APPENDIX O

Short-List of Alternatives Evaluation Tables

COUNTY ROAD 26 EVALUATION TABLE

CRITERIA	CRITERIA WEIGHTING	SCALE	INDICATOR	County Road 26 C-2	County Road 26 C-6	County Road 26 C-7
			Alternative Description	Replace bridge to the west (intermediate)	Replace bridge on existing alignment (temporary closure)	Replace bridge on existing alignment (temporary single-lane traffic control)
				SCORE	SCORE	SCORE
Natural Environment	25%	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Fish & Aquatic Habitat** Direct and/or indirect impacts on fisheries, including Species at Risk (SAR).	0	0	0
				No watercourses identified within 30 m of proposed work area; no impacts anticipated as a result of the proposed work.		
			Terrestrial Ecosystems Direct and/or indirect impacts on vegetation communities, significant wildlife, wildlife habitat, and movement patterns, including SAR.	5	1	1
				Alignment travels through young conifer plantation south of 401 and cultural meadow north of 401. Vegetation types not significant and provides general wildlife habitat for common species. Cultural meadow north of 401 provides potential breeding habitat for SAR Eastern Meadowlark/Bobolink and would include removal of approximately 1.5 ha. Telephone Road: Removal of swath of conifer plantation and edge of mixed woodland for realignment; impact also from creating small plantation patch between grading limit and existing Telephone Rd.	Minor vegetation removal associated with widening on existing alignment. Minor removal of potential habitat for SAR Eastern Meadowlark/Bobolink.	Minor vegetation removal associated with widening on existing alignment. Minor removal of potential habitat for SAR Eastern Meadowlark/Bobolink.
			Designated Natural Features Direct and/or indirect impacts on Designated Natural Areas, including Environmentally Sensitive Areas (ESAs), Areas of Natural and Scientific Interest (ANSI), and Provincially Significant Wetlands (PSWs).	0	0	0
				No designated natural areas		
			Contamination Number of potentially contaminated properties to be impacted.	0	0	0
				No impact		
			Excess Soil Management Quantity excess soil subject to O.Reg. 406/19 (relative to other alternatives).	1	1	1
				Minor shallow cut resulting in relatively low quantities of excess soil		
			Erosion and Sediment Control Qualitative measure of impacts to areas with Erosion and Sediment Control concern	1	1	1
				Medium erosion potential but only minor cut and fill		
			Surface Water & Drainage Number of watercourse crossings and impacts to surface water features; Impacts to existing highway drainage systems and ability to provide stormwater management.	1	1	1
				All alternatives have the same amount of impervious area from a drainage analysis perspective and hence the same impacts. In all alternatives there are no watercourses crossing.		
			Groundwater Qualitative / quantitative assessment of impacts to groundwater.	1	1	1
				No wetlands, IPZ or ANSI are present within this alternative. No ponds or waterbodies are present within 100 m of this alternative. One watercourse is present within this alternative. Zero indicators of potential groundwater upwelling were observed near this alternative. 35% of this alternative is within a WHPA-B, 50% is within a WHPA-C, and 5% is within a WHPA-D. 10% is not within a WHPA. 35% of this alternative is within an SGRA and HVA. 100% of this alternative is within an area of high groundwater susceptibility and 5% is within an area of high surface water susceptibility. One well with a shallow water level (less than 3mbgs) is present within this alternative. There are 2 other wells present. Two deep (greater than 15 mbgs) domestic water supply wells are present within this alternative. One deep municipal water supply well is present. No impacts to wetlands, waterbodies, or shallow wells are anticipated. Potential impacts to one watercourse and shallow groundwater are anticipated. Mitigation measures to protect sensitive source water features are required.	No wetlands, IPZ or ANSI are present within this alternative. No ponds or waterbodies are present within 100 m of this alternative. One watercourse is present within this alternative. Zero indicators of potential groundwater upwelling were observed near this alternative. 10% of this alternative is within a WHPA-B, 75% is within a WHPA-C, and 10% is within a WHPA-D. 5% is not within a WHPA. 10% of this alternative is within an SGRA and HVA. 100% of this alternative is within an area of high groundwater susceptibility and 5% is within an area of high surface water susceptibility. One well with a shallow water level (less than 3 mbgs) is present within this alternative. There is 1 other well present. Two deep (greater than 15 mbgs) domestic water supply wells are present within this alternative. No impacts to wetlands, waterbodies, or shallow wells are anticipated. Potential impacts to one watercourse and shallow groundwater is anticipated. Mitigation measures to protect sensitive source water features are required.
Total Natural Environment Score				**2.25**	**1.25**	**1.25**
Total Natural Environment Rank				**3**	**1**	**1**
Summary of Natural Environment Key Aspects				**From a Natural Environment perspective Alternatives C-6 and C-7 are equally preferred since Alternative C-2 has greater impacts to potential breeding habitat for SAR Eastern Meadowlark/Bobolink and a greater amount of vegetation removal associated with Telephone Road realignment.**		
Cultural Environment	20%	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Archaeology** Impacts to known archaeological features or areas of archaeological potential.	3	3	3
				Archaeological potential is present in all three alternatives. This alternative requires significantly more Stage 2 survey than alternatives C6 and C7.	Archaeological potential is present in all three alternatives. The amount of Stage 2 survey required is significantly less than alternative C-2 and comparable to C-7.	Archaeological potential is present in all three alternatives. The amount of Stage 2 survey required is significantly less than alternative C-2 and comparable to C-6.
			Built Heritage Resources and Cultural Heritage Landscapes Number of impacts to properties designated under the *Ontario Heritage Act* (OHA) or listed on municipal Heritage Registers; number of cultural heritage landscapes displaced or disrupted;	5	5	5
				Impact to 1 CHL (638 County Road 26) due to property taking/grading. A CHER was completed for 638 County Road 26 and it was found to possess cultural heritage value or interest and is now identified as a Provincial Heritage Property (PHP). A Heritage Impact Assessment (HIA) is recommended to be prepared in advance of Detail Design if possible. Impact to Telephone Road CHL alignment.	Impact to 1 CHL (638 County Road 26) due to property taking/grading. A CHER was completed for 638 County Road 26 and it was found to possess cultural heritage value or interest and is now identified as a Provincial Heritage Property (PHP). A Heritage Impact Assessment (HIA) is recommended to be prepared in advance of Detail Design if possible.	
			Impacts to Indigenous lands The extent of Indigenous lands required.	0	0	0
				The study area falls within the boundaries of the 1923 Williams Treaties. The Williams Treaties First Nations include the Chippewas of Beausoleil, Georgina Island, and Rama and the Mississaugas of Alderville, Curve Lake, Hiawatha, and Scugog Island. The Alderville First Nation Reserve is to the north of the study area. There are no impacts to Reserve Lands.		
Total Cultural Environment Score				**1.6**	**1.6**	**1.6**
Total Cultural Environment Rank				**1**	**1**	**1**
Summary of Cultural Environment Key Aspects				From a Cultural Environment perspective there is no preference for a preferred alternative. All alternatives require property taking/grading for a potential cultural heritage landscape and a CHER was completed. 638 County Road 26 was found to possess cultural heritage value or interest and is now identified as a Provincial Heritage Property (PHP). A Heritage Impact Assessment (HIA) is recommended to be prepared in advance of Detail Design if possible. Alternative C-2 is anticipated to impact more areas that contain archaeological potential, there is no significant difference in the archaeological potential of the alternatives. The possibility of recovering archaeological material is equal for all alternatives.		
			Property & Access Number of residential and commercial/industrial properties / accesses impacted.	5	3	3
				Impacts to 8 private properties and 7 accesses due to road realignments, with grading limits in close proximity to some existing buildings. Greater number of impacts and impacted area compared to Alternatives 6 and 7.	Impacts to 5 private properties and 6 accesses. Smaller impacted area and less severe impacts than Alternative 2.	
			Noise Number of noise sensitive receptors/areas within 600 m and ability to provide noise mitigation measures (if required).	3	3	3
				Since the County Road 26, is not the dominant source these options have less variations in impact.		
			Community Facilities Number of cemeteries, schools, places of worship, and recreation centres directly impacted or potentially displaced.	0	0	0
				No cemeteries, schools, places of worship, or recreation centres directly impacted or potentially displaced.		
			Recreation and Tourism Features Number of parks and trails directly impacted.	0	0	0
				Per the Northumberland County Transportation Master Plan (2017), Northumberland County Cycling Master Plan (2014), and the Northumberland County Official Plan (2016), there are no trail networks or recreational facilities within the County Road 26 bridge replacement limits.		
			Air Quality and Climate Change	1	1	1

