Downtown One Way Street Conversion
Technical Feasibility Report

As part of the City's Transportation Master Plan, this report reviews the technical feasibility of the proposed conversion of the current one-way street system to two-way operation under the existing and future (2016) traffic demands.

Recognizing that the conversion to a two way street system may not necessarily need to include the entire study area, or may be implemented in phases, a series of one way street conversion scenarios were also assessed as part of this study including:

1. Full conversion of the existing one-way street system on Colborne and Dalhousie Streets to two-way streets;
2. Partial conversion of the existing one-way street system on Colborne and Dalhousie Streets to operate as two-way streets between King Street and Clarence Street. The remaining sections would continue to operate as one way facilities;
3. Partial conversion of the existing one-way street system on Colborne and Dalhousie Streets to operate as two-way streets between King Street and Murray Street. The remaining sections would continue to operate as one way facilities.

However, partial conversion scenarios were eliminated from further consideration due to safety concerns with the two way street system termination treatments. Ideally, the transition between the two way street system and the one way street system should physically prevent the possibility of wrong way movements to avoid the potential for head on collisions.

Based on the restricted geometry within the downtown street system, each potential termination area was reviewed to determine if an adequate design was possible within the existing property limits. At each of the potential termination intersections, King Street, Murray Street, and Clarence Street design measures could not be introduced to physically prevent head on collisions without significant acquisition of property or significant impacts to on-street parking and sidewalks.

For these reasons, the partial conversion was not recommended as a long term solution. As these risks may be mitigated, to some degree, through the use of traffic control measures such as signing, pavement markings and other warning devices, a partial conversion could be considered as an interim measure during implementation of the entire system. The detailed implementation plan would be refined as part of the Class Environmental Assessment Study.

One Way Street System Operations

An assessment of the current one way traffic operations was completed to serve as a benchmark for evaluating the feasibility of the proposed conversion of the downtown streets to two-way system and to identify potential deficiencies / shortfalls that may currently exist.

Turning movement traffic counts for the study area intersections (16 intersections) were obtained from the City of Brantford. These counts (2002-2005) were all projected to year 2005 to reflect the existing base traffic conditions applying 2% annual growth rate. Turning movement counts for the intersections without actual traffic data were estimated

based on the in/out traffic flows of the adjacent intersections and logical assumptions. Intersection lane arrangements and timing/phasing plans were also obtained from the City of Brantford / field visits.

To ensure that future growth in traffic was accounted for, annual growth rates were determined for individual links comparing City's TransCad Model forecasts for 2005 and 2031 under the Compact City growth scenario. These growth rates were applied to the existing 2005 traffic volumes to project 2016 horizon year traffic volumes at the study intersections. A summary of the existing and future PM peak traffic volumes under the current one-way street system is shown in attached **Figure 1.**

"*Synchro & SimTraffic" (version 6)* traffic simulation models of the current downtown one-way street system were developed for both existing and future 2016 horizon to assess current traffic operations using the methodology outlined in Transportation Research Board's *"Highway Capacity Manual, HCM 2000"* for capacity analysis. The PM peak hour was selected for the purpose of this analysis as it generally reflects the highest traffic volumes in the City. A summary of the downtown one-way street system operational assessment under the existing and future 2016 are presented in the attached **Table 1**.

The results of the operational assessment of the downtown one-way street system under the existing traffic conditions indicate that, the downtown streets are functioning well without any major capacity concerns, with the exception of the Colborne Street / Brant Avenue / Icomm Drive Intersection, where the southbound right turn movement is operating at capacity. However, the other movements at this intersection contain a fair amount of reserve capacity and the overall operational conditions reflect a Level of Service C[1].

The results of the operational assessment of the downtown one-way street system under the future 2016 traffic conditions indicate that the following improvements may be required:

- Double southbound right turn lanes on Brant Street at Colborne Street
- Exclusive southbound left turn lane on Clarence Street at Colborne Street
- Exclusive eastbound right turn lane on Colborne Street at Icomm Drive
- New Traffic Signals on Dalhousie Street intersection with Charlotte Street

Two Way Street System Operations

In order to estimate the base 2005 and future 2016 traffic patterns under the two-way street system and to determine how the existing traffic volumes would re-route in response to the conversion, logical assumptions were made based on existing turning movement patterns, origins and destinations of trip within the study area and forecasts undertaken using the City Transportation Model. A summary of the existing and future PM peak traffic volumes projected for the proposed two-way street system is shown in attached **Figure 2**.

Synchro models of the two way downtown street system were developed to assess and confirm the feasibility of the conversion under the existing and future 2015 planning horizon. A summary of the operation assessments are included in the attached **Table 2.**

[1] Definitions of Level of Service are provided in Appendices

Basically one lane along each of these roads was assigned to the opposite direction of traffic to convert them to two way facilities. Initially, shared turning lanes were assumed at all the study intersections except a few key locations with critical turning volumes that were felt to warrant separate turning lanes.

