

APPENDIX B

ASSESSMENT OF ALTERNATIVE DESIGN CONCEPTS

B1 – Screening of Long List of Alternative Road Alignments

- B2 Detailed Evaluation of Alternative Road Cross-Section
- B3 Detailed Evaluation of Alternatives Road Alignments

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APPENDIX B1

Screening of Long List of Alternative Road Alignments

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SCREENING CRITERIA	Option 1 Major Northerly Diversion to Avoid Wetland and Dense Forest	Option 2 Moderate Northerly Diversion to Avoid Wetland and Groundwater Discharge Area	Option 3 Minor Northerly Diversion with Wetland Crossing and Avoid Dense Forest	Option 4 Minor Northerly Diversion with Wetland Crossing to Minimize Impacts to Forest	Option 5 Direct Extension with Wetland Crossing	Option 6 South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest	Option 7 South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest	Option 8 Minor Southerly Diversion to Avoid Wetland	Option 9 Moderate Southerly Diversion to Avoid Wetland and Minimize Impacts to Dense Forest		
TECHNICAL ENVIRO	NMENT										
Ability to provide highest level of transportation and municipal services to proposed new development	Major route diversion poses design challenges, major horizontal realignments require lower speeds for safe operation for most modes of transportation if combined with vertical curves, maintenance challenges, limits access to developable lands and development potential.	Moderate route diversion limits design flexibility, moderate horizontal realignments generally well tolerated by most modes of transportation at appropriate speed limits, some maintenance challenges, somewhat limits access to developable lands and development potential.	Minor route diversion offers good design flexibility, minor horizontal realignments are well tolerated by all modes of transportation, offers ease of maintenance, provides acceptable access to developable lands and development potential.	Minor route diversion offers good design flexibility, minor horizontal realignments are well tolerated by all modes of transportation, offers ease of maintenance, provides acceptable access to developable lands and development potential.	Direct route extension offers the most design flexibility, ease of operation for all modes of transportation, offers ease of maintenance and least amount of maintenance, provides the most direct access to developable lands and development potential.	Minor jogged route diversion offers good design flexibility, minor horizontal realignments are well tolerated by all modes of transportation, offers ease of maintenance, provides acceptable access to developable lands and development potential.	Minor jogged route diversion offers good design flexibility, minor horizontal realignments are well tolerated by all modes of transportation, offers ease of maintenance, provides acceptable access to developable lands and development potential.	Minor route diversion offers good design flexibility, minor horizontal realignments are well tolerated by all modes of transportation, offers ease of maintenance, provides acceptable access to developable lands and development potential.	Moderate route diversion limits design flexibility, moderate horizontal realignments generally well tolerated by most modes of transportation at appropriate speed limits, some maintenance challenges, somewhat limits access to developable lands and development potential.		
Optimum footprint promoting compatibility with existing elevations while minimizing the amount of grading required. Minimizes impact to surrounding environment	Route diversion generates a largest grading area footprint of approximately 117,150 m2.	Route diversion generates a medium grading area footprint of approximately 100,470 m2.	Route diversion generates a small grading area footprint of approximately 91,800 m2.	Route diversion generates a small grading area footprint of approximately 90,816 m2.	Route extension generates a smallest grading area footprint of approximately 69,470 m2.	Route diversion generates a small grading area footprint of approximately 89,000 m2.	Route diversion generates a medium grading area footprint of approximately 108,490 m2.	Route diversion generates a medium grading area footprint of approximately 108,289 m2.	Route diversion generates a large grading area footprint of approximately 113,650 m2.		



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Optimum crossing point of the East Patterson Creek/Provincially Significant Wetland (PSW)	Crossing of creek or wetland not required. Potential interference with a disturbed area with some wetland characteristics can be mitigated.	Crossing of creek or wetland not required. Potential interference with a disturbed area with some wetland characteristics can be mitigated.	Largest crossing of PSW required. Can likely be accommodated with large bridge structure, however will result in most costly option.	Moderate length of PSW and associated groundwater discharge areas crossing required.	Moderate length of PSW and associated groundwater discharge areas crossing required.	Crossing of creek required. Opportunity to avoid PSW but may impact PSW buffer.	Crossing of creek required. Opportunity to avoid PSW but may impact PSW buffer.	Crossing of narrow and disturbed portion of intermittent creek required.	Crossing of narrow and disturbed portion of intermittent creek required.
SOCIO-ECONOMIC E	NVIRONMENT		· · ·	-		-	-		
Compatibility with existing and proposed provincial, regional and municipal long range planning land use policies	Compatible with planning policies to least extent. Longest length passing through Natural Core Area.	Compatible with planning policies to less extent. Longer length passing through Natural Core Area. Avoids PSW.	Compatible with planning policies to less extent. Moderate length passing through Natural Core Area. Requires crossing of PSW.	Compatible with planning policies to less extent. Moderate length passing through Natural Core Area. Requires crossing of PSW.	Compatible with planning policies to less extent. Moderate length passing through Natural Core Area. Requires crossing of PSW. Provides direct access to lands approved for residential development.	Compatible with planning policies to less extent. Moderate length passing through Natural Core Area. Potential to impact PSW buffer.	Compatible with planning policies to less extent. Relatively short length passing through Natural Core Area. Potential to impact PSW buffer.	Compatible with planning policies to less extent. Moderate length passing through Natural Core Area. Avoids PSW.	Compatible with planning policies to less extent. Moderate length passing through Natural Core Area. Avoids PSW.



SCREENING CRITERIA Option 1 Major knitwow Weiland Crossing Weiland Weiland Crossing Weiland Crossing Weiland Weiland We		Ontion	Ontion 0	Ontion	Ontion	Ontion F		Ontion 7	Ontion 0	Ontion
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Cross impacts on existing and future land useModerate impact on existing and future land use.Moderate impact on existing and future land use.Major impact on existing and future land use.No impact on existing agriculural uses.Moderate impact on existing agriculural uses.Moderate impact on existing agriculural uses.Moderate impact on existing agriculural uses.Major impact on existing and future land use.Major impact on existing and future land use.Major impact on existing and future land use.Voiderate impact on existing agriculural uses.Moderate impact on existing agriculural uses.Moderate impact on existing agriculural uses.Moderate impact on existing agriculural uses.Major impact on existing agriculural of land agriculural development.Major impact on existing agriculural divelopment.Major impact on existing agriculural of land agriculural development.Major impact on existing agriculural divelopment.Void	Constitution									
\mathbf{v} i central \mathbf{v} is the first operator \mathbf{v} is the first operator \mathbf{v}	existing and future land use	Major impact on existing and future land use. Long route requires acquisition of more lands. Severely limits access from the future residential use to the proposed roadway. Moderate impact on existing agricultural uses.	Moderate impact on existing and future land use. Relatively short route. Requires acquisition of vacant lands and small amount of agricultural lands. No impact on existing employment use. Moderate impact on future residential use by limiting access to the proposed roadway.	Moderate impact on existing and future land use. Relatively short route. Requires acquisition of vacant lands. No impact on existing employment use. Moderate impact on future residential use by limiting access to the proposed roadway. Minimal impact on existing agricultural uses.	Moderate impact on existing and future land use. Minimal impact on existing employment use. Does not limit access from the future residential use. Moderate impact on existing agricultural uses.	Minimal impact on existing and future land use. Shortest and most direct route. Most cost efficient option with respect to land acquisition costs. Minimal impact on existing employment use and future residential use in the southwest quadrant of the Study Area. Minimal impact on existing agricultural uses.	Moderate impact on existing and future land use. Less cost efficient option with respect to land acquisition costs. Requires acquisition of lands approved for residential development. Moderate impact on existing employment use. Moderate impact on future residential use through the creation of an inefficient development block that will be isolated from the rest of the residential community. Moderate impact on existing agricultural uses.	Major impact on existing and future land use. Least cost efficient option with respect to land acquisition costs. Requires acquisition of lands approved for residential development. Significant impact on existing employment use. Significant impact on future residential use through the creation of an inefficient development block that will be isolated from the rest of the residential community. Moderate impact on existing agricultural uses.	Major impact on existing and future land use. Least cost efficient option with respect to land acquisition costs. Requires acquisition of lands approved for residential development. Significant impact on existing employment use. Significant impact on future residential use through the creation of an inefficient development block that will be isolated from the rest of the residential community. Moderate impact on existing agricultural uses.	Major impact on existing and future land use. Least cost efficient option with respect to land acquisition costs. Requires acquisition of lands approved for residential development. Significant impact on existing employment use. Creates a barrier that divides the future residential community. Moderate impact on existing agricultural uses.



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Need and extent of alterations to the existing unopened Right of Way (RoW)	Major alterations to existing right of way. Alignment follows 500m of already dedicated RoW with approximately 1815m of linear new RoW required. Additional 36m of cross sectional new RoW required with varied encroachment beyond available RoW for grading purposes.	Minor to Moderate alterations to existing right of way. Alignment follows 1000m of already dedicated RoW with approximately 1130m of linear new RoW required. Additional 36m of cross sectional new RoW required with varied encroachment beyond available RoW for grading purposes.	Moderate alterations to existing right of way. Alignment follows 800m of already dedicated RoW with approximately 1260m of linear new RoW required. Additional 36m of cross sectional new RoW required with varied encroachment beyond available RoW for grading purposes.	Minor to Moderate alterations to existing right of way. Alignment follows 950m of already dedicated RoW with approximately 1100m of linear new RoW required. Additional 36m of cross sectional new RoW required with varied encroachment beyond available RoW for grading purposes.	Least extent of alterations to the existing RoW. Alignment fully follows along lands already dedicated as RoW. Additional 16m of cross sectional new RoW required with varied encroachment beyond available RoW for grading purposes.	Moderate alterations to existing right of way. Alignment follows 628m of already dedicated RoW with approximately 1448m of linear new RoW required. Additional 36m of cross sectional new RoW required with varied encroachment beyond available RoW for grading purposes.	Major alterations to existing right of way. Alignment follows 250m of already dedicated RoW with approximately 1830m of linear new RoW required. Additional 36m of cross sectional new RoW required with varied encroachment beyond available RoW for grading purposes.	Major alterations to existing RoW. Alignment follows 400m of already dedicated RoW with approximately 1660m of linear new RoW required. Additional 36m of cross sectional new RoW required with varied encroachment beyond available RoW for grading purposes.	Major alterations to existing right of way. Alignment follows 400m of already dedicated RoW with approximately 1760m of linear new RoW required. Additional 36m of cross sectional new RoW required with varied encroachment beyond available RoW for grading purposes.
NATURAL ENVIRON	MENT								
Gross impacts to aquatic resources	Least or no aquatic impacts.	Least or no aquatic impacts.	Greatest aquatic impacts to groundwater discharge areas.	Moderate aquatic impacts to groundwater discharge areas.	Moderate aquatic impacts to groundwater discharge areas.	Moderate aquatic impacts from watercourse crossing can be mitigated.	Moderate aquatic impacts from watercourse crossing can be mitigated.	Moderate aquatic impacts from watercourse crossing can be mitigated.	Moderate aquatic impacts from watercourse crossing can be mitigated.



	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
SCREENING	Major Northerly	Moderate	Minor Northerly	Minor Northerly	Direct Extension	South to North	South to North	Minor Southerly	Moderate
CRITERIA	Diversion to Avoid	Northerly	Diversion with	Diversion with	with Wetland	Minor Jog	Minor Jog	Diversion to Avoid	Southerly
	Wetland and	Diversion to Avoid	Wetland Crossing	Wetland Crossing	Crossing	Diversion to	Diversion to Avoid	Wetland	Diversion to Avoid
	Dense Forest	Wetland and	and Avoid Dense	to Minimize		Avoid Wetland	Wetland and		Wetland and
		Groundwater	Forest	Impacts to Forest		and Minimize	Minimize Impacts		Minimize Impacts
		Discharge Area				Impacts to Forest	to Forest		to Dense Forest
	X	X	X	√	√		√		
	Large impacts to	Greatest impacts to	Greatest impacts to	Moderate impacts to	Moderate impacts to	Moderate impacts to	Moderate impacts	Moderate impacts to	Least impacts to
	terrestrial resources.	to terrestrial	terrestrial resources.	terrestrial resources.					
							resources.		
	Moderate footprint	Large footprint	PSW crossing can	PSW crossing can	PSW crossing can	Potential crossing of		Avoids Provincially	Avoids Provincially
	impacts to	impacts to	likely be mitigated	likely be mitigated	likely be mitigated	PSW, may encroach	Potential crossing	Significant ANSI and	Significant ANSI
	Provincially	Provincially	through engineering	through engineering	through engineering	into PSW buffer.	of PSW, may	PSW.	and PSW.
	Significant ANSI,	Significant ANSI,	design.	design.	design.	Can likely be	encroach into PSW		
	headwater drainage	headwater drainage				mitigated through	buffer. Can likely	Bisects woodland at	Bisects woodland at
	feature to the PSW,	feature to the PSW,	Large footprint	Moderate woodland	Moderate woodland	engineering design.	be mitigated	narrow point.	a wider point.
	Significant	Significant	impacts to	footprint, primarily	footprint, primarily		through engineering	-	
	Woodlands and	Woodlands and	Provincially	along existing	along existing	Moderate woodland	design.	Direct	Avoids impacts to
	SWH.	associated SWH.	Significant ANSI,	woodland edge.	woodland edge.	footprint, primarily		crossing/impacts to	dense forest.
Gross impacts to			Significant			along existing	Bisects woodland at	dense forest.	
terrestrial resources			woodlands and	Drovingially	Provincially	woodland edge can	narrow point.		
				Significant ANSI	Significant ANSI	through	Minorimpacts		
				Significant	Significant	compensatory tree	along the edge of		
				Woodlands and	Woodlands and	nlanting	the Provincially		
				associated SWH.	associated SWH.	pranting.	Significant ANSI.		
						Bisects woodland at			
				No direct impacts to	No direct impacts to	narrowest point.	No direct impacts		
				dense forest.	dense forest.	-	dense forest.		
						Minor impacts			
						along the edge of			
						the Provincially			
						Significant ANSI.			
						No direct impacts to			
						dense forest.			



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Screening Results	Strongly satisfies 2 major components. Does not satisfy 6 major components.	Strongly satisfies 3 major components and acceptably satisfies 4 components. Does not satisfy 1 major component.	Strongly satisfies 2 major components and acceptably satisfies 3 components. Does not satisfy 3 major components.	Strongly satisfies 3 major components and acceptably satisfies 5 components. Carried forward for further consideration.	Strongly satisfies 4 major components and acceptably satisfies 4 components. Carried forward for further consideration.	Strongly satisfies 2 major components and acceptably satisfies 6 components. Carried forward for further consideration.	Strongly satisfies 1 major component and acceptably satisfies 5 components. Does not satisfy 2 major components.	Strongly satisfies 1 major component and acceptably satisfies 5 components. Does not satisfy 2 major components.	Strongly satisfies 1 major component and acceptably satisfies 4 components. Does not satisfy 3 major components.





