Appendix E:

Intersection Safety Issues

Issue 1: Poor Cross-Street Visibility on Northbound Connaught Drive

Issue Description

On northbound Connaught Drive, there is limited visibility of vehicles and pedestrians on Miette Avenue due to the buildings in the southwest and southeast corners. As a result, motorists on Connaught Drive, may not anticipate the intersection and the associated increase in conflict points with turning vehicles and crossing pedestrians.

Issue Photo(s)

Improvement Suggestions

- Provide wayfinding signage on Connaught Drive and at intersection. *Estimated Cost: $2,000*
- Provide a bulb-out in southwest corner. *Estimated Cost: $60,000*

Issue 2: Limited Intersection Sight Distance on Miette Avenue

Issue Description

The intersection sight distance (ISD) looking north from Miette Avenue is limited due to on-street southbound Connaught Drive. The ISD is adequate, based on the Transportation Association of Canada *Geometric Design Guide for Canadian Roads* (2017), if it is assumed that motorists reassess gap availability closer to the travel lanes. However, this would require motorists to potentially stop within the crosswalk. Motorists that do not reassess gap availability after the stop bar, may select an inadequate gap, increasing the risk of right-angle collisions in the intersection.

Issue Photo(s)

Improvement Suggestions

It is suggested that the existing parking restriction on southbound Connaught Drive remain as it is the correct length to provide adequate ISD. Taxi parking could remain given the short duration of loading/unloading operations. Taxis sitting in the zone for extended periods of time should be discouraged. Similarly, the unloading zone on the south side should be preserved and monitored for compliance.

It is recommended that curb-extensions (bulb-outs) be implemented on the southwest and northwest corners. This would shift the stop bar further east, increasing the ISD to both the north and south. They would also mitigate some of the other safety issues identified in this report. The cost of the bulbs is estimated at $60,000 for the southwest bulb and $50,000 for the northwest.

Issue 3: Limited Stopping Sight Distance on Miette Avenue

Issue Description

There are two stop signs on Miette Avenue, both of which are difficult to see on the approach due the horizontal alignment. The sign on the right-hand side is obstructed by the building and on-street parking in the southwest corner. The stop sign on the left-hand (median) sign can be blocked by preceding vehicles. Furthermore, there is a "keep right" sign mounted behind the left-hand sign that obscures the octagonal shape of the sign. The shape of a stop sign is important and should not be obstructed by mounting a sign behind it. The limited stop sign visibility could result in sudden braking or potentially stop sign violations.

The sight obstructions also reduce visibility of pedestrians crossing Miette Avenue on the west crosswalk. The combination of factors increases the risk of a pedestrian being struck in the cross-walk.

Issue Photo(s)

Improvement Suggestion(s)

- Put the left-hand stop sign on its own post approximately 1m west of the existing sign. *Estimated Cost: $500*
- Relocate the end of the on-street parking further west (approximately 4m), such that on-street parking does not reduce sight lines more than the building already does. *Estimated Cost: $1,000 (sign relocation, additional curb paint).*
- In the longer-term, curb extensions as discussed in the previous issues would also help mitigate this issue.

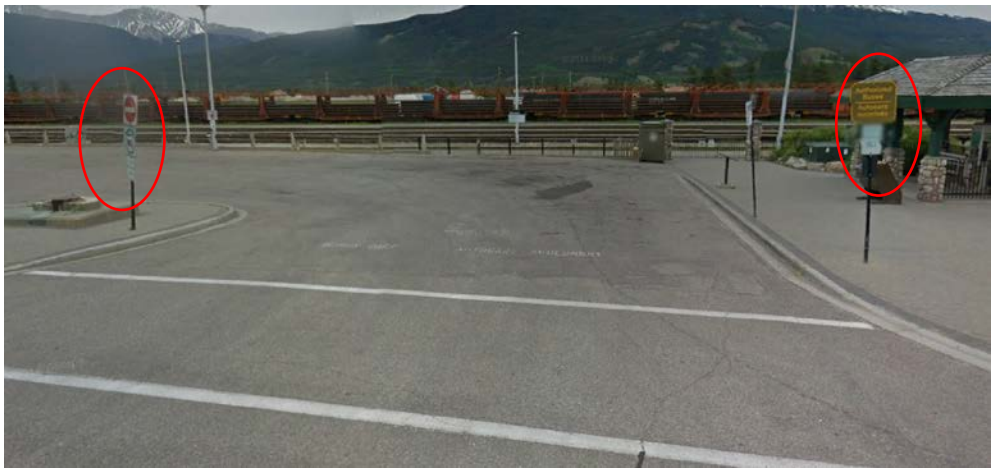
Issue 4: Bus Only Restriction on East Leg is Not Clearly Evident

Issue Description

The east leg of the intersection is an entrance only and is restricted to buses only. There are no signs informing of the bus restriction on any of the approach legs. There are signs, but they are small and not oriented towards approaching traffic. The placement on the east leg also means that they are not visible until after motorists have already turned.

Furthermore, the design of the east leg looks like a standard two-way approach. This may result in vehicles exiting from the east leg that is intended as entrance only. This is not expected to be an issue with bus drivers that are more likely to understand how the parking lot operates, but rather vehicles that inadvertently enter the parking lot unaware of the bus restrictions. During the site visits, several passenger cars were observed within the lot.

Issue Photo(s)



Improvement Suggestions

It is unclear if the parking lot is restricted to busses only or if tenant passenger cars can park in the lot as well. It is recommended that the lot be restricted to busses only to reduce the potential for conflicts and to make it easier to inform motorists of the function of the lot.

- As a short-term improvement, the “authorized autocars” and “tenant parking only” signs on the right-hand sign should be replaced with the “entry prohibited” and “busses only” signage used on the left-hand sign. These signs better convey the restricted access. An additional “entry prohibited” sign should be provided to discourage motorists in the parking lot from exiting via the intersection. *Estimated Cost: $2,500*
- In the future, it is suggested that the east leg be reconstructed to better resemble an entrance only. This would be accommodated by extending the NE sidewalk further south to better emphasize that there is no westbound exit. This would have the additional benefits of reducing the pedestrian crossing distance and providing better opportunities for sign and pavement marking placement. *Estimated Cost: $65,000*

Issue 5: Inadequate Wayfinding

Issue Description

There is limited wayfinding signage along Connaught Drive, and within Town in general, and the same is true at this intersection. There are street name signs, but they are inconspicuous and the sign text is too small to be legible. Inadequate wayfinding can result in erratic movements by confused motorists and increases motorist distraction, both of which contribute to the risk of collisions.

Issue Photo(s)

Improvement Suggestions

- Provide larger street name signs. It is suggested that the Miette Avenue sign go within the median and the Connaught Drive sign go above the stop sign in the southwest corner: *Estimated Cost: $3,000*

Issue 6: Inconsistent and Incorrect Pedestrian Crossing Signage

Issue Description

In general, pedestrian crossing signs are applied inconsistently along the Connaught Drive corridor, including lateral and longitudinal placement, height and orientation. At the Miette intersection, there is one sign provided in the median in the northbound direction. The pedestrian symbol is facing away from the northbound lanes (left) and should be the right facing version as per the Transportation Association of Canada (TAC) *Manual of Uniform Traffic Control Devices for Canada* (MUTCDC). Left and right versions of the sign should be provided on each side of the street in each direction with the left sign being in the median.

In addition, Hospital guide signs are provided within the median at the intersection. The signs are too close to the intersection to provide motorists with opportunity to change lanes. They also increase clutter / driver workload within the intersection.

Issue Photo(s)

Improvement Suggestions

- Provide left and right versions of the pedestrian crossing signs on both approaches to the intersection. *Estimated Cost: $2,000*
- Relocate the Hospital guide signs further upstream. *Estimated Cost: $1,000*

Issue 7: Miette Avenue Median Encourages Jaywalking

Issue Description

The large median on Miette Avenue may encourage pedestrians to use it as an island to cross Miette Avenue. There are multiple pathways between the raised planters within the median which may entice pedestrians to jaywalk. The aesthetic paving stones may also give the impression that the island is intended for pedestrians. Further contributing to the risk is the presence of large trees and shrubs within the raised planters that create sight obstructions for motorists. Motorists will likely not anticipate a pedestrian crossing through the median, increasing the risk of a collision.

Issue Photo(s)

Improvement Suggestions

This collision risk is likely low given the low travel speeds and low volume of jaywalking traffic. Mitigating this risk would require a physical obstruction to discourage crossings. Physical obstructions could be detrimental to the aesthetics of the median and planters or expensive to properly integrate. Therefore, larger scale improvements would be a longer-term improvement, potentially in conjunction with future maintenance of the planters. In the interim, vegetation within the planters should be mindful of the impacts on sight lines and should be planted/trimmed to minimize sight obstructions.

Issue 1: Intersection Layout Creates Driver Confusion

Issue Description

The intersection layout is complex due to the combination of intersection skew, offsets and horizontal curvature. Further contributing to the complexity is the wide median width of Miette Avenue. Because of the width, Miette Avenue operates more like two parallel one-way streets, so the intersection functions more like a five-leg intersection rather than a four-leg.

The combination of the above factors makes it very difficult for motorists to understand the intended travel paths, traffic control, and rights-of-way. The resulting confusion could result in motorists failing to yield the proper right-of-way, increasing the risk of angle collisions.

Issue Photo(s)

Improvement Suggestions

Ideally this intersection should be reconfigured to minimize the skew and offsets. However, this is a challenge given the residential development surrounding the intersection. Reconfiguration could result in property impacts requiring land acquisition or potentially adding additional land in front of dwellings. The biggest challenge is minimizing the impacts to on-street parking and residential driveways.

Traffic volume counts show that there is a demand between all four legs of the intersection, so closing any movements at the intersection(s) could face opposition from residents. The alignment of the roadways also makes it difficult to consolidate the intersections into one four-leg intersection. A review of potential improvement options indicated that realigning the approaches to form two offset T-intersections or shifting westbound Miette Avenue south to form a four-leg intersection may help define the right-of-way at the intersection. However, given the costs and property impacts involved, a solution would need to be developed in consultation with the Town and the public.

If it is decided that conceptual change to the intersection is not desired, there are some improvements that could be made to improve the existing configuration. Curb extensions would help delineate the travel paths and would also address some of the issues discussed in the following sections. Lower cost pavement marking improvements, such as white edge lines and hatched islands could be used as a short-term improvement.

Issue 2: Lack of Defined Pedestrian Crossings

Issue Description

Related to Issue #1, the intersection configuration creates a challenging environment for pedestrians. There are sidewalks on both sides of all three roadways. However, there are no marked crosswalks at the intersection. There are some wheelchair ramps, but they are not properly aligned.

Due to the intersection configuration it is difficult for pedestrians to know where to cross and the path to travel for their intended destination. It is likewise difficult for motorists to anticipate where pedestrians may come into conflict. The intersection design and wide road cross-sections create long travel paths for pedestrians, increasing their exposure to traffic.

Issue Photo(s)

Improvement Suggestions

Marked crosswalks (parallel lines) should be provided across Pine Avenue, Miette Avenue and two across Bonhomme Street on the far sides of the intersections. The existing wheelchair ramps are poorly located and aligned for where the crosswalks should ideally be aligned. Furthermore, there is no accessibility for wheelchairs or other wheeled users across the Miette Avenue. An accessible path should be provided through the median. Until such a path is provided, a painted crosswalk should not be provided as the crossing is inadequate. Pedestrians would be encouraged to circle around across Bonhomme Street.

