI (Class 1-3) agricultural lands. Quantitative assessment of the number of agricultural properties directly impacted by loss of land. Quantitative assessment of the number of agricultural properties directly impacted through severance of property. Quantitative assessment of the number of agricultural facilities directly impacted. Quantitative assessment of hectares (ha) of agricultural land use lost.</p>	<p>Affected Soil Classes Total Class 1 = 119.1 ha Total Class 3 = 21.5 ha</p> <p>Note: Most agricultural impacts for widening alternatives occur on new alignment section east of Trafalgar Road.</p> <p>Agricultural Properties: 21</p> <p>Severed Agricultural Properties: 10</p> <p>Agricultural Facilities Beef/Horse: 1 Horse: 2 Storage: 1</p> <p>Agricultural Properties by Categories Built Up: 4.6 ha Corn: 34.5 ha Forage: 14.5 ha Grains: 8.5 ha Pasture: 9.3 ha Ploughed: 11.0 ha Unknown use: 13.7 ha Winter Wheat: 8.9 ha Woods: 1.4 ha</p>	<p>Affected Soil Classes Total Class 1 = 122.6 ha Total Class 2 = 0.5 Total Class 3 = 22.5 ha</p> <p>Note: Most agricultural impacts for widening alternatives occur on new alignment section east of Trafalgar Road.</p> <p>Agricultural Properties: 27</p> <p>Severed Agricultural Properties: 10</p> <p>Agricultural Facilities Beef/Horse: 1 Horse: 2 Storage: 1</p> <p>Agricultural Properties by Categories Built Up: 4.6 ha Corn: 37.6 ha Forage: 14.5 ha Grains: 8.5 ha Pasture: 10.4 ha Ploughed: 11.0 ha Scrubland: 0.3 ha Soybean: 0.5 ha Unknown use: 13.7 ha Winter Wheat: 8.9 ha Woods: 1.4 ha</p>	<p>Affected Soil Classes Total Class 1: 133.3 – 221.7 ha Total Class 3: 233.4 - 225.0 ha Total Class 4: 0 - 1.7 ha Total Class 7: 0 – 3.0 ha</p> <p>Agricultural Properties: 42 – 54</p> <p>Severed Agricultural Properties: 13 – 19</p> <p>Agricultural Facilities Beef Feedlot: 0 – 1 Cash Crop: 1 – *2 (*1 of 2 unused) Dairy: 0 – 2 Hobby Horse: 0 – 1 Horse: 0 – 2 Not used/derelict: 0 – 2 Poultry (Old): 0 – 1</p> <p>Agricultural Properties by Categories Built Up: 10.3 – 21.5 ha Corn: 33.6 – 88.4 ha Forage: 4.1 – 70.1 ha Grains: 35.0 – 52.3 ha Open Field, scrubland: 3.0 – 24.4 ha Market Garden – Cabbage: 0 – 3.9 ha Pasture: 18.6 – 33.0 ha Ploughed: 26.3 – 54.9 ha Soybean: 35.3 -46.0 ha Special Crop – Garden Stock: 0 – 1.4 ha Unknown use: 7.6 – 72.6 ha Winter Wheat: 7.6 – 40.3 ha Woods: 25.9 – 55.1ha</p>

Exhibit 5-5: Socio-Economic Environment Evaluation (2011 / 2012)

FACTOR	SUB-FACTOR AND MEASURE	FURTHER 401 WIDENING TO 12 LANES 	FURTHER 401 WIDENING TO 14 LANES 	NEW CORRIDOR 
	2.5.3 Recreational Lands and Natural Areas of Provincial Significance (e.g. national / provincial parks, conservation areas, major trails) <u>Measure:</u> Number of parks and recreational areas potentially affected.	No Provincial or Regional Parks affected. <u>Recreational Areas: 4</u> <ul style="list-style-type: none"> Bruce Trail Kelso Lake Conservation Area Commercial Campgrounds Country Heritage Park 	No Provincial or Regional Parks affected. <u>Recreational Areas: 4</u> <ul style="list-style-type: none"> Bruce Trail Kelso Lake Conservation Area Commercial Campgrounds Country Heritage Park 	No Provincial Parks affected. <u>Recreational Lands Impacted: 4 - 6</u> <ul style="list-style-type: none"> Bruce Trail Sport's Club Campground Kelso Lake Conservation Area Commercial Campgrounds Country Heritage Park
	2.5.4 Aggregate and Mines <u>Measure:</u> Number of pits and quarries potentially affected and their current status.	<u>Pit/Quarry: 1</u> <ul style="list-style-type: none"> Inactive quarry potentially impacted 	<u>Pit/Quarry: 1</u> <ul style="list-style-type: none"> Inactive quarry potentially impacted 	No aggregates or mines have the potential to be impacted.
2.6 Municipal Services	2.6.1 Major Utility Transmission Corridors <u>Measure:</u> Number of major utility transmission corridors that could be potentially impacted.	<u>Hydro ROW Crossings: 2</u> <u>Railway Crossings: 1</u>	<u>Hydro ROW Crossings: 2</u> <u>Railway Crossings: 1</u>	<u>Hydro ROW Crossings: 2</u> <u>Railway Crossings: 1</u>
2.7 Contaminated Property Identification and Management	2.7.1 Landfills, Hazardous Waste Sites, Brownfield Areas, etc. <u>Measure:</u> Number and type of contaminated sites potentially affected.	No landfills or contaminated sites affected.	No landfills or contaminated sites affected.	No landfills or contaminated sites affected.
SOCIO-ECONOMIC SUMMARY (COMMUNITY, AGRICULTURE AND LAND USE)		OVERALL MODERATELY PREFERRED <u>Community:</u> Moderately Preferred- urban, built-up community is already adjacent to Highway 401. <u>Agricultural:</u> Moderately Preferred – widening of Highway 401 will have lower impact to agriculture. <u>Land Use:</u> Moderately Preferred – makes use of existing infrastructure and provides infrastructure needs to 2031. Impacts adjacent employment uses.	OVERALL MODERATELY PREFERRED <u>Community:</u> Moderately Preferred- urban, built-up community is already adjacent to Highway 401. <u>Agricultural:</u> Moderately Preferred – widening of Highway 401 will have lower impact to agriculture. <u>Land Use:</u> Moderately Preferred – makes use of existing infrastructure and provides infrastructure needs to beyond 2031. Impacts adjacent employment uses.	OVERALL LEAST PREFERRED <u>Community:</u> Less Preferred – impacts of new corridor on community features will be hard to mitigate in existing rural community. <u>Agricultural:</u> Least Preferred – net impact of new corridor to agriculture is high. <u>Land Use:</u> Less Preferred – impact to existing land uses would be difficult to mitigate and could impact long-term retention of agricultural land uses.

* Note: All Socio-Economic information is collected from secondary sources (including consultation with agencies, municipalities, and the public, etc.) and will be confirmed through field investigations to be conducted during Stage 2 of the Environmental Assessment.

5.4 ADDITIONAL ANALYSIS IN HALTON AREA – CULTURAL ENVIRONMENT

5.4.1 Methodology

The additional analysis in Halton area included discussions with community members, heritage home owners, members of the local historical society and representatives of Boston Church, one of the important heritage features in Halton Hills. Their main interests were to minimize impacts to the cultural landscape, including heritage structures and several graveyards that are scattered throughout the area - referred to as Scotch Block.

Within Halton Region, Scotch Block is a notable and identifiable rural area settled in the early 1800s by Scottish settlers and is shown on the adjacent exhibit. Several of the original homesteads remain and descendants of original settlers continue to live in the area. First Nation artifacts have also been found within the area of Scotch Block by local farmers and through archaeological studies carried out in Halton over the last several decades.

The methodology for assessing potential impacts to cultural resources in the Halton area as part of the additional work in Halton was to build on the information collected during previous work (as outlined in **Chapter 4.6**) and to augment that knowledge with information collected from local historians and residents as well as the local historical society. Through discussions with local stakeholders the Study Team was able to review a number of newspaper articles and local books used to document the history of the area. Stage 2 of the EA will include further archaeological and heritage investigations in accordance with Ministry of Tourism, Culture and Sport guidelines and protocols for MTO undertakings.

5.4.2 Findings

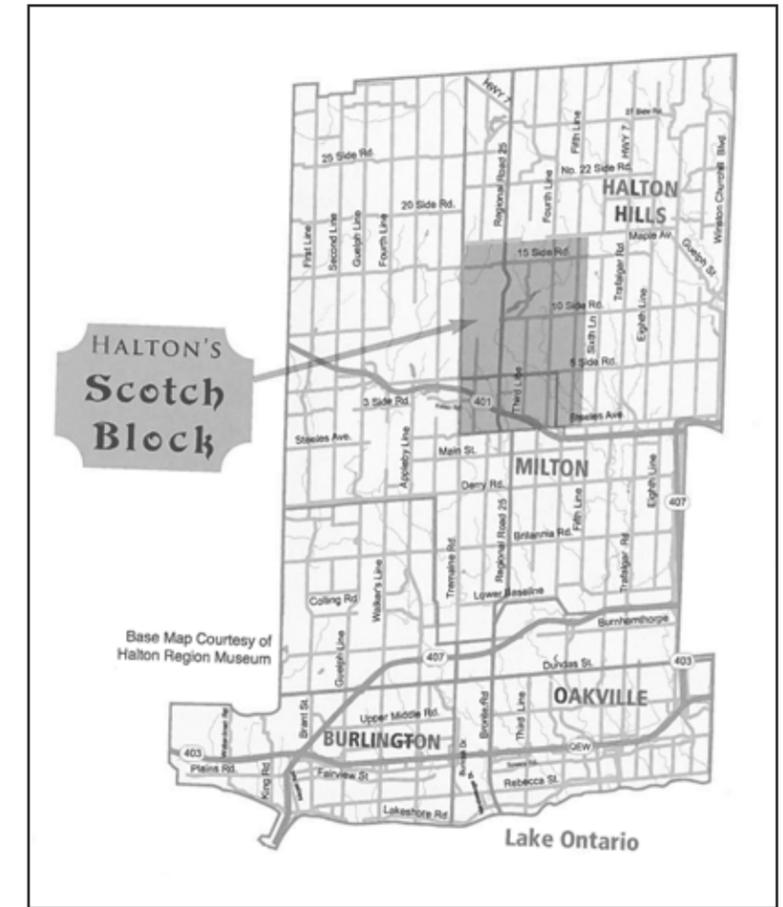
Cultural Heritage – Built Heritage and Cultural Heritage Landscapes

Overall, the Highway 401 Widening Alternatives have limited potential to impact the cultural environment because most areas have been previously disturbed either through highway construction or urbanization. The New Corridor Alternative would have the highest potential to impact cultural heritage, landscape, and built heritage features. Route generation, selection and design would potentially mitigate those impacts, but impacts to the cultural landscape in Scotch Block cannot be avoided with a new corridor through Halton Hills given the area coverage of Scotch Block.

Cultural Heritage – Archaeological Sites or Resources

Overall, the Highway 401 Widening Alternatives have the least potential to impact archaeological sites and resources as most have been previously disturbed either through highway construction or urbanization. The New Corridor Alternative would have the greatest potential impact to archaeological sites and resources as it would pass through the Scotch Block area - known to have heritage farms, unmarked graves, First Nation artifacts, etc. While some of these impacts could be potentially mitigated through route generation, selection or design, significant impacts to previously undisturbed archaeological sites and resources could occur.

Exhibit 5-6 documents the detailed evaluation findings under cultural environment criteria.



Source: J. Dills & G. Brown, *Halton's Scotch Block - The People and Their Stories*, The Milton Historic Society, 2009

Exhibit 5-6: Cultural Environment Evaluation (2011 / 2012)

FACTOR	SUB-FACTOR AND MEASURE	FURTHER 401 WIDENING TO 12 LANES 	FURTHER 401 WIDENING TO 14 LANES 	NEW CORRIDOR 
3.0 CULTURAL ENVIRONMENT FACTORS*				
3.1 Cultural Heritage – Built Heritage and Cultural Heritage Landscapes	3.1.1 Buildings (e.g., standing sites of architectural or heritage significance, Ontario Heritage Properties, heritage bridges, cemeteries) and Cultural Heritage Landscapes (e.g., areas of historic 19 th century settlement). <i>Measure:</i> Quantitative assessment of potentially impacted built cultural heritage areas and resources.	No known built heritage sites are affected by this alternative.	No known built heritage sites are affected by this alternative.	Potential impact to one built heritage site (cemetery).
	3.1.2 First Nations Burial Sites <i>Measure:</i> Qualitative assessment of the potential to impact First Nation Burial Sites.	The potential impact to First Nation Burial sites will be confirmed through discussions with First Nations as part of the environmental assessment process.	The potential impact to First Nation Burial sites will be confirmed through discussions with First Nations as part of the environmental assessment process.	The potential impact to First Nation Burial sites will be confirmed through discussions with First Nations as part of the EA process. Secondary source information indicates high potential for First Nations burial sites in Scotch Block.
3.2 Cultural Heritage – Archaeology	3.2.1 Pre- Historic and Historic First Nations Sites <i>Measure:</i> Qualitative assessment of the potential to impact First Nation Burial Sites.	The potential to impact archaeological sites of historical significance to First Nations will be confirmed through discussions with First Nations as part of the environmental assessment process.	The potential to impact archaeological sites of historical significance to First Nations will be confirmed through discussions with First Nations as part of the environmental assessment process.	The potential to impact archaeological sites of historical significance to First Nations will be confirmed through discussions with First Nations as part of the EA process. Secondary source information indicates high potential for First Nations historic sites.
	3.2.2 Archaeological Sites or Resources <i>Measure:</i> Quantitative assessment of impacts to archaeological sites or resources and impacts to undisturbed areas.	Archaeological Sites: 2 1 Homestead – AjGw-271 – midden, historic – Euro-Canadian 1 Homestead – AjGw-253 – midden, historic – Euro-Canadian	Archaeological Sites: 4 1 Findspot – AjGw-133 – Bifurcate; Archaic, Early 1 Unknown Site - AjGx-132 1 Homestead – AjGw-271 – midden, historic – Euro-Canadian 1 Homestead – AjGw-253 – midden, historic – Euro-Canadian	Archaeological Sites: 2 – 7 3 – Undetermined – Undermined 1 – Village – AjGx-64 – Native, Historic; Neutral 1 – Campsite – AjGw-276 – Pre-Contact 1 – Homestead – AjGw-271 – midden, historic – Euro-Canadian 1 – Homestead – AjGw-253 – midden, historic – Euro-Canadian
CULTURAL SUMMARY		MOST PREFERRED Less impact to previously undisturbed areas along Highway 401.	MODERATELY PREFERRED Slightly higher potential to impact previously undisturbed areas (with wider footprint) along Highway 401.	LESS PREFERRED Impact on cultural landscape (Scotch Block) and high potential for archaeological resources.

* Note: Cultural information is collected from secondary sources, including consultation with agencies, municipalities and the public, and the Stage 1 Archaeological and Built Heritage Assessment conducted during Stage 1 of the EA process. A Stage 2 Archaeological and Built Heritage Assessment will be carried out during Stage 2 of the Environmental Assessment.

