CHURCH STREET NORTH

Town of New Tecumseth

Transportation Needs Study

prepared by:

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prepared for

Town of New Tecumseth

November 24, 2016

CCTA File 116057

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1 Introduction

1.1 Purpose

The Town of New Tecumseth has retained C.C. Tatham & Associates to conduct a *Transportation Needs Study* to identify the need for, and extent of, improvements to adequately accommodate existing and future transportation demands along the Church Street North corridor from Victoria Street to Hussey Street. The study includes an inventory and assessment of existing conditions on the study area roads, an assessment of future operations based on traffic forecasts, identification of current and future road system needs, and development of recommended solutions to address these needs (as appropriate).

1.2 Objectives

The objectives of the *Church Street North Transportation Needs Study* are as follows:

- inventory the existing conditions in the study area in terms of the road network and traffic volumes;
- provide an assessment of existing conditions with respect to traffic operations;
- considering anticipated growth rates and development growth, identify the future conditions for the 5, 10 and 20-year horizon periods (2021, 2026 and 2036);
- identify road improvements, if required, to support existing and future traffic demands within the Church Street North study area;
- present alternative solutions (where appropriate) to address the identified needs of the study area road system; and
- provide a road improvement strategy and implementation plan for the area road network through to 2036.

2 Existing Conditions

This chapter will describe the road network, traffic volumes and operations for the existing conditions.

2.1 Study Area

The overall study area which was considered in this study is illustrated in Figure 1. The corresponding road network consists of Church Street North and its intersections with the following (from south to north):

- Victoria Street;
- Dominion Street;
- Fletcher Crescent;
- Evans Road;
- Doner Street; and
- Hussey Street.

Additional details with respect to the road system and key intersections are provided below, whereas corresponding photographs are provided in Figure 2.

2.2 Designation

Church Street North is currently designated as a local road, but under New Tecumseth's *Official Plan - Schedule E2 - Road Widening*, it is planned as a minor collector road.

2.3 Posted Speed Limit

Given Church Street North's residential nature, the posted speed limit is 50 km/h.

2.4 Road Cross-Section

Church Street North is oriented north-south and generally provides 1 lane per direction (from Victoria Street to Dominion Street, the width increases to accommodate exclusive turn lanes and/or parking lanes). The corresponding road widths, measured from edge of pavement to edge of pavement (or curb to curb) were determined through field measurements, and are summarized in Table 1. Between Dominion Street and Fletcher Crescent, Church Street North crosses the Boyne River via a 29 metre single span bridge with a width of 13.2 metres (as reflected in Table 1). As per the Town's Municipal Bridge Inspection Reports, the bridge is referred to as the Cunningham Bridge (#11001).

Table 1: Road Widths

Road Section			Pavement Width (m)
Victoria Street	to	Dominion Street	13.2 metres
Dominion Street	to	Fletcher Crescent	8.3[1]
Fletcher Crescent	to	Evans Road	9.2
Evans Road	to	Doner Street	9.6
Doner Street	to	Hussey Street	7.2 to 7.7

[1] width of asphalt on bridge

From Victoria Street to Doner Street, Church Street North has an urban cross section (eg. curb and gutter with storm sewers, sidewalk on one side) whereas from Doner Street to Hussey Street it has a semi-urban cross section (no curbs or storm sewers).

2.5 On-Street Parking

The *Town of New Tecumseth By-Law 93-128* prohibits on-street parking on the east side of Church Street North from Hussey Street to Dominion Street at any time of day. Parking is permitted on the east side between Dominion Street and Victoria Street with space allocated for a single on-street parking stall with “no parking” signs posted along the remainder of the section. It is noted that north of Fletcher Crescent, there is no signage indicating that parking is prohibited and vehicles were observed parking adjacent to the curb (in the urban section) during the field visit.

On the west side, the by-law prohibits parking from Victoria Street to Fletcher Crescent. On-street parking is otherwise permitted north of Fletcher Crescent.

2.6 Key Intersections

Descriptions of the key intersections are provided below and evident in Figure 2, including:

- one signalized intersection at Victoria Street;
- one 4-way stop controlled intersection at Hussey Street;
- one 2-way stop controlled intersection at Dominion Street; and
- three 1-way stop controlled intersections (T intersections) at Fletcher Crescent, Evans Road and Doner Street.

2.6.1 Victoria Street & Church Street North

The intersection of Victoria Street with Church Street North serves as the only signalized intersection in the study area, having the following configuration:

- east and west approaches (Victoria Street) – a shared left turn/through lane and an exclusive right turn lane (10 to 15 metres in length); and
- north and south approaches (Church Street North) – a shared left turn/through lane and an exclusive right turn lane (12 to 25 metres in length).

Neither the existing signal timing plans nor the traffic signal installation include consideration for advance green phases on any of the approaches.

2.6.2 Dominion Street & Church Street North

The intersection of Dominion Street with Church Street North is a 2-way stop controlled intersection, with Church Street North having the right-of-way. The north and south approaches have a single lane in each direction (ie. combined left turn/through/right turn lane) with a single on-street parking space in the northbound direction south of the intersection. The east and west approaches on Dominion Street also have singled shared turn/through lanes, which are controlled with stop signs.

2.6.3 Fletcher Crescent & Church Street North

The intersection at Fletcher Crescent is a 1-way stop controlled intersection, with Church Street North having the right-of-way. The north and south approaches have a single lane in each direction and the bridge crossing the Boyne River ends just before the intersection. The west approach (Fletcher Crescent) has a single lane and is controlled with a stop sign.

2.6.4 Evans Road & Church Street North

The intersection at Evans Road is also a 1-way stop controlled intersection, with Church Street North having the right-of-way. All approaches are single lanes (shared turn/through lanes) with the east approach (Evans Road) operating under stop control. The centre to centre distance from Evans Road to Fletcher Crescent is approximately 20 metres.

2.6.5 Doner Street & Church Street North

The intersection at Doner Street mirrors that at Fletcher Crescent – single lane shared approaches, with the west approach operating under stop control. Immediately south of the intersection, there is a combined reverse horizontal curve/vertical curve on Church Street North with a length of approximately 85 metres.

2.6.6 Hussey Street & Church Street North

The intersection of Hussey Street with Church Street North is a 4-way stop controlled intersection. All directions have a shared turning and through lane and are controlled with stop signs.

2.7 Horizontal & Vertical Alignment

Significant horizontal and vertical curves, and areas of increased road grades, were reviewed based on site measures, engineering drawings of the initial road construction, aerial photographs and GIS information obtained from Simcoe County. The most significant instance of changing horizontal and/or vertical alignments is through the reverse curve immediately south of Doner Street, which is accordingly the focus of this review.

2.7.1 Horizontal Alignment

The most pronounced horizontal and vertical curves in the study area are within the reverse curve south of Doner Street (refer to Figure 3). Further to a review of the engineering records and aerial photography, the radius of the southerly horizontal curve was established to be 140 metres, whereas the northerly curve has a radius of 150 metres.

2.7.2 Vertical Alignment & Sightlines

Existing sight lines through the reverse curve were established based on field measurements for various scenarios (field measures consider both the horizontal and vertical alignment limitations and thus are preferred over a review of the engineering drawings).

For a vehicle stopped at the stop bar on Doner Street proceeding to Church Street North, the driver has a sightline of approximately 85 metres to the south, into the curve. This is the minimum required sightline set forth in the MTO *Geometric Design Standards for Ontario Highways* for a road with a design speed of 60 km/h (on lower speed roads, the design speed is taken as 10 km/h over the posted speed limit). Upon stopping and advancing further into the intersection (provided the crosswalk is clear of pedestrians), the available sightline exceeds 140 metres. The reduce sight lines results from the presence of trees on the south-west corner of the intersection (albeit on private property) which limit the driver's line of sight while at the stop bar.

A motorist travelling northbound on Church Street North through the reverse curve has a sightline in excess of 100 metres to a vehicle stopped at the Doner Street stop bar. Again, this exceeds the minimum requirement as established through the MTO road design standards (the minimum stopping sight distances is considered sufficient for an oncoming motorist to observe a hazard, react, and bring their vehicle to a complete stop prior to impact).

2.8 Traffic Volumes

To obtain current traffic volumes through the study area road system, a comprehensive count program was undertaken, consisting of intersection turning movement counts at the 6 key intersections and automatic traffic recorder (ATRs) counts at 7 mid-block locations. The count locations are noted in Figure 4. The intersection counts were completed on a typical weekday and on a Saturday to investigate variations in traffics volumes. Dates and times of the counts are noted below:

Tuesday April 19, 2016

- 7:00 - 10:00
- 11:00 - 13:00
- 15:00 - 18:00

Saturday April 23, 2016

- 11:00-14:00

For the ATRs, the counts were completed over the following period:

- 7-days from Tuesday May 24, 2016 to Monday, May 30, 2016.

Traffic volume associated with the AM, mid-day and PM peak hours were reviewed, and it was determined that the AM and PM peak hour volumes were typically greater than the mid-day counts and thus are representative of the more critical period. Similarly, the Saturday peak hour was compared to the AM and PM peak hour volumes; the latter volumes were determined to be greater for volumes to/from Church Street North. As such, only the AM and PM peak hour volumes have been considered further.

As a means of further confirmation of peak hour conditions, the resulting peak hour volumes on Church Street North, as established from the intersection turning movement counts, were compared to the peak hour volumes established from the ATR counts for the same locations (south of Fletcher Crescent and south of Doner Street), recognizing that the turning counts were completed over a single day period, whereas the ATRs were conducted over 7 days. Where the intersection counts exceeded the ATR counts, they were maintained to provide a conservative estimate. Where the intersection counts were less than the ATR counts, they were adjusted (which was required for the southbound volumes during the PM peak hour, and the northbound volumes during the AM peak hour). The resulting peak hour traffic volumes, illustrated in Figure 5, create the baseline data upon which the future traffic forecasts are established. Detailed traffic count data is provided in Appendix A.

As the counts were conducted in April and May 2016, they are considered reflective of typical traffic conditions and as such.

It is noted that at the time of the traffic counts, approximately 80% of the River's Edge Phase II development was considered complete, based on the number of residential units constructed and occupied. Consideration for the remainder of the development, and the associated traffic volumes it will generate, is discussed further in Section 4.2.2.

2.9 Travel Speeds

In conjunction with the traffic counts, the Automatic Traffic Recorders (ATRs) also recorded travel speeds over the 7-day count period. The ATRs on Church Street North were placed immediately south of Fletcher Crescent and south of Doner Street (within the reverse curve) to establish the overall travel speeds through the Church Street North corridor. A summary of the resulting recorded travel speeds is provided in Table 2, whereas graphical representations are provided in Figure 6.

Table 2: Travel Speeds

Speed Measure	South of Fletcher Crescent			South of Doner Street[1]		
	NB	SB	NB + SB	NB	SB	NB + SB
15th Percentile	41 km/h	41 km/h	41 km/h	41 km/h	40 km/h	41 km/h
50th Percentile	49	49	49	49	47	48
67th Percentile	52	52	52	50	52	51
85th Percentile	56	56	56	55	54	55
95th Percentile	62	62	62	61	60	61
Average Speed	49	49	49	49	47	48
10 km/h Pace Speed	46-55	46-55	46-55	46-55	46-55	46-55
% in Pace	53%	52%	53%	52%	50%	51%

[1] data observed within the reverse curve south of Doner Street

As noted, the speed data is consistent at both locations and for both directions of travel. The overall average speed over the 7-day count period was 49 km/h south of Fletcher Crescent and 48 km/h south of Doner Street (considering the northbound and southbound directions of travel combined). While the average speed coincides with the posted speed limit of 50 km/h, this suggests that 50% of motorists are travelling in excess of the speed limit. As noted in the table and evident in the figure, the 85% percentile speed (ie. the speed at which 85% of the motorists were recorded travelling at or below) is 54 to 56 km/h (ie. 10% over the posted speed limit). While it can be said that 50% of motorists are speeding, 85% are travelling at or below 55 km/h and hence the degree to which they are speeding is not excessive.

The Town's practice is not to set speed limits below the 67th speed percentile (ie. the speed at which two-thirds of motorists travel) so as to avoid increased potential for non-compliance.

2.10 Collisions

Collision data was provided by the Town for the period January 2011 to March 2016 (amounting to 5.25 years). In total, 17 collisions occurred along the subject length of Church Street North, including at the intersections from Victoria Street to Hussey Street. Additional details are summarized below, whereas a further listing of collision data is provided in Appendix B.

2.10.1 Road Condition

- 12 collisions occurred on a clear day when the road conditions were dry
- 3 occurred when the road was wet
- 2 occurred when there was loose snow on the road surface

2.10.2 Injuries & Fatalities

- 3 collisions resulted in non-fatal injuries
- no fatalities were observed

2.10.3 Mid-block Collisions

- 3 collisions occurred at mid-block locations (ie. between intersections)
- 2 were the result of vehicles rear-ended when turning into a commercial centre or when using on-street parking
- 1 occurred due to a vehicle drifting across the centre line and striking several parked cars

2.10.4 Intersection Collisions

- 13 collisions occurred at intersections – 10 at Victoria Street and 3 at Dominion Street
- 6 were caused by vehicles being rear ended at a red light, or shortly after it became green
- 2 were the result of being rear-ended while waiting to perform a turning movement
- 2 were the result of being rear-ended while accelerating after a turning movement was performed
- 1 was a sideswipe while stopped at an intersection
- 1 vehicle was struck on the side while crossing an intersection; (right angle collision)
- 1 vehicle struck a pedestrian in a crosswalk while completing a turn manoeuvre

2.11 Pedestrian & Cyclist Facilities

2.11.1 Pedestrian Facilities

Church Street North has a sidewalk on the west side of the road throughout the study area. On the east side of the road, a sidewalk exists from the Victoria Street intersection to the north side of the Evans Road intersection. An overall summary of the existing sidewalk system is provided in Table 3.

Table 3: Sidewalk Summary

Road Section	West Sidewalk	East Sidewalk
Victoria Street to Dominion Street	▪ continuous concrete sidewalk ▪ varies in width from 1.7 to 2.8 metres	▪ continuous concrete sidewalk ▪ approximately 3.4 metres in width throughout
Dominion Street to Fletcher Crescent	▪ concrete sidewalk throughout ▪ discontinuous sidewalk across commercial driveways ▪ sidewalk is 1.5 metres width at the centre of the Cunningham Bridge, but narrows to 1.3 metres between the edge of the bridge and the expansion joints	▪ concrete sidewalk throughout ▪ discontinuous sidewalk across commercial driveway ▪ reduced to 1.2 metres width around hydro pole on north-east corner of Dominion Street ▪ sidewalk is 1.5 metres width at the centre of the Cunningham Bridge, but narrows to 1.3 metres between the edge of the bridge and the expansion joints
Fletcher Crescent to Evans Road	▪ continuous concrete sidewalk ▪ sidewalk is 1.5 metres wide	▪ continuous concrete sidewalk ▪ sidewalk narrows to 1.2 metres wide north of bridge ▪ widens to 1.5 metres from Evans Road for approximately 3 metres south
Evans Road to Hussey Street	▪ continuous concrete sidewalk ▪ sidewalk is 1.5 metres wide	▪ sidewalk does not continue beyond north side of Evans Road

School crossing guards are currently utilized to assist children crossing Church Street North at Victoria Street, Fletcher Street and Hussey Street.

2.11.2 Cyclist Facilities

There are no dedicated cyclist facilities along Church Street North through the study area (ie. dedicated bike lanes or shared vehicle/cyclist lanes). It is noted that cyclist traffic is not permitted on the sidewalks (there are pavement markings at various locations on the sidewalks to indicate this) and thus cyclists are expected to travel on the road.

2.12 Pedestrian Volumes

In conjunction within the intersection traffic counts at the 6 study area intersections, pedestrian crossings were also observed and recorded during the full count program. The resulting pedestrian crossing volumes during the AM and PM peak hours, which coincide with the greatest vehicle volumes, are illustrated in Figure 7. As crosswalks on Church Street North only exist at the Hussey Street and Victoria Street intersections, all other pedestrian crossings were made by “jaywalking” across Church Street North. It is noted that there are 2 schools approximately 300 metres north of the study area on Church Street North and a recreation center on Fletcher Crescent. During the field visit, a group of school age pedestrians were observed travelling along Church Street North to presumably the recreation centre.

As indicated in Figure 7, pedestrian crossing volumes ranged from 0 to 110 people, with the following observed:

- At Fletcher Crescent, there were 20 pedestrians crossing Fletcher Crescent during the AM peak hour and 45 during the PM peak hour. There were no significant crossings of Church Street North. There is a school crossing guard at this location.
- At Evans Road, there was minimal pedestrian traffic on all 3 legs (typically 0 to 2 pedestrians per hour). The exception was during the PM peak, when there were 9 pedestrians crossing Church Street North between Evans Road and Fletcher Crescent.
- At Doner Street, there were 85 pedestrians crossing Doner Street during the AM peak and 19 during the PM, with minimal crossings of Church Street North (0 to 2 pedestrians per hour).
- At Hussey Street, 80 pedestrians crossed the west leg during the AM peak hour and 13 during the PM peak hour, whereas the east leg had 5 and 0 pedestrian crossings. There were 70 crossings of the north leg during the AM and 6 in the PM, but no crossings of the south leg. It is noted that the PM peak hour of the road system is slightly later than the peak hour of the school (which corresponds to the end of the school day). During the afternoon school peak, there were 70 pedestrian crossings of the north leg. As previously noted, a school crossing guard is provided at this intersection, and crosswalks are provided on the west and north legs.

3 Existing Conditions Assessment

This chapter provides an assessment of the existing conditions of the study area.

3.1 Road Configuration

Current Town standards for urban local and minor collector roads are provided in Appendix C, whereas key elements of each are summarized in Table 4, with a comparison to existing conditions.

Table 4: Road Configuration

Element	Existing Conditions	Urban Local Road Standards	Minor Collector Road Standards
right-of-way	20 metres	20 metres	23 metres
lanes per direction	1	1	1
lane width	3.6 to 4.15 m	4.25 m	5.0 m
total road width	7.2 to 8.3 m	8.5 m	10 m
sidewalk	1.2 to 1.5m location varies	1.5 m one side only	1.5 m both sides

In comparison to the current Town standard for a local road (as per the road's current designation), the road generally complies with the standard with exception of some sections through which the road width is somewhat less and/or the sidewalk width is deficient or non-existent.

In comparison to the Town's minor collector standard, deficiencies exist relating to each of the noted elements. The existing right-of-way is 20 metres along Church Street North, with the exception of through the reverse curve where it ranges from 20 to 30 metres, reflective of the angular approach to extending the right-of-way through the curve (ie. the right-of-way is not curved as the road is). In this regard, a re-designation of Church Street North to a minor collector would require modifications to ensure compliance with the Town standards, including a widening of the right-of-way by 3 metres through most areas (eg. 1.5 metres on either side to balance impacts), the widening of the road and provision of sidewalks on both sides (all of which are unlikely given the potential impacts to the existing residences along both sides of Church Street North).

3.2 On-Street Parking

As previously noted, parking is permitted on the west side of Church Street North of Fletcher Crescent, whereas it is prohibited on the east site (via Town By-Law 93-128). It is recommended that this be reversed in consideration of the horizontal geometry of the road (eg. S curve). Prohibiting parking on the west side will maintain a clear line of sight through the curve and in the area of the community mailbox. It is also recommended that appropriate signage be installed to inform motorists of the parking prohibition (while parking is currently prohibited on the east side of Church Street North, there are no signs north of Fletcher Crescent to indicate such and thus on-street parking does occur).

3.3 Horizontal & Vertical Alignment

3.3.1 Horizontal Alignment

As per the *Town of New Tecumseth Engineering Design Criteria and Standards for Subdivisions and Capital Works Projects*, the minimum recommended centerline radius is 115 metres for both urban local and minor collector roads.

As per *MTO Geometric Design Standards*, the minimum radius for a design speed of 60 km/h is 130 metres with a 6% superelevation and 120 metres with an 8% superelevation. For local roads, superelevations are not typically implemented given the lower speeds and lower volumes (superelevations aid in the ability of the vehicle to remain in their travel lane when traversing through horizontal curves at higher speeds).

As noted in Section 2.7.1, the existing radii were determined to be in the order of 150 to 160 metres and thus comply with the noted standards. As such, the application of a 60 km/h design speed is considered appropriate.

3.3.2 Vertical Alignment

As noted in Section 2.7.2, sight lines of 85 metres to in excess of 100 metres are provided at the critical locations through the reverse curve. As per Town standards, the minimum stopping sight distance requirement for an urban local road is 65 metres (reflective of a 50 km/h design speed), whereas for a minor collector it is 85 metres (reflective of a 60 km/h design speed). As per MTO standards, the minimum stopping sight distance requirement for a 60 km/h design speed is 85 metres. In this regard, the available sight lines, as established through field measures, are appropriate.

Further to the field measures, the available sightlines were also investigated using the engineering drawings for Church Street North. The review confirmed that the available sight lines for motorists approaching the curve and travelling through it, exceed the minimum requirement of 85 metres. It is also noted that further adjustments to stopping sight distance are appropriate to reflect an increasing grade. The northbound grade through the reverse curve is approximately 8% (as per the engineering drawings), which will assist vehicles in completing a stop manoeuvre. As per MTO standards, the minimum stopping sight distance for a design speed of 60 km/h can be reduced from 85 to 80 metres, reflective of the noted grade.

With respect to the vertical grade, there is a vertical curve through the reverse horizontal curve immediately south of Doner Street extending approximately 100 metres. Through this vertical curve, the maximum grade is 8% extending approximately 35 metres. Town standards dictate a desired maximum grade of 5% for both urban local and minor collector roads, whereas MTO standards dictate a maximum grade of 6 to 12% for an urban road with a design speed of 60 to 70km/h, and 8 to 12% for a 50 km/h design speed. In context of the MTO criteria and the short length of curve in question, the 8% grade is considered acceptable.

3.4 Traffic Operations

3.4.1 Intersection Operations

The assessment of existing conditions provides the baseline from which the future traffic volumes and operations can be assessed. The capacity, and hence operations, of a road system are effectively dictated by its intersections. As such, the analysis of existing conditions focused on the operations of the 6 key intersections previously noted. The analysis is based on the 2016 traffic volumes, the existing intersection configurations and control, existing signal timings at the Victoria Street intersection (60 second cycle length with 28 second green for E-W, 20 second green for N-S, 4 second yellow and 2 second all-red), and procedures outlined in the *Highway Capacity Manual*[1] (using Synchro v.9 software).

The results of the existing intersection operations are summarized in Table 5 whereas detailed worksheets are provided in Appendix D. For the signalized intersection at Victoria Street, the results are displayed in the form of average delay (measured in seconds), level of service (LOS) and volume to capacity (v/c) for each approach and the overall intersection. It is noted that while the results summarize the intersection operations by approach, additional discussion is provided with respect to individual movements in such cases where an approach offers otherwise acceptable operations but operational issues exist for an individual movement. For the unsignalized intersections, the results are provided for the critical movements, namely those that are stop controlled. Level of service A corresponds to the best operating condition with minimal delays whereas level of service F corresponds to poor operations resulting from high intersection delays. A v/c ratio of less than 1.0 indicates the intersection movement/approach is operating at less than capacity while v/c of 1.0 indicates capacity has been reached.

Based on the 2016 traffic volumes and the existing intersection configuration, the signalized intersection at Victoria Street provides good levels of service when considering the overall intersection operations (LOS B or better), with minor delays during both peak hours. In terms of individual approaches, each provides good levels of service (LOS B). Likewise, the unsignalized intersections offer good levels of service (LOS C or better) on the critical movements with acceptable delays. As such, no improvements are recommended to address operations under the existing 2016 conditions.

[1] *Highway Capacity Manual.* Transportation Research Board, Washington DC, 2000.

Table 5: Intersection Operations - 2016

Intersection and Movement			Control	Weekday AM Peak Hour			Weekday PM Peak Hour		
				delay	LOS	v/c	delay	LOS	v/c
1	Victoria St & Church St N[1]	EB	signal	15	B	0.59	17	B	0.70
		WB		16	B	0.66	17	B	0.73
		NB		8	A	0.18	12	B	0.44
		SB		10	A	0.36	15	B	0.56
		overall	signal	13	B	0.48	16	B	0.64
2	Dominion St & Church St N	EB	stop	13	B	0.06	19	C	0.24
		WB	stop	11	B	0.09	13	B	0.20
3	Fletcher Cr & Church St N	EB	stop	12	B	0.15	12	B	0.19
4	Evans Rd & Church St N	WB	stop	12	B	0.07	12	B	0.06
5	Doner St & Church St N	EB	stop	10	A	0.03	10	A	0.02
6	Hussey St & Church St N	EB	stop	7	A	0.07	7	A	0.04
		WB	stop	8	A	0.02	8	A	0.02
		NB	stop	8	A	0.17	9	A	0.25
		SB	stop	8	A	0.19	8	A	0.18

[1] reflects existing traffic signal timings

3.4.2 Road Section Operations

Further to the review of the key intersections, which has confirmed that there are no operational issues given 2016 conditions, road section operations have also been investigated whereby traffic volumes on specific road sections have been reviewed in consideration of typical planning capacities.

Ideally, a road can accommodate between 1800 to 2000 vehicles per hour per lane (vphpl). However, this value must be reduced due to the effects of adjacent signals and intersection controls, road grade, lane width, vehicle composition (ie. number of trucks), obstructions and access, and road function. As such, an effective capacity of 1800 to 2000 vphpl is not realistic along Church Street North. Rather, the following planning capacities have been applied:

- minor collector – 600 vehicles per hour per lane (vphpl); and
- local road – 400 vphpl.

An assessment of the existing traffic operations was undertaken based on the 2016 AM and PM peak hour traffic volumes, the road classification as per the Town's Official Plan and the above noted assumed planning capacities. The resulting volume to capacity ratios are presented in Table 6 for the noted road sections along Church Street North. As indicated, a capacity of 400 vehicles per hour per lane has been assumed, reflective of the current local road designation. Should the volume exceed 90% of the road capacity (ie. v/c ≥ 0.90), congestion is likely to occur, whereas a capacity deficiency occurs when the volume exceeds capacity (ie. v/c ≥ 1.0).

Table 6: Road Section Operations - 2016

Road Section & Capacity[1]		Traffic Volumes AM (PM)				Volume to Capacity AM (PM)			
		NB		SB		NB		SB	
Victoria St to Dominion St	400	162	(284)	281	(300)	0.41	(0.71)	0.70	(0.75)
Dominion St to Fletcher Cres	400	249	(376)	314	(327)	0.62	(0.94)	0.79	(0.82)
Fletcher Cres to Evans Rd	400	190	(252)	268	(212)	0.48	(0.63)	0.67	(0.53)
Evans Rd to Doner St	400	139	(226)	219	(180)	0.35	(0.57)	0.55	(0.45)
Doner St to Hussey St	400	131	(197)	201	(168)	0.33	(0.49)	0.50	(0.42)

[1] capacity is denoted as vehicles per hour per lane

Based on the assessment of the existing (2016) traffic volumes, the section of Church Street North from Dominion Street to Fletcher Crescent is approaching its theoretical planning capacity (it is at 94% capacity). However, as indicated in the previous section, both the upstream and downstream intersections provide acceptable levels of service and operations, and thus additional capacity on Church Street North through this section is not considered necessary. For the remaining road sections, they are operating at 82% or less of the available capacity with reduced degrees of utilization for the more northerly road sections given the associated drops in traffic volumes.

3.5 Traffic Control Warrants

Notwithstanding the acceptable operating conditions under the existing intersection controls, the need for traffic signals and/or all-way stop control have been explored based on corresponding warrants.

3.5.1 Traffic Signal Control

Traffic signal warrant analysis was performed for the 2016 traffic volume conditions for those intersections that are currently unsignalized. The warrants are based on MTO procedures and consider the 8 busiest hours of the day, which typically correspond to the periods addressed during the intersection turning movement counts. A summary of the warrant analysis review is provided in Table 7 whereas additional details as to the individual warrants are provided in Appendix E.