In the longer-term, intersection reconfiguration or curb extensions (as discussed in Issue #1) would reduce pedestrian crossing distances and increase pedestrian visibility. Given the cost of these improvements, a long-term plan, developed in consultation with the Town and stakeholders, should be developed to reduce future throw-away costs and stage construction.

Issue 3: Wide Streets May Result in Poor Speed Compliance

Issue Description

Bonhomme Street and Pine Avenue have wide (14.5m) pavement widths as does Miette Avenue with 8m per direction. Even with on-street parking, the large cross-sections encourage faster speeds as motorists likely perceive a lack of conflicts. Poor speed limit compliance may occur as a result, particularly with the 30 km/h speed limits, which is slower than most residential streets in Alberta.

Issue Photo(s)

Improvement Suggestions

All roadways could theoretically be narrowed. The Transportation Association of Canada (TAC) *Geometric Design Guide for Canadian Roads* (2017) recommends a lower limit of 3.0m for travel lanes and 2.4m for on-street parking. On Bonhomme Street and Pine Avenue, that would result in a 10.8m wide road instead of 14.4m.

The extra 3.6m could be reallocated to wider sidewalks, grass boulevards, or cycle lanes. Sidewalk and boulevard improvements would require expensive road reconstruction, but could be implemented in conjunction with other road maintenance projects to reduce costs. As an interim option, road narrowing could take place at intersections (where practical) via curb bulb-outs. Bulb-outs would also have additional benefits related to pedestrian crossings (see Issue 2).

As an alternative, bike lanes could be provided on both sides of the road via pavement markings only as the recommended lower limit is 1.8m wide. The cost of the bike lanes would depend on the overall length and the degree of pavement markings used, such as coloured markings at conflict points. It should be noted that curb bulb-outs would obstruct bicycle lanes, so the longer-term plans for bicycle facilities along the corridors should be considered prior to the construction of any bulb-outs.

Issue 4: Inconspicuous Stop Control on Westbound Miette Avenue

Issue Description

Motorists may be unaware of the stop control on westbound Miette Avenue approaching Bonhomme Street for the following reasons:

- Westbound alignment gives the impression that Miette Avenue is the through (uncontrolled) roadway.
- Right-hand stop sign is obstructed by a tree and fence.
- Left-hand (median) stop sign is camouflaged by houses in the background.

As a result, motorists may fail to stop, or stop suddenly, at the intersection creating the risk of right-angle and rear-end collisions respectively.

Issue Photo(s)

Improvement Suggestions

Longer-term intersection reconfiguration or curb extensions could mitigate this issue. Realignment of the approach would also improve sight lines by increasing the intersection angle. In the interim, the following improvements could be implemented:

- Relocate right-hand stop sign to the left of the tree/fence so it is visible on the approach.
- Provide cross-walk pavement markings to emphasis the need to stop (also improves pedestrian crossings as per Issue #2, but median crossing required).
- Increase size of median stop sign.

Issue 5: Various Sign Related Issues

Issue Description

A few sign related issues were identified and a summary is provided below:

- There is very little wayfinding signage at the intersection. There are street name signs above the stop sings, but they are inconspicuous due to obstruction by trees and small letter text. There are no other signs to help guide motorists.
- On northbound Pine Avenue there is a 30km/h maximum speed sign at the corner of Tonquin Street followed immediately by a 50km/h maximum speed sign 30m to the north. It is assumed the 50 km/h speed sign was replaced by the 30 km/h sign but was yet to be removed at the time of the site visit. The 30 km/h sign is located too close to an intersection and could be overlooked and the 50km/h sign is at the very end of Pine Avenue so serves little purpose.
- The stop sign on northbound Pine Avenue was not visible on the approach due to adjacent overgrown trees.

Issue Photo(s)

Improvement Suggestions

The following suggestions are proposed to mitigate the signage issues.

- Provide additional wayfinding signage at the intersection, such as street name signs that are legible and in easy to identify locations. *Estimated Cost: $2,500*
- The posted speed limit on Pine Avenue should only be posted west of Connaught Drive and possibly west of Geike Street. *Estimated Cost: $1,000*
- Trim overgrown trees adjacent to stop sign on northbound Pine Avenue.

Appendix F:

Pedestrian and Signal Warrants

City of Calgary Canadian Matrix Traffic Signal Warrant Analysis

Main Street (name)	Connaught Drive	Direction (EW or NS)	NS
Side Street (name)	Miette Avenue	Direction (EW or NS)	EW
Quadrant / Int #		Comments	Existing volumes based on count data. For analysis, AM, PM, and off peak hour traffic volumes duplicated for second hour of peak interval period.
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET		

Road Authority:	City of Calgary
City:	Calgary
Analysis Date:	2018 Jul 11, Wed
Count Date:	2017 Jul 06, Thu
Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Connaught Drive	NB	1		1		1		430	2
Connaught Drive	SB	1		1		1		5,000	2
Miette Avenue	WB				1				
Miette Avenue	EB		1				1		
Are the Miette Avenue WB right turns significantly impeded by through movements? (y/n)							n		
							n		

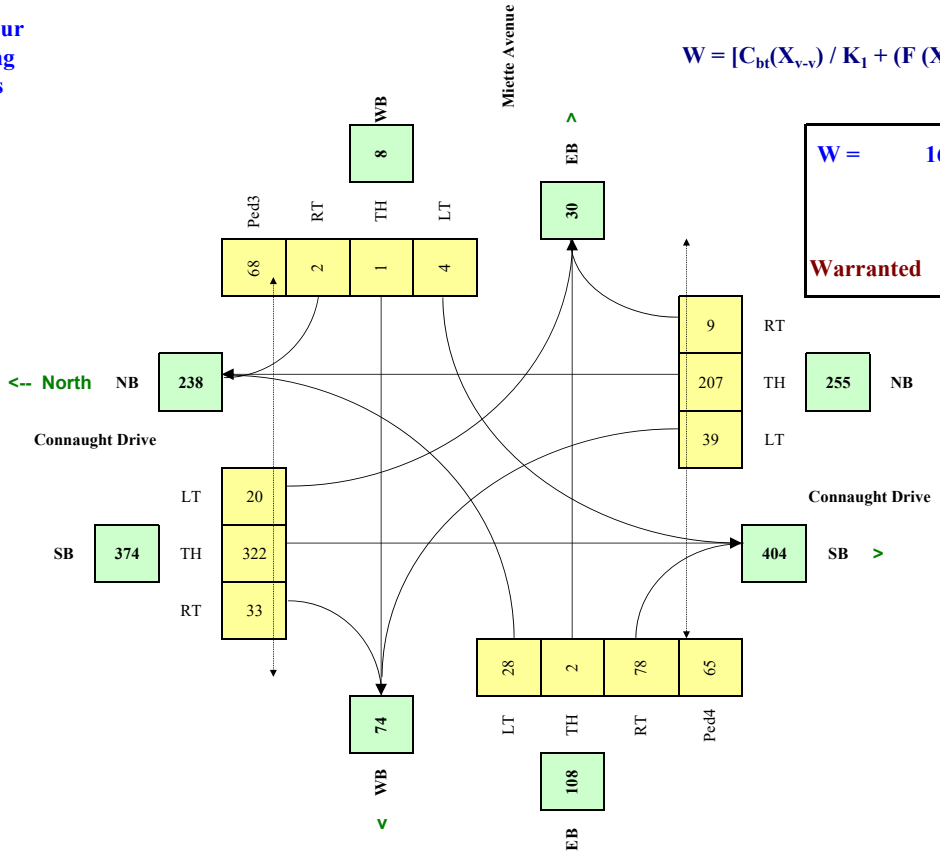
Demographics		
Elem. School/Mobility Challenged	(y/n)	y
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	5,000
Central Business District	(y/n)	y

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Connaught Drive	NS	50	12.5%	n	2.0
Miette Avenue	EW	50	17.0%	n	2.0

Set Peak Hours

Traffic Input	NB			SB			WB			EB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side
9:45 - 10:45	44	157	6	20	312	46	4	1	2	27	3	79	161	43	35	48
10:45 - 11:45	44	157	6	20	312	46	4	1	2	27	3	79	161	43	35	48
13:45 - 14:45	27	212	5	19	322	11	3	0	0	24	1	73	238	67	68	25
14:45 - 15:45	27	212	5	19	322	11	3	0	0	24	1	73	238	67	68	25
4:15 - 5:15	47	252	16	20	331	42	6	3	5	34	1	81	305	125	102	122
5:15 - 6:15	47	252	16	20	331	42	6	3	5	34	1	81	305	125	102	122
Total (6-hour peak)	236	1,242	54	118	1,930	198	26	8	14	170	10	466	1,408	470	410	390
Average (6-hour peak)	39	207	9	20	322	33	4	1	2	28	2	78	235	78	68	65

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F\,(X_{v\text{-}p})\,L) / K_2] \times C_i$$

W =	163	28	135
		Veh	Ped

Warranted

RESET SHEET

Roadway, Vehicle and Pedestrian Factors		Range			
		Min	Low Cutoff	Max	High Cutoff
C_i	**Roadway Char Factor**	**0.90**		**1.59**	
C_s	Int SpacingFactor	0.90	200	1.05	isolated
C_{mt}	MainStTruckFactor	1.00	5%	1.15	20%
C_v	SpeedFactor	1.00	60	1.10	80
C_p	PopDemoFactor	1.00	250,000	1.20	10,000
C_{bt}	**Side Bus/Truck Factor**	**1.00**		**1.05**	
C_{sb}	SideStBusFactor	1.00	no	1.05	yes
C_{st}	SideStTruckFactor	1.00	10%	1.05	10%
F	**Ped DemoFactor**	**1.00**		**1.20**	
	Elementary School	1.00	no	1.20	yes
	Seniors Complex	1.00	no	1.10	yes
	Path to School	1.00	no	1.10	yes
RT_{rd}	**RT Reduction Factors**				
RT_{lane}	Basic Saturation Flow	**LT**	**Thru**	**RT**	
		1,650	1,800	1,500	
	Gap Acceptance Coeff	1 Lane	2 Lanes	3 Lanes	4 Lanes
		1.000	0.625	0.510	0.440
$RT_{v/c}$	RT Factor	Min reduct	high cut	Max Reduc	low cut
	- merging traffic/capacity	1.000	1,100	0.000	0
$RT_{platoon}$	RT Factor	Min reduct		Max Reduct	
	- platoon factor	1.000	0	0.690	1,000
K_1	Veh-Veh Denominator	-10.0	200.0	1,400.0	2,150
K_2	Veh-Ped Denominator	-30.0	1,150.0	-150.0	4,850

25.0

X_{v-v}	**44.669**	(MainStVeh-Veh#)	C_s	1.000	(Int SpacingFactor)
X_{v-p}	**84.655**	(MainStVeh-Ped#)	C_{mt}	1.075	(MainStTruckFactor)
K_1	**2,150**	(Veh-Veh const)	C_v	1.000	(SpeedFactor)
K_2	**4,850**	(Veh-Ped const)	C_p	1.200	(PopDemoFactor)
L_t	**5.0**	TotalMainStLanes	C_{sb}	1.000	(SideStBusFactor)
F	**1.200**		C_{st}	1.050	(SideStTruckFactor)
C_i	**1.290**	(product of roadway factors)	L_p	**5.0**	PedestrianExposure
C_{bt}	**1.050**	(maximum of Csb,Cst)	L_v	**5.0**	VehicleExposure