5.5 ADDITIONAL ANALYSIS IN HALTON AREA – ECONOMY

5.5.1 Methodology

One of the key comments received on the Draft Strategy Report (February 2011) is related to the potential impact to the agricultural industry in Halton area. Therefore, the approach to additional analysis was developed to identify relevant differences between the three alternatives (ie. comparative analysis), which include:

- Qualitative assessment of indirect impacts and direct impacts on connectivity and linkages
- Quantitative analysis of user impacts based on traffic modelling data and economic values for travel time, vehicle operating costs and accident
- Quantitative analysis of property assembly costs based on land use data and property value ranges based on MLS asking price data in the study area
- Quantitative analysis of employment and economic output based on estimated construction costs using the Statistics Canada Input-Output model
- Analysis of lost farm output from impacted agricultural lands, using cropping pattern for Halton Region and average revenue data from Ontario Ministry of Agriculture, Food and Rural Affairs

Economy impacts were considered having regards to:

- Direct User Impacts: travel time, vehicle operating costs, accidents and injury, and redundancy
- Indirect Impacts: land value uplift, economic productivity, and area desirability
- Construction Impacts: land assembly cost, employment, economic output, and construction delays
- Industry / Agriculture / Tourism Impacts: connectivity and linkages to industry, lost output from farming, and tourism connectivity

The economic assessment was carried out as part of social environment (see Section 5.3), including land use, community and agriculture. The economic assessment is dependent on the land use data and agricultural assessment outcome, quantifying type of land use and agricultural output as a result of the new transportation corridor and the widening of Highway 401. Direct User Impact analysis was based on information derived from the transportation assessment (Section 5.6). Cost of travel time represents the total annual amount of time spent traveling by users on the highway segment multiplied by the average hourly wage. These costs are incurred by direct users with or without the transportation alternatives in place. While these costs are probably higher from the Base Case scenario, the analysis comprises only three alternatives, where lower costs are more desirable. It is also important to note that these figures are annual (starting after the project becomes operational).

5.5.2 Findings

All three alternatives would provide connection to employment areas south of Georgetown and Halton Hills, and improved access to the employment areas along Winston Churchill Boulevard west of 407 ETR. The New Corridor Alternative would provide better access to businesses north of Highway 401 in the Milton urban area.

Key findings indicated that the key advantage of the New Corridor Alternative is providing system redundancy where an alternate route is available to minimize time lost due to incidents and closures on other roadways. With a new corridor, it would also benefit from having the least amount of travel delay compared to the Highway 401 Widening Alternatives. However, the New Corridor Alternative would have higher impact on agricultural zoned lands.

Highway 401 widening to 12 lanes would not provide an alternate corridor to minimize congestion delays and incident occurrence delays, which would impact the competitiveness of the economy. This alternative would have some impact to existing commercial and industrial properties along the Highway 401 corridor; however, it is not anticipated that there would be direct impact to existing buildings. This alternative would have the lowest impact to agricultural zoned lands,

while providing accessibility to established commercial and industrial areas along the Highway 401 corridor.

Similar to the Highway 401 widening to 12 lanes alternative, the widening of Highway 401 to 14 lanes would not provide an alternate corridor to minimize congestion delays and incident occurrence delays, which would impact the competitiveness of the economy. It would have the highest impact to existing commercial and industrial properties along the Highway 401 corridor. While this alternative would generate the highest economic output and job creation during construction, it would also have the highest impact from congestion delays during construction.

Exhibit 5-7 documents the detailed evaluation findings under the economy criteria.

FACTOR	SUB-FACTOR AND MEASURE	FURTHER 401 WIDENING TO 12 LANES 	FURTHER 401 WIDENING TO 14 LANES 	NEW CORRIDOR 
4.0 ECONOMIC FACTORS				
4.1 Direct User Impacts	4.2.1 Potential to support industry and trade by efficient and reliable movement of goods and people. <i>Measure:</i> Quantitative assessment of Travel Time Accidents & Injury Vehicle Operating Costs Redundancy. (lower figures are more desirable)	Widening of existing transportation corridors would service existing and future industry located near the existing provincial highway. The additional capacity on the existing highways would reduce congestion and facilitate goods movement and trade. The key cost parameters in goods and people movement: cost of travel time and vehicle operating costs are highest for this alternative and it offers the lowest benefit in terms of congestion reduction. <u>Cost Of Travel Time (annual)</u> For automobiles: \$662 Million For trucks: \$54 Million Total: \$716 Million <u>Cost Of Accidents & Injury (annual)</u> Cost of Accidents: \$405 Million <u>Vehicle Operating Costs (annual)</u> For automobiles: \$1,299 Million For trucks: \$468 Million Total: \$1,767 Million <u>Cost Of Travel Time During Incidence (Redundancy) (annual)</u> For automobiles: \$38 Million For trucks: \$13 Million Total: \$51Million	Widening of existing transportation corridors would service existing and future industry located near the existing provincial highway. The additional capacity on the existing highways would reduce congestion and facilitate goods movement and trade. The key cost parameters in goods and people movement: cost of travel time and vehicle operating costs are higher than the new corridor alternative. <u>Cost Of Travel Time (annual)</u> For automobiles: \$631 Million For trucks: \$47 Million Total: \$678 Million <u>Cost Of Accidents & Injury (annual)</u> Cost of Accidents: \$406 Million <u>Vehicle Operating Costs (annual)</u> For automobiles: \$1,302 Million For trucks: \$474 Million Total: \$1,778 Million <u>Cost Of Travel Time During Incidence (Redundancy) (annual)</u> For automobiles: \$42 Million For trucks: \$15 Million Total: \$57 Million	The evaluation of economic impact identifies the highest level of economic benefits associated with this option in terms of serving the goods and people movement for industry and trade. The new corridor would provide an alternate route and additional capacity and improve access to existing and planned industrial areas, taking pressure off municipal roads, reducing cost of congestion and enhancing transportation system efficiency and reliability/redundancy. The key cost parameters in goods and people movement: cost of travel time and vehicle operating costs are the lowest for this alternative. This alternative provides an alternative route during incidence and minimizes travel time. <u>Cost Of Travel Time (annual)</u> For automobiles: \$ 613 Million For trucks: \$44 Million Total \$657 Million <u>Cost Of Accidents & Injury (annual)</u> Cost of Accidents \$401 Million <u>Vehicle Operating Costs (annual)</u> For automobiles \$1,264 Million For trucks \$471 Million Total \$1,736 Million <u>Cost Of Travel Time During Incidence (Redundancy) (annual)</u> For automobiles \$29 Million For trucks \$10 Million Total \$40 Million
4.2 Indirect User Impacts	4.2.1 Potential to support the economy. <i>Measure:</i> Qualitative assessment of indirect impacts from land value uplift, economic efficiency and area desirability.	As the area will continue to be supported by the existing road network it is not likely to support any new sites for commercial, industrial or retail development.	As the area will continue to be supported by the existing road network it is not likely to support any new sites for commercial, industrial or retail development.	The new corridor can potentially provide an additional link to the markets in the region thus helping to make the corridor areas more competitive for growth. This is likely to enhance the development potential of areas traversed by the new highway facility and open up new sites for commercial and industrial development. The development of the local access roads is further likely to stimulate retail development.

FACTOR	SUB-FACTOR AND MEASURE	<p style="text-align: center;">FURTHER 401 WIDENING TO 12 LANES</p> 	<p style="text-align: center;">FURTHER 401 WIDENING TO 14 LANES</p> 	<p style="text-align: center;">NEW CORRIDOR</p> 
<p>4.3 CONSTRUCTION IMPACTS</p>	<p>4.3.1 Effects of construction spending on the economy and construction impacts on traffic</p> <p><u>Measure:</u> <i>Quantitative measure of output and employment creation due to construction</i> <i>Land assembly costs</i> <i>Assessment of travel time delays due to congestion during construction</i></p>	<p>The evaluation of economic impact identifies the lowest economic benefits associated with construction of this option. The impact on agricultural properties is the lowest for this alternative.</p> <p><u>Output and Employment creation due to construction</u> Output: \$721 Million Employment: 3,700 FTE Jobs</p> <p><u>Land Assembly Costs</u> Agricultural Properties: \$32 Million - \$39 Million Commercial/industrial Properties: \$44 Million - \$73 Million</p> <p><u>Cost of Travel time delays due to congestion during construction</u> For automobiles: \$21 Million For trucks: \$6 Million Total: \$27 Million</p>	<p>The evaluation of economic impact identifies the highest level of economic benefits associated with construction of this option. This has the highest impact on the existing businesses along Highway 401.</p> <p><u>Output and Employment creation due to construction</u> Output: \$1,163 Million Employment: 5,900 FTE Jobs</p> <p><u>Land Assembly Costs</u> Agricultural Properties: \$33 Million - \$40 Million Commercial/industrial Properties: \$65 Million - \$105 Million</p> <p><u>Cost of Travel time delays due to congestion during construction</u> For automobiles: \$36 Million For trucks: \$11 Million Total: \$47 Million</p>	<p>The evaluation of economic impact identifies the following economic benefits associated construction of this option. However, it has higher impact to agriculture sector.</p> <p><u>Output and Employment creation due to construction</u> Output: \$888 Million Employment: 4,500 FTE Jobs</p> <p><u>Land Assembly Costs</u> Agricultural Properties: \$73 Million - \$94 Million Commercial/industrial Properties: \$26 Million - \$44 Million</p> <p><u>Cost of Travel time delays due to congestion during construction</u> For automobiles: \$15 Million For trucks: \$4 Million Total: \$19 Million</p>
<p>4.4 AGRICULTURE/INDUSTRY/TOURISM</p>	<p>4.4.1 Potential to support area agriculture industry</p> <p><u>Measure:</u> <i>Connectivity and Linkages for Agriculture and Industry.</i> <i>A quantitative assessment of potential impacts of lost output from farming operations</i> <i>Qualitative description of how tourism and recreation are supported.</i></p>	<p>Widening of existing transportation corridors would service existing transportation corridor located close to the existing provincial highway and provide connectivity and linkages for agriculture and industry.</p> <p>Annual Revenue Loss = \$210,000 approx. (Loss of Area Under Major Crops, Fruit Crops & Vegetable Crops)</p> <p>The existing corridor provides connectivity and linkages for tourism.</p>	<p>The existing corridor provides connectivity and linkages for agriculture and industry.</p> <p>Annual Revenue Loss = \$220,000 approx. (Loss of Area Under Major Crops, Fruit Crops & Vegetable Crops)</p> <p>The existing corridor provides connectivity and linkages for tourism.</p>	<p>The new corridor provides additional connectivity and linkages for Agriculture and Industry.</p> <p>Annual Revenue Loss = \$610,000 approx. (Loss of Area Under Major Crops, Fruit Crops & Vegetable Crops)</p> <p>The new corridor provides additional connectivity and linkages for tourism.</p>
<p>ECONOMIC SUMMARY</p>		<p>LESS PREFERRED</p> <p>This alternative has no alternate corridor for minimizing congestion delays, and incidence occurrence delays. This is likely to impact the competitiveness of the regional economy.</p>	<p>LEAST PREFERRED</p> <p>This alternative is the least preferred as it provides no alternate corridor for minimizing congestion delays, and incidence occurrence delays. This is likely to impact the competitiveness of the regional economy. It also has higher impact to existing businesses along Highway 401.</p>	<p>MODERATELY PREFERRED</p> <p>This alternative is moderately preferred as it has the best travel time results, supports business & tourism sector, promotes economic development. However, it has higher impact to agriculture sector.</p>

5.6 ADDITIONAL ANALYSIS IN HALTON AREA – TRANSPORTATION

5.6.1 Modeling Methodology

The additional transportation analysis in the Halton area was conducted to assist in identifying the preferred termination of the GTA West corridor in Halton and the configuration of Highway 401 through Halton. The analysis included detailed modeling of the Highway 401 Widening and New Corridor alternatives, and assessment of each alternative using both qualitative and quantitative evaluation methodologies.

The results from the transportation modeling and forecasting also provided key inputs to support the economic analysis, and air quality and noise assessments documented as part of the overall evaluation.

The Ontario Ministry of Transportation (MTO) Greater Golden Horseshoe Model (GGH Model) was used to forecast future travel demands for the transportation modeling and analysis. A description of the GGH model setup and process is provided in the Transportation Model Technical Background Report (February 2011). The land use, transportation network and other assumptions used for the Draft Transportation Development Strategy (February 2011) were carried over for the 2011/2012 additional analysis, with a few changes. The elements that are common with the Draft Transportation Development Strategy (Strategy) (February 2011) are as follows:

1. The land use patterns developed for the Metrolinx RTP were updated with the regional allocation of population and employment as per their *Growth Plan* conformance reviews.
2. Road, transit and active transportation programs identified through approved Transportation Master Plans, Official Plans or Development Charge Background Studies completed by Regional/Lower Tier municipalities
3. Full implementation of Metrolinx RTP 25-year transit plan by 2031 and GO Transit's Strategic Plan GO 2020

The Base Case scenario was used as a reference for comparing the Widening and New Corridor alternatives. The Base Case scenario described in the Draft Strategy Report (February 2011) was updated:

- The Base Case scenario in the Draft Strategy Report (February 2011) had Highway 401 at 6 lanes through Halton. For the 2011/2012 additional work, Highway 401 was assumed to be widened to 12 lanes from 407 ETR to James Snow Parkway and to 10 lanes to Regional Road 25. This was done to reflect the progress for the ongoing Preliminary Design for Highway 401.
- In the NGTA study area, the Base Case scenario in the Draft Strategy Report (2011) assumed no additional improvements to the provincial highway network beyond MTO's planned and committed improvements including projects identified in the Southern Ontario Highway Program (2006-2010) and the High Occupancy Vehicle (HOV) Lanes Plan (2007). For the additional work, the Niagara GTA Group #3 (Highway Widening) scenario was assumed as part of the definition of the Base Case scenario. Please refer to the *NGTA Draft Transportation Development Strategy Report (March 2011)* for the definition of the NGTA Group #3 (Highway Widening) scenario.

Another update to the transportation modeling for the Draft Strategy was to the commercial vehicle (CV) forecasts used to develop the transportation demand forecasts for the year 2031. The GGH Model CV forecasts were updated to be consistent with the forecasts from the Continental Gateway study. Details of the update to freight forecasts can be found in the *Transportation Model Technical Background Report (2012)*. The evaluation criteria used in the Draft Strategy were also used to perform transportation evaluation of the alternatives in the Halton area. The following updates have been made to the evaluation methodology:

1. Some of the stakeholders commented on the Draft Strategy Report (February 2011) that the planning year of 2031 is not sufficiently long-term. However, there is a constraint to forecast travel demand beyond 2031. The *Growth Plan* only provides growth projections to 2031. Transportation demand forecasting for beyond 2031 is not feasible based on official growth projections. In an attempt to address the concern of the stakeholders without developing demand forecasts beyond 2031, the Study Team was able to assess the capacity of the transportation system for growth beyond 2031. This was done by assessing the roadway system capacity available

after serving the demand forecast for the year 2031. This remaining capacity is defined as 'residual capacity'. The residual capacity would provide an estimate of how much additional system capacity is left to serve the growth in demand beyond 2031. Additionally, based on a conservative assumption of 1% annual growth in travel demand beyond 2031, a projection of when the system would exceed the capacity threshold (demand more than 90% of capacity) could be made.