As indicated, traffic signal control is not currently warranted at any of the unsignalized intersections along Church Street North. While having traffic signal control at the intersection with Fletcher Crescent would provide right-of-way for emergency vehicles (via emergency vehicle pre-emption) and better facilitate pedestrian crossings (particularly seniors given the adjacent seniors residence), the existing volumes do not meet the volume or delay requirements to warrant a signal.

Table 7: Traffic Signal Warrants - 2016

Intersection	Warrant Compliance		Recommended Signal Installation
	Minimum Volume	Delay to Cross Traffic	
Dominion Street	75%	76%	No
Fletcher Crescent	66%	55%	No
Evans Road	48%	44%	No
Doner Street	39%	44%	No
Hussey Street	35%	50%	No
Fletcher Crescent & Evans Road (realigned)[1]	68%	80%	No

[1] assumes the two 3-way intersections are realigned to create a single 4-leg intersection

Consideration was also given to the potential to realign Fletcher Crescent and/or Evans Road to create a 4-leg intersection due to the close proximity of the two intersections (the centerlines of the two roads are approximately 20 metres apart). The potential need for signal control was assessed (recognizing that the warrants differ between 3-leg and 4-leg intersections). However, the volumes through the combined/realigned intersection are not sufficient to warrant traffic signals. It is also noted that the creation of a 4-leg intersection would require the realignment of 70 to 100 metres of road, which in turn would require the acquisition of 1 or more properties and removal of the existing residences. Given the associated costs (both road construction and property acquisition) and impacts to residences, coupled with the acceptable operations that will otherwise be provided should the existing intersection configurations remain, a realignment is not considered practical and hence not recommended.

3.5.2 All-Way Stop Control

Under existing conditions, all intersections between Hussey Street and Victoria Street along Church Street North have either one-way or two-way stop control with right of way given to Church Street North. As current traffic volumes do not warrant traffic signal control, all-way stop control was investigated as an alternative. According to the *Ontario Traffic Manual Book 5: Regulatory Signs*[2] published by the Ministry of Transportation Ontario (MTO), all-way stop controls should be considered only under the following situations:

[2] *Ontario Traffic Manual Book 5: Regulatory Signs.* MTO, March 2000.

- as an interim measure, where traffic control signals are warranted but cannot be implemented immediately;
- at locations having a high collision frequency where less restrictive measures have been tried and found inadequate; or
- as a means of providing a transition period to accustom drivers to a change in intersection right-of-way control from one direction to another.

In consideration of the Church Street North environment, the associated traffic volumes and operations, the above criteria are not satisfied and thus all-way stop need not be considered.

Notwithstanding, in some circumstances, it may be appropriate to install stop signs on all approaches to an intersection. All-way stop control disrupts the flow of traffic and introduces delays to all drivers within the intersection and should only be considered at the intersection of two relatively equal roadways having similar traffic volume demand and operating characteristics. All-way stop control may be considered on minor roads (which is considered applicable to Church Street North in that it is not otherwise an arterial or major road) where the following conditions are met:

- the total vehicle volume on all approaches exceeds 350 for the highest hour recorded; and
- the volume split does not exceed 75/25 for three-way control, or 65/35 for four-way control (volume is defined as vehicles only).

Table 8 summarizes the results of the all-way stop control warrant analysis based on the above requirements and considering the 2016 AM and PM peak hour volumes.

Table 8: All-Way Stop Warrants - 2016

Intersection & Peak Hour Period		Total Vehicle Volume for Highest Peak Hour	Volume Split	All-Way Stop Control Volume Warrant Met
Dominion Street	AM	555	13 / 87	No
	PM	785	22 / 78	No
Fletcher Crescent	AM	544	16 / 84	No
	PM	646	17 / 83	No
Evans Road	AM	417	8 / 92	No
	PM	472	6 / 94	No
Doner Street	AM	361	5 / 95	No
	PM	379	4 / 96	No
Hussey Street	AM	340	20 / 80	No
	PM	341	11 / 89	No

As noted, all-way stop control is not warranted for any of the intersections under investigation for either the AM or PM peak hour conditions. While most of the intersections satisfy the highest peak hour vehicle volume for the warrant, no intersection satisfies the requisite volume split (which is indicative of Church Street North serving the higher traffic volumes). It is noted that despite its existing 4-way stop control, such is not warranted at the intersection of Hussey Street with Church Street North (the need for motorists on Church Street North to come to a stop results in additional, unwarranted delays).

The *Ontario Traffic Manual Book 5: Regulatory Signs* also provides guidance regarding inappropriate use of all-way stop control. All-way stop controls should not be used under the following conditions:

- where the protection of pedestrians, school children in particular, is a prime concern (this concern can usually be addressed by other means); and
- as a speed control device.

3.6 Turn Lane Warrants

The need for exclusive turn lanes, where such do not otherwise exist, was reviewed at each of the key intersections which operate under one-way or two-way stop control. Turn lanes were considered for the free flow movements.

The need for right turn lanes was evaluated based on the following MTO criteria:

- right turn lanes should be considered when the turning volume exceeds 60 vehicles per hour and has the potential to interfere with through traffic.

The need for left turn lanes was reviewed based on the following:

- MTO guidelines for left turn lanes at unsignalized intersections on 2-lane roads;
- a design speed of 60 km/h (10 km/h over the posted speed of 50 km/h); and
- the 2016 traffic volumes.

3.6.1 Right Turn Lanes

As per the 2016 volumes, the only intersection at which the right turn volumes exceed the noted threshold of 60 vehicles is the Victoria Street intersection, at which northbound and southbound right turn lanes are already provided. While the northbound right turn volume during the PM peak hour is approaching 60 vehicles at Evans Road (50 vehicles were observed), such are not considered to cause significant impacts to the through vehicles (there is less than 1 right turn per minute, with approximately 4 vehicles per minute proceeding northbound).

3.6.2 Left Turn Lanes

Left turn lane warrant analysis was performed for the 2016 traffic volume conditions for all intersections without an existing dedicated left turn lane in the study area as summarized in Table 9.

Table 9: Left Turn Lane Warrant - 2016

Intersection	Left Turn Lane Warrant		Minimum Storage
	NB	SB	
Dominion Street	No	No	-
Fletcher Crescent	Yes	-	15 metres
Evans Road	-	No	-
Doner Street	No	-	-
Hussey Street	No	No	-

As noted, under 2016 traffic volumes, a left turn lane is warranted at the Church Street North and Fletcher Crescent intersection. As per MTO standards for a design speed of 60 km/h, the left turn lane should consist of the following: 50 metre taper + 30 metre parallel lane + 15 metre storage length + 15 metre offset to the centre of the intersection. In this regard, the left turn lane would commence 110 metres in advance of the Fletcher Crescent intersection. It is noted that the Boyne River is located immediately south of Fletcher Crescent and thus a left turn lane of the noted dimensions would extend into and beyond the Cunningham Bridge (the bridge has a length of approximately 60 metres). As the bridge is only 8.3 metres wide, it is not of sufficient width to accommodate a left turn lane (the minimum required width would be 10.0 metres, to accommodate a 3.5 metre southbound through lane, a 3.5 metre northbound through lane and a 3.0 metre northbound left turn lane). While “pocket turn lanes” are often provided in urban environments (these are turns lanes of reduced length and not conforming to standards recognizing constraints of urban environments), such cannot be accommodated under the existing configuration given the close proximity of the bridge to the intersection (there is less than 5 metres available beyond the end of the bridge and the south curb line of Fletcher Crescent). In this regard, a northbound left turn lane could only be accommodated should the bridge be widened or if Fletcher Crescent were to be realigned to the north, thereby increasing the offset to the structure (in which case only a small “pocket turn lane” would be possible).

3.7 Speed Limit

As previously noted, the current posted speed limit on Church Street North is 50 km/h whereas the average recorded speed is 47 to 49 km/h (refer to Table 2). In considering the appropriateness of the existing speed limit, a number of approaches were considered.

3.7.1 Provincially Accepted Method

The provincially accepted method for establishing a speed limit is to use the 85th percentile speed. As per the data provided in Table 2, the observed 85th percentile speed is in the order of 54 to 56 km/h (varies slightly by location and direction of travel).

3.7.2 Town Policy

The Town's policy is not to set speed limits lower than the 67th percentile speed. As per the speed information obtained, and reflected in the cumulative speed plots of Figure 6, the 67th percentile speed is approximately 50 km/h.

3.7.3 Transportation Association of Canada

The Transportation Association of Canada (TAC) developed the *Canadian Guidelines for Establishing Posted Speed Limits*[3] to provide guidance and to enhance consistency in the evaluation of posted speed limits. In establishing an appropriate speed limit, the guidelines consider the classification, function and physical characteristics of the road section in question, providing an objective assessment based on engineering factors and associated risks (the higher the level of risk, the lower the recommended posted speed limit). Based on the guidelines (a completed worksheet is provided in Appendix F), a speed limit of 40 km/h is recommended. This is premised largely on the following:

- the increased number of driveways along Church Street North at which conflicts may result;
- the provision of on-street parking opportunities; and
- the potential for cyclists to be sharing the road with motorized vehicles.

That being said, the TAC guidelines also note:

> *For roads with a posted speed of 70 km/h or less, the 85th percentile speed under relatively ideal driving conditions should be within +/-10 km/h of the posted speed.*
>
> *It is inappropriate to set a posted speed limit that is inconsistent with drivers' perceptions, and then to rely on enforcement efforts to reduce operating speeds. As well, posted speed limits that are significantly different than the prevailing speeds contribute to speed dispersion and a higher risk of collisions.*

With an 85th percentile speed of 54 to 56 km/h, this suggests the posted speed limit should be no less than 50 km/h (recognizing that speed limits are set in increments of 10 km/h and that a 40 km/h speed limit would be approximately 15 km/h less than the 85th percentile speed).

[3] *Canadian Guidelines for Establishing Posted Speed Limits.* Transportation Association of Canada, June 2009.

3.7.4 Assessment

In consideration of the above, the existing 50 km/h posted speed limit is considered appropriate.

3.8 Collisions

3.8.1 Mid-Block Collisions

Accident Rate is defined as the number of reportable accidents occurring annually on a particular road section for every million vehicle kilometres (MVKM) travelled on that road section during the same period. The accident rate is calculated as follows:

- Accident Rate = the number of accidents for a given year divided by the MVKM
- MVKM = average daily traffic x 365 days/year x road section length (km) ÷ 1,000,000

Church Street North Accident Rate

The accident rate for Church Street North was established based on the following:

- 17 total collisions over the 2012 to 2016 review period (5.25 years), of which 3 were identified as occurring at mid-block locations on Church Street North (the remaining collisions occurred at intersections and are attributed to the intersection control and vehicle operations through such);
- an average daily volume of 4870 vehicles per day (represents the average daily volume over the 7-day count period considering both Church Street North count locations); and
- a 600 metre length of Church Street North, from Victoria Street to Hussey Street.

The Accident Rate was determined to be 0.56 collisions per million vehicle-kilometres of travel.

Published Accident Rates

As per MTO published data for the year 2010[4], the following accident rates were realized (collisions per million vehicle kilometres of travel):

- 0.6 for King's Highways not including freeways (eg. QEW, 400, 401, 410, etc.);
- 1.0 for Secondary Highways;
- 2.7 for Other Roads (relating to non-provincial roads/highways, as per the Ontario Road Safety Annual Report); and
- 1.7 for the provincial road system overall.

[4] *Provincial Highways Traffic Volumes, 1988-2010*. Ministry of Transportation.

Assessment

In this regard, the accident rate observed on Church Street North is less than published rates for other roads in the province.

Of the 3 collisions noted on Church Street North not attributed to intersections, 1 occurred between Dominion Street and Fletcher Crescent and 2 occurred between Evans Road and Doner Street. For the later, both occurred in the vicinity of the reverse curve with one relating to street-parking and the other the result of cars being sideswiped. To provide some additional direction and indication to motorists, advance warning signs (Wa-5R) are recommended for the reverse curve (in both directions). In addition, it is recommended that the road centerline be painted to provide a visual cue to motorists as to delineation of the northbound and southbound travel lanes.

3.8.2 Intersection Collisions

Of the 17 collisions, 13 occurred at intersections with the greatest number at Victoria Street (10) and the remaining at Dominion Street.

Victoria Street & Church Street North

The intersection of Church Street North and Victoria Street is signalized. All approaches provide an exclusive right turn lane and a shared through/left lane. Based on 2016 volumes, the intersection experiences a high volume of southbound left turns, particularly during the PM peak hour. While the southbound PM left turns are highest, there are still a large number of turning vehicles in the remaining directions. Where there are high volumes of turning vehicles at an intersection, there is a greater opportunity for collision. The higher number of collisions at this intersection could be a result of the following:

- vehicles approach at high speeds - a majority of the collisions at this intersection were the result of stopped vehicles rear-ended when the signal was red;
- no advance green phase or the lack of a dedicated left turn lane - resulting in all left turns being completed during an unprotected phase; and
- lane configuration - it is noted that the north approach has a shared through/left lane and an exclusive right turn lane which results in southbound through vehicles using the right turn lane to slip-by left turning vehicles, thus creating potential conflict with the northbound left turn.

Dominion Street & Church Street North

This intersection offers stop control on Dominion Street with each approach providing a shared right/through/left lane. The profiles of Church Street North and Dominion Street through the area are straight and flat. Vehicles on Dominion Street primarily turn northbound or southbound onto Church Street North. The higher number of collisions at this intersection was the result of vehicles turning onto

Church Street North striking, or being struck by, vehicles that were travelling on Church Street North. This could be a result of long wait times before turning movements could be performed. Sight lines at the intersection are otherwise clear in both directions.

3.9 Pedestrian & Cyclist Facilities

3.9.1 Pedestrian Facilities

Town Standards

The *Town of New Tecumseth Engineering Design Criteria and Standards for Subdivisions and Capital Works Projects* specifies the following:

- sidewalks shall be constructed on one side of local and industrial roads;
- sidewalks shall be constructed on both sides of collector and arterial roads;
- in general, sidewalks should be located on the north and east sides of the road;
- sidewalks are to be 1.5 metres in width, increased to 1.8 metres in width where adjacent to the road (ie. curb face sidewalk); and
- sidewalks are to be continuous through industrial, commercial and institutional driveways (although not specifically noted, sidewalks are to be continuous through residential driveways also).

Assessment

As per the current road designation, that being a local road, the existing sidewalk system complies with the Town standards with respect to the provision of sidewalk on one side. While the standards note sidewalks are generally to be on the east side of north-south roads, the Church Street North sidewalk is continuous on the west side. Under the recommended designation as a minor collector road, additional sidewalk would be required on the east side of Church Street North between Evans Road and Hussey Street to ensure continuous sidewalk is provided on both sides.

With respect to the remaining standards and compliance of the existing sidewalk system, the following are noted:

- the sidewalk between Dominion Street and Fletcher Crescent does not comply with the minimum width of 1.8 metres given that this is directly adjacent to the road (the sidewalk is 1.7 metres wide between Fletcher Crescent and Dominion Street, 1.3 metres wide at the north end of the bridge on both sides, and 1.2 metres wide around the hydro pole on the north-west corner of the Dominion Street intersection);

- the east sidewalk between Fletcher Crescent and Evans Road does not comply with the minimum width of 1.8 metres given that this is directly adjacent to the road (it narrows to 1.2 metres until approach to Evans Road where it widens to 1.5 metres); and
- sidewalks are discontinuous through the driveways at the commercial block on the north-west corner of the Dominion Street intersection and the Beer Store (the provision of a continuous sidewalk will reinforce the pedestrian space and provide a visual indicator to motorists of the potential presence of pedestrians).

In addition, the following are also noted:

- there is no painted crosswalk across Evans Road to facilitate north-south pedestrian crossings;
- painted crosswalks are only provided on the north and west legs of the Hussey Street intersection (crosswalks should be implemented on all 4-legs in that each is stop controlled, thus offering pedestrians an opportunity to safely cross);
- the sidewalk on the north side of Evans Road is not 1.5 metres wide and there is no sidewalk extension to meet the sidewalk on the west side of Church Street North;
- the sidewalks from Dominion Street to Fletcher Crescent are aged and there are several areas where deficiencies exist (including some areas where asphalt patching has been added, or vertical steps ground down to eliminate trip hazards); and
- the sidewalks on the Cunningham Bridge and its approaches are deteriorating and have settled in areas upon approach to the bridge.

As noted, the sidewalk across the Cunningham Bridge is 1.5 metres in width. However, the approach sidewalks are 1.3 metres as they are not integrated with the top abutment wall/railing system (as they are across the bridge, thus providing the extra width). As the existing sidewalks are a separate entity, they have settled creating a vertical step and isolating the sidewalk from the top abutment wall/railing system. It appears that the approach sidewalk on the north-east corner of the bridge was recently replaced to correct such deficiencies – the same improvements should be undertaken on the remaining corners. Regardless, neither the sidewalk across the bridge nor the approaches meets the 1.8 metre required sidewalk width for sidewalks adjacent to roadways.

3.9.2 Cyclist Facilities

There are no requirements for designated cycling facilities on Church Street North.

3.10 Roadside Safety

The field inventory included a review of the road network with respect to potential roadside hazards and the existing safety measures in place protecting motorists from said hazards. Several potential hazards were identified where safety measures were absent or where the existing safety measures were considered insufficient given the hazard.

For a road with a design speed of 60 km/h or less, the *Ontario Roadside Safety Manual*[5] specifies a clear zone width of 0.5 metres when barrier curb is present or 3 metres where there is no barrier curb. The clear zone width is defined as the distance from the edge of the travelled portion of the road to the face of an unprotected hazard. Any hazards within the clear zone must be removed or appropriately shielded to minimize impacts upon collision.

Table 10 summarizes noted hazard locations, whereas corresponding photographs are provided in Figure 8 and additional details provided below. While sidewalks of deficient width are not considered as a hazard to motorists, they are considered hazardous to pedestrians (particularly those requiring mobility aids) and thus have been flagged accordingly.

Table 10: Roadside Safety Hazards

Road Section	Location	Hazard Type	Photo Reference[1]
Victoria Street to Dominion Street	east sidewalk	obstruction in clear zone	1
Dominion Street to Fletcher Crescent	north-west corner of Dominion Street intersection	reduced sidewalk width around hydro pole (1.8m width required)	2
	eastbound lane on Dominion St at Church St	stop sign next to the EB travel lane (<0.5m) with improper installation	3
	Beer Store and commercial block on east side	sidewalk discontinuous across commercial access	4, 5 & 6
	rear access to the Beer Store	for vehicles exiting the Beer Store, visibility to the north is somewhat restricted	5
	west side of Church St north of Dominion St	missing no parking signs	7
	all corners of bridge	missing or sub-standard guiderail bridge end treatments	8 & 9
	multiple areas on east and west sidewalk	inconsistent and/or deficient sidewalk widths (1.8m width required)	10
Fletcher Crescent to Evans Road	east side of road	inconsistent and deficient sidewalk widths (1.8m width required)	10
Evans Road to Doner Street	north side sidewalk on Evans Road	no sidewalk extension to the sidewalk on the west side of Church Street North	11
	mailbox on the west side of Church Street North	vehicles parked at the mailbox could obstruct sightlines for those at Doner Street intersection and those proceeding southbound on Church Street North	12
	south-west corner of Doner Street intersection	trees and hydro poles could obstruct sight lines	13

[1] refers to photographs provided in Figure 8

[5] *Ontario Roadside Safety Manual. MTO, 1993.*

3.10.1 Victoria Street to Dominion Street

Photo 1: There are multiple obstructions/hazards within the 0.5 metre clear zone width. As shown, there are 2 flower boxes and 2 street poles in the clear zone on the east side of the road, as well as 2 flower boxes and 1 street pole on the west side of the road.

3.10.2 Dominion Street to Fletcher Crescent

Photo 2: At the north-east corner of the Dominion Street and Church Street North intersection, a hydro pole causes the sidewalk to narrow due to the proximity to the edge of the right-of-way. This forces pedestrians to manoeuvre around the pole to continue along the sidewalk. The hydro pole should be relocated or the sidewalk widened to address this. It is noted that the adjacent commercial parking lot encroaches into the municipal right-of-way along Church Street North, and thus lands can be reclaimed as necessary. Sidewalks adjacent to the road are to have a minimum width of 1.8 metres.

Photo 3: A stop sign in a concrete pole base is within the clear zone of Dominion Street at the south-east corner of the intersection of Dominion Street with Church Street North. Given the steadfast nature of the sign installation, it poses a hazard should it be impacted by an errant vehicle. The intersection corner and the adjacent parking area should be properly delineated via a curb and the sign installed as per current standards (including provision for break-way upon impact).

Photos 4, 5 & 6: The existing sidewalks are discontinuous across the existing 3 commercial driveways. Without the sidewalks continuing, vehicles may not know the proper location to stop before turning on the adjacent road, potentially blocking pedestrians. As per Town standards, it is recommended that the sidewalks be continued across the driveway, thereby better defining the pedestrian realm, visibility and safety. As these sidewalks are adjacent to the road, they should have a minimum width of 1.8 metres.

Photo 5: A delivery access for trucks entering/exiting the Beer Store on the west side of Church Street North has very poor visibility and has a discontinuous sidewalk across the entrance. Located at the south-west corner of the bridge, unmaintained brush decreases the sightlines to the north and a coniferous tree reduces the sightlines to the south. In addition, due to the discontinuous sidewalk, it is unclear where delivery trucks should stop before proceeding on Church Street North, potentially blocking pedestrians from crossing. It is recommended to better maintain the brush on the north side of the access and the tree on the south side to help improve sightlines for trucks using this access. Should this access be an entrance only (ie. no exit), the issues regarding sightlines can be dismissed in that they are only applicable to exiting vehicles.

Photo 7: The taper on the southbound lane after crossing the bridge does not have “no parking” signs within it, resulting in parked vehicles potentially hindering turning movements into the Beer Store or to Dominion Street. This was documented during the site visit, where the photo shows an illegally parked vehicle. It is recommended to improve signage and road markings to better indicate the intention of the taper and the widened section of road.

As an alternative, the taper can be eliminated all together in that the southbound right turn volumes into the Beer Store and at Dominion Street are not significant and thus do not warrant a separate lane. Elimination of the taper would allow the overall footprint of the intersection to be reduced, thus improving pedestrian operations.

Photos 8 & 9: All corners of the bridge are missing guiderail end treatments which pose a hazard to errant vehicles (potential impact with the abutment wall or traversing beyond the wall into the river). While guiderail is present on the south-west corner of the bridge, its main purpose is to protect those serving the Beer Store, not those travelling on Church Street North. Given the embankment and the presence of the river, it is recommended that proper guiderail and end treatments be installed.

Photo 10: The sidewalk narrows from 1.5 metres to 1.3 metres while approaching the bridge from the south-east sidewalk. In the middle of the bridge, the sidewalk widens to 1.5 metres for a short section before narrowing to 1.2 metres on the north-east section. As per the *Town of New Tecumseth Engineering Design Criteria*, sidewalks adjacent to roads should have a minimum width of 1.8 metres.

3.10.3 Fletcher Crescent to Evans Road

Photo 10: The sidewalk width varies from 1.2 metres to 1.5 metres near the pedestrian in the picture. As per Town standards, sidewalks adjacent to roads should have a width of 1.8 metres.

Photo 11: The existing north sidewalk on Evans Road terminates at Church Street North. There is no sidewalk extension on the west side of Church Street North to connect to the existing sidewalk. Furthermore, the placement of the sidewalk on the north-east corner does not properly align with the Church Street North sidewalk on the east side of the road, due to a change in the road width from 9.2 to 9.6 metres beyond the intersection. As such, the pedestrian standing area on the south-east corner should be extended along Evans Road to better align with that on the north-east corner. A painted crosswalk is also recommended on Evans Road (along this same sidewalk alignment), as previously noted.

3.10.4 Evans Road to Doner Street

Photo 12: Vehicles parked at the community mailbox on the reverse curve may result in sight line obstructions for vehicles turning from Doner Street to proceed southbound on Church Street North. In addition, due to the presence of on-street parking on both sides of the road through the reverse curve (despite being prohibited on the east side by a Town by-law), this could prove an additional hazard as this encourages motorists who wish to obtain their mail to park in the middle of the reverse curve. At this location, the road width is 9.6 metres, which is not sufficient to accommodate on-street parking on both sides of the road whilst maintaining two active lanes of traffic. It is recommended to relocate the mailbox further along Church Street North outside of the reverse curve, or to an adjacent side street. In addition, on-street parking should be prohibited on the west side of Church Street North through the reverse curve to ensure clear sight lines are afforded to those approaching from the north and to provide additional width for vehicles; parking should be permitted on the east side only.

Photo 13: At the Doner Street stop bar, the presence of several mature trees and the recently installed hydro pole are within the line of sight for motorists waiting to proceed to Church Street North. However, as previously discussed, the available sight line does comply with the appropriate requirements and can be increased should motorists advance beyond the stop bar towards the intersection. It is noted that there are no reverse curve signs on Church Street North which would provide motorists with a reminder (it is recognized that most motorists are likely area residents or frequent visitors to the area and thus should be well aware of the road alignment).

It is noted that there are two driveways on the west side of Church Street North immediately south of Doner Street (within the reverse curve) that have sightlines less than 85 metres (as illustrated in Figure 9). Both of the associated residences (7 Doner Street and 116 Church Street North) have 2 driveways, the second of which provides improved sightlines. As such, it is recommended that these residents be encouraged to use the access with the greatest sight lines when exiting their residence (the Doner Street access at 7 Doner Street and the south access at 116 Church Street North). The remaining access points can be readily used for inbound travel as the sightlines for northbound travel on Church Street North are increased.

4 Future Conditions

4.1 Future Road Network

Outside of routine maintenance and minor improvements to Church Street North that may result from this study, no other significant road network improvements have been identified by the Town (ie. that are currently planned or otherwise being considered) that would significantly alter the road system or increase the available capacity. In this regard, the existing road system has been maintained as it relates to the operational assessment of the future conditions.

4.2 Future Traffic Volumes

4.2.1 Horizon Years

Future traffic volumes have been forecasted for the years 2021, 2026 and 2036 (5, 10 and 20 year periods beyond the study commencement year). The horizon years have been chosen in order to identify the short, medium and long-term needs of the study area road network.

4.2.2 Background Development

There are 2 developments with the area that have been considered with respect to additional traffic that they will create through the study area road system.

River's Edge II

River's Edge is the residential development located along the northerly extension of Church Street North and area roads, extending from Church Street North to Boyne Street and up to Gray Avenue. Phase II is currently under construction with approximately 200 units remaining to be constructed and occupied. Traffic volumes associated with the River's Edge II development were obtained from the corresponding traffic impact study, with adjustments to reflect those units that have since been completed (recognizing that the latest traffic counts were completed in April 2016). In considering the extent of development complete, approximately 15% of the AM peak hour volumes have yet to be realized and 20% of the PM peak hour volumes (it is noted that the Alliston Union Public School has been completed, which generates more traffic in the AM peak hour as compared to the PM peak hour, thus skewing the remaining estimates).

The resulting increase in traffic volumes amount to 35 to 45 trips on Church Street North through the study area (recognizing that the development also provides access to King Street to the west and Boyne Street to the east beyond the limits of the study area). The completion of River's Edge II is expected within the next 1 to 2 years and thus has been fully considered in the 2021 horizon.

Stevenson Memorial Hospital

The Stevenson Memorial Hospital is planning to expand from 6700m^2 (71,925 ft^2) to 15,000m^2 (161,577 ft^2) to better service its market area. This represents an increase of approximately 125% and thus a comparable increase in associated traffic volumes to/from the hospital is expected. Trip estimates were derived based on the noted hospital floor areas and trip generation rates reflecting a "hospital" land use, as per the *ITE Trip Generation Manual*[6] *9th Edition*. The resulting trip estimates are summarized in Table 11.