$X_{v-v\ raw}$	**65,131**	(Raw Veh-Veh conflict sum)	$X_{v-v\ mr}$	**35,897**	(Veh-Veh conflict - median refuge)
$X_{v-p\ raw}$	**84,655**	(Raw Veh-Ped conflict sum)	$X_{v-p\ mr}$	**32,837**	(Veh-Ped conflict - median refuge)
$X_{v-v\ rt}$	**44,669**	(Veh-Veh conflict sum with RT reduction)			
$X_{v-p\ rt}$	**84,655**	(Veh-Ped conflict sum with RT reduction)			

Curb Lane Calc	Opposing lane Coeff	Opposing Th volume	LT Sat Flow adjust	LT Sat Flow	LT Factor	RT Factor	Avg Equiv Thru Flow	Avg Equiv Flow / lane	Curb Lane Flow
NB	0.625	322	0.773	1,276	1.411	1.200	218	109	98
SB	0.625	207	0.848	1,399	1.287	1.200	361	181	141

RT Reduct Calc	Main St Curb Lane	Platoon Factor	Adjusted Curb Lane	RT_{rd}
NB	98	0.823	81	**0.076**
SB	141	1.000	141	**0.199**

C_{bt} 1.05 if the side street either is a bus route, or has more than 10% trucks, otherwise = 1.00.
(it is assumed that these two factors only affect the side street vehicles trying to cross the main street, not the pedestrians)

C_i the product of the other 4 geographic factors
(Cs = intersection spacing, Cmt = main street truck, Cv = Speed, Cp = Population)

X_{v-v} the sum of the individual cross products of the actual vehicle-vehicle conflicting movements
(adjusted by RT reduction factor and vehicle refuge factor)

X_{v-p} the sum of the individual cross products of the actual vehicle-pedestrian conflicting movements
(adjusted by pedestrian refuge factor)

F Pedestrian demographic factor

L total number of lanes crossed by the pedestrian or vehicles on the main street

L_p highest number of lanes crossed by the pedestrian, in one movement to pedestrian refuge

L_v highest number of lanes crossed by the vehicle, in one movement to vehicle refuge

K_1 Vehicle - Vehicle denominator constant

K_2 Vehicle - Pedestrian denominator constant

Exposure

			NB			SB			WB			EB				Ped3 EW N Side	Ped4 EW S Side	V-P	V-V
			LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT					
			39	207	9	20	322	33	4	1	2	28	2	78		68	65		
NB	LT	39	x	x	x	x	12,652	1,298	170	52	x	1,114	66	x	15,353	x	2,557	2,557	15,353
	Th	207	x	x	x	4,071	x	x	897	276	483	5,865	345	x	11,937	14,145	13,455	27,600	11,937
	RT	9	x	x	x	177	x	x	x	x	x	x	15	x	192	x	585	585	192
SB	LT	20	x	4,071	177	x	x	x	85	26	x	557	33	x	701	1,344	x	1,344	701
	Th	322	12,652	x	x	x	x	x	1,394	429	x	9,114	536	24,983	36,456	21,981	20,908	42,889	36,456
	RT	33	1,298	x	x	x	x	x	x	44	x	x	x	x	44	2,255	x	2,255	44
WB	LT	4	170	897	x	85	1,394	x	x	x	x	x	7	337	344	x	282	282	344
	Th	1	52	276	x	26	429	44	x	x	x	38	x	x	38	x	x	0	38
	RT	2	x	483	x	x	x	x	x	x	x	66	x	x	66	159	x	159	66
EB	LT	28	1,114	5,865	x	557	9,114	x	x	38	66	x	x	x	0	1,936	x	1,936	0
	Th	2	66	345	15	33	536	x	7	x	x	x	x	x	0	x	x	0	0
	RT	78	x	x	x	x	24,983	x	337	x	x	x	x	x	0	x	5,048	5,048	0
			65,131	15,353	11,937	192	701	36,456	44	344	38	66	0	0	0	65,131			**84,655**	**65,131**
EW	N Side	68	x	14,145	x	1,344	21,981	2,255	x	x	159	1,936	x	x	41,820	x	x		
EW	S Side	65	2,557	13,455	585	x	20,908	x	282	x	x	x	x	5,048	42,835	x	x		
															84,655				

SSRT Adjust (MS lanes)

			NB			SB			WB			EB				Ped3 EW N Side	Ped4 EW S Side
			LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT			
			39	207	9	20	322	33	4	1	2	28	2	78		68	65
NB	LT	39	x	x	x	x	1.000	1.000	1.000	1.000	x	1.000	1.000	x		x	1.000
	Th	207	x	x	x	1.000	x	x	1.000	1.000	0.076	1.000	1.000	x		1.000	1.000
	RT	9	x	x	x	1.000	x	x	x	x	x	x	1.000	x		x	1.000
SB	LT	20	x	1.000	1.000	x	x	x	1.000	1.000	x	1.000	1.000	x		1.000	x
	Th	322	1.000	x	x	x	x	x	1.000	1.000	x	1.000	1.000	0.199		1.000	1.000
	RT	33	1.000	x	x	x	x	x	x	1.000	x	x	x	x		1.000	x
WB	LT	4	1.000	1.000	x	1.000	1.000	x	x	x	x	x	1.000	1.000		x	1.000
	Th	1	1.000	1.000	x	1.000	1.000	1.000	x	x	x	1.000	x	x		x	x
	RT	2	x	0.076	x	x	x	x	x	x	x	1.000	x	x		1.000	x
EB	LT	28	1.000	1.000	x	1.000	1.000	x	x	1.000	1.000	x	x	x		1.000	x
	Th	2	1.000	1.000	1.000	1.000	1.000	x	1.000	x	x	x	x	x		x	x
	RT	78	x	x	x	x	0.199	x	1.000	x	x	x	x	x		x	1.000
EW	N Side	68	x	1.000	x	1.000	1.000	1.000	x	x	1.000	1.000	x	x		x	x
EW	S Side	65	1.000	1.000	1.000	x	1.000	x	1.000	x	x	x	x	1.000		x	x

Adjusted Matrix

			NB			SB			WB			EB				Ped3 EW N Side	Ped4 EW S Side	V-P	V-V
			LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT					
			39	207	9	20	322	33	4	1	2	28	2	78		68	65		
NB	LT	39	x	x	x	x	12,652	1,298	170	52	x	1,114	66	x	15,353	x	2,557	2,557	15,353
	Th	207	x	x	x	4,071	x	x	897	276	36	5,865	345	x	11,490	14,145	13,455	27,600	11,490
	RT	9	x	x	x	177	x	x	x	x	x	x	15	x	192	x	585	585	192
SB	LT	20	x	4,071	177	x	x	x	85	26	x	557	33	x	701	1,344	x	1,344	701
	Th	322	12,652	x	x	x	x	x	1,394	429	x	9,114	536	4,967	16,440	21,981	20,908	42,889	16,440
	RT	33	1,298	x	x	x	x	x	x	44	x	x	x	x	44	2,255	x	2,255	44
WB	LT	4	170	897	x	85	1,394	x	x	x	x	x	7	337	344	x	282	282	344
	Th	1	52	276	x	26	429	44	x	x	x	38	x	x	38	x	x		38
	RT	2	x	36	x	x	x	x	x	x	x	66	x	x	66	159	x	159	66
EB	LT	28	1,114	5,865	x	557	9,114	x	x	38	66	x	x	x	0	1,936	x	1,936	0
	Th	2	66	345	15	33	536	x	7	x	x	x	x	x	0	x	x		0
	RT	78	x	x	x	x	4,967	x	337	x	x	x	x	x	0	x	5,048	5,048	0
			15,353	11,490	192	701	16,440	44	344	38	66	0	0	0	44,669			**84,655**	**44,669**
EW	N Side	68	x	14,145	x	1,344	21,981	2,255	x	x	159	1,936	x	x	41,820	x	x		
EW	S Side	65	2,557	13,455	585	x	20,908	x	282	x	x	x	x	5,048	42,835	x	x		
															84,655				

Median Refuge

			NB			SB			WB			EB				Ped3 EW N Side	Ped4 EW S Side	WB V-P refuge	EB V-P refuge
			LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT					
			39	207	9	20	322	33	4	1	2	28	2	78		68	65		
NB	LT	39	x	x	x	*x*	*12,652*	*1,298*	**170**	**52**	**x**	**1,114**	***66***	**x**		x	2,557	**2,557**	
	Th	207	x	x	x	*4,071*	*x*	*x*	**897**	**276**	**36**	**5,865**	**345**	**x**		14,145	13,455	**27,600**	
	RT	9	x	x	x	*177*	*x*	*x*	**x**	**x**	**x**	**x**	**15**	**x**		x	585	**585**	
SB	LT	20	x	4,071	177	x	x	x	**85**	*26*	x	**557**	**33**	x		1,344	x		**1,344**
	Th	322	12,652	x	x	x	x	x	**1,394**	**429**	x	**9,114**	**536**	**4,967**		21,981	20,908		**42,889**
	RT	33	1,298	x	x	x	x	x	x	**44**	x	x	x	x		2,255	x		**2,255**
WB	LT	4	170	897	x	85	1,394	x	x	x	x	*x*	*7*	*337*		x	282		**282**
	Th	1	52	276	x	26	429	44	**x**	**x**	**x**	*38*	*x*	*x*		x	x		
	RT	2	x	36	x	x	x	x	x	x	x	*66*	*x*	*x*		159	x	**159**	
EB	LT	28	1,114	5,865	x	557	9,114	x	x	38	66	x	x	x		1,936	x	**1,936**	
	Th	2	66	345	15	33	536	x	7	x	x	x	x	x		x	x		
	RT	78	x	x	x	x	4,967	x	337	x	x	x	x	x		x	5,048		**5,048**
			15,353	11,490	192	701	16,440	44	344	38	66	0	0	0				**32,837**	**51,818**
EW	N Side	68	x	14,145	x	1,344	21,981	2,255	x	x	159	1,936	x	x					
EW	S Side	65	2,557	13,455	585	x	20,908	x	282	x	x	x	x	5,048					
																		V-V refuge	**V-P refuge**
NB	V-V refuge		**8,837**	*18,198*	*448*	*26*									**27,509**			**35,897**	**51,818**
SB	V-V refuge		**17,185**	*18,198*	*448*	***66***									**35,897**				