2. As the study progressed, one of the considerations in forecasting travel demand was the impact of factors that are beyond the control of the GTA West Study Team or differ from the assumptions made for the GTA West Study. The forecasts for travel demand forecasting are conservative and are based on the following assumptions. Details about these assumptions are provided in the Transportation Model Technical Background Report (February 2011).

- Full implementation of Metrolinx RTP 25-year transit plan by 2031
- No increase in transit fares (not considering inflation) to 2031
- A doubling of auto operating costs by 2031 (not considering inflation)
- 50% increase in non-residential parking costs by 2031 (not considering inflation)
- Introduction of new parking costs in all Urban Growth Centers, nodes/corridors, and major employment nodes by 2031
- Optimization of transportation network and expansion of non-roadway infrastructure could further reduce auto demands by 4%, and long distance truck demands by 10% by 2031.

These forecasts are the basis for estimating the network performance under the different alternatives. However, there are factors that could lead to an increase in these forecasts in the Halton area. Some of these factors are not under the purview of the GTA West Study – for instance, the recommendation of the NGTA Study. Other factors represent scenarios in the future that could create different travel patterns and amount of auto travel demand in the

Halton area – for instance, summer tourism-related trips could increase auto demand. Another scenario could be a lower than expected reduction in auto and truck demand on the roadway network due to implementation of Group #1 and Group #2 alternatives:

- Summer traffic in the study area is typically 11% higher than average weekday traffic based on historical relationship between Summer Average Daily Traffic (SADT) and Annual Average Daily Traffic (AADT). Forecasts considering SADT scenario could increase auto demand on Highway 401 by about 8 to 10%.
- Potential NGTA Corridor connection to Highway 401 (NGTA Study is ongoing and a connection from Highway 403 to Highway 401 west of the Niagara Escarpment is an alternative under consideration). Comparison of forecasts with and without the NGTA connection to Highway 401 shows that the NGTA connection could increase travel demand on Highway 401 by approximately 3 to 8%. Details of this analysis are presented in the *Transportation Model Technical Background Report (2012)*.
- Expected reduction in auto (4%) and truck (10%) demand from non-roadway infrastructure and existing transportation network optimization (Group #1 and #2 initiatives) may not fully occur by 2031. This assumed reduction in auto demand is in addition to the reduction in auto demand expected to result from the implementation of the Metrolinx RTP. Forecasts considering the possibility that the expected reduction in auto demand may not fully occur could increase auto demand on Highway 401 by about 4 to 5%.

These factors together could increase the auto demand on Highway 401 by approximately 15 to 25%. The impact on available capacity on the highway road network (Highway 401 plus the new corridor) is shown in **Exhibit 5-8**. The sensitivity analysis suggests that the combined system of Highway 401 and a new corridor could provide adequate capacity to serve the potentially higher amount of traffic in the Halton area resulting from the above factors. However, a 12-lane Highway 401 without a new corridor may not provide sufficient capacity if the above factors were to result in higher auto

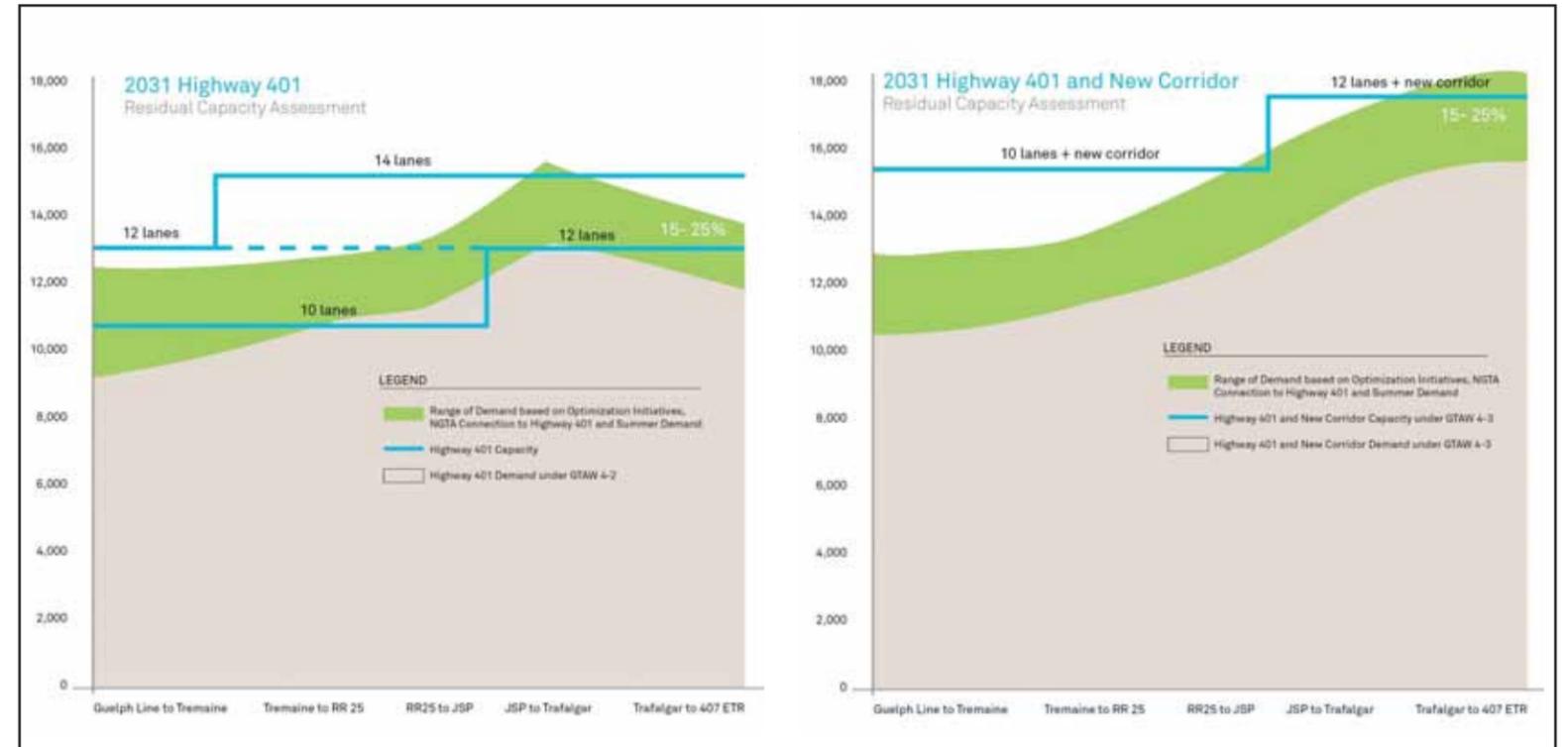


Exhibit 5-8: Sensitivity of Travel Demand to factors such as NGTA Connection and Summer Demand

demand, particularly between James Snow Parkway and 407 ETR. This led to the inclusion of a 14-lane Highway 401 as an additional alternative for evaluation.

As items (1) and (2) above would suggest, the residual capacity assessment captures the ability of the roadway network to accommodate higher demands arising from either growth beyond 2031 or other possible planning scenarios for the study area in Halton.

Both criteria suggest the need to consider a 14-lane Highway 401 as an alternative for evaluation.

3. In addition to estimating people and goods movement benefits for the inter-regional and local roadway network, the Study Team assessed the performance of Highway 401 in moving passenger and freight demand in the study area. This assessment of Highway 401 performance in more detail is intended to better inform the decision to choose between widening Highway 401 to 12 or 14 lanes or a new corridor in the Halton area.

4. In response to the feedback on the Draft Strategy Report (February 2011), transportation system redundancy in the Halton area is assessed quantitatively. The Draft Strategy Report (February 2011) included a qualitative evaluation of the alternatives for the level of redundancy that they may provide. As part of the 2011/2012 additional analysis in the Halton area, the alternatives are evaluated for redundancy based on quantitative network performance measures. For the purpose of this exercise, redundancy is defined as the ability of the roadway network to accommodate the diversion of traffic from the major facilities due to closures resulting from incidents. Select road closure scenarios are modeled and resulting travel delays under different alternatives are compared to those under the Base Case scenario to derive a measure of transportation network redundancy. In addition to the transportation evaluation, road network redundancy is also considered in the economic evaluation of alternatives. The ability of the road network to absorb the impact of unexpected incidents by minimizing resulting delays to passenger and freight movement has implications

to the performance of the local economy. Results of the road network redundancy assessment were fed into the estimation of benefits to road users as part of the economic evaluation.

5. Transportation system safety assessment is quantified. For the purpose of the additional analysis, road safety is defined in terms of expected number of collisions on the roadway network under different alternatives. This was intended to capture the differences between the alternatives in traffic safety resulting from the level of traffic and the nature of interactions based on the type of roadway network element – mainline freeway, arterial intersection, freeway interchange, etc. - that the traffic may access.

The network performance measures of safety, redundancy, screenline capacity, and people and goods movement are extracted for the area in Halton within the defined limits shown in Exhibit 5-9.

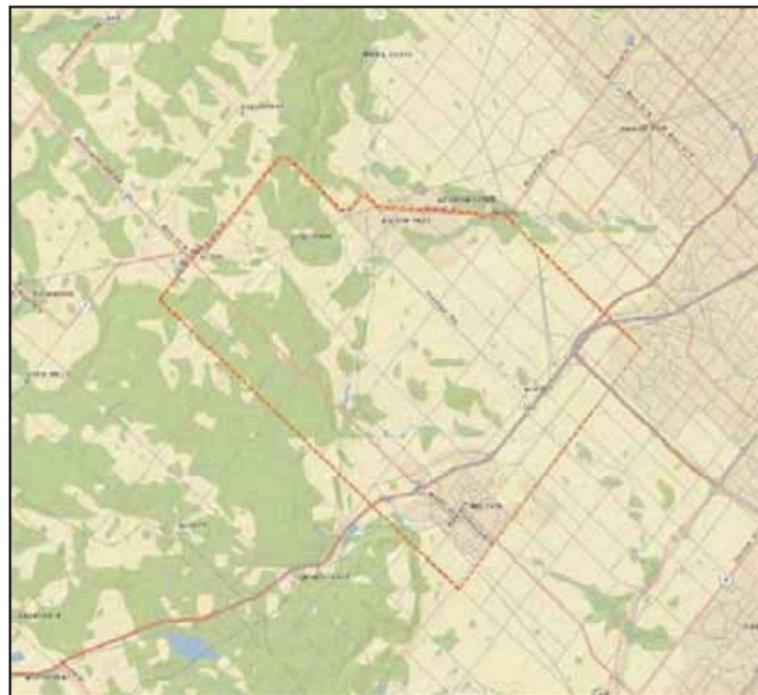


Exhibit 5-9: Study Area Limits for Transportation Evaluation

5.6.2 Sensitivity Analysis and Findings (12 Lanes, 14 Lanes Highway 401, and New Corridor)

Road Network Capacity Assessment

The road network within the study area was assessed for the capacity it could provide to serve the demand forecast for 2031. Also assessed was how much additional capacity would be available after serving the forecast demand for 2031.

One of the ways the network capacity was assessed is at the screenline level. The screenlines defined in the Draft Strategy

Report (February 2011) covered the larger GTA West area. For the 2011/2012 additional work focusing on the Halton area, additional screenlines were identified. Additional screenlines were located at every interchange along Highway 401 within the focused study area, as shown in Exhibit 5-10.

Exhibit 5-11 shows the performance of the screenline capacity under the Widening and New Corridor alternatives. All the three alternatives improve the screenline capacity compared to the Base Case. None of the screenlines would be at a volume-capacity (V/C) ratio of 0.90 or over, which is the capacity

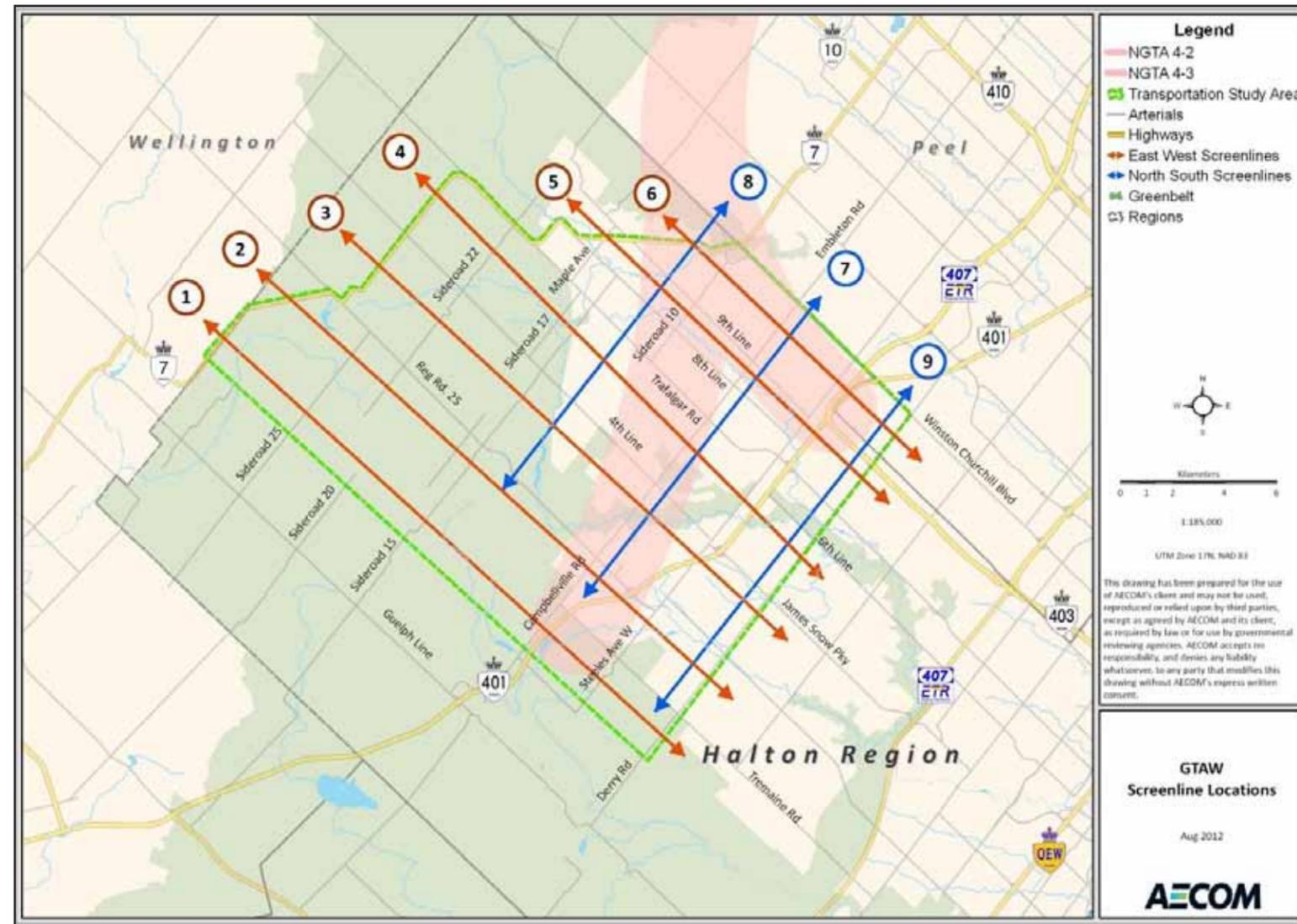


Exhibit 5-10: Screenlines in Halton Area

SCREENLINE NUMBER	SCREENLINE NAME	BASE CASE	12-LANE HIGHWAY 401	14-LANE HIGHWAY 401	NEW CORRIDOR
East – West Roads					
1	West of Tremaine Road	1.00	0.77	0.78	0.62
2	Tremaine Road to Regional Road 25	0.91	0.74	0.63	0.63
3	Regional Road 25 to James Snow Parkway	0.70	0.67	0.62	0.63
4	James Snow Parkway to Trafalgar Road	0.78	0.82	0.76	0.71
5	Trafalgar Road to Highway 401-407ETR	0.81	0.82	0.75	0.81
6	Highway 401-407 ETR to Winston Churchill Blvd	0.83	0.80	0.80	0.81
North – South Roads					
7	North of Highway 401	0.75	0.71	0.71	0.57
8	South of Highway 401	0.84	0.80	0.80	0.79
9	North of Side Rd. 10 - RR25 to Highway 7	0.79	0.71	0.72	0.76