	Socio-Economic Environment	**25%**	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	Qualitative assessment of impacts to air quality and greenhouse gas emissions. *N.B. MTO Guide identifies 500 m as the distance 'to avoid the need for air quality impact mitigations' in most cases.*	Operational -Road segment length increases approximately 20m, results in minimal increase to emissions. -Replacing the bridge to the West reduces impact for three receptors (residences) on Telephone Rd. and County Rd. 26 due to increased distance to the road way. -Replacing the bridge to the West decreases the distance to one receptor West of the existing bridge however the impact is anticipated to be minimal as the receptor is over 400m away from the new bridge alignment. During Construction -Construction impacts from option C-2 are decreased at three sensitive receptors (residences) on Telephone Rd. and County Rd. 26 as a result of the increased distance to the new bridge alignment -Construction impacts are minimally increased for one receptor to the West (approx. 400m separation to nearest residential building). -Greater length of Construction zone for option C-2 increases emissions; due to increased construction time. -No road closure anticipated during construction will allow continuing bridge traffic while the new alignment is constructed. This leads to combined effects of construction emissions plus existing vehicle traffic emissions (operational).	Operational -Road segment length and alignment remains the same, emissions do not increase. Emission increase with expected population growth; not associated with bridge replacement. -Replacing the bridge on the same alignment does not increase or decrease distances to the sensitive receptors (residences). No impact to emissions as a result of the bridge replacement. During construction -Impacts from option C-6 impact nearby receptors during construction only. -Temporary road closure to complete construction may speed up construction timeline; diverts existing road traffic away from the nearby receptors eliminating a combined construction plus traffic emission scenario. -Bridge closure and road detour increases emissions in the vicinity of the construction zone.	Operational -Road segment length and alignment remains the same, emissions do not increase. Emission increase with expected population growth; not associated with bridge replacement. -Replacing the bridge on the same alignment does not increase or decrease distances to the sensitive receptors (residences). No impact to emissions as a result of the bridge replacement. During construction -Construction emissions from option C-7 impact nearby receptors during construction only. -Temporary single lane traffic control to complete construction may only slightly speed up construction timeline; shorter construction timeline decreases emission potential. -Temporary single lane traffic control anticipated to divert some traffic from the existing road way, but increases potential for idling in the area; increasing emissions in the construction zone. -Temporary single land traffic leads to combined effects of construction emissions plus decreased ongoing vehicle traffic emissions (operational).
				Agricultural Resources Impact on local agricultural resources using quantitative measure of area (ha).	**1**	**1**	**1**
					Lands surrounding the County Road 26 bridge are classified as Class 6 soils, meaning these soils are capable only of producing perennial forage crops. None of the alternatives impact land designated as agricultural land use.		
				Approved Local, Regional and Provincial Plans and Policies Assessment of conformity with approved local, regional and provincial plan and policies.	**0**	**0**	**0**
					The proposed County Road 26 bridge replacement conforms with the approved local Official Plans, Northumberland County Transportation Master Plan, and provincial plans and policies.		
	Total Socio-Economic Environment Score				**2.5**	**2**	**2**
	Total Socio-Economic Environment Rank				**3**	**1**	**1**
	Summary of Socio-Economic Environment Key Aspects				**From a Socio-Economic perspective both Alternatives C-6 and C-7 are preferred since they both have less severe and small impacted area to private properties. From an Air Quality perspective Alternative is C-7 is slightly preferred due to the lowest potential to increase emissions.**		
	Transportation / Technical Considerations	**30%**	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Traffic Operations and Geometry** Crossing road geometry, geometry/tie-in of intersecting roads.	**3**	**3**	**3**
					County Road 26 horizontal alignment is improved compared to existing. Sight distance to Telephone Road intersection can be improved compared to existing. Telephone Road geometry is worse than existing. Sight distance to County Road 26 intersection are not ideal. Skew of County Road 26 underpass relative to Highway 401 is worse than existing.	Constrained geometric elements such as sight distance and skewed intersection due to existing conditions.	Constrained geometric elements such as sight distance and skewed intersection due to existing conditions.
				Constructability Complexity of construction of structures and crossing road improvements, utility relocation requirements.	**3**	**1**	**5**
					Constructing entirely new alignment and tie in to existing alignment is more difficult than Alternatives 6 and 7. Construction of realigned roads and skew of bridge over Highway 401 increases construction complexity. High potential for impacting existing hydro poles due to grading and anticipated to require relocation of some hydro poles impacted by road realignment.	Simplest construction since road will be closed and existing alignment is maintained, maximizing reuse of the existing infrastructure. To maintain the existing alignment (and tie into the existing profile), a thin bridge structure must be used. High potential for impacting existing hydro poles due to grading.	Most difficult construction due to partial demolition/staging and maintaining vehicle traffic. Existing alignment is maintained, maximizing reuse of the existing infrastructure. To maintain the existing alignment (and tie into the existing profile), a thin bridge structure must be used. High potential for impacting existing hydro poles due to grading.
				Construction Staging Construction staging impacts, accommodation of traffic during construction, detour/out-of-way travel requirements, including impacts to emergency services response times.	**1**	**5**	**3**
					Bridge is constructed on separate alignment, which minimizes traffic impacts during construction.	Bridge will be fully closed, with detour via County Road 20 resulting in out-of-way travel for residents and for access to the County landfill on County Road 26.	Bridge will have one-way signalized traffic during construction. Complicated staging due to bridge demolition and new construction while maintaining traffic. Maintaining traffic on the existing road during construction.
				Maintenance Maintenance of retaining walls, snow clearing.	**0**	**0**	**0**
					There are no proposed retaining walls or major snow clearing considerations for the alternatives.		
	Total Transportation / Technical Considerations Score				**2.1**	**2.7**	**3.3**
	Total Transportation / Technical Considerations Rank				**1**	**2**	**3**
	Summary of Transportation / Technical Considerations Key Aspects				**From a Transportation/Technical perspective, Alternative C-2 is preferred. Alternative C-2 uses a new alignment which reduces construction staging impacts and has better constructability than Alternative C-7 since it can be constructed mostly offline.**		
	Cost	**0%**	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Cost Estimate (Parametric)** Parametric cost estimate for structures, highway infrastructure, and construction staging. **To be used for comparison purposes only. Not to be used for Construction Programming / Planning.*	**3**	**1**	**1**
					$ 9.5 M	$ 7.3 M	$ 7.3 M
					Highest estimated cost due to County Road 26 and Telephone Road realignments.	Lowest estimated cost since the existing road alignments are maintained.	
	Total Cost Score				**0**	**0**	**0**
	Total Cost Rank				**3**	**1**	**1**
	Summary of Cost Key Aspects				**Alternatives C-6 and C-7 have the lowest estimated cost.**		
	OVERALL SCORE:				**8.45**	**7.55**	**8.15**
	OVERALL RANKING:				**3**	**1**	**2**

Notes:
1) Each indicator is given a score of 0 = no impact, 1 = minor impact, 3 = moderate impact, 5 = significant impact.
2) Each indicator is given equal weight within its respective criteria.
3) Each of the 4 criteria have different weights.
4) The preferred alternative is chosen based on the least amount of impact (i.e. the closer the overall score is to 0, the better the alternative is).

HERLEY ROAD EVALUATION TABLE

CRITERIA	CRITERIA WEIGHTING	SCALE	INDICATOR	Herley Road H-1	H-2	H-3
			Alternative Description	Replace bridge to the west	Replace bridge to the east	Replace bridge on existing alignment (temporary road closure)
				SCORE	SCORE	SCORE
Natural Environment	25%	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Fish & Aquatic Habitat** Direct and/or indirect impacts on fisheries, including Species at Risk (SAR).	0	0	0
				No watercourses identified within 30 m of proposed work area; no impacts anticipated as a result of the proposed work.		
			Terrestrial Ecosystems Direct and/or indirect impacts on vegetation communities, significant wildlife, wildlife habitat, and movement patterns, including SAR.	1	1	3
				Vegetation cover is thicket, cultural woodland, cultural meadow and agricultural. Common and not significant. General wildlife habitat and use by common species. Agricultural field in N section provides potential breeding habitat for SAR Eastern Meadowlark/Bobolink.	Vegetation cover is cultural meadow, cultural woodland and a small area of poplar deciduous forest. General wildlife habitat and use by common species. No potential breeding habitat for Eastern Meadowlark/Bobolink.	This option has the combined effects of H-1 and H-2 as there is generally equal widening to the west and east.
			Designated Natural Features Direct and/or indirect impacts on Designated Natural Areas, including Environmentally Sensitive Areas (ESAs), Areas of Natural and Scientific Interest (ANSI), and Provincially Significant Wetlands (PSWs).	0	0	0
				No designated natural features		
			Contamination Number of potentially contaminated properties to be impacted.	0	0	0
				No impact		
			Excess Soil Management Quantity of excess soil subject to O.Reg. 406/19 (relative to other alternatives).	1	1	1
				Minor shallow cut resulting in relatively low quantities of excess soil		
			Erosion and Sediment Control Qualitative measure of impacts to areas with Erosion and Sediment Control concern	1	1	1
				Minor shallow cut, low erosion potential		
			Surface Water & Drainage Number of watercourse crossings and impacts to surface water features; Impacts to existing highway drainage systems and ability to provide stormwater management.	1	1	1
				All alternatives have the same amount of impervious area from a drainage analysis perspective and hence the same impacts. In all alternatives there are no watercourses crossing.		
			Groundwater Qualitative / quantitative assessment of impacts to groundwater.	1	1	1
				No watercourses, wetlands, IPZ or ANSI are present within this alternative. No ponds or waterbodies are present within 100 m of this alternative. Zero indicators of potential groundwater upwelling were observed near this alternative. 90% of this alternative is within a WHPA-B, 10% is within a WHPA-C. This alternative is not within an SGRA but is 100% within an HVA. 100% of this alternative is within an area of high groundwater susceptibility and 0% is within an area of high surface water susceptibility. One well with a shallow water level (less than 3mbgs) is present within this alternative. There are 3 other wells present. Three shallow (less than 15 mbgs) domestic water supply wells are present within this alternative. One abandoned well is present. No impacts to watercourses, wetlands or waterbodies are anticipated. Potential impacts to three shallow wells and shallow groundwater are anticipated. Mitigation measures to protect sensitive source water features are required.		
Total Natural Environment Score				**1.25**	**1.25**	**1.75**
Total Natural Environment Rank				**1**	**1**	**3**
Summary of Natural Environment Key Aspects				**From a Natural Environmental perspective there is no preference for a preferred alternative. There is small differences in the vegetation removals for the terrestrial component but the differences are small. Alternative H-3 does have a lesser area of impact to potential breeding habitat for Eastern Meadowlark/Bobolink.**		
Cultural Environment	20%	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Archaeology** Impacts to known archaeological features or areas of archaeological potential.	3	3	3
				Archaeological potential is present in all three alternatives. The amount of Stage 2 survey required is comparable for all three alternatives.		
			Built Heritage Resources and Cultural Heritage Landscapes Number of impacts to properties designated under the *Ontario Heritage Act* (OHA) or listed on municipal Heritage Registers; number of cultural heritage landscapes displaced or disrupted;	1	1	0
				Impact to 1 CHL (Durham Road/Herley Road) due to bridge replacement/road realignment.		No impacts as road alignment will not change.
			Impacts to Indigenous lands The extent of Indigenous lands required.	0	0	0
				The study area falls within the boundaries of the 1923 Williams Treaties. The Williams Treaties First Nations include the Chippewas of Beausoleil, Georgina Island, and Rama and the Mississaugas of Alderville, Curve Lake, Hiawatha, and Scugog Island. The Alderville First Nation Reserve is to the north of the study area. There are no impacts to Reserve Lands.		
Total Cultural Environment Score				**0.8**	**0.8**	**0.6**
Total Cultural Environment Rank				**2**	**2**	**1**
Summary of Cultural Environment Key Aspects				**From a Cultural Environment perspective Alternative H-3 is preferred since there are no impacts to any built or cultural resources or landscapes with heritage potential and there is impacts to a potential cultural heritage landscape for H-1 and H-2. All alternatives requite Stage 2 investigations to be complete. All alternatives are anticipated to contain the same archaeological potential. The possibility of recovering archaeological material is equal for all alternatives.**		
			Property & Access Number of residential and commercial/industrial properties / accesses impacted.	3	3	1
				Minor impacts to 2 private properties on the west side.	Minor impacts to 2 private properties on the east and west side.	Minor impacts to 2 private properties on the east and west side. Greatest potential to mitigate property impacts.
			Noise Number of noise sensitive receptors/areas within 600 m and ability to provide noise mitigation measures (if required).	3	3	3
				Receptors are mostly near Purdy Road, This option slightly increase the noise at the west side receptor while reduce at the east side receptor. However the increase in noise on the west receptors are expected to be less than 3 dB, and expected to be dominated by traffic after the change than distance change (in acoustics, distance is a logarithmic function). Therefore , a moderate impact (considering about 3 dB anticipated change) was given.	Receptors are mostly near Purdy Road, This option slightly increase the noise at the east side receptor while reduce at the west side receptor. However the increase in noise on the east receptors are expected to be less than 3 dB, and expected to be dominated by traffic after the change than distance change (in acoustics, distance is a logarithmic function). Therefore , a moderate impact (considering about 3 dB anticipated change) was given.	This option have equal effect on both west and east side receptors. Since the alignment does not change, the change in acoustic environment due to improvement on traffic flow (number and speed) is expected to dominate after the change . the traffic factor is considered independent of alignment option and therefore a moderate impact (considering about 3 dB anticipated change) was given.
			Community Facilities Number of cemeteries, schools, places of worship, and recreation centres directly impacted or potentially displaced.	0	0	0
				No cemeteries, schools, places of worship, or recreation centres directly impacted or potentially displaced.		
			Recreation and Tourism Features Number of parks and trails directly impacted.	0	0	0
				Per the Northumberland County Transportation Master Plan (2017), Northumberland County Cycling Master Plan (2014), and the Northumberland County Official Plan (2016), there are no trail networks or recreational facilities within the Herley Road bridge replacement limits.		
			Air Quality and Climate Change	1	1	1