Table 11: Stevenson Hospital Trip Estimates

Land Use	GFA	Weekday AM Peak Hour			Weekday PM Peak Hour		
		in	out	total	in	out	total
existing hospital	71,925 ft^2	43	25	68	25	41	67
expansion	89,652 ft^2	54	32	85	32	52	83
Total		97	57	153	57	93	150

As noted, the planned expansion is projected to generate an additional 85 trips during the AM peak hour and 83 trips during the PM peak hour. In considering the assignment of these trips to the area road system, it was assumed that 60% would travel to/from the east via Fletcher Crescent to Church Street North, continuing through the study area intersections reflective of existing travel patterns. This equates to an additional 50 vehicles per hour on Fletcher Crescent, which translates to an increase of approximately 20 to 25% in volumes on Fletcher Crescent.

Stevenson Memorial Hospital indicated construction is anticipated to begin in 2019, proceeding under 5 phases with completion over 15 years. As such:

- Phase 1 is assumed to be completed by 2021 and would add 18,000 ft^2 of new space (20%);
- Phase 2 is assumed to be completed by 2026, adding an additional 18,000 ft^2 (20%); and
- Phases 3 to 5 are assumed to be completed by 2036, adding the remaining 54,000 ft^2 (60%).

4.2.3 Background Growth

Background growth rates, which consider growth on the area road network not otherwise attributed to development identified, have been determined based on historic traffic data and population and employment projections for the area.

[6] *ITE Trip Generation Manual, 9th Edition*. Institute of Transportation Engineers, 2012.

The growth rates which primarily serve the study area have been based on the projected population and employment growth for the Town of New Tecumseth. The *Ontario Places to Grow Growth Plan*[7] projects the following growth for the Town over the period 2006 to 2031:

- population will increase from 28,800 to 56,000 persons (2.6% annual growth); and
- employment will increase from 19,700 to 26,500 jobs (1.2% annual growth).

The Official Plan for the Town of New Tecumseth predicted that Alliston would grow from 9,700 persons in 2001 to 21,100 persons in 2031, translating to a growth rate of 2.6%. Under both growth scenarios, much of the anticipated growth is expected to occur outside of the Church Street North study area given that it is relatively built-out.

As many of the developments planned around Church Street North have been completed, apart from those specifically noted, and recognizing that the area is largely residential (which typically does not translate to significant growth), an annual growth rate of 2.0% has been assumed.

4.2.4 Future Traffic Volumes

The future traffic volumes for 2021, 2026, and 2036 horizon years are based on the existing 2016 volumes (as captured by the traffic count program and adjusted to ensure balance and representation of peak conditions), traffic associated with the specific background developments (River's Edge II and the Stevenson Memorial Hospital expansion), and the assumed growth rate of 2% per annum. The resulting 2021, 2026 and 2036 projections are provided in Figure 10, Figure 11 and Figure 12 respectively.

4.3 Future Traffic Operations

The following is an assessment of the future conditions of the study area based on the future traffic volumes. The results of the assessment will inform the identification of road system needs and alternative solutions

4.3.1 Intersection Operations

The analyses are based on the projected future traffic volumes for each horizon year and follow the methodology noted in Section 3.4.1. For the signalized intersection at Victoria Street, the signal timings have been optimized. It is noted that while the assumed signal timings may differ from the existing signal timing plans, such have been considered to address the best possible operations under future conditions. For comparative purposes, operations with the existing signal timings have also been presented.

[7] *Places to Grow Growth Plan for the Greater Golden Horseshoe 2006, Office Consolidation 2013*. Ontario Ministry of Municipal Affairs, 2013.

The results of the future intersection operations for the 2016, 2026 and 2036 horizon periods are illustrated in Table 12, Table 13 and Table 14 respectively (bold values coincide with poor operations). Detailed operations worksheets are included in Appendix G.

Table 12: Intersection Operations - 2021

Intersection and Movement			Control	Weekday AM Peak Hour			Weekday PM Peak Hour		
				delay	LOS	v/c	delay	LOS	v/c
1	Victoria St & Church St N (existing signal timings - 60s cycle length)	EB	signal	18	B	0.70	35	D	0.92
		WB		17	B	0.70	20	C	0.81
		NB		9	A	0.21	14	B	0.52
		SB		11	B	0.44	20	C	0.71
		overall	signal	14	B	0.56	23	C	0.82
1	Victoria St & Church St N (optimized signal timings - 50s cycle length)	EB	signal	18	B	0.70	33	C	0.91
		WB		16	B	0.71	19	B	0.81
		NB		9	A	0.22	15	B	0.55
		SB		11	B	0.46	21	C	0.73
		overall	signal	14	B	0.57	22	C	0.82
2	Dominion St & Church St N	EB	stop	16	C	0.12	29	D	0.40
		WB	stop	12	B	0.13	16	C	0.29
3	Fletcher Cr & Church St N	EB	stop	13	B	0.22	14	B	0.26
4	Evans Rd & Church St N	WB	stop	13	B	0.10	14	B	0.10
5	Doner St & Church St N	EB	stop	10	B	0.04	10	B	0.04
6	Hussey St & Church St N	EB	stop	8	A	0.09	8	A	0.06
		WB	stop	8	A	0.05	8	A	0.05
		NB	stop	9	A	0.21	9	A	0.32
		SB	stop	9	A	0.25	9	A	0.22

In all cases, the existing intersection configurations and control are adequate to accommodate the anticipated 2021 peak hour traffic volumes (ie. level of service C or better). In this regard, no improvements are considered necessary to address the anticipated traffic operations. In considering the traffic signal timings at Victoria Street, the optimized timings yield comparable operations.

Table 13: Intersection Operations - 2026

Intersection and Movement			Control	Weekday AM Peak Hour			Weekday PM Peak Hour		
				delay	LOS	v/c	delay	LOS	v/c
1	Victoria St & Church St N (existing signal timings - 60s cycle length)	EB	signal	24	C	0.80	40	D	0.95
		WB		18	B	0.74	19	B	0.81
		NB		10	B	0.24	19	B	0.66
		SB		13	B	0.51	47	D	0.96
		overall	signal	17	B	0.65	31	C	0.96
1	Victoria St & Church St N (optimized signal timings - 50/65s cycle lengths)	EB	signal	25	C	0.83	46	D	0.97
		WB		18	B	0.75	22	C	0.82
		NB		10	A	0.25	19	B	0.61
		SB		13	B	0.53	40	D	0.92
		overall	signal	17	B	0.67	32	C	0.94
2	Dominion St & Church St N	EB	stop	16	C	0.14	32	D	0.45
		WB	stop	12	B	0.15	16	C	0.31
3	Fletcher Cr & Church St N	EB	stop	14	B	0.25	15	C	0.31
4	Evans Rd & Church St N	WB	stop	14	B	0.12	14	B	0.11
5	Doner St & Church St N	EB	stop	11	B	0.04	11	B	0.04
6	Hussey St & Church St N	EB	stop	8	A	0.10	8	A	0.07
		WB	stop	8	A	0.06	9	A	0.06
		NB	stop	9	A	0.23	10	A	0.37
		SB	stop	9	A	0.27	9	A	0.25

As with the 2021 horizon, the existing intersection configurations and control can accommodate the projected 2026 travel demands without the need for intersection improvements. At the Victoria Street intersection, the operations with the existing signal timings and with “optimized” timings are comparable. It is noted that the cycle length varies from 50 to 65 seconds (AM and PM) under the optimized timings, in consideration of varying demands, whereas with the existing timing, it has been maintained at 60 seconds. In both cases, the eastbound approach will be approaching capacity and thus improvements may be required beyond 2026 to accommodated continued growth in the area.

Table 14: Intersection Operations - 2036

Intersection and Movement			Control	Weekday AM Peak Hour delay	LOS	v/c	Weekday PM Peak Hour delay	LOS	v/c
1	Victoria St & Church St N (existing signal timings - 60s cycle length)	EB	signal	42	D	0.95	142	F	1.27
		WB		21	C	0.82	54	F	1.04
		NB		13	B	0.34	136	F	1.28
		SB		20	B	0.71	320	F	1.83
		overall	signal	25	C	0.83	150	F	1.55
1	Victoria St & Church St N (optimized signal timings - 50/120s cycle lengths)	EB	signal	44	D	0.95	208	F	1.40
		WB		22	C	0.83	94	F	1.13
		NB		13	B	0.33	67	E	1.00
		SB		20	B	0.70	220	F	1.50
		overall	signal	25	C	0.83	145	F	1.44
2	Dominion St & Church St N	EB	stop	21	C	0.20	259	F	1.29
		WB	stop	14	B	0.20	34	D	0.60
3	Fletcher Cr & Church St N	EB	stop	19	C	0.41	23	C	0.52
4	Evans Rd & Church St N	WB	stop	16	C	17	17	C	0.15
5	Doner St & Church St N	EB	stop	11	B	0.06	11	B	0.05
6	Hussey St & Church St N	EB	stop	8	A	0.13	8	A	0..08
		WB	stop	9	A	0.07	9	A	0.06
		NB	stop	10	A	0.03	11	B	0.45
		SB	stop	10	A	0.03	10	A	0.32

For the 2036 horizon, the optimized signal timings will provide comparable results during the AM peak hour (existing cycle length of 60 seconds vs optimized cycle length of 50 seconds), both of which are acceptable. During the PM peak hour however, the optimized timings (120 second cycle length) yield improved operations based on the overall intersection operations and delays (145 seconds average delay vs 150 seconds). Notwithstanding, poor levels of service will remain. This is primarily a result of increased volumes on Victoria Street (as opposed to those on Church Street North).

To remedy this, is it recommended that the intersection approach configurations be revised from a shared left turn/through lane with an exclusive right turn to an exclusive left turn lane with a shared through/right turn lane. This will allow the through movements to proceed without being impeded by left turning traffic. All of the approaches are of sufficient width to accommodate this lane configuration (in that each approach is effectively 4 lanes wide including the parking lanes). Several possible intersection configurations are possible as illustrated in Figure 13 through Figure 15. While the lane geometry can be readily accommodated (and in some cases, right turn lanes can also be provided), the lane reconfigurations will result in a loss of parking (in the order of 7 to 14 spaces depending on the configuration).

For the left turns on Victoria Street, the 95th percentile queues will be 2 vehicles or less (requiring a queue storage length of 15 metres or less), whereas those on Church Street North equate to approximately 4 vehicles northbound (30 metres) and 12 vehicles southbound (81 metres). There is approximately 35 metres of storage between the Victoria and Dominion Street intersections (following consideration for stop bar placement and cross-walks) and thus the anticipated 95% southbound left turn queue will extend beyond the Dominion Street intersection. It is noted the average southbound left turn queue is 34 metres (5 vehicles) which can be accommodated. It is recommended that the left turn lane extend from Victoria Street to Dominion Street.

The resulting intersection operations with the noted lane configuration improvements are summarized in Table 15, whereas the corresponding detailed operational worksheets are provided in Appendix G. As indicated, all movements will provide improved levels of service. While some movements will operate at or near capacity during the PM peak hour (ie. v/c of 0.96 to 1.00), the delays remain acceptable, as does the level of service. Beyond the noted improvements, there is limited opportunity for further improvement given the "downtown" environment, level of development, and proximity of development to the road.

Table 15: Intersection Operations - 2036 with Improvements

Intersection and Movement			Control	Weekday AM Peak Hour			Weekday PM Peak Hour		
				delay	LOS	v/c	delay	LOS	v/c
1	Victoria St & Church St N (optimized timings)	EB	signal	27	C	0.37	36	D	0.86
		WB		37	D	0.21	58	E	1.00
		NB		20	C	0.44	52	D	0.90
		SB		14	B	0.46	49	D	0.96
		overall	signal	26	C	0.67	49	D	0.95

For the Dominion Street intersection, the eastbound approach will experience a high level of delay and hence poor operations during the PM peak hour, given the increased volumes on Church Street North.

It is noted however, that the eastbound volume is only 120 vehicles which equates to 2 vehicles each minute. Given the proximity of the signalized intersection at Victoria Street, courtesy gaps on Church Street North at Dominion Street are expected. It is noted that Dominion Street is only 440 metres in length and its sole purpose is to provide access to the public parking lots behind Victoria Street and to the rear parking areas of the Victoria Street downtown businesses.

Consideration could be given to one-way operations (westbound) on Dominion Street to reduce intersection volumes at Church Street North. This would also provide opportunity to reclaim some of the road width to provide improved pedestrian measures and separation between the road and private parking areas. The *Downtown Enhancement Master Plan*[8] also noted the need to re-organize the parking area between the Boyne River and Victoria Street, in addition to the development of additional retail space fronting the Boyne River, along the section of Dominion Street west of Church Street North.

While the noted improvements are associated with the 2036 horizon, they will be required between 2026 and 2036 in response to actual vehicle demands. To further explore the associated time of need, operations at the Victoria Street intersection were reviewed for the 2031 horizon (traffic volumes were inferred from the 2026 and 2036 volumes). The results for the 2031 PM peak hour operations (recognizing that the AM peak hour operations are acceptable under all horizons) are illustrated in Table 16. As noted, the eastbound and southbound movements will experience higher delays, resulting in levels of service F, with operations exceeding capacity (ie. v/c > 1.0). While the provision of advance green phases for these movements will improve operations slightly (more so for the eastbound movement), it is not sufficient. In this regard, reconfiguration of this intersection is recommended prior to the 2031 horizon.

Table 16: Intersection Operations - 2031

Intersection and Movement			Control	Weekday AM Peak Hour			Weekday PM Peak Hour		
				delay	LOS	v/c	delay	LOS	v/c
1	Victoria St & Church St N (optimized timings)	EB	signal	-	-	-	105	F	1.14
		WB		-	-	-	45	D	0.94
		NB		-	-	-	33	C	0.74
		SB		-	-	-	98	F	1.13
		overall	signal	-	-	-	69	E	1.13

To explore the potential benefits of implementing the recommended improvements to the Victoria Street intersection sooner, the intersection operations were revisited under the 2016, 2021 and 2026

[8] *Downtown Enhancement Master Plan.* Meridian Planning Consultants, June 2009.

horizons for the PM peak hour (the more critical period). The resulting intersection operations are provided in Table 17 through Table 19, considering the existing intersection configuration (eg. shared left-through with exclusive right) and the recommended improvement (eg. shared right-through with exclusive left).

Table 17: Intersection Operations - 2016 with Improvements

Intersection and Movement			Control	Weekday PM Peak Hour (existing configuration)			Weekday PM Peak Hour (with improvements)		
				delay	LOS	v/c	delay	LOS	v/c
1	Victoria St & Church St N	EB	signal	17	B	0.70	18	B	0.70
		WB		17	B	0.73	14	B	0.69
		NB		12	B	0.44	10	A	0.35
		SB		15	B	0.56	10	B	0.38
		overall	signal	16	B	0.64	13	B	0.58

Table 18: Intersection Operations - 2021 with Improvements

Intersection and Movement			Control	Weekday PM Peak Hour (existing configuration)			Weekday PM Peak Hour (with improvements)		
				delay	LOS	v/c	delay	LOS	v/c
1	Victoria St & Church St N	EB	signal	35	D	0.92	20	B	0.76
		WB		20	C	0.81	16	B	0.75
		NB		14	B	0.52	11	B	0.41
		SB		20	C	0.71	11	B	0.47
		overall	signal	23	C	0.82	15	B	0.66

Table 19: Intersection Operations - 2026 with Improvements

Intersection and Movement			Control	Weekday PM Peak Hour (existing configuration)			Weekday PM Peak Hour (with improvements)		
				delay	LOS	v/c	delay	LOS	v/c
1	Victoria St & Church St N	EB	signal	40	D	0.95	21	C	0.78
		WB		19	B	0.81	19	B	0.81
		NB		19	B	0.66	12	B	0.46
		SB		47	D	0.96	14	B	0.56
		overall	signal	31	C	0.96	17	B	0.74

In considering the various horizons, the recommended improvements yield marginal benefit in 2016 with increasing benefits in 2021 and 2026. In this regard, consideration should be given to accelerating the implementation of the improvements to provide improved operations over what would otherwise be provided under the existing configuration (albeit they remain acceptable). It is acknowledged however, that the implementation will require the removal of several parking stalls on each leg of the intersection (depending on the ultimate lane configuration and geometry), and thus this should also be considered in context of competing interests (ie. improve traffic operations at the cost of parking).

In considering the individual approaches, it is noted that greater benefits are realized for the eastbound left turn movement on Victoria Street in the 2026 horizon. In the 2031 horizon, the greatest benefits are realized by the southbound movement on Church Street North, given the increased number of left turning vehicles and the difficulty in completing these moves across the increased east-west volumes on Victoria Street.

4.3.2 Road Section Operations

The road section operations have been revisited in consideration of the future traffic projections. While it is acknowledged that the Town has identified the upgrading of Church Street North from a local road to a minor collector, it is unlikely that the road will be widened to minor collector status (from 8.5 to 11.0 metres) and the right-of-way widened (from 20 to 23 metres). In this regard, the operational review has maintained a lane capacity of 400 vehicles per hour per lane (vphpl). With a minor collector designation and configuration, an increased capacity of 600 vphpl could be considered thereby theoretically improving the level of service and reducing the overall utilization (ie. v/c ratio). The results of the road section review are summarized in Table 20 through Table 22.

Table 20: Road Section Operations - 2021

Road Section & Capacity[1]		Traffic Volumes AM (PM)				Volume to Capacity AM (PM)			
		NB		SB		NB		SB	
Victoria St to Dominion St	400	250	(360)	345	(355)	0.50	(0.72)	0.69	(0.71)
Dominion St to Fletcher Cres	400	290	(455)	380	(390)	0.58	(0.91)	0.76	(0.78)
Fletcher Cres to Evans Rd	400	225	(315)	325	(255)	0.45	(0.63)	0.65	(0.51)
Evans Rd to Doner St	400	185	(300)	275	(220)	0.37	(0.60)	0.55	(0.44)
Doner St to Hussey St	400	155	(250)	255	(205)	0.31	(0.50)	0.51	(0.41)

[1] capacity is denoted as vehicles per hour per lane

Table 21: Road Section Operations - 2026

Road Section & Capacity[1]		Traffic Volumes AM (PM)				Volume to Capacity AM (PM)			
		NB		SB		NB		SB	
Victoria St to Dominion St	400	280	(400)	380	(395)	0.56	(0.80)	0.76	(0.79)
Dominion St to Fletcher Cres	400	315	(505)	420	(430)	0.63	(1.01)	0.84	(0.86)
Fletcher Cres to Evans Rd	400	245	(340)	360	(280)	0.49	(0.68)	0.72	(0.56)
Evans Rd to Doner St	400	200	(330)	300	(240)	0.40	(0.66)	0.60	(0.48)
Doner St to Hussey St	400	170	(275)	280	(230)	0.34	(0.55)	0.56	(0.46)

[1] capacity is denoted as vehicles per hour per lane

Table 22: Road Section Operations - 2036

Road Section & Capacity[1]		Traffic Volumes AM (PM)				Volume to Capacity AM (PM)			
		NB		SB		NB		SB	
Victoria St to Dominion St	400	345	(485)	465	(490)	0.69	(0.97)	0.93	(0.98)
Dominion St to Fletcher Cres	400	390	(610)	510	(535)	0.78	(1.22)	1.02	(1.07)
Fletcher Cres to Evans Rd	400	300	(410)	435	(335)	0.60	(0.82)	0.87	(0.67)
Evans Rd to Doner St	400	245	(395)	365	(290)	0.49	(0.79)	0.73	(0.58)
Doner St to Hussey St	400	210	(330)	335	(275)	0.42	(0.66)	0.67	(0.55)

[1] capacity is denoted as vehicles per hour per lane

The road section capacity analyses indicate that within the next 20 years, 2 road sections of Church Street North will experience traffic volumes at or above the noted planning capacities (assuming the local road designation remains). These road sections are:

- between Dominion Street and Fletcher Crescent (2026 northbound travel, PM peak only; 2036 southbound only in the AM peak and both northbound and southbound in the PM peak); and
- between Victoria Street and Dominion Street (2036 southbound only in the AM peak and both northbound and southbound in the PM peak).

As previously indicated, the assessment of mid-block operations is secondary to the intersection operations – provided the intersections can accommodate the projected traffic volumes, so too can the road sections. In this regard, a widening of Church Street North beyond 1 lane per direction is not considered necessary throughout the horizon of this study. Where additional capacity is required, this can be achieved through the provision of additional turn lanes at individual intersections, as warranted.

It is further noted that should the Town pursue the upgrading of Church Street North to a minor collector, the theoretical capacity would also increase (to 600 vphpl), such that the future volumes can be accommodated. This would reduce the overall v/c ratios and hence improve the level of service.

4.4 Traffic Control Warrants

4.4.1 Traffic Signal Warrant Analysis

The warrants for traffic signal control were investigated at the Dominion Street and Fletcher Crescent intersections under the 2036 traffic projections (which, as they are greatest at these locations, represent the worst case scenario). A supplementary analysis was also performed assuming that Fletcher Crescent and/or Evans Road were realigned to provide a single 4-leg intersection with Church Street North. The results of the signal warrants are summarized in Table 23, whereas additional details are provided in Appendix H.

Table 23: Traffic Signal Warrants - 2036

Intersection	Warrant Compliance		Recommended Signal Installation
	Minimum Volume	Delay to Cross Traffic	
Dominion Street	86%	75%	No
Fletcher Crescent	80%	71%	No
Fletcher Crescent & Evans Road (realigned)[1]	79%	69%	No

[1] assumes the two 3-way intersections are realigned to create a single 4-leg intersection

As shown in Table 23, the realignment of Fletcher Crescent and/or Evans Road reduces (by 1 to 2%) the need for a traffic signal at the Fletcher Crescent intersection when compared to the existing 3-way intersection. Regardless, signals are not warranted at either intersection for the 2036 horizon. By inference, it can also be concluded that signals would not be required at the remaining intersections nor for the early time horizons (2021 or 2026).

4.4.2 All-Way Stop Control

The need for all-way stop control was not explored further given the results of the previous analyses, and that those intersections that are currently operating under stop control will provide acceptable levels of service under the future conditions.

The exception is the intersection with Dominion Street, which under 2-way stop control will result in high delays to eastbound travel during the 2036 PM peak hour. The implementation of 4-way stop control at this intersection will alleviate the delays to the eastbound travel, but in doing so, will introduce delays to the northbound and southbound movements (which are otherwise uncontrolled and thus experience limited delays). Given the proximity of the Dominion Street and Victoria Street intersections, and the potential for queues to extend from one intersection during the other, all-way stop control at Dominion Street is not recommended.

4.5 Turn Lane Requirements

The need for exclusive right or left turn lanes on Church Street North, where such do not otherwise exist, was revisited in consideration of the future horizon traffic projections.

4.5.1 Right Turn Lanes

The northbound right turn volumes at Evans Road exceed the 60 vehicles per hour threshold for a right turn lane under all future horizons. However, given the residential nature of both Church Street North and Evans Road, and the difficulty in implementing a right turn lane due to existing development, such is not considered necessary. Furthermore, the operational analyses have confirmed that adequate operations will be provided given the existing intersection configuration.

4.5.2 Left Turn Lanes

A summary of the stop controlled intersections where an exclusive left turn lane is warranted for the free flow movement is provided in Table 24. As noted, left turn lanes are warranted at both the Fletcher Crescent and Dominion Street intersections for the 2021 horizon. The corresponding volumes are projected in the order of 40 to 65 vehicles per hour at Dominion Street and 100 to 165 vehicles per hour at Fletcher Street over the 20-year planning horizon considered. At the former, this translates to approximately 1 left turn per minute, whereas at the latter, it translates to approximately 2 to 3 per minute.

Table 24: Left Turn Lane Warrants

Intersection	Turn Lane Requirement	Required Year	Required Storage
Fletcher Crescent	northbound left turn lane on Church Street North	2021[1]	15 metres
Dominion Street	northbound and southbound left turn lanes on Church Street North	2021	15

[1] the left turn lane was also warranted under 2016 conditions

Given the proximity of the Victoria Street and Dominion Street intersections, and the recommendation for the provision of left turn lanes at Victoria Street, coupled with the elimination of the southbound right turn lane at Dominion Street, additional left turn lanes at Dominion Street cannot be readily implemented. It would be possible however to extend the recommended southbound left turn lane at Victoria Street through the Dominion Street intersection to provide service to it as well. The southbound right turn lane at Dominion Street would revert to a southbound through/right lane, continuing to Victoria Street in the same manner as shown on Figure 19.

The left turn lane could also be extended northerly to the Beer Store access to minimize impacts resulting from those entering the Beer Store (see Figure 19). The turn lane would then terminate prior to the bridge recognizing that it is not of sufficient with to continue the lane further north. The anticipated southbound queue at Dominion Street would be less than 1 vehicle and thus it would not interfere with access to the Beer Store.

With respect to the provision of a northbound left turn lane at Fletcher Crescent, such is only possible through a widening of the Cunningham Bridge, recognizing that the current road width over the bridge is only 8.3 metres. As previously noted, the intersection will provide acceptable operations under the current lane configuration and thus a left turn lane is not considered necessary to ensure acceptable future traffic operating conditions.

5 Road System Improvements

This chapter identifies the need for operational and infrastructure improvements to address deficiencies in the road network as required to sufficiently accommodate existing conditions (2016) and future conditions (2021, 2026 and 2036).

5.1 Summary of Recommendations

A summary of the recommendations in addition to the recommended horizon year of implementation is provided in Table 25. As noted, a number of needs have been identified for the 2016 horizon in that they correspond to existing deficiencies. It is understood that the Town is planning to reconstruct Church Street North in the next 2 to 5 years, and thus a number of improvements can be deferred and addressed in conjunction with the reconstruction to yield a comprehensive improvement program and provide the greatest cost efficiencies.

Table 25: Recommended Improvements

Improvement	Time of Need
1. Provide centreline pavement markings along Church Street North to provide a visual cue to motorists as to lane allocation and road alignment.	2016
2. Paint a crosswalk at the Evans Road intersection, east leg.	2016
3. Install warning signs (Wa-5R) relating to the reverse curve.	2016
4. Relocate the community mailbox currently within the reverse curve south of Doner Street to eliminate the need for motorists to park within the reverse curve and hence obstruct sight lines for southbound motorists.	2016[1]
5. Provide crosswalks at the Hussey Street intersection, east and south legs (crosswalks are currently provided on the west and north legs) and ensure the proper alignment of the approach sidewalks and pedestrian standing areas.	2016[1]
6. Address sidewalk alignment and configuration at Evans Road intersection. Provide a sidewalk extension to connect to the sidewalk on the west side of Church Street North and ensure alignment of the sidewalks and crosswalk on the east leg.	2016[1]
7. Reclaim the boulevard space in front of the commercial block on the east side of Church Street North, north of Dominion Street, and provide an improved sidewalk.	2016[1]
8. Address various sidewalk deficiencies with respect to width, condition and location.	2016[1]
9. Extend sidewalks across all commercial driveways.	2016[1]

Improvement	Time of Need
10. Provide guiderail upon approach to the Cunningham Bridge, complete with appropriate end treatments.	2016[1]
11. Prohibit parking on the west side of Church Street North to eliminate sight line obstructions/limitations for motorists travelling through the reverse curve. Permit parking on the east side (which will also facilitate Improvement 11). Place appropriate parking signs to inform motorists of restrictions.	2016[1]
12. Improve the south-west corner of the Dominion Street intersection to provide a pedestrian standing area, improved delineation of the road, adjacent parking and pedestrian areas. Reinstall the eastbound stop sign in accordance with current standards (eliminate the concrete sign base).	2016[1]
13. Eliminate the southbound right turn lane on Church Street North at Dominion Street and reclaim the area for sidewalk use/pedestrians.	2016[1]
14. Review and modify traffic signal timing plan at Victoria Street to reflect increased traffic demands and varying demands throughout the day (eg. introduce various time of day plans).	2016-2036
15. Consider one-way westbound operations on Dominion Street to reduce volumes through the Church Street North intersection, thereby improving operations. This will also facilitate the redevelopment of the river front area as per the *Downtown Enhancement Master Plan*. (It is noted that additional investigations of the full parking lot operations and the potential impacts to the operations of Victoria Street at the remaining parking lot access points would be required prior to implementation.)	2026-2031
16. At the Victoria Street intersection, reconfigure each approach to provide an exclusive left turn lane and a shared through/right lane (to better serve the left turning traffic volumes and reduce overall intersection delay). Modify the signal timings to provide advance greens for the left turn movements.	2026-2031[2]
17. Extend the southbound left turn lane at Victoria Street northerly to serve the southbound left movement at Dominion Street and also the northbound left turn movement at the Beer Store access (would preclude the implementation of Improvement 13).	2026-2031[2]

[1] these improvements are recommended to be undertaken in conjunction with the reconstruction of Church Street North in 2-5 years to yield the most cost effective construction program

[2] these can be implemented in 2021 or 2026 to provide improved operations, albeit they are not needed until post 2026

Illustrations of the noted key road improvements are provided in Figure 16 through Figure 15.