XXX – V/C ratio greater than target of 0.90 (LOS E)

Exhibit 5-11: Screenline capacity under the Widening and New Corridor alternatives

	BASE CASE	12-LANE HIGHWAY 401	14-LANE HIGHWAY 401	NEW CORRIDOR
407 to Trafalgar Rd.	1.01	0.97	0.86	0.94
Trafalgar Rd. to James Snow Parkway	0.92	1.04	0.94	0.86
James snow Parkway to RR 25	0.92	0.91	0.82	0.87
RR 25 to Tremaine Rd.	1.30	0.98	0.75	0.75
West of Tremaine Rd.	1.22	0.90	0.77	0.68

XXX – V/C ratio greater than target of 0.90 (LOS E)

Exhibit 5-12: 2031 PM Peak Hour Peak Direction (Westbound) Volume-Capacity Ratios for Inter-Regional Facilities (Highway 401 and New Corridor)

threshold established for the additional analysis. This finding validates the definition of alternatives in the Draft Strategy (February 2011) aimed at providing basic capacity to support the travel demand in 2031. Among the three alternatives, the new corridor would provide similar to or marginally better screenline capacity than the Highway 401 14-Lane Widening alternative, and both the alternatives would perform better than Highway 401 12-Lane Widening.

A combined volume-capacity ratio is calculated for Highway 401 and the new corridor (**Exhibit 5-12**). The capacity assessment indicates that the Highway 401 12-Lane Widening would have less than 10% additional capacity available upon serving the 2031 forecast demand. Most of Highway 401 in this section operates at or over capacity in 2031 under the Highway 401 12-Lane Widening alternative. The Highway 401 14-Lane Widening alternative performs better than the Highway 401 12-Lane Widening in providing capacity, and the new corridor alternative also improves upon the Highway 401 12-Lane Widening throughout the study area. The new corridor alternative performs marginally better than the Highway 401 14-Lane Widening at the west end of the study area, while the Highway 401 14-Lane Widening would perform better in providing capacity east of Regional Road 25. The Highway 401 12-Lane Widening and Highway 401 14-Lane Widening alternatives would perform worse than the Base Case between Trafalgar and Regional Road 25 because the GTA West corridor that terminates at the Highway 401/407 ETR interchange under these alternatives feeds additional demand to Highway 401.

In addition to screenline and highway network (Highway 401 and new corridor) volume-capacity assessment, the roadway network was evaluated for its ability to provide suitable capacity beyond 2031. The rationale and methodology for this assessment is described in **Section 5.6.1**. The *Growth Plan* provides land use forecasts only to the year 2031. Hence, travel demand forecasts could not be developed for a horizon year beyond 2031. However, the capacity of the system to serve the growth in demand beyond 2031 was reviewed through residual capacity – a measure of the capacity left upon serving the demand forecast for 2031. This residual capacity would be used by the growth in demand beyond 2031 – assumed at a conservative 1% (the demand on QEW is projected to grow

at an average of 2% in the NGTA study area). By stipulating the rate at which the demand would likely grow beyond 2031 and estimating the residual capacity for the system in 2031, a timeline was estimated for the system (Highway 401 plus the new corridor) to exceed the threshold of 90% of capacity – (volume-capacity ratio of 0.90). The results are shown in **Exhibit 5-13**. The sections of the network exceeding capacity threshold prior to 2031 are highlighted.

As the results show, all the sections of Highway 401 would exceed capacity threshold by 2031 with the Highway 401 12-Lane Widening alternative. With the Highway 401 14-Lane Widening alternative, most sections of Highway 401 would not exceed capacity threshold before 2035 based on assumption. Similarly, the new corridor alternative would provide sufficient capacity on Highway 401 to last till 2035 and beyond.

A sensitivity analysis was performed to assess the variability in travel demand in the study area due to factors that are uncertain within the framework of the current GTA West Study.

People Movement

A series of network performance metrics were analyzed to assess the alternatives in terms of their ability to improve the movement of people in the Halton area. These metrics included

- Travel delays on Highway 401 and overall roadway network
- Local and Inter-regional roadway network operating at good levels of service
- Inter-regional trips using local roads

The delays on the total road network are also presented in **Exhibit 5-14**. Delays to passenger travel are shown in **Exhibit 5-15**.

As the exhibit shows, the new corridor alternative would provide the most delay savings over the Base Case scenario. The new corridor could also provide the most delay savings

	BASE CASE	12-LANE HIGHWAY 401	14-LANE HIGHWAY 401	NEW CORRIDOR
407 ETR to Trafalgar Rd.	2026	2028	2036	2032
Trafalgar Rd. to James Snow Parkway	2030	2025	2029	2036
James Snow Parkway to RR 25	2030	2030	2041	2035
RR 25 to Tremaine Rd.	2016	2028	2050	2049
West of Tremaine Rd.	2019	2030	2047	2059

XXX – indicates segment could reach capacity threshold (0.9) prior to 2031

Exhibit 5-13: Timeline projection for Highway 401 exceeding capacity threshold under Widening and New Corridor Alternatives

CRITERIA	BASE CASE	12-LANE HIGHWAY 401	14-LANE HIGHWAY 401	NEW CORRIDOR
Auto delay on total roadway network (auto veh-hr)	9,064	7,525 (1,539)	7,065 (1,999)	6,965 (2,099)
Auto delay on Highway 401 roadway network (auto veh-hr)	1,897	1,571 (326)	1,100 (797)	898 (999)
Auto delay on Existing Local roadway network (auto veh-hr)	6,262	4,229 (2,033)	4,168 (2,094)	4,173 (2,090)

(xxx) – indicates reduction from Base Case

Exhibit 5-14: 2031 PM Peak Hour Passenger Travel Delays

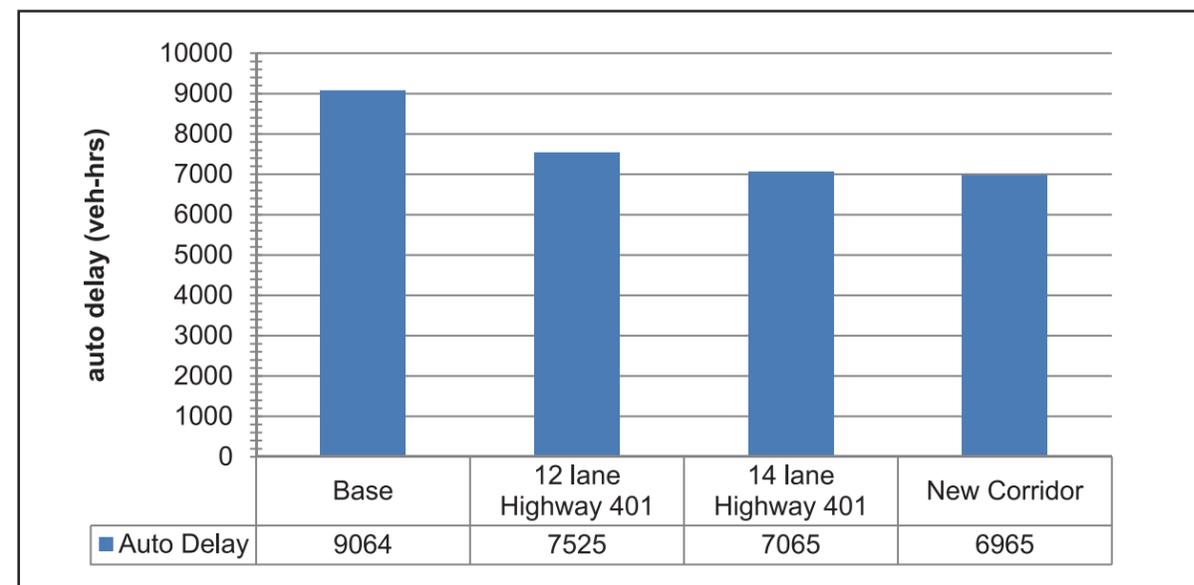


Exhibit 5-15: Roadway Network Delays for Passenger Vehicles

when considering Highway 401 alone. The delay savings on the total road network with the new corridor are about 35% higher than with the Highway 401 12-Lane Widening. The delay savings on Highway 401 with the new corridor are about three times the savings with the Highway 401 12-Lane Widening. The performance of the local road network would be similar either with the Highway 401 14-Lane Widening or the new corridor.

The alternatives are also assessed in terms of the share of the road network operating at good levels of service (represent better than LOS D conditions). Good level of service is defined as volume-capacity ratio being 0.80 or lower, i.e. the demand for the facility being below 80% of its capacity. As is the case with delays, the new corridor alternative performs considerably better than the Highway 401 12-Lane Widening and marginally better than the Highway 401 14-Lane Widening alternative. The performance of Highway 401 would be considerably better with Highway 401 14-Lane Widening and new corridor than with the Highway 401 12-Lane Widening, as shown in Exhibit 5-16.

Also included in Exhibit 5-16 is the percentage of inter-regional auto travel using existing local roads. This criterion is intended to measure the amount of inter-regional travel (defined as longer than 20 kilometres for passenger travel) that is diverted to the local road network because the highway network is congested. The additional highway road network capacity provided by the new corridor could keep the amount of long-distance travel on local roads to 38%, which is similar to 12-lane widening.

Goods Movement

The benefits to goods movement provided by the alternatives are assessed through metrics similar to those for the benefits to passenger travel discussed in the previous section. The results are provided in Exhibit 5-17. Truck delays on total road network are also shown in Exhibit 5-18.

The new corridor and Highway 401 14-Lane Widening would provide similar delay savings for trucks, while the Highway 401 14-Lane Widening would provide the most delay savings on Highway 401.

CRITERIA	BASE CASE	12 LANE HIGHWAY 401	14 LANE HIGHWAY 401	NEW CORRIDOR
% of Total roadway network better than V/C 0.8 (auto veh-km)	43%	53%	58%	60%
% of Total roadway network worse than V/C 1.0 (auto veh-km)	20%	13%	5%	6%
% of Highway 401 roadway network better than V/C 0.8 (auto veh-km)	7%	24%	40%	38%
% of Highway 401 roadway network worse than V/C 1.0 (auto veh-km)	34%	29%	4%	2%
% of Existing Local roadway network better than V/C 0.8 (auto veh-km)	61%	67%	68%	68%
% of Existing Local roadway network worse than V/C 1.0 (auto veh-km)	12%	5%	6%	7%
% of Inter-regional auto travel using existing local roads	53%	40%	39%	38%

Exhibit 5-16: 2031 PM Peak Hour Passenger Travel Level of Service

CRITERIA	BASE CASE	12 LANE HIGHWAY 401	14 LANE HIGHWAY 401	NEW CORRIDOR
Truck delay on total roadway network (auto veh-hr)	461	330 (131)	271 (189)	270 (191)
Truck delay on Highway 401 roadway network (auto veh-hr)	273	179 (94)	156 (117)	103 (169)

(XXX) – indicates reduction from Base Case

Exhibit 5-17: 2031 PM Peak Hour Truck Travel Delays

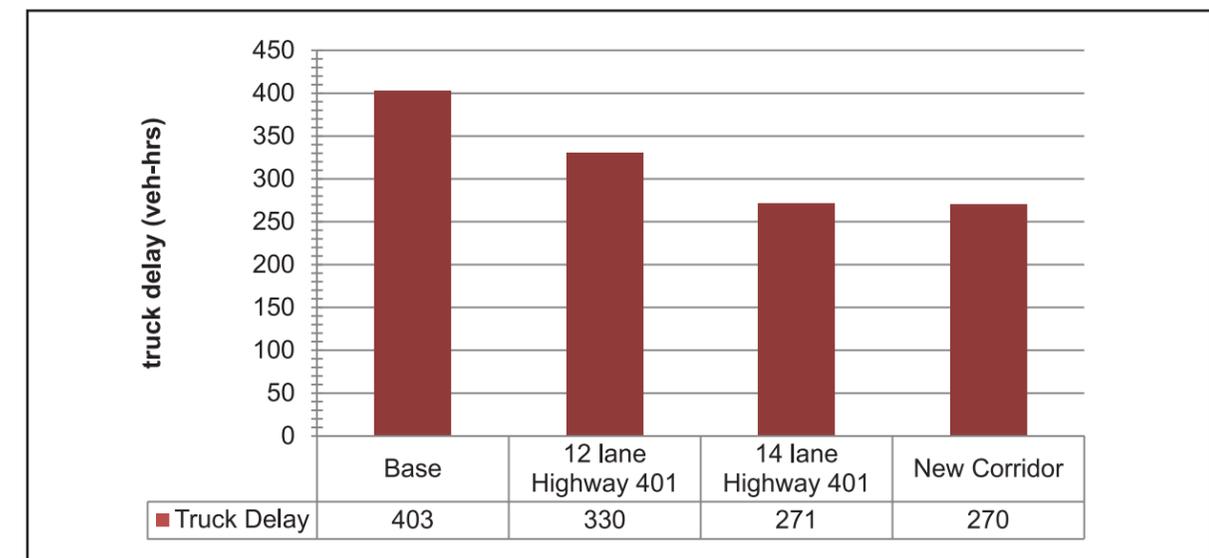


Exhibit 5-18: Roadway Network Delays for Commercial Vehicles

CRITERIA	BASE CASE	12 LANE HIGHWAY 401	14 LANE HIGHWAY 401	NEW CORRIDOR
% of Total roadway network better than V/C 0.8 (truck veh-km)	23%	34%	46%	45%
% of Total roadway network worse than V/C 1.0 (truck veh-km)	33%	22%	4%	3%
% of Highway 401 roadway network better than V/C 0.8 (truck veh-km)	7%	21%	37%	33%
% of Highway 401 roadway network worse than V/C 1.0 (truck veh-km)	39%	30%	4%	2%
% of Inter-regional truck travel using existing local roads	16%	8%	8%	8%

Exhibit 5-19: 2031 PM Peak Hour Truck Travel Level of Service

The road network is also assessed for the level of service it provides under the various alternative scenarios. The results are shown in Exhibit 5-19. Similar to passenger travel, the truck traffic on Highway 401 would benefit considerably more with the Highway 401 14-Lane Widening or new corridor alternatives compared to the Highway 401 12-Lane Widening. Unlike passenger travel, the amount of long-distance truck travel using local road network would not be different across the alternatives (at 8% under all three alternatives).