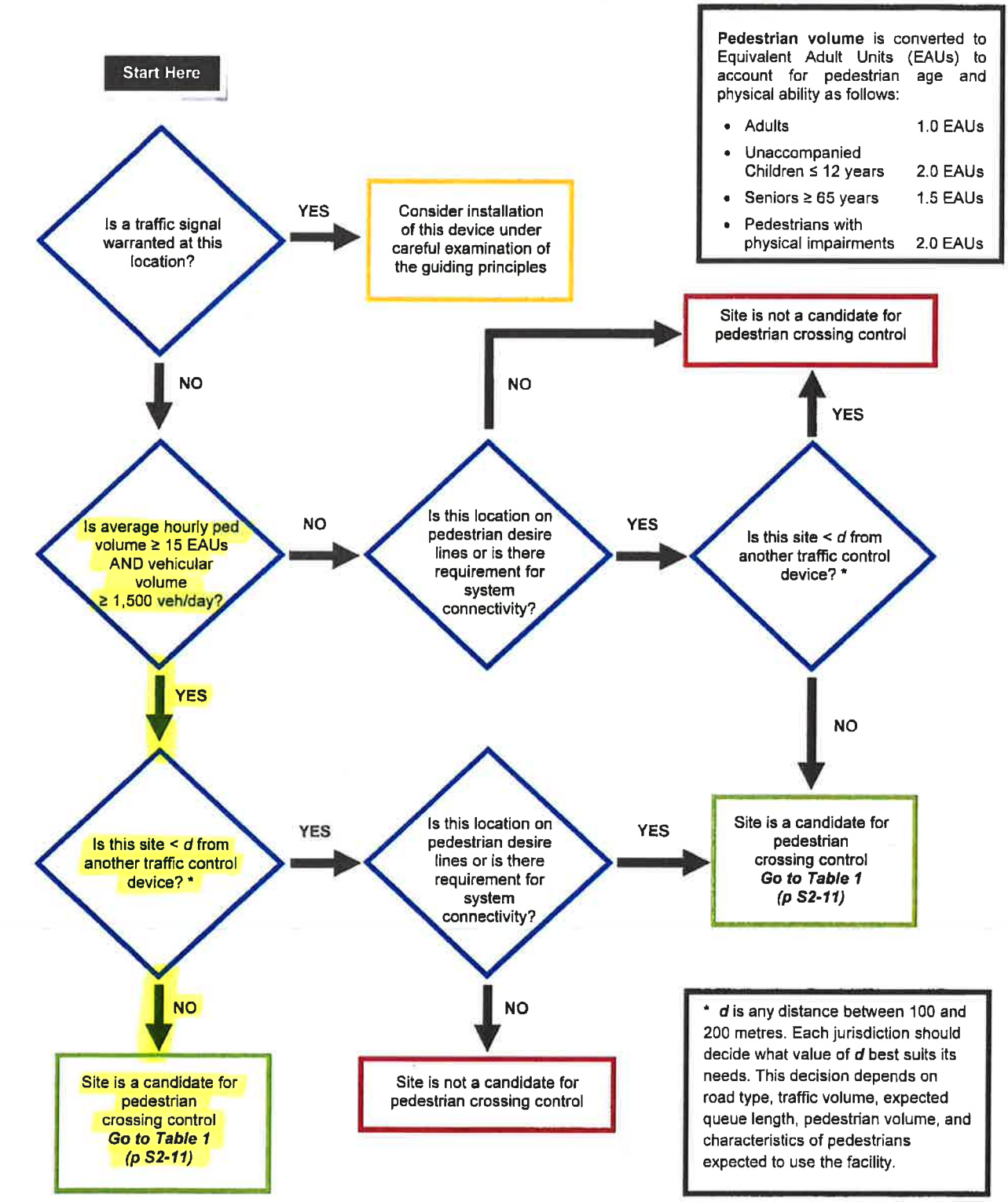


Figure 6: Decision Support Tool – Preliminary assessment.

Table 1: Decision Support Tool – Treatment selection matrix.

Use this table ONLY if instructed to do so in Figure 6 (p S2-8)

AVERAGE DAILY TRAFFIC	SPEED LIMIT (km/h)	TOTAL NUMBER OF LANES (includes all types of lanes^)			
		1 or 2 lanes	3 lanes	2 or 3 lanes/direction w/ raised refuge	2 lanes/direction w/o raised refuge
1,500 < ADT ≤ 4,500	≤50	GM1	GM1	GM1	GM2
	60	GM2	GM2	OF	OF
	70	GM2	GM2	OF	OF
4,500 < ADT ≤ 9,000	≤50	GM1	GM1	GM1	GM2
	60	GM2	GM2	OF	TS
	70	OF	OF	OF	TS
9,000 < ADT ≤ 12,000	≤50	GM1	GM2	OF	OF
	60	OF	OF	OF	TS
	70	OF	OF	TS	TS
12,000 < ADT ≤ 15,000	≤50	GM2	OF	OF	OF
	60	OF	OF	TS	TS
	70	OF	TS	TS	TS
>15,000	≤50	OF	OF	OF	TS
	60	OF	TS	TS	TS
	70	OF	TS	TS	TS

^ The total number of lanes is representative of crossing distance. The width of these lanes is assumed to be between 3.0 and 3.7 m according to TAC *Geometric Design Guide for Canadian Roads* (Table 2.2.2.3). A cross-sectional feature (e.g., a bike lane) that extends the average crossing distance per lane beyond this range of lane widths may need to be considered as an additional lane in this table.

- A **TS treatment system** should be selected: (1) for cross sections with GREATER THAN 6 lanes where a raised refuge is present; (2) for cross sections with GREATER THAN 4 lanes where no raised refuge is present; (3) for speeds GREATER THAN 70 km/h; and (4) in cases where the table recommends an OF system but these systems are not used in the jurisdiction.
- Installation of an **OF treatment system** can negatively impact traffic operations when there is high pedestrian demand and vehicular traffic volumes are greater than 12,000 vehicles per day. As a general rule, pedestrian demand may be considered high when the volume of crossing pedestrians exceeds 100 EAUs per hour, averaged over a seven-hour continuous counting period. In these cases, **replace the OF system with a TS system**.
- If this table recommends a TS or OF system AND the application environment is a roundabout, **select a GM2 system** instead for installation. OF or TS systems should not be installed at roundabouts.
- Always check stopping sight distance at the site as per the *Geometric Design Guide for Canadian Roads*, and if it is insufficient, create it by applying available tools.

GM1	GM2	OF	TS
Go to Table 3A Page S2-18	Go to Table 3B Page S2-19	Go to Table 3C Page S2-20	Go to Table 3D (half) or 3E (full signal) Page S2-21

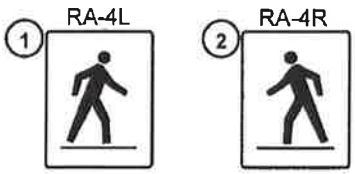
Table 3B: Components for crosswalk with overhead-mounted signs treatment system.

SYSTEM	RECOMMENDED COMPONENTS	DESIRABLE COMPONENTS	OPTIONAL COMPONENTS
GM2 Crosswalk with overhead-mounted signs	**GENERAL CASE** • Overhead-mounted signs (RA-4) on both sides of the road • Twin Parallel Line Crosswalk markings • Advanced warning sign (WC-2) where visibility is limited • Stopping prohibition for a minimum of 15 m on each approach to the crossing, and 10 m following the crossing • Passing restrictions on single lane approaches • Lane change prohibition on multiple lane approaches using solid white lines (recommended length of solid line depends on approach speed – use 30 m for 50 km/h speed limit) **See FIGURES 13 to 16** (Pages S2-32 to S2-35)	**GENERAL CASE** • Zebra crosswalk markings • Advance Yield to Pedestrians line on multiple lane approaches • Raised refuge island for road cross-sections with more than two lanes and two-directional traffic • Stopping prohibition for a minimum of 30 m on each approach to the crossing, and 15 m following the crossing • Additional side-mounted signs for road cross-sections with more than two lanes (RA-4)	**GENERAL CASE** • Crossing guards • Additional side-mounted signs for road cross-sections with two lanes (RA-4)
	SCHOOL AREAS • Overhead-mounted signs (RA-3) on both sides of the road • Zebra Crosswalk markings • Advanced warning sign (WC-16) where visibility is limited • Stopping prohibition for a minimum of 15 m on each approach to the crossing, and 10 m following the crossing • Passing restrictions on single lane approaches • Lane change prohibition on multiple lane approaches as in GENERAL CASE above **See FIGURES 17 and 18** (Pages S2-36 and S2-37)	**SCHOOL AREAS** • Advance Yield to Pedestrians line on multiple lane approaches • Raised refuge island for road cross-sections with more than two lanes and two-directional traffic • Stopping prohibition for a minimum of 30 m on each approach to the crossing, and 15 m following the crossing • Additional side-mounted signs for road cross-sections with more than two lanes (RA-3)	**SCHOOL AREAS** • In-Street School Crosswalk sign • Crossing guards • Additional side-mounted signs for road cross-sections with two lanes (RA-3)

Note 1: The GENERAL CASE applies to every situation other than school areas.

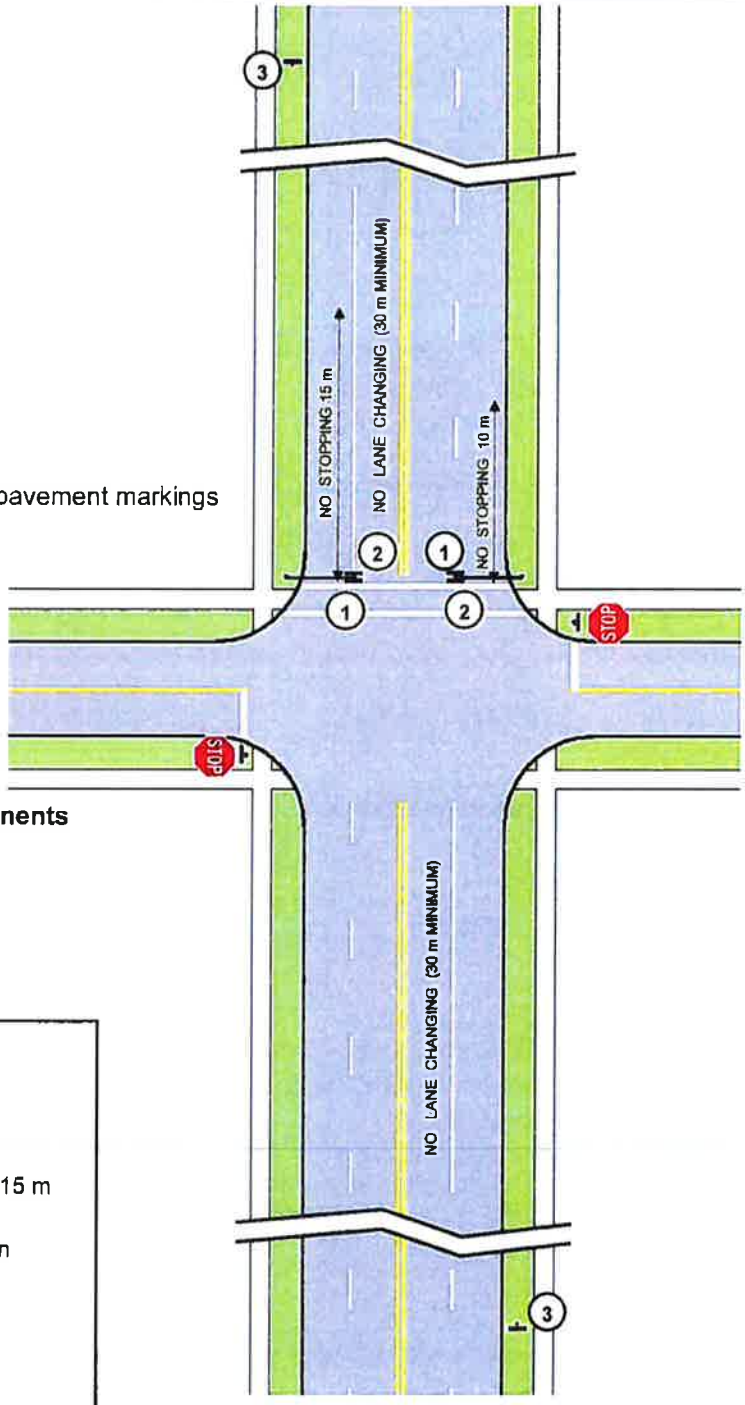
Note 2: If a practitioner determines that a crossing outside the designated school area is influenced by school activities, a school area crossing treatment may be applied.

Note 3: Advance Yield to Pedestrians line markings should not be used in advance of crosswalks that cross an approach to or departure from a roundabout.