While a northbound left turn lane was warranted at Fletcher Crescent based on the existing and future traffic volumes, it cannot be readily implemented given the proximity and limited width of the Cunningham Bridge. Given the need to widen the bridge to accommodate a turn lane, and the associated costs, coupled with the acceptable traffic operations that will remain without the left turn lane, such is note considered necessary.

5.2 Class EA Implications

Given the scope of work envisioned for each of the noted recommendations, all are considered Schedule A or A+ undertakings and thus would not be subject to the full Class EA requirements. The Town can proceed to implementation without the need for a comprehensive environmental study or public consultation.

Should it be desired to implement the northbound left turn lane at Fletcher Crescent, a widening of the Cunningham Bridge will be required, which would be subject to a Schedule B or Schedule C Class Environmental Assessment (subject to confirmation of bridge needs and associated costs).

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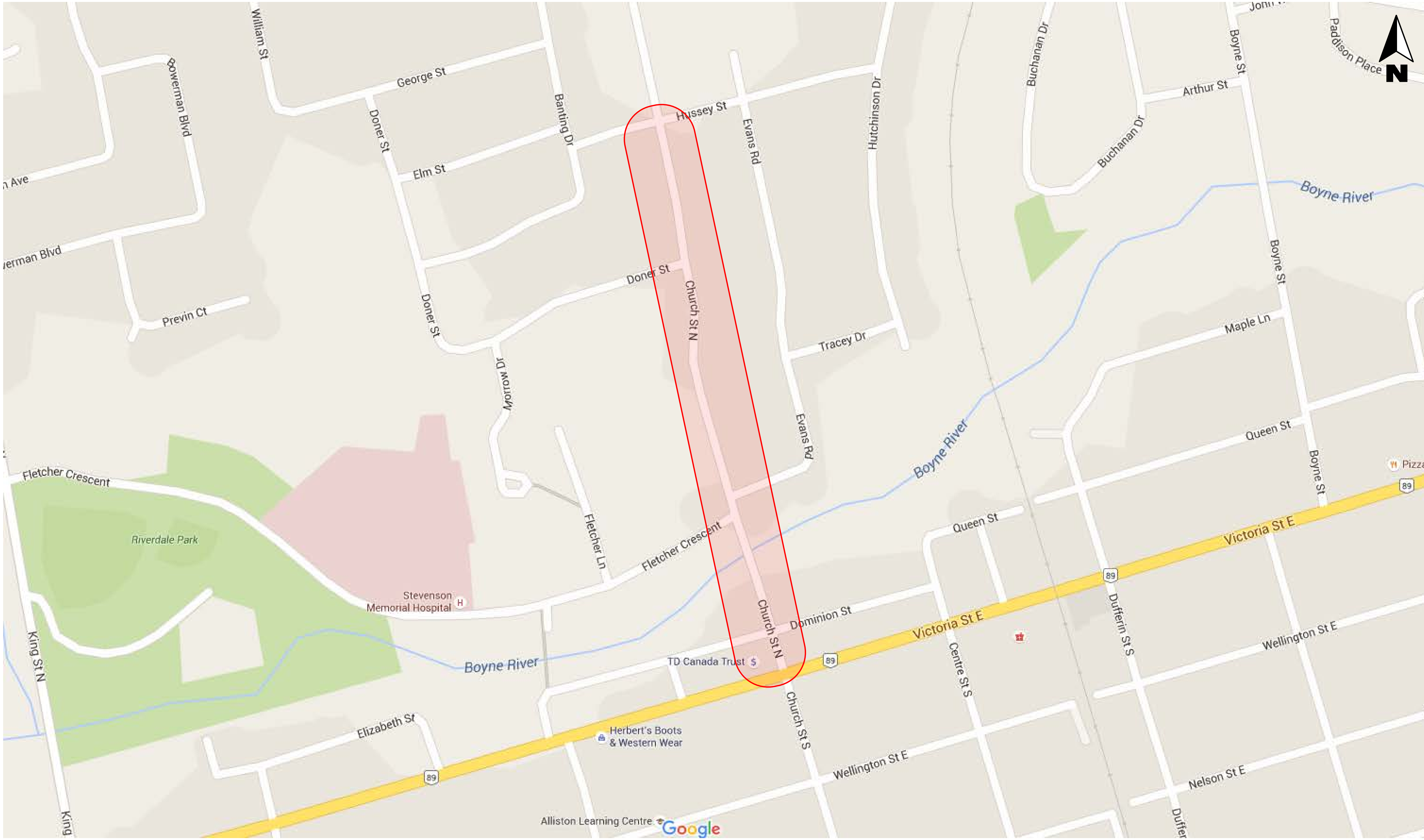


C.C. Tatham & Associates Ltd.
Consulting Engineers

Church Street North Transportation Review

Study Area

Figure

1

source: Simcoe Maps, Google Street View

Church St. N at Victoria St. looking north

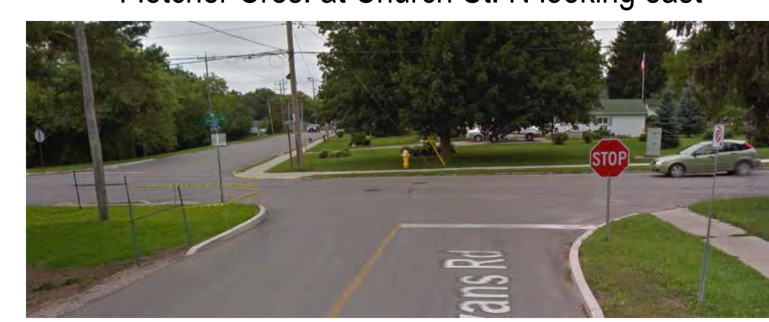
Victoria St. at Church St. N looking East

Church St. N at Dominion St. looking south

Dominion St. at Church St. N looking west

Church St. N at Fletcher Cres. and Evans Rd. looking north

Fletcher Cres. at Church St. N looking east

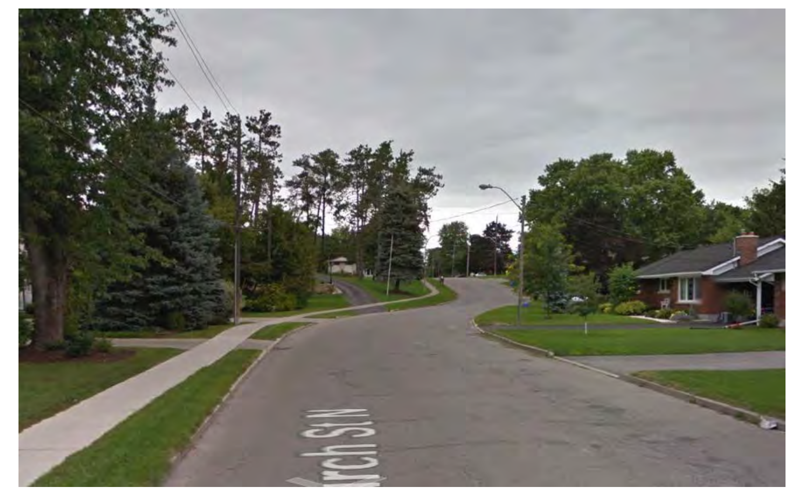


Evans Rd. at Church St. N looking west

source: Simcoe Maps, Google Street View

Church St. N at Doner St. looking south

Doner St. at Church St. N looking east



Church St. N south of Doner St. looking north at reverse bend

Church St. N at Doner St. looking south at reverse bend

Church St. N at Hussey St. looking north

Hussey St. at Church St. N looking east

source: Simcoe Maps, Google Street View

Looking south into the reverse curve from Doner Street

Looking north into the reverse curve

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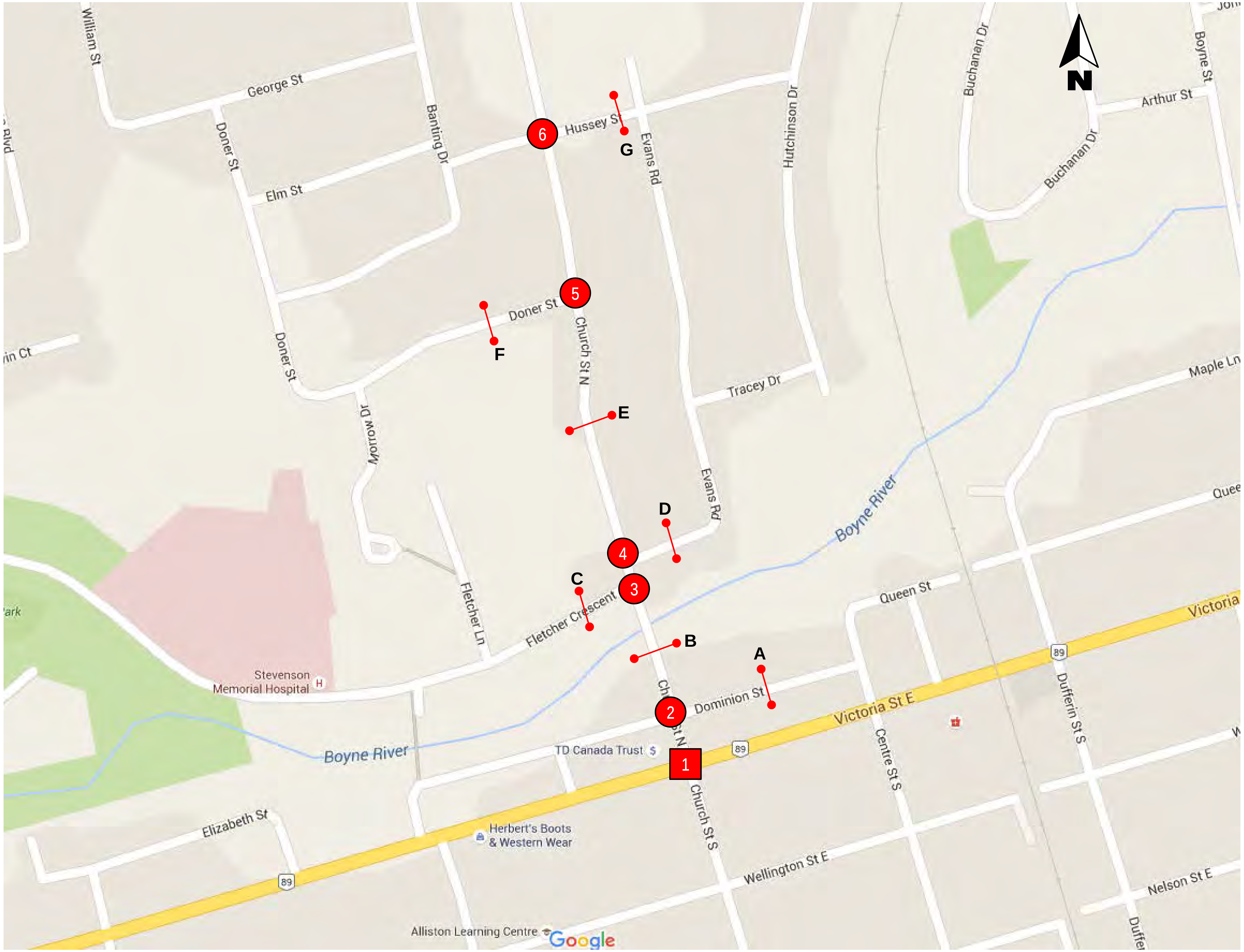
Church Street North Transportation Review

Reverse Curve

Figure

3

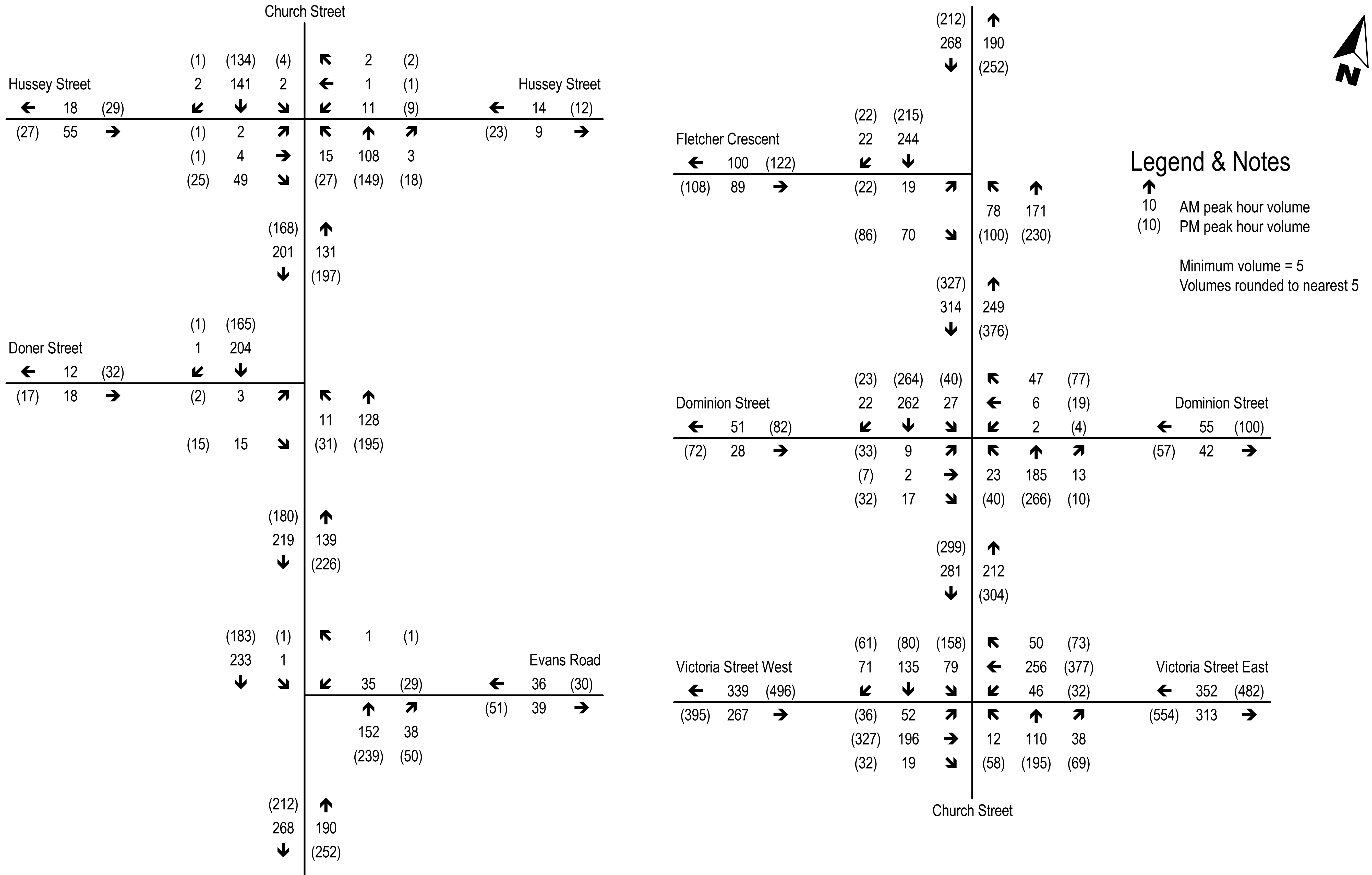


Intersections

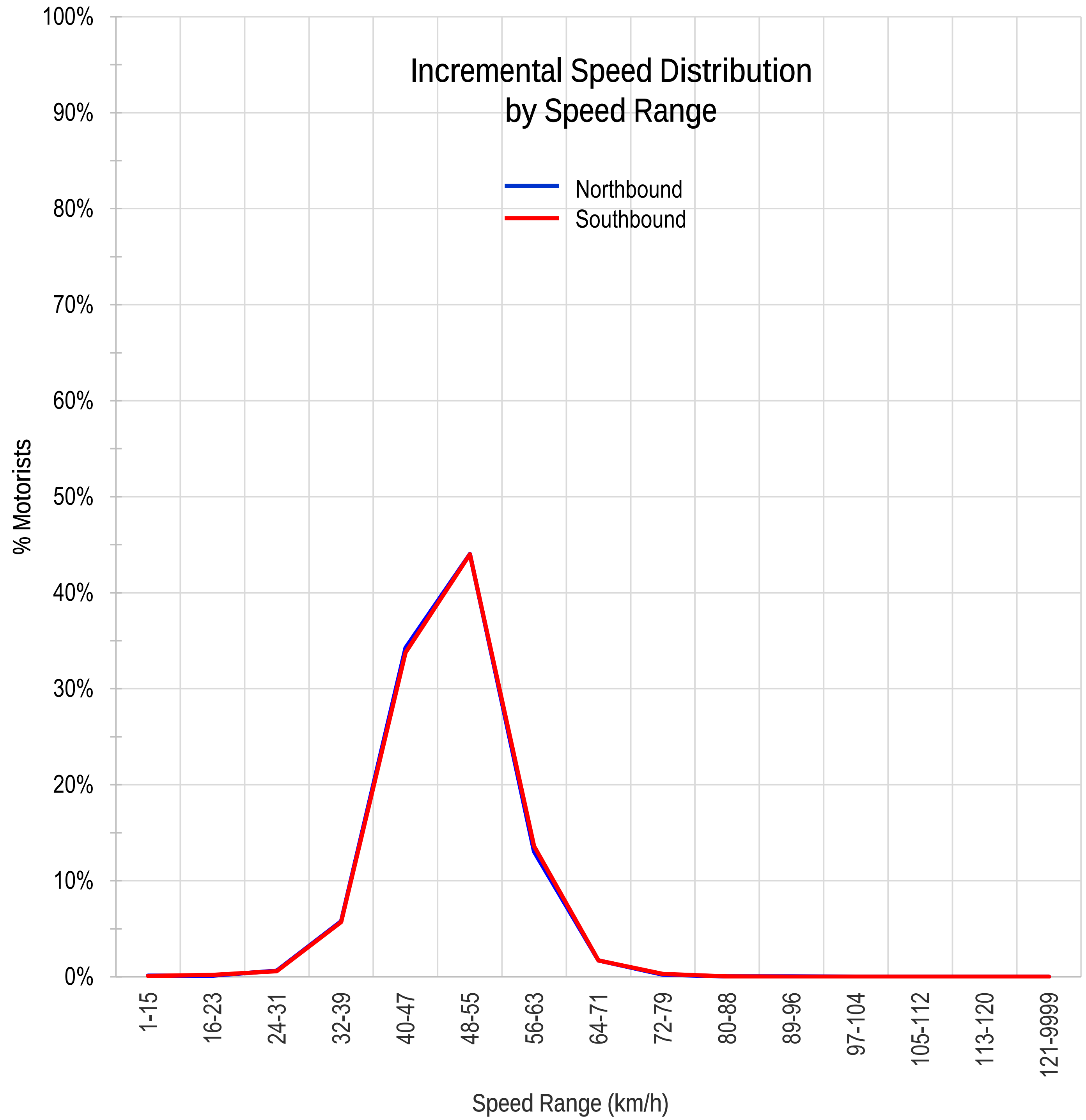
1. Church Street North and Victoria Street
2. Church Street North and Dominion Street
3. Church Street North and Fletcher Crescent
4. Church Street North and Evans Road
5. Church Street North and Doner Street
6. Church Street North and Hussey Street

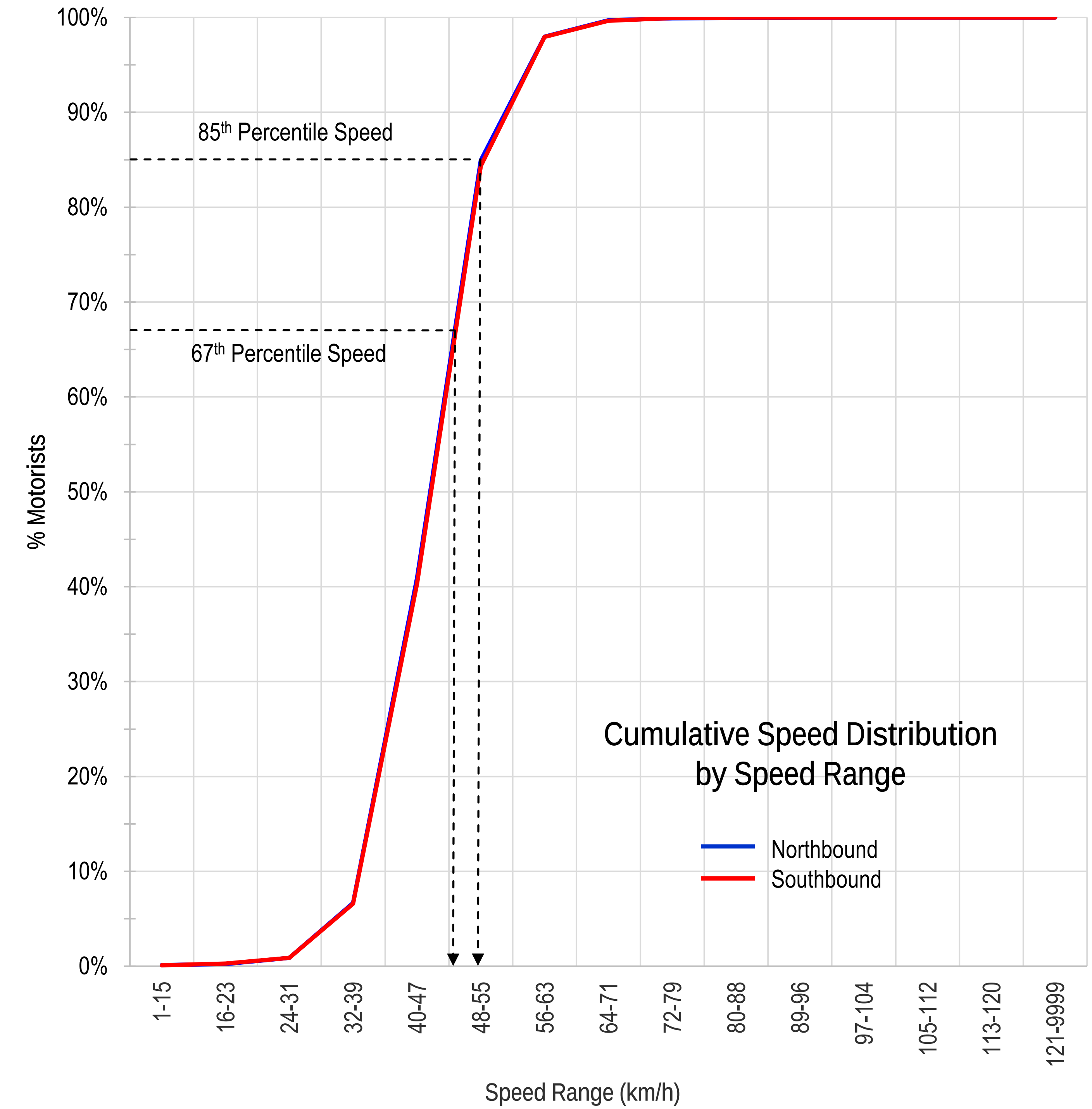
Traffic Count

- Intersection Count – unsignalized intersection
- Intersection Count – unsignalized intersection
- Automatic Traffic Recorder (ATR) count

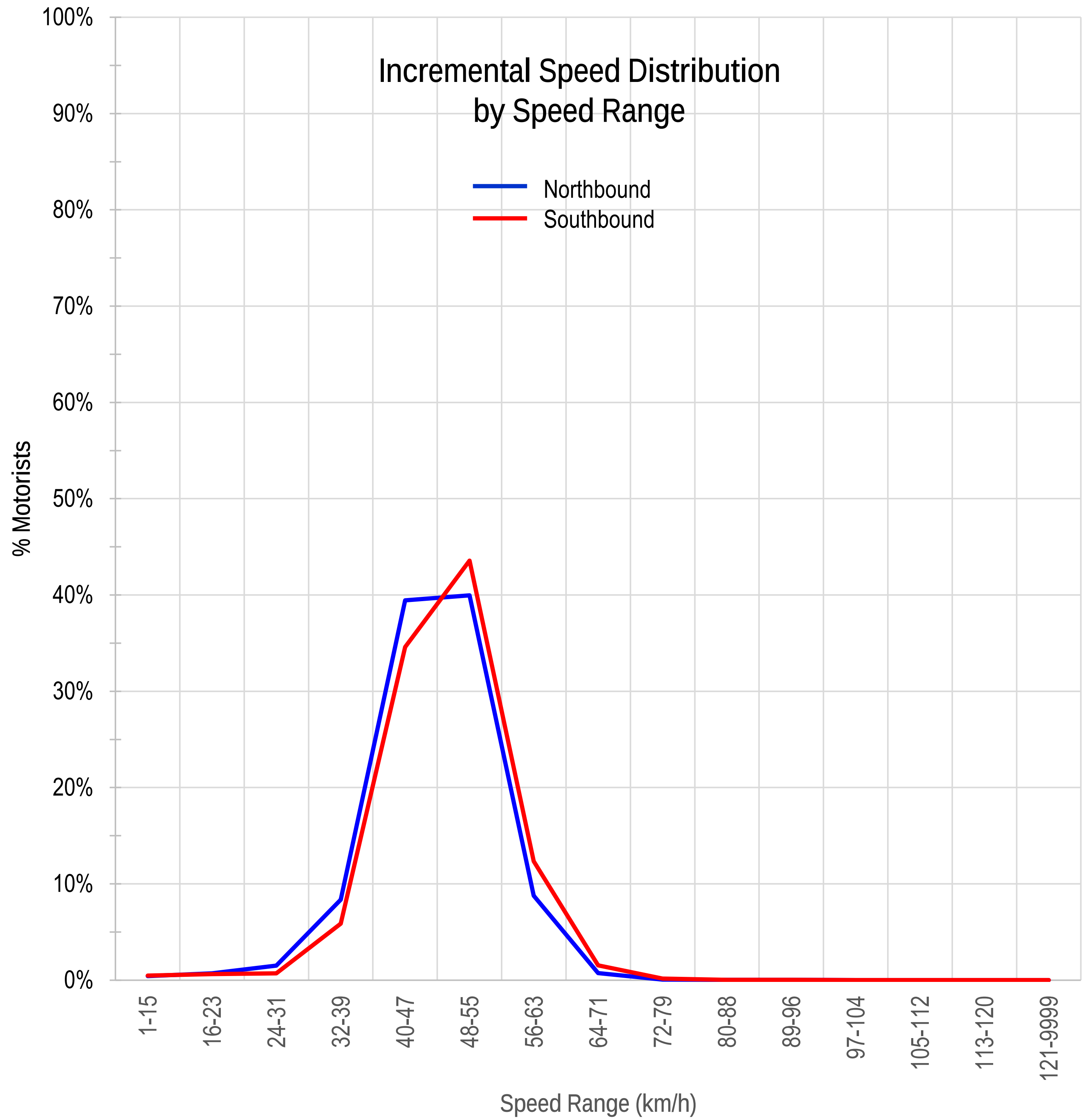

Church Street
Hussey Street
Hussey Street
Doner Street
Evans Road
Fletcher Crescent
Dominion Street
Dominion Street
Victoria Street West
Victoria Street East
Church Street
N
Legend & Notes
10 AM peak hour volume
(10) PM peak hour volume
Minimum volume = 5
Volumes rounded to nearest 5