Transportation System Redundancy Assessment

An additional measure of the transportation network performance was quantified as part of the detailed analysis in the Halton area. This is the transportation system redundancy, which is a measure of the availability of alternative travel routes for passenger and freight movement in case the primary travel facilities are blocked. In the Draft Strategy Report (February 2011, Chapter 4), the alternatives were assessed qualitatively for the level of transportation system redundancy that they may provide.

Redundancy means having an alternate route available for motorists / trucks to use to avoid congestion or delays in the event of incidents, construction / maintenance.

- Redundancy reduces impacts on local road network
- Redundancy provides significant benefits to goods movement industry by

- reducing overall cost of shipping,
- improving competitiveness of GTA for logistics / manufacturing industries
- increasing the reliability of supply chains to support manufacturing that relies on just in time delivery

As part of the additional analysis within the Halton area, the system redundancy was quantified in terms of the delay savings that an alternative would provide if an unexpected incident were to occur on Highway 401, which necessitated either a partial or full closure. The GGH travel demand model was used to model scenarios of partial and full closure of Highway 401 during a weekday PM peak in 2031. The resulting travel delays are estimated under the Base Case scenario and each of the three alternative scenarios.

Delays due to road closures are projected to a full year based on the data for closures on similar highways in the province. Data on partial and full closures due to an incident on highways such as Highway 400, Highway 401, Highway 403, Highway 427, Highway 410, Highway 407, etc. were obtained for the year 2011. Since data for multiple years was not readily available, an average annual closure rate (per unit length of highway) for similar highways was used instead of the closure rate for Highway 401 alone. This was done because a single incident on Highway 401 in a single year could skew the closure rate and lead to misrepresentation of delays due to such incidents.

A few critical elements of the methodology to estimate the delays from road closures are below:

1. Annual rate of partial and full road closures during different times of the day – peak, mid-day and night - were considered. However, only the peak period was modeled in the GGH model to estimate delays from a typical partial and full closure. A relationship was established between delays during peak period and other times of the day was established. Mid-day delays were assumed to be 65% of peak period delays, and night-time delays were assumed to be 15% of peak period delays.

MAINLINE CLOSURES PER YEAR		
	Full closures Per km	Partial closures Per km
Peak Period	1.15	17.29
Mid-Day	0.16	5.64
Night	0.36	2.15

2. Express-collector and simple freeway configurations were evaluated separately. The 12-lane and 14-lane Highway 401 Widening alternatives differ from the New Corridor alternative in that they would include an express-collector system on Highway 401 through Milton. An express-collector system would rarely be fully closed due to an incident. Either the express or the collector lanes may be closed completely while the other could remain open to traffic. Hence a full closure (of both express and collector lanes) is assumed to happen only in 10% of cases, while the rest of the full closures for an express-collector system is treated as a partial closure.
3. The total delays are allocated to auto and truck demand based on an 85%-15% split for peak periods, 80%-20% for mid-day and 65%-35% for night.
4. The data on road closures also included the duration of each closure. An average duration for a partial and full closure was used to estimate total delay during a typical closure.

AVERAGE DURATION OF A TYPICAL CLOSURE		
	Full closure	Partial closure
Peak Period	4.81	4.87
Mid-Day	1.72	2.43
Night	3.05	5.93

A partial closure scenario was modeled as only three lanes on a stretch of Highway 401 between James Snow Parkway and Regional Road 25 being open to westbound passenger and truck vehicles. A full closure meant that all lanes in that stretch were closed to traffic. In order to simulate (at the least, partially) the effect of queuing on lanes upstream of the closure, the roadway capacity was downstream from the Highway 401-407 ETR interchange.

The results are presented in **Exhibit 5-20**. As the results suggest, the new corridor alternative would provide the most savings (or the least delays) due to closures of Highway 401. The New Corridor Alternative provides the best ability to manage delays due to incidents / closures:

- New Corridor reduces annual estimated delays due to incidents by 22% compared to Highway 401 12-Lane Widening alternative
- New Corridor reduces annual estimated delays due to incidents by 30% compared to the Highway 401 14-Lane Widening alternative
- The additional delays due to incidents under the Base Case are shown to be lower than under the widening and new corridor alternatives. This is because the delays on the roadway network under the Base Case are high to begin with, and even though incidents result in additional delays, the additional delays are not as significant under the widening and new corridor alternatives.

Transportation Safety Assessment

A quantitative assessment of safety is performed by estimating the expected number of collisions due to a combination of factors such as introduction of new roadway interchanges and

arterial intersections, and additional traffic on the facilities. Expected collisions were estimated for the new corridor considering prescribed collision rates for the mainline and interchange segments. Expected collisions were estimated for the existing road network considering highway mainline and interchange areas, and arterial roads and intersections.

Mid-Block Road Sections:

- Steeles Avenue between Regional Road 25 and Ninth Line
- No. 5 Side Road between Tremaine Road and Ninth Line
- No. 10 Side Road between Regional Road 25 and Ninth Line
- Trafalgar Road between Steeles Avenue and No. 5 Side Road
- Regional Road 25 between Highway 401 and No. 5 Side Road

Intersections:

- Steeles Avenue / Trafalgar Road
- No. 5 Side Road / Trafalgar Road

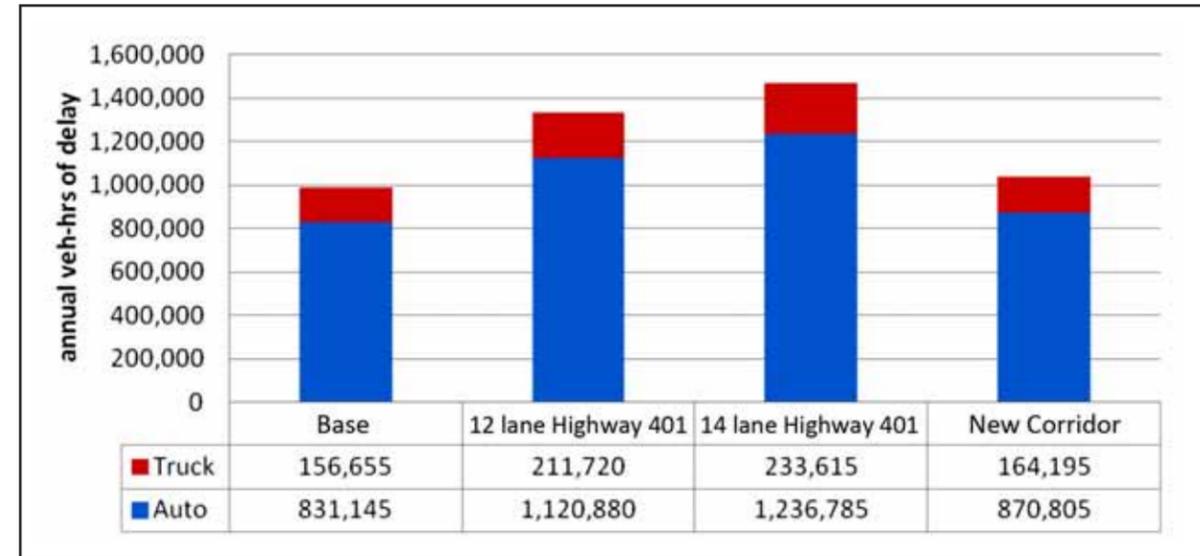


Exhibit 5-20: Annual Delays Caused by Highway 401 Closures due to Incidents

- No. 10 Side Road / Trafalgar Road
- No. 10 Side Road / Regional Road 25
- No. 10 Side Road / Esquesing Line (4th Line)
- No. 5 Side Road / Regional Road 25
- No. 5 Side Road / Tremaine Road
- No. 5 Side Road / Esquesing Line (4th Line)
- James Snow Parkway and Steeles Avenue
- Esquesing Line and Steeles Avenue

Safety Performance Functions (SPFs) are used to explore relationship between collision frequencies and traffic volume and site characteristics. The safety performance functions (SPFs) were obtained from "Safety-Analyst Interim Tools"¹. MTO-approved SPFs were not selected for this analysis as they do not differentiate between 4-lane (2 lanes per direction), 6-lane (3-lanes per direction), and 8+ lane (4 or more lanes per direction) freeways. For this study, the SPFs presented by Harwood et al were used as these SPFs were calibrated based on data from some states in the US and assumed to be transferable to our application. The selected SPFs were applied to predict total (TOT) and severe (SEV) collisions for

¹Harwood, D. W., K. M. Bauer, K. R. Richard, D. K. Gilmore, B. Persaud, and C. Lyon, Development of SPFs for Safety Analyst Interim Tools—Technical Memorandum, Prepared by Midwest Research Institute for the Federal Highway Administration. September 2004

	COLLISION TYPE	BASE CASE	12-LANE HIGHWAY 401	14-LANE HIGHWAY 401	NEW CORRIDOR AND HIGHWAY 401
Freeways	Injury	344	513	525	493
	Fatal	5	7	8	7
	Property Damage only (PDO)	531	823	841	806
	Severe (Injury and Fatal)	349	520	533	500
	Total Freeways	881	1344	1374	1306
Arterials	Injury	684	601	596	583
	Fatal	10	9	9	9
	Property Damage only (PDO)	2710	2382	2360	2310
	Severe (Injury and Fatal)	694	610	604	592
	Total Arterials	3404	2993	2964	2901
Total (Arterials and Freeways)	Injury	1028	1114	1121	1076
	Fatal	15	16	16	16
	Property Damage only (PDO)	3241	3206	3201	3116
	Severe (Injury and Fatal)	1043	1130	1137	1092
	Total	4284	4336	4338	4207

Exhibit 5-21: Annual Estimated Collisions under the Widening and New Corridor Alternatives

subtypes of each interchange element including mainline freeway segments, ramp portions, acceleration lanes, crossroad ramp terminals and intersections, and crossing roadway segments, where subtypes differ by geometric design or functional characteristics. For instance, according to Harwood et al, proper SPFs related to mainline freeway segments are selected based on the followings:

- Area Type (Urban or Rural)
- Number of lanes (2, 3, 4 or more)
- Inside /outside Interchange area (in order to account for the increased level of weaving, lane changing, and acceleration/deceleration that takes place immediately upstream, downstream, and between interchange ramps).

Three types of collisions were estimated – Property Damage Only (PDO), Injury and Fatal. Injury and Fatal collisions together are considered as severe collisions. The expected annual number of collisions for the alternatives are presented in Exhibit 5-21.

The Highway 401 12-Lane and 14-Lane Widening alternatives would result in additional collisions over the Base Case, primarily due to the complex interchange at the Highway 401/407 ETR interchange. The new corridor, by relieving Highway 401 congestion, would result in lower number of collisions on the freeway system than the Highway 401 12-Lane and 14-Lane Widening scenarios. The new corridor alternative would result in more collisions on the highway network than the Base Case. However, it would result in lower number of collision on local roads by diverting some of demand to the new corridor. All the three alternatives, by providing relief to arterials through additional highway capacity, would result in lower number of collisions on arterials. In summary, the new corridor would result in lowest number of collisions by balancing the traffic demand among Highway 401, the new corridor and the arterial road network. The estimated total and severe collisions are presented in graphs in Exhibits 5-22 and 5-23, respectively.

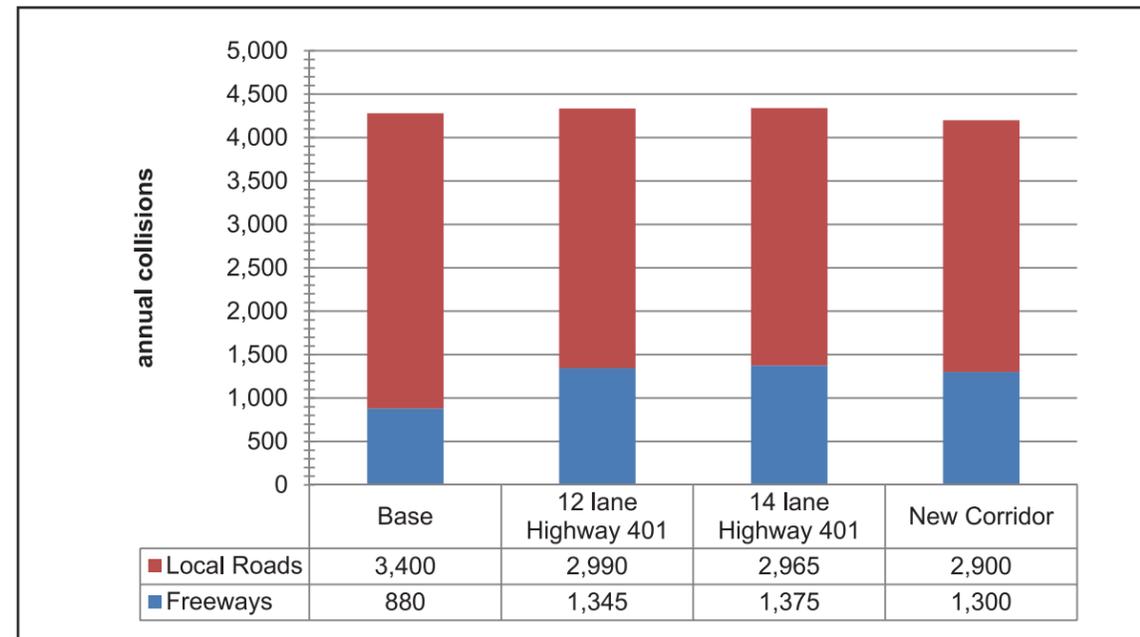


Exhibit 5-22: Total Annual Estimated Collisions under the Widening and New Corridor Alternatives

Delays During Construction

The delays to users due to lane closures during construction for the three alternatives were assessed. These delays were considered in the Economic evaluation of the alternatives, and also in the Constructability analysis.

Construction for the Highway 401 12-Lane and 14-Lane Widening scenarios in the Halton area would involve widening mainline Highway 401, and connecting the GTA West transportation corridor at the Highway 401/407 ETR interchange. Construction for the new corridor alternative in the Halton area would involve building the GTA West transportation corridor and connecting it to Highway 401 west of Tremaine Road, and tying the north-south link to the Highway 401/407 ETR interchange. There is no additional widening of Highway 401 over the Base Case for the new corridor alternative.

Scenarios are specified to represent a typical closure during construction. The following considerations were made in defining the construction closure delays:

- Only weekday closures were considered.