APPENDIX B2

Detailed Evaluation of Alternative Road Cross-Sections

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Option 1 4 Travel Lanes Option 2 4 Travel Lanes Option 3 5 Trave Lanes Option 4 5 Trave Lanes Option 5 5 Trave Lanes Option 1 5 Trave Lanes Option 5 5 Trave Lanes Option 2 5 Trave Lanes Option 5 5 Trave Lanes Option 5 7 Trave Lane			Alternative Boad Cross sections							
Criteria Upton 1 Upton 2 Upton 3 Upton 4 <				, 			Out to E			
Criteria 4 Travel Lancs 4 Travel Lancs 5 Travel Lancs 5 Travel Lancs 5 Travel Lancs 6 Travel Lancs 4 Travel Lancs 4 Travel Lancs 4 Travel Lancs 5 Travel Lancs			Option 1	Option 2	Option 3	Option 4	Option 5			
Criteria Audilary Lanes where Engineed Audilary Lanes where required Continuous shared Left required Continuous shared Left Turn Lane Continuous shared Left Turn Lane Audilary Lanes where required 14 Sm Pavement on 36m ROW Bike Lanes ROW 13 Sm Pavement on 36m ROW Bike Lanes 13 Sm Pavement on 36m ROW 19 Sm Pavem			4 Travel Lanes	4 Travel Lanes	5 Travel Lanes	5 Travel Lanes	4 Travel Lanes + Refuge			
Criteria Measures required Fequired Turn iane Turn iane Turn iane Ausility lane, where Sidewalk + Multi-User (not include) Sidewalk + Multi-User (not include) Sidewalk + Decisitate Sidewalk + Duti-User (not include) Sidewalk + Duti-User (not include) <td></td> <td></td> <td>Auxiliary Lanes where</td> <td>Auxiliary Lanes where</td> <td>Continuous Shared Left</td> <td>Continuous Shared Left</td> <td>Strip</td>			Auxiliary Lanes where	Auxiliary Lanes where	Continuous Shared Left	Continuous Shared Left	Strip			
Sidewalk + Multi-Use Trail Bite Lanes	Criteria	Measures	required	required	Turn Lane	Turn Lane	Auxiliary Lanes where			
Image: Instant			Sidewalk + Multi-Use Trail	Sidewalks + Dedicated	Sidewalk + Multi-Use Trail	Sidewalks + Dedicated	required			
ROW17.5m Payement on 36m ROWROW22.5m Payement on 36m ROWDedicated Bike Lanes 17.5m Payement + 9m Refuge Strip on 45m ROWPlanning Appect-Improves connectivity to existing road network. Connectivity - Capability to support regulatory framework, including regional and guidelinosImproves connectivity to existing road network. Meets the requirements of the York and Yaughan TMPs.Improves connectivity to existing road network. Meets the requirements of the York and Yaughan TMPs.Improves connectivity to existing road network. Meets the requirements of the York and Yaughan TMPs.Improves connectivity to existing road network. Meets the requirements of the York and Yaughan TMPs.Improves connectivity to existing road network. Meets the requirements of the York and Yaughan TMPs.Improves connectivity to existing road network. Meets the requirements of the York and Yaughan TMPs.Improves connectivity to existing road network. Meets the requirements of the York and Yaughan TMPs.Improves connectivity to existing road network. Meets the requirements of the York and Yaughan TMPs.Improves connectivity to existing road network. Meets the requirements of the York and Yaughan TMPs.Improves connectivity to existing road network. Meets the requirements of the York and Yaughan TMPs.Improves connectivity to existing road network. Meets the requirements of the York and Yaughan TMPs.Improves connectivity to existing road network. Meets all forecast modal demands.Provides satisfactory operating capacity with maximum but unnecessary cross-section.Meets all forecast modal demands.Provides satisf			14.5m Pavement on 36m	Bike Lanes	19.5m Pavement on 36m	Bike Lanes	Sidewalk + Multi-Use Trail +			
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Planning Aspect Planning Aspect Refuge Strip on 45m ROW Network Connectivity - Improvement in Network Improves connectivity to existing road network. <				ROW		ROW	17.5m Pavement + 9m			
Planning Aspect Network Connectivity - Improvement in Network Improves connectivity to Network Improves connectivity to existing road network. Connectivity Improves connectivity to existing road network. Meets the requirements of the York and Vaughan TMPs. Improves connectivity to existing road network. Meets the requirements of the York and Vaughan TMPs. Improves connectivity to existing road network. Meets the requirements of the York and Vaughan TMPs. Improves connectivity to existing road network. Meets the requirements of the York and Vaughan TMPs. Improves connectivity to existing road network. Meets the requirements of the York and Vaughan TMPs. Improves connectivity to existing road network. Meets the requirements of the York and Vaughan TMPs. Improves connectivity to existing road network. Meets the requirements of the York and Vaughan TMPs. Improves connectivity to existing road network. Meets the requirements of the York and Vaughan TMPs. Improves connectivity to existing road network. Meets the requirements of the York and Vaughan TMPs. Improves connectivity to existing road network. Meets the requirements of the York and Vaughan TMPs. Improves connectivity to existing road network. Meets the requirements of the York and Vaughan TMPs. Improves connectivity to existing road network. Meets the requirements of the York and Vaughan TMPs. Improves connectivity to existing road network. Meets the requirements of the York and Vaughan TMPs. Improves connectivity to existing road network. Meets the requirements of the York and Vaughan TMPs. Improves connectivity to existing road network. Meets the requirements of the York and Yaughan TMPs. Improves connectivity to							Refuge Strip on 45m ROW			
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Lonnectivity - Capability to support regulatory framework, including regional and municipal plans, optici initiatives, standards and guidelinesMeets the requirements of the York and Vaughan TMPs.Meets all Kappen to the York and Vaughan TMPs.Meets all York and Yaughan TMPs.Meets all York and Yaughan TMPs.Meets all York and Yaughan TMPs.Meets all York and Yaughan TMPs.TMPs.Meets all York and Yaughan TMPs.TMPs.TMPs.Meets all York and Yaughan TMPs.TMPs.Meets all York and Yaughan TMPs.TMPs.Meets all York and Yaughan TMPs.TMPs. </td <td></td> <td>Network</td> <td>existing road network.</td>		Network	existing road network.	existing road network.	existing road network.	existing road network.	existing road network.			
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Support Financourk, including regional and municipal plans, policy initiatives, standards and guidelines No Effect (5) Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section. Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section. Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section. Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section. Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section. Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section. Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section. Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section. Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section. Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section. Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section. Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section. Meets all forecast modal demands. Provides satisfactory o		- Capability to	TMDc	TMDc		TMDc				
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municipal plans, policy initiatives, standards and guidelinesNo Effect (S)No Effect (S)No Effect (S)No Effect (S)Network Capacity- Improvement in Future Congestion (meeting of projected travel demands. Provides satisfactory operating capacity with most efficient cross-section. - Improvement in Traffic Operations for commuters, local businesses (reduced congestion)Meets all forecast modal demands. Provides satisfactory operating capacity with reasonably efficient cross-section.Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section.Meets all forecast modal demands. Provides satisfactory operating capacity with measimum but unnecessary cross- section.Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section.Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section.Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section.Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section.Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section.Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section.Meets all forecast modal demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section.Meets all forecast modal demands. Provides satisfac		regional and								
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Future Congestion (meeting of projected travel demands. Provides satisfactory operating capacity with most demands. Provides satisfactory operating capacity with most demands. Provides satisfactory operating capacity with reasonably efficient cross-section. demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section. demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section. demands. Provides satisfactory operating capacity with maximum but unnecessary cross- section. satisfactory operating capacity	Network Capacity	- Improvement in	Meets all forecast modal	Meets all forecast modal	Meets all forecast modal	Meets all forecast modal	Meets all forecast modal			
Interfine of meeting of modelSatisfactory operating capacity with most efficient cross-section.Satisfactory operating capacity with reasonably efficient cross-section.Satisfactory operating capacity with maximum but unnecessary cross- section.Satisfactory operating capacity with maximum but unnecessary cross		Future Congestion	demands. Provides	demands. Provides	demands. Provides	demands. Provides	demands. Provides			
Improvement in Traffic Operations for commuters, local businesses (reduced congestion)efficient cross-section.efficient cross-section.efficient cross-section.efficient cross-section.but unnecessary cross- section.capacity with maximum but unnecessary cross- section. </td <td></td> <td>nrojected travel</td> <td>canacity with most</td> <td>canacity with reasonably</td> <td>capacity with maximum</td> <td>canacity with maximum</td> <td>capacity with maximum but</td>		nrojected travel	canacity with most	canacity with reasonably	capacity with maximum	canacity with maximum	capacity with maximum but			
- Improvement in Traffic Operations for commuters, local businesses (reduced congestion) - Improvement in Traffic Operations for of service to each mode of of service to each mode of - Improvement in Section. -		demands)	efficient cross-section	efficient cross-section	but unnecessary cross-	but unnecessary cross -	unnecessary cross-section			
Traffic Operations for commuters, local businesses (reduced congestion) Image: Commuter comm		- Improvement in			section.	section.				
commuters, local businesses (reduced congestion)locallocallocallocallocallocalNo Effect (5)Minimal Effect (4)Moderate Effect (3)Moderate Effect (3)Moderate Effect (3)Moderate Effect (3)Engineering AspectMode of Transportation- Ability to accommodateProvides maximum level of service to each modeProvides maximum level of service to each mode ofProvides maximum level of service to each mode		Traffic Operations for								
businesses (reduced congestion)businesses (reduced congestion)l ll l ll l l l minimal Effect (4)l l l moderate Effect (3)l l l moderate Effect (3)Moderate Effect (3)Moderate Effect (3)Moderate Effect (3)Image: Engineering AspectImage: Engineering AspectIm		commuters, local								
congestion)congestion)Image: Congestion (Congestion)Image: Congestion (Congestion)I		businesses (reduced								
No Effect (5)Minimal Effect (4)Moderate Effect (3)Moderate Effect (3)Moderate Effect (3)Engineering AspectMode of Transportation- Ability to accommodateProvides maximum level of service to each modeProvides maximum level of service to each mode of of service to each mode ofProvides maximum level of service to each mode ofProvides maximum lev		congestion)								
Engineering Aspect Mode of Transportation - Ability to accommodate Provides maximum level of service to each mode Provides maximum level of service to each mode of Provides maximum level of service to each mode Provides maximum level of service to each mode of Provides maximum level of service to each mode Provides maximum level of servic			No Effect (5)	Minimal Effect (4)	Moderate Effect (3)	Moderate Effect (3)	Moderate Effect (3)			
- Ability to Provides maximum level Provides maximum level of service to each mode of of service to ea	Engineering Aspect	A 1-111 - 1	Due tales and the t			Due tales and the tale				
accommodate of service to each mode of or service to each mode of or service to each mode of or service to each mode of service to each mode of	viode of Transportation	- Ability to	Provides maximum level	Provides maximum level	Provides maximum level	Provides maximum level	Provides maximum level of			
Transit Overling I of transportation I transportation with I transportation Disvelicts I of transportation with		accommodate	of transportation	transportation with	transportation Biovelists	of transportation with	transportation with			
Pedestrian Vehicular Bicyclists secure highest excention of hicyclists On secure highest level of excention of hicyclists excention of hicyclists excention of hicyclists excention of hicyclists excention e		Pedestrian Vehicular	Bicyclists secure highest	excention of higherists. On	secure highest level of	exception of biovelists	exception of higherists. On			
modes level of service in multi- street bike lane has less service in multi-use trail. On street bike lane has street bike lane has less		modes	level of service in multi-	street bike lane has less	service in multi-use trail.	On street bike lane has	street bike lane has less			

Transportation Net Effect Analysis for Cross-Sections

Transportation Net Effect Analysis for Cross-Sections

				Alternative Road Cross-sectio	ns	
		Option 1	Option 2	Option 3	Option 4	Option 5
		4 Travel Lanes	4 Travel Lanes	5 Travel Lanes	5 Travel Lanes	4 Travel Lanes + Refuge
		Auxiliary Lanes where	Auxiliary Lanes where	Continuous Shared Left	Continuous Shared Left	Strip
Critoria	Massuras	required	required	Turn Lane	Turn Lane	Auxiliary Lanes where
Criteria	ivieasures	Sidewalk + Multi-Use Trail	Sidewalks + Dedicated	Sidewalk + Multi-Use Trail	Sidewalks + Dedicated	required
		14.5m Pavement on 36m	Bike Lanes	19.5m Pavement on 36m	Bike Lanes	Sidewalk + Multi-Use Trail +
		ROW	17.5m Pavement on 36m	ROW	22.5m Pavement on 36m	Dedicated Bike Lanes
			ROW		ROW	17.5m Pavement + 9m
						Refuge Strip on 45m ROW
		use trail.	level of service capability		less level of service	level of service capability
			than multi-use trail P.		capability than multi-use	than multi-use trail.
					trail.	
		No Effect (5)	Moderate Effect (3)	No Effect (5)	Moderate Effect (3)	Moderate Effect (3)
Design Complexity	- Use of substandard	Least complex design due	More complex design due	More complex design than	More complex design	Most complex non-standard
	design components	to widest boulevard	to reduced width of	Options 1 and 2 due to	than Options 1,2 and 3	design due to reduced
	(I.e.	available to	boulevard to	reduced width of	due to reduced width of	width of boulevard to
			Additional safety	accommodate utilities	accommodate utilities	Requires additional design
	- Improvement in		consideration for curb and		Additional safety	elements including
	roadway geometry		catchbasin design to		consideration for curb	landscaping and special
			accommodate dedicated		and catchbasin design to	provisions for stormwater
			bike lane.		accommodate dedicated	management.
					bike lane.	
			Nainimal Effect (4)	Madavata Effect (2)	Cignificant Effect (2)	Vers Circlinent Effect (1)
Construction Complexity	Constructability	NO ETTECT (5)	More then Option 1	Wore then Options 1 and	Significant Effect (2)	Very Significant Effect (1)
Construction complexity		requirements least	structural requirements	2 structural requirements	and 3 structural	roquiromonts most
	requirements	infrastructure for storm	infrastructure for storm	infrastructure for storm	requirements	infrastructure for storm
	retaining walls, earth	water management and	water management, and	water management and	infrastructure for storm	water management and
	balance,	least width of pavement	width of pavement area.	width of pavement area.	water management and	moderate width of
	watercourse/wetland	area.			width of pavement area.	pavement area. Requires
	crossing)					additional construction for
	- Construction					landscape component.
	staging challenges					
	- Geotechnical					Widest roadway footprint
	challenges					which requires wider
	(soil/ground					crossing structure.
	conditions)			Mederate Effect (2)		Many Cimplicant Effect (4)
		INO ETTECT (5)	iviinimai Effect (4)	ivioderate Effect (3)	Significant Effect (2)	very significant Effect (1)

			-			
				Alternative Road Cross-sectio	ns	
		Option 1	Option 2	Option 3	Option 4	Option 5
		4 Travel Lanes	4 Travel Lanes	5 Travel Lanes	5 Travel Lanes	4 Travel Lanes + Refuge
		Auxiliary Lanes where	Auxiliary Lanes where	Continuous Shared Left	Continuous Shared Left	Strip
Critoria	Mossuros	required	required	Turn Lane	Turn Lane	Auxiliary Lanes where
Citteria	iviedsures	Sidewalk + Multi-Use Trail	Sidewalks + Dedicated	Sidewalk + Multi-Use Trail	Sidewalks + Dedicated	required
		14.5m Pavement on 36m	Bike Lanes	19.5m Pavement on 36m	Bike Lanes	Sidewalk + Multi-Use Trail +
		ROW	17.5m Pavement on 36m	ROW	22.5m Pavement on 36m	Dedicated Bike Lanes
			ROW		ROW	17.5m Pavement + 9m
						Refuge Strip on 45m ROW
Operation	- Improvement in	Achieves adequate Road	Achieves adequate Road	Achieves adequate Road	Achieves adequate Road	Achieves adequate Road
	road safety and accessibility (sight	safety and accessibility.	safety and accessibility.	safety and accessibility.	safety and accessibility.	safety and accessibility.
	distance; turning	Least maintenance	More maintenance	The continuous center	The continuous center	The continuous center lane
	movements)	requirements compared	requirements compared	lane will never likely be	lane will never likely be	will never likely be needed
	- Reduction in	to Options 2, 3, 4 and 5	to Option 1 but less than	needed due to land	needed due to land	due to land formation.
	maintenance	due to minimum	3, 4 and 5.	formation.	formation.	
	requirements	pavement area.		More maintenance	More maintenance	requirements compared to
				requirements compared	requirements compared	Options 1 to 4.
				to Option 1 and 2 but less	to Option 1, 2 and 3.	
				than 4 and 5.		
		No Effect (5)	Minimal Effect (4)	Moderate Effect (3)	Significant Effect (2)	Very Significant Effect (1)
TRANSPORTATION RANKING	Average Symbol					
	Average Score	5.00	4.00	3.67	2.83	2.33
	Option 1 is most prefe	rred as it creates least enviro	onmental effects compared to	o other options. Option 1 is m	ost efficient cross-section th	nat improves connectivity,
	meets all forecast mod	dal demands, provides maxim	num level of service to each n	node of transportation, and e	xhibits least design and con	struction complexity. No
Summary	development is expect	ed north of the Kirby Road E	xtension. Therefore, a contin	uous center left turn lane is n	lot needed from an operatio	ons perspective. The minimal
	significant overall envi	ronmental effects exhibits h	ighest level of design and cor	astruction complexity and high	hest operation requirement	rsections. Option 5 creates

Transportation Net Effect Analysis for Cross-Sections

Cross- section Alternative Design	Advantages	Disadvantages
Option 1 4 Lane Cross Section Auxiliary Lanes Where Required 4 meter Wide Multi-Use Trails 14.5m Pavement On 36m Right- Of-Way	 All modal travel demands served in a direct and efficient manner. Cross –section employs maximum service level for bicyclists. Wide boulevards offer flexibility in placement of utilities and road furniture. Least structural requirements, least infrastructure for storm water management and least width of pavement area. Least interference with surface water quality and quantity. Least expensive option in terms of capital, operation and maintenance costs. 	Poor future traffic intensification opportunities.
Option 2 4 Travel Lanes Auxiliary Lanes where required Sidewalks + Dedicated Bike Lanes 17.5m Pavement on 36m ROW	 All modal travel demands served in a direct and efficient manner. Dedicated bike lane continuity from Gamble Road. Second lowest cost of capital, operation and maintenance costs. 	 On road bike lane is provided with reduced level of service. Extremely variable pavement width due to right/left turn lane and bus stops.
Option 3 5 Travel Lanes Continuous Shared Left Turn Lane Right Turn Lanes where required Sidewalk + Multi-Use Trail 19.5m Pavement on 36m ROW	 All modal demands served in a direct and efficient manner. Cross – section employs maximum level of service for bicyclists. Good future traffic intensification opportunities. Mainly consistent pavement width. 	 Cross – section includes continuous centre left turn lane. The lane will likely never be needed due to land formation. Lack of dedicated bike lane continuity from Gamble Road.
Option 4 5 Travel Lanes Continuous Shared Left Turn Lane	 All modal travel demands served in a direct and efficient manner. Less complex design due to larger pavement area, allowing 	 On road bike lane is provided with reduced level of service. Cross – section includes continuous centre left turn

Cross- section Alternative Design	Advantages	Disadvantages
Right Turn Lanes where required Sidewalk + Multi-Use Trail + Dedicated Bike Lanes 22m Pavement on 36m ROW	for use of additional lane designations and for easier accommodation of public transport stops.	 lane. The lane will likely never be needed due to land formation. Greatest potential run off and erosion impacts to adjacent wetland and vegetation.
Option 5 4 Travel Lanes + Refuge Strip Auxiliary Lanes where required Sidewalk + Multi-Use Trail + Dedicated Bike Lanes 17.5m Pavement + 9m Refuge Strip on 45m ROW	 All modal travel demands served in a direct and efficient manner. Excellent future traffic intensification opportunities. Ability to incorporate more "green" planting 	 On road bike lane is provided with reduced level of service Cross – section includes continuous centre left turn lane. The lane will likely never be needed due to land formation Most complex non-standard design and structural requirements. Greatest encroachment into adjacent natural heritage features and wildlife habitat. Most expensive option.