The results of the two way downtown operational assessment under the base 2005 traffic conditions indicates that the study intersections will continue to operate reasonably well without major capacity concerns after the full conversion. However, there are three key locations where some geometric improvements will be required to facilitate the conversion, including:

- Reconfiguration and widening required along Colborne Street at Icomm Drive to accommodate an exclusive westbound left turn lane;
- Widening required along southbound Brant St to accommodate an exclusive southbound left turn lane on Brant Street at the intersection with Dalhousie Street;
- Reconfiguration of Colborne Street / Dalhousie Street Intersection required:
  - ➔ Minimal adjustment to the curb line/Radii on the north-west quadrant
  - ➔ Minor adjustment to the two traffic islands on the north side
  - ➔ Adjustment of existing lane arrangements

Table below presents a summary of the required improvements / potential implications under the base 2005 traffic conditions:

Intersection	One way Do Nothing	Full conversion
Dalhousie/Brant	N/A	SBL
Colborne/Icomm	Double SBR	Minor Widening on Colborne St. to provide a WBL at the intersection
Dalhousie/Colborne	N/A	Minimal adjustment to the curb line/Radii & traffic islands

- The result of our technical work suggests that two-way street system is feasible in the downtown under the existing traffic demands. The current transportation facilities are able to accommodate the projected base 2005 two way traffic demands, given the above noted improvements applied.
- Although minimal impacts to existing on street parking anticipated which can be offset by the extra space between Clareance Street and Brant Avenue which can be used for additional on-street parking spaces.

Future 2015 Planning Horizon Traffic Conditions

The results of the future 2016 intersection operational assessment under the proposed two way downtown street system indicates that further infrastructure improvements / widening will be required to facilitate future traffic demands projected for the two way downtown street system. In addition more impacts to the on-street parking supply are anticipated as a result of these improvements.

This assessment assumes that no other network improvements have been implemented

to divert through traffic out of the downtown area. Based on the future 2015 planning horizon, which includes new growth directed to the downtown area, a number of additional infrastructure improvement have been identified that may affect potential property requirements:

- Exclusive southbound left turn lane on Brant Street at Dalhousie Street ;
- Exclusive westbound left turn lane on Colborne Street at Brant St / Icomm Drive;
- Exclusive southbound and northbound left turn lanes on Clarence Street at Dalhousie Street;
- Exclusive southbound and northbound left turn lanes are required on Clarence Street at Colborne Street; and
- Reconfiguration of the Dalhousie Street and Colborne Street intersection required (design alternatives may include a roundabout, traditional intersection or partial one way street on Dalhousie Street);
- Provision of traffic signals will be required at the following intersections:
  - ➔ Dalhousie Street / Charlotte Street
  - ➔ Dalhousie Street / Alfred Street
  - ➔ Colborne Street / Queen Street

Table below presents a summary of major infrastructural/operational Improvements /implications under the future 2016 traffic conditions for the current one-way and proposed two-way conversion scenarios:

Intersection	One way Do Nothing	Full conversion
Dalhousie/Brant	**N/A**	**SBL**
Dalhousie/Clarence	**N/A**	**SBL, NBL**
Colborne/Icomm	**Double SBR, EBR**	**WBL**
Colborne/Clarence	**SBL**	**SBL, NBL/ Impact on Street Parking**
Colborne/Queen	**N/A**	**New Traffic Signals**
Dalhousie/Colborne	**N/A**	**Geometric Reconfigurations**
Dalhousie/King/Queen	**N/A**	**Impact on Street Parking**
Dalhousie/Alfred	**N/A**	**New Traffic Signals**
Dalhousie/Charlotte	**New Traffic Signals**	**New Traffic Signals**

Accordingly we can conclude that under the base 2016 condition:

- The existing downtown transportation system does not include enough capacity to support the proposed one way street conversion to two way operation under future 2016 demands. The findings of the transportation Master Plan also noted that the downtown one way street network would be approaching capacity by 2031 as well.
- The recommended network improvements, including completion of the BSAR extension to Wayne Gretzky Parkway will remove sufficient through traffic from

Table 1: One-Way Traffic Operation Summary

Intersection		Existing / 2005			Future 2016		
		V/C[1]	Critical [2] Movement	Recommended Improvements	V/C[1]	Critical [2] Movement	Recommended Improvements
Dalhousie	**Signalized Intersections**						
	Brant	0.78	WBL: 0.86		0.90	WBL:0.90 SBTR: 0.89	
	King	0.53			0.63		
	Queen	0.41			0.52		
	Market	0.44			0.65		
	Clarence	0.62			0.91	WBL : 0.93 NBTL : 0.91	
	Murray	0.43			0.51		
	Rawdon	0.35			0.43		
	Stanley	0.47			0.56		
	Colborne	0.61			0.63		
	Unsignalized Intersections						
	George	1.2 [3]			1.4		
	Charlotte	5.0			56.5	NB: 360/LOS=F	Provision of Traffic Signals: v/c=0.68
	Alfred	2.3			3.3		
Colborne	**Signalized Intersections**						
	Icomm	1.06	SBR: 1.06	With Double SBR: v/c=0.72 (Widening)	1.36	SBR : 1.36 SBT : 0.89	Separate EBR Required (No-Widening) With Double SBR: v/c=0.72 (Widening)
	Clarence	0.73			0.80	EBT : 0.97	
	Alfred	0.47			0.53	EBTL : 0.91	
	Murray	0.63			0.71		
	Rawdon	0.50			0.56		
	Unsignalized Intersections						
	King	4.2			4.5		
	Queen	3.7			6.3		
	Charlotte	4.2			10.5		
	Stanley	1.9			2.9		