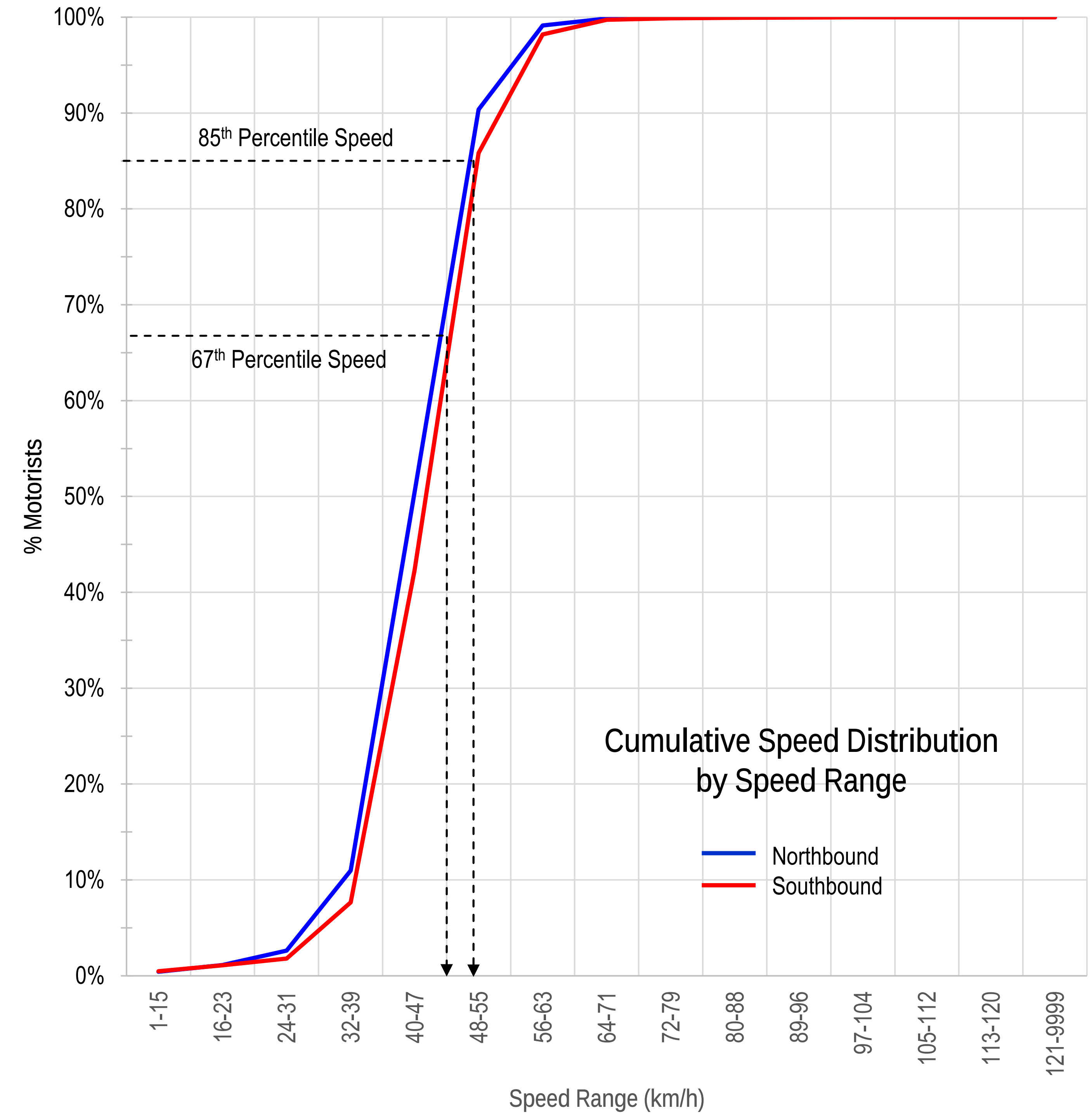
Location: south of Fletcher Crescent
Count Period: May 24-30, 2016

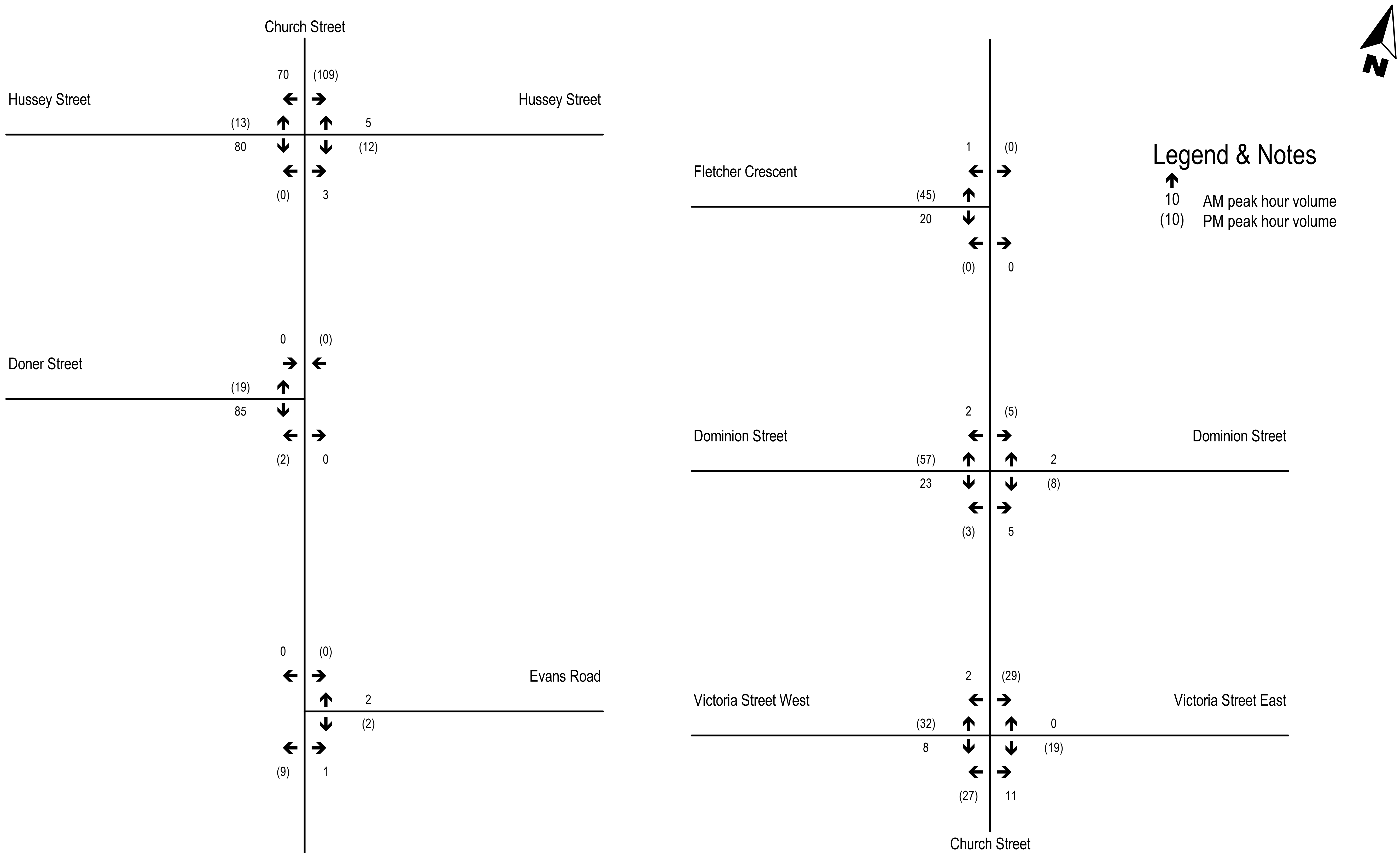




Location: south of Doner Street (within reverse curve)
Count Period: May 24-30, 2016







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Church Street North Transportation Review

2016 Pedestrian Crossing Volumes

Figure
7

1. Street furniture in clear zone

2. Reduced sidewalk width around hydro pole

3. Stop sign on Dominion Street in clear zone (<0.5m from EOP) and improper installation

4. Sidewalk discontinuous across commercial driveway

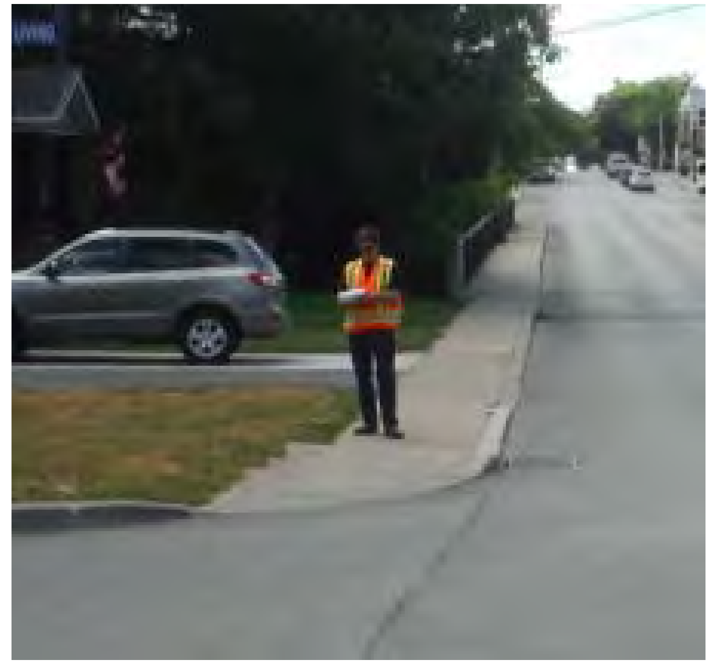
5. Sidewalk discontinuous across commercial driveway

6. Sidewalk discontinuous across commercial driveway

7. Missing No Parking signs

8. No guiderail end treatments at the bridge corners

9. Substandard end treatment on bridge

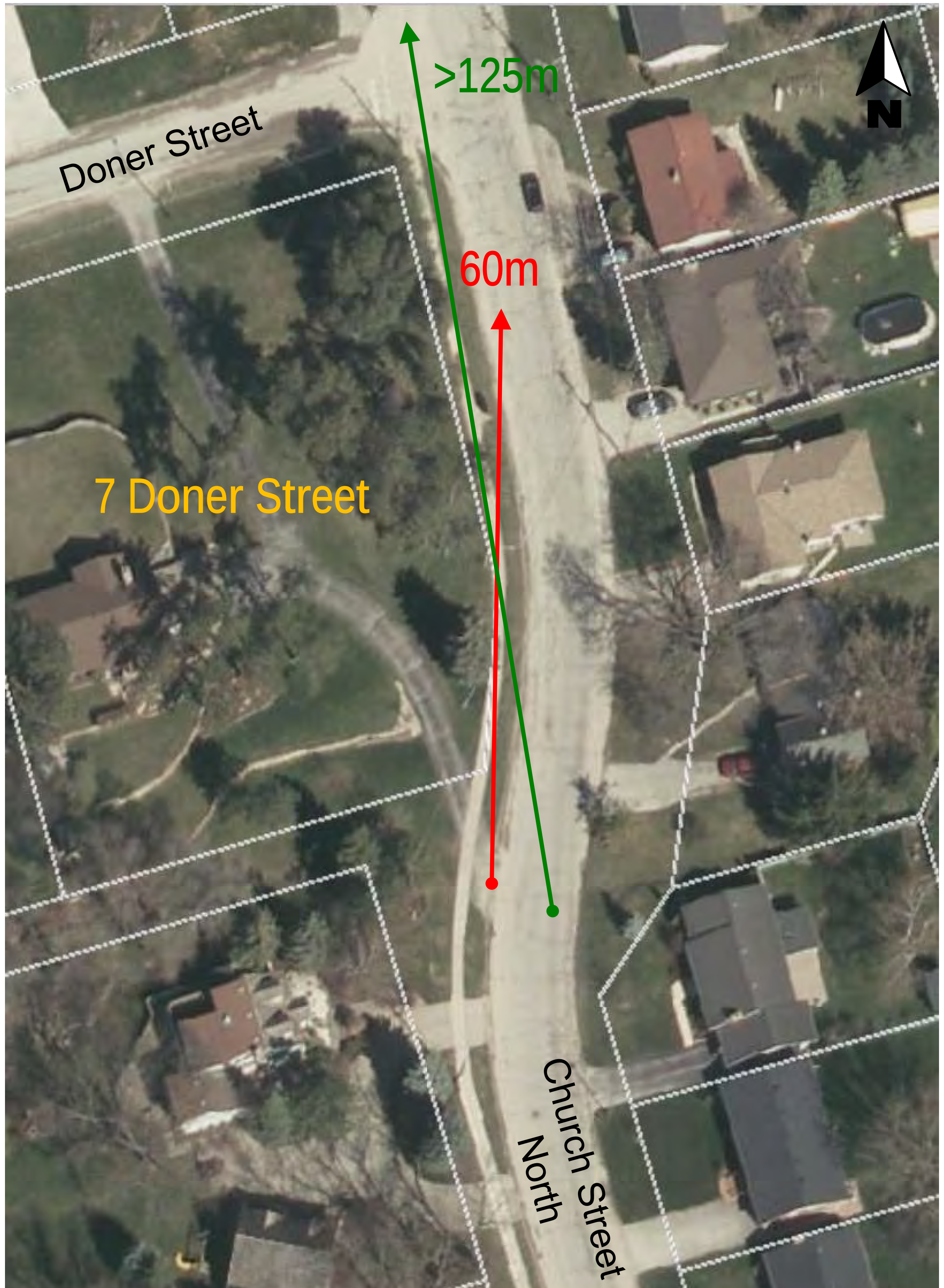


10. Inconsistent and deficient sidewalk width

11. No sidewalk extension on the west side of Church Street to match N-S sidewalk; sidewalk does not align with the east sidewalk on Church Street.

12. Vehicles parked at mailbox could obstruct sightlines (relocated mailbox)

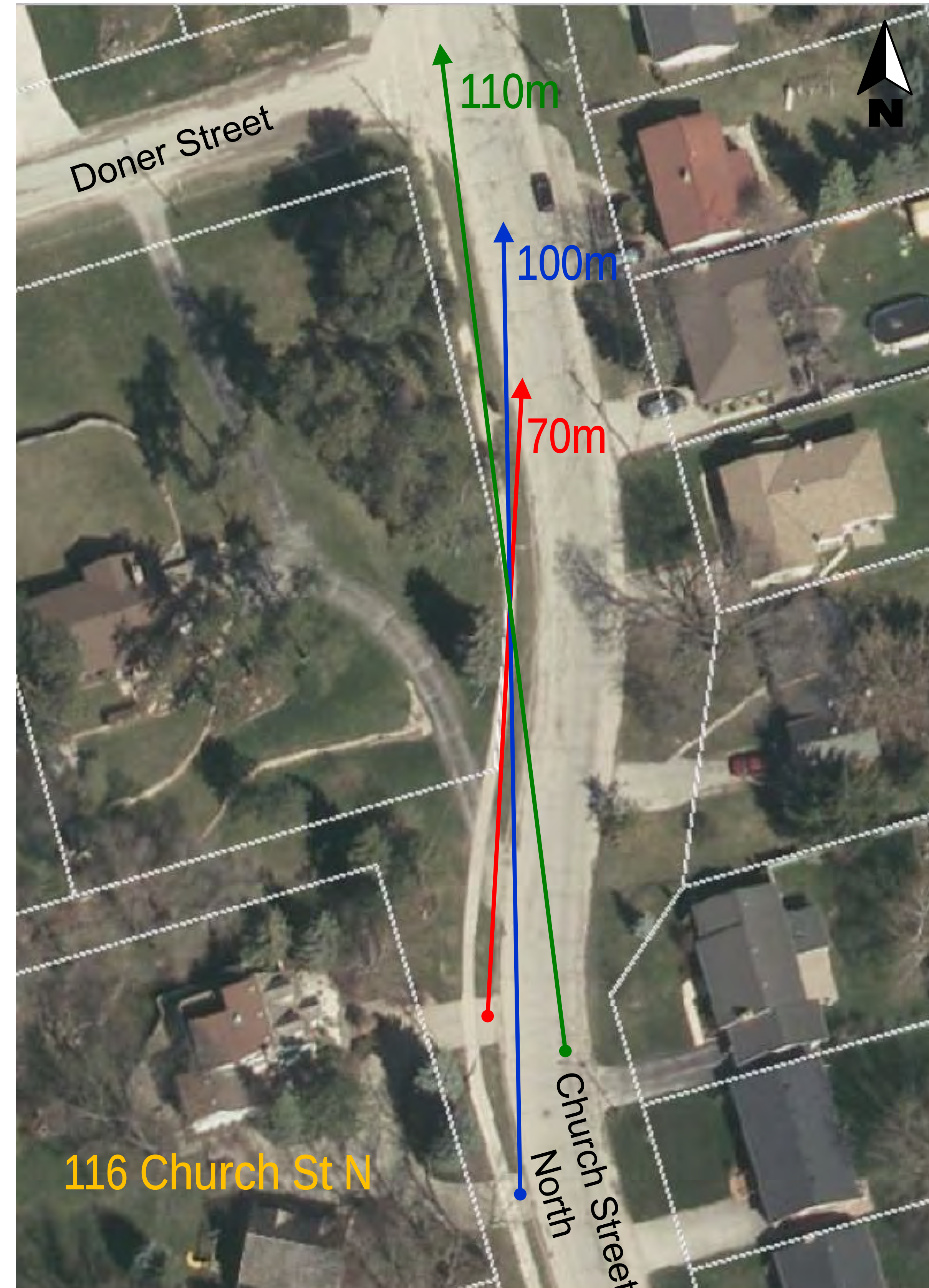
13. Obstructions are within the line of sight for vehicles approaching at Doner St.



Sight line for vehicles exiting the access with limited sight lines

Sight line for vehicles exiting the access with increased sight lines

Sight line for vehicles entering the access with limited sight lines



source: Simcoe Maps, Google Street View

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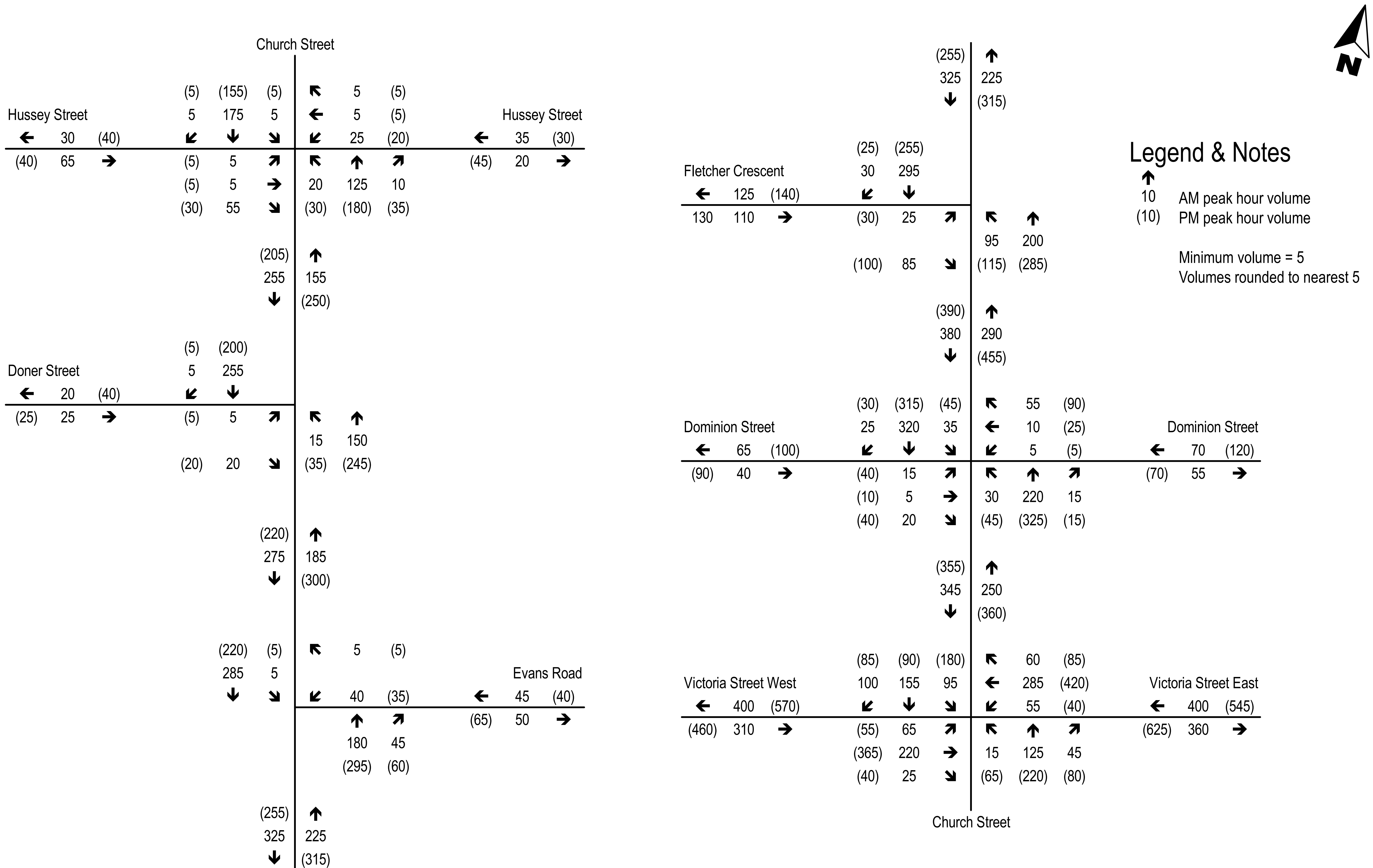
Church Street North Transportation Review

Sight Lines at Residences in Reverse Curve

Figure 9



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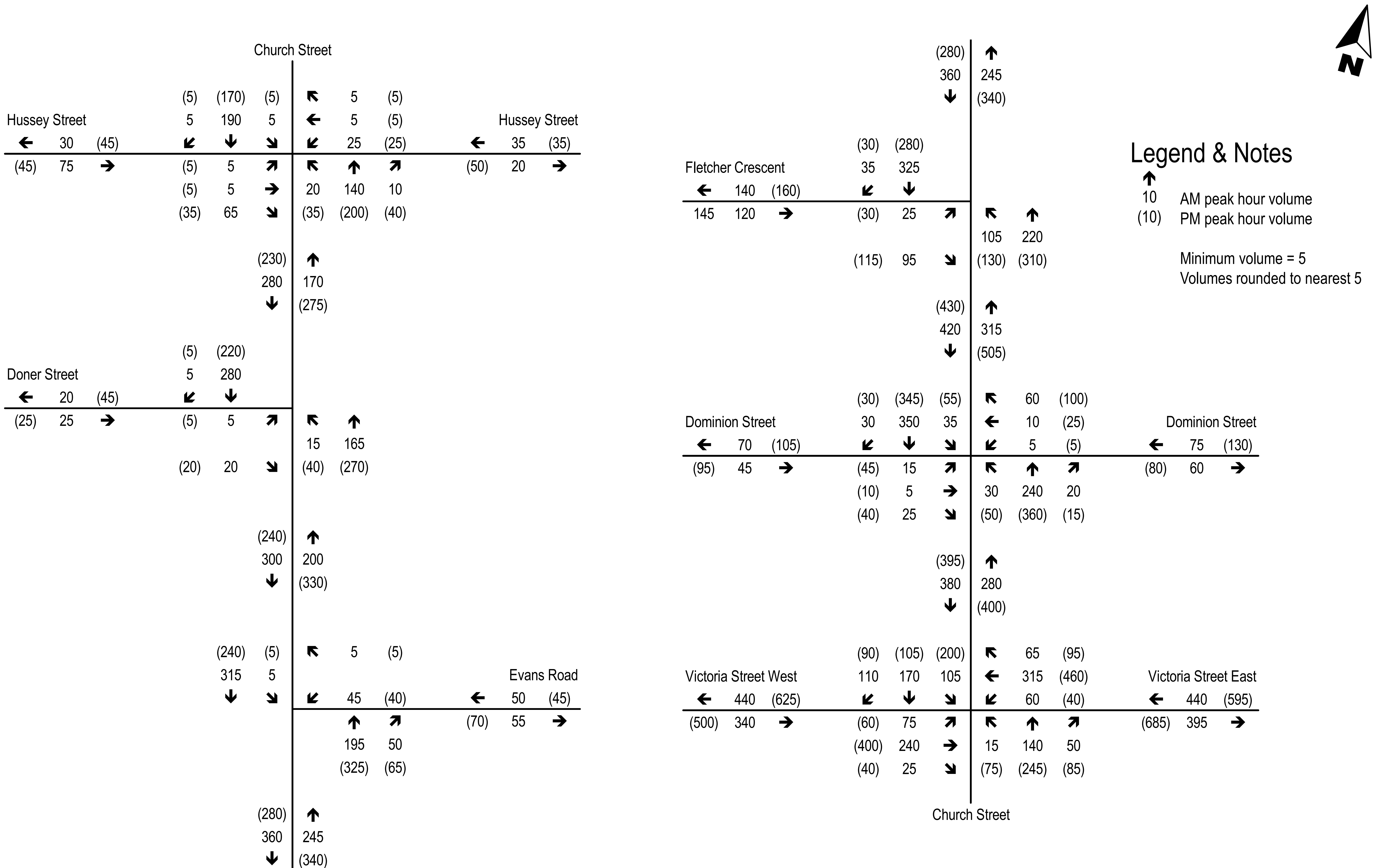
Church Street North Transportation Review

2021 Traffic Volumes

Figure 10



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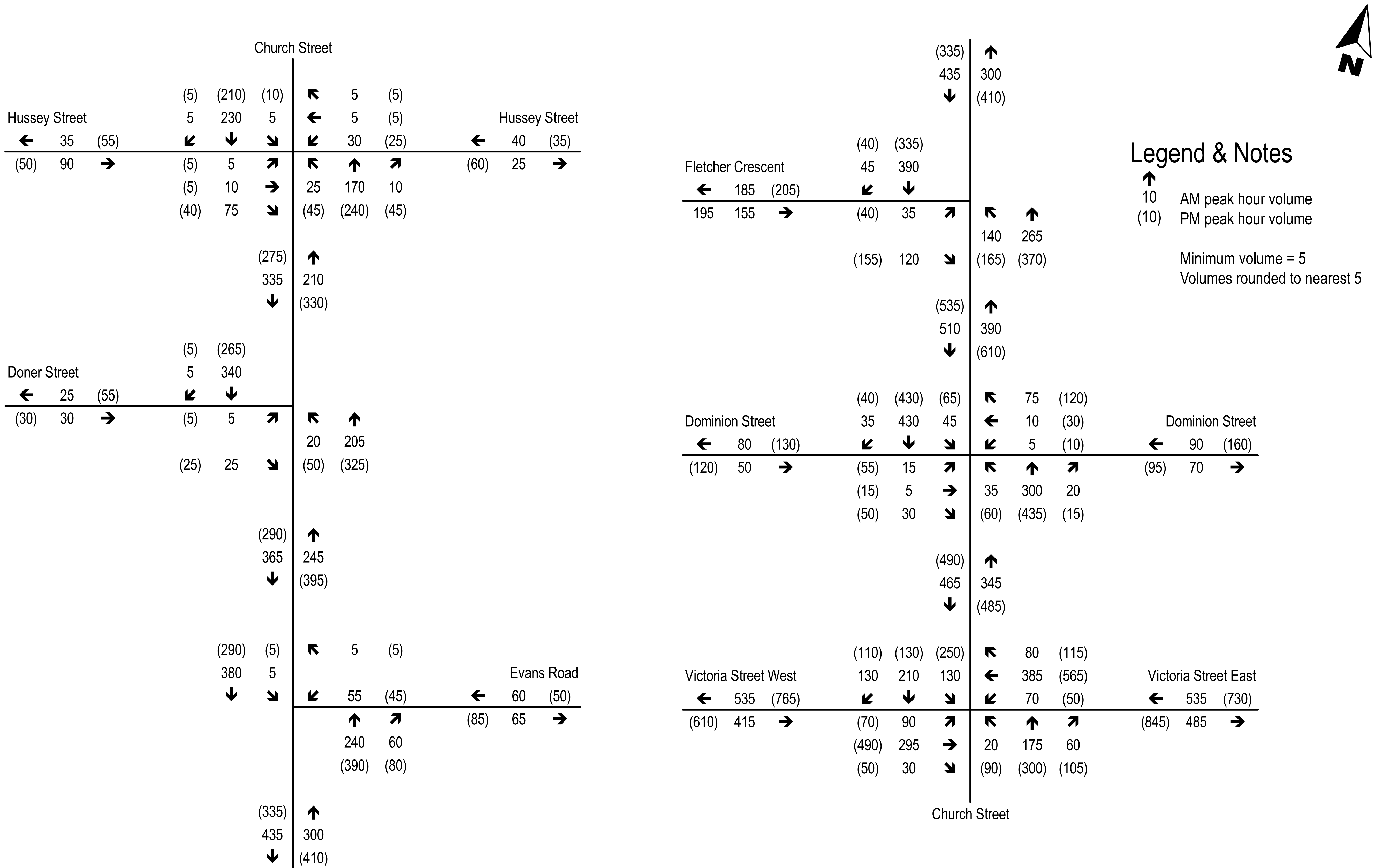
Church Street North Transportation Review