(where visibility is limited)

Sign placement should be in advance of pavement markings where practical



Layout shows recommended components

Ensure provision of:

- Adequate sight distance
- Artificial lighting
- Curb cuts and ramps
- Sidewalks and crosswalk access

Desirable components (not shown):

- Zebra Crosswalk markings
- Advance Yield to Pedestrians line
- Raised refuge
- No stopping 30 m prior to crossing and 15 m following the crossing
- Additional side-mounted signs (RA-4) on overhead pole

Optional components (not shown):

- Crossing guards

Figure 15: GM2 GENERAL CASE - Crosswalk with overhead-mounted signs Multi-lane, 2-way without refuge.

Appendix G:
Transit Case Studies and Literature Review

EXAMPLE CASE STUDIES / SMALL COMMUNITY TRANSIT SERVICES

Hinton – Fixed Route/Service Transit

The Town of Hinton committed to undertake an 18-month pilot transit project in 2007. The intent of this pilot project was to address a gap in transportation service available to low-income individuals and families who did not fit the warranting criteria for Handibus service. Specifically targeting low-income families, seniors and youths, the project focused on improving access to local employment, shopping, health and education services, and recreation in Hinton in a manner that would not compete with Hinton's existing Handibus service.

The bus operated on a 25 km loop that took 1-hour to complete, providing service from Monday through Saturday. Feedback throughout the pilot identified that the service was viewed as empowering to its riders, increasing their quality of life by increasing their mobility and freedom to support daily activities.

The program initially received Green Trip funding to build accompanying infrastructure, such as shelters and benches, and to provide ongoing advertising revenue supporting the service. The 2013 reported annual ridership as 24,846 trips, with expenses of $262,101 and total revenue was $76,681 (including $65,308 from fares). This trial stands as a solid Canadian case study that transit service in smaller communities may be viable and cost-effective.

Peace River – Taxi Program and Public Transit Services

The Town of Peace River initiated a pilot **Public Transit Program** in 2005 using a single 16-seat bus. Running until 2011, the service averaged 10,871 rides per year and a full-service loop required 1 hour 17 minutes to complete. Ridership amounted to roughly 2 percent of the town's population and was popular with lower income families and individuals, with the bus often reaching capacity during peak hours. Despite its popularity, the service was cancelled I 2001 due to the high cost of operation and lower than anticipated revenues.

The Town of Peace River began the **Taxi-Pass Program** in 2012 to serve clients who met the following criteria:

- A registered student at the Northern Lakes College
- A combined family income below $25,000 or individual income below $15,000
- Seniors over 65 years old
- Assumed Income for the Severely Handicapped (AISH) recipient
- A client of the Peace River Regional Women's Shelter
- A medical disability

There are three taxi service providers in Peace River who honour this program and approved clients were provided with a pass that allows the user up to 40 tickets every four weeks (individual booklets of 20 tickets are available for $15.00). Provision of this service cost the Town $98,167 in 2012, with total revenues of $11,224, resulting in a program deficit of $86,943 for that year. Though revenues increased in 2013, operational costs also increased and the overall program deficit rose to $132,011 in 2013.

Though community feedback has identified some concerns with service affordability, accessibility and complexity of the ticketing system, the service saw steady demand with over 13,801 rides provided in 2012 and 20,589 rides provided in 2013. The Taxi-Pass Program is still operational and has highlighted a local market need for accessible transportation options in Peace River.

Mayerthorpe – Volunteer Drivers, Vanpool, Subsidized Taxi

Town of Mayerthorpe provides a pool of drivers for the following transportation services for seniors:

- West End Bus Excursion Program
- Accessible transportation service for residents of the Pleasant View Lodge Auxiliary and Extendicare for medical appointments

West End Bus Excursion Program

West End Bus Excursion Program is a partnership between Lac Ste. Anne County, the Town of Mayerthorpe, Woodlands County and the West End Bus Society (the Group) to provide subsidized recreational trips for people over the age of 50. Originally operating with one Sprinter van that can carry up to 12-15 people, this program recently added a second van to accommodate growing demand. Drivers for the program are employed by the Town of Mayerthorpe and fleet is owned by Lac Ste Anne County. There are currently no fleet storage or maintenance facilities and both vehicles are stored in different locations, pending available space.

A total of 65 trips were offered in 2014, but some were canceled when registration did not meet the minimum threshold, resulting in 49 trips being provided that served 459 riders. Similarly, 65 trips were offered in 2015, of which 49 were successfully completed, serving 450 riders. A fully-accessible minivan is provided by the Group for residents of Pleasant View Lodge Auxiliary and Extendicare for medical appointments. This vehicle was purchased in the summer of 2015 and ridership information is not yet available.

Senior Public Taxi

The senior public taxi service operates with the help of a local driver who provides weekly rides within Mayerthorpe on Tuesdays and Fridays from 9 a.m. to 4 p.m. Riders are from Pleasantview Lodge, High View Haven, the Manors and/or live independently in Mayerthorpe. Approximately 20-30 people use this service regularly for personal appointments and to run errands. An average of 17 to 18 trips are provided each day and service is available year-round.

Volunteer Driver Program

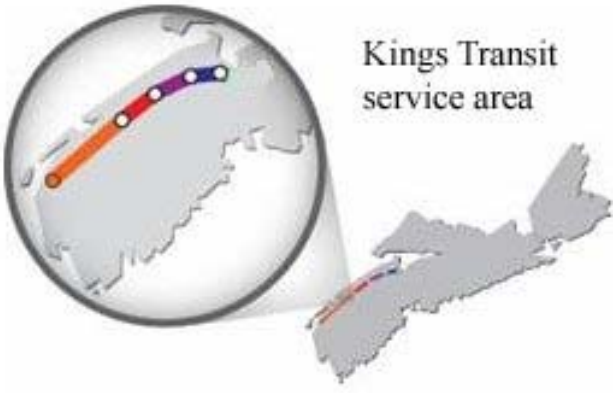
The volunteer driver program has two active drivers who provide rides to inter-municipal locations, primarily for medical purposes. Approximately 36 rides were provided by the volunteer program from January 1, 2015 to the end of November 2015, with most rides starting in Mayerthorpe and ending in Edmonton, Barrhead or Whitecourt. Volunteer drivers are reimbursed for each trip at the following rates:

- Mayerthorpe to Whitecourt = $30
- Mayerthorpe to Barrhead = $40
- Mayerthorpe to Edmonton = $80

Kings Transit – Intermunicipal Service

The Canadian Urban Transit Association (CUTA) suggests that partnerships with neighbouring communities may help small rural communities overcome the budgetary and resource challenges of starting a transit service (CUTA 2009). In their report *Developing Sustainable Transit Options for Small Communities*, the Northern Alberta Development Council cautions that purchasing transit services for inter-municipal transit can be less viable in northern Alberta due to the great distances between communities. Both CUTA and NADC profile the County of Kings in Nova Scotia as a successful example of inter-municipal transit partnership, where transit service is provided in two neighbouring counties, shown inset, under contract with Oakville Transit. However, two of the four service partners have recently pulled out of the service agreement due to low ridership and lack of funding support, which will likely impact Kings Transit's ability to delivery service.

Kings Transit Inter-municipal Service Area
(www.kingstransit.ns.ca)



In total, four routes are provided covering almost 200 km of highway six days of the week. Service is provided every two hours, operating from 7:00 a.m. to 7:00 p.m. Monday through Friday and from 9:00 a.m. to 7:00 p.m. on Saturdays. Services were cut in 2014 due to low ridership and high operating costs, resulting in annual ridership dropping from 32,000 to 19,000 annual passengers (CBC Sept 14, 2015). The cost of the Kings Transit systems was borne by four municipal partners (NS Utility Board Review 2015). The Town of Windsor funded 29 percent of the service costs and formally ended their portion of the service agreement as of September 2015 due to the high cost of service (NS Utility Board Review 2015). Following this notice, the Municipality of West Hants, who contributed 48 percent of the service funding, also provided formal notice of service cessation. Cancellation of partnership between Kings Transit and the Town of Windsor and Municipality of West Hants represented a 76 percent reduction in funding for one of the systems' four routes (CBC Sept 30, 2015), which resulted in the cancellation of that route.

Yellowhead County Transit – Intermunicipal Service

A Community Connector bus service (Wildwood Legion) is provided as part of a non-profit door-to-door service operating throughout the County and connecting to various destinations within and outside of the County. The service is jointly funded by fares, the County and local groups, providing service using a single bus that runs from Wildwood Legion on the following limited schedule:

- Thursdays to/from Drayton Valley;
- Every first and last Monday of the month to Edmonton; and
- Wednesdays for 'Grandparents Day' to the seniors' centre in Wildwood.

A *Social Transportation Assessment* was completed for Yellowhead County in 2014 to guide the development of mobility options for rural residents, particularly for seniors, persons with disabilities or low incomes, and tourists. The assessment identified demand for regular and reliable transit service to critical destinations, such as medical services and retail centres, and recommended that the County complete the following actions:

- Develop a mobility services information centre to provide information on all County mobility services and maintain a volunteer ridematching bulletin-board for residents.
- Work with local municipalities such as Hinton, Edson and Wildwood to expand fixed-route and paratransit services around urban areas.

- Establish regular intercity bus service on Highway 16 to provide twice-daily connections from municipalities like Wildwood and Hinton to Edmonton.
- Subsidize taxi fares to provide mobility at times and locations that lack bus service.

Discussions with Yellowhead County indicate that they have identified inter-municipal travel needs for medical purposes and/or for Provincial / low-income services as transportation service priorities in their community. Most medical-related travel is destined for Mayerthorpe, Edmonton or Red Deer, and travel for low-income / Provincial services is often destined for Spruce Grove, Edmonton or Entwistle. While the Community Connector can serve some of these needs, the program's schedule is too restrictive to provide reliable transportation when needed for access to medical and/or Provincial support programs. Therefore, the County is looking into developing a volunteer driver program to address the above travel needs. The County's Council is supportive of this program and the County is currently looking into partnership opportunities with Drayton Valley.

Transportation Association of Canada

Primer on

Design and Implementation of Transit Services in Smaller Communities

Recognizing the impacts of limited transportation choices, these specific transit planning guidelines can help to start, expand and sustain transit services in small communities.

Be adaptable, be collaborative, be informed and be prepared - the major planning directions of these guidelines.

Introduction

Transit plays an essential role in improving the social, economic, and environmental conditions of Canada's cities and communities. While there is greater political attention to serving transit needs in larger urban areas, transit services are increasingly vital for improving the well-being of small communities.

There are unique challenges small and rural Canadian communities face in providing transit services compared to large, more urban areas. The approaches to planning for transit and the range of solutions appropriate for providing transit is broader for small communities compared to larger urban centres.

Recognizing these unique conditions, the purpose of these guidelines is to provide advice and guidance to planning and transportation professionals in planning for transit services in small communities. The guidelines were developed to tailor to a wide range of different stages of a transit service provision in the community:

- starting a new service
- expanding an existing service
- maintaining a service in potential decline

Recognizing the unique characteristics (e.g. land uses, travel patterns, demographics, economic conditions) of small towns and villages, these guidelines are intended to identify the directions and considerations required for planning and implementing new or improved existing transit services for small communities.

These guidelines will be of particular interest to communities with populations under 50,000, but will also be useful to larger municipalities under 100,000 or regions interested in serving a collection of towns and villages.