(1) V/C: Volume to Capacity Ratio/Average Delay (Sec/Veh) for Unsignalized Intersections
(2) Critical Movement V/C>0.85

Table 2: Two-Way Traffic Operation Summary, Full Conversion Scenario

Intersection		Existing / 2005			Future / 2016		
		V/C[1]	Critical [2] Movement	Recommended Improvements	V/C[1]	Critical [2] Movement	Recommended Improvements
Dalhousie	**Signalized Intersections**						
	Brant	0.88	SBL: 0.89 WBL: 0.88	SBL (Widening)	0.90	SBL:0.92 NBTL: 0.95 WBL: 0.89	SBL (Widening)
	King	0.63			0.41		WB: LTR=> LT+TR (Impact on Street Parking)
	Queen	0.63			0.44		WB: LTR=> LT+TR (Impact on Street Parking)
	Market	0.47			0.54		
	Clarence	0.71	WBTR: 0.91		0.81	WBL: 0.95	EB: L+TR=>LT+TR (Parking) SBL: LT+TR=> L+T+TR(Widening) NBL: LT+TR=>L+T+TR (Widening)
	Murray	0.57			0.61		
	Rawdon	0.53			0.59		
	Stanley	0.54			0.69		
	Colborne	0.74	EBT: 0.88 WBT: 0.87	Adjustment to Curb/Island	0.49		EB: L+T+R=> LT+TR WB: L+T+R=> LT+T+R (EB/WB Widening)
	Unsignalized Intersections						
	George	1.3			2.8		
	Charlotte	4.2			11.8	SBL: 53/LOS=F	Provision of Traffic Signals: v/c=0.72
	Alfred	3.6			4.9	NBL: 38/LOS=E	Provision of Traffic Signals
Colborne	**Signalized Intersections**						
	Icomm	0.80	EBL: 0.90 WBTR: 0.89	EB L+LT+TR=> L+L+TR (N-Widening) WBL (Widening)	0.96	EBL : 0.99 WBTR : 0.92 SBR: 0.96	EBR (N-Widening)
	Clarence	0.84	WBTR: 0.91		0.94	WBLTR : 0.96 SBTL: 0.92	WB: L+TR=> LT+TR (Impact on Street Parking) EB: L+TR=> LT+TR (Impact on Street Parking) NB: LT+T+R=> L+T+TR (N-Widening) SB: LT+TR=>L+T+TR (Widening)
	Alfred	0.52			0.68	WBLTR : 0.89	
	Murray	0.66			0.82	EBLTR : 0.86	
	Rawdon	0.62			0.72	EBLTR : 0.90	
	Unsignalized Intersections						
	King	3.2			4.1		
	Queen	2.6			12.3		Provision of Traffic Signals
	Charlotte	1.7			6.9		
	Stanley	1.9			4.1		

(1) V/C: Volume to Capacity Ratio/Average Delay (Sec/Veh) for Unsignalized Intersections
(2) Critical Movement V/C>0.85

Level of Service Definition

V/C Ratio : **Volume to Capacity Ratio** which measures the ratio of the intersection volumes to theoretical intersection capacity. A ratio of 1.0 means an intersection is operating at capacity

LOS : **Intersection Level of Service** (6 categories between A and F as described below)

Level A (Volume / Capacity Ratio 0.0-0.30)

At this level of service, vehicles rarely wait longer than one red indication to clear the intersection, turning movements are made easily, and the drivers are not obstructed by other vehicles.

Level B (Volume / Capacity Ratio 0.30-0.45)

At this level of service, drivers will often have to yield to opposing traffic before making turns, and will begin to feel somewhat restricted within groups of vehicles approaching an intersection.

Level C (Volume / Capacity Ratio 0.45-0.66)

At this level of service, the flow of traffic is stable. Drivers will have to yield to opposing traffic before making left turns, and may occasionally have to wait longer than one traffic signal cycle to clear the intersection. Short queues may develop for a few cycles.

Level D (Volume / Capacity Ratio 0.66-0.80)

At this level of service, the motorist experiences increasing restriction and instability of traffic flow. There are substantial delays to approaching vehicles during short peaks with the peak period, and it becomes difficult to find gaps in traffic to complete left turns.

Level E (Volume / Capacity Ratio 0.80-1.00)

At this level of service, capacity is reached and the flow of traffic is not stable. There are frequent queues of vehicles approaching intersections and delays to vehicles may extend to several signal cycles.

Level F (Volume / Capacity Ratio >1.00)

At this level, capacity is exceeded. There are persistent long queues of vehicles waiting on all approaches to the intersection and vehicles will often have to wait numerous signal cycles to clear the intersection.