	Socio-Economic Environment	**25%**	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	Qualitative assessment of impacts to air quality and greenhouse gas emissions. *N.B. MTO Guide identifies 500 m as the distance 'to avoid the need for air quality impact mitigations' in most cases.*	Operational -Road segment length remains virtually the same, emissions do not increase. Emission increase with expected population growth; not associated with bridge replacement. -Replacing the bridge to the West brings the road way minimally closer (approximately 20m at the greatest offset) to one sensitive receptor (a farm/residence), and further from two sensitive receptors (farms/residences) to the East. Realignment expected to have insignificant impact on emissions overall. During Construction -Construction emissions from option H-1 are increased at the one receptor to the West and decreased at the two receptors to the East based on the distance to the realignment. Construction emission impacts are only expected through the duration of the construction timeline. -No road closure during construction allows continuing bridge traffic while the new one is constructed. This leads to combined effects of construction emissions plus existing vehicle traffic emissions (operational).	Operational -Road segment length and alignment remains the same, emissions do not increase. Emission increase with expected population growth; not associated with bridge replacement. -Replacing the bridge on the same alignment does not increase or decrease distances to the sensitive receptors (farms/residences). No impact to emissions as a result of the bridge replacement. During construction -Impacts from option H-2 impact nearby receptors during construction only. -Temporary road closure to complete construction may speed up construction timeline; diverts existing road traffic away from the nearby receptors eliminating a combined construction plus traffic emission scenario. -Bridge closure and road detour increases emissions in the vicinity of the construction zone.	Operational -Road segment length decreases minimally (by approximately 5m), insignificant decrease in emissions. Emission increase with expected population growth; not associated with bridge replacement. -Replacing the bridge to the East brings the road way minimally closer (approximately 10m at the greatest offset) to two sensitive receptors (farms/residences), and further from one sensitive receptor (a farm/residence) to the West. Realignment expected to have insignificant impact on emissions overall. During Construction -Construction emissions from option H-3 are increased at the two receptors to the East and decreased at the one receptor to the West based on the distance to the realignment. Construction emission impacts are only expected through the duration of the construction timeline. -No road closure during construction allows continuing bridge traffic while the new one is constructed. This leads to combined effects of construction emissions plus existing vehicle traffic emissions (operational).
				Agricultural Resources Impact on local agricultural resources using quantitative measure of area (ha).	**1**	**1**	**1**
					The north side of the Herley Road bridge is classified as Class 3 soils, meaning these soils have moderately sever limitations that restrict the range of crops. The south side is classified as Class 2 soils, meaning these soils have moderate limitations that restrict the range of crops. Potential for minor impacts to lands designated as agricultural land use in the northwest quadrant due to grading limits.		
				Approved Local, Regional and Provincial Plans and Policies Assessment of conformity with approved local, regional and provincial plan and policies.	**0**	**0**	**0**
					The proposed Herley Road bridge replacement conforms with the approved local Official Plans, Northumberland County Transportation Master Plan, and provincial plans and policies.		
	Total Socio-Economic Environment Score				**2**	**2**	**1.5**
	Total Socio-Economic Environment Rank				**2**	**2**	**1**
	Summary of Socio-Economic Environment Key Aspects				**From a Socio-Economic perspective the preferred alternative is H-3 since it has minor property impacts and the greatest potential to mitigate property impacts. Also from an Air Quality perspective alternative is H-3 has the lowest potential to increase emissions.**		
	Transportation / Technical Considerations	**30%**	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Traffic Operations and Geometry** Crossing road geometry, geometry/tie-in of intersecting roads.	**3**	**3**	**1**
					Introduces tighter horizontal curves to the Herley Road alignment, which is less desirable than the existing tangential alignment, and requires adjustment to the Honey Road intersection to tie into the realignment.		Existing alignment is maintained which accommodates a perpendicular intersection and tangential horizontal alignment, which is preferred.
				Constructability Complexity of construction of structures and crossing road improvements, utility relocation requirements.	**3**	**5**	**1**
					Easier construction and access to build a new alignment offline. Tie-in to existing alignment is more difficult than Alternative 3. More difficult construction due to tight curvilinear geometrics and not impacting existing structure. Least potential for impacting hydro poles on the east side due to grading.	Easier construction and access to build a new alignment offline. Tie-in to existing alignment is more difficult than Alternative 3. More difficult construction due to tight curvilinear geometrics and not impacting existing structure. Highest potential for impacting hydro poles on the east side due to grading.	Simpler construction since the road will be closed to replace the structure and the alignment matches existing conditions more closely than other alternatives. Slight potential for impacting hydro poles on the east side due to grading.
				Construction Staging Construction staging impacts, accommodation of traffic during construction, detour/out-of-way travel requirements, including impacts to emergency services response times.	**1**	**1**	**5**
					Bridge is constructed on separate alignment, which minimizes traffic impacts during construction.		The road will be closed during construction, with detour via Percy Street or Lake Road resulting in out-of-way travel for residents, emergency services, and for access to Township of Cramahe water stand pipe.
				Maintenance Maintenance of retaining walls, snow clearing.	**0**	**0**	**0**
					There are no proposed retaining walls or major snow clearing considerations for the alternatives.		
	Total Transportation / Technical Considerations Score				**2.1**	**2.7**	**2.1**
	Total Transportation / Technical Considerations Rank				**1**	**3**	**1**
	Summary of Transportation / Technical Considerations Key Aspects				**From a Transportation/Technical perspective, Alternatives H-1 and H-3 are equally preferred. Alternative H-1 has simpler construction staging because it can be built on a new alignment and Herley Road can remain open during construction. Alternative H-3 has preferred geometry, but requires road closure during construction.**		
	Cost	**0%**	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Cost Estimate (Parametric)** Parametric cost estimate for structures, highway infrastructure, and construction staging. **To be used for comparison purposes only. Not to be used for Construction Programming / Planning.*	**3**	**3**	**1**
					$ 8.0 M	$ 8.0 M	$ 6.5 M
					Highest estimated cost due to road realignment.		Lowest estimated cost because existing alignment is maintained.
	Total Cost Score				**0**	**0**	**0**
	Total Cost Rank				**1**	**1**	**1**
	Summary of Cost Key Aspects				**Alternative H-3 has the lowest estimated cost.**		
	OVERALL SCORE:				**6.15**	**6.75**	**5.95**
	OVERALL RANKING:				**2**	**3**	**1**

Notes:

1) Each indicator is given a score of 0 = no impact, 1 = minor impact, 3 = moderate impact, 5 = significant impact.
2) Each indicator is given equal weight within its respective criteria.
3) Each of the 4 criteria have different weights.
4) The preferred alternative is chosen based on the least amount of impact (i.e. the closer the overall score is to 0, the better the alternative is).

HWY 401 WIDENING EVALUATION TABLE

CRITERIA	CRITERIA WEIGHTING	SCALE	INDICATOR	SECTION 2			SECTION 3	
			Alternative Description	S2-1A Widen inside only	S2-2 Widen inside in the Interim and outside in the Ultimate	S2-3 Widen to the north	S3-1B Widen outside only and widen median shoulders (maintain existing alignment) with retaining walls	S3-2A Widen outside only and realign using two 1200 m radius curves
				SCORE	SCORE	SCORE	SCORE	SCORE
Natural Environment	25%	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Fish & Aquatic Habitat** Direct and/or indirect impacts on fisheries, including Species at Risk (SAR).	0	0	0	3	3
				No watercourses identified within 30 m of proposed work area; no impacts anticipated as a result of the proposed work.			Potential impacts to two intermittent watercourses [Little Lake trib. 1, Little Lake trib. 3 (w/in 30 m); low sensitivity] and 1 permanent watercourse (culvert 21-471/C3; high sensitivity with Salmonids).	Potential impacts to two intermittent watercourses [Little Lake trib. 1, Little Lake trib. 3 (w/in 30 m); low sensitivity] and one permanent watercourse (culvert 21-471/C3; high sensitivity with Salmonids).
			Terrestrial Ecosystems Direct and/or indirect impacts on vegetation communities, significant wildlife, wildlife habitat, and movement patterns, including SAR.	1	1	1	1	3
				Grading limits to impact edge of deciduous woodland and conifer plantation and encroachment toward wetland pond on north side. No significant habitats or species.	Small increase in woodland removal compared to S2-1. Likely encroachment into wetland pond on north side. No significant species or habitats. SAR not present.	Small amount of deciduous woodland and conifer plantation. Removal of portion of wetland pond on north side. No significant species or habitat. SAR not present.	Small amount of vegetation removal from woodland edge. 0.5 ha removal of potential SAR Eastern Meadowlark/Bobolink habitat. Impacts opportunity for wildlife passage through structural culvert	Small amount of vegetation removal from woodland edge. 1.7 ha removal of potential SAR Eastern Meadowlark/Bobolink habitat. Impacts opportunity for wildlife passage through structural culvert.
			Designated Natural Features Direct and/or indirect impacts on Designated Natural Areas, including Environmentally Sensitive Areas (ESAs), Areas of Natural and Scientific Interest (ANSI), and Provincially Significant Wetlands (PSWs).	0	0	0	1	1
				No designated natural areas.			Minor intrusion into Natural Heritage System.	Slightly more intrusion into Natural Heritage System and Unevaluate
			Contamination Number of potentially contaminated properties to be impacted.	0	0	0	0	0
				No impact.			No impact	
			Excess Soil Management Quantity of excess soil subject to O.Reg. 406/19 (relative to other alternatives).	1	1	1	3	5
				A shallow excavation cut resulting in relatively low quantities of excess materials.			A moderate excavation cut resulting in relatively moderate quantities of excess soil	A significant cut resulting in relatively significant qua
			Erosion and Sediment Control Qualitative measure of impacts to areas with Erosion and Sediment Control concern	1	1	1	3	5
				A shallow excavation cut, low erosion potential			A moderate excavation cut / high sensitive fishery	A significant cut/ high sensitive fish
			Surface Water & Drainage Number of watercourse crossings and impacts to surface water features; Impacts to existing highway drainage systems and ability to provide stormwater management.	1	1	1	3	1
				All alternatives have the same amount of impervious area from a drainage analysis perspective and hence the same impacts. Open median and ditches provide opportunities for stormwater management. In all alternatives there are no watercourses crossings.			All alternatives have the same amount of impervious area from a drainage analysis perspective. But the retaining walls in alternative 1 prohibits the use of open ditching system and limits the opportunities for stormwater management. In all alternatives there is one watercourse crossing and there are no additional impacts comparing the three different alternatives.	All alternatives have the same amount of impervious area from a drainage analysis perspective. Alter stormwater management facilitie In all alternatives there is one watercourse crossing and there are no additional ir
				1	1	1	1	1