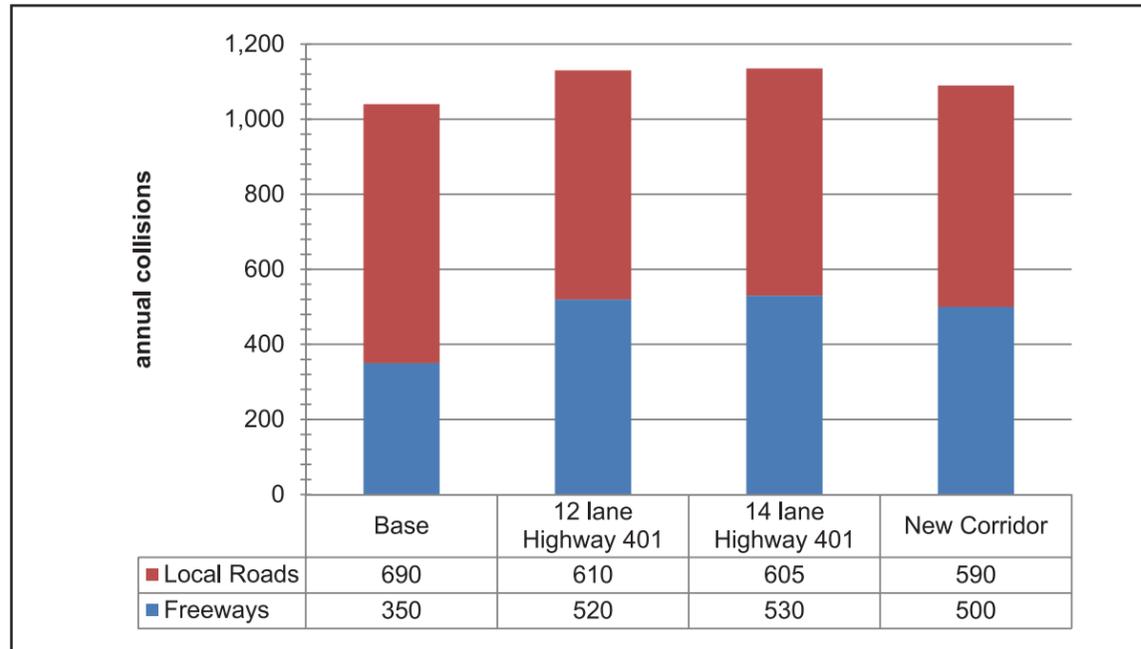


Exhibit 5-23: Total Annual Estimated Severe Collisions under the Widening and New Corridor Alternatives

- Construction is assumed during 9 out of 12 months (excluding winter)
- Construction for Highway 401 12-Lane and 14-Lane Widening is assumed to last for a duration of 4 years.
- Construction for the new corridor interchange at Highway 401 is assumed to last for 2 years.
- Night time is defined as the 9 hours between 9 pm and 6 am. For delays during the night time, the average delay for 9 pm-midnight period is applied for the first 4 hours. The average delay for 9 pm to 6 am is applied to the next 5 hours.
- The peak hour delays are multiplied by a factor of 9 to estimate delays for the day time (15-hour period).

The construction scenarios for daytime and night time are modeled as below:

- Day time delays for 12-lane and 14-lane Highway 401 widening: capacity per lane is reduced from Guelph Line to 407 ETR. Even though there are no lane closures during daytime construction, the reduced lane and shoulder widths are reflected in the lower capacity per lane.
- Night time delays for 12-lane and 14-lane Highway 401

widening: 3 out of 5 lanes (Base Case has 10 lanes in this stretch) are kept open between James Snow Parkway to Regional Road 25.

- Daytime delays for the new corridor: capacity per lane is reduced from Guelph Line to 407 ETR to reflect the construction at the interchange with Highway 401.
- Night time delays for the new corridor: 4 out of 6 lanes are assumed to be kept open between 407 ETR and Trafalgar Road, and 1 out of 3 lanes are kept open between Guelph Line and Tremaine Road.

Based on the above assumptions and analysis methodology, potential construction delays for the alternatives are as shown in **Exhibit 5-24**.

As can be seen from the above exhibit, potential delays during daytime construction for the Highway 401 14-Lane Widening are forecast to be the highest among the three alternatives. The delays for the new corridor are projected to be the lowest, since there is no mainline widening of Highway 401. Most of the construction for the new corridor is away from Highway 401 in the green field.

Night time construction delays for the new corridor are

	12 LANE HIGHWAY 401 – DAYTIME	12 LANE HIGHWAY 401 – NIGHT TIME	14 LANE HIGHWAY 401 – DAYTIME	14 LANE HIGHWAY 401 – NIGHT TIME	NEW CORRIDOR DAYTIME	NEW CORRIDOR NIGHT TIME
Auto Hours of Delay (veh-hours)	630,242	7	1,093,295	7	430,319	2,930
Truck Hours of Delay (veh-hours)	87,287	25	163,819	38	47,546	3,159

Exhibit 5-24: Construction Delays for the Widening and New Corridor Alternatives

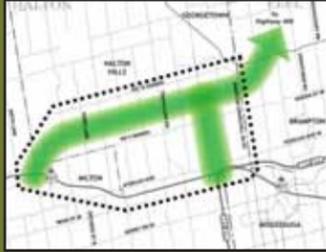
significantly higher than those for the widening alternatives. The reason is that since Highway 401 widening is incremental (from 10 lanes to 12 or 14 lanes), there would be sufficient capacity remaining even with some of the lanes closed. However, for the construction of the new GTAW corridor interchange with Highway 401 west of Tremaine Road, there are only three lanes on Highway 401 and only one of the lanes would be kept open during night time construction. This may result in significantly higher night time construction delays for the new corridor alternative compared to the widening alternatives.

Construction delays for the new corridor alternative do not include delays due to construction of new interchanges at Trafalgar and Regional Road 25. However, these delays are expected to be insignificant compared to delays on Highway 401 for the widening alternatives.

Conclusion

Based on the above transportation evaluation, the new corridor alternative is found to perform the best among the three alternatives. The evaluation tables in **Exhibit 5-25** show the entire spectrum of transportation evaluation criteria. The above discussion has focused mostly on the quantitative aspects of transportation evaluation—such as network capacity, travel delays, redundancy, construction impacts and safety. The evaluation tables, considering all the criteria, also suggest that the new corridor would provide the best transportation performance, followed by the Highway 401 14-Lane and 12-Lane Widening alternatives. However, it should be noted that even the Highway 401 12-Lane Widening alternative is still expected to accommodate transportation demands to 2031.

Exhibit 5-25: Transportation Evaluation (2011 / 2012)

FACTOR	SUB-FACTOR AND MEASURE	FURTHER 401 WIDENING TO 12 LANES 	FURTHER 401 WIDENING TO 14 LANES 	NEW CORRIDOR 
5.0 TRANSPORTATION FACTORS				
5.1 Traffic Operations <i>Measure</i> Potential Impact on Traffic Operations and capacity at key screenlines.	5.1.1. Peak Period performance of key corridors – forecast volume/capacity ratio at critical screen lines.	West of Tremaine Rd – 0.77 Tremaine Rd to RR 25 – 0.74 RR 25 to James Snow Pkwy– 0.67 James Snow Pkwy to Trafalgar Rd – 0.82 Trafalgar Rd to Highway 407 IC – 0.82 North of Highway 401 – 0.71	West of Tremaine Rd – 0.78 Tremaine Rd to RR 25 – 0.63 RR 25 to James Snow Pkwy– 0.62 James Snow Pkwy to Trafalgar Rd – 0.76 Trafalgar Rd to Highway 407 IC – 0.75 North of Highway 401 – 0.71	West of Tremaine Rd – 0.62 Tremaine Rd to RR 25 – 0.63 RR 25 to James Snow Pkwy– 0.63 James Snow Pkwy to Trafalgar Rd – 0.71 Trafalgar Rd to Highway 407 IC – 0.81 North of Highway 401 – 0.57
	5.1.2. Peak Period performance of key inter-regional corridors – forecast volume/capacity ratio at critical screen lines.	West of Tremaine Rd – 0.90 Tremaine Rd to RR 25 – 0.98 RR 25 to James Snow Pkwy– 0.91 James Snow Pkwy to Trafalgar Rd – 1.04 Trafalgar Rd to Highway 407 IC – 0.97	West of Tremaine Rd – 0.66 Tremaine Rd to RR 25 – 0.75 RR 25 to James Snow Pkwy– 0.82 James Snow Pkwy to Trafalgar Rd – 0.94 Trafalgar Rd to Highway 407 IC – 0.86	West of Tremaine Rd – 0.68 Tremaine Rd to RR 25 – 0.75 RR 25 to James Snow Pkwy– 0.87 James Snow Pkwy to Trafalgar Rd – 0.86 Trafalgar Rd to Highway 407 IC – 0.94
5.2. Commuter Travel Characteristics <i>Measure</i> Potential impact on commuter trip distribution and trip length.	5.2.1. Percentage of peak period self-containment of trips within the municipality / region.	Peel – 69% Halton – 63% Wellington – 80%	Peel – 69% Halton – 63% Wellington – 80%	Peel – 69% Halton – 63% Wellington – 80
	5.2.2 Average automobile trip length.	No difference between alternatives		
	5.2.3. Potential to support transit opportunities on a new corridor.	Opportunities for new transit linkages on N-S portion of new corridor connecting to Highway 401/407 IC Highway 401 widening may permit improved transit services on existing corridor although limited access to HOV lane (located in express) from GTAW corridor	Opportunities for new transit linkages on N-S portion of new corridor connecting to Highway 401/407 IC Highway 401 widening may permit improved transit services on existing corridor although limited access to HOV lane (located in express) from GTAW corridor	New corridor allows for protection of transitway to better serve Milton growth area, although connection via RR 25 would be required.
5.3 Efficient movement of people <i>Measure</i> Potential to support the efficient movement of people between communities and regions by road.	5.3.1. Percentage of inter-regional network operation better than Level of Service D (automobile km).	53% of overall network operating at LOS D or better 24% of Highway 401 operating at LOS D or better	58% of overall network operating at LOS D or better 40% of Highway 401 operating at LOS D or better	60% of overall network operating at LOS D or better 38% of Highway 401 operating at LOS D or better
	5.3.2. Percentage of local road network operating better than Level of Service D in peak hours (automobile km).	67% of local road network operating at LOS D or better		
	5.3.3. Percentage of inter-regional automobile trips* using the local road network in peak hours.	38%	37%	36%

FACTOR	SUB-FACTOR AND MEASURE	FURTHER 401 WIDENING TO 12 LANES 	FURTHER 401 WIDENING TO 14 LANES 	NEW CORRIDOR 
	5.3.4. Peak Hour Automobile hours of delay on the inter-regional transportation network† (automobile hours).	7,525 automobile hours of delay	7,065 automobile hours of delay	6,965 automobile hours of delay
	5.3.5. Peak Hour Automobile hours of delay on the local transportation network† (automobile hours).	4,229 automobile hours of delay	4,168 automobile hours of delay	4,173 automobile hours of delay
	5.3.6. Total persons moved in the study area.	No difference between alternatives	No difference between alternatives	No difference between alternatives
5.4. Efficient movement of goods. <i>Measure</i> <i>Potential to support the efficient movement of goods between communities and regions by road.</i>	5.4.1. Percentage of inter-regional system operating better than Level of Service D in peak hours (truck km).	34% of overall network operating at LOS D or better 21% of Highway 401 operating at LOS D or better	46% of overall network operating at LOS D or better 37% of Highway 401 operating at LOS D or better	45% of overall network operating at LOS D or better 33% of Highway 401 operating at LOS D or better
	5.4.2. Percentage inter-regional truck trips using the local road network* in peak hours.	8% of inter-regional truck traffic using local road network	8% of inter-regional truck traffic using local road network	8% of inter-regional truck traffic using local road network
	5.4.3. Peak Hour Truck hours of delay on the inter-regional transportation network†.	330 veh-hrs	271 veh-hrs	270 veh-hrs
5.5. System Reliability / Redundancy <i>Measure</i> <i>Potential to support system reliability and redundancy for travel (people and goods) between regions and communities during adverse conditions.</i>	5.5.1. Availability of alternate routes / facilities for inter-regional transportation between regions, communities and terminals (qualitative).	No inter-regional alternate route through Milton / Halton Hills area. Express-Collector system allows some ability to route traffic around incidents on Highway 401.	No inter-regional alternate route through Milton / Halton Hills area. Express-Collector system allows some ability to route traffic around incidents on Highway 401.	New corridor provides an alternate inter-regional route through Milton / Halton Hills area with direct connections to Highway 401.
	5.5.2. Potential to improve transportation system reliability (quantitative).	Reduces annual delays due to incidents by approximately 3% when compared to base case Est. Annual Truck Delay – 211,720 veh-hrs Est. Annual Auto Delay – 1,120,880 veh-hrs	Increases annual delays by approximately 7% when compared to base case Est. Annual Truck Delay – 233,615 veh-hrs Est. Annual Auto Delay – 1,236,785 veh-hrs	Reduces annual delays by approximately 25% when compared to base case Est. Annual Truck Delay – 164,195 veh-hrs Est. Annual Auto Delay – 870,805 veh-hrs
	5.5.3. Residual capacity to accommodate demands higher than base forecasts or growth beyond 2031.	Limited amount of reserve capacity to accommodate demands beyond base forecasts. At 1% annual growth rate capacity on Highway 401 would be reached by year: West of Tremaine Rd - 2045 Tremaine Rd to RR 25 – 2036 RR 25 to James Snow Pkwy– 2044 James Snow Pkwy to Trafalgar Rd – 2030 Trafalgar Rd to Highway 407 IC – 2037	Can accommodate demands 15% higher than base forecasts with reserve capacity in most segments. At 1% annual growth rate capacity on Highway 401 would be reached by year: West of Tremaine Rd - 2061 Tremaine Rd to RR 25 – 2064 RR 25 to James Snow Pkwy– 2054 James Snow Pkwy to Trafalgar Rd – 2040 Trafalgar Rd to Highway 407 IC – 2049	Can accommodate demands 15% higher than base forecasts with reserve capacity on new corridor in all segments. At 1% annual growth rate capacity on Highway 401 would be reached by year: West of Tremaine Rd – 2063 (2100 on new corridor) Tremaine Rd to RR 25 – 2050 (2100 on new corridor) RR 25 to James Snow Pkwy– 2041 (2067 on new corridor) James Snow Pkwy to Trafalgar Rd – 2044 (2048 on new corridor) Trafalgar Rd to Highway 407 IC – 2038 (2048 on new corridor)

Exhibit 5-25: Transportation Evaluation (2011 / 2012)