2026 Traffic Volumes

Figure 11



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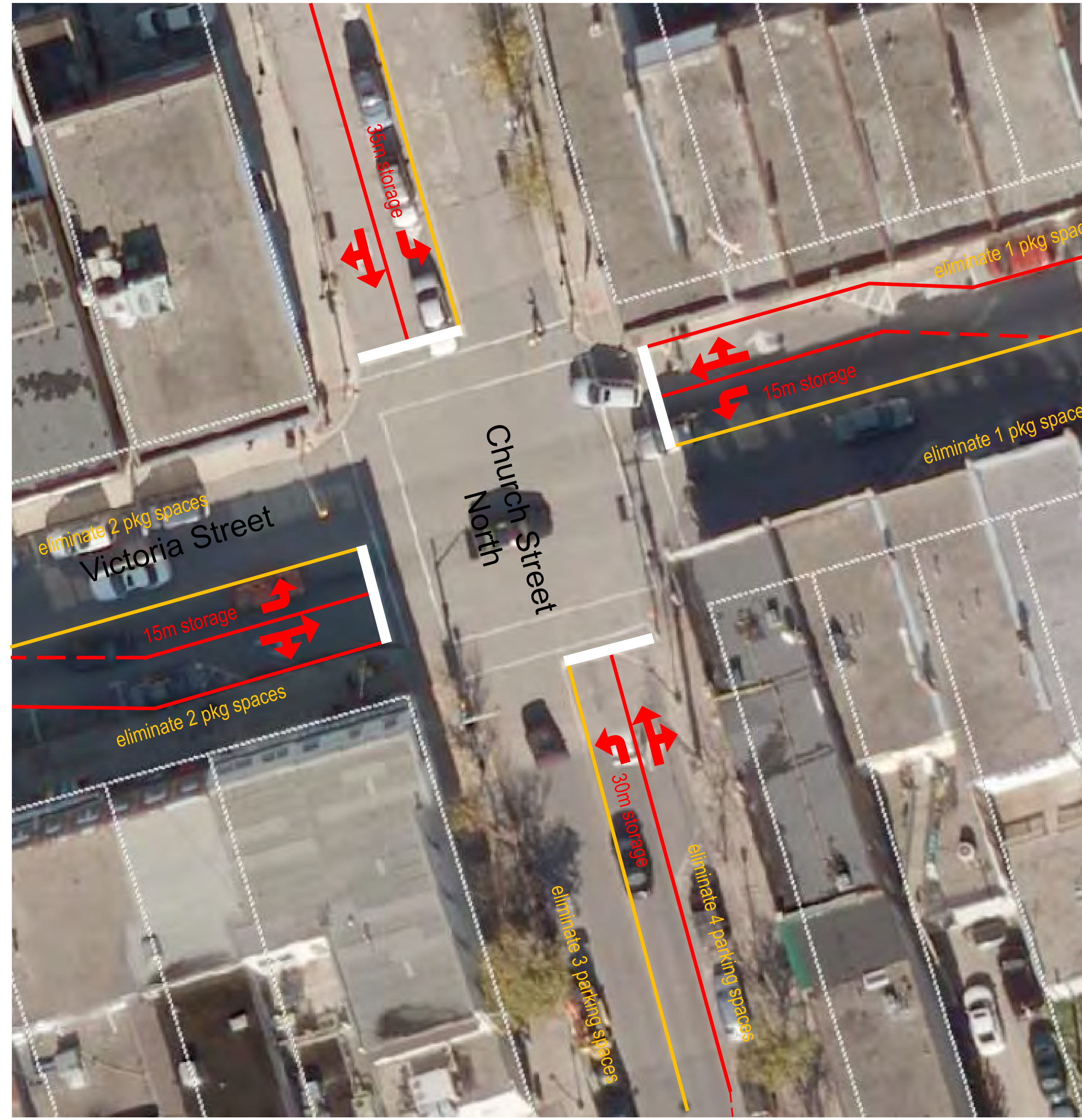
Church Street North Transportation Review

2036 Traffic Volumes

Figure
12

2026-2031: Convert right turn lanes to shared right/through lanes and create pocket left turn lanes to better accommodate travel demands for 2026 and beyond. Left turn lanes are offset from one another.

Implement advance green signal phase for left turn movements..



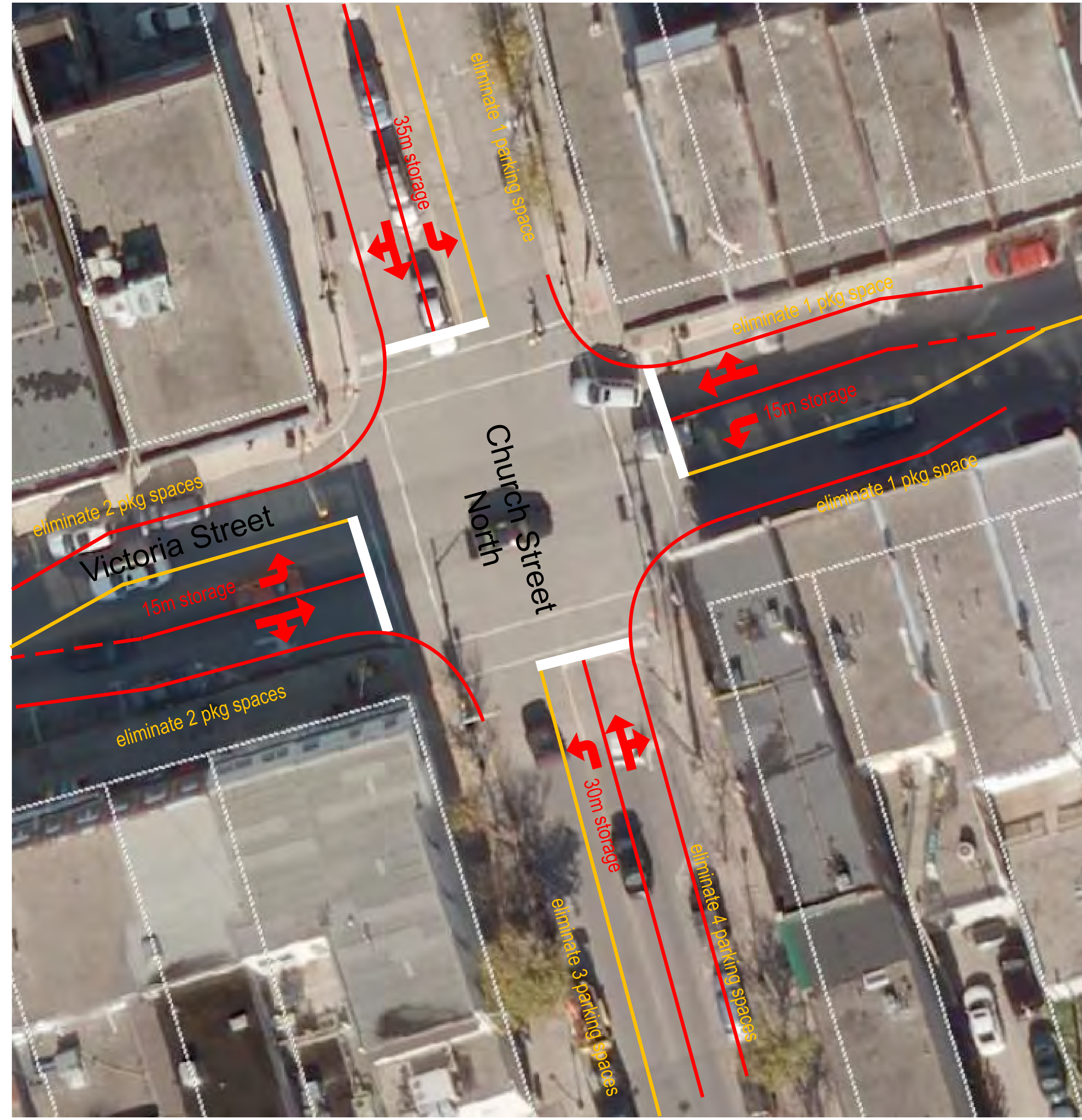
source: Simcoe Maps

source: Simcoe Maps

2026-2031: Convert right turn lanes to shared right/through lanes and create pocket left turn lanes to better accommodate travel demands for 2026 and beyond. Left turn lanes are opposing one another.

Implement advance green signal phase for left turn movements.

Lane configurations are centred in the right-of-way, thereby impacting parking on both sides of Church Street and Victoria Street.



source: Simcoe Maps

source: Simcoe Maps

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Church Street North Transportation Review

Road System Improvements – Victoria Street (opposing left turns, centred alignment)

Figure 14

2026-2031: Convert right turn lanes to shared right/through lanes and create pocket left turn lanes to better accommodate travel demands for 2026 and beyond. Left turn lanes are opposing one another.

Implement advance green signal phase for left turn movements.

Lane configurations are shifted to one side of the road, thereby impacting parking on only one side of Church Street and Victoria Street, and allowing right turn lanes to remain on some of the approaches.

source: Simcoe Maps

source: Simcoe Maps

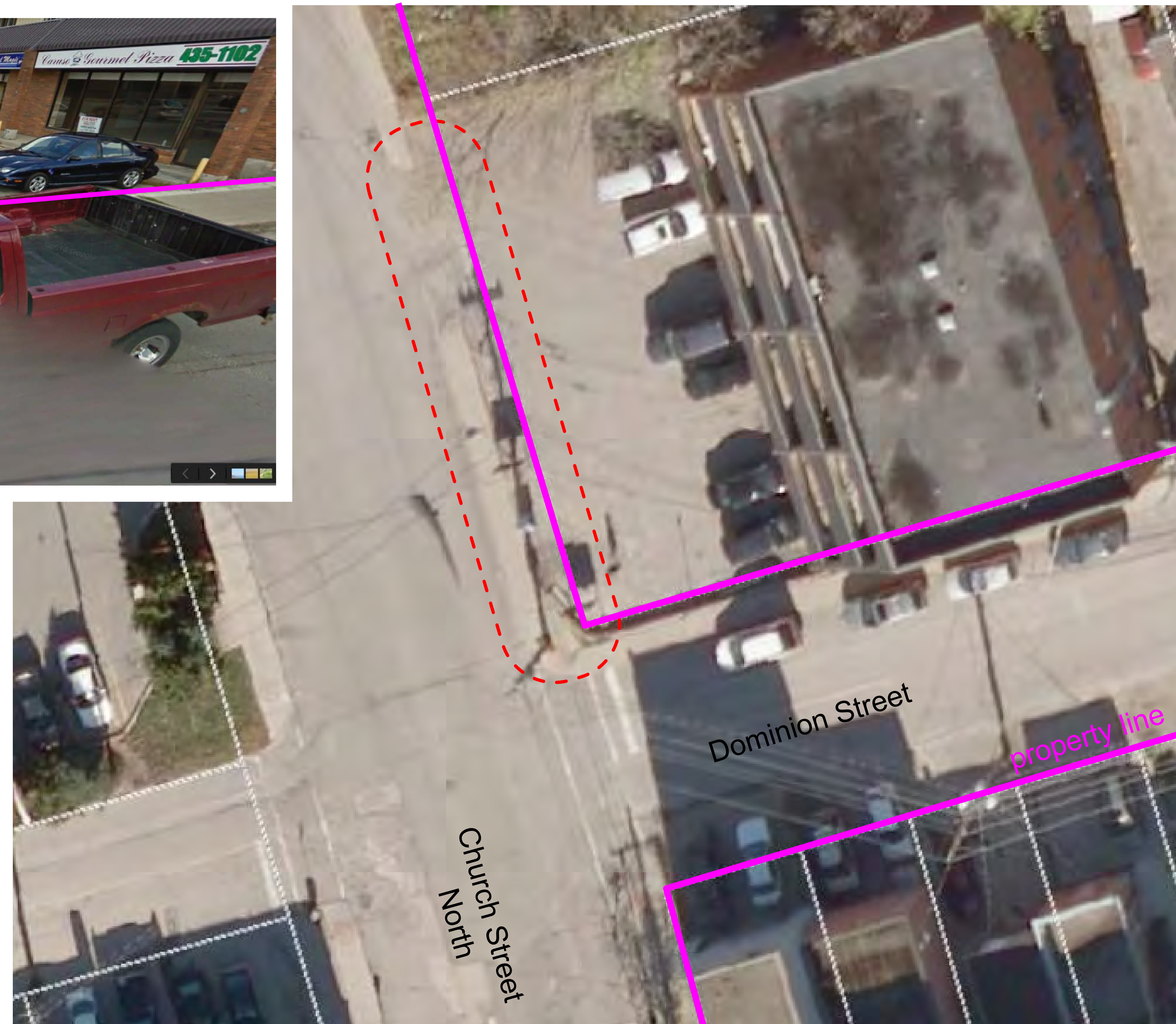
Provide crosswalks at Hussey Street intersection and ensure proper sidewalk alignments and pedestrian standing areas to facilitate crossings.

Provide crosswalks at Evans Road intersection and ensure proper sidewalk alignments and pedestrian standing areas to facilitate crossings.

source: Simcoe Maps

Reclaim the boulevard space within the right-of-way to improve sidewalk facilities and negate the need to relocate the hydro pole. Will result in the loss of 2 parking spaces currently on Town property)

Extend the sidewalk though the commercial access.



source: Google Streetview, Simcoe Maps

Improve the southwest corner of the intersection to better delineate driving lane, private parking area and pedestrian facilities.

Consider one-way operations to reduce overall road width within the constrained Dominion Street right-of-way.

source: Google Streetview, Simcoe Maps

Road System Improvements – SW Corner Dominion Street

Figure 18

source: Simcoe Maps

source: Simcoe Maps

Appendix A:
Traffic Counts

Ontario Traffic Inc

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 10:00:00

One Hour Peak
From: 8:15:00
To: 9:15:00

Municipality: Alliston
Site #: 1613700001
Intersection: Victoria St & Church St N
TFR File #: 3
Count date: 19-May-16

Weather conditions:

Person(s) who counted:

**** Signalized Intersection ****

Major Road: Victoria St runs W/E

North Leg Total: 447
North Entering: 285
North Peds: 2
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	0	1	0	1
Cars	71	134	79	284
Totals	71	135	79	

Heavys	0
Trucks	2
Cars	160
Totals	162

East Leg Total: 653
East Entering: 340
East Peds: 0
Peds Cross: ⧗

Church St N

Heavys	Trucks	Cars	Totals
0	4	335	339

Cars	Trucks	Heavys	Totals
37	1	0	38
252	4	0	256
44	2	0	46
333	7	0	

Victoria St

N
W E
S

Heavys	Trucks	Cars	Totals
0	1	39	40
0	14	182	196
0	0	19	19
0	15	240	

Victoria St

Cars	Trucks	Heavys	Totals
299	14	0	313

Church St N

Peds Cross: ⧗
West Peds: 8
West Entering: 255
West Leg Total: 594

Cars	197
Trucks	3
Heavys	0
Totals	200

Cars	12	84	38	134
Trucks	0	0	0	0
Heavys	0	0	0	0
Totals	12	84	38	

Peds Cross: ⋈
South Peds: 11
South Entering: 134
South Leg Total: 334

Comments

Ontario Traffic Inc

Mid-day Peak Diagram

Specified Period		One Hour Peak	
From:	11:00:00	**From:**	12:00:00
To:	13:00:00	**To:**	13:00:00

Municipality: Alliston
Site #: 1613700001
Intersection: Victoria St & Church St N
TFR File #: 3
Count date: 19-May-16

Weather conditions:

Person(s) who counted:

**** Signalized Intersection ****

Major Road: Victoria St runs W/E

North Leg Total: 385
North Entering: 225
North Peds: 48
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	0	0	1	1
Cars	54	72	98	224
Totals	54	72	99	

Heavys	0
Trucks	4
Cars	156
Totals	160

East Leg Total: 891
East Entering: 460
East Peds: 28
Peds Cross: ⧗

Church St N

Heavys	Trucks	Cars	Totals
0	11	465	476

Victoria St

Heavys	Trucks	Cars	Totals
0	3	34	37
0	7	273	280
0	0	28	28
0	10	335	

N
W E
S

Cars	Trucks	Heavys	Totals
50	0	0	50
370	11	0	381
29	0	0	29
449	11	0	

Victoria St

Cars	Trucks	Heavys	Totals
423	8	0	431

Church St N

Peds Cross: ⧗
West Peds: 39
West Entering: 345
West Leg Total: 821

Cars	129
Trucks	0
Heavys	0
Totals	129

Cars	41	72	52	165
Trucks	0	1	0	1
Heavys	0	0	0	0
Totals	41	73	52	

Peds Cross: ⋈
South Peds: 72
South Entering: 166
South Leg Total: 295

Comments

Ontario Traffic Inc

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 15:45:00
To: 16:45:00

Municipality: Alliston
Site #: 1613700001
Intersection: Victoria St & Church St N
TFR File #: 3
Count date: 19-May-16

Weather conditions:

Person(s) who counted:

**** Signalized Intersection ****

Major Road: Victoria St runs W/E

North Leg Total: 554
North Entering: 270
North Peds: 29
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	0	3	0	3
Cars	56	85	126	267
Totals	56	88	126	

Heavys	0
Trucks	3
Cars	281
Totals	284

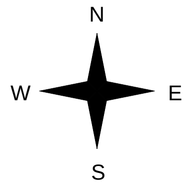
East Leg Total: 1062
East Entering: 472
East Peds: 19
Peds Cross: ⧗

Church St N

Heavys	Trucks	Cars	Totals
0	8	486	494

Victoria St

Cars	Trucks	Heavys	Totals
59	2	0	61
373	8	0	381
30	0	0	30
462	10	0	



Heavys	Trucks	Cars	Totals
0	0	37	37
0	11	368	379
0	0	29	29
0	11	434	

Victoria St

Cars	Trucks	Heavys	Totals
579	11	0	590

Church St N

Peds Cross: ⧗
West Peds: 32
West Entering: 445
West Leg Total: 939

Cars	144
Trucks	3
Heavys	0
Totals	147

Cars	57	185	85	327
Trucks	0	1	0	1
Heavys	0	0	0	0
Totals	57	186	85	

Peds Cross: ⋈
South Peds: 27
South Entering: 328
South Leg Total: 475

Comments

Ontario Traffic Inc
Traffic Count Summary

Intersection: Victoria St & Church St N | **Count Date:** 19-May-16 | **Municipality:** Alliston

	North Approach Totals						South Approach Totals					
	Includes Cars, Trucks, & Heavys							Includes Cars, Trucks, & Heavys				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	101	72	37	210	1	282	8:00:00	13	40	19	72	23
9:00:00	76	127	69	272	3	406	9:00:00	10	87	37	134	14
10:00:00	78	82	45	205	13	349	10:00:00	34	63	47	144	23
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	95	58	62	215	27	369	12:00:00	34	74	46	154	66
13:00:00	99	72	54	225	48	391	13:00:00	41	73	52	166	72
15:00:00	7	5	1	13	0	21	15:00:00	2	1	5	8	6
16:00:00	142	72	55	269	30	591	16:00:00	58	195	69	322	63
17:00:00	117	80	53	250	29	571	17:00:00	57	174	90	321	22
18:00:00	95	71	38	204	13	448	18:00:00	36	137	71	244	28
Totals:	810	639	414	1863	164	3428		285	844	436	1565	317

	East Approach Totals						West Approach Totals					
	Includes Cars, Trucks, & Heavys							Includes Cars, Trucks, & Heavys				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	25	207	29	261	0	461	8:00:00	16	175	9	200	2
9:00:00	42	246	55	343	0	579	9:00:00	36	180	20	236	16
10:00:00	35	281	35	351	2	626	10:00:00	29	224	22	275	15
11:00:00	1	4	0	5	0	13	11:00:00	2	5	1	8	0
12:00:00	26	333	53	412	9	745	12:00:00	23	281	29	333	28
13:00:00	29	381	50	460	28	805	13:00:00	37	280	28	345	39
15:00:00	3	15	3	21	1	32	15:00:00	0	11	0	11	0
16:00:00	32	377	73	482	16	877	16:00:00	36	327	32	395	61
17:00:00	30	388	53	471	15	920	17:00:00	38	388	23	449	32
18:00:00	41	412	63	516	11	973	18:00:00	48	383	26	457	25
Totals:	264	2644	414	3322	82	6031		265	2254	190	2709	218

Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	10:00	12:00	13:00	16:00	17:00	18:00
Crossing Values:	188	229	211	240	280	472	395	304

Ontario Traffic Inc

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 10:00:00

One Hour Peak
From: 8:15:00
To: 9:15:00

Municipality: Alliston
Site #: 1613700002
Intersection: Church St N & Dominion St
TFR File #: 8
Count date: 19-May-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 492
North Entering: 311
North Peds: 2
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	0	1	0	1
Cars	22	261	27	310
Totals	22	262	27	

Heavys	0
Trucks	2
Cars	179
Totals	181

East Leg Total: 87
East Entering: 45
East Peds: 2
Peds Cross: ⧗

Church St N

Heavys	Trucks	Cars	Totals
0	0	51	51

Dominion St

Cars	Trucks	Heavys	Totals
36	1	0	37
6	0	0	6
2	0	0	2
44	1	0	

N

W E

S

Heavys	Trucks	Cars	Totals
0	0	9	9
0	0	2	2
0	1	16	17
0	1	27	

Dominion St

Cars	Trucks	Heavys	Totals
40	2	0	42

Church St N

Peds Cross: ⧗
West Peds: 23
West Entering: 28
West Leg Total: 79

Cars	279
Trucks	2
Heavys	0
Totals	281

Cars	23	134	11	168
Trucks	0	1	2	3
Heavys	0	0	0	0
Totals	23	135	13	

Peds Cross: ⋈
South Peds: 5
South Entering: 171
South Leg Total: 452

Comments

Ontario Traffic Inc

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 13:00:00

One Hour Peak
From: 11:30:00
To: 12:30:00

Municipality: Alliston
Site #: 1613700002
Intersection: Church St N & Dominion St
TFR File #: 8
Count date: 19-May-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 423
North Entering: 206
North Peds: 4
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	0	3	0	3
Cars	14	169	20	203
Totals	14	172	20	

Heavys	0
Trucks	4
Cars	213
Totals	217

East Leg Total: 121
East Entering: 88
East Peds: 13
Peds Cross: ⧖

Church St N

Heavys	Trucks	Cars	Totals
0	0	59	59

Dominion St

Cars	Trucks	Heavys	Totals
57	0	0	57
19	0	0	19
10	2	0	12
86	2	0	

N

W E

S

Heavys	Trucks	Cars	Totals
0	0	21	21
0	0	7	7
0	0	47	47
0	0	75	

Dominion St

Cars	Trucks	Heavys	Totals
32	1	0	33

Church St N

Peds Cross: ⧖
West Peds: 28
West Entering: 75
West Leg Total: 134

Cars	226
Trucks	5
Heavys	0
Totals	231

Cars	26	135	5	166
Trucks	0	4	1	5
Heavys	0	0	0	0
Totals	26	139	6	

Peds Cross: ⋈
South Peds: 5
South Entering: 171
South Leg Total: 402

Comments

Ontario Traffic Inc

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 15:00:00
To: 16:00:00

Municipality: Alliston
Site #: 1613700002
Intersection: Church St N & Dominion St
TFR File #: 8
Count date: 19-May-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 673
North Entering: 297
North Peds: 5
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	0	5	1	6
Cars	23	229	39	291
Totals	23	234	40	

Heavys	0
Trucks	4
Cars	372
Totals	376

East Leg Total: 157
East Entering: 100
East Peds: 8
Peds Cross: ⧗

Church St N

Heavys	Trucks	Cars	Totals
0	0	82	82

Dominion St

Cars	Trucks	Heavys	Totals
76	1	0	77
19	0	0	19
4	0	0	4
99	1	0	

N
W E
S

Heavys	Trucks	Cars	Totals
0	0	33	33
0	0	7	7
0	0	32	32
0	0	72	

Dominion St

Cars	Trucks	Heavys	Totals
55	2	0	57

Church St N

Peds Cross: ⧗
West Peds: 57
West Entering: 72
West Leg Total: 154

Cars	265
Trucks	5
Heavys	0
Totals	270

Cars	40	263	9	312
Trucks	0	3	1	4
Heavys	0	0	0	0
Totals	40	266	10	

Peds Cross: ⋈
South Peds: 3
South Entering: 316
South Leg Total: 586

Comments

Ontario Traffic Inc
Traffic Count Summary

Intersection: Church St N & Dominion St	Count Date: 19-May-16	Municipality: Alliston

North Approach Totals (Includes Cars, Trucks, & Heavys) / **South Approach Totals** (Includes Cars, Trucks, & Heavys)

Hour Ending	N Left	N Thru	N Right	N Grand Total	N Total Peds	North/South Total Approaches	Hour Ending	S Left	S Thru	S Right	S Grand Total	S Total Peds
7:00:00	0	10	0	10	0	15	7:00:00	3	2	0	5	0
8:00:00	18	196	8	222	1	314	8:00:00	6	82	4	92	1
9:00:00	21	250	15	286	3	473	9:00:00	23	154	10	187	5
10:00:00	27	176	19	222	1	360	10:00:00	20	104	14	138	0
11:00:00	6	5	7	18	0	25	11:00:00	2	3	2	7	0
12:00:00	18	159	14	191	3	347	12:00:00	33	115	8	156	3
13:00:00	23	166	18	207	7	371	13:00:00	20	133	11	164	5
15:00:00	7	18	2	27	0	61	15:00:00	11	19	4	34	0
16:00:00	40	234	23	297	5	613	16:00:00	40	266	10	316	3
17:00:00	24	196	15	235	5	510	17:00:00	24	239	12	275	4
18:00:00	23	157	13	193	8	440	18:00:00	26	212	9	247	2
Totals:	207	1567	134	1908	33	3529		208	1329	84	1621	23

East Approach Totals (Includes Cars, Trucks, & Heavys) / **West Approach Totals** (Includes Cars, Trucks, & Heavys)

Hour Ending	E Left	E Thru	E Right	E Grand Total	E Total Peds	East/West Total Approaches	Hour Ending	W Left	W Thru	W Right	W Grand Total	W Total Peds
7:00:00	0	1	4	5	0	10	7:00:00	1	1	3	5	0
8:00:00	4	4	12	20	1	26	8:00:00	2	1	3	6	3
9:00:00	3	4	36	43	4	65	9:00:00	6	1	15	22	36
10:00:00	2	5	33	40	3	81	10:00:00	10	2	29	41	27
11:00:00	7	8	7	22	0	28	11:00:00	2	2	2	6	1
12:00:00	12	15	37	64	8	134	12:00:00	15	11	44	70	29
13:00:00	12	15	57	84	13	146	13:00:00	17	1	44	62	18
15:00:00	3	7	14	24	2	47	15:00:00	4	7	12	23	3
16:00:00	4	19	77	100	8	172	16:00:00	33	7	32	72	57
17:00:00	9	15	98	122	12	195	17:00:00	28	9	36	73	28
18:00:00	8	9	70	87	8	157	18:00:00	30	10	30	70	17
Totals:	64	102	445	611	59	1061		148	52	250	450	219

Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	10:00	12:00	13:00	16:00	17:00	18:00
Crossing Values:	12	21	18	48	56	64	61	58

Ontario Traffic Inc

Morning Peak Diagram

Specified Period		One Hour Peak	
From:	7:00:00	**From:**	8:15:00
To:	10:00:00	**To:**	9:15:00

Municipality: Alliston
Site #: 1613700003
Intersection: Church St N & Fletcher Cres
TFR File #: 27
Count date: 19-May-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 415
North Entering: 266
North Peds: 1
Peds Cross: ⋈

Heavys	0	0	0
Trucks	0	3	3
Cars	22	241	263
Totals	22	244	

Heavys	0
Trucks	3
Cars	146
Totals	149

Church St N

Heavys	Trucks	Cars	Totals
0	2	79	81

Fletcher Cres

N
W E
S

Heavys	Trucks	Cars	Totals
0	0	19	19
0	0	70	70
0	0	89	

Church St N

Peds Cross: ⧗
West Peds: 20
West Entering: 89
West Leg Total: 170

Cars	311
Trucks	3
Heavys	0
Totals	314

Cars	57	127	184
Trucks	2	3	5
Heavys	0	0	0
Totals	59	130	

Peds Cross: ⋈
South Peds: 0
South Entering: 189
South Leg Total: 503

Comments

Ontario Traffic Inc

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 13:00:00

One Hour Peak
From: 11:30:00
To: 12:30:00

Municipality: Alliston
Site #: 1613700003
Intersection: Church St N & Fletcher Cres
TFR File #: 27
Count date: 19-May-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 295
North Entering: 143
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0
Trucks	0	5	5
Cars	18	120	138
Totals	18	125	

Heavys	0
Trucks	7
Cars	145
Totals	152

Church St N

Heavys	Trucks	Cars	Totals
0	1	72	73

Fletcher Cres

N
W E
S

Heavys	Trucks	Cars	Totals
0	1	17	18
0	3	67	70
0	4	84	

Church St N

Peds Cross: ⧖
West Peds: 10
West Entering: 88
West Leg Total: 161

Cars	187
Trucks	8
Heavys	0
Totals	195

Cars	54	128	182
Trucks	1	6	8
Heavys	0	0	0
Totals	55	134	

Peds Cross: ⋈
South Peds: 1
South Entering: 190
South Leg Total: 385

Comments

Ontario Traffic Inc

Afternoon Peak Diagram

Specified Period		One Hour Peak	
From:	15:00:00	**From:**	15:00:00
To:	18:00:00	**To:**	16:00:00

Municipality: Alliston
Site #: 1613700003
Intersection: Church St N & Fletcher Cres
TFR File #: 27
Count date: 19-May-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 459
North Entering: 207
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0
Trucks	1	7	8
Cars	21	178	199
Totals	22	185	

Heavys	0
Trucks	4
Cars	248
Totals	252

Church St N

Heavys	Trucks	Cars	Totals
0	4	118	122

N

W E

S

Fletcher Cres

Heavys	Trucks	Cars	Totals
0	1	21	22
0	2	84	86
0	3	105	

Church St N

Peds Cross: ⧗
West Peds: 45
West Entering: 108
West Leg Total: 230

Cars	262
Trucks	9
Heavys	0
Totals	271

Cars	97	227	324
Trucks	3	3	7
Heavys	0	0	0
Totals	100	230	

Peds Cross: ⋈
South Peds: 0
South Entering: 331
South Leg Total: 602

Comments

Ontario Traffic Inc
Traffic Count Summary

Intersection: Church St N & Fletcher Cres | **Count Date:** 19-May-16 | **Municipality:** Alliston

North Approach Totals / South Approach Totals

Includes Cars, Trucks, & Heavys

Hour Ending	Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	0	161	13	174	8	272	8:00:00	39	59	0	98	0
9:00:00	0	230	20	250	2	451	9:00:00	62	139	0	201	0
10:00:00	0	155	16	171	1	310	10:00:00	51	88	0	139	0
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	0	127	15	142	1	297	12:00:00	52	103	0	155	1
13:00:00	0	115	12	127	0	301	13:00:00	49	124	1	174	0
15:00:00	0	2	0	2	0	2	15:00:00	0	0	0	0	0
16:00:00	0	185	22	207	0	538	16:00:00	100	230	1	331	0
17:00:00	0	159	23	182	1	516	17:00:00	101	233	0	334	0
18:00:00	0	147	16	163	7	474	18:00:00	85	226	0	311	0
Totals:	0	1281	137	1418	20	3161		539	1202	2	1743	1

East Approach Totals / West Approach Totals

Includes Cars, Trucks, & Heavys

Hour Ending	Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	0	0	0	0	0	69	8:00:00	6	0	63	69	18
9:00:00	0	0	0	0	0	76	9:00:00	18	0	58	76	29
10:00:00	0	0	0	0	0	79	10:00:00	12	0	67	79	5
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	0	0	0	0	0	87	12:00:00	24	0	63	87	8
13:00:00	0	0	0	0	0	91	13:00:00	11	0	80	91	13
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	0	0	0	0	0	108	16:00:00	22	0	86	108	45
17:00:00	0	0	0	0	0	83	17:00:00	24	0	59	83	14
18:00:00	0	0	0	0	0	71	18:00:00	19	0	52	71	18
Totals:	0	0	0	0	0	664		136	0	528	664	150

Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	10:00	12:00	13:00	16:00	17:00	18:00
Crossing Values:	14	20	13	26	11	22	25	26

Ontario Traffic Inc

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 10:00:00

One Hour Peak
From: 8:15:00
To: 9:15:00

Municipality: Alliston
Site #: 1613700004
Intersection: Church St N & Evans St
TFR File #: 7
Count date: 19-May-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 354
North Entering: 233
North Peds: 0
Peds Cross: ⋈

North approach (Church St N)

Heavys	0	0	0
Trucks	3	0	3
Cars	230	0	230
Totals	233	0	

North exit

Heavys	0
Trucks	3
Cars	118
Totals	121

East Leg Total: 63
East Entering: 35
East Peds: 2
Peds Cross: ⧗

Church St N

East approach

Cars	Trucks	Heavys	Totals
0	0	0	0
35	0	0	35
35	0	0	

N
W
E
S

Evans St

East exit

Cars	Trucks	Heavys	Totals
28	0	0	28

Church St N

South exit

Cars	265
Trucks	3
Heavys	0
Totals	268

South approach

Cars	118	28	146
Trucks	3	0	3
Heavys	0	0	0
Totals	121	28	

Peds Cross: ⋈
South Peds: 1
South Entering: 149
South Leg Total: 417

Comments

Ontario Traffic Inc

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 13:00:00

One Hour Peak
From: 11:30:00
To: 12:30:00

Municipality: Alliston
Site #: 1613700004
Intersection: Church St N & Evans St
TFR File #: 7
Count date: 19-May-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 230
North Entering: 112
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0
Trucks	5	0	5
Cars	106	1	107
Totals	111	1	

Heavys	0
Trucks	6
Cars	112
Totals	118

East Leg Total: 64
East Entering: 31
East Peds: 0
Peds Cross: ⧖

Church St N

Cars	Trucks	Heavys	Totals
1	0	0	1
30	0	0	30
31	0	0	

N
W E
S

Evans St

Cars	Trucks	Heavys	Totals
31	2	0	33

Church St N

Cars	136
Trucks	5
Heavys	0
Totals	141

Cars	111	30	141
Trucks	6	2	8
Heavys	0	0	0
Totals	117	32	

Peds Cross: ⋈
South Peds: 2
South Entering: 149
South Leg Total: 290

Comments

Ontario Traffic Inc

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:30:00
To: 17:30:00

Municipality: Alliston
Site #: 1613700004
Intersection: Church St N & Evans St
TFR File #: 7
Count date: 19-May-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 393
North Entering: 153
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0
Trucks	1	0	1
Cars	152	0	152
Totals	153	0	

Heavys	0
Trucks	3
Cars	237
Totals	240

East Leg Total: 80
East Entering: 30
East Peds: 2
Peds Cross: ⧖

Church St N

Cars	Trucks	Heavys	Totals
1	0	0	1
28	1	0	29
29	1	0	

N
W E
S

Evans St

Cars	Trucks	Heavys	Totals
49	1	0	50

Church St N

Cars	180
Trucks	2
Heavys	0
Totals	182

Cars	236	49	285
Trucks	3	1	4
Heavys	0	0	0
Totals	239	50	

Peds Cross: ⋈
South Peds: 9
South Entering: 289
South Leg Total: 471

Comments

Ontario Traffic Inc
Traffic Count Summary

Intersection: Church St N & Evans St | **Count Date:** 19-May-16 | **Municipality:** Alliston

North Approach Totals							**South Approach Totals**					
	Includes Cars, Trucks, & Heavys							Includes Cars, Trucks, & Heavys				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	0	157	0	157	4	221	8:00:00	0	59	5	64	3
9:00:00	0	222	0	222	1	381	9:00:00	0	138	21	159	2
10:00:00	1	136	0	137	1	235	10:00:00	0	70	28	98	1
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	1	111	0	112	0	236	12:00:00	0	99	25	124	0
13:00:00	1	105	0	106	0	238	13:00:00	0	98	34	132	3
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	2
16:00:00	4	162	0	166	3	413	16:00:00	0	199	48	247	0
17:00:00	1	148	0	149	0	406	17:00:00	0	217	40	257	2
18:00:00	0	136	0	136	0	382	18:00:00	0	207	39	246	7
Totals:	8	1177	0	1185	9	2512		0	1087	240	1327	20

East Approach Totals							**West Approach Totals**					
	Includes Cars, Trucks, & Heavys							Includes Cars, Trucks, & Heavys				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	18	0	0	18	6	18	8:00:00	0	0	0	0	0
9:00:00	31	0	0	31	1	31	9:00:00	0	0	0	0	0
10:00:00	32	0	0	32	3	32	10:00:00	0	0	0	0	0
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	30	0	1	31	0	31	12:00:00	0	0	0	0	0
13:00:00	20	0	0	20	0	20	13:00:00	0	0	0	0	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	42	0	2	44	2	44	16:00:00	0	0	0	0	0
17:00:00	35	0	2	37	2	37	17:00:00	0	0	0	0	0
18:00:00	24	0	0	24	0	24	18:00:00	0	0	0	0	0
Totals:	232	0	5	237	14	237		0	0	0	0	0

Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	10:00	12:00	13:00	16:00	17:00	18:00
Crossing Values:	25	34	34	30	23	45	37	31

Ontario Traffic Inc

Morning Peak Diagram

Specified Period		One Hour Peak	
From:	7:00:00	**From:**	8:00:00
To:	10:00:00	**To:**	9:00:00

Municipality: Alliston
Site #: 1613700005
Intersection: Church St N & Doner St
TFR File #: 4
Count date: 19-May-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 335
North Entering: 204
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0
Trucks	0	4	4
Cars	0	200	200
Totals	0	204	

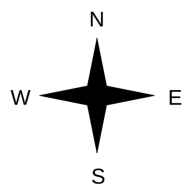
Heavys	0
Trucks	7
Cars	124
Totals	131

Church St N

Heavys	Trucks	Cars	Totals
0	0	11	11

Doner St

Heavys	Trucks	Cars	Totals
0	0	3	3
0	2	13	15
0	2	16	



Church St N

Peds Cross: ⧗
West Peds: 85
West Entering: 18
West Leg Total: 29

Cars	213
Trucks	6
Heavys	0
Totals	219

Cars	11	121	132
Trucks	0	7	7
Heavys	0	0	0
Totals	11	128	

Peds Cross: ⋈
South Peds: 0
South Entering: 139
South Leg Total: 358

Comments

Ontario Traffic Inc

Mid-day Peak Diagram

Specified Period		One Hour Peak	
From:	11:00:00	**From:**	11:30:00
To:	13:00:00	**To:**	12:30:00

Municipality: Alliston
Site #: 1613700005
Intersection: Church St N & Doner St
TFR File #: 4
Count date: 19-May-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 190
North Entering: 93
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0	
Trucks	0	5	5	
Cars	0	88	88	
Totals	0	93		

Heavys	0
Trucks	5
Cars	92
Totals	97

Church St N

Heavys	Trucks	Cars	Totals
0	1	17	18

Doner St

N
W E
S

Heavys	Trucks	Cars	Totals
0	1	2	3
0	0	15	15
0	1	17	

Church St N

Peds Cross: ⧗
West Peds: 12
West Entering: 18
West Leg Total: 36

Cars	103
Trucks	5
Heavys	0
Totals	108

Cars	17	90	107
Trucks	1	4	5
Heavys	0	0	0
Totals	18	94	

Peds Cross: ⋈
South Peds: 0
South Entering: 112
South Leg Total: 220

Comments

Ontario Traffic Inc

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:30:00
To: 17:30:00

Municipality: Alliston
Site #: 1613700005
Intersection: Church St N & Doner St
TFR File #: 4
Count date: 19-May-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 333
North Entering: 136
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0
Trucks	0	1	1
Cars	1	134	135
Totals	1	135	

Heavys	0
Trucks	4
Cars	193
Totals	197

Church St N

Heavys	Trucks	Cars	Totals
0	0	32	32

Doner St

N
W E
S

Heavys	Trucks	Cars	Totals
0	0	2	2
0	1	14	15
0	1	16	

Church St N

Peds Cross: ⧖
West Peds: 19
West Entering: 17
West Leg Total: 49

Cars	148
Trucks	2
Heavys	0
Totals	150

Cars	31	191	222
Trucks	0	4	4
Heavys	0	0	0
Totals	31	195	

Peds Cross: ⋈
South Peds: 2
South Entering: 226
South Leg Total: 376

Comments

Ontario Traffic Inc
Traffic Count Summary

Intersection: Church St N & Doner St	Count Date: 19-May-16	Municipality: Alliston

North Approach Totals							South Approach Totals					
	Includes Cars, Trucks, & Heavys							Includes Cars, Trucks, & Heavys				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	10	0	10	0	11	7:00:00	0	1	0	1	0
8:00:00	0	145	0	145	1	202	8:00:00	3	54	0	57	0
9:00:00	0	204	0	204	0	343	9:00:00	11	128	0	139	0
10:00:00	0	119	0	119	0	192	10:00:00	11	62	0	73	0
11:00:00	0	4	0	4	0	12	11:00:00	0	8	0	8	0
12:00:00	0	95	0	95	0	189	12:00:00	13	81	0	94	0
13:00:00	0	88	0	88	0	180	13:00:00	18	74	0	92	0
15:00:00	0	26	1	27	0	38	15:00:00	1	10	0	11	0
16:00:00	0	147	1	148	0	347	16:00:00	29	170	0	199	0
17:00:00	0	121	1	122	0	335	17:00:00	20	193	0	213	0
18:00:00	0	128	2	130	0	328	18:00:00	27	171	0	198	2
Totals:	0	1087	5	1092	1	2177		133	952	0	1085	2

East Approach Totals							West Approach Totals					
	Includes Cars, Trucks, & Heavys							Includes Cars, Trucks, & Heavys				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	0	0	0	0	0	18	8:00:00	0	0	18	18	23
9:00:00	0	0	0	0	0	18	9:00:00	3	0	15	18	85
10:00:00	0	0	0	0	0	14	10:00:00	0	0	14	14	13
11:00:00	0	0	0	0	0	1	11:00:00	0	0	1	1	0
12:00:00	0	0	0	0	0	14	12:00:00	1	0	13	14	9
13:00:00	0	0	0	0	0	19	13:00:00	2	0	17	19	14
15:00:00	0	0	0	0	0	2	15:00:00	0	0	2	2	28
16:00:00	0	0	0	0	0	19	16:00:00	0	0	19	19	90
17:00:00	0	0	0	0	0	22	17:00:00	1	0	21	22	14
18:00:00	0	0	0	0	0	8	18:00:00	1	0	7	8	33
Totals:	0	0	0	0	0	135		8	0	127	135	309

Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	10:00	12:00	13:00	16:00	17:00	18:00
Crossing Values:	1	3	0	1	2	0	1	3

Ontario Traffic Inc

Morning Peak Diagram

Specified Period		One Hour Peak	
From:	7:00:00	**From:**	8:00:00
To:	10:00:00	**To:**	9:00:00

Municipality: Alliston
Site #: 1613700006
Intersection: Church St N & Hussey St
TFR File #: 8
Count date: 19-May-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 257
North Entering: 145
North Peds: 70
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	0	0	0	0
Cars	2	141	2	145
Totals	2	141	2	

Heavys	0
Trucks	4
Cars	108
Totals	112

East Leg Total: 23
East Entering: 14
East Peds: 5
Peds Cross: ⧗

Church St N

Heavys	Trucks	Cars	Totals
0	4	14	18

Hussey St

Cars	Trucks	Heavys	Totals
2	0	0	2
0	1	0	1
9	2	0	11
11	3	0	

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Heavys	Trucks	Cars	Totals
0	0	2	2
0	0	4	4
0	1	48	49
0	1	54	

Hussey St

Cars	Trucks	Heavys	Totals
9	0	0	9

Church St N

Peds Cross: ⧗
West Peds: 80
West Entering: 55
West Leg Total: 73

Cars	198
Trucks	3
Heavys	0
Totals	201

Cars	12	104	3	119
Trucks	3	4	0	7
Heavys	0	0	0	0
Totals	15	108	3	

Peds Cross: ⋈
South Peds: 3
South Entering: 126
South Leg Total: 327

Comments

Ontario Traffic Inc

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 13:00:00

One Hour Peak
From: 11:30:00
To: 12:30:00

Municipality: Alliston
Site #: 1613700006
Intersection: Church St N & Hussey St
TFR File #: 8
Count date: 19-May-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 130
North Entering: 63
North Peds: 5
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	0	4	0	4
Cars	0	55	4	59
Totals	0	59	4	

Heavys	0
Trucks	5
Cars	62
Totals	67

East Leg Total: 25
East Entering: 14
East Peds: 1
Peds Cross: ⧗

Church St N

Heavys	Trucks	Cars	Totals
0	1	26	27

Hussey St

Cars	Trucks	Heavys	Totals
2	0	0	2
3	1	0	4
8	0	0	8
13	1	0	

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Heavys	Trucks	Cars	Totals
0	0	0	0
0	0	1	1
0	0	21	21
0	0	22	

Hussey St

Cars	Trucks	Heavys	Totals
11	0	0	11

Church St N

Peds Cross: ⧗
West Peds: 11
West Entering: 22
West Leg Total: 49

Cars	84
Trucks	4
Heavys	0
Totals	88

Cars	23	60	6	89
Trucks	0	5	0	5
Heavys	0	0	0	0
Totals	23	65	6	

Peds Cross: ⋈
South Peds: 1
South Entering: 94
South Leg Total: 182

Comments

Ontario Traffic Inc

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:30:00
To: 17:30:00

Municipality: Alliston
Site #: 1613700006
Intersection: Church St N & Hussey St
TFR File #: 8
Count date: 19-May-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 260
North Entering: 109
North Peds: 6
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	0	0	0	0
Cars	1	104	4	109
Totals	1	104	4	

Heavys	0
Trucks	1
Cars	150
Totals	151

East Leg Total: 35
East Entering: 12
East Peds: 0
Peds Cross: ⧗

Church St N

Heavys	Trucks	Cars	Totals
0	0	29	29

Hussey St

Cars	Trucks	Heavys	Totals
2	0	0	2
1	0	0	1
9	0	0	9
12	0	0	

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Heavys	Trucks	Cars	Totals
0	0	0	0
0	0	1	1
0	0	25	25
0	0	26	

Hussey St

Cars	Trucks	Heavys	Totals
22	1	0	23

Church St N

Peds Cross: ⧗
West Peds: 13
West Entering: 26
West Leg Total: 55

Cars	138
Trucks	0
Heavys	0
Totals	138

Cars	27	148	17	192
Trucks	0	1	1	2
Heavys	0	0	0	0
Totals	27	149	18	

Peds Cross: ⋈
South Peds: 0
South Entering: 194
South Leg Total: 332

Comments

Ontario Traffic Inc
Traffic Count Summary

Intersection: Church St N & Hussey St	Count Date: 19-May-16	Municipality: Alliston

North Approach Totals							South Approach Totals					
	Includes Cars, Trucks, & Heavys							Includes Cars, Trucks, & Heavys				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0	1	7:00:00	0	1	0	1	0
8:00:00	0	109	0	109	2	161	8:00:00	6	42	4	52	6
9:00:00	2	141	2	145	70	271	9:00:00	15	108	3	126	3
10:00:00	2	77	0	79	3	140	10:00:00	13	43	5	61	1
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	1
12:00:00	2	59	0	61	3	141	12:00:00	20	54	6	80	2
13:00:00	2	53	0	55	5	129	13:00:00	13	54	7	74	0
15:00:00	0	3	0	3	0	4	15:00:00	0	1	0	1	0
16:00:00	3	102	0	105	70	274	16:00:00	30	126	13	169	6
17:00:00	2	91	1	94	4	279	17:00:00	34	137	14	185	3
18:00:00	3	99	2	104	9	272	18:00:00	22	131	15	168	4
Totals:	16	734	5	755	166	1672		153	697	67	917	26

East Approach Totals							West Approach Totals					
	Includes Cars, Trucks, & Heavys							Includes Cars, Trucks, & Heavys				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	9	1	0	10	4	35	8:00:00	1	0	24	25	13
9:00:00	11	1	2	14	5	69	9:00:00	2	4	49	55	80
10:00:00	11	2	0	13	1	45	10:00:00	1	1	30	32	7
11:00:00	1	0	0	1	1	3	11:00:00	0	0	2	2	0
12:00:00	11	1	0	12	1	33	12:00:00	1	1	19	21	8
13:00:00	8	6	2	16	0	42	13:00:00	2	1	23	26	9
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	1
16:00:00	12	2	3	17	5	47	16:00:00	1	0	29	30	80
17:00:00	10	1	1	12	0	27	17:00:00	0	0	15	15	9
18:00:00	10	1	2	13	5	37	18:00:00	0	2	22	24	15
Totals:	83	15	10	108	22	338		8	9	213	230	222

Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	10:00	12:00	13:00	16:00	17:00	18:00
Crossing Values:	19	90	18	18	21	91	18	25

Ontario Traffic Inc

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 11:15:00
To: 12:15:00

Municipality: Alliston
Site #: 1613700007
Intersection: Victoria St & Church St N
TFR File #: 1
Count date: 23-Apr-16

Weather conditions:

Person(s) who counted:

**** Signalized Intersection ****

Major Road: Victoria St runs W/E

North Leg Total: 420
North Entering: 251
North Peds: 32
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	0	0	0	0
Cars	80	46	125	251
Totals	80	46	125	

Heavys	0
Trucks	0
Cars	169
Totals	169

East Leg Total: 1060
East Entering: 482
East Peds: 26
Peds Cross: ⧗

Church St N

Heavys	Trucks	Cars	Totals
0	6	541	547

Victoria St

Cars	Trucks	Heavys	Totals
32	0	0	32
429	6	0	435
15	0	0	15
476	6	0	

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Heavys	Trucks	Cars	Totals
0	0	32	32
0	5	389	394
0	0	24	24
0	5	445	

Victoria St

Cars	Trucks	Heavys	Totals
573	5	0	578

Church St N

Peds Cross: ⧗
West Peds: 25
West Entering: 450
West Leg Total: 997

Cars	85
Trucks	0
Heavys	0
Totals	85

Cars	32	105	59	196
Trucks	0	0	0	0
Heavys	0	0	0	0
Totals	32	105	59	

Peds Cross: ⋈
South Peds: 23
South Entering: 196
South Leg Total: 281

Comments

Ontario Traffic Inc
Traffic Count Summary

Intersection: Victoria St & Church St N	Count Date: 23-Apr-16	Municipality: Alliston

North Approach Totals							South Approach Totals					
	Includes Cars, Trucks, & Heavys							Includes Cars, Trucks, & Heavys				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
11:00:00	0	0	0	0	0	2	11:00:00	0	0	2	2	1
12:00:00	125	46	74	245	37	426	12:00:00	33	97	51	181	25
13:00:00	102	35	72	209	31	393	13:00:00	27	85	72	184	25
14:00:00	126	32	57	215	32	361	14:00:00	28	79	39	146	11
Totals:	353	113	203	669	100	1182		88	261	164	513	62

East Approach Totals							West Approach Totals					
	Includes Cars, Trucks, & Heavys							Includes Cars, Trucks, & Heavys				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	14	428	40	482	21	926	12:00:00	36	384	24	444	39
13:00:00	10	463	35	508	18	950	13:00:00	26	392	24	442	26
14:00:00	16	441	51	508	5	956	14:00:00	33	395	20	448	6
Totals:	40	1332	126	1498	44	2832		95	1171	68	1334	71

Calculated Values for Traffic Crossing Major Street

Hours Ending:	0:00	0:00	0:00	0:00	11:00	12:00	13:00	14:00
Crossing Values:	0	0	0	0	0	315	258	244

Ontario Traffic Inc

Mid-day Peak Diagram

Specified Period		One Hour Peak	
From:	11:00:00	**From:**	11:15:00
To:	14:00:00	**To:**	12:15:00

Municipality: Alliston
Site #: 1613700008
Intersection: Church St N & Dominion St
TFR File #: 1
Count date: 23-Apr-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 478
North Entering: 259
North Peds: 4
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	0	0	0	0
Cars	18	203	38	259
Totals	18	203	38	

Heavys	0
Trucks	1
Cars	218
Totals	219

East Leg Total: 127
East Entering: 77
East Peds: 23
Peds Cross: ⧗

Church St N

Heavys	Trucks	Cars	Totals
0	0	49	49

Dominion St

Cars	Trucks	Heavys	Totals
55	0	0	55
17	0	0	17
5	0	0	5
77	0	0	

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Heavys	Trucks	Cars	Totals
0	0	17	17
0	0	3	3
0	0	40	40
0	0	60	

Dominion St

Cars	Trucks	Heavys	Totals
50	0	0	50

Church St N

Peds Cross: ⧗
West Peds: 20
West Entering: 60
West Leg Total: 109

Cars	248
Trucks	0
Heavys	0
Totals	248

Cars	14	146	9	169
Trucks	0	1	0	1
Heavys	0	0	0	0
Totals	14	147	9	

Peds Cross: ⋈
South Peds: 7
South Entering: 170
South Leg Total: 418

Comments

Ontario Traffic Inc
Traffic Count Summary

Intersection: Church St N & Dominion St	Count Date: 23-Apr-16	Municipality: Alliston

North Approach Totals							South Approach Totals					
	Includes Cars, Trucks, & Heavys					North/South Total Approaches		Includes Cars, Trucks, & Heavys				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds		Hour Ending	Left	Thru	Right	Grand Total	Total Peds
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	33	194	18	245	6	421	12:00:00	22	144	10	176	7
13:00:00	14	169	14	197	9	345	13:00:00	11	134	3	148	3
14:00:00	18	175	20	213	6	376	14:00:00	16	139	8	163	4
Totals:	65	538	52	655	21	1142		49	417	21	487	14

East Approach Totals							West Approach Totals					
	Includes Cars, Trucks, & Heavys					East/West Total Approaches		Includes Cars, Trucks, & Heavys				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds		Hour Ending	Left	Thru	Right	Grand Total	Total Peds
11:00:00	0	0	0	0	3	1	11:00:00	0	1	0	1	0
12:00:00	5	12	49	66	29	129	12:00:00	15	5	43	63	20
13:00:00	4	13	78	95	6	161	13:00:00	19	8	39	66	28
14:00:00	7	12	51	70	9	120	14:00:00	19	4	27	50	13
Totals:	16	37	178	231	47	411		53	18	109	180	61

Calculated Values for Traffic Crossing Major Street

Hours Ending:	0:00	0:00	0:00	0:00	11:00	12:00	13:00	14:00
Crossing Values:	0	0	0	0	1	45	48	48

Ontario Traffic Inc

Mid-day Peak Diagram

Specified Period		One Hour Peak	
From:	11:00:00	**From:**	12:30:00
To:	14:00:00	**To:**	13:30:00

Municipality: Alliston
Site #: 1613700009
Intersection: Church St N & Fletcher Cres
TFR File #: 1
Count date: 23-Apr-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 301
North Entering: 130
North Peds: 5
Peds Cross: ⋈