			Groundwater Qualitative / quantitative assessment of impacts to groundwater. Static Water Levels: not deeper than 3 meters below the ground, Shallow Wells: no deeper than 15 meters below the ground	No watercourses, wetlands, WHPA or ANSI is within this alternative. Two ponds are present within 100 m of this alternative. Zero indicators of potential groundwater upwelling were observed near this alternative. 100% of this alternative is within an SGRA and HVA. 5% of this alternative is within an IPZ. 100% of this alternative is within an area of high groundwater susceptibility and 5% is within high surface water susceptibility. Three wells with a shallow (less than 3mbgs) water level are present within this alternative. There are 6 other wells present. Four deep (greater than 15 mbgs) and four shallow domestic water supply wells are present within 100 m of this alternative. 1 abandoned well is present. Potential Impacts to four shallow wells and shallow groundwater are anticipated. Mitigation measures to protect sensitive source water features are required.			No wetlands, WHPA or ANSI are within this alternative. Three watercourses are present within this alternative. One pond is present within 100 m of this alternative. Zero indicators of potential groundwater upwelling were observed near this alternative. 70% of this alternative is within an SGRA and 80% is within an HVA. 55% of this alternative is within an IPZ. 90% of this alternative is within an area of high groundwater susceptibility, 10% is within moderate groundwater susceptibility and 55% is within an Sixteen wells with a shallow water level (less than 3mbgs) are present within this alternative. There are 18 other well Eight deep (greater than 15 mbgs) and eighteen shallow domestic water supply wells are present within 100 m of this Potential impacts to wetlands and the waterbodies are not anticipated. Potential impacts to three watercourses, eighteen shallow wells and shallow groundwater are anticipated. Mitigation measures to protect sensitive source water features are required.	
Total Natural Environment Score				**1.25**	**1.25**	**1.25**	**3.75**	**4.75**	
Total Natural Environment Rank				**1**	**1**	**1**	**1**	**2**	
Summary of Natural Environment Key Aspects				**From a Natural Environmental perspective there is no preference for a preferred alternative. There are small differences in the woodland and wetland removals for the terrestrial component but the differences are small.**			**From a Natural Environment perspective Alternative S3-1 is preferred since there is a small amount of impact to potential SAR E moderate excavation cuts opposed to significant cuts with S3-2 an S3-3. Although from a drainage perspective the retaining wa system and limits the opportunity for stormwater management facilities.**		
Cultural Environment	**20%**	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Archaeology** Impacts to known archaeological features or areas of archaeological potential.	**3** Archaeological potential in all three alternatives is similar and areas of impact will require Stage 2 test pit survey. S2-1 and S2-3 will require comparable level of Stage 2 investigation.	**3** Archaeological potential in all three alternatives is similar; however, this alternative includes a large area at the east end that will require more Stage 2 test pit survey than S2-1 and S2-3.	**3** Archaeological potential in all three alternatives is similar and areas of impact will require Stage 2 test pit survey. S2-1 and S2-3 will require comparable level of Stage 2 investigation.	**3** Archaeological potential is present in all three alternatives. All alternatives include areas of test pit and pedestrian survey. This alternative has less impacts to areas of potential than S3-2 and S3-3.	**3** Archaeological potential is present in all three alternatives. This alternative includes larger areas requiring both test pit and pedestrian survey due to the realignment of Crandall Road and wider grading limits.
			Built Heritage Resources and Cultural Heritage Landscapes Number of impacts to properties designated under the *Ontario Heritage Act* (OHA) or listed on municipal Heritage Registers; number of cultural heritage landscapes displaced or disrupted;	**0** Impact to 1 CHL (439 Crandall Rd) due to property taking/grading. No direct impacts to barn. CHER completed. Property determined not to be a Provincial Heritage Property (PHP).	**0** Impact to 1 CHL (439 Crandall Rd) from property taking, encroaching closer to agricultural landscape/barn. No direct impacts to barn. CHER completed. Property determined not to be a Provincial Heritage Property (PHP).	**0**	**3** Impact to 2 CHLs: 12 McDonald Rd visually disrupted due to retaining wall (CHER completed and property determined not to be a Provincial Heritage Property (PHP)), direct impact to Little Lake CHL due to significant change in grade resulting in multiple property impacts.	**0** Impact to 1 BHR (318 Lake Rd), disrupted due to realignment of Crandall Rd and 401 widening. CHER completed for 318 Lake Road. MTO CHRC did not find the property to be a Provincial Heritage Property (PHP).
			Impacts to Indigenous lands The extent of Indigenous lands required.	**0** The study area falls within the boundaries of the 1923 Williams Treaties. The Williams Treaties First Nations include the Chippewas of Beausoleil, Georgina Island, and Rama and the Mississaugas of Alderville, Curve Lake, Hiawatha, and Scugog Island. The Alderville First Nation Reserve is to the north of the study area. There are no impacts to Reserve Lands.	**0**	**0**	**0** The study area falls within the boundaries of the 1923 Williams Treaties. The Williams Treaties First Nations include the Chippewas of Beausoleil, Georgina Island, and Rama and t The Alderville First Nation Reserve is to the north of the study area. There are no impacts to Reserve Lands	**0**
Total Cultural Environment Score				**0.6**	**0.6**	**0.6**	**1.2**	**0.6**	
Total Cultural Environment Rank				**1**	**1**	**1**	**3**	**1**	
Summary of Cultural Environment Key Aspects				**From a Cultural Environment perspective, There is no preference in alternatives since there are no impacts to any built or cultural resources or landscapes with heritage potential since a CHER was completed at 439 Crandall Road to determine it not to be a Provincial Heriage Property (PHP). All alternatives require Stage 2 investigations to be complete. Alternative S2-2 is anticipated to impact more areas that contain archaeological potential; there is no significant difference in the archaeological potential of the alternatives. The possibility of recovering archaeological material is equal for all alternatives.**			**From a Cultural Environment perspective, Alternative S3-2 and S3-3 are preferred as it disrupts 1 potential heritage property at this property. Alternative S3-1 has impacts to 2 Cultural Heritage Landscapes. A CHER was completed for these properties to d and 12 McDonald Road were not found to be Provincial Heritage Properties (PHP). All alternatives requite Stage 2 investigations to be complete. Alternative S3-3 is anticipated to impact more areas that contain a difference in the archaeological potential of the alternatives. The possibility of recovering archaeological material is equal for a**	
			Property & Access Number of residential and commercial/industrial properties / accesses impacted.	**1** Minor impacts to 4 private properties. Minimizes property impacts relative to other alternatives.	**5** Impacts to 4 private properties. Property impacts are similar to Alternative 1, except for significant property requirement on the south side of the highway.	**3** Impacts to 4 private properties. Property impacts are similar to but slightly greater than Alternative 1. On the north side of the highway there is a smaller offset to existing buildings relative to Alternatives 1 and 2; however there is potential for further mitigation.	**3** Impacts to 15 private properties and 9 accesses (estimated). Minimizes impacted area (approximately 10 ha). Relatively minor property impacts along Highway 401, except for one larger impact northeast of Lake Road and Highway 401. Moderate to significant impacts along McDonald Road due to profile raise required to match Lake Road profile raise.	**3** Impacts to 10 private properties and 5 accesses (estimated). Greater impacted area than Alternative 1 (approximately 12 ha). Larger property impacts along Highway 401 than Alternative 1 (greater impacts northeast and northwest of Lake Road and Highway 401).
			Noise Number of noise sensitive receptors/areas within 600 m and ability to provide noise mitigation measures (if required).	**3** Residential dwellings located along the Highway 401 closer to this segment to the north; receptors will experience increase in sound levels as a result of the Highway 401 widening. Noise impact is not anticipated to be significant.	**3** Residential dwellings located along the Highway 401 closer to this segment to the north; receptors will experience increase in sound levels as a result of the Highway 401 widening. Noise impact is not anticipated to be significant.	**3** Could potentially increase the sound level at receptors closest to the receptors in this segment, however the change is anticipated to be moderate.	**5** The proposed change will put the alignment closer to the existing residential properties and increase the noise effects.	**3** The proposed changes put the alignment a bit further from the receptors;
			Community Facilities Number of cemeteries, schools, places of worship, and recreation centres directly impacted or potentially displaced.	**0** No cemeteries, schools, places of worship, or recreation centres directly impacted or potentially displaced.	**0**	**0**	**0** No cemeteries, schools, places of worship, or recreation centres directly impacted or potentially displaced.	**0** No schools, places of worship, or recreation centres directly impacted or potentially displaced. No operati impacted.
			Recreation and Tourism Features Number of parks and trails directly impacted.	**0** Per the Northumberland County Transportation Master Plan (2017), Northumberland County Cycling Master Plan (2014), and the Northumberland County Official Plan (2016), there are no trail networks or recreational facilities within the Section 2 study limits.	**0**	**0**	**0** Per the Northumberland County Transportation Master Plan (2017), Northumberland County Cycling Master Plan (2014), and the Northumberland County Official Plan (2016), the P crosses Highway 401 within the Section 3 study limits. However, there are no proposed works on the Lake Road underpass so the Highway 401 widening alterna	**0**
			Air Quality and Climate Change	**1**	**1**	**1**	**1**	**1**	