FACTOR	SUB-FACTOR AND MEASURE	FURTHER 401 WIDENING TO 12 LANES 	FURTHER 401 WIDENING TO 14 LANES 	NEW CORRIDOR 
5.6. Safety <i>Measure</i> Potential to improve traffic safety based on opportunity to reduce congestion on the area road network.	5.6.1. Potential to improve response times for emergency service providers due to reduced congestion on the inter-regional road network (refer to Level of Service in Traffic Operations). 5.6.2. Potential to reduce collisions due to improved network LOS (refer to Level of Service in Traffic Operations).	Lowest overall network and Highway 401 Level of Service performance Emergency response times may be higher No system alternative available to accommodate emergency service vehicle during closures A slight overall increase (1%) in collisions expected annually compared to base case due to additional widening to more complex express-collector system and higher volumes Severe collisions anticipated to increase by 9% annually	Highest Highway 401 Level of Service performance Improved corridor may improve emergency response time, however no system alternative available to accommodate emergency service vehicles during closures A slight overall increase (1%) in collisions expected annually compared to base case due to additional widening to more complex express-collector system and higher volumes Severe collisions anticipated to increase by 9% annually	Highest overall network Level of Service performance New corridor provides an alternative route to accommodate traffic during closures and may improve emergency response times A 2% overall decrease in collisions expected annually compared to base case due to lower volumes (traffic split between Highway 401 and new corridor) Severe collisions anticipated to increase by 5%
5.7. Modal integration, balance and choice for movement of people (commuters, recreation / tourist) <i>Measure</i> Potential to improve modal integration, balance and choice for person trips between communities' employment centres and major transit hubs.	5.7.1. Potential to increase attractiveness / effectiveness of existing, new and improved transit services (qualitative). 5.7.2. Peak period transit mode share (by destination). 5.7.3. Provision of higher order inter-regional transit services (qualitative) 5.7.4. Provision of linkages between inter-regional and regional/community (local) transit systems (qualitative) 5.7.5. Bus operational performance on inter-regional road network (refer to Level of Service in Traffic Operations). 5.7.6. Availability/provision of alternative travel modes for tourism / recreation travel (qualitative) 5.7.7. Potential of/allowance for active transportation measures (e.g., bike lanes, bike racks on buses / trains) (qualitative)	Moderate potential to increase attractiveness/ effectiveness of inter-regional transit on existing corridors. No difference between alternatives Higher order transit services limited to existing/widened freeway Potential to improve linkages between inter-regional and local transit with improved service integration at Highway 401 interchanges. Improves bus operational performance with improved road network operations No difference between alternatives Highest use of local roads by inter-regional trips expected, affecting safety/security for active transportation users.	Moderate potential to increase attractiveness/ effectiveness of inter-regional transit on existing corridors. No difference between alternatives Higher order transit services limited to existing/widened freeway Potential to improve linkages between inter-regional and local transit – although wider cross section may restrict opportunities to integrate local transit service in interchange areas. Improves bus operational performance with improved road network operations No difference between alternatives Reduced use of local roads for inter-regional trips expected, improving safety/security for active transportation users. Wider Highway 401 results in higher costs to provide new north-south connections for active travel modes.	Moderate potential to increase attractiveness/ effectiveness of inter-regional transit on existing corridors. Opportunity to introduce new services on a new corridor over a moderate distance No difference between alternatives Potential for new higher order inter-regional transit on new corridor Linkages between inter-regional and local transit possible although local buses in Milton would have to travel further to access station locations and service connections on new corridor. Improves bus operational performance with improved road network operations Potential for bus rapid transit (BRT) on new corridor No difference between alternatives Lowest use of local roads by inter-regional trips expected, improving safety/security for active transportation users. New corridor introduces a new barrier to north-south travel using active travel modes requiring crossing road grade separations
5.8. Modal integration, balance and choice for movement of goods. <i>Measure</i> Potential to improve modal integration, balance and choice for goods movement between ports and terminals, communities and employment centres.	5.8.1 Potential to improve accessibility of inter-modal centres, ports and terminals (qualitative)	No difference between alternatives	No difference between alternatives	No difference between alternatives

FACTOR	SUB-FACTOR AND MEASURE	FURTHER 401 WIDENING TO 12 LANES 	FURTHER 401 WIDENING TO 14 LANES 	NEW CORRIDOR 
<p>5.9. Linkages to Population and Employment Centres.</p> <p><i>Measure</i> Potential to improve accessibility to Urban Growth Centres, Gateway Economic Centres and Gateway Economic Zones for people and goods movement based on higher order network continuity and connectivity.</p>	<p>5.9.1. Availability/provision of higher order linkages between Urban Growth Centres, Gateway Economic Centres, and Gateway Economic Zones (qualitative).</p> <p>5.9.2. Accessibility of Urban Growth Centres, Gateway Economic Centres, and Gateway Economic Zones (qualitative).</p> <p>5.9.3. Percentage change in peak hour travel times between Urban Growth Centres.</p>	<p>All alternative improve connection between the Milton Urban Growth Centre to other Growth Centres in northern GTA (i.e. Vaughan)</p> <p>Congestion on Highway 401 may reduce accessibility to Milton Urban Growth Centre from GTA.</p> <p>No difference between alternatives</p>	<p>All alternative improve connection between the Milton Urban Growth Centre to other Growth Centres in northern GTA (i.e. Vaughan)</p> <p>Increased capacity on Highway 401 improves accessibility to Milton Urban Growth Centres and the GTA.</p> <p>No difference between alternatives</p>	<p>All alternative improve connection between the Milton Urban Growth Centre to other Growth Centres in northern GTA (i.e. Vaughan)</p> <p>New corridor improves linkage between Urban Growth Centres west of GTA and those in northern GTA (i.e. Vaughan)</p> <p>New Corridor improves accessibility to Milton Urban Growth Centre and to other Growth Centres west of the GTA and in northern GTA.</p> <p>No difference between alternatives</p>
<p>5.10. Recreation and Tourism Travel</p> <p><i>Measure</i> Potential to support recreation and tourism travel within and to / from the study area.</p>	<p>5.10.1. Directness of routes between population centres, international gateways and tourist/ recreation destinations (qualitative).</p> <p>5.10.2. Diversion of summer recreation trips from local and regional roadways (qualitative).</p>	<p>Provides moderate potential to improve directness of routes to tourist destinations within and outside of the study area, including the GTA and toward northern Ontario, with a new transportation corridor that links to Highway 401 to Highway 400 over a moderate distance.</p> <p>Some potential to divert summer/recreational trips from local and regional roads in close proximity to existing corridors due to increased freeway capacity</p>	<p>Provides moderate potential to improve directness of routes to tourist destinations within and outside of the study area, including the GTA and toward northern Ontario, with a new transportation corridor that links to Highway 401 to Highway 400 over a moderate distance.</p> <p>Improved potential to divert summer/recreational trips from local and regional roads in close proximity to existing corridors due to increased freeway capacity</p>	<p>Provides improved potential to improve directness of routes to tourist destinations within and outside of the study area, including the GTA and toward northern Ontario, with a new transportation corridor over a long distance. Potential for improved directness to Niagara Region and U.S. border if combined with a connection to NGTA corridor.</p> <p>Greatest potential to divert summer/recreational trips from local/regional roads to new corridor over a long distance</p>

* "Inter-regional trip" defined as trips with a length greater than average commuting distance within study area (>20km)

^ Total person demand between Urban Growth Centers, 3-hour AM peak period

† "Inter-regional network" defined as provincial freeways and "relevant" highway systems – e.g., where a local highway is planned to be improved as part of a transportation alternatives (e.g., County Road 124)

	<p>FURTHER 401 WIDENING TO 12 LANES</p> 	<p>FURTHER 401 WIDENING TO 14 LANES</p> 	<p>NEW CORRIDOR</p> 
<p>TRANSPORTATION SUMMARY</p>	<p>LESS PREFERRED This alternative is less preferred because:</p> <ul style="list-style-type: none"> • Worst overall network performance; Highway 401 performance is also worst • Provides limited capacity to accommodate higher than base demands or growth beyond 2031. • Highest amount of auto and truck delay • Highest amount of inter-regional auto and truck traffic using local roads • Reduces annual delays due to incidents by 3% compared to base • Increases overall network collisions by 1% compared to base conditions 	<p>MODERATELY PREFERRED This alternative is moderately preferred because:</p> <ul style="list-style-type: none"> • Better overall network performance; Best performance on Highway 401 • Performs reasonably well in terms of capacity to accommodate higher demands - no flexibility to address deficiencies east of James Snow Parkway • Widening to 14 lanes provides similar results to the east of Regional Road 25 but not to the same extent as the new corridor • Provides the second lowest amount of auto and truck delay • Provides the second lowest amount of inter-regional auto and truck traffic using local roads • Increases annual delays due to incidents by 7% compared to base • Increases overall network collisions by 1% compared to base conditions. 	<p>MOST PREFERRED This alternative has been selected as the most preferred because:</p> <ul style="list-style-type: none"> • Best overall network performance; Better performance on Highway 401 • Performs the best in terms of capacity to accommodate higher demands • Provides the greatest residual capacity with 4 lane new corridor (provides sufficient capacity until 2033-2100) • Lowest amount of auto and truck delay • Lowest amount of inter-regional auto and truck traffic using local roads • Provides network redundancy with an alternative inter-regional corridor to Highway 401 in case of adverse conditions / closures • Reduces annual estimated delays due to incidents by 25% compared to base • Reduces overall network collisions by 2% compared to base conditions – lowest increase in severe collisions

5.7 ADDITIONAL ANALYSIS IN HALTON AREA – ROAD DESIGN, CONSTRUCTABILITY AND COST

Additional cost and constructability analysis was undertaken to assess the New Corridor Alternative and two Highway 401 Widening Alternatives including a new interchange at Highway 401 / 407ETR at a higher level of detail. The Study Team used 2031 lane requirements as the primary input to evaluate constructability and cost of the three alternatives. These lane requirements were developed as part of the travel demand forecasting work. It should be emphasized that the majority of this work has been prepared only to a conceptual level of design, sufficient for the assessment and comparison of alternatives at Stage 1 of the study and should not be taken to be representative of the absolute requirements for this project, which are subject to Stage 2 of the EA.

5.7.1 Methodology

The following approach and assumptions were used in undertaking the additional analysis:

- Preliminary layouts for Highway 401 Widening to 12 and 14 lanes as well as Representative Routes for the New Corridor were identified in accordance with MTO Geometric Design Standards. In addition, New Corridor routes were subject to the MTO Safety Standards Manual for Rural Freeways which utilizes a higher design standard, a common practice for new rural freeways.
- All highway widening requirements identified as part of the Highway 401 12-Lane and 14-Lane Widening alternatives are over and above what is currently being planned by MTO in the ongoing Highway 401 Environmental Assessment / Preliminary Design (EA/PD) Studies which was assumed to be the base case for this analysis:
 - **W.O. 07-20024 Highway 401 EA/PD from Regional Road 25 to East of Trafalgar Road** recommends widening Highway 401 from 6 lanes to a 12 lane express-collector system between east of Trafalgar Road and east of James Snow Parkway, and from 6 lanes to a 10 lane core between east of James Snow Parkway and Regional Road 25. The Alternative for Widening Highway 401 to 12 lanes requires widening Highway 401 as identified in the base case above from a 10 lane core to a 12 lane express-collector system

from east of Regional Road 25 to east of James Snow Parkway. The Alternative for Widening Highway 401 to 14 lanes requires widening Highway 401 as identified in the base case from a 10 lane core to a 14 lane express-collector system from east of Trafalgar Road to east of James Snow Parkway, and from a 10 lane core to a 12 lane express-collector system from east of James Snow Parkway to Regional Road 25.

- **W.O. 07-20021 Highway 401 EA/PD from East of Trafalgar Road to east of the Credit River** recommends widening Highway 401 from 6 lanes to a 12 lane express-collector system between east of Trafalgar Road and 407ETR, 10 lanes from 407ETR to east of Winston Churchill Boulevard, and 12 lane express-collector system from east of Winston Churchill Boulevard to east of the Credit River. The Alternative for Widening Highway 401 to 12 lanes does not require any additional lanes along Highway 401 east of Trafalgar Road. The Alternative for Widening Highway 401 to 14 lanes requires widening Highway 401 from a 12 lane express-collector system to a 14 lane express-collector system from east of Trafalgar Road to 407ETR.
- The Highway 401 Widening alternatives included assessment of impacts to bridges, interchanges, adjacent service roads, drainage systems including stormwater management ponds, and impacts to adjacent properties including buildings, parking lots and fire access routes.
- Locations where future grading limits would impact buildings, parking areas and fire routes were mitigated by introducing retaining walls.
- All requirements including property were cost based on unit pricing for similar freeway widening expansion projects in the Greater Toronto Area.
- A complex 'full movement' interchange was assessed at Highway 401 / 407ETR as part of the Highway 401 Widening alternatives. Parameters used in developing the full-movement interchange include:
 - Provide full moves between the GTA West, Highway 401 and 407ETR in all directions;
 - Interchange geometrics were in accordance with MTO Safety Standards Manual for Rural Freeways, where practical;

- Traffic analysis must be consistent with traffic analysis undertaken in the ongoing two EA/PD studies along Highway 401;
- Existing 407ETR bridges are to be retained.

The following criteria have been used consistently in other evaluations for this study and have been applied for assessment of the alternatives in Halton area.

- Highway and Interchange Geometrics
- Impacts to Existing Infrastructure (i.e., bridges, stormwater management facilities etc.)
- Impacts to Municipal Side Roads or Service Roads
- Retaining Wall Requirement to Minimize Property Impact
- Compatibility with Adjacent MTO Studies
- Flexibility to Accommodate Future Expansion



Existing Cross-section of Highway 401 through Milton

New Corridor Alternative

The process for assessing the New Corridor alternative included high level review of representative alignments between Winston Churchill Boulevard (eastern limit) to Dublin Line (western limit) with partial moves freeway to freeway interchange connections at Highway 401 west of Tremaine Road, and at a North-South Link to Highway 401/407ETR. Representative alignments were created for the purpose of defining a length of highway, approximate number of interchanges, structures, freeway elements and impacts. The conceptual alignments were also used to estimate the property footprint based on the minimum right-of-way of 200 m which allows for a 110 m freeway, 60 m transitway and an additional 30 m for high fill and deep cuts. The footprint was expanded at select locations to allow for a standard Parclo A-4 interchange with major Regional Road crossings at Trafalgar Road and Regional Road 25. It was assumed that all other north-south roadways would be grade separated with a bridge. A range of impacts was determined based on three (3) representative east-west routes in the analysis area. The east-west representative routes were located in the “north”, “middle” and “south” portions of the analysis area, and were generated strictly for the purpose of identifying a quantitative range of impacts for the east/west portion of the corridor. The Environmental impacts of the generated routes were minimized by avoiding visible natural features such as wood lots and river valleys, bisecting farms avoiding communities, clusters of homes and farm buildings and heritage features. In general, the representative routes were selected to balance impacts to the extent possible. The range of impacts is approximate only and will be updated as the Environmental Assessment Study proceeds to Stage 2 where the route of the proposed new transportation corridor will be identified.

Two North-South link alternatives were assumed as part of the analysis: The first alternative assumed a 200 m right-of-way to accommodate a North-South Link freeway connection and transitway between the New Corridor and Highway 401/407ETR. The second alternative assumed a 100 m right-of-way to accommodate a North-South arterial connection and transitway.

Key elements of the New Corridor included eight underpass structures at crossing roads, one rail overpass and one major creek crossing at Middle Sixteen Mile Creek. Two Parclo A4 interchanges were assumed at Regional Road 25 and Trafalgar Road interchange. The New Corridor includes a new partial freeway to freeway interchange with Highway 401 west of the proposed Realigned Tremaine Road interchange. The interchange includes ramps from Highway 401 eastbound to GTA West eastbound, and from GTA West westbound to Highway 401 westbound.

Highway 401 Widening Alternatives (12 Lanes or 14 Lanes)

Existing Highway 401 is a 6-lane freeway with median concrete barrier through Milton. Interchanges are located at 407ETR, Trafalgar Road, James Snow Parkway and Regional Road 25. Grade separations are located at Ninth Line, Sixth Line, Fifth Line, Steeles Avenue and CN Rail. The average right-of-way width is 90 m, with additional property at interchanges and areas of high fill. The highway is drained by a median storm sewer and drainage ditches. Stormwater management ponds for highways are located at the 407ETR interchange. Smaller stormwater ponds are located along Highway 401 to service development.