		Alternative Road Cross-sections								
		Option 1	Option 2	Option 3	Option 4	Option 5				
		4 Travel Lanes	4 Travel Lanes	5 Travel Lanes	5 Travel Lanes	4 Travel Lanes + Refuge Strip				
		Auxiliary Lanes where required	Auxiliary Lanes where required	Continuous Shared Left Turn	Continuous Shared Left Turn	Auxiliary Lanes where				
Criteria	Maagurag	Sidewalk + Multi-Use Trail	Sidewalks + Dedicated Bike	Lane	Lane	required				
	Measures	14.5m Pavement on 36m ROW	Lanes	Sidewalk + Multi-Use Trail	Sidewalks + Dedicated Bike	Sidewalk + Multi-Use Trail +				
			17.5m Pavement on 36m ROW	19.5m Pavement on 36m ROW	Lanes	Dedicated Bike Lanes				
					22.5m Pavement on 36m ROW	17.5m Pavement + 9m Refuge				
						Strip on 45m ROW				
NATURAL ENVIRONME	NT FACTOR									
Terrestrial Features As	pect									
	- Effects on Provincially	Least amount of impervious	Minor increase in impervious	More impervious surface area	Greatest amount of	Requires additional 9 meters				
	Significant Wetland and	surface area (pavement) as	surface area (pavement) as	(pavement) than options 1 and	impervious surface area	of RoW compared to other				
	other wetlands	compared to options 2, 3, 4	compared to Option 1.	2.	(pavement) as compared to	alternative designs resulting				
		and 5.			options 1, 2, 3 and 5.	In greater impact and				
						adjacent wetland area				
						Minor increase in impervious				
						surface area (pavement) as				
Watlands						compared to Option 1 and 2.				
wetianus										
		Least potential run off and	Potential for slightly more run	More potential run off and	Greatest potential run off and	Potential for more run off and				
		erosion impacts to wetland and	off and erosion impacts to	erosion impacts to wetland	erosion impacts to wetland	erosion impacts to wetland				
		effects to hydrologic regime as	wetland and effects to	and effects to hydrologic	and effects to hydrologic	and effects to hydrologic				
		and 5	compared to option 1 same	1 2 and 5 but less than 4	1 2 3 and 5	1 same amount of impact as				
			amount of impact as option 5	1, 2 and 5 but less than 4.	1, 2, 5 and 5.	option 5 but less than 3 and 4.				
			but less than 3 and 4.							
		No Effect (5)	Minimal Effect (4)	Significant Effect (2)	Very Significant Effect (1)	Moderate Effect (3)				
	- Encroachment on	Provides opportunity for tree	Provides opportunity for tree	Provides opportunity for tree	Provides opportunity for tree	Provides opportunity for tree				
	Designated Environmentally	scaping/green planting on	scaping/green planting on	scaping/green planting on	scaping/green planting on	scaping/green planting on				
	Sensitive Areas / Areas of	boulevards.	boulevards.	boulevards.	boulevards.	boulevards and along center				
	Natural and Scientific					refuge strip.				
	Interest	Least amount of impervious	Minor increase in impervious	More impervious surface area	Greatest amount of					
Vegetation	- Enects on Significant	compared to Options 2.3.4	surface area (pavement) as	and 5	(navement) as compared to	additional tree canony and				
	(encroachment reduction	and 5			ontions 1 2 3 and 5	opportunity for integration				
	of area)					into adjacent Natural Heritage				
	- Fragmentation /	Less potential run off and	Potential for slightly more run	More potential run off and	Greatest potential run off and	features.				
	Connectivity of features	erosion impacts to adjacent	off and erosion impacts to	erosion impacts to adjacent	erosion impacts to adjacent					
	- Species at Risk (rare,	vegetation as compared to	adjacent vegetation as	vegetation as compared to	vegetation as compared to	Wider road Right of Way				

Natural Environment Net Effect Analysis for Cross-Sections

				Alternative Road Cross-sections		
		Option 1	Option 2	Option 3	Option 4	Option 5
		4 Travel Lanes	4 Travel Lanes	5 Travel Lanes	5 Travel Lanes	4 Travel Lanes + Refuge Strip
		Auxiliary Lanes where required	Auxiliary Lanes where required	Continuous Shared Left Turn	Continuous Shared Left Turn	Auxiliary Lanes where
Criteria		Sidewalk + Multi-Use Trail	Sidewalks + Dedicated Bike	Lane	Lane	required
	Measures	14.5m Pavement on 36m ROW	Lanes	Sidewalk + Multi-Use Trail	Sidewalks + Dedicated Bike	Sidewalk + Multi-Use Trail +
			17 5m Payement on 36m BOW	19 5m Payement on 36m ROW		Dedicated Bike Lanes
					22 Em Dovoment en 26m BOW	17 Em Davament L Om Refuge
						Strip op 45m ROW
	endangered and	Options 2, 3, 4 and 5	compared to Option 1	Option 1, 2 and 5	Option 1, 2, 3 and 5	greater impact/
	threatened)					encroachment within
	- Opportunities for					adjacent vegetation which
	enhancement					provides habitat for SAR.
						Minor increase in impervious
						surface area (pavement) as
						compared to option 1.
						Potential for slightly more run
						off and erosion impacts to
						adjacent vegetation as
						compared to option 1.
		No Effect (5)	Minimal Effect (4)	Significant Effect (2)	Very Significant Effect (1)	Moderate Effect (3)
	- Effects on Significant	Potential for temporary effects	Potential for temporary effects	Potential for temporary effects	Potential for temporary effects	Requires additional 9 meters
	Wildlife Habitat	during construction. Potential	during construction. Potential	during construction. Potential	during construction. Potential	of ROW compared to other
	(encroachment, reduction	for loss of edge habitat within	for loss of edge habitat within	for loss of edge habitat within	for loss of edge habitat within	alternative designs resulting
	of area)	the ROW.	the R	the ROW.	the RoW.	in greater impact and
	-		OW.			potential encroachment into
	Fragmentation/Connectivity	No significant difference		No significant difference	No significant difference	adjacent natural heritage
Wildlife Habitat	of features	between design options 1, 2, 3	No significant difference	between design options 1, 2, 3	between design options 1, 2, 3	features and significant
	- Species at Risk (rare,	and 4.	between design options 1, 2, 3	and 4.	and 4.	wildlife habitat.
	endangered and		and 4.			Contor refuge strip recu
	Opportunities for					provide temperary babitat for
	- Opportunities for					wildlife stopover or fooding
	emancement	No Effect (5)	No Effect (5)	No Effect (5)	No Effect (5)	Very Significant Effect (1)
Aquatic Features Aspec		No Effect (5)	No Lifect (5)	No Lifect (5)	No Lifect (5)	Very Significant Effect (1)
Aquatier catales Aspec	- Degree of interference	Least impact on stormwater	More impact on stormwater	More impact on stormwater	Most impact on stormwater	More impact on stormwater
	with water quality thermal	quantity and quality of all	quantity and quality than	quantity and quality than	quantity and quality of all	quantity and quality than
Surface Water	regime or baseflow	options.	option 1, same impact as	option 1, 2 and 5, but less than	options.	option 1, same impact as
Quantity and Quality			option 5 and less than options	option 4.		option 5 and less than options
			3 and 4.			3 and 4.
		No Effect (5)	Minimal Effect (4)	Significant Effect (2)	Very Significant Effect (1)	Moderate Effect (3)

Natural Environment Net Effect Analysis for Cross-Sections

		Natural Enviro	nment Net Effect Anal	ysis for Cross-Sections	i	
				Alternative Road Cross-sections		
		Option 1	Option 2	Option 3	Option 4	Option 5
		4 Travel Lanes	4 Travel Lanes	5 Travel Lanes	5 Travel Lanes	4 Travel Lanes + Refuge Strip
		Auxiliary Lanes where required	Auxiliary Lanes where required	Continuous Shared Left Turn	Continuous Shared Left Turn	Auxiliary Lanes where
Criteria		Sidewalk + Multi-Use Trail	Sidewalks + Dedicated Bike	Lane	Lane	required
	Measures	14.5m Pavement on 36m ROW	Lanes	Sidewalk + Multi-Use Trail	Sidewalks + Dedicated Bike	Sidewalk + Multi-Use Trail +
			17.5m Pavement on 36m ROW	19.5m Pavement on 36m ROW	Lanes	Dedicated Bike Lanes
					22.5m Pavement on 36m ROW	17.5m Pavement + 9m Refuge
						Strip on 45m ROW
	- Effects on extent (area)	Potential for temporary effects	Potential for temporary effects	Potential for temporary effects	Potential for temporary effects	Potential for temporary
	and function of riparian	during construction. Potential	during construction. Potential	during construction. Potential	during construction. Potential	effects during construction.
	habitat	for loss of edge/riparian habitat	for loss of edge/riparian	for loss of edge/riparian	for loss of edge/riparian	Greater potential for loss of
		within the RoW.	habitat within the RoW.	habitat within the RoW.	habitat within the RoW.	edge/riparian habitat due to
						wider road RoW.
			No significant difference	No significant difference	No significant difference	
		No significant difference	between design Options 1, 2, 3	between design Options 1, 2, 3	between design Options 1, 2, 3	Minor increase in impervious
		between design Options 1, 2, 3	and 4.	and 4.	and 4.	surface area (pavement) as
		and 4.				compared to Option 1.
Aquatic Habitat			Minor increase in impervious	More impervious surface area	Greatest amount of	Potential for slightly more run
		Least amount of impervious	surface area (pavement) as	(pavement) than Options 1,2	impervious surface area	off/erosion impacts and
		surface area (pavement) as	compared to Option 1.	and 5.	(pavement) as compared to	effects to hydrologic inputs to
		compared to Options 2, 3, 4	Slightly more potential for run		Options 1, 2 and 3.	adjacent drainage feature as
		and 5. Less potential run	off/erosion impacts and	More potential run off/erosion	Greatest potential run	compared to Option 1.
		off/erosion impacts and effects	effects to hydrologic inputs to	impacts and effects to	off/erosion impacts and	
		to hydrologic inputs to adjacent	adjacent drainage feature as	hydrologic inputs to adjacent	effects to hydrologic inputs to	
		drainage feature.	compared to Option 1.	drainage feature as compared	adjacent drainage feature as	
				to Options 1, 2 and 5.	compared to Option 1, 2 and	
		No Effect (5)	No Effect (5)	No Effect (5)	No Effect (5)	Very Significant Effect (1)
Surface Drainage Aspe	ct					
	- Requirements for crossing	No significant difference	No significant difference	No significant difference	No significant difference	Requires additional 9 meters
	of East Patterson Creek	between alternative designs	between alternative designs	between alternative designs	between alternative designs	of ROW compared to other
	(reduction of area)	with exception of Option 5.	with exception of Option 5.	with exception of Option 5.	with exception of Option 5.	alternative designs.
Watercourses						Greater road ROW results in
						greater encroachment into
						adjacent riparian habitat.
		No Effect (5)	No Effect (5)	No Effect (5)	No Effect (5)	Very Significant Effect (1)

		Natural Enviro	nment Net Effect Anal	ysis for Cross-Sections	5	
				Alternative Road Cross-sections		
Criteria	Measures	Option 1 4 Travel Lanes Auxiliary Lanes where required Sidewalk + Multi-Use Trail 14.5m Pavement on 36m ROW	Option 2 4 Travel Lanes Auxiliary Lanes where required Sidewalks + Dedicated Bike Lanes 17.5m Pavement on 36m ROW	Option 3 5 Travel Lanes Continuous Shared Left Turn Lane Sidewalk + Multi-Use Trail 19.5m Pavement on 36m ROW	Option 4 5 Travel Lanes Continuous Shared Left Turn Lane Sidewalks + Dedicated Bike Lanes 22.5m Pavement on 36m ROW	Option 5 4 Travel Lanes + Refuge Strip Auxiliary Lanes where required Sidewalk + Multi-Use Trail + Dedicated Bike Lanes 17.5m Pavement + 9m Refuge Strip on 45m ROW
Stormwater Management	 Effects on catchment area Operation and maintenance requirements Opportunities to enhance roadway stormwater management measures, including coordination with/use of adjacent future 	Smallest paved area requires less stormwater management measures.	Slightly more paved area than Option 1 requires more stormwater management measures. Minimal Effect (4)	More paved area than Options 1, 2 and 5 requires more stormwater management measures.	More paved area than Options 1, 2, 3 and 5, requires more stormwater management measures.	Greatest catchment area, increases run-off and stormwater management requirements.
Groundwater Aspect				moderate Enect (5)	Significant Lifect (2)	
Recharge/Discharge Areas	 Degree of interference with groundwater recharge/discharge areas Effects on vulnerable areas 	No significant difference between alternative designs. No Effect (5) No significant difference	No significant difference between alternative designs. No Effect (5) No significant difference	No significant difference between alternative designs. No Effect (5) No significant difference	No significant difference between alternative designs. No Effect (5) No significant difference	No significant difference between alternative designs. No Effect (5) No significant difference
Groundwater Quality	(area)	between alternative designs.	between alternative designs.	between alternative designs.	between alternative designs.	between alternative designs.
NATURAL ENVIRONMENT RANKING	Average Symbol					
	Average Score	5.00	4.56	3.78	3.33	2.56
Summary	All Options except Option 5 w of impervious surface area (p of impervious surface area (p greatest amount of encroach (36 m) and has the least amo (45 m).	vill generally result in the same am avement) as compared to all other avement) as compared to all other ment into adjacent features as it is unt of impervious surface area (pa	ount of impact/encroachment int Options resulting in the least por Options resulting in the most po 45 m in width. Option 1 is prefer vement). Option 5 is least prefer	to adjacent natural heritage featur tential run off and erosion impact tential run off and erosion impact rred as it will result in the least an red as it will result in the greatest	res as they are all 36 m in width. s to wetland hydrologic regime. (s to wetland hydrologic regime. (nount of encroachment into adjac amount of encroachment into ad	Option 1 has the least amount Option 4 has the most amount Option 5 will result in the cent natural heritage features jacent natural heritage features

Cross-section Alternative	Advantages	Disadvantages
Option 1 4 Travel Lanes Auxiliary Lanes where required Sidewalk + Multi-Use Trail 14.5m Pavement on 36m ROW	Least amount of impervious surface area (pavement) as compared to options 2, 3 and 4. Less potential run off and erosion impacts to wetland and effects to hydrologic regime as compared to Options 2, 3, 4 and 5. Preferred road width of 36 m provides for less encroachment into adjacent natural features resulting in less impact/encroachment within adjacent vegetation which includes PSW riparian areas, Significant Woodlands, SWH and habitat for Species at Risk (SAR) as compared to Option 5. Provides opportunity for tree scaping/green planting on boulevards.	Potential for temporary effects to wildlife during construction. Potential for loss of edge habitat within the ROW. However no significant difference between design options 1, 2, 3 and 4.
Option 2 4 Travel Lanes Auxiliary Lanes where required Sidewalks + Dedicated Bike Lanes 17.5m Pavement on 36m ROW	 Preferred road width of 36 m provides for less encroachment into adjacent natural features resulting in less impact/encroachment within adjacent vegetation which includes PSW riparian areas, Significant Woodlands, SWH and habitat for Species at Risk (SAR) as compared to Option 5. Less amount of impervious surface area (pavement) as compared to Options 3 and 4. Provides opportunity for tree scaping/green planting on boulevards. 	Minor increase in impervious surface area (pavement) as compared to Option 1. Potential for slightly more run off and erosion impacts to wetland and effects to hydrologic regime as compared to Option 1. Potential for temporary effects to wildlife during construction. Potential for loss of edge habitat within the ROW. However no significant difference between design options 1, 2, 3 and 4.
Option 3 5 Travel Lanes Continuous Shared Left Turn Lane Sidewalk + Multi-Use Trail 19.5m Pavement on 36m ROW	Preferred road width of 36 m provides for less encroachment into adjacent natural features resulting in less impact/encroachment within adjacent vegetation which includes PSW riparian areas, Significant Woodlands, SWH and habitat for Species at Risk (SAR) as compared to Option 5. Less amount of impervious surface area (pavement) as compared to Option 4. Provides opportunity for tree scaping/green planting on boulevards.	More impervious surface area (pavement) than options 1, 2 and 5. More potential run off and erosion impacts to wetland and effects to hydrologic regime as compared to Option 1 and 2. Potential for temporary effects to wildlife during construction. Potential for loss of edge habitat within the ROW. However no significant difference between design options 1, 2, 3 and 4.