Socio-Economic Environment	**25%**	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Change** Qualitative assessment of impacts to air quality and greenhouse gas emissions. *N.B. MTO Guide identifies 500 m as the distance 'to avoid the need for air quality impact mitigations' in most cases.*	Operational -Road segment length remains the same, emissions increase proportionally to population growth which lead to increased traffic volume increases; the addition of active traffic lanes may decrease the overall emission impact as flow of traffic is improved. During Construction -Minor increase in emissions. Construction emission impacts are only expected through the duration of the construction phase. Note: existing highway operational emissions may be increased during construction phase due to decrease speed enforcement in the construction zone. -Construction emissions from option S2-1 limited by widening inside lanes only.	Operational -Road segment length remains the same, emissions increase with expected traffic volume increases due to population growth; the addition of active traffic lanes may decrease the overall emission impact as flow of traffic is improved. -Widening outside in the ultimate decreases the separation distance from the Northern most emission source to the sensitive receptors (residences) on Crandall Rd; results in minimal increase in emissions. However, road widening improves dispersion as the same emissions are emitted from a wider source, therefore potentially decreasing potential impact at residences. During Construction -Minor increase in emissions. Construction emission impacts are only expected through the duration of the construction phase. Note: existing highway operational emissions may be increased during construction phase due to decrease speed enforcement in the construction zone. -Construction impacts from S2-2 would be greater if the inside is widened in the interim, and then outside in the ultimate; due to extended construction time. -Construction for the widening outside in the ultimate occurs closer to sensitive receptors (residences) on Crandall Rd. Minor increase in emissions. Construction emission impacts are only expected through the duration of the construction phase.	Operational -Road segment length remains the same, emissions increase with expected traffic volume increases; the addition of active traffic lanes may decrease the overall emission impact as flow of traffic is improved. -Widening to the North decreases the distance from the emission source to the sensitive receptors (residences) on Crandall Rd.; results in minimal increase in emissions. However, road widening improves dispersion as the same emissions are emitted from a wider source, therefore potentially decreasing potential impact at residences. During Construction -Minor increase in emissions. Construction emission impacts are only expected through the duration of the construction phase. Note: existing highway operational emissions may be increased during construction phase due to decrease speed enforcement in the construction zone. -Construction emissions from option S2-3 increased minimally by widening to the North, closer in proximity to receptors in the vicinity of the construction zone.	Operational -Road segment length remains the same, emissions increase with expected traffic volume increases due to population growth; the addition of active traffic lanes may decrease the overall emission impact as flow of traffic is improved. -Widening outside lanes only and widening median shoulders decreases the separation between the existing highway alignment and numerous sensitive receptors along McDonald Rd. (approximately 30 homes) Highway widening encroaches on McDonald Rd. residences resulting in an increase in emissions. However, road widening improves dispersion as the same emissions are emitted from a wider source, therefore potentially decreasing potential impact at residences. During Construction -Minor increase in emissions. Construction emission impacts are only expected through the duration of the construction phase. Note: existing highway operational emissions may be increased during construction phase due to decrease speed enforcement in the construction zone. -Construction emissions from option S3-1 increased by widening outside lanes only and widening median shoulders as a result of the decreased distance between the residences on McDonald Rd. and the existing highway extent.	Operational -Road segment length decreases minimally, emissions increase with expected traffic volume increases due to population growth; the addition of active traffic lanes may decrease the overall emission impact as flow of traffic is improved. -Realignment option S3-2 includes a tighter curve to the highway which can slow traffic and increase emissions. -Realignment option S3-2 increases separation distance to residences on McDonald Rd. (approximately 30 homes) decreasing emission impact at the residences. Furthermore, road widening improves dispersion as the same emissions are emitted from a wider source, therefore potentially decreasing potential impact at nearby residences. -Realignment option S3-2 involves the realignment of Crandall Rd. increasing road segment length by ~20m; minimal increase in emissions. Crandall Rd. realignment only impacts two receptors near its most Eastern end. During Construction -Minor increase in emissions. Construction emission impacts are only expected through the duration of the construction phase. Note: existing highway operational emissions may be increased during construction phase due to decrease speed enforcement in the construction zone. -Construction emission impact at residences on McDonald Rd. decreased in this option as the separation from the receptors to the construction zone is increased. -Construction emission impacts decreased minimally in this option due to highway segment length decrease. However, construction on Crandall Rd realignment increases overall construction period; increasing emission impacts overall.
				1	**1**	**1**	**1**	**3**
			Agricultural Resources Impact on local agricultural resources using quantitative measure of area (ha).	Lands within the grading limits of Section 2 are identified as Class 3 soils, meaning that there are moderately severe limitations that limit the range of crops. None of the alternatives impact land designated as agricultural land use.			Lands within the grading limits of Section 3 are identified as Class 3 soils, meaning that there are moderately severe limitations that limit the range of crops. A small portion lands is classified as Class 2 soils to the eastern limits of Section 3, meaning that there are moderate limitations that restrict the range of crops. Minor impacts to properties on the north designated as agricultural land use due to the grading limits.	Lands within the grading limits of Section 3 are identified as Class 3 soils, meaning that there are moderat classified as Class 2 soils to the eastern limits of Section 3, meaning that there are moderate limitations t realigned at Lake Road, this will impact more Class 3 soils than S3-1. More impacts to lands to the nor realignment of Crandall Road compared
				0	**0**	**0**	**0**	**0**
			Approved Local, Regional and Provincial Plans and Policies Assessment of conformity with approved local, regional and provincial plan and policies.	The proposed widening of Highway 401 is in keeping with the Northumberland County Transportation Master Plan policy recommendation PO21 "Advocate for additional widening of Highway 401 east of Cobourg".			The proposed widening of Highway 401 is in keeping with the Northumberland County Transportation Master Plan policy recommendation PO21 "Advocate for a	
Total Socio-Economic Environment Score				**1.5**	**2.5**	**2**	**2.5**	**2.5**
Total Socio-Economic Environment Rank				**1**	**3**	**2**	**1**	**1**
Summary of Socio-Economic Environment Key Aspects				**From a Socio-Economic perspective Alternative S2-1 is preferred as it minimizes property impacts compared to the other alternatives. Although the impacts are minor from an Air Quality perspective S2-1 has the lowest potential to increase emissions.**			**From a Socio-Economic perspective Alternative S3-2 is preferred since it has the lowest property impacts and the alignment is may slightly improve the noise effects. Although the alignment does impact more Class 3 soils than S3-1 due to the realignmen**	
				5	**1**	**1**	**5**	**1**
			Traffic Operations and Geometry Traffic operations on Highway 401, highway geometry, roadside safety, impacts on emergency services response times.	Guiderail protection required along valley on the south side (same as existing conditions). Median barrier is required in the Ultimate condition, which is less desirable than an open median. May require relocation of one emergency median turnaround to the west, with minimal impact on response times.	Guiderail protection required along valley on the south side (same as existing conditions) and potentially along the wetland on the north side. Open median is maintained.		Existing curves meet the minimum radius requirement. Widened shoulders (approximately 7 m) are required to provide the required sight distance, which is less desirable from a safety perspective. The proposed roadside retaining walls and widened shoulders are less desirable than open grading from a safety and maintenance perspective.	Proposed curves meet the minimum radius requirement. Widened shoulders (approximately 4 m) are required to provide the required sight distance, which is less desirable from a safety perspective. Retaining walls are not proposed which is more desirable from a safety and maintenance perspective.
				1	**3**	**1**	**3**	**3**
			Constructability Complexity of construction of structures and highway infrastructure, compatibility with structure replacement alternatives, utility relocation requirements.	Eliminates large fills in the valley on the south side and minimizes potential impacts to the buried Bell cable south of the highway.	Requires large fill in the valley on the south side of the highway, and this alternative has the greatest potential impact to the buried Bell cable on the south side.	Eliminates large fills in the valley on the south side and minimizes potential impacts to the buried Bell cable south of the highway.	Maintains existing highway alignment, which maximizes reuse of existing highway infrastructure and does not require overbuild of the structure to accomodate existing and future widening due to no realignment (2 span bridge ~ 64 m long) Retaining wall proposed on the north side to avoid realignment of Crandall Road and eliminate large cuts. Lake Road profile must be raised to provide vertical clearance, resulting in a grade raise at the intersections of Crandall Road and MacDonald Road with Lake Road. Structure can be replaced in the existing location. Closure of Lake Road is required to replace bridge on the same alignment (same for all alternatives). Potential impacts to hydro poles (similar for all alternatives).	Significant highway realignment complicates construction and also results in some throwaway of existing highway infrastructure. Maintains open grading (no retaining wall), which is preferable from a safety perspective, but requires large cuts and realignment of Crandall Road. Existing Lake Road profile can be maintained, however it will require a slight overbuild (~10 m) and an extra span (3 spans) compared to Alternative 1 to accomodate replacement of the structure prior to the widening/realignment of the higway Closure of Lake Road is required to replace bridge on the same alignment (same for all alternatives). Potential impacts to hydro poles (similar for all alternatives).
				1	**1**	**1**	**3**	**5**

Transportation / Technical Considerations	**30%**	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Construction Staging** Construction staging impacts, accommodation of traffic during construction, detour/out-of-way travel requirements, including impacts to emergency services response times.	Similar construction staging impacts for all alternatives.			Maintaining existing highway alignment minimizes construction staging complexity and impacts to traffic. Existing Highway 401 traffic can be maintained during widening. Grade raise of Lake Road and at intersections of Crandall Road and McDonald Road with Lake Road will require some traffic shifting or temporary detours / out-of-way travel. Structure to be replaced in the same location as existing, which results in more difficult construction access than for Alternatives 2 and 3. Short-term closure / detour of Highway 401 traffic may be required for bridge construction and there will be a closure of Lake Road during bridge replacement, with detour via Herley Road (similar for all alternatives).	Highway realignment increases staging complexity. Highway construction staging is significantly more complex than Alternative 1, less complex than Alternative 3. Offline construction as much as possible. A portion of the realigned highway overlapping the existing highway will require traffic shifting to tie in to the existing alignment. Lake Road profile can be maintained, resulting in less staging impacts on Lake Road and at the intersections of Crandall Road and McDondald Road than for Alternative 1. Bridge will require to be overbuilt in order to accomodate existing lanes due to the bridge being replaced prior to highway widening/realignment Easier construction access to new structure than for Alternative 1. Short-term closure / detour of Highway 401 traffic may be required for bridge construction and there will be a closure of Lake Road during bridge replacement, with detour via Herley Road (similar for all alternatives).
				5	**0**	**0**	**5**	**1**
			Maintenance Maintenance and serviceability of retaining walls, snow clearing.	This alternative would require median barrier (double steel-beam guide rail or a concete barrier) in the Ultimate condition. High maintenance cost and effort to maintain median barrier and median area.	No median barrier is required for these alternatives, which simplifies maintenance.		This alternative uses a retaining wall approximately 500 m long on the north side of the highway, west of Lake Road. Greater maintenance cost and effort for long-term maintenance of retaining walls. May require greater snow clearing effort to remove snow along the lengh of retaining wall.	No retaining walls, which avoids maintenance and snow clearing challenges associated with retaining walls. Slightly longer structure so some additional maintenance costs associated with this.
Total Transportation / Technical Considerations Score				**3.6**	**1.5**	**0.9**	**4.8**	**3**
Total Transportation / Technical Considerations Rank				**3**	**2**	**1**	**3**	**1**
Summary of Transportation / Technical Considerations Key Aspects				**From a Transportation/Technical perspective, Alternative S2-3 is preferred since it maintains an open median, does not require large fills in the valley on the south, and minimizes potential utility impacts.**			**From a Transportation/Technical perspective, Alternative S3-3 is preferred since it improves the existing highway geometry, ha has less maintenance requirements than Alternative S3-1.**	
Cost	**0%**	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Cost Estimate (Parametric) for Interim 6-lane Condition** Parametric cost estimate for structures, highway infrastructure, and construction staging. **To be used for comparison purposes only. Not to be used for Construction Programming / Planning.*	1 $ 7.7 M	1 $ 7.7 M	1 $ 7.7 M	1 $ 22.5 M	3 $ 27.3 M
				The alternatives have the same estimated cost in the Interim condition.			Lowest estimated cost because this alternative maximizes reuse of the existing highway and shortest span structure	Moderate estimated cost, slightly longer structure that Alternative 1.
Total Cost Score				**0**	**0**	**0**	**0**	**0**
Total Cost Rank				**1**	**1**	**1**	**1**	**2**
Summary of Cost Key Aspects				**The estimated cost of all alternatives is the same in the Interim condition.**			**Alternative S3-1 has the lowest estimated cost.**	
OVERALL SCORE:				**6.95**	**5.85**	**4.75**	**12.25**	**10.85**
OVERALL RANKING:				**3**	**2**	**1**	**2**	**1**

Notes:
1) Each indicator is given a score of 0 = no impact, 1 = minor impact, 3 = moderate impact, 5 = significant impact.