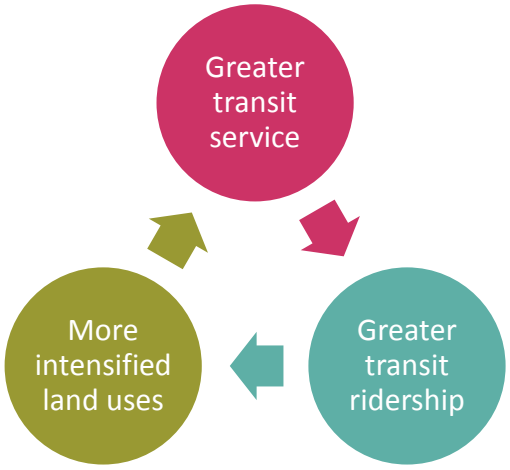
Challenge and opportunities for transit in small communities

Small communities across the country face a number of challenges that reinforce the need for transit services to improve community well-being:

Land use conditions not conducive to conventional transit operation

Small towns and villages typically contain low residential and employment densities and dispersed land uses. These conditions make it less cost effective to operate conventional transit services because buses must travel longer distances to serve a sufficient number of customers. Due to higher costs for providing services, transit services in these communities tend to have lower levels of service, which in turn, makes it difficult to generate ridership. Small communities need to look beyond conventional transit services to meet their transportation needs.

Despite these realities, there are still opportunities to provide transit services in smaller communities by not only scaling the time span of operation and service frequency, but also offering alternative service options such as demand response and flexible route services.



Smaller municipalities may be reluctant to start or maintain the provision of transit services due to possible low levels of ridership. However, it is important to position communities towards a positive feedback cycle towards greater ridership, service, and intensified land uses by fully integrating transportation planning and planning for community development.

Limited transportation choices constrain mobility

Canada's small towns and villages are often faced with limited transportation choices other than the use of personal vehicles. The lack of transportation choices poses significant implications on mobility—mobility not only in the sense of getting from A to B, but also the mobility to improve community vitality and the economy.

Having limited transportation choices will significantly impact our growing senior populations and people with disabilities who rely on transit services to get around, gain enhanced independence, and to actively participate in an inclusive community.

Today's youth—who are less inclined to drive compared to the generation before them—have a stronger appreciation for having transportation choices. Transit service provides them with flexibility to travel on their own accord, and allow them to better pursue education, employment, leisure, and social activities.

Finally, limited transportation choices constrain the potential of the local economy, because it limits the opportunities to match people to labour markets, as well as limiting access to local businesses. As municipalities aggressively aim to retain and grow jobs amid an increasingly competitive and global economy, transit is a part of the suite of solutions to improve employment opportunities for people.

Major transit planning directions for small communities

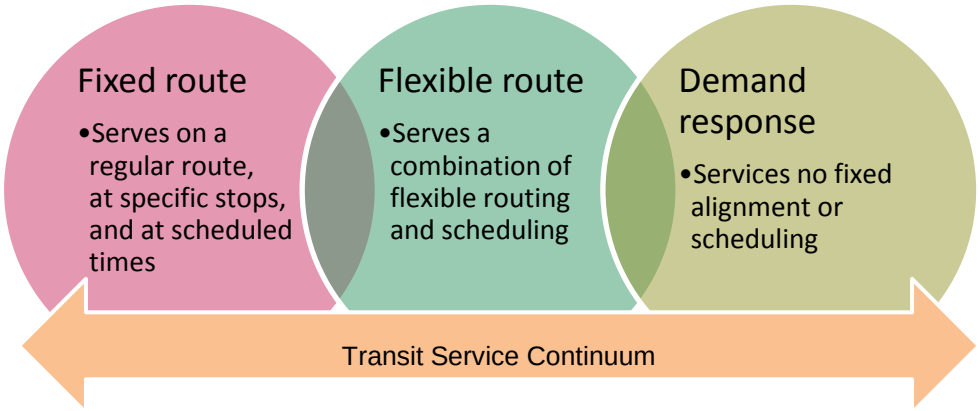
Be adaptable – *Develop services that suit your community's needs*

Planning a transit service is similar to planning any other service or business: there is a need to have a strong understanding of market conditions. That understanding is fundamental to identifying goals and objectives, prioritizing the services to offer, and maximizing the ridership of the transit service.

Developing new or expanded services that suit community needs requires an understanding of the market you are trying to serve. There are three types of market characteristics that require detailed examination.

Types of market characteristics	Key activities and considerations
Demographics (Who should be served?)	▸ Identify the key demographic groups to serve/expand: o Seniors o People with disabilities o Youth and students o Commuters o Tourists
Geography (Where should service be provided?)	▸ Identify the specific size and area to serve/expand: ▸ Highlight the major geographic connections the selected demographic groups would make
Trip purpose (What types of trips should be served?)	▸ Identify service needs for: o Commuting o School o Medical o Shopping o Recreational o Tourism

Transit services are commonly viewed as a service that operates on a fixed route and arrives at specific points along that route at a specified time. However, this is only one of a number of ways transit services can be provided. There are three major service types that sit on a continuum— the appropriateness of these service types depends on the community characteristics and the selected target markets to serve.



Be collaborative – Work closely with your community

Public and stakeholder consultation

Operating a successful transit service requires knowing what the service needs are in the community. Like any product or service, transit needs to be valued and supported by the community, and that requires having opportunities for stakeholders and the public to be part of the transit planning process.

Regardless of the status of transit operations in a community, the consultation process typically follows four stages. The first three stages occur through the course of a planning process, while the fourth-stage process relates to facilitating the ongoing dialogue with citizens and passengers.

STAGE 1: Background and Context	STAGE 2 Assessment of Options	STAGE 3 Confirmation of Recommendations	STAGE 4 Ongoing Monitoring
Present current issues for transit improvements in the community	Present options for the new or improved service, identifying the benefits and costs	Present the assessment leading to the identification of a preferred option	Assess feedback for continuous improvement upon implementation of new/revised service

Different engagement activities may be appropriate depending on the stage of the consultation process. There are a number of different consultation approaches depending on who is to be consulted, how formal the process is, and the communication means used. Organizing public meetings, completing survey research, conducting stakeholder discussion groups, and leading social media and other web-based consultations are some of the more common consultation methods.

Fostering community partnerships

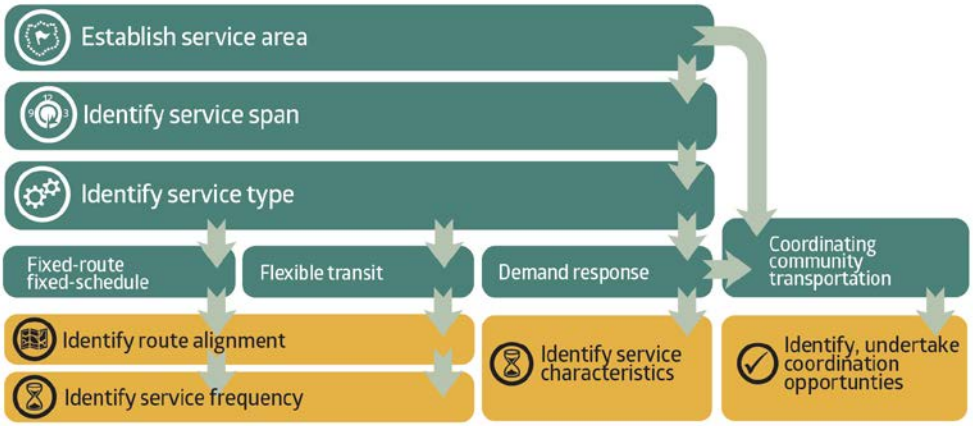
Being collaborative also means fostering partnership opportunities that could benefit the transit service. There are many partnership opportunities to consider as described in the table below.

Partnership areas	Description
Service integration	Integrate services and pool available resources together to assist in improving service and cost effectiveness.
Operations and maintenance	Partner with nearby third-party public or private agencies to operate services and maintain the fleet to capitalize on already established expertise.
Information provision	Work with other nearby transit agencies providers to share planning data and service information with the goal of improving services for everyone.
Customer service	Collaborate in organizing training programs to combine customer service functions to allow for a seamless and consistent passenger experience.

Be informed – *Present an informed case for service changes and improvement*

In the simplest terms, what local officials and public want to know when starting or improving a transit service comes down two main questions: What does the service look like? How much is it going to cost?

Planning and transportation practitioners should be equipped to develop an informed case for any transit service changes. This requires first designing the new or improved service. The following flowchart summarizes the major processes for developing service designs.



Regardless of the type of transit service (fixed route, flexible transit, or demand response), a service design outlines where and when services are provided.

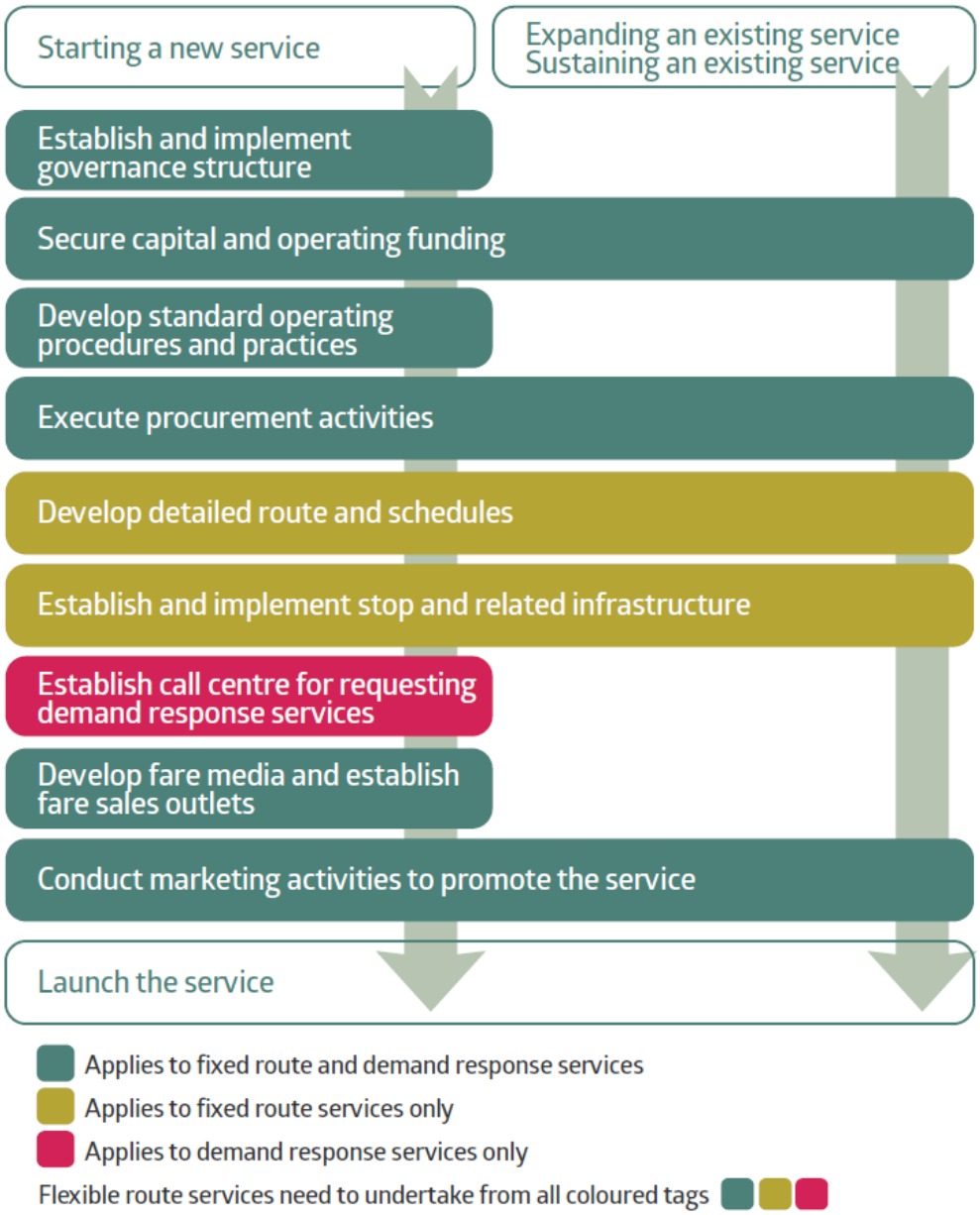
With the service design structure in place, all other analytical components come into place, including estimating revenues and costs associated with the new service or service change. The following outlines the major components for revenues and costs of the planned service.