Cross-section Alternative	Advantages	Disadvantages
	Preferred road width of 36 m provides for less encroachment into adjacent natural features resulting in less impact/encroachment within adjacent vegetation which includes PSW riparian areas, Significant Woodlands, SWH and habitat for Species at Risk (SAR) as compared to Option 5.	Greatest amount of impervious surface area (pavement) as compared to options 1, 2, 3 and 5.
Option 4 5 Travel Lanes Continuous Shared Left Turn Lane Sidewalks + Dedicated Bike	Provides opportunity for tree scaping/green planting on boulevards.	Greatest potential run off and erosion impacts to wetland and effects to hydrologic regime as compared to Option 1,2, 3 and 5.
Lanes 22.5m Pavement on 36m ROW		Potential for temporary effects to wildlife during construction. Potential for loss of edge habitat within the ROW. However no significant difference between design options 1, 2, 3 and 4.
Option 5 4 Travel Lanes + Refuge Strip Auxiliary Lanes where required Sidewalk + Multi-Use Trail + Dedicated Bike Lanes 17.5m Pavement + 9m Refuge Strip on 45m ROW	 Provides opportunity for tree scaping/green planting on boulevards and along center refuge strip. Center refuge strip provides additional tree canopy and opportunity for integration into adjacent Natural Heritage features. Less amount of impervious surface area (pavement) as compared to Options 	Wider ROW resulting in greater impact/encroachment within adjacent vegetation which includes PSW riparian areas, Significant Woodlands, SWH and habitat for Species at Risk (SAR). Minor increase in impervious surface area
	3 and 4.	(pavement) as compared to Option 1. Potential for slightly more run off and erosion impacts to wetland and effects to hydrologic regime as compared to Option 1.

Alternative Road Cross-sections Option 1 Option 2 **Option 3** 4 Travel Lanes 4 Travel Lanes **5** Travel Lanes 5 Auxiliary Lanes where Auxiliary Lanes where **Continuous Shared Left Turn** Continuou Criteria Measures required required Lane Sidewalk + Multi-Use Trail Sidewalks + Dedicated Bike Sidewalk + Multi-Use Trail Sidewalk 14.5m Pavement on 36m 19.5m Pavement on 36m Lanes ROW ROW 17.5m Pavement on 36m 22.5m F ROW Land Use Aspect Resource Designations and Policies - Degree of No significant difference No significant difference No significant difference No signific compatibility with between alternative designs. between alternative designs. between alternative designs. between a provincial, regional and municipal growth/development goals/objectives No Effect (5) No Effect (5) No Effect (5) N - Physical resource Agricultural Operations No significant difference No significant difference No significant difference No signific consumption between alternative designs. between alternative designs. between alternative designs. between a - Facility resource consumption - Operational impacts No Effect (5) No Effect (5) No Effect (5) N No significant difference No significant difference Approved Development Proposals - Accommodating No significant difference No signific existing/future between alternative designs. between alternative designs. between alternative designs. between a development proposals (public access/intersecting streets/connections for all modes of transportation) No Effect (5) No Effect (5) No Effect (5) N Community Aspect Quality of Life - Encroachment on No significant difference No significant difference No significant difference No signific individual properties between alternative designs. between alternative designs. between alternative designs. between a (number/area) - Improvement in traffic operations for commuters and active

transportation

Social Net Effects Analysis for Cross Sections

Option 4	Option 5
Fravel Lanes	4 Travel Lanes + Refuge Strip
us Shared Left Turn	Auxiliary Lanes where
Lane	required
s + Dedicated Bike	Sidewalk + Multi-Use Trail +
Lanes	Dedicated Bike Lanes
avement on 36m	17.5m Pavement + 9m
ROW	Refuge Strip on 45m ROW
ant difference	The wider ROW results in a
lternative designs.	larger footprint and a larger
	Heritage feature
	Themage reactive.
o Effect (5)	Very Significant Effect (1)
ant difference	The wider ROW results in a
Iternative designs.	larger footprint and a larger
	Impact on existing
	agriculturarianus.
o Effect (5)	Very Significant Effect (1)
ant difference	The wider ROW results in a
Iternative designs.	larger footprint and a larger
	impact on residentially
	approved lands.
o Effect (5)	Very Significant Effect (1)
ant difference	The wider POW results in a
ant unterence	larger footprint and a larger
	impact on individual
	properties.

Social Net Effects Analysis for Cross Sections

				Alternative Road Cross-sections		
		Option 1	Option 2	Option 3	Option 4	Option 5
		4 Travel Lanes	4 Travel Lanes	5 Travel Lanes	5 Travel Lanes	4 Travel Lanes + Refuge Strip
		Auxiliary Lanes where	Auxiliary Lanes where	Continuous Shared Left Turn	Continuous Shared Left Turn	Auxiliary Lanes where
Criteria	Measures	required	required	Lane	Lane	required
		Sidewalk + Multi-Use Trail	Sidewalks + Dedicated Bike	Sidewalk + Multi-Use Trail	Sidewalks + Dedicated Bike	Sidewalk + Multi-Use Trail +
		14.5m Pavement on 36m	Lanes	19.5m Pavement on 36m	Lanes	Dedicated Bike Lanes
		ROW	17.5m Pavement on 36m	ROW	22.5m Pavement on 36m	17.5m Pavement + 9m
			ROW		ROW	Refuge Strip on 45m ROW
		No Effect (5)	No Effect (5)	No Effect (5)	No Effect (5)	Very Significant Effect (1)
Existing Wells	- Effects on water	No significant difference	No significant difference	No significant difference	No significant difference	No significant difference
	quality and quantity	between alternative	between alternative	between alternative	between alternative	between alternative
	- Number of affected	designs.	designs.	designs.	designs.	designs.
	wells					
		No Effect (5)	No Effect (5)	No Effect (5)	No Effect (5)	No Effect (5)
Noise	- Change in sound	No significant difference	No significant difference	No significant difference	No significant difference	No significant difference
	levels over pre-existing	between alternative designs.	between alternative designs.	between alternative designs.	between alternative designs.	between alternative designs.
	conditions	No Effect (5)	No Effect (5)	No Effect (5)	No Effect (5)	No Effect (5)
					The 2Country of the second	
Archaeological Resources	Degree of Interference	The 36m cross-section would	The 36m cross-section would	The 36m cross-section would	Ine 36m cross-section would	Ine 45m cross-section would
	with known areas of	nave a narrower grading limit	nave a narrower grading limit	nave a narrower grading limit	nave a narrower grading limit	have a wider grading limit
	archaeological	Stage 2 survey then Option 5	Stage 2 survey then Option 5	Stage 2 survey then Option 5	Stage 2 survey than Option F	than Options 1-4 and
	potential	Stage 2 survey than Option 5.	Stage 2 Survey than Option 5.	Stage 2 Survey than Option 5.	Stage 2 Survey than Option 5.	2 survey.
		Significant Effect (2)	Significant Effect (2)	Significant Effect (2)	Significant Effect (2)	Very Significant Effect (1)
Built Heritage Resources	Degree of interference	The 36m cross-section would	The 36m cross-section would	The 36m cross-section would	The 36m cross-section would	The 45m cross-section would
	with cultural heritage	have a narrower grading limit	have a narrower grading limit	have a narrower grading limit	have a narrower grading limit	have a wider grading limit
	features	and therefore result in more	and therefore result in more	and therefore result in more	and therefore result in more	than Options 1-4 and
		limited impacts to the	limited impacts to the	limited impacts to the	limited impacts to the	therefore result in greater
		farmscape at 11490 Bathurst	farmscape at 11490 Bathurst	farmscape at 11490 Bathurst	farmscape at 11490 Bathurst	impacts to the farmscape at
		Street than Option 5.	Street than Option 5.	Street than Option 5.	Street than Option 5.	11490 Bathurst Street.
		Significant Effect (2)	Significant Effect (2)	Significant Effect (2)	Significant Effect (2)	Very Significant Effect (1)
SOCIAL ENVIRONMENT RANKING	Average Symbol					
	Average Score	4.25	4.25	4.25	4.25	2.00
Summary	From a cultural perspect Option 5 is the least pref From a policy and impac	tive Options from 1 to 4 are prefe ferred as it requires more Stage 3 t on existing and approved land	erred due to the less Stage 2 surv 2 survey and includes the widest uses, Option 5 has the only signi	vey required and more limited in grading limit and poses very sig ficant impact due to its larger wi	npacts to the identified farmscap nificant impacts to the identified dth and physical impact.	be at 11490 Bathurst Street. Farmscape.

Cross-section Alternative	Advantages	Disadvantages
Option 1 4 Travel Lanes Auxiliary Lanes where required Sidewalk + Multi-Use Trail 15m Pavement on 36m ROW	(There are no socio-economic advantages or disadvantages amongst Options 1 through 4.)	
Option 2 4 Travel Lanes Auxiliary Lanes where required Sidewalks + Dedicated Bike Lanes 17m Pavement on 36m ROW	(There are no socio-economic advantages or disadvantages amongst Options 1 through 4.)	
Option 3 5 Travel Lanes Continuous Shared Left Turn Lane Right Turn Lanes where required Sidewalk + Multi-Use Trail 19.5m Pavement on 36m ROW	(There are no socio-economic advantages or disadvantages amongst Options 1 through 4.)	
Option 4 5 Travel Lanes Continuous Shared Left Turn Lane Right Turn Lanes where required Sidewalk + Multi-Use Trail + Dedicated Bike Lanes 22m Pavement on 36m ROW	(There are no socio-economic advantages or disadvantages amongst Options 1 through 4.)	
Option 5 4 Travel Lanes + Refuge Strip Auxiliary Lanes where required Sidewalk + Multi-Use Trail + Dedicated Bike Lanes 17.5m Pavement + 9m Refuge Strip on 45m ROW		The wider ROW results in a larger footprint and a larger impact on a Key Natural Heritage feature.

			Alternative Roa	ad Cross-sections		
		Option 1	Option 2	Option 3	Option 4	Option 5
		4 Travel Lanes	4 Travel Lanes	5 Travel Lanes	5 Travel Lanes	4 Travel Lanes + Refuge Strip
		Auxiliary Lanes where	Auxiliary Lanes where	Continuous Shared Left Turn	Continuous Shared Left Turn	Auxiliary Lanes where
Criteria	Measures	required	required			required
Chiena	Wiedsures	Sidowalk + Multi Uso Trail	Sidowalks + Dodicated Bike		Sidowalks + Dodicated Pike	Sidowalk + Multi Llco Trail +
		14 Em Devement en 26m		10 Em Devement en 26m		Dedicated Dike Lance
		14.5m Pavement on 36m	Lanes	19.5m Pavement on 36m		
		ROW	17.5m Pavement on 36m	ROW	22.5m Pavement on 36m	17.5m Pavement + 9m Refuge
			ROW		ROW	Strip on 45m ROW
ECONOMIC ENVIRONMENT FAC	CTOR				1	
		Lowest construction cost due to	Higher construction cost	Higher construction cost than	Higher construction cost	Highest construction cost due to
		least amount of paved area and	compared to Option 1 due to	Options 1 and 2 due to increase	compared to Option 1, 2 and 3	both paved area and
	- Capital Costs	stormwater management	increase of both paved area and	of both paved area and	due to increase of both paved	stormwater management
		requirements.	stormwater management	stormwater management	area and stormwater	requirements and addition of
			requirements.	requirements.	management requirements.	landscape center median.
		Minimal Effect (4)	Minimal Effect (4)	Moderate Effect (3)	Significant Effect (2)	Very Significant Effect (1)
		Lowest operation and	Higher operation and	Higher operation and	Higher operation and	Highest operation and
Cost Estimates		maintenance costs due to least	maintenance costs compared to	maintenance costs compared to	maintenance costs compared to	maintenance costs due to both
	- Operation and Maintenance	amount of paved area and	Option 1 due to increase of both	Option 1 and 2 due to increase	Option 1 and 2 due to increase	paved area and stormwater
	Costs	stormwater management	paved area and stormwater	of both paved area and	of both paved area and	management requirements and
		requirements.	management requirements.	stormwater management	stormwater management	addition of landscape center
				requirements.	requirements.	median.
		Minimal Effect (4)	Minimal Effect (4)	Moderate Effect (3)	Significant Effect (2)	Very Significant Effect (1)
	- Property acquisition	No significant difference	No significant difference	No significant difference	No significant difference	Additional property acquisition
	requirements	between Options 1 to 4.	between Options 1 to 4.	between Options 1 to 4.	between Options 1 to 4.	is required compared to Option
						1 to 4.
		Moderate Effect (3)	Moderate Effect (3)	Moderate Effect (3)	Moderate Effect (3)	Very Significant Effect (1)
ECONOMIC ENVIRONMENT RANKING	Average Symbol					
	Average Score	3.67	3.67	3.00	2.33	1.00
Summary	Options 1 and 2 are most pre creates significate overall env	ferred as they are cost slightly hi vironmental effect due to its high	igher than conventional boulevar nest costs for construction, opera	d configuration with two sidewa tion and land requirements.	lks on both side with no accomm	odate to cyclist. Option 5

Economic Net Effect Analysis for Cross-Sections



APPENDIX B3

Detailed Evaluation of Alternative Road Alignments

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PRELIMINARY DESIGN | ALIGNMENT 4 | H = 1:1000 / V = 1:200



ALIGNME

±27.0m RETAINING WALL (±108m²)

ADING IT KIRBY ROAD 2-1 SLOPE (TYP)

±24.0m RETAINING WALL (±86m²)

PROPOSED WETLAND CROSSING ______ (DESIGN DETAILS CONFIRMED AT 30% DESIGN STAGE)

±50.0m POTENTIAL BRIDGE

±20.0m RETAINING WALL (±66.0m²)

188.21m @ 5.00)%			IOW PT STA	0+749.33			161.56m @ 2	54%		
				LOW PT ELEV	1: 284.67						
				PVI STA:0+	-710.00						
				PVI ELEV: 2	282.64						
				K: 32.(
				LVC: 24	1.54						
	Ex. GROUND										
								<i>Ex.</i> 6	<i>ROUND</i>		
			PROP GRADE								
					-PROP GUARD	RAII					
					Ex. GROUND						
4 0	40			→ Q					4 M		
293.1 296.6	290.6 291.82	288.1 288.1	286.2 284.3	2 85.0 280.5,	284.6 278.0.	2 85.0 285.4	286.2 285.55	287.4 290.7,4	288.7 290.7	290.C	283.4
0	0	0	0	0	0	0	0	0	00	(
.000	250.	000	550.	700.	200.	00.	350.	.006)50.		
+	+	+	+ 0	+	+			+			ر +











PRELIMINARY DESIGN | ALIGNMENT 6 | H = 1:1000 / V = 1:200

ALIGNME

 O.50% I.I.I.I.I.I.I.I.I.I.I.I.I.I.I.I.I.I.I.		HIGH P HIGH F PVI PVI	T STA: 1+785.3 PT ELEV: 296.19 STA: 1+857.34 ELEV: 296.60 K: 36.00 -VC: 180.00	94 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	98.3	35m @ 4.50%	10.00m 3.50% 10.00m 3.50% 10.00m 1.50% 8.65m 0.50% 2.63%
295.81 284.32	296.06 292.63	296.16	295.61 297.99	294.37 299.34	292.43 298.50	292.53	287.97
+ 700.00	+ 750.00	+ 800.00	+ 850.00	00.006 +	+ 950.00	00.000	+050.00