CRITERIA	CRITERIA WEIGHTING	SCALE	INDICATOR	SECTION 5			SECTION 7	
				S3-3A	S5-3B	S5-4B	S7-2B	S7-4B
			Alternative Description	Widen outside only and realign using two 1700 m radius curves	Widen to the south **MTO will be acquiring property beyond ROW in the area of the drumlins but no further environmental impacts since a retaining wall will be used**	Widen inside in the Interim and widen outside in the Ultimate **MTO will be acquiring property beyond ROW in the area of the drumlins but no further environmental impacts since a retaining wall will be used**	West & East end - Widen inside in the Interim and widen outside in the Ultimate	West end - Widen inside in the Interim and widen outside in the Ultimate; East end – Widen inside only
				SCORE	SCORE	SCORE	SCORE	SCORE
Natural Environment	25%	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Fish & Aquatic Habitat** Direct and/or indirect impacts on fisheries, including Species at Risk (SAR).	5	5	5	3	1
				Potential impacts to two intermittent watercourses [Little Lake trib. 1, Little Lake trib. 3 (w/in 30 m); low sensitivity] and one permanent watercourse (culvert 21-471/C3; high sensitivity with Salmonids). Upstream (south) side proposed works have potentially larger habitat loss of high sensitivity habitat than other two options. Potential for reinstatement of currently enclosed upstream (north) channel due to realignment of highway.	Potential impacts to two reaches of Biddy Creek (culvert 21-474/C6 and branches within 30 m; permanent, coldwater, high sensitivity).		Potential impacts to three intermittent watercourses (Mayhew Creek trib. 1, Mayhew Creek trib. 2, and Mayhew Creek trib. 3; all low sensitivity)	Potential impacts to three intermittent watercourses (Mayhew Creek trib smaller area of work proposed at east end resulting in likelihood of reduce S7
			Terrestrial Ecosystems Direct and/or indirect impacts on vegetation communities, significant wildlife, wildlife habitat, and movement patterns, including SAR.	3	1	1	1	1
				Moderate amount of woodland removal. 1.6 ha removal of potential SAR Eastern Meadowlark/Bobolink habitat. Impacts opportunity for wildlife passage through structural culvert.	Woodland edge removal on N/S sides of highway. Lengthening of structural culvert may affect wildlife passage (turtles) opportunity.	Woodland edge removal on N/S sides of highway. Lengthening of structural culvert may affect wildlife passage (turtles) opportunity (ultimate slightly greater than S5-3).	Negligible encroachment into woodland edge. No significant habitat, vegetation and species affected. Butternut (SAR) located on the north side of 1st Avenue approximately 20-25 m from the grading limit which places the works within the protected habitat.	Small encroachment into woodland edge. No significant habitat, vegetation and species affected. Butternut (SAR) located on the north side of 1st Avenue approximately 20-25 m from the grading limit which places the works within the protected habitat.
			Designated Natural Features Direct and/or indirect impacts on Designated Natural Areas, including Environmentally Sensitive Areas (ESAs), Areas of Natural and Scientific Interest (ANSI), and Provincially Significant Wetlands (PSWs).	1	1	1	1	1
				d Wetlands than Alternative 1 (S3-1).	Minor intrusion into Natural Heritage System, evaluated and non-evaluated wetlands associated with Biddy Creek. Potential impact to wetland hydrology.		Negligible encroachment into Brighton Bluffs ANSI, Mayhew Creek Significant Natural Area and Natural Heritage System	
			Contamination Number of potentially contaminated properties to be impacted.	0	0	0	0	0
					No impact			No impact
			Excess Soil Management Quantity of excess soil subject to O.Reg. 406/19 (relative to other alternatives).	5	3	3	3	3
				ntities of excess soil.	A moderate excavation cut resulting in relatively moderate quantities of excess soil		A moderate excavation cut resulting in relatively moderate quantities of excess	
			Erosion and Sediment Control Qualitative measure of impacts to areas with Erosion and Sediment Control concern	5	5	5	3	3
				hery	A moderate excavation cut / high sensitive fishery , high erosion potential		A moderate excavation cut / low sensitive fishery, low to high erosion potent	
			Surface Water & Drainage Number of watercourse crossings and impacts to surface water features; Impacts to existing highway drainage systems and ability to provide stormwater management.	1	1	1	1	1
				native 2 and 3 have more open space and opportunities to implement s. mpacts comparing the three different alternatives.	All alternatives have the same amount of impervious area from a drainage analysis perspective and hence the same impacts. Open median and ditches provide opportunities for stormwater management. In all alternatives there is one watercourse crossing and there are no additional impacts comparing the two different alternatives.		All alternatives have the same amount of impervious area from a drainage analysis perspective and hence the same impacts. Open mediar In all alternatives there are no watercourses crossing.	

			Groundwater Qualitative / quantitative assessment of impacts to groundwater. Static Water Levels: not deeper than 3 meters below the ground, Shallow Wells: no deeper than 15 meters below the ground	area of high surface water susceptibility. s present. alternative.	No WHPA or ANSI is within this alignment. Three watercourses and one wetland are present within this alternative. One pond is present within 100 m of this alternative. One indicator of potential groundwater upwelling was observed within 100 m of this alternative. This alternative is not within an SGRA or an HVA. 50% of this alternative is within an IPZ. 0% of this alternative is within an area of high groundwater susceptibility, 90% is within an area of moderate groundwater susceptibility and 50% is within an area of high surface water susceptibility. Two wells with a shallow water level (less than 3mbgs) are present within this alternative. One shallow (less than 15 mbgs) commercial supply well and 1 shallow test hole are present within 100 m of this alternative. No impacts to the pond are anticipated. Potential impacts to three watercourses, one non-evaluated wetland, one shallow well and shallow groundwater are anticipated. Limited mitigation measures to protect sensitive source water features are required.		No wetlands or WHPA are present within this alternative. Three watercourses are present within this alternative. One pond is present within 100 m of this alternative Zero indicators of potential groundwater upwelling were observed near this altern 30% of this alternative is within an SGRA and 50% is within and HVA. 15% of this alternative is within an IPZ and 80% of this alignment borders an AI 100% of this alternative is within an area of high groundwater susceptibility and 5% is within an area of hig Seven wells with a shallow water level (less than 3mbgs) are present within this alternative. There ar Four shallow (less than 15 mbgs) and 20 deep domestic water supply wells are present within this alternative. No impacts to wetlands or the waterbodies are anticipated. Potential impacts to three watercourses, four shallow wells and shallow groundwater are Mitigation measures to protect sensitive source water features are required.	
Total Natural Environment Score				**5.25**	**4.25**	**4.25**	**3.25**	**2.75**
Total Natural Environment Rank				**3**	**1**	**1**	**3**	**1**
Summary of Natural Environment Key Aspects				**Eastern Meadowlark/Bobolink habitat and there are alls in S3-1 do prohibit the use of open ditching**	**From a Natural Environmental perspective there is no preference in alternatives. There is small differences in the lengthening of the structural culvert that may affect wildlife passage (turtles) opportunity and it is a slightly greater impact in Alternative S5-4 than S5-3, but the difference is small.**		**From a Natural Environment perspective Alternatives S7-4 and S7-5 are equally preferred since Alternativ intermittent watercourses (Mayhew Creek trib. 1, Mayhew Creek trib. 2, and Mayhew Creek trib. 3; all low**	
Cultural Environment	**20%**	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Archaeology** Impacts to known archaeological features or areas of archaeological potential.	**3** Archaeological potential is present in all three alternatives. This alternative includes larger areas requiring both test pit and pedestrian survey due to the realignment of Crandall Road and grading limits wider than both S3-1 and S3-2.	**3** Archaeological potential present in both alternatives. Stage 2 test pit and pedestrian survey areas are comparable for both S5-3 and S5-4.	**3**	**3** Archaeological potential present in all three alternatives. Stage 2 test pit survey areas are comparabl	**3**
			Built Heritage Resources and Cultural Heritage Landscapes Number of impacts to properties designated under the *Ontario Heritage Act* (OHA) or listed on municipal Heritage Registers; number of cultural heritage landscapes displaced or disrupted;	**0** Impact to 1 BHR (318 Lake Rd), displaced due to widening. CHER completed for 318 Lake Road. MTO CHRC did not find the property to be a Provincial Heritage Property (PHP).	**1** Impact to 1 CHL (15154 Telephone Rd) due to property taking/grading	**1**	**1** Impact to 1 CHL (16536 Telephone Rd) due to property taking/grading	**1**
			Impacts to Indigenous lands The extent of Indigenous lands required.	**0** he Mississaugas of Alderville, Curve Lake, Hiawatha, and Scugog Island.	**0** The study area falls within the boundaries of the 1923 Williams Treaties. The Williams Treaties First Nations include the Chippewas of Beausoleil, Georgina Island, and Rama and the Mississaugas of Alderville, Curve Lake, Hiawatha, and Scugog Island. The Alderville First Nation Reserve is to the north of the study area. There are no impacts to Reserve Lands.	**0**	**0** The study area falls within the boundaries of the 1923 Williams Treaties. The Williams Treaties First Nations include the Chippewas of Beausoleil, G Hiawatha, and Scugog Island. The Alderville First Nation Reserve is to the north of the study area. There ar	**0**
Total Cultural Environment Score				**0.6**	**0.8**	**0.8**	**0.8**	**0.8**
Total Cultural Environment Rank				**1**	**1**	**1**	**1**	**1**
Summary of Cultural Environment Key Aspects				**318 Lake Road, whereas Alternative S3-3 displaces letermine their heritage potential. 318 Lake Road archaeological potential, there is no significant ll alternatives.**	**There is no preference from a Cultural Environment perspective as both alternatives impact 1 cultural heritage landscape due to property taking/grading. A CHER was not recommended for this property. All alternatives require Stage 2 investigations to be complete and have the same archaeological potential, there is no significant difference in the archaeological potential of the alternatives. The possibility of recovering archaeological material is equal for all alternatives.**		**There is no preference from a Cultural Environment perspective as all alternatives impact 1 cultural herita CHER was not recommended for this property. All alternatives require Stage 2 investigations to be complete and have the same archaeological potential archaeological potential of the alternatives. The possibility of recovering archaeological material is equal**	
			Property & Access Number of residential and commercial/industrial properties / accesses impacted.	**5** Impacts to 13 private properties and 5 accesses (estimated), including 1 residential displacement. Greater impacted area than Alternative 1 (approximately 12 ha). Most significant property impacts along Highway 401, including large impacts northeast and northwest of Lake Road and Highway 401 and one residential displacement.	**3** Minor to moderate impacts to 13 private properties (similar for all alternatives). At existing drumlin features in this section, large property requirement to place drumlins and erodible soils within future MTO right-of-way.	**3**	**1** West end - property impacts are the same as other alternatives (minor impacts on the north and south side of Highway 401). East end - Minor impacts to 8 properties. Property impacts are similar to Alternatives 4 and 5 on the north side, but slightly greater than Alternative 4 on the south side.	**1** West end - property impacts are the same as other alternatives (minor impacts on the north and south side of Highway 401). East end - Minor impacts to 8 properties. Minimizes impacts relative to other alternatives.
			Noise Number of noise sensitive receptors/areas within 600 m and ability to provide noise mitigation measures (if required).	**3** ; it may slightly improve the noise effects.	**0** There are no valid receptors identified at this stage for this segment.	**0**	**3** There are receptors on the south side, the effect from these options are similar for all a	**3**
			Community Facilities Number of cemeteries, schools, places of worship, and recreation centres directly impacted or potentially displaced.	**0** ing cemeteries will be impacted, but one cemetery-owned property will be	**0** No cemeteries, schools, places of worship, or recreation centres directly impacted or potentially displaced.	**0**	**0** No cemeteries, schools, places of worship, or recreation centres directly impacted or poten	**0**
			Recreation and Tourism Features Number of parks and trails directly impacted.	**0** resqu'ile Promise Cycling Loop runs along the Lake Road underpass that tives through Section 3 do not impact the cycling loop.	**0** Per the Northumberland County Transportation Master Plan (2017), Northumberland County Cycling Master Plan (2014), and the Northumberland County Official Plan (2016), there are no trail networks or recreational facilities within the Section 5 study limits.	**0**	**0** Per the Northumberland County Transportation Master Plan (2017), Northumberland County Cycling Master Plan (2014), and the Northumberland Cou within the Section 7 study limits.	**0**
			Air Quality and Climate Change	**1**	**1**	**1**	**1**	**1**