Account	Account components
Revenue	• Fare revenue (from ridership forecasts and fare assumptions) • Government contributions • Community contributions
Cost	• Operating costs (e.g. fuel, operation, maintenance, administration) • Capital costs (e.g. fleet, infrastructure, garage facility)

Be prepared – *Identify all the activities that need to be completed before implementation*

With the approval to proceed with a service initiation or change, it is important to establish a clear roadmap for implementation. Setting out the specific tasks and timeline targets will be important to enable a successful launch of any service changes and improvements.

The figure below illustrates the common implementation activities that need to be completed prior to launching the service. Agencies starting a new service will need to complete all of the listed activities, while those expanding or sustaining an existing service will typically complete a subset of the checklist. Some of the checklist components will vary depending on the type of service provided (e.g. fixed route, flexible transit, demand response).


Starting a new service
Expanding an existing service
Sustaining an existing service
Establish and implement governance structure
Secure capital and operating funding
Develop standard operating procedures and practices
Execute procurement activities
Develop detailed route and schedules
Establish and implement stop and related infrastructure
Establish call centre for requesting demand response services
Develop fare media and establish fare sales outlets
Conduct marketing activities to promote the service
Launch the service
Applies to fixed route and demand response services
Applies to fixed route services only
Applies to demand response services only
Flexible route services need to undertake from all coloured tags

More Information

This primer is based on the Transportation Association of Canada publication *Design and Implementation of Transit Services: Guidelines for Smaller Communities*, which readers can purchase from TAC's online bookstore at www.tac-atc.ca.

Disclaimer

Every effort has been made to ensure that this primer is accurate and up-to-date. The Transportation Association of Canada assumes no responsibility for errors or omissions. The primer does not reflect a technical or policy position of TAC.

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DEVELOPING SUSTAINABLE TRANSIT OPTIONS FOR SMALL COMMUNITIES

A Summary of Best Practices

Prepared for the Town of Peace River

by the Northern Alberta Development Council (NADC)

Developing Sustainable Transit Options for Small Communities

A SUMMARY OF BEST PRACTICES

TABLE OF CONTENTS

BACKGROUND

Rural areas and small towns across Canada are characterized by a combination of low population densities, large distances within or between communities and limited or no publically available affordable transportation services. Individuals in rural communities with populations under 50,000 have unique travel needs; and the absence of a large, concentrated population shifts the economics under which transit operates.

The following report defines small communities as having a population between 5,000 and 50,000. The report brings together a range of best practices used to develop transit systems in small communities by citing numerous online and academic sources. In addition, the NADC would like to acknowledge the Town of Hinton and the Town of Peace River for providing information on their respective public transit systems.

OPPORTUNITIES AND CHALLENGES

The Canadian Urban Transit Association includes 36 conventional transit systems and 13 specialized transit systems for people with disabilities that serve areas with fewer than 50,000 people. A 2005 CUTA discussion paper identified common opportunities and challenges of public transit in small communities.

A more recent report released by Transport Canada in 2011 echoed many of the recommendations advanced by CUTA and provided increased data on existing public transit services in Canada.

Transit Systems in Smaller Communities: Opportunities[i]

- **They support local businesses by helping commuters get to work, bringing shoppers to stores, supporting dynamic downtown cores, and meeting the needs of festivals and other events.**
- **They offer independence and mobility to people who are non-drivers by choice or necessity — seniors, children, students, workers, low-income families, and even tourists. Persons with disabilities, who may have very limited mobility options, are primary beneficiaries.**
- **They reduce local air pollution, and contribute to local climate change strategies.**

Transit Systems in Smaller Communities: Challenges[ii]

- **Building ridership can be difficult when trip distances are short, parking is inexpensive, and there is no traffic congestion. In addition, land use patterns are often not transit-supportive.**

- **Municipal funding sources are limited, and transit must compete with other basic community needs for funds. Tight budgets also mean fewer staff training opportunities like conferences, where smaller systems can exchange information and learn about best practices.**

- **The ability of smaller systems generally to research and develop innovative solutions is often limited because of very lean management structures**

FINANCIAL PERFORMANCE

As a result of fiscal constraints, public transit systems in smaller communities see the efficient use and recovery of operating funds as a key to sustainability. As a result, many conventional systems in communities under 50,000 deliver service very cost-effectively. In 2003, their average cost per transit service hour was $61, substantially less than the $96 average cost of systems in communities over 400,000 people. Smaller systems also recovered an average of 39% of their operating costs from fares, about the same as the average of all American transit systems[iii].

The following table illustrates financial data from 2011 of transit systems in Canadian communities with populations between 15,000 and 45,000.

Transit System Data Comparisons[iv]

	Leduc, AB	Spruce Grove, AB	Miramichi, NB	Kentville, NS	The Nation, ON	Charlottetown, PEI
Population	25,842	27,790	16,000	42,540	15,000	45,000
Fare Media for Adult	Cash/Ticket/ Pass $5, $4.5, $75	Cash/ Pass $5, $125	Cash/Ticket/ Pass $3, $2.7, $72	Cash/Ticket/ Pass $3.5, $3, $90	Cash/Ticket/ Pass $15, $10, $255	Cash/Ticket/Pass $2.25, $2, $65
Ridership	41,603	84,600	81,001	405,427	106,833	373,374
Total Vehicle Hours	167,821	271,928	330,000	1,600,000	460,000	551,668
Operating Cost	$599,441	$1,000,500	$466,000	$2,564,235	$1,165,982	$1,816,054
Recovery of Cost	24%	42%	57%	37%	57%	44%
Service provided by:	Contracted out	Contracted out	Municipality	Municipality	Contracted out	PPP

PRINCIPLES FOR ACTION

Transport Canada's Report titled 'Improving Travel Options in Small and Rural Communities' suggests communities consider the following principles for action:

Take an Integrated, Strategic Approach[v]

Developing a strategic plan can motivate and guide decision-making. It can also bring together relevant community members to identify collective goals, resources, challenges and opportunities. By following this approach, communities are able to cut across silos of responsibility within municipal governments and bring together government, not for profit and private sector interests.

Consider the Triple Bottom Approach[vi]

Instead of the conventional focus on economic bottom lines, rural municipalities are encouraged to consider a 'triple bottom line' which gives equal weight to economic, social and environmental outcomes. Transportation,

as a municipal responsibility having extensive impacts on social and environmental systems in addition to economic effects, is a particularly important area for triple bottom line analysis. Practitioners should view transportation projects as more than line items in a budget— they should weigh the municipal savings and expenses against the benefits and costs to individuals, families, neighbourhoods, businesses and the ecosystem. By doing so, they can better inform decision-makers of the pros and cons of either approving or rejecting an initiative—and decision-makers, in turn, become more accountable to the public.

Balance Supply and Demand[vii]

Communities have been using measures that manage the demand for transportation, rather than simply focusing on the supply. Transportation Demand Management (TDM) is the application of strategies and policies to reduce travel demand of single-occupancy private vehicles. TDM measures influence whether, why, when, where and how people travel. Municipal TDM initiatives can include educational and promotional tools, incentives and disincentives. They include measures like information campaigns, special events, discounted transit fares, public ride-matching services, active and safe routes to school programs for children, workplace-based commuting options programs, and household-based individualized marketing. TDM measures often involve partnerships between municipalities and employers, schools and community organizations. They are typically less costly than infrastructure solutions, but improve the cost-effectiveness of those solutions by increasing their levels of use.

Focus on Priorities[viii]

There are a great many actions that can be taken by smaller communities to improve travel options for different groups of people. Well-designed pilot projects can gain positive media coverage, attract new supporters and overcome opponents' skepticism. When communities focus their initial efforts on a small number of priorities and ensure their success, transit plans gain momentum as well as community buy-in for additional actions. Ultimately, individual communities need to decide whether they would be better off with incremental action that strengthens existing transportation services, or create something new and innovative.

MEETING THE CHALLENGES

There have been several strategies employed by rural and small communities to increase transportation options to enhance the quality of life of their citizens. The following list provides some examples of strategies employed by smaller communities to neutralize the challenges listed on Page 3.

Inter-Municipal Partnerships[ix]

Smaller communities can avoid the challenges associated with starting a new transit system by purchasing services from established urban transit systems in the region. This strategy is less viable for northern Alberta due to the great distances between communities. However, it raises the possibility of regional inter-municipal routes.

Provincial Partnerships[x]

An example of this type of partnership is the Municipal Systems Program, where BC Transit partners with communities across the province (outside Greater Vancouver) to coordinate the delivery of 70 conventional and specialized public transit systems. Municipalities approve service levels and set fares and, in a few cases, operate the service. In most cases, BC Transit contracts for service delivery with a private company or non-profit society. BC Transit capitalizes on specialized skills and economies of scale to provide planning, marketing and contract administration services, and arranges province-wide contracts for vehicle and fuel purchases. About half of each system's operating and amortized capital costs are funded by BC Transit, with the other half funded through fares and local governments.

Market-Oriented Service Planning[xi]

One way that smaller communities maximize ridership and stay ahead of rising costs is to focus on understanding and serving key market segments. Examples include secondary school services that are planned around class hours, or workplace services that meet the needs of shift workers. In 1999 a division of Maple Leaf Foods opened in Brandon, Manitoba, several kilometers outside the urban area. Maple Leaf workers were able to buy bus passes through payroll deduction, and Brandon Transit adjusts schedules as needed to meet unexpected variations in shift times.

Flexible Delivery — Conventional Services[xii]

In smaller communities, lower demands may mean that fixed routes and standard 12-meter buses are neither effective nor efficient. More flexible, demand-responsive approaches including dial-a-ride are used by some systems (like Medicine Hat Transit, Alta.) to provide service during off-peak hours, or to serve low-density or rural areas. Other communities partner with taxi companies to provide feeder services in outlying areas (e.g. Welland Transit, Ont.). In Rimouski, Quebec the entire public transit service (known as Taxibus) is delivered using taxis.

Flexible Delivery — Specialized Services[xiii]

Rising operating costs for specialized transit services have led many communities to explore taxis as a means of serving customers with disabilities. In British Columbia, where many smaller communities operate accessible handyDART services in partnership with BC Transit, specialized transit trips can be served using taxis when it is more efficient or effective. Another BC Transit program gives eligible handyDART clients the freedom to call their own taxi, with a 50% fare subsidy.

Marketing[xiv]

Most small transit systems lack the specialized expertise and resources needed to deliver comprehensive marketing strategies. Despite these limitations, many systems are finding ways to effectively communicate with key segments of the transit market. For example, U-Pass programs, which are still most common in large and medium-sized communities (+100,000), have found a foothold in the small city of North Bay, Ontario. In British Columbia, BC Transit actively lends its marketing knowledge to smaller communities through an online community outreach toolkit, and its centralized production of printed and Web-based public information yields higher-quality materials at more affordable prices.