710																			
310 308-		0%		98.85m	n @ 2.0	0%										0+354.85 299.50			
306-	0.5																		
304-	0 0													PROP. GR	ADE				
302-					OP. GRA	DE													
300-	0.0 M																		
298-										HIGH F	T STA:	0+21	0.85						
296-										PVL	STA: 0	+246.8	35						
294-				_						PV	ELEV:	: 303.82	2						
292-											LVC: 21	6.00					λ.		
290-									5 00										
288-								<u> </u>	EX. GR	UUND									
286-																			
284-																			
282-																			
280-																			
278-																			
276-																			
274-																			
272																			
ROPOSED EVATION	299.45 299.45		299.88 <i>294.76</i>		300.88 <i>290.76</i>		201 01 201	289.02	302.36 <i>286.66</i>		302.17	288.12		301.28 <i>291.70</i>		299.69 <i>295.19</i>	297.69	292.04	
HAINAGE	0+000.00		0+050.00		0+100.00			0+150.00	0+200.00			00.0007+0		0+300.00		0+350.00))) + -)	

ALIGNMENT 6A

Т	6AA	PROFILE

	444.96m @ 2.70%	274.75m @ 0.50%	HIGH PT STA: 1+801.47 98.39m 4.50% 80 00 00 00 00 00 00 00 00 00 00 00 00 0
			K: 36.00 K: 36.00 Ex. GROUND Image: Constraint of the second secon
			PROP. GRADE PROP. GRADE PROP. GUARD RAIL PROP. GUA
	HIGH PT ST HIGH PT ST HIGH PT E PVI STA: PVI ELE	A: 1+508.70 EV: 294.78 1+469.10 V: 294.58	294 PROP. GRADE
286.41 284.61 284.93 284.93	285.96 285.96 285.96 285.96 285.96 288.40 289.51 289.60 294.00 294.00 294.00 294.00	294.72 294.72 294.72 294.98 295.98 295.98 295.14 295.14 295.14 295.14	225719 296.19 296.19 296.19 296.19 296.19 296.19 296.19 296.19 296.19 296.19 296.19 296.19 296.19 296.19 296.19 296.24 297.56 299.24
1+100.00	1+150.00 $1+350.00$ $1+400.00$	1 + 500.01 $1 + 550.01$ $1 + 650.00$ $1 + 7500.00$ $1 + 7500.00$	$\begin{array}{c} 1+750.01\\ 1+850.01\\ 1+950.01\\ 2+100.00\\ 2+100.00\\ 2+100.00\\ \end{array}$

Transportation Net Effects Analysis for Road Alignments

		Alternative Road Alignments			
Criteria	Measures	Alignment 4 Minor Northerly Diversion with Wetland Crossing to Minimize Impacts to Forest	Alignment 5 Direct Extension with Wetland Crossing	Alignment 6 South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest	Alignment 6A Modified South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest
Planning Aspect					
Network Connectivity	 Improvement in Network Connectivity Capability to support regulatory framework, including regional and municipal plans, policy initiatives, 	Improves connectivity and overall network performance. Provides options for travel and encourages transit and active transportation.	Improves connectivity and overall network performance. Provides options for travel and encourages transit and active transportation.	Improves connectivity and overall network performance. Provides options for travel and encourages transit and active transportation.	Improves connectivity and overall network performance. Provides options for travel and encourages transit and active transportation.
Network Capacity	 Improvement in Future Congestion (meeting of projected travel demands) Improvement in Traffic Operations for commuters, local businesses (reduced congestion) 	Directly and efficiently secures satisfactory increase in roadway capacity and operating performance to serve total travel demands. Modal flow is accommodated in a direct and efficient manner.	Directly and efficiently secures satisfactory increase in roadway capacity and operating performance to serve total travel demands. Modal flow is accommodated in a direct and efficient manner.	Directly and efficiently secures satisfactory increase in roadway capacity and operating performance to serve total travel demands. Modal flow is accommodated in a direct and efficient manner.	Directly and efficiently secures satisfactory increase in roadway capacity and operating performance to serve total travel demands. Modal flow is accommodated in a direct and efficient manner.
		No Effect (5)	No Effect (5)	No Effect (5)	No Effect (5)
Mode of Transportation	- Ability to accommodate Transit, Cycling, Pedestrian, Vehicular modes	Able to accommodate Transit, Cycling, Pedestrian, Vehicular modes.			
				However, the curvature increases travel time and results increased operating cost for transit, longer walking distance for pedestrians and increased vehicle fuel consumption and gas emissions.	However, the curvature increases travel time and results increased operating cost for transit, longer walking distance for pedestrians and increased vehicle fuel consumption and gas emissions.
		No Effect (5)	No Effect (5)	Moderate Effect (3)	Moderate Effect (3)
Design Complexity	 Use of substandard design components (i.e. horizontal/vertical curves) Improvement in roadway geometry 	Conforms with City of Vaughan and York Region Road Design Guidelines following Transportation Association of Canada Design Manual.	Conforms with City of Vaughan and York Region Road Design Guidelines following Transportation Association of Canada Design Manual.	Conforms with City of Vaughan and York Region Road Design Guidelines following Transportation Association of Canada Design Manual.	Conforms with City of Vaughan and York Region Road Design Guidelines following Transportation Association of Canada Design Manual.
		Less complex design due to minimal curvature requiring	Least complex design without horizontal curvature does not	Increase challenge for traffic safety due to number of	Increase challenge for traffic safety due to highest number of

Transportation Net Effects Analysis for Road Alignments

Criteria Measures Alignment 4 Alignment 5 Alignment 6 Alignment 6A Criteria Measures Minor Northerly Diversion with Wetland Crossing to Minimize Impacts to Forest Direct Extension with Wetland Crossing South to North Minor Jog Modified South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest Impacts to Forest Super-elevated sections. require super-elevated sections segments between curves curves and transition between curves (horizontal and between cu
super-elevated sections. require super-elevated sections curvatures and transition curves and transition segments between curves between curves between curves between curves
(horizontal and vertical) includingvertical) including safe distancesafe distance for curve andfor curve and super-elevationsuper-elevation transition.transition.
Bridge structure required to cross existing PSW.Bridge structure required to cross existing PSW.Large open bottom culvert required to cross existing watercourse. Also required long section of retaining wall to protect existing PSW.Large open bottom culvertLarge open bottom culvert
Additional culvert crossing is required (5 total) to address existing ground elevation (road shifted north of existing ROW east of PSW).Minimal number of culvert crossing (4 total) due to least number of depressions based on existing ground elevation.Additional culvert crossing is required (5 total) to address existing ground elevation (road shifted north of existing ROW east of PSW).Additional culvert crossing is required (5 total) to address existing ground elevation.Additional culvert crossing is required (5 total) to address existing ground elevation (road shifted north of existing ROW east of PSW).Additional culvert crossing is required (5 total) to address existing ground elevation.Additional culvert crossing is required (5 total) to address existing ground elevation (road east of PSW).Additional culvert crossing is required (5 total) to address existing ground elevation.Additional culvert crossing is required (5 total) to address existing ground elevation (road east of PSW).Additional culvert crossing is required (5 total) to address existing ground elevation.Additional culvert crossing is required (5 total) to address existing ground elevation (road east of PSW).Additional culvert crossing is required (5 total) to address existing ground elevation.
Moderate Effect (3)Minimal Effect (4)Moderate Effect (3)Moderate Effect (3)
Construction Complexity- Constructability (structural requirements, retaining walls, earth balance, watercourse/wetland crossing)Bridge structure and small section of retaining wall required.Large open bottom culvert required.Large open bottom culvert small section of retaining wall required.
- Construction staging challengesAdditional culvert crossing isMinimal number of culvertAdditional culvert crossing isAdditional culvert crossing is- Geotechnical challengesrequired (5 total).required (5 total).required (5 total).required (5 total).required (5 total).(soil/ground conditions)- Construction staging challenges- Construction s
Small earthwork quantity moderate grading requirements and environmental footprint.Smallest earthwork quantity reduces grading requirements
Subsurface conditions in the wetland area could be a challenge for bridge crossing based on preliminarySubsurface conditions in the wetland area could be aHigh groundwater maybe encountered at large open bottom culvert location based on preliminary geotechnicalHigh groundwater maybe encountered at large open bottom culvert location based on preliminary geotechnicalHigh groundwater maybe encountered at large open bottom culvert location based on preliminary geotechnical
geotechnical investigation.geotechnical investigation.investigation.investigation.Moderate Effect (3)Minimal Effect (4)Moderate Effect (3)Moderate Effect (3)

Transportation Net Effects Analysis for Road Alignments

		Alternative Road Alignments				
		Alignment 4	Alignment 5	Alignment 6	Alignment 6A	
Criteria	Measures	Minor Northerly Diversion with	Direct Extension with Wetland	South to North Minor Jog	Modified South to North Minor	
		Wetland Crossing to Minimize	Crossing	Diversion to Avoid Wetland and	Jog Diversion to Avoid Wetland	
		Impacts to Forest		Minimize Impacts to Forest	and Minimize Impacts to Forest	
Operation	- Improvement in road safety and	Standard design pavement cross-	Standard design pavement cross-	Super elevated pavement cause	Super elevated pavement cause	
	accessibility (sight distance; turning	section having higher elevation	section having higher elevation	drainage to cross center travel	drainage to cross center travel	
	movements)	at the center of pavement keep	at the center of pavement keep	lanes which may cause black ice	lanes which may cause black ice	
	- Reduction in maintenance	storm/ice melting water clear	storm/ice melting water clear	during spring freeze/thaw period	during spring freeze/thaw period	
	requirements	from the center (main) travel	from the center travel lane to	that impact to traffic safety.	that impact to traffic safety.	
		lane to ensure traffic safety.	ensure traffic safety.			
		Some section of retaining wall at	Some section of retaining wall at	Large section of retaining wall at	Some section of retaining wall at	
		watercourse crossing and culture	watercourse crossing and culture	watercourse crossing, some	culture heritage site requires	
		heritage site requires additional	heritage site requires additional	section of retaining wall at	slight increased level of	
		inspection and maintenance.	inspection and maintenance.	culture heritage site requires	inspection and maintenance.	
				increased level of inspection and		
				maintenance.		
		Bridge structure required higher	Bridge structure required higher	Open bottom culvert structure	Open bottom culvert structure	
		level of inspection and	level of inspection and	required additional inspection	required additional inspection	
		maintenance.	maintenance.	and maintenance.	and maintenance.	
		Achieves adequate Road safety	Achieves adequate Road safety	Achieves adequate Road safety	Achieves adequate Road safety	
		and accessibility	and accessibility	and accessibility The curvature	and accessibility. The curvature	
				slightly reduces sight visibility.	slightly reduces sight visibility.	
		Minimal Effect (4)	Minimal Effect (4)	Significant Effect (2)	Moderate Effect (3)	
TRANSPORTATION RANKING	Average Symbol					
	Average Score	4.17	4.50	3.50	3.67	
	All alignments improve the overall roa	ad network operational capability. Th	ne connectivity provides opportunity	to balance and distribute modal de	mands in direct and efficient	
	manner. All alignments by virtue of in	corporating appropriate geometric a	ind operating standards provide sim	ilar capacity (for each mode). The ex	ception is Alignment 6 and	
	Alignment 6A which introduce varying	ng center line curvature including the formation of back to back curves in order to connect to required north south arterial road intersections.				
Summary	Although network capacity is not direct	ctly affected, operating differences v	vill occur. The introduction of curves	s in Alignments 6 and 6A lengthens t	the total travel distance for all	
Summary	modes between Bathurst Street and D	Oufferin Street. Transit will experience	e increased travel times and increas	ed operating costs due to additiona	Il travel distance. Similarly,	
	pedestrians and bicyclists will take lon	nger to traverse the alignment. Autor	mobiles and trucks again due to the	increased travel distance will take a	bit longer travel time and	
	experience increased fuel consumption	n. Alignment 5 exhibits no to minim	al effects with regards to the evalua	tion criteria. Alignments 6 and 6A ex	whibit no effects on the Planning	
	Aspect and with respect to Engineerin	g Aspect, moderate to significant eff	fects have been determined.			

Alignment Alternative	Advantages	Disadvantages
Alignment 4 Minor Northerly Diversion	Secures area roadway network connectivity permitting all travel demands to be served at very good levels of service. Permits all modes of transportation to operate.	Bridge structure required to cross existing PSW Some section of retaining wall at watercourse crossing requires additional inspection and maintenance.
with Wetland Crossing to Minimize Impacts to	Less complex design due to minimal curvature requiring super-elevated sections.	Additional culvert crossing is required (5 total)
Forest	Small earthwork quantity moderate grading requirements and environmental footprint. (3)	
	Secures area roadway network connectivity permitting all travel demands to be served at very good levels of service. Permits all modes of transportation to operate.	Bridge structure required to cross existing PSW Some section of retaining wall at watercourse crossing
Alignment 5 Direct Extension with Wetland Crossing	Least complex design without horizontal curvature does not require super-elevated sections Minimal number of culvert crossing (4 total) due to least number of depressions based on existing ground elevation. Shortest and most direct route best option for traffic safety. Smallest earthwork quantity reduces grading requirements and environmental footprint	requires additional inspection and maintenance.
Alignment 6 South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest	Secures area roadway network connectivity permitting all travel demands to be served at very good levels of service. Permits all modes of transportation to operate.	Lengthens the total travel distance for all modes between Bathurst Street and Dufferin Street. Transit will experience increased travel times and increased operating costs due to additional travel distance. Similarly, pedestrians and bicyclists will take longer to traverse the alignment. The curvature slightly reduces sight visibility. Increase number of curvatures and transition segments between curves (horizontal and vertical) increase design complexity. Required long section of retaining wall to protect existing PSW. Additional culvert crossing is required (5 total). Larger earthwork quantity great grading requirements and environmental footprint.
Alignment 6A Modified South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest	Secures area roadway network connectivity permitting all travel demands to be served at very good levels of service. Permits all modes of transportation to operate. No retaining wall required. No additional maintenance	Lengthens the total travel distance for all modes between Bathurst Street and Dufferin Street. Transit will experience increased travel times and increased operating costs due to additional travel distance. Similarly, pedestrians and bicyclists will take longer to traverse the alignment. The curvature slightly reduces sight visibility. Greatest number of curvatures and transition segments between curves (horizontal and vertical) increase design complexity. Largest earthwork quantity increasing construction complexity.
		Additional culvert crossing is required (5 total).