Socio-Economic Environment	**25%**	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Change** Qualitative assessment of impacts to air quality and greenhouse gas emissions. *N.B. MTO Guide identifies 500 m as the distance 'to avoid the need for air quality impact mitigations' in most cases.*	Operational -Road segment length decreases minimally, emissions increase with expected traffic volume increases due to population growth; the addition of active traffic lanes may decrease the overall emission impact as flow of traffic is improved. -Realignment option S3-3 further increases separation distance to residences on McDonald Rd. (approximately 30 homes) decreasing emission impact at the residences. Furthermore, road widening improves dispersion as the same emissions are emitted from a wider source, therefore potentially decreasing potential impact at nearby residences. -Realignment option S3-3 involves the realignment of Crandall Rd. increasing road segment length by ~15m; minimal increase in emissions. Crandall Rd. realignment only impacts two receptors near its most Eastern end. During Construction -Minor increase in emissions. Construction emission impacts are only expected through the duration of the construction phase. Note: existing highway operational emissions may be increased during construction phase due to decrease speed enforcement in the construction zone. -Construction emission impact at residences on McDonald Rd. further decreased in this option as the separation from the receptors to the construction zone is increased. -Construction emission impacts further decreased minimally in this option due to highway segment length decrease. However, construction on Crandall Rd realignment increases overall construction period; increasing emission impacts overall.	Operational -Road segment length remains the same, emissions increase with expected traffic volume increases due to population growth; the addition of active traffic lanes may decrease the overall emission impact as flow of traffic is improved. -Road widening improves dispersion as the same emissions are emitted from a wider source, therefore potentially decreasing potential impact at nearby residences/camp grounds. During Construction -Minor increase in emissions. Construction emission impacts are only expected through the duration of the construction phase. Note: existing highway operational emissions may be increased during construction phase due to decrease speed enforcement in the construction zone. -Construction emission impacts decreased as widening to the South increases separation distance to receptors (residences and camp ground) on Telephone Rd. and Cedardale Rd.	Operational -Road segment length remains the same, emissions increase with expected traffic volume increases due to population growth; the addition of active traffic lanes may decrease the overall emission impact as flow of traffic is improved. -Widening outside in the ultimate decreases the separation distance from the Northern most emission source to the sensitive receptors (residences and camp ground) on Telephone Rd. and Cedardale Rd. However, road widening improves dispersion as the same emissions are emitted from a wider source, therefore potentially decreasing potential impact at the residences/camp grounds. During Construction -Minor increase in emissions. Construction emission impacts are only expected through the duration of the construction phase. Note: existing highway operational emissions may be increased during construction phase due to decrease speed enforcement in the construction zone. -Construction impacts from S5-4 would be greater if the inside is widened in the interim, and then outside in the ultimate; due to extended construction time. -Construction for the widening outside in the ultimate occurs closer to sensitive receptors (residences and camp ground) on Telephone Rd. and Cedardale Rd. Minor increase in emissions. Construction emission impacts are only expected through the duration of the construction phase.	Operational -Road segment length remains the same, emissions increase with expected traffic volume increases due to population growth; the addition of active traffic lanes may decrease the overall emission impact as flow of traffic is improved. -Widening outside in the ultimate decreases the distance from the emission sources to the sensitive receptors (residences) on Telephone Rd. and Coltman Rd. However, road widening improves dispersion as the same emissions are emitted from a wider source, therefore potentially decreasing potential impact at the residences. During Construction -Minor increase in emissions. Construction emission impacts are only expected through the duration of the construction phase. Note: existing highway operational emissions may be increased during construction phase due to decrease speed enforcement in the construction zone. -Construction impacts from S7-2 would be greater if the inside is widened in the interim, and then outside in the ultimate; due to extended construction time. -Construction for the widening outside in the ultimate occurs closer to sensitive receptors (residences) on Telephone Rd. and Coltman Rd. Construction emission impacts are only expected through the duration of the construction phase.	Operational -Road segment length remains the same, emissions increase with expected traffic volume increases due to population growth; the addition of active traffic lanes may decrease the overall emission impact as flow of traffic is improved. -Widening outside in the ultimate (on the East end) decreases the distance from the Northern most emission source to the sensitive receptors (residences) on Coltman Rd. However, road widening improves dispersion as the same emissions are emitted from a wider source, therefore potentially decreasing potential impact at the residences. During Construction -Minor increase in emissions. Construction emission impacts are only expected through the duration of the construction phase. Note: existing highway operational emissions may be increased during construction phase due to decrease speed enforcement in the construction zone. -Construction impacts from S7-4 would be greater if the inside is widened in the interim, and then outside in the ultimate; due to extended construction time. -Construction emission impact from West end widening to the inside is decreased as the separation distance between the receptors (residences) on Telephone Rd. and the construction zone is increased. -Construction for the widening outside in the ultimate (on the East end) occurs closer to sensitive receptors (residences) on Coltman Rd. Construction emission impacts are only expected through the duration of the construction phase.
				3	**1**	**1**	**1**	**1**
			Agricultural Resources Impact on local agricultural resources using quantitative measure of area (ha).	tely severe limitations that limit the range of crops. A small portion lands is hat restrict the range of crops. S3-2 and S3-3 require Crandall Road to be th designated as agricultural land use due to the grading limits and the to S3-1.	Lands within the grading limits of Section 5 are identified as Class 3 soils, meaning that there are moderately severe limitations that limit the range of crops. A small portion lands is classified as Class 2 soils to the eastern limits of Section 5, meaning that there are moderate limitations that restrict the range of crops. Similar impacts to lands to the north and southwest designated as agricultural land use due to the grading limits.		Class 2 soils are located on the south side of Section 7 on the western portion and the eastern limits. Class 3 soils are located on the north side of t lands within the Section 7 grading limits is classified as Class 6 soils, meaning the soils are capable only of producing perennial forage crops. A sr meaning these soils have severe limitations that restrict the range of crops. None of the alternatives impact lanc	
				0	**0**	**0**	**0**	**0**
			Approved Local, Regional and Provincial Plans and Policies Assessment of conformity with approved local, regional and provincial plan and policies.	additional widening of Highway 401 east of Cobourg".	The proposed widening of Highway 401 is in keeping with the Northumberland County Transportation Master Plan policy recommendation PO21 "Advocate for additional widening of Highway 401 east of Cobourg".		The proposed widening of Highway 401 is in keeping with the Northumberland County Transportation Master Plan policy recommendation PO21	
Total Socio-Economic Environment Score				**3**	**1.25**	**1.25**	**1.5**	**1.5**
Total Socio-Economic Environment Rank				**3**	**1**	**1**	**1**	**1**
Summary of Socio-Economic Environment Key Aspects				**a bit further from the noise sensitive receptors and t at Lake Road.**	**From a Socio-Economic perspective there is no preference in a preferred alternative since the property impacts are similar and no valid noise sensitive receptors in this section. Although from an Air Quality perspective there is a slight preference in S5-3 since it has the lowest potential to increase emissions.**		**From a Socio-Economic perspective Alternative S7-4 is slightly preferred from an Air Quality perspective The property impacts are similar for all alternatives.**	
				0	**3**	**1**	**1**	**3**
			Traffic Operations and Geometry Traffic operations on Highway 401, highway geometry, roadside safety, impacts on emergency services response times.	Proposed curves meet the minimum and desirable radius requirement and widened shoulders are not required. Retaining walls are not proposed which is more desirable from a safety and maintenance perspective.	Traffic operations and roadside safety are similar for all alternatives. Retaining walls are proposed on the north side to avoid impacts to existing drumlins. Harder to tie in to the proposed County Road 30 design which widens one lane inside and one lane outside; lane widening strategy would have to be transitioned on the curve to tie into the County Road 30 study limits.	Traffic operations and roadside safety are similar for all alternatives. Retaining walls are proposed on the north side to avoid impacts to existing drumlins. Easier to tie in to the proposed County Road 30 design which also widens one lane inside and one lane outside.	Retaining wall is proposed on the north side to avoid impacts to the existing drumlin for all alternatives. Open median is maintained in the Interim and Ultimate conditions. Maintains continuity with widening strategy through the west end.	Retaining wall is proposed on the north side to avoid impacts to the existing drumlin for all alternatives. Median barrier required in the Ultimate condition, which is less desirable than an open median from a safety perspective.
				5	**3**	**3**	**1**	**3**
			Constructability Complexity of construction of structures and highway infrastructure, compatibility with structure replacement alternatives, utility relocation requirements.	Major highway realignment, which complicates construction and also results in throwaway of the existing highway infrastructure. However, most of the realigned highway is in greenfield which provides easier construction access and improves constructability. Maintains open grading (no retaining wall), which is preferable from a safety perspective, but requires large cuts and realignment of Crandall Road. Existing Lake Road profile can be maintained, however it will require a overbuild (~double the length) and extra spans (4spans) compared to Alternative 1 to accomodate replacement of the structure prior to the widening/realignment of the higway. Most of the new structure can be replaced north of the existing structure, and can likely be constructed entirely offline. Closure of Lake Road is required to replace bridge on the same alignment (same for all alternatives). Potential impacts to hydro poles (similar for all alternatives).	Constructability is similar for all alternatives. The proposed retaining wall may be slightly shorter for Alternative 3.	Constructability is similar for all alternatives. Proposed retaining wall may be slightly taller for Alternative 4.	This alternative provides more space for median ditching/grading than Alternative 4.	Widening to the inside leaves less space in the median for grading/ditching, which reduces constructability.
				5	**3**	**1**	**1**	**3**