CASE STUDY: HINTON PUBLIC TRANSIT[1]

Overview

In 2007, Hinton's Town Council committed to funding an 18-month pilot public transit project. The pilot project was developed in response to a 2006 Mayor's Task Force that identified transportation and affordable housing as key issues in Hinton. A gap in services was identified for low-income individuals and families who did not fit the criteria for the existing Handibus service. Coupled with the sprawling nature of Hinton's commercial and residential development, many individuals and families were experiencing great difficulty in accessing local employment opportunities and essential services.

The pilot project specifically targeted low-income individuals, youth and seniors to increase their access to local employment, shopping, health and education services as well as recreational activities. The pilot program did not compete with the existing Handibus service as (Hinton Transit's) focus was on *mobile* customers.

[1] All information on Hinton Transit was provided by the Town of Hinton

Passenger surveys conducted by the Town of Hinton indicate that public transit has had the effect of empowering as well as increasing the quality of life of those segments of the community the system intended to serve. Increased mobility has provided individuals and families with the support needed to access employment, medical services, social services, and recreational opportunities. Hinton's public transit system has also helped to strengthen the community by connecting many neighborhoods not previously accessible to those without private transit options.

Additional Notes on Hinton's Transit System

- Hinton's census population in 2011 was 9,640
- The bus operates on a 25km loop which takes 1 hour
- Hours of operation: M-W: 8am-8pm, T-F: 8am-9pm; S: 8am-7pm; no service Sundays and Holidays
- Bus drivers are town staff and buses and maintenance are contracted out
- Staffing complement: 1 part-time supervisor and 2 full-time, 1 part-time and 3 casual drivers

FARE TYPE	RATE
Day pass - unlimited travel by one person in one day	$8 per day
Monthly pass - unlimited travel by one person in one month	$70 per month
One-way cash fare	$3 per ride
Punch card- 12 rides with no expiration date	$30 per card
Quarterly senior pass - unlimited travel for three months (65+)	$50
Transfer tickets are available to passengers having short stops along the route	

2013 Financial Information

- Budget approved $185,000deficit
- Revenue from fares: $65,308
- Total revenue: $76,681
- Total expenses:$262,101
- 2013 Annual ridership: 24,846

The transit program initially received Green Trip funding to build shelters and benches, providing the system with ongoing advertising revenues. In closing, Hinton's experience is indicative of the potential for large towns and small cities in northern Alberta to successfully operate a viable and cost-effective transit service.

CASE STUDY: PEACE RIVER PUBLIC TRANSIT

Overview

In 2005, a pilot transit service consisting of one 16 seat bus was initiated in the Town of Peace River by the Town council with financial assistance from the Persons with Developmental Disabilities Northwest Community Board. The initial contract with Cardinal Coach Lines was to end May 21, 2005 and was extended to December 31st, 2005. A survey of transit users was completed in October 2005. The service was further extended in 2006, 2007 and 2008 to allow for the development of a permanent system[xv].

In 2008, a request for proposal was issued in Peace River. Peace River Town Council approved a 5-year contract, with the option for a 2-year renewal. Based on ridership numbers in Peace River between 2006 and 2011, the service averaged approximately 10,871 rides per year (53 rides per day)[xvi]. The actual revenues and operating expenses for the Peace River transit service between 2009 and 2011 (see table below) were within range of the estimates provided in 2008 however revenues were considerably lower than anticipated.

Peace River Transit Annual Operating Expenses, 2008 - 2011

	2008 (estimated $ cost if run by town - including amortization of capital expenses over four years)	2008 (estimated $ cost if run by contractor)	2009 (actual $)	2010 (actual $)	2011 (estimated $)[xvii]
Annual Operating Expense	206,444	180,492	189,347	193,709	197,788
Annual Revenues	30,000	30,000	23,824	20,119	23,184
Deficit	176,444	150,492	165,523	173,590	174,604

The service ended in early 2011. High costs were cited as one of the main factors in the cancellation of the service.

Summary of 2005 Survey Results[xviii]

Although only 2% of the town's population used transit on a regular basis in 2005, up to 38% of the lowest (and apparently growing) income groups used it. It was also found that the service increased the mobility of transit users by a reported 61% and reduced reliance on personal vehicles by 45%. Moreover, 40% of those riders used it for work, and 53% used it for shopping.

Challenges[xix]

- Route and Route Time:
    - Determining adequate community coverage schedules
    - The full service loop was very long (1 hour, 17 minutes)
    - Finding safe places to stop that did not interfere with traffic and the length of the route
- Driver Challenges:
    - Bus unduly detained as a result of drivers being late for their shift
    - Drivers giving free rides/going off-route
- System Challenges:
    - Wheel chair accessibility was planned but unavailable at the time
    - Strollers were difficult to load and store on the bus
    - The bus was reaching capacity at peak times

The survey suggested that users of the transit service enjoyed increased mobility within Peace River enhancing access to employment, shopping, recreation, and medical services. It is also noted that rates of transit use declined as the income level of users increased and there were higher percentages of female riders as opposed to males in most categories.

CASE SYUDY: PEACE RIVER TAXI-PASS PROGRAM[xx]

Overview

The Peace River Taxi-Pass Program is meant to serve clients who meet at least one of the following criteria[xxi]:

- A registered student at Northern Lakes College
- A combined family income level below $25,000
- An individual Income Level below $15,000
- Seniors – over the age of 65 years

- Assured Income for the Severely Handicapped (AISH) recipients
- A client of the Peace River Regional Women's Shelter – purchased through the Women's Shelter
- A medical disability (must provide a note from a physician)

Approved applicants are provided with a plastic Taxi Card that allows the purchaser up to 40 tickets every four weeks. Individual booklets of 20 tickets are priced at $15.00. There are three taxi companies in Peace River who currently honor taxi passes.

In 2012, the cost to the town of Peace River to operate the service was $98,167 with total revenues of $11,224. A total deficit of $86,943 was funded by rate payers in Peace River in 2012. In 2013, the total cost of the service increased to $146,109 with revenues also increasing to $14, 098. A total deficit of $132,011 was funded by rate payers in Peace River in 2013.

Community feedback from the program has identified a number of concerns about the service including the affordability of the service, access for disabled individuals, stringent application criteria and the overall complexity of the ticket system. Much of the community's feedback was in the form of recommendations aimed at getting more individuals and groups to qualify for the service.

The service saw over 13,801 rides in 2012 and 20,589 rides in 2013. However, in 2012 there were only 149 individual clients of the service (there are no figures showing the number of individual clients in 2013). Regardless, the large increase in ridership indicates that there remains a steady need for public transportation options in Peace River and a growing awareness of existing services amongst the public. Both of these facts are highly favorable to the future development of sustainable transit services in Peace River.

CONSIDERATIONS FOR FUTURE TRANSIT DEVELOPMENT

In smaller communities, economic viability is a critical test for a public transit service. A minimum density of demand (hourly passengers per bus) is required for transit to be cost effective - but sprawling, unfocused land uses with highly dispersed origins and destinations make this difficult. Only when clusters of trips share a common start or end point (and preferably both) is bus transit likely to be truly viable. From a land use perspective, bus transit needs concentrations of residential land uses, workplaces, schools, medical and retail destinations[xxii].

Population growth in northern Alberta provides opportunities for communities to consider public transportation options which would have the effect of enhancing both residents' quality of life and the sustainability of local businesses. Between 2006 and 2011, there has been significant population growth in communities like Cold Lake (15%), Peace River (7%), Bonnyville (7%) and Whitecourt (7%)[xxiii]. It is reasonable to assume that the numbers of individuals in these communities who would benefit the most from public transit; one-parent households, low-income wage earners, Temporary Foreign Workers, seniors and youth have also increased at comparable rates.

An efficient and well-thought out system with functional supporting infrastructure would increase the likelihood of northern residents 'buying- in' to local transit services. Challenges like building ridership can be addressed through the innovative implementation of bus pass systems and the marketing of incentives. Individuals can claim federal tax credit for public transit passes for monthly, annual and shorter interval (5-day) public transit passes. Also, with a pass system, employers may be more inclined to subsidize transit for staff thereby increasing ridership. Partnerships are important factors to consider in the development of a sustainable transit service and public awareness is a key contributor to increasing transit use.

A possible strategy for increasing system efficiency during peak hours could be the addition of a part-time driver. During peak hours, a second bus driven by a part-time driver, could service a portion of the route up to a transfer point with the remainder of the route being serviced by the full-time driver. This would increase the frequency of service at each bus stop throughout the route as well as overall transit capacity.

In reality, many communities are unable to reach a minimum density of demand to bear the cost of busses. Shared taxi systems, common throughout the developing world could be an option for communities in

northern Alberta since they are intended to service smaller batches of passengers where it is not possible to establish a bus service. Shared taxi systems employ vehicles for hire which are typically smaller than buses and usually take passengers on a fixed or semi-fixed route without timetables, often only departing when all seats are filled. They may stop anywhere to pick up or drop off passengers.

Rimouski's Taxibus[2] functions as a shared taxi service which operates on both fixed and variable routes serving residents on the outskirts of the city and areas with lower population density. The level of service offered for each region it services is based on its population density and the distance that must be covered to stay on schedule. In addition to being a scheduled service accepting several independent passengers on any given trip, Taxibus also functions as an 'on demand' service where residents can call in advance for reservations.[xxiv]

The evidence from around the globe shows that these systems are very effective in bringing riders from areas of low population densities to urban cores. A shared taxi system could be an affordable option for communities in northern Alberta that are characterized by sprawling and unconnected populations needing access to centralized services as well as peripheral industrial and business districts.

Communities need to engage in a range of techniques for assessing the need and projecting the use of local transit systems. A survey of residents should be conducted to determine if, when and why they would use public transit, and at what cost. A strong business case needs to be made for local transit development. Collaboration enables local transit. The local business community, education institutions, recreation facilities, healthcare practitioners and other service providers are invaluable partners in developing a detailed understanding of local residents' transportation patterns. The information generated through collaboration with local stakeholders is essential to determining routes and schedules.

[2] For more information on Rimouski's Taxibus, got to Société des Transports de Rimouski, Rimouskibus, Ville de Rimouski http://www.ville.rimouski.qc.ca/en/citoyens/nav/circulation/Rimouskibus.html?iddoc=188156

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[iii] *Ibid*, Page 2

[iv] Canadian Transit Fact Book – 2012 Operating Data, Transit Cooperative Research Program (TCRP), 2012

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[vii] *Ibid*, Page 8

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[x] *Ibid*, Page 3

[xi] *Ibid*

[xii] *Ibid*

[xiii] Public Transit and Small Communities, CUTA, 2005. Page 3
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[xiv] *Ibid*

[xv] Peace River Transit Service Overview, Town of Peace River, 2011

[xvi] Combined Transit Stats 2005-2011, Town of Peace River, 2011

[xvii] Based on 3 months of operation in early 2011prior to the system's cancellation. Costs are extrapolated by multiplying the data from the 3 months by 4.

[xviii] Peace River Transit Pilot Project Survey Final Report, NADC, 2005. Page 5

[xix] *Ibid*, Page 11

[xx] Peace River Taxi-Pass Program Review, 2007-2011

[xxi] Peace River General Taxi-Pass Program Information, 2013

[xxii] Improving Travel Options in Small and Rural Communities, Transport Canada, 2011. Page 25
http://www.fcm.ca/Documents/tools/GMF/Transport_Canada/ImprovingTravelSmallRural_EN.pdf

[xxiii] Statscan Community Profile, 2006/2011 Census

[xxiv] Société des Transports de Rimouski, Rimouskibus, Ville de Rimouski
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