			Alternative	e Road Alignments				
Criteria	Measures	Alignment 4 Minor Northerly Diversion with Wetland Crossing to Minimize Impacts to Forest	Alignment 5 Direct Extension with Wetland Crossing	Alignment 6 South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest	Alignment 6A Modified South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest			
	NATURAL ENVIRONMENT FACTOR							
Terrestrial Features Aspe	ct							
	Effects on Provincially Significant Wetland and	Provincially Significant Wetlands	Provincially Significant Wetlands	Provincially Significant Wetlands	Provincially Significant Wetlands			
	other wetlands	 Potential Direct Impacts Proposed bridge footings and retaining wall will encroach into wetland riparian area (buffer) and potential seepage/recharge area; Direct loss of wetland riparian vegetation below bridge footings/retaining wall and surrounding area of disruption due to construction; 	 Potential Direct Impacts Proposed bridge footings and retaining wall will encroach into wetland riparian area (buffer) and potential seepage/recharge area; Direct loss of wetland riparian vegetation below bridge footings/retaining wall and surrounding area of disruption due to construction; 	 Potential Direct Impacts Avoids crossing of PSW; Retaining wall and road alignment encroaches into 30m PSW buffer area. Direct loss of wetland riparian vegetation and surrounding area of disruption due to construction; 	 Potential Direct Impacts Avoids the King-Vaughan PSW (SWT3); Avoids 30m PSW buffer area. 			
Wetlands		 Potential Indirect Impacts Erosion/sedimentation; Potential to affect hydrologic regime of wetland; Bridge will shade wetland vegetation below which may result in a change to wetland composition/water evaporation; Introduction of salt/sand and contaminants from roads will affect wetland; and Localized effect on wildlife and vegetation during construction; 	 Potential Indirect Impacts Erosion/sedimentation; Potential to affect hydrologic regime of wetland; Bridge will shade wetland vegetation below which may result in a change to wetland composition/water evaporation; Introduction of salt/sand and contaminants from roads will affect wetland; and Localized effect on wildlife and vegetation during construction; 	 Potential Indirect Impacts Erosion/sedimentation; Potential to affect hydrologic regime of wetland; Introduction of salt/sand and contaminants from roads will affect wetland; and Localized effect on wildlife and vegetation during construction; 	 Potential Indirect Impacts Erosion/sedimentation; Potential to affect hydrologic regime of wetland; Introduction of salt/sand and contaminants from roads will affect wetland; and Localized effect on wildlife and vegetation during construction; 			
		 Potential Mitigation Measures Narrowing road width through sensitive features; Use of retaining walls and / or increased grade slopes through sensitive features to reduce total footprint in these areas; 	 Potential Mitigation Measures Narrowing road width through sensitive features; Use of retaining walls and / or increased grade slopes through sensitive features to reduce total footprint in these areas; 	 Potential Mitigation Measures Revise road geometry to avoid wetland buffer, if feasible Use of retaining walls and / or increased grade slopes through buffer to reduce footprint requirement in these areas. 	 Potential Mitigation Measures No wetland specific mitigation identified. Use of appropriate erosion and sedimentation measures; Complete a feature-based water balance of the PSW to understand function and dependence of the PSW on buffer areas 			

		Alternative Road Alignments			
		Alignment 4	Alignment 5	Alignment 6	Alignment 6A
Criteria	Measures	Minor Northerly Diversion with Wetland	Direct Extension with Wetland	South to North Minor Jog Diversion to	Modified South to North Minor Jog Diversion to
		Crossing to Minimize Impacts to Forest	Crossing	Avoid Wetland and Minimize Impacts	Avoid Wetland and Minimize Impacts to Forest
				to Forest	
		 Use of structure(s) to cross PSW to minimize direct removals and maintain portion or all existing hydrologic connectivity. Use of appropriate erosion and sedimentation measures; Consider wildlife passage structure(s) if feasible to maintain connectivity, where appropriate; Complete a feature-based water helenes of the DSW/te inform design 	 Use of structure(s) to cross PSW to minimize direct removals and maintain portion or all existing hydrologic connectivity. Use of appropriate erosion and sedimentation measures; Consider wildlife passage structure(s) if feasible to maintain connectivity, where appropriate; Complete a feature-based water halance of the PSW to cross and page structure is a sedimentation water halance of the PSW to cross PSW to minimize direct and page structure is a sedimentation water halance of the PSW to cross PSW to minimize direct and page structure is a sedimentation water halance of the PSW to cross PSW to minimize direct and page set to cross PSW t	 Use of appropriate erosion and sedimentation measures; Complete a feature-based water balance of the PSW to understand function and dependence of the PSW on buffer areas potentially impacted. 	potentially impacted.
		and mitigation options.	design and mitigation options.		
		Other Wetlands	Other Wetlands	Other Wetlands	Other Wetlands
		No other wetland units are impacted by this alignment.	No other wetland units are impacted by this alignment.	No other wetland units are impacted by this alignment.	No other wetland units are impacted by this alignment.
		 Criterion Rank Direct impacts associated with Alternative 4 and 5 are the same through the PSW. 	 Criterion Rank Direct impacts associated with Alternative 4 and 5 are the same through the PSW. 	 Criterion Rank Direct impacts associated with Alternative 6 are slightly greater than 6A, but much less than either Alternative 4 or 5 	 Criterion Rank Alternative 6A has no anticipated direct impacts
		Significant Effect (2)	Significant Effect (2)	Moderate Effect (3)	Minimal Effect (4)
	 Encroachment on Designated 	Designated Features	Designated Features	Designated Features	Designated Features
Vegetation	Environmentally Sensitive Areas / Areas of Natural and Scientific Interest • Effects on	 King-Vaughan Provincially Significant Wetland PSW (SWT3) buffer/riparian area will be fragmented by this alignment; A portion of the wetland riparian area (buffer will be removed within 	 King-Vaughan Provincially Significant Wetland PSW (SWT3) buffer/riparian area will be fragmented by this alignment; A portion of the wetland riparian area (buffer will be removed within) 	 King-Vaughan Provincially Significant Wetland Avoids the King-Vaughan PSW (SWT3); Alignment and retaining wall encroaches into 30m PSW buffer area. Also, impacts due to 	 King-Vaughan Provincially Significant Wetland Avoids the King-Vaughan PSW (SWT3);
	Terrestrial	the construction footprint (bridge	the construction footprint (bridge	construction footprint (grading).	

			e Road Alignments	
Criteria	Measures	Alignment 4 Minor Northerly Diversion with Wetland Crossing to Minimize Impacts to Forest	Alignment 5 Direct Extension with Wetland Crossing	Alignment 6 South to North Minor Jog Diversio Avoid Wetland and Minimize Imp to Forest
	 Features (encroachment, reduction of area) Fragmentation/ Connectivity of features Species at Risk (rare, endangered and threatened) Opportunities for enhancement 	 footings, retaining wall, road and associated grading); Significant Woodlands Approximate length through woodland: 933 m; S Significant Woodlands patches will be directly impacted by this alignment; Significant direct removal of woodlands will occur within the road footprint and grading limits, largely through the western portion of the alignment; A total of 8 ELC units will be impacted including wetland, woodland and meadow; and Alignment will bisect the broader contiguous central woodland at its narrowest point. Approximate length of hedgerow removed: 0 m Removal of a hedgerow at the eastern edge of the corridor. Edge effects and impacts along forest communities. Potential increased introduction of invasive species. Potential impacts associated with salt and other contaminants from the introduction of a roadway through these features. Impacts to the following ELC communities: SWT3; FOD2-4 (in 2 areas); 	 footings, retaining wall, road and associated grading); Significant Woodlands Longest length through woodlands (1069 m); S Significant Woodland patches will be directly impacted by this alignment; Greatest amount of direct removal of woodlands will occur as a result of road footprint and grading limits, largely through the western portion of the alignment; Bisects the broader central woodland at its widest point; A total of 8 ELC units will be impacted including wetland, woodland and meadow; Approximate length of hedgerow removed: 372 m Removal of a hedgerow at the eastern edge of the corridor. Edge effects and impacts along forest communities. Potential increased introduction of invasive species. Potential impacts associated with salt and other contaminants from the introduction of a roadway through these features Impacts to the following ELC communities: SWT3; FOD2-4 (in 2 areas); 	 Significant Woodlands Approximate length through woodland: 661 m; 4 Significant Woodlands patche will be directly impacted by thi alignment; Moderate direct removal of woodlands will occur within th road footprint and grading limit through the western portion or alignment - compared to Option and 5 - effects are primarily associated with edge; Bisects the broader central woodland at its narrowest poir and A total of 6 ELC units will be impacted including woodland, thicket and meadow. Approximate length of hedgeror removed: 153 m Removal of a hedgerow at the eastern edge of the corridor. Edge effects and impacts along forest communities. Potential increased introduction invasive species. Potential impacts associated wis salt and other contaminants from the introduction of a roadway through these features.

on to pacts	Alignment 6A Modified South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest				
nes his he hits of the ons 4 int; , row e g on of with rom	 Significant Woodlands Shortest crossing length through woodlands (274 m); Least amount of direct removal of/impact to woodlands as of result of road footprint and grading limits, largely at the western most point of the alignment near Dufferin Street and through the large central contiguous woodland patch. Bisects the broader central woodland at its narrowest point; and A total of 4 ELC units will be impacted including woodland, thicket and meadow. Approximate length of hedgerow removed: 153 m Removal of a hedgerow at the eastern edge of the corridor. Edge effects and impacts along forest communities. Potential increased introduction of invasive species. Potential impacts associated with salt and other contaminants from the introduction of a roadway through these features. Impacts to the following ELC communities: FOD2-4 (in 1 area along edge of feature); FOD5-11; CUT1-7; CUM1-1; and Hedgerow. 				

		Alternative Road Alignments				
Criteria	Measures	Alignment 4 Minor Northerly Diversion with Wetland Crossing to Minimize Impacts to Forest	Alignment 5 Direct Extension with Wetland Crossing	Alignment 6 South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts	Alignment 6A Modified South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest	
			Crossing	to Forest	Avoid Wetland and Winninize impacts to Porest	
		 FOD5-3; FOD3-1; Edge of FOD6-2; FOD5-11; CUM1-1; and Hedgerow. 	 FOD5-3; FOD3-1; Edge of FOD6-2; FOD5-11; CUM1-1; and Hedgerow. 	 FOD2-4 (in 2 areas along edge of feature); FOD5-3 (along edge of feature); FOD5-11; CUT1-7; CUM1-1; and Hedgerow. 		
		 Areas of Natural and Scientific Interest Maple Spur ORM Earth Science Provincially Significant ANSI; Maple Uplands and Kettles Life Science Provincially Significant ANSI; 	 Areas of Natural and Scientific Interest Maple Spur ORM Earth Science Provincially Significant ANSI; Maple Uplands and Kettles Life Science Provincially Significant ANSI; 	 Areas of Natural and Scientific Interest Maple Spur ORM Earth Science Provincially Significant ANSI; Maple Uplands and Kettles Life Science Provincially Significant ANSI; 	 Areas of Natural and Scientific Interest Maple Spur ORM Earth Science Provincially Significant ANSI; Maple Uplands and Kettles Life Science Provincially Significant ANSI; 	
		 Oak Ridges Moraine Conservation Plan Natural Core area and Natural Linkage area. 	 Oak Ridges Moraine Conservation Plan Natural Core area and Natural Linkage area. 	 Oak Ridges Moraine Conservation Plan Natural Core area and Natural Linkage area. 	 Oak Ridges Moraine Conservation Plan Natural Core area and Natural Linkage area. 	
		 Regional Greenlands (York OP, 2013) Impact to woodlands identified as Regional Greenlands in the York OP. 	 Regional Greenlands (York OP, 2013) Impact to woodlands identified as Regional Greenlands in the York OP. 	 Regional Greenlands (York OP, 2013) Impact to woodlands identified as Regional Greenlands in the York OP. 	Regional Greenlands (York OP, 2013) Impact to woodlands identified as Regional Greenlands in the York OP.	
		 Potential Mitigation Measures Narrowing road width through sensitive features; Consider minor geometric design changes to minimize encroachment areas; Use of retaining walls and / or increased grade slopes through sensitive features to reduce total footprint in sensitive areas (north side); 	 Potential Mitigation Measures Narrowing road width through sensitive features; Consider minor geometric design changes to minimize encroachment areas; Use of retaining walls and / or increased grade slopes through sensitive features to reduce total footprint in sensitive areas (north side); 	 Potential Mitigation Measures Narrowing road width through sensitive features; Consider minor geometric design changes to minimize encroachment areas; Use of retaining walls and / or increased grade slopes through sensitive features to reduce total footprint in sensitive areas (north side); Use of appropriate erosion and 	 Potential Mitigation Measures Narrowing road width through sensitive features; Consider minor geometric design changes to minimize encroachment areas; Use of retaining walls and / or increased grade slopes through sensitive features to reduce total footprint in sensitive areas (north side); Use of appropriate erosion and sedimentation measures. 	

		Alternative Road Alignments			
Criteria	Measures	Alignment 4 Minor Northerly Diversion with Wetland Crossing to Minimize Impacts to Forest	Alignment 5 Direct Extension with Wetland Crossing	Alignment 6 South to North Minor Jog Diversio Avoid Wetland and Minimize Imp to Forest	
		 Use of appropriate erosion and sedimentation measures. Criterion Rank Direct Impacts are slightly less than Alternative 5. Significant amount of woodland removal/impacts. 	 Use of appropriate erosion and sedimentation measures. Criterion Rank Similar impact to Alternative 4 but greatest amount of direct impact to woodland features. 	sedimentation measures. Criterion Rank Less direct impacts when compare Alternatives 4 and 5 - shorter leng through woodlands, smaller amou of woodland removal.	
Wildlife Habitat	 Effects on Significant Wildlife Habitat (encroachment, reduction of area) Fragmentation/ Connectivity of features Species at Risk (rare, endangered and threatened) Opportunities for enhancement 	 Significant Effect (2) Species at Risk (SAR): Direct impact to confirmed habitat for two Endangered bat species: Little Brown Myotis and Eastern Small-footed Myotis in two locations: Moderate impact and total length within meadow feature CUM1-1, identified as Bobolink (Threatened) breeding habitat, approximate length through cultural meadow: 167 m; and Moderate amount of potential impact to Category 1 Butternut trees (Endangered) – 3 trees. 	 Very Significant Effect (1) Species at Risk (SAR): Direct impact to confirmed habitat for two Endangered bat species: Little Brown Myotis and Eastern Small-footed Myotis in two locations. Least amount of impact and total length within meadow feature CUM1-1, identified as Bobolink (Threatened) breeding habitat, Approximate length through cultural meadow: 38 m; and Significant amount of potential impact to Category 1 Butternut trees (Endangered) – 7 trees. 	 Moderate Effect (3) Species at Risk (SAR): Direct impact to confirmed ha for two Endangered bat species Little Brown Myotis and Easter Small-footed Myotis in two locations. Longest length (178m) and more amount of impact within mean feature identified as Bobolink (Threatened) habitat; Moderate amount of potentia impact to Category 1 Butternut trees (Endangered) – 4 trees. 	
		 Significant Wildlife Habitat (SWH): Significant impact to woodlands identified as SWH for species of Conservation Concern (Eastern Wood -Pewee, Wood Thrush) and Bat maternity colonies resulting in direct loss and fragmentation of woodlands/habitat; and Reduction in interior woodland breeding bird habitat due to encroachment into/removal of woodland features in large 	 Significant Wildlife Habitat (SWH): Greatest amount of impact to woodlands identified as SWH for species of Conservation Concern (Eastern Wood -Pewee, Wood Thrush) and Bat maternity colonies resulting in direct loss and fragmentation of woodlands/habitat; and Reduction in interior woodland breeding bird habitat due to encroachment into/removal of 	 Significant Wildlife Habitat (SWH Direct loss and fragmentation woodlands adjacent to Duffer Street (identified as SWH for be maternity colonies); Moderate direct loss/impact t woodlands identified as SWH Species of Conservation Concee (Eastern Wood -Pewee and W Thrush) - compared to Option and 5 – effects primarily associated with edge: 	

on to bacts	Alignment 6A Modified South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest
ed to gth	Criterion Rank Least amount of direct removal of woodlands and associated impacts as compared to all
unt	other Alternatives.
	Minimal Effect (4)
	Species at Risk (SAR):
ibitat es: rn	 Direct impact to confirmed habitat for two Endangered bat species: Little Brown Myotis and Eastern Small-footed Myotis in one location and affects edge of habitat in one location.
ost dow	 Moderate amount of impact and total length within meadow feature, identified as Bobolink (Threatened) breeding habitat - approximate length through cultural
u ut	 Moderate amount of potential impact to Category 1 Butternut trees (Endangered) – 4 trees.
l):	Significant Wildlife Habitat (SWH):
of	 Least amount of impact to woodlands
in	identified as SWH for species of
oat	Conservation Concern (Eastern Wood-
	Pewee and Wood Thrush) and Bat
0	maternity colonies resulting in less
for	fragmentation and direct loss of
ern	vegetation/habitat;
/ood	Reduction in interior woodland breeding
s 4	bird habitat due to encroachment
	into/removal of woodland features in large contiguous central woodland.