Transportation / Technical Considerations	**30%**	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Construction Staging** Construction staging impacts, accommodation of traffic during construction, detour/out-of-way travel requirements, including impacts to emergency services response times.	Most complex highway staging of the alternatives due to major highway realignment. Large portions of the highway and structure can be constructed offline. However, a portion of the realigned highway overlapping the existing highway will require traffic shifting to tie in to the existing alignment (more overlap than Alternative 2). Lake Road profile can be maintained, resulting in less staging impacts on Lake Road and at the intersections of Crandall Road and McDondald Road than for Alternative 1. Bridge will require to be overbuilt (more than Alt. 2) in order to accomodate existing lanes due to the bridge being replaced prior to highway widening/realignment. The new structure can likely be constructed entirely offline (easier to construct than Alternative 2). Easier construction access to new structure than for Alternative 1. Short-term closure / detour of Highway 401 traffic may be required for bridge construction and there will be a closure of Lake Road during bridge replacement, with detour via Herley Road (similar for all alternatives).	Construction staging is slightly more complex since the widening strategy must be transitioned on the curve to tie into the County Road 30 study limits.	Construction staging is slightly simpler since the widening strategy is the same as the County Road 30 design and does not require lane transitions.	Construction staging is slightly simpler since the widening strategy is the same as the strategy to the west.	Construction staging is slightly more complex since the widening strategy must be transitioned on the curve to tie into the strategy to the west.
				3	**5**	**5**	**3**	**5**
			Maintenance Maintenance and serviceability of retaining walls, snow clearing.	No retaining walls, which avoids maintenance and snow clearing challenges associated with retaining walls. Much longer structure so some additional maintenance costs associated with this.	Both alternatives use two retaining walls, approximately 300 m long each, on the north side of the highway. Greater maintenance cost and effort for long-term maintenance of retaining walls. May require greater snow clearing effort to remove snow along the lengh of retaining wall or clear snow over the wall.		This alternative uses a retaining wall, approximately 250 m long, on the north side of the highway. Greater maintenance cost and effort for long-term maintenance of retaining walls. May require greater snow clearing effort to remove snow along the lengh of retaining wall or clear snow over the wall.	This alternative uses a retaining wall, approximately 250 m long, on the north side of the highway and would require median barrier in the Ultimate condition. Greater maintenance cost and effort for long-term maintenance of retaining walls. High maintenance cost and effort to maintain median barrier and median area. May require greater snow clearing effort to remove snow along the lengh of retaining wall or clear snow over the wall.
Total Transportation / Technical Considerations Score				**3.9**	**4.2**	**3**	**1.8**	**4.2**
Total Transportation / Technical Considerations Rank				**2**	**2**	**1**	**1**	**3**
Summary of Transportation / Technical Considerations Key Aspects				**s better constructability than Alternative S3-2, and**	**From a Transportation/Technical perspective, Alternative S5-4 is preferred since it is easier to tie in this alternative to the County Road 30 design at the project study limit.**		**From a Transportation/Technical perspective, Alternative S7-2 is preferred since it maintains an open me the west and at the east limit.**	
Cost	**0%**	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Cost Estimate (Parametric) for Interim 6-lane Condition** Parametric cost estimate for structures, highway infrastructure, and construction staging. **To be used for comparison purposes only. Not to be used for Construction Programming / Planning.*	**5** $ 29.8 M Highest estimated cost because this alternative has the greatest realignment and longest structure.	**1** $ 23.8 M The alternatives have the same estimated cost.	**1** $ 23.8 M	**1** $ 40.2 M Slightly higher estimated cost because retaining wall my be slightly taller than for other alternatives.	**1** $ 39.9 M Slightly lower estimated c
Total Cost Score				**0**	**0**	**0**	**0**	**0**
Total Cost Rank				**3**	**1**	**1**	**1**	**1**
Summary of Cost Key Aspects					**The estimated cost of all alternatives is the same in the Interim condition.**		**Alternatives S7-4 and S7-5 have a slightly lower estimated cost than Alternative S7-2.**	
OVERALL SCORE:				**12.75**	**10.50**	**9.30**	**7.35**	**9.25**
OVERALL RANKING:				**3**	**2**	**1**	**1**	**3**

Notes:
1) Each indicator is given a score of 0 = no impact, 1 = minor impact, 3 = m

CRITERIA	CRITERIA WEIGHTING	SCALE	INDICATOR	S7-5B
			Alternative Description	West end - Widen inside in the Interim and widen outside in the Ultimate; East end – Widen to the south
				SCORE
Natural Environment	25%	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Fish & Aquatic Habitat** Direct and/or indirect impacts on fisheries, including Species at Risk (SAR).	1 , 1, Mayhew Creek trib. 2, and Mayhew Creek trib. 3; all low sensitivity); l impacts for Mayhew Creek trib. 2 and Mayhew Creek trib. 3 compared to -2
			Terrestrial Ecosystems Direct and/or indirect impacts on vegetation communities, significant wildlife, wildlife habitat, and movement patterns, including SAR.	1 Small encroachment (but greater than S7-4) into woodland edge. No significant habitat, vegetation and species affected. Butternut (SAR) located on the north side of 1st Avenue approximately 20-25 m from the grading limit which places the works within the protected habitat.
			Designated Natural Features Direct and/or indirect impacts on Designated Natural Areas, including Environmentally Sensitive Areas (ESAs), Areas of Natural and Scientific Interest (ANSI), and Provincially Significant Wetlands (PSWs).	1 Negligible encroachment into Brighton Bluffs ANSI. Some encroachment into edge of Mayhew Creek Significant Natural Area and Natural Heritage System
			Contamination Number of potentially contaminated properties to be impacted.	0
			Excess Soil Management Quantity of excess soil subject to O.Reg. 406/19 (relative to other alternatives).	3 soil
			Erosion and Sediment Control Qualitative measure of impacts to areas with Erosion and Sediment Control concern	3 ial
			Surface Water & Drainage Number of watercourse crossings and impacts to surface water features; Impacts to existing highway drainage systems and ability to provide stormwater management.	1 and ditches provide opportunities for stormwater management.
				1

			Groundwater Qualitative / quantitative assessment of impacts to groundwater. Static Water Levels: not deeper than 3 meters below the ground, Shallow Wells: no deeper than 15 meters below the ground	ative. NSI. h surface water susceptibility. e 21 other wells present. Four abandoned wells are present. anticipated.
Total Natural Environment Score				**2.75**
Total Natural Environment Rank				**1**
Summary of Natural Environment Key Aspects				**e S7-2 has greater potential impacts to three sensitivity).**
Cultural Environment	**20%**	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Archaeology** Impacts to known archaeological features or areas of archaeological potential.	**3** for all three alternatives.
			Built Heritage Resources and Cultural Heritage Landscapes Number of impacts to properties designated under the *Ontario Heritage Act* (OHA) or listed on municipal Heritage Registers; number of cultural heritage landscapes displaced or disrupted;	**1**
			Impacts to Indigenous lands The extent of Indigenous lands required.	**0** orgina Island, and Rama and the Mississaugas of Alderville, Curve Lake, e no impacts to Reserve Lands.
Total Cultural Environment Score				**0.8**
Total Cultural Environment Rank				**1**
Summary of Cultural Environment Key Aspects				**ge landscape due to property taking/grading. A , there is no significant difference in the for all alternatives.**
			Property & Access Number of residential and commercial/industrial properties / accesses impacted.	**1** West end - property impacts are the same as other alternatives (minor impacts on the north and south side of Highway 401). East end - Minor impacts to 8 properties. Property impacts are similar to Alternative 2 and 4 on the north side, but slightly greater than Alternatives 2 and 4 on the south side.
			Noise Number of noise sensitive receptors/areas within 600 m and ability to provide noise mitigation measures (if required).	**3** lternatives
			Community Facilities Number of cemeteries, schools, places of worship, and recreation centres directly impacted or potentially displaced.	**0** tially displaced.
			Recreation and Tourism Features Number of parks and trails directly impacted.	**0** nty Official Plan (2016), there are no trail networks or recreational facilities
			Air Quality and Climate Change	**1**

Socio-Economic Environment	**25%**	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	Qualitative assessment of impacts to air quality and greenhouse gas emissions. *N.B. MTO Guide identifies 500 m as the distance 'to avoid the need for air quality impact mitigations' in most cases.*	Operational -Road segment length remains the same, emissions increase with expected traffic volume increases due to population growth; the addition of active traffic lanes may decrease the overall emission impact as flow of traffic is improved. -Widening outside in the ultimate (on the East end) decreases the distance from the Northern most emission source to the sensitive receptors (residences) on Coltman Rd. However, road widening improves dispersion as the same emissions are emitted from a wider source, therefore potentially decreasing potential impact at the residences. During Construction -Minor increase in emissions. Construction emission impacts are only expected through the duration of the construction phase. Note: existing highway operational emissions may be increased during construction phase due to decrease speed enforcement in the construction zone. -Construction impacts from S7-5 would be greater if the inside is widened in the interim, and then outside in the ultimate; due to extended construction time. -Construction emission impact from West end widening to the South is increased as the separation distance between the receptors (residences) on Telephone Rd. and the construction zone is decreased. -Construction for the widening outside in the ultimate (on the East end) occurs closer to sensitive receptors (residences) on Coltman Rd. Construction emission impacts are only expected through the duration of the construction phase.
				1
			Agricultural Resources Impact on local agricultural resources using quantitative measure of area (ha).	he Section 7, mostly located outside of the grading limits. Majority of the nall portion of Class 5 soils is located at the eastern limits of Section 7, designated as agricultural land use.
				0
			Approved Local, Regional and Provincial Plans and Policies Assessment of conformity with approved local, regional and provincial plan and policies.	"Advocate for additional widening of Highway 401 east of Cobourg".
Total Socio-Economic Environment Score				**1.5**
Total Socio-Economic Environment Rank				**1**
Summary of Socio-Economic Environment Key Aspects				**as it has the lowest potential to increase emissions.**
				3
			Traffic Operations and Geometry Traffic operations on Highway 401, highway geometry, roadside safety, impacts on emergency services response times.	Retaining wall is proposed on the north side to avoid impacts to the existing drumlin for all alternatives. Open median is maintained in the Interim and Ultimate conditions. Widening strategy is not continuous with the strategy to the west, requiring lane shifting on the curve.
				1
			Constructability Complexity of construction of structures and highway infrastructure, compatibility with structure replacement alternatives, utility relocation requirements.	This alternative provides more space for median ditching/grading than Alternative 4.
				3

Transportation / Technical Considerations	**30%**	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Construction Staging** Construction staging impacts, accommodation of traffic during construction, detour/out-of-way travel requirements, including impacts to emergency services response times.	Construction staging is slightly more complex since the widening strategy must be transitioned on the curve to tie into the strategy to the west.
				3
			Maintenance Maintenance and serviceability of retaining walls, snow clearing.	This alternative uses a retaining wall, approximately 250 m long, on the north side of the highway. Greater maintenance cost and effort for long-term maintenance of retaining walls. May require greater snow clearing effort to remove snow along the lengh of retaining wall or clear snow over the wall.
Total Transportation / Technical Considerations Score				**3**
Total Transportation / Technical Considerations Rank				**2**
Summary of Transportation / Technical Considerations Key Aspects				**dian, is easiest to tie into the widening strategy to**
Cost	**0%**	0 = no impact 1 = minor impact 3 = moderate impact 5 = significant impact	**Cost Estimate (Parametric) for Interim 6-lane Condition** Parametric cost estimate for structures, highway infrastructure, and construction staging. **To be used for comparison purposes only. Not to be used for Construction Programming / Planning.*	**1** $ 39.9 M ost than Alternative S7-2.
Total Cost Score				**0**
Total Cost Rank				**1**
Summary of Cost Key Aspects				
OVERALL SCORE:				**8.05**
OVERALL RANKING:				**2**

Notes:
1) Each indicator is given a score of 0 = no impact, 1 = minor impact, 3 = m