Recommendations from the ongoing Highway 401 Environmental Assessment / Preliminary Design Study from west of Trafalgar Road to east of Regional Road 25, include widening Highway 401 from 6 to 12 lanes between the 407ETR and James Snow Parkway, and from 6 to 10 lanes between James Snow Parkway and Regional Road 25. The recommendations also include replacement of bridges at Trafalgar Road, Sixth Line and Regional Road 25, reconfiguration of interchanges at Trafalgar Road and Regional Road 25 and widening of existing bridges at Sixth Line, Fifth Line, Steeles Avenue, CN Rail and various watercourse crossings. Completion of this work represents ‘the base case’. Impacts and costs associated with implementing the base case are not included in our analysis / findings.

The process for assessing improvements to existing roadway facilities involved a generalized approach for identifying property requirements for constructing additional lanes (between east of James Snow Parkway and Regional Road

25 for the Highway 401 12-Lane Widening alternative, and between 407ETR and Regional Road 25 for the Highway 401 14-Lane Widening alternative) and modifying existing interchanges as required at Regional Road 25, James Snow Parkway, Regional Road 25 and 407ETR. The approach included applying cross-sections of the future 12 or 14 lane highway to the base case, ensuring adequate drainage could be provided and determining the resulting property requirements. The approach assumed that the construction of future lanes would be based on retaining the existing centre line of the highway. For all scenarios, it was assumed that typical freeway cross-sections would be updated to include the best practice roadway elements such as standard 3.75 m lanes, 3.0 m outside shoulders, HOV lanes with buffers and a median shoulder width of 4.25 m to include enforcement of HOV lanes. Additional property widths were added as required to account for ramp relocations at interchanges, relocation of service roads and known areas of high fill and deep cuts. The assumed cross-section for the 12 and 14 lane alternatives is a semi-urban cross-section, which is standard practice for MTO freeways in urban areas. The cross-section includes an urban median with storm sewers and rural outside shoulders with drainage ditches. Rural outside shoulders were replaced by urban outside shoulders and retaining walls in constrained areas (i.e. areas in which the rural outside shoulder and drainage ditch would impact adjacent buildings, parking spaces or fire routes). Property requirements were determined by calculating the area between the existing right-of-way (ROW) and future ROW lines. It is recognized that improvement alternatives will each have some unique challenges and opportunities, and that actual ROW requirements will likely vary somewhat from the ROW lines generated for this assessment. However, it is believed that this approach would provide a reasonable representation of the footprint impacts of the alternatives being evaluated.

Two options were examined as part of the Highway 401 Widening Scenarios:

- i.) Widen Highway 401 to 12 lanes. This alternative includes widening Highway 401 as identified in the base case from 10 lane core to a 12 lane express-collector system from east of James Snow Parkway to east of

Regional Road 25. This alternative would result in a 12 lane express-collector system from east of Trafalgar Road to Regional Road 25, and a 10 lane core from Regional Road 25 to west of Realigned Tremaine Road. This alternative is similar to an alternative developed by Halton Hills as part of their review of the feasibility to provide an express-collector system between James Snow Parkway and Regional Road 25.

- ii.) Widen Highway 401 to 14 lanes. This alternative includes widening Highway 401 as identified in the base case from a 12 lane express-collector system to a 14 lane express-collector system between east of Trafalgar Road to James Snow Parkway, and widening Highway 401 from a 10 lane core to 12 lane express-collector system from James Snow Parkway to Regional Road 25. This option assumed that transfer lanes would be required at key locations to provide opportunities for vehicles to transfer back and forth between the core and collector lanes. This alternative would result in a 14 lane express-collector system from east of Trafalgar Road to James Snow Parkway, a 12 lane express-collector system from James Snow Parkway to Regional Road 25, and a 10 lane core from Regional Road 25 to west of Realigned Tremaine Road.

Freeway to Freeway Interchange

Additional analysis was completed for a full moves interchange with GTA West and Highway 401 / 407ETR as part of the Highway 401 Widening alternatives. This interchange is constrained by proposed development, the existing Trafalgar Road interchange and Sixteen Mile Creek tributary to the west and the existing Winston Churchill Boulevard interchange to the east.

Part of the additional analysis included a full one day Constructability Review workshop for the interchange. The primary purpose of the workshop was to invite the independent team of highway specialists to review and comment on the staging, detour and design of the full movement interchange. The workshop provided confirmation that an interchange is constructable at this location and can be staged without long term closures of freeway segments or ramps. Additional traffic analysis based on travel demand forecasting to 2031 was completed using the VISSIM software package. The

analysis confirmed adequate operations and the need for an auxiliary lane along Highway 401 westbound between the on-ramp from the GTA West (east of Trafalgar Road) to the Highway 401 westbound off-ramp to James Snow Parkway.



Conceptual GTA West transportation corridor and Highway 401 / 407ETR Interchange (only Freeway to Freeway ramps are shown)



5.7.2 Findings

The New Corridor provides a higher degree of flexibility to incorporate features such as a dedicated transitway or truck lanes. It also provides flexibility for providing additional lanes in the median in the future if needed including HOV lanes. The New Corridor will also include protection for a transitway including transitway stations and carpool lots. The Highway 401 Widening alternatives are constrained through the built-up area of Milton. Key constraints include retail, commercial, stormwater management ponds and service roads. One of the constraints is the Steeles Avenue bridge over Highway 401 which when replaced, would impact adjacent properties / businesses. Retaining wall is a mitigation measure to minimize displacement of buildings, service roads and stormwater management ponds in some areas where sloped fills will have significant impacts. The construction of retaining walls will limit flexibility to further expand Highway 401 in the future if extra lanes are required.

Exhibit 5-26 documents the detailed evaluation findings under the cost and constructability criteria.

Exhibit 5-26: Cost and Constructability Factors Evaluation (2011 / 2012)

FACTOR	SUB-FACTOR AND MEASURE	FURTHER 401 WIDENING TO 12 LANES 	FURTHER 401 WIDENING TO 14 LANES 	NEW CORRIDOR 
6.0 Cost and Constructability Factor				
6.1 Potential to ease implementation considering relative cost, relative property impacts, feasibility / difficulty and requirements for environmental mitigation.	6.1.1 Cost (range. \$B) (includes construction and property costs only)	\$ 0.5 - 0.55 B	\$ 0.8 - 0.85 B	\$ 0.6 - 0.7 B
	6.1.2. Feasibility of implementation (including interchange reconstruction requirements, impacts on existing schemes, etc.).	<ul style="list-style-type: none"> Requires extensive retaining walls (2.5 km) to avoid impacts to service roads, SWMPs, buildings, parking/fire routes between Regional Road 25 (RR25) and James Snow Parkway (JSP). Requires reconstruction of interchange at JSP and partial reconstruction of interchanges at RR25 and Trafalgar Road. JSP Ramp S-E realignment required to avoid impacts to Hydro tower at Highway 401/JSP quadrant. (Increased property requirement). 	<ul style="list-style-type: none"> Requires extensive retaining walls (5.0 km) to avoid impacts to service roads, SWMPs, buildings, parking/fire routes between RR25 and JSP. Requires reconstruction of interchanges at Tremaine Road, RR25, JSP and partial reconstruction of interchange at Trafalgar Road. Will result in reduced cross-section of Highway 401 (ie reduced shoulders) at Trafalgar Road and Sixth Line. Requires realignment of 2.1 km of Boston Church Road (retaining wall required). JSP Ramp S-E realignment required to avoid impacts to Hydro tower at Highway 401/JSP quadrant. (Increased property requirement). 	<ul style="list-style-type: none"> Impact to hydro corridor between Dublin Line and RR25. Requires relocation of poles. May require high skew crossing of Rail, Third Line and Winston Churchill Boulevard. Constrained opportunities for interchange at existing Winston Churchill Boulevard due to proximity of Credit River. Re-aligned Winston Churchill Boulevard in close proximity to N-S Link interchange.
	6.1.3 Potential transportation construction staging impacts.	<ul style="list-style-type: none"> Requires complex staging along Highway 401 between RR25 and JSP to convert from Core to Express-Collector configuration, and to construct retaining walls along Highway 401. CN bridge replacement East of RR25 would require complex staging of 401 or lowering of CN rail. Staging of bridge replacements at RR25, Steeles Avenue and JSP will impact local traffic. Requires high complex staging of new full moves Interchange at Highway 401/407ETR and new corridor including temporary detours. 	<ul style="list-style-type: none"> Requires complex staging along Highway 401 between RR25 and JSP to convert from Core to Express-Collector configuration with additional transfer lanes, and to construct retaining walls along Highway 401. CN bridge replacement East of RR25 would require complex staging of Highway 401 or lowering of CN rail. Staging of bridge replacements at Tremaine, RR25, Steeles Avenue and JSP will impact local traffic. Requires high complex staging of new full moves Interchange at Highway 401/407ETR and new corridor including temporary detours. 	<ul style="list-style-type: none"> Requires moderately complex staging of new partial moves N-S Link Interchange at Highway 401/407ETR including temporary detours. Requires minor staging of new partial moves interchange at Highway 401 and new corridor, west of Tremaine Road.

FACTOR	SUB-FACTOR AND MEASURE	FURTHER 401 WIDENING TO 12 LANES 	FURTHER 401 WIDENING TO 14 LANES 	NEW CORRIDOR 
	6.1.4 Requirements for environmental mitigation.	<ul style="list-style-type: none"> Impacts to East Sixteen Mile Creek at N-S Link. Long construction duration will result in increased noise, air quality concerns in the short term; noise wall may be required at Highway 401/JSP SW quadrant. Impacts to planned Stormwater Management Ponds (SWMPs) between Highway 401 and Steeles Avenue, east of Trafalgar Road. 	<ul style="list-style-type: none"> Realignment of Sixteen Mile Creek West Branch in SW quadrant of Highway 401/RR25 Interchange and impacts to East Sixteen Mile Creek. Long construction duration will result in increased noise, air quality concerns in the short term; noise wall may be required at Highway 401/JSP SW quadrant. Impact to existing SWMP at Highway 401/RR25 NE quadrant. Requires expansion of planned SWMPs between JSP and Trafalgar. Impacts to planned SWMPs between Highway 401 and Steeles, east of Trafalgar. Minor impacts to Kelso Lake. 	<ul style="list-style-type: none"> Impacts to new corridor crossing of Middle Sixteen Mile Creek. Minor impacts to Kelso Lake.
CONSTRUCTABILITY SUMMARY		LESS PREFERRED Geometrics will need to be reduced, complex interchange at 407ETR, limited flexibility for future expansion.	LEAST PREFERRED Geometrics will need to be reduced, requires extensive retaining walls, complex interchange at 407ETR, limited flexibility for future expansion.	MOST PREFERRED Allows use of higher MTO Design Standards. Maximum flexibility for future expansion.
COST SUMMARY		MOST PREFERRED Moderate complication associated with construction. Less costly compared to new corridor.	LEAST PREFERRED High complication associated with construction. Highest estimated cost.	MODERATELY PREFERRED Can be built "off-line"

5.8 SUMMARY OF EVALUATION FINDINGS OF 2011/2012 ADDITIONAL ANALYSIS

In summary, while the New Corridor Alternative would provide the best transportation and long-term economic benefits, its construction would have the highest impact on the natural environment, agriculture and rural communities. Between the two “Further Widening of Highway 401” alternatives, the Highway 401 12-Lane Widening alternative would have much less impact on adjacent business and commercial land uses when compared to the Highway 401 14-Lane Widening alternative.

The “Further Widening of Highway 401 to 12 lanes” alternative would accommodate forecast demand to 2031 and could be designed to provincial design standards, with retaining walls proposed to mitigate property impacts, although this would limit the flexibility to further expand Highway 401 in the future.

The “Further Widening of Highway 401 to 12 lanes” alternative would also have minimal impact to agricultural lands and the agricultural economy, as well as the cultural heritage and rural character of the community and it better reflects the land use planning and policies of local municipalities, as established in their respective Official Plans.

Exhibit 5-27 summarizes the evaluation findings of 2011/2012 additional analysis.

Given that considerably more social and environmental impacts would be expected with a new corridor through Halton Hills and that the Highway 401 alternative at 12 lanes will provide the essential transportation needs to 2031, it is recognized that “**Further Widening of Highway 401 to 12 lanes**” through Halton will provide the best balance of benefits and impacts and is therefore preferred based on the additional analysis.

	New Corridor	Further 401 Widening to 12 lanes	Further 401 Widening to 14 lanes	
Community (Residences, Tourism and Recreational Lands, Community Facilities/Institutions)	Less Preferred	Moderately Preferred	Moderately Preferred	Given the rural nature of the community and presence of active agricultural land uses, the “Further 401 Widening to 12 lanes” alternative would have the least impact to existing rural communities, agriculture lands, as well as built heritage and archaeology resources.
Cultural (Archaeology, Built Heritage, First Nations)	Less Preferred	Most Preferred	Moderately Preferred	
Agriculture (Agricultural Facilities and Land Use, Class 1 to Class 3 Lands)	Least Preferred	Moderately Preferred	Moderately Preferred	
Natural (Fish and Fish Habitat, Terrestrial Ecosystems, Surface Water, Designated Area)	Less Preferred	Most Preferred	Moderately Preferred	The “Further 401 Widening to 12 lanes” alternative would have the least impact to natural environment features, as the widening would be along an existing corridor.
Land Use Planning (Planning Policies, Existing and Future Land Use)	Less Preferred	Moderately Preferred	Moderately Preferred	The “Further 401 Widening to 12 lanes” alternatives would make use of existing infrastructure and meets infrastructure needs to 2031. There would be some impacts to adjacent commercial lands, but no complete business removals along Highway 401 are expected under the 12-lane Widening alternative scenario.
Economy (Savings, Benefits / Impact to Industries, Construction)	Moderately Preferred	Less Preferred	Least Preferred	The “New Corridor” alternative is preferred as there would be greater travel time savings, it supports business & tourism sector, promotes economic development; however, there would be higher impact to agriculture sector / economy.
Transportation (Network Performance, Residual Capacity, People & Goods Movement, Redundancy, Safety)	Most Preferred	Less Preferred	Moderately Preferred	The “New Corridor” and “Further 401 Widening” alternatives address transportation need to 2031 to an adequate level of service (“New Corridor” alternative would provide more redundancy, while “Further 401 Widening to 12 lanes” would be close to capacity shortly after 2031). The “New Corridor” alternative reflected more opportunities to achieve efficient and reliable transportation connections than the “Further 401 Widening” alternatives over the long term.
Road Design / Constructability (Geometrics, Staging, Impact to Existing Infrastructure, Flexibility for Future Expansion)	Most Preferred	Less Preferred	Least Preferred	The “New Corridor” is preferred as it would allow the use of higher MTO design standards, and it would allow maximum flexibility for future expansion (when required).
Cost	Moderately Preferred	Most Preferred	Least Preferred	The “Further 401 Widening to 12 lanes” alternative has the lowest estimated construction cost.

PREFERRED ALTERNATIVE

Exhibit 5-27: Summary of Evaluation Findings of 2011/2012 Additional Analysis