		Alternative Road Alignments				
Criteria	Measures	Alignment 4 Minor Northerly Diversion with Wetland Crossing to Minimize Impacts to Forest	Alignment 5 Direct Extension with Wetland Crossing	Alignment 6 South to North Minor Jog Diversio Avoid Wetland and Minimize Imp to Forest		
		contiguous central woodland.	woodland features in large contiguous central woodland.	 Reduction in interior woodlan breeding bird habitat due to encroachment into/removal o woodland features in large contiguous central woodland. 		
		 General Wildlife: Direct removal of woodland, wetland and meadow features resulting in loss of wildlife habitat and vegetation; and Fragmentation of woodlots resulting in loss of wildlife habitat and connectivity. 	 General Wildlife: Direct removal of woodland, wetland and meadow features resulting in loss of wildlife habitat and vegetation; and Fragmentation of woodlots resulting in loss of wildlife habitat and connectivity. 	 General Wildlife: Direct removal of woodland at meadow features resulting in of wildlife habitat and vegetat and Fragmentation of woodlots resulting in loss of wildlife hab and connectivity. 		
		 Potential Mitigation Measures Narrowing road width through sensitive features, where feasible; Use of retaining walls and / or increased grade slopes through sensitive features to reduce total footprint in these areas; Use of appropriate erosion and sedimentation measures; and Integrate wildlife passage structure(s) into the design at key locations to maintain connectivity. 	 Potential Mitigation Measures Narrowing road width through sensitive features, where feasible; Use of retaining walls and / or increased grade slopes through sensitive features to reduce total footprint in these areas; Use of appropriate erosion and sedimentation measures; and Integrate wildlife passage structure(s) into the design at key locations to maintain connectivity. 	 Potential Mitigation Measures Narrowing road width through sensitive features, where feasi Use of retaining walls and / or increased grade slopes throug sensitive features to reduce to footprint in these areas; Use of appropriate erosion and sedimentation measures; and Integrate wildlife passage structure(s) into the design at locations to maintain connection 		
		Criterion Rank Direct Impacts are slightly less than Alternative 5. Significant amount of removal/impact to woodlands identified to provide SWH habitat.	Criterion Rank Similar impact to Alternative 4 but greatest amount of direct impact and removal to woodland features identified to provide SWH habitat.	Criterion Rank Less direct impacts when compare Alternatives 4 and 5 - shorter leng through woodlands and smaller amount of removal /impacts to woodlands identified to provide S habitat.		
		Moderate impact to Bobolink habitat	Shortest length within cultural	Longest length and most impacts		

on to bacts	Alignment 6A Modified South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest
d	
of	
nd loss tion;	 General Wildlife: Direct removal of woodland and meadow features resulting in loss of wildlife habitat and vegetation; and Fragmentation of woodlots resulting in loss of wildlife habitat and connectivity.
n ible; sh otal d key ivity.	 Potential Mitigation Measures Narrowing road width through sensitive features, where feasible; Use of retaining walls and / or increased grade slopes through sensitive features to reduce total footprint in these areas; Use of appropriate erosion and sedimentation measures; and Integrate wildlife passage structure(s) into the design at key locations to maintain connectivity.
ed to gth SWH	Criterion Rank Least amount of direct removal of woodlands identified to provide SWH habitat and associated impacts as compared to all other Alternatives.
	Moderate impact to Bobolink habitat and

		Alternative Road Alignments			
Criteria	Measures	Alignment 4 Minor Northerly Diversion with Wetland Crossing to Minimize Impacts to Forest	Alignment 5 Direct Extension with Wetland Crossing	Alignment 6 South to North Minor Jog Diversi Avoid Wetland and Minimize Im to Forest	
		and Category 1 Butternut trees.	meadow and least effect on Bobolink habitat. Significant impact to Category 1 Butternut trees.	predicted to Bobolink habitat. Moderate impact to Category 1 Butternut trees.	
		All Alternatives affect SAR bat habitat equally except for Alternative 6A which will result in least amount of impact/removal of woodlands identified to provide habitat for SAR bats.	All Alternatives affect SAR bat habitat equally except for Alternative 6A which will result in least amount of impact/removal of woodlands identified to provide habitat for SAR bats.	All Alternatives affect SAR bat ha equally except for Alternative 6A which will result in least amount impact/removal of woodlands identified to provide habitat for S bats.	
		Significant Effect (2)	Very Significant Effect (1)	Moderate Effect (3)	
Aquatic Features Aspect	1	1	1		
Surface Water Quantity and Quality	Degree of interference with water quality, thermal regime or baseflow	 Crosses at PSW not within creek channel. Small drainage feature originates from PSW. Changes to hydrologic inputs from wetland can impact flows to drainage feature. i.e. grading within wetland buffer, retaining wall within wetland buffer. 	 Crosses at PSW not within creek channel. Small drainage feature originates from PSW. Changes to hydrologic inputs from wetland can impact surface water flows to downstream drainage feature. i.e. grading within wetland buffer, retaining wall within wetland buffer. 	 Crosses East Patterson Creek area where there is narrow intermittent riparian habitat. impacts to downstream flows anticipated. Retaining wall within wetland buffer. Changes to hydrologic inputs from wetland can impa surface water lows to downst drainage feature. 	
		 No impacts to thermal regime anticipated as this watercourse does not provide direct or contributing fish habitat. 	 No impacts to thermal regime anticipated as this watercourse does not provide direct or contributing fish habitat. 	 No impacts to thermal regime anticipated as this watercour does not provide direct or contributing fish habitat. Minimal Effect (4) 	
	Effects on extent (area)	Fish and Fish Habitat	Fish and Fish Habitat	Fish and Fish Habitat	
Aquatic Habitat	and function of riparian habitat	 There is no direct fish habitat within the study area; No direct impacts to the contributing habitat present in the HDF; No riparian fish habitat is impacted. 	 There is no direct fish habitat within the study area; No direct impacts to the contributing habitat present in the HDF; No riparian fish habitat is impacted. 	 There is no direct fish habitat within the study area; Direct impacts to the contribut habitat present in the HDF; There is no riparian habitat associated with the HDF / Na and intermittent riparian hab 	

on to oacts	Alignment 6A Modified South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest
	Butternut trees.
	Least amount of impact/removal of woodlands identified to provide habitat for SAR bats.
bitat	
of	
AR	
	Moderate Effect (3)
at an No c act ream	 Crosses East Patterson Creek at an area where there is narrow intermittent riparian habitat. No impacts to downstream flows anticipated.
5e	 No impacts to thermal regime anticipated as this watercourse does not provide direct or contributing fish habitat.
	Minimal Effect (4)
	Fish and Fish Habitat
	• There is no direct fish habitat within the
	study area;
ıting	 Direct impacts to the contributing habitat present in the HDF;
	There is no riparian habitat associated with
row	the HDF / Narrow and intermittent riparian
itat	habitat impacted by crossing.

			Alternativ	rnative Road Alignments	
Criteria	Measures	Alignment 4 Minor Northerly Diversion with Wetland Crossing to Minimize Impacts to Forest	Alignment 5 Direct Extension with Wetland Crossing	Alignment 6 South to North Minor Jog Diversio Avoid Wetland and Minimize Imp to Forest	
		 Crosses at PSW (SWT3) not watercourse. Potential Mitigation Measures No mitigation measures are identified for aquatic habitat as no impacts are anticipated with this alignment. 	 Crosses at PSW (SWT3) not watercourse. Potential Mitigation Measures No mitigation measures are identified for aquatic habitat as no impacts are anticipated with this alignment. 	 impacted by crossing. Potential Mitigation Measures Maintain contributions from headwater drainage feature to downstream watercourse. 	
		 Criterion Rank Direct impacts associated with Alternative 4 and 5 are the same – crosses at PSW not watercourse. No Effect (5) 	 Criterion Rank Direct impacts associated with Alternative 4 and 5 are the same – crosses at PSW not watercourse. No Effect (5) 	 Criterion Rank Direct impacts associated with Alternative 6 and 6A are the s moderate effects to waterco can be mitigated. Minimal Effect (4) 	
Surface Drainage Aspect	Requirements for crossing of East Patterson Creek (reduction of area)	 Small drainage feature originates from PSW (SWT3); impacts to the PSW with this Alignment will impact hydrologic inputs to the drainage feature. 50 m single span bridge structure and retaining wall required for crossing over the wetland. Potential grading impact within wetland buffer area. Potential Mitigation Measures Maintain hydraulic / hydrologic connection of the wetland across 	 Small drainage feature originates from PSW (SWT3); impacts to the PSW with this Alignment will impact hydrologic inputs to the drainage feature. 50 m single span bridge structure and retaining wall required for crossing over the wetland. Potential grading impact within wetland buffer area. Potential Mitigation Measures Maintain hydraulic / hydrologic connection of the wetland across 	 Alignment will cross the small drainage feature that originat the PSW (SWT3); Direct impact to portions downstream of the Alignment Open bottom culvert crossing the watercourse. Avoids the n for wetland crossing. Outside TRCA regulatory limits. Crossing the watercourse at a perpendicular angle through a disturbed area is preferred fro geomorphological perspective Potential Mitigation Measures Maintain connectivity (e.g. structure maintain inputs 	
		the road (e.g. structure).	the road (e.g. structure).	downstream)	

on to pacts	Alignment 6A Modified South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest
o h ame ourse	 Potential Mitigation Measures Maintain contributions from headwater drainage feature to downstream watercourse. Criterion Rank Direct impacts associated with Alternative 6 and 6A are the same – moderate effects to watercourse can be mitigated.
	Minimal Effect (4)
es in t. over need of	 Alignment will cross the small drainage feature that originates in the PSW (SWT3); Direct impact to portions downstream of the Alignment. Open bottom culvert crossing over the watercourse. Avoids the need for wetland crossing. Outside of TRCA regulatory limits.
a om e.	 Crossing the watercourse at a perpendicular angle through a disturbed area is preferred from geomorphological perspective.
	 Potential Mitigation Measures Maintain connectivity (e.g. structure, maintain inputs downstream) Criterion Bank

	Alternative Road Alignments				
Criteria	Measures	Alignment 4 Minor Northerly Diversion with Wetland Crossing to Minimize Impacts to Forest	Alignment 5 Direct Extension with Wetland Crossing	Alignment 6 South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest	Alignment 6A Modified South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest
		 Direct impacts associated with Alternative 4 and 5 are the same - encroachment of bridge footings and retaining wall in wetland buffer. Potential impacts to hydrologic inputs of wetland to downstream drainage feature/watercourse. 	 Direct impacts associated with Alternative 4 and 5 are the same - encroachment of bridge footings and retaining wall in wetland buffer. Potential impacts to hydrologic inputs of wetland to downstream drainage feature/watercourse. 	 Direct impacts associated with Alternative 6 and 6A are the same – moderate effects to watercourse can be mitigated. 	 Direct impacts associated with Alternative 6 and 6A are the same – moderate effects to watercourse can be mitigated.
Stormwater Management	 Effects on catchment area Operation and maintenance requirements Opportunities to enhance roadway stormwater management measures, including coordination with/use of adjacent future development 	 Moderate Effect (3) Five culverts for minor depressions and one bridge for East Patterson Creek. Small footprint impact on the drainage areas. Shorter road length requires less SWM infrastructure. Culverts can be designed to accommodate wildlife passage. 	 Moderate Effect (3) Four culverts for minor depressions and one bridge for East Patterson Creek. Smallest footprint impact on the drainage areas. Shortest road length requires least SWM infrastructure. Culverts can be designed to accommodate wildlife passage. 	 Minimal Effect (4) Five culverts for minor depressions and one culvert for East Patterson Creek. Greater footprint impact on the drainage areas. Longer road length requires more SWM infrastructure. Moderate Impacts on proposed SWM solutions by the super elevation in the road which is caused by additional curvature of the road. Culverts can be designed to accommodate wildlife passage. 	 Minimal Effect (4) Five culverts for minor depressions and one culvert for East Patterson Creek. Greatest footprint impact on the drainage areas. Longest road length requires more SWM infrastructure. Moderate impacts on proposed SWM solutions by the super elevation in the road which is caused by additional curvature of the road. Culverts can be designed to accommodate wildlife passage.
Croundwater Assoct	facilities	Minimal Effect (4)	No Effect (5)	Moderate Effect (3)	Moderate Effect (3)
Recharge/Discharge Areas	 Degree of interference with groundwater recharge/discharge areas 	 Direct encroachment into PSW (SWT3) riparian area (buffer) which can result in the disruption to the ground water regime associated with the wetland. 	• Direct encroachment into PSW (SWT3) riparian area (buffer) which can result in the disruption to the ground water regime associated with the wetland.	 No major impact anticipated. Potential impact to groundwater regime associated with PSW due to close proximity of road works (footprint and grading). 	 No impact anticipated. Potential to impact groundwater regime associated with PSW due to close proximity or road works (footprint and grading).
		 Potential Mitigation Measures Completion of a feature-based water balance analysis to determine 	 Potential Mitigation Measures Completion of a feature-based water balance analysis to 	 Potential Mitigation Measures Completion of a feature-based water balance analysis to 	 Potential Mitigation Measures Completion of a feature-based water balance analysis to determine wetland

		Alternative Road Alignments					
Criteria		Alignment 4	Alignment 5	Alignment 6	Alignment 6A		
	Measures	Minor Northerly Diversion with Wetland	Direct Extension with Wetland	South to North Minor Jog Diversion to	Modified South to North Minor Jog Diversion to		
		Crossing to Minimize Impacts to Forest	Crossing	Avoid Wetland and Minimize Impacts	Avoid Wetland and Minimize Impacts to Forest		
				to Forest			
		wetland function and develop	determine wetland function and	determine wetland function and	function and develop appropriate		
		appropriate mitigation measures.	develop appropriate mitigation	develop appropriate mitigation	mitigation measures.		
		Maintain hydraulic / hydrologic	measures.	measures.			
		connectivity across road (e.g.	Maintain hydraulic / hydrologic				
		structure)	connectivity across road (e.g.				
			structure)				
		Criterion Rank	Criterion Rank	Criterion Rank	Criterion Rank		
		Similar effects for both Alternatives 4	Similar effects for both Alternatives 4	Potential to affect groundwater	No direct impact anticipated as no		
		and 5. Impacts within wetland buffer	and 5. Impacts within wetland buffer	regime of wetland as minor	encroachment into wetland or buffer area is		
		can result in disruption to ground water	can result in disruption to ground	encroachment into wetland buffer	proposed.		
		regime of wetland.	water regime of wetland.	area.			
		Moderate Effect (3)	Moderate Effect (3)	Minimal Effect (4)	Minimal Effect (4)		
	Effects on vulnerable	No significant difference between	No significant difference between	No significant difference between	No significant difference between alternative		
Groundwater Quality	areas (area)	alternative designs.	alternative designs.	alternative designs.	designs.		
		No Effect (5)	No Effect (5)	No Effect (5)	No Effect (5)		
NATURAL ENVIRONMENT	Average Symbol						
KAINKIING	Average Score	3.22	3.11	3.67	3.89		
	Alternatives 4 and 5 will I	result in the most amount of impact to adja	acent natural heritage features with Alter	native 5 resulting in the most amount of i	mpact. Alternative 6 and 6A will result in		
Current of the	relatively equal amounts	of impact to adjacent features with Alterna	ative 6 resulting in more encroachment ir	nto adjacent woodland and PSW buffer ar	ea than Alternative 6A. Alternative 6A is the		
Summary	preferred as it avoids mo	st woodlands and the PSW and associated	riparian area, Alternative 5 is least prefer	red as it will result in the greatest amoun	t of removal of woodlands and encroaches		
	within PSW riparian areas.						

Alignment Alternative	Advantages	Disadvantages
Alignment 4 Minor Northerly Diversion with Wetland Crossing to Minimize Impacts to Forest	 Shorter total length of impact than Options 6 and 6a (2036 m); Bridge over PSW to mitigate impacts; Shorter length of crossing through woodland features as compared to Option 5 (933m); 	 Footings for bridge crossing and retaining wall will be located in PSW riparian area (30 m buffer) resulting in localized impacts and direct loss of riparian habitat; Bridge structure will result in shading of wetland resulting in potential changes to wetland vegetation. Potential short term (during construction) and long term (post construction) changes in hydrologic regime to PSW as a result of bridge structure; Introduction of road contaminants/salt into wetland as a result of bridge structure through wetland. Longer length though woodlands as compared to Options 6 and 6a (933 m); Bisects woodlots identified as SWH for Eastern Wood - Pewee Wood Thrush and Bat maternity colonies at 4 locations within western area of Subject Lands resulting in direct loss and fragmentation of woodlands/habitat; Retaining wall proposed in surrounding PSW riparian area (within 30 m buffer to PSW) resulting in direct loss of vegetation resulting in potential impacts to wildlife movement, fragmentation and affects to hydrologic regime of wetland. Impact to habitat for SAR bats; Impact to cultural meadow (CUM1-1) habitat for Bobolink, length of impact through feature is 167 m; Potential to impact 3 Category 1 Butternut trees;
Alignment 5 Direct Extension with Wetland Crossing	 Shortest total length of impact as compared to other Options (2021 m); Bridge over PSW to mitigate impacts; Least amount of impact length through cultural meadow (CUM1-1) identified as habitat for Bobolink (38 m); 	 Footings for bridge crossing and retaining wall will be located in PSW riparian area (30 m buffer) resulting in localized impacts and direct loss of riparian habitat; Bridge structure will result in shading of wetland resulting in potential changes to wetland vegetation. Potential short term (during construction) and long term (post construction) changes in hydrologic regime to PSW as a result of bridge structure; Introduction of road contaminants/salt into wetland as a result of bridge structure through wetland. Retaining wall proposed in surrounding PSW riparian area (within 30 m buffer to PSW) resulting in direct loss of vegetation resulting in potential impacts to wildlife movement, fragmentation and affects to hydrologic regime of wetland. Longest length through wooded areas (1069 m); Bisects woodlands identified as SWH for Eastern Wood - Pewee Wood Thrush and Bat maternity colonies at four locations within western area of Subject Lands resulting in fragmentation/loss of woodland habitat; Impact to habitat for SAR bats; Impact to habitat for Bobolink; Potential to impact 7 Category 1 Butternut trees:
Alignment 6 South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest	 Avoids crossing of PSW; Shorter crossing length/impact through woodlands as compared to Options 4 and 5 (661m); Primarily edge effects to woodlands identified as SWH for Eastern Wood - Pewee, Wood Thrush and Bat maternity colonies resulting in less fragmentation and direct loss of vegetation; Crosses large contiguous woodlands at narrow point. 	 Potential to impact 7 Category 1 Butternut trees; Retaining wall proposed in surrounding PSW riparian area (within 30 m buffer to PSW) resulting in direct loss of vegetation resulting in potential impacts to wildlife movement, fragmentation and affects to hydrologic regime of wetland. Longer total length of crossing/impact as compared to Options 4 and 5. Largest length of impact through cultural meadow (CUM1-1) identified as habitat for Bobolink (178 m); Direct loss and fragmentation of woodlands adjacent to Dufferin Street (identified as SWH for bat maternity colonies); Impact to habitat for SAR bats; Impact to habitat for Bobolink; Potential to impact 4 Category 1 Butternut trees:
Alignment 6A Modified South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest	 Avoids crossing of PSW and associated 30 meter buffer area; Shortest crossing length through woodlands (274 m); Avoids most woodlands identified as SWH for Eastern Wood-Pewee, Wood Thrush and Bat maternity colonies resulting in less fragmentation and direct loss of vegetation; Crosses large contiguous woodlands at narrow point; 	 Longest total length of crossing/impact as compared to all other Options. Longer length of impact through cultural meadow (CUM1-1) identified as habitat for Bobolink (173 m) as compared to Options 4 and 5; Direct loss and fragmentation of woodlands adjacent to Dufferin Street (identified as SWH for bat maternity colonies); Impact to habitat for SAR bats; Impact to habitat for Bobolink; Potential to impact 4 Category 1 Butternut trees;

Social Net Effects Analysis for Road Alignments

		Alternative Road Alignments				
Criteria	Measures	Alignment 4 Minor Northerly Diversion with Wetland Crossing to Minimize Impacts to Forest	Alignment 5 Direct Extension with Wetland Crossing	Alignment 6 South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest	Alignment 6A Modified South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest	
Land Use Aspect						
Land Use Designations and Policies	- Degree of compatibility with provincial, regional and municipal growth/development	Requires a bridge crossing of the PSW resulting in a Moderate impact on the PSW.	Requires a bridge crossing of the PSW resulting in a Moderate impact on the PSW.	Avoids PSW.	Avoids PSW.	
	goals/objectives	Avoids the hedgerow.		Avoids the hedgerow.	Avoids hedgerow.	
		Affects approx. 5.62 ha of Core forested lands.	Has a more significant impact on the of Core forested lands with the removal of approx. 7.13 ha.	Requires the total removal of approx. 4.63 ha of Core forested lands.	Requires the total removal of approx. 3.83 ha of Core forested lands.	
		Establishes a new forest edge in the western portion of the Study Area. Avoids the hedgerow in the eastern portion of the Study Area.	Establishes a new forest edge in the western portion of the Study Area. Includes the removal of the hedgerow in the eastern portion of the Study Area.	Has a minimal impact on forest edge in the western portion of the Study Area.	Has a minimal impact on forest edge in the western portion of the Study Area.	
		Moderate Effect (3)	Significant Effect (2)	Minimal Effect (4)	Minimal Effect (4)	
Agricultural Operations	 Physical resource consumption Facility resource consumption Operational impacts 	Significant impact on existing agricultural lands with the removal of approximately 4.07 ha of agricultural lands	Has the least impact on Agricultural land affecting approx. 2.48 ha. Does not result in the creation of a remnant piece of agricultural lands.	Significant impact on existing agricultural lands with the removal of approximately 4.04 ha of agricultural lands.	Significant impact on existing agricultural lands with the removal of approximately 4.02 ha of agricultural lands.	
		Results in the creation of an unusable remnant piece of agricultural lands with an area of approx. 0.91 ha		Results in the creation of an unusable remnant piece of agricultural lands with an area of approx. 0.11 ha.	Results in the creation of an unusable remnant piece of agricultural lands with an area of approx. 0.25 ha.	
		Total impact on agricultural lands of approx. 4.98 ha.		Total impact on agricultural lands of approx. 4.15 ha.	Total impact on agricultural lands of approx. 4.27 ha	
		Significant Effect (2)	Minimal Effect (4)	Significant Effect (2)	Significant Effect (2)	
Approved Development Proposals	 Accommodating existing/future development proposals (public access/intersecting streets/connections for all modes of transportation) 	Impacts 1.38 ha of lands designated low density residential.	Impacts 1.36 ha of lands designated low density residential.	Significant encroachment into the Low Density Residential Designation of approx. 2.83 ha and the creation of an unusable remnant piece of residentially designated lands with an area of approx. 0.38 ha.	Very significant encroachment into the Low Density Residential Designation of approx. 4.21 ha and the creation of an unusable remnant piece of residentially designated lands with an area of approx. 1.98	
	. ,				ha.	

Social Net Effects Analysis for Road Alignments

	Measures	Alternative Road Alignments			
Criteria		Alignment 4 Minor Northerly Diversion with Wetland Crossing to Minimize Impacts to Forest	Alignment 5 Direct Extension with Wetland Crossing	Alignment 6 South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest	Alignment 6A Modified South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest
		Minimal Effect (4)	Minimal Effect (4)	Significant Effect (2)	Very Significant Effect (1)
Community Aspect					
Quality of Life	- Encroachment on individual properties (number/area)	Uses approximately 10.37 ha of privately owned lands. Approximately half of the alignment uses the existing Kirby Road right of way (2.50 ha) with a minimal impact on Parcels 1, 4 & 6 associated with the widening of the road allowance. Has a larger impact on Parcel 3 where the alignment uses approx. 4.98 ha of agricultural lands. Uses approximately 6.51 ha of vacant/forested lands.	Uses approximately 6.96 ha of privately owned lands. The entire alignment uses the existing road right of way (4.01 ha) and the only impacts are associated with widening of the road allowance on Parcels 1, 3, 4, and 6	Uses approximately 11.35 ha of privately owned lands. Uses a smaller portion of the existing Kirby Road right of way (2.25 ha). Uses approx. 4.16 ha of agricultural lands and approx. 3.21 of lands used for and existing employment use and future low density residential use. Approximately 6.24 ha of vacant/forested lands are impacted.	Has the largest impact on privately owned lands using approx. 16.20 ha of land. Uses the smallest area of the Kirby Road right away (1.67 ha) and approx. 4.27 ha of agricultural lands. The alignment has a greatest impact on the existing employment use and future low density residential use by swinging further south and using more land (6.19 ha).Uses approx. 6.74 ha of vacant/forested lands.
		Moderate Effect (3)	Minimal Effect (4)	Significant Effect (2)	Very Significant Effect (1)
Existing Wells	 Effects on water quality and quantity Number of affected wells 	No significant difference between alternative alignments.	No significant difference between alternative alignments.	No significant difference between alternative alignments.	No significant difference between alternative alignments.
		No Effect (5)	No Effect (5)	No Effect (5)	No Effect (5)
Noise	- Change in sound levels over pre-existing conditions	No significant difference between alternative alignments. Four of the five existing residences located in the Study Area are located in access of 200 metres from the alternative road alignments. The potential noise impacts on the fifth residence, located adjacent to the road allowance in the eastern portion of the Study Area same regardless of the road alignment.	No significant difference between alternative alignments. Four of the five existing residences located in the Study Area are located in access of 200 metres from the alternative road alignments. The potential noise impacts on the fifth residence, located adjacent to the road allowance in the eastern portion of the Study Area same regardless of the road alignment.	No significant difference between alternative alignments. Four of the five existing residences located in the Study Area are located in access of 200 metres from the alternative road alignments. The potential noise impacts on the fifth residence, located adjacent to the road allowance in the eastern portion of the Study Area same regardless of the road alignment.	No significant difference between alternative alignments. Four of the five existing residences located in the Study Area are located in access of 200 metres from the alternative road alignments. The potential noise impacts on the fifth residence, located adjacent to the road allowance in the eastern portion of the Study Area same regardless of the road alignment.

Social Net Effects Analysis for Road Alignments

		Alternative Road Alignments				
Criteria	Measures	Alignment 4 Minor Northerly Diversion with Wetland Crossing to Minimize	Alignment 5 Direct Extension with Wetland Crossing	Alignment 6 South to North Minor Jog Diversion to Avoid Wetland and Minimize	Alignment 6A Modified South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest	
		No Effect (5)	No Effect (5)	No Effect (5)	No Effect (5)	
Cultural Aspect						
Archaeological Resources	Degree of interference with known areas of	The alignment is within areas of archaeological potential with	The alignment is within areas of archaeological potential with	Most of the alignment is within areas of archaeological potential	Considerable segment of the	
	archaeological potential	exception of a very small segment.	exception of a very small segment.		archaeological potential.	
		Very Significant Effect (1)	Very Significant Effect (1)	Significant Effect (2)	Moderate Effect (3)	
Built Heritage Resources	Degree of interference with cultural heritage	The alignment will result in the encroachment of the farmhouse at 11490 Bathurst Street and avoid	The alignment will result in the encroachment of the farmhouse at 11490 Bathurst Street and potential	The alignment will result in the encroachment of the farmhouse at 11490 Bathurst Street and avoid	The alignment will result in the encroachment of the farmhouse at 11490 Bathurst Street and avoid	
		removal of established vegetation and landscape features associated with the historical farmscape.	removal of established vegetation and landscape features associated with the historical farmscape.	removal of established vegetation and landscape features associated with the historical farmscape.	removal of established vegetation and landscape features associated with the historical farmscape.	
		Moderate Effect (3)	Significant Effect (2)	Moderate Effect (3)	Moderate Effect (3)	
SOCIAL ENVIRONMENT RANKING	Average Symbol					
	Average Score	3.25	3.38	3.13	3.00	
Summary	From a cultural perspective, Alignments 6 and 6A are preferred over Alignments 4 and 5 as they interfere to lesser degree with areas of known archaeological potential. Alignment 4, 6 and 6A would have moderate direct impacts on one previously identified cultural heritage resource of interest (11490 Bathurst St., farmhouse listed by the municipality). Alignments 5 would have significant direct impacts to one previously identified cultural heritage resource of interest (11490 Bathurst St., farmhouse listed by the municipality and farmscape of interest to the municipality). A resource-specific Heritage Impact Assessment (HIA) and post-construction rehabilitation is recommended. From a policy and impact on existing and approved lands uses, Alignments 4 and 5 are the same except Alignment 4 avoids the hedgerow located in the existing ROW in the eastern portion of the Study Area and as a result, has a significant impact on agricultural lands. Alignment 5, also has the least impact on existing and approved lands and requires the least amount of privately owned lands that must be acquired. Alignments 6 and 6a have the least impact on existing and approved land uses. Alignments 6 and 6a have the least impact on existing and approved land uses. Alignments 6 and 6a have the greatest impact on existing and approved land uses. Alignments 6 and 6a have the greatest impact on existing and approved land uses. Alignments 6 and 6a have the greatest impact on existing and approved land uses. Alignments 6 and 6a have the greatest impact on existing and approved land uses. Alignments 6 has a significant impact on existing and approved land uses. Alignments 6 has a significant impact on privately owned lands requiring the acquisition of approx. 11.35 ha of land including approx. 3.21 ha of lands designated for residential development. Alignment 6 has a very significant impact on privately owned lands requiring the acquisition of approx. 14.53 ha of land including approx. 6.19 ha of lands designated for residential development.					

Alignment Alternative	Advantages	Disadvantages		
Alignment 4 Minor Northerly Diversion with Wetland Crossing to Minimize Impacts to Forest	 Utilizes a significant portion of the existing ROW. Minimizes the impact on the lands approved for residential development. Avoids existing hedgerow. 	 Impacts existing agricultural lands and creates an unusable remnant parcel of agricultural lands. Requires a crossing of a PSW. Requires acquisition of agricultural lands. 		
Alignment 5 Direct Extension with Wetland Crossing	 Utilizes all of the existing ROW and minimizes the amount of privately owned lands that must acquired. Minimizes the impact on the lands approved for residential development. Minimizes the impact on existing agricultural lands. 	 Requires a crossing of a PSW Impacts an existing hedgerow 		
Alignment 6 South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest	 Avoids crossing a PSW. Avoids existing hedgerow. 	 Impacts existing agricultural lands and creates an unusable remnant parcel of agricultural lands. Impacts lands approved for residential development and creates a moderately sized unusable remnant parcel of residential lands. Requires acquisition of residentially approved lands and agricultural lands. 		
Alignment 6A Modified South to North Minor Jog Diversion to Avoid Wetland and Minimize Impacts to Forest	 Avoids crossing a PSW Minimizes the impact on forested lands located within the existing ROW. Avoids existing hedgerow. 	 Impacts existing agricultural lands and creates an unusable remnant parcel of agricultural lands. Impacts lands approved for residential development and creates a large sized unusable remnant parcel of residential lands. Requires acquisition of residentially approved lands and agricultural lands. 		

Economic Net Effects Analysis for Road Alignments

Criteria		Alternative Road Alignments				
		Alignment 4	Alignment 5	Alignment 6	Alignment 6A	
	Measures	Minor Northerly Diversion with	Direct Extension with Wetland	South to North Minor Jog Diversion	Modified South to North Minor Jog	
		Wetland Crossing to Minimize	Crossing	to Avoid Wetland and Minimize	Diversion to Avoid Wetland and	
		Impacts to Forest		Impacts to Forest	Minimize Impacts to Forest	
ECONOMIC ENVIRONMENT FACT	OR			<u> </u>	<u>I</u>	
	- Capital Costs	The most expensive alignment at	More expensive than Alignments 6 and	The least expensive in comparison to all	Slightly more expensive than Alignment	
		\$21,662,783.00.	6A at \$20,402,248.00.	other alignments at \$15,487,536.00.	6 at \$15,722,604.00.	
		Moderate Effect (3)	Moderate Effect (3)	Minimal Effect (4)	Minimal Effect (4)	
		Slightly higher operation and	Slightly higher operation and	Highest operation and maintenance	Higher operation and maintenance	
		maintenance costs due to bridge	maintenance costs due to bridge	costs in comparison to all other	costs in comparison to alignments 4 and	
	- Operation and Maintenance	structural.	structural.	alignments due to additional retaining	5 due to non-standard pavement cross-	
	Costs	No significant difference between	No significant difference between	wall and non-standard pavement cross-	section.	
		Alignments 4 and 5.	Alignments 4 and 5	section.		
		Minimal Effect (4)	Minimal Effect (4)	Significant Effect (2)	Moderate Effect (3)	
Cost Estimates		Acquisition Area – 10.37ha	Acquisition Area – 6.96ha	Acquisition Area – 11.29ha	Acquisition Area – 14.44ha	
cost Estimates		Total Cost - \$12,197,043.00	Total Cost - \$11,616,070.00	Total Cost - \$26,780,274.00	Total Cost - \$50,732,662.00	
		Minimal encroachment on the higher	Alignment 5 has a minimal impact on	Alignment 6 has a significant impact on	Alignment 6A has a significant impact	
		value residential approved lands.	the higher value residential approved	the higher value residential approved	on the higher value residential	
		Moderate encroachment on the lower	land, and a minimal impact on the	land and creates a moderately sized	approved land and creates large	
	- Property acquisition	value agricultural lands. Creates	lower value agricultural lands.	unusable remnant parcel of	unusable remnant parcel of	
	requirements	unusable remnant parcel of agricultural		residentially approved lands. Alignment	residentially approved lands. Alignment	
		land.		6 also has a moderate impact on the	6A also has a moderate impact on the	
				lower value agricultural lands and	lower value agricultural lands and	
				results in the creation of an unusable	results in the creation of an unusable	
				remnant parcel agricultural lands.	remnant parcel agricultural lands.	
		Minimal Effect (4)	No Effect (5)	Moderate Effect (3)	Very Significant Effect (1)	
ECONOMIC ENVIRONMENT RANKING	Average Symbol					
	Average Score	3.67	4.00	3.00	2.67	
Summary	Alignments 6 and 6A exhibit lower capital costs over Alignments 4 and 5. Alignment 6 is considered to have the highest relative operation and maintenance costs while Alignments 4 and 5 have the lowest					
	relative operation and maintenance costs. Alignment 5 has lowest property acquisition costs while Alignment 6A exhibits the highest property acquisition costs.					
	Alignment 6A is overall least preferred option due to moderate relative operation and maintenance cost and very high property acquisition costs. Alignment 5 is overall most preferred due to moderate					
	capital cost and lowest property acquisition costs.					