Heavys	0	0	0
Trucks	0	0	0
Cars	15	115	130
Totals	15	115	

Heavys	0
Trucks	0
Cars	171
Totals	171

Church St N

Heavys	Trucks	Cars	Totals
0	0	69	69

Fletcher Cres

N
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Heavys	Trucks	Cars	Totals
0	0	32	32
0	0	44	44
0	0	76	

Church St N

Peds Cross: ⧗
West Peds: 17
West Entering: 76
West Leg Total: 145

Cars	159
Trucks	0
Heavys	0
Totals	159

Cars	54	139	193
Trucks	0	0	0
Heavys	0	0	0
Totals	54	139	

Peds Cross: ⋈
South Peds: 2
South Entering: 193
South Leg Total: 352

Comments

Ontario Traffic Inc
Traffic Count Summary

Intersection: Church St N & Fletcher Cres | **Count Date:** 23-Apr-16 | **Municipality:** Alliston

North Approach Totals / South Approach Totals

Hour Ending	Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
	Includes Cars, Trucks, & Heavys							Includes Cars, Trucks, & Heavys				
11:00:00	0	6	0	6	0	15	11:00:00	0	9	0	9	0
12:00:00	0	131	13	144	4	296	12:00:00	49	103	0	152	1
13:00:00	0	112	17	129	2	308	13:00:00	55	124	0	179	0
14:00:00	0	98	9	107	3	274	14:00:00	47	120	0	167	5
Totals:	0	347	39	386	9	893		151	356	0	507	6

East Approach Totals / West Approach Totals

Hour Ending	Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
	Includes Cars, Trucks, & Heavys							Includes Cars, Trucks, & Heavys				
11:00:00	0	0	0	0	0	2	11:00:00	1	0	1	2	0
12:00:00	0	0	0	0	0	58	12:00:00	12	0	46	58	18
13:00:00	0	0	0	0	0	75	13:00:00	27	0	48	75	22
14:00:00	0	0	0	0	0	88	14:00:00	30	0	58	88	15
Totals:	0	0	0	0	0	223		70	0	153	223	55

Calculated Values for Traffic Crossing Major Street

Hours Ending:	0:00	0:00	0:00	0:00	11:00	12:00	13:00	14:00
Crossing Values:	0	0	0	0	1	17	29	38

Ontario Traffic Inc

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 11:30:00
To: 12:30:00

Municipality: Alliston
Site #: 1613700009
Intersection: Church St N & Evans St
TFR File #: 1
Count date: 23-Apr-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 270
North Entering: 143
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0
Trucks	0	0	0
Cars	142	1	143
Totals	142	1	

Heavys	0
Trucks	1
Cars	126
Totals	127

East Leg Total: 71
East Entering: 38
East Peds: 7
Peds Cross: ⧖

Church St N

Cars	Trucks	Heavys	Totals
1	0	0	1
37	0	0	37
38	0	0	

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Evans St

Cars	Trucks	Heavys	Totals
33	0	0	33

Church St N

Cars	179
Trucks	0
Heavys	0
Totals	179

Cars	125	32	157
Trucks	1	0	1
Heavys	0	0	0
Totals	126	32	

Peds Cross: ⋈
South Peds: 4
South Entering: 158
South Leg Total: 337

Comments

Ontario Traffic Inc
Traffic Count Summary

Intersection: Church St N & Evans St	Count Date: 23-Apr-16	Municipality: Alliston

North Approach Totals / South Approach Totals

Includes Cars, Trucks, & Heavys

Hour Ending	Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
11:00:00	0	8	0	8	0	17	11:00:00	0	6	3	9	0
12:00:00	1	134	0	135	1	274	12:00:00	0	105	34	139	4
13:00:00	0	120	0	120	0	295	13:00:00	0	143	32	175	2
14:00:00	1	112	0	113	0	273	14:00:00	0	132	28	160	3
Totals:	2	374	0	376	1	859		0	386	97	483	9

East Approach Totals / West Approach Totals

Includes Cars, Trucks, & Heavys

Hour Ending	Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	1
12:00:00	42	0	1	43	11	43	12:00:00	0	0	0	0	0
13:00:00	34	0	0	34	3	34	13:00:00	0	0	0	0	0
14:00:00	29	0	0	29	6	30	14:00:00	0	1	0	1	0
Totals:	105	0	1	106	20	107		0	1	0	1	1

Calculated Values for Traffic Crossing Major Street

Hours Ending:	0:00	0:00	0:00	0:00	11:00	12:00	13:00	14:00
Crossing Values:	0	0	0	0	0	47	36	33

Ontario Traffic Inc

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 12:30:00
To: 13:30:00

Municipality: Alliston
Site #: 1613700011
Intersection: Church St N & Doner St
TFR File #: 8
Count date: 23-Apr-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

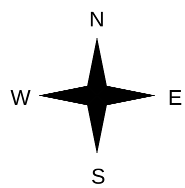
North Leg Total: 260
North Entering: 113
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0
Trucks	0	0	0
Cars	1	112	113
Totals	1	112	

Heavys	0
Trucks	0
Cars	147
Totals	147

Church St N

Heavys	Trucks	Cars	Totals
0	0	22	22



Doner St

Heavys	Trucks	Cars	Totals
0	0	2	2
0	0	13	13
0	0	15	

Church St N

Peds Cross: ⧗
West Peds: 13
West Entering: 15
West Leg Total: 37

Cars	125
Trucks	0
Heavys	0
Totals	125

Cars	21	145	166
Trucks	0	0	0
Heavys	0	0	0
Totals	21	145	

Peds Cross: ⋈
South Peds: 0
South Entering: 166
South Leg Total: 291

Comments

Ontario Traffic Inc
Traffic Count Summary

Intersection: Church St N & Doner St | **Count Date:** 23-Apr-16 | **Municipality:** Alliston

North Approach Totals							South Approach Totals					
	Includes Cars, Trucks, & Heavys					North/South Total Approaches		Includes Cars, Trucks, & Heavys				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds		Hour Ending	Left	Thru	Right	Grand Total	Total Peds
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	0	115	1	116	0	227	12:00:00	12	99	0	111	0
13:00:00	0	117	2	119	0	267	13:00:00	24	124	0	148	0
14:00:00	0	90	0	90	0	232	14:00:00	17	125	0	142	0
Totals:	0	322	3	325	0	726		53	348	0	401	0

East Approach Totals							West Approach Totals					
	Includes Cars, Trucks, & Heavys					East/West Total Approaches		Includes Cars, Trucks, & Heavys				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds		Hour Ending	Left	Thru	Right	Grand Total	Total Peds
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	0	0	0	0	0	29	12:00:00	3	0	26	29	8
13:00:00	0	0	0	0	0	10	13:00:00	2	0	8	10	21
14:00:00	0	0	0	0	0	16	14:00:00	0	0	16	16	11
Totals:	0	0	0	0	0	55		5	0	50	55	40

Calculated Values for Traffic Crossing Major Street

Hours Ending:	0:00	0:00	0:00	0:00	11:00	12:00	13:00	14:00
Crossing Values:	0	0	0	0	0	3	2	0

Ontario Traffic Inc

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 12:30:00
To: 13:30:00

Municipality: Alliston
Site #: 1613700012
Intersection: Church St N & Hussey St
TFR File #: 10
Count date: 23-Apr-16

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Church St N runs N/S

North Leg Total: 198
North Entering: 85
North Peds: 6
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	0	0	0	0
Cars	1	83	1	85
Totals	1	83	1	

Heavys	0
Trucks	0
Cars	113
Totals	113

East Leg Total: 23
East Entering: 11
East Peds: 1
Peds Cross: ⧗

Church St N

Heavys	Trucks	Cars	Totals
0	0	24	24

Hussey St

Cars	Trucks	Heavys	Totals
2	0	0	2
1	0	0	1
8	0	0	8
11	0	0	

N
W
E
S

Heavys	Trucks	Cars	Totals
0	0	1	1
0	0	1	1
0	0	22	22
0	0	24	

Hussey St

Cars	Trucks	Heavys	Totals
12	0	0	12

Church St N

Peds Cross: ⧗
West Peds: 7
West Entering: 24
West Leg Total: 48

Cars	113
Trucks	0
Heavys	0
Totals	113

Cars	22	110	10	142
Trucks	0	0	0	0
Heavys	0	0	0	0
Totals	22	110	10	

Peds Cross: ⋈
South Peds: 1
South Entering: 142
South Leg Total: 255

Comments

Ontario Traffic Inc
Traffic Count Summary

Intersection: Church St N & Hussey St	Count Date: 23-Apr-16	Municipality: Alliston

North Approach Totals							South Approach Totals					
	Includes Cars, Trucks, & Heavys					North/South Total Approaches		Includes Cars, Trucks, & Heavys				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds		Hour Ending	Left	Thru	Right	Grand Total	Total Peds
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	7	69	2	78	3	176	12:00:00	19	67	12	98	3
13:00:00	2	83	2	87	11	209	13:00:00	15	98	9	122	2
14:00:00	0	70	0	70	5	198	14:00:00	16	102	10	128	1
Totals:	9	222	4	235	19	583		50	267	31	348	6

East Approach Totals							West Approach Totals					
	Includes Cars, Trucks, & Heavys					East/West Total Approaches		Includes Cars, Trucks, & Heavys				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds		Hour Ending	Left	Thru	Right	Grand Total	Total Peds
11:00:00	0	0	0	0	0	1	11:00:00	0	1	0	1	0
12:00:00	11	2	1	14	6	46	12:00:00	0	1	31	32	7
13:00:00	14	1	3	18	2	39	13:00:00	0	1	20	21	11
14:00:00	7	1	1	9	0	32	14:00:00	3	2	18	23	9
Totals:	32	4	5	41	8	118		3	5	69	77	27

Calculated Values for Traffic Crossing Major Street

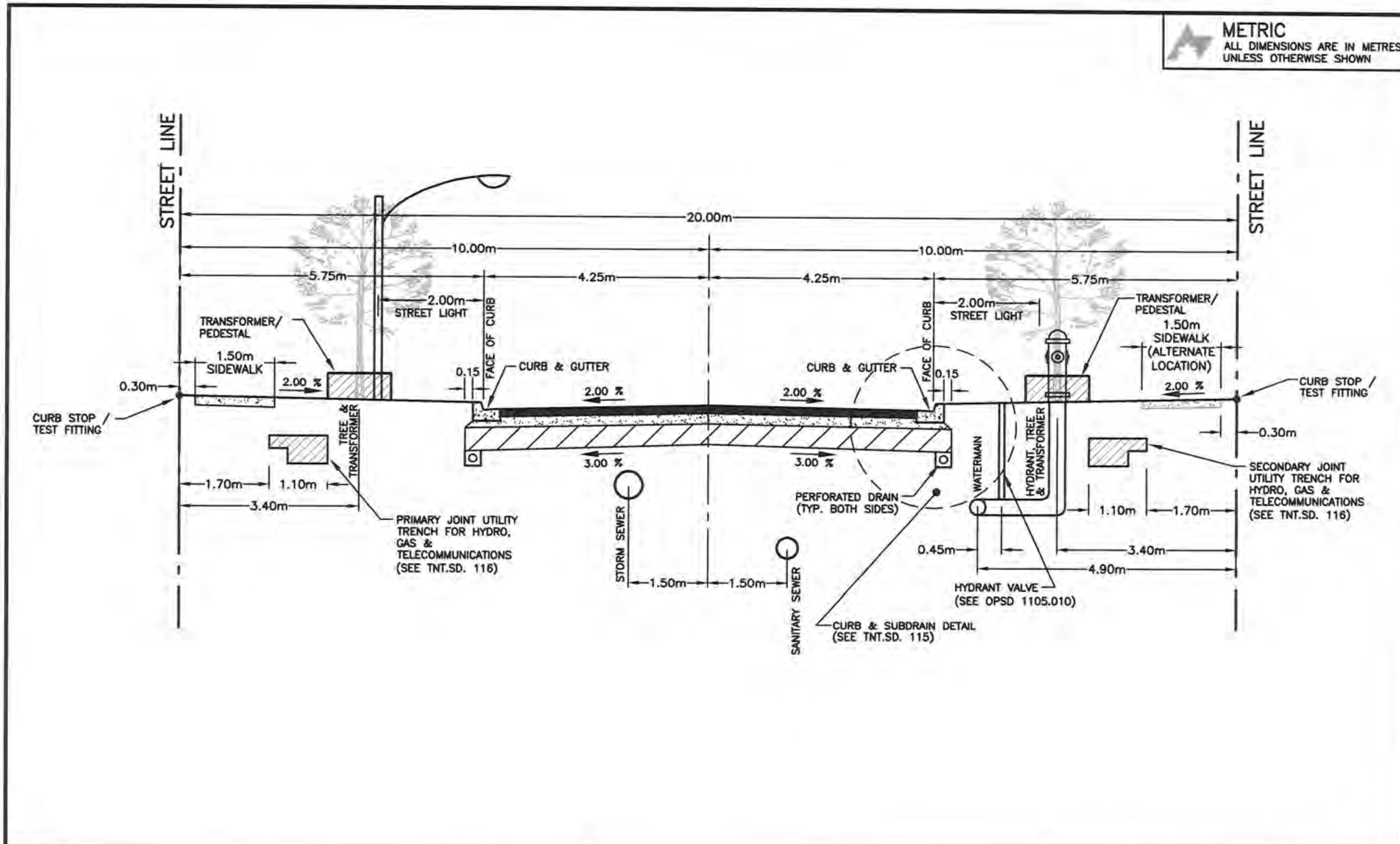
Hours Ending:	0:00	0:00	0:00	0:00	11:00	12:00	13:00	14:00
Crossing Values:	0	0	0	0	1	19	28	18

Appendix B:
Collision Data

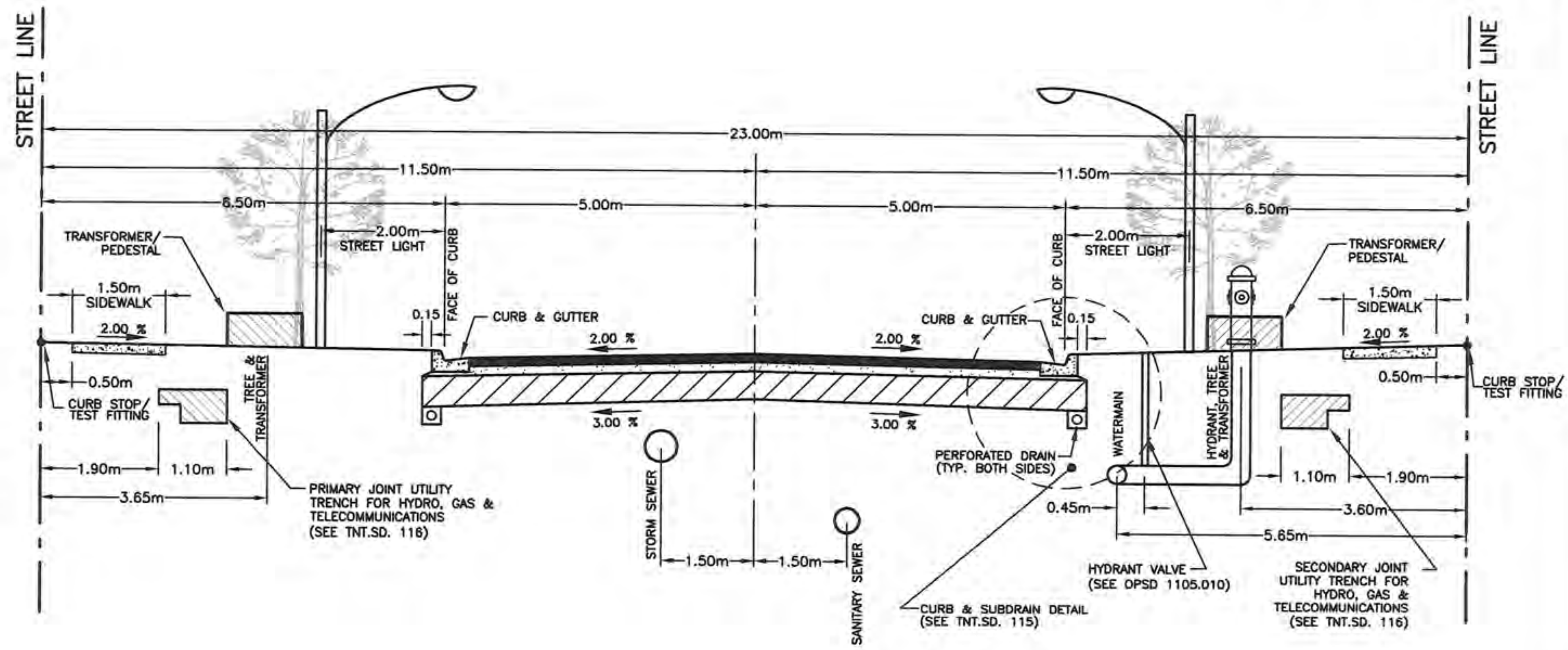
Church St Intersection	Collision Number	Direction/Location	Cause	Weather	Time of Day	Road Condition	Damage to Car	Injury	At Intersection?
Victoria Street	12-0319	EB	Rear Ended at light	Rain	Day	Wet		None	Yes
	13-0420	EB	Rear ended at light	Clear	Day	Dry			Yes
	12-0232	NB/SB -> EB	Rear Ended during Turning Movement	Clear	Day	Dry		None	Yes
	11-0093	SB	Rear ended at light	Clear	Day	Loose Snow		None	Yes
	13-0739	SB	Sideswiped at Intersection	Clear	Day	Dry		None	Yes
	16-063744	SB	T-Boned	Snow	Dusk	Loose Snow		None	Yes
	11-0490	WB	Rear ended at light	Clear	Day	Dry		None	Yes
	14-00765	WB	Rear Ended at light		Day	Wet	Minor	None	Yes
	15-404867	WB	Rear Ended at light	Clear	Day	Dry		Non-Fatal	Yes
	14-10074	WB -> SB	Turning Vehicle hits Pedestrian on Crosswalk	Clear	Day	Dry		Non-Fatal	Yes
Dominion Street	11-0467	SB - EB	Rear Ended during Turning Movement	Clear	Day	Dry	Minor	None	Yes
	13-00429	WB -> SB	Rear Ended while Accelerating After Turning	Clear	Day	Dry	Severe	Non-Fatal	Yes
	13-0121	NB	Rear Ended during Turning Movement into Beer Store	Clear	Day	Dry	Light-Mod	None	No
	14-00864	EB	Rear Ended while Accelerating After Turning	Rain	Day	Wet	Light-Mod	None	Yes
	14-00880	SB	Lost control due to Medical	Clear	Day	Dry	Light		No
Fletcher Crescent		None							
Evans Road		None							
Doner Street	15-270699	NB	Rear Ended while Slowing to use Street Parking	Clear	Day	Dry	Light	None	No
	14-0538	NB	Sideswiped on Road	Clear	Day	Dry	Light	None	No
Hussey Street		None							

Intersection: 13
Straight Road: 3

Appendix C:
Town of New Tecumseth Road Standards



TOWN OF NEW TECUMSETH					SCALE: N.T.S.
					DATE: FEB. 2011
URBAN LOCAL (8.5m ROAD ON 20.0m RIGHT-OF-WAY)	NO.	REVISIONS	DATE	APR'D	TNT.SD. 102



TOWN OF NEW TECUMSETH

MINOR COLLECTOR
(10.0m ROAD ON 23.0m RIGHT-OF-WAY)

NO.	REVISIONS	DATE	APR'D

SCALE: N.T.S.

DATE: FEB. 2011

TNT.SD. 103

Appendix D:
2016 Intersection Operations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	52	196	19	46	256	50	12	110	38	79	135	70
Future Volume (vph)	52	196	19	46	256	50	12	110	38	79	135	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.97		1.00	0.97		1.00	0.97		1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.99	1.00		0.99	1.00		1.00	1.00		0.98	1.00
Satd. Flow (prot)		1820	1515		1826	1515		1832	1515		1801	1515
Flt Permitted		0.82	1.00		0.90	1.00		0.96	1.00		0.84	1.00
Satd. Flow (perm)		1513	1515		1652	1515		1772	1515		1539	1515
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	58	218	21	51	284	56	13	122	42	88	150	78
RTOR Reduction (vph)	0	0	15	0	0	39	0	0	24	0	0	44
Lane Group Flow (vph)	0	276	6	0	335	17	0	135	18	0	238	34
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		14.3	14.3		14.3	14.3		20.2	20.2		20.2	20.2
Effective Green, g (s)		14.3	14.3		14.3	14.3		20.2	20.2		20.2	20.2
Actuated g/C Ratio		0.31	0.31		0.31	0.31		0.43	0.43		0.43	0.43
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		465	465		508	465		769	658		668	658
v/s Ratio Prot												
v/s Ratio Perm		0.18	0.00		c0.20	0.01		0.08	0.01		c0.15	0.02
v/c Ratio		0.59	0.01		0.66	0.04		0.18	0.03		0.36	0.05
Uniform Delay, d1		13.6	11.2		14.0	11.3		8.1	7.5		8.8	7.6
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		2.0	0.0		3.1	0.0		0.5	0.1		1.5	0.1
Delay (s)		15.7	11.2		17.1	11.3		8.5	7.6		10.3	7.8
Level of Service		B	B		B	B		A	A		B	A
Approach Delay (s)		15.4			16.3			8.3			9.7	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	46.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	2	17	2	6	47	23	185	13	27	262	22
Future Volume (Veh/h)	9	2	17	2	6	47	23	185	13	27	262	22
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	10	2	19	2	7	52	26	206	14	30	291	24
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								48				
pX, platoon unblocked	0.98	0.98		0.98	0.98	0.98				0.98		
vC, conflicting volume	672	623	291	636	640	213	315			220		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	651	601	291	614	618	181	315			188		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	99	97	99	98	94	98			98		
cM capacity (veh/h)	333	387	748	370	378	841	1245			1352		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2
Volume Total	31	61	246	321	24
Volume Left	10	2	26	30	0
Volume Right	19	52	14	0	24
cSH	512	711	1245	1352	1700
Volume to Capacity	0.06	0.09	0.02	0.02	0.01
Queue Length 95th (m)	1.4	2.1	0.5	0.5	0.0
Control Delay (s)	12.5	10.5	1.0	0.9	0.0
Lane LOS	B	B	A	A	
Approach Delay (s)	12.5	10.5	1.0	0.8	
Approach LOS	B	B			

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	19	70	78	171	244	22
Future Volume (Veh/h)	19	70	78	171	244	22
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	21	78	87	190	271	24
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				182		
pX, platoon unblocked						
vC, conflicting volume	647	283	295			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	647	283	295			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	90	93			
cM capacity (veh/h)	406	756	1266			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	99	277	295
Volume Left	21	87	0
Volume Right	78	0	24
cSH	639	1266	1700
Volume to Capacity	0.15	0.07	0.17
Queue Length 95th (m)	4.1	1.7	0.0
Control Delay (s)	11.7	3.0	0.0
Lane LOS	B	A	
Approach Delay (s)	11.7	3.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	42.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	35	1	152	38	1	233
Future Volume (Veh/h)	35	1	152	38	1	233
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	39	1	169	42	1	259
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			201			
pX, platoon unblocked						
vC, conflicting volume	451	190			211	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	451	190			211	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	100			100	
cM capacity (veh/h)	566	852			1360	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	40	211	260
Volume Left	39	0	1
Volume Right	1	42	0
cSH	570	1700	1360
Volume to Capacity	0.07	0.12	0.00
Queue Length 95th (m)	1.7	0.0	0.0
Control Delay (s)	11.8	0.0	0.0
Lane LOS	B		A
Approach Delay (s)	11.8	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	23.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	15	11	128	204	1
Future Volume (Veh/h)	3	15	11	128	204	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	3	17	12	142	227	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	394	228	228			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	394	228	228			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	99			
cM capacity (veh/h)	606	812	1340			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	20	154	228
Volume Left	3	12	0
Volume Right	17	0	1
cSH	772	1340	1700
Volume to Capacity	0.03	0.01	0.13
Queue Length 95th (m)	0.6	0.2	0.0
Control Delay (s)	9.8	0.7	0.0
Lane LOS	A	A	
Approach Delay (s)	9.8	0.7	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	25.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	2	4	49	11	1	2	15	108	3	2	141	2
Future Volume (vph)	2	4	49	11	1	2	15	108	3	2	141	2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	2	4	54	12	1	2	17	120	3	2	157	2

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	60	15	140	161
Volume Left (vph)	2	12	17	2
Volume Right (vph)	54	2	3	2
Hadj (s)	-0.50	0.11	0.05	0.03
Departure Headway (s)	4.1	4.8	4.3	4.2
Degree Utilization, x	0.07	0.02	0.17	0.19
Capacity (veh/h)	810	697	815	829
Control Delay (s)	7.4	7.8	8.1	8.2
Approach Delay (s)	7.4	7.8	8.1	8.2
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.0		
Level of Service	A		
Intersection Capacity Utilization	28.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	327	32	32	377	73	58	195	69	158	80	61
Future Volume (vph)	36	327	32	32	377	73	58	195	69	158	80	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.97		1.00	0.97		1.00	0.97		1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		0.99	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00		0.99	1.00		0.97	1.00
Satd. Flow (prot)		1832	1513		1834	1513		1817	1513		1772	1513
Flt Permitted		0.87	1.00		0.94	1.00		0.87	1.00		0.64	1.00
Satd. Flow (perm)		1605	1513		1730	1513		1594	1513		1172	1513
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	40	363	36	36	419	81	64	217	77	176	89	68
RTOR Reduction (vph)	0	0	23	0	0	38	0	0	44	0	0	41
Lane Group Flow (vph)	0	403	13	0	455	43	0	281	33	0	265	27
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		18.2	18.2		18.2	18.2		20.3	20.3		20.3	20.3
Effective Green, g (s)		18.2	18.2		18.2	18.2		20.3	20.3		20.3	20.3
Actuated g/C Ratio		0.36	0.36		0.36	0.36		0.40	0.40		0.40	0.40
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		578	545		623	545		640	608		471	608
v/s Ratio Prot												
v/s Ratio Perm		0.25	0.01		c0.26	0.03		0.18	0.02		c0.23	0.02
v/c Ratio		0.70	0.02		0.73	0.08		0.44	0.05		0.56	0.04
Uniform Delay, d1		13.8	10.4		14.0	10.6		11.0	9.2		11.7	9.2
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		3.7	0.0		4.4	0.1		2.2	0.2		4.8	0.1
Delay (s)		17.5	10.4		18.4	10.7		13.1	9.4		16.5	9.3
Level of Service		B	B		B	B		B	A		B	A
Approach Delay (s)		16.9			17.2			12.3			15.0	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	15.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	50.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	33	7	32	4	19	77	40	266	10	40	264	23
Future Volume (Veh/h)	33	7	32	4	19	77	40	266	10	40	264	23
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	37	8	36	4	21	86	44	296	11	44	293	26
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								48				
pX, platoon unblocked	0.92	0.92		0.92	0.92	0.92				0.92		
vC, conflicting volume	867	776	293	810	796	302	319			307		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	808	709	293	747	731	190	319			196		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	83	97	95	98	93	89	96			97		
cM capacity (veh/h)	218	306	746	266	297	779	1241			1260		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2
Volume Total	81	111	351	337	26
Volume Left	37	4	44	44	0
Volume Right	36	86	11	0	26
cSH	332	566	1241	1260	1700
Volume to Capacity	0.24	0.20	0.04	0.03	0.02
Queue Length 95th (m)	7.0	5.4	0.8	0.8	0.0
Control Delay (s)	19.3	12.9	1.3	1.3	0.0
Lane LOS	C	B	A	A	
Approach Delay (s)	19.3	12.9	1.3	1.2	
Approach LOS	C	B			

Intersection Summary			
Average Delay	4.3		
Intersection Capacity Utilization	53.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	22	86	100	230	215	22
Future Volume (Veh/h)	22	86	100	230	215	22
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	24	96	111	256	239	24
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				182		
pX, platoon unblocked						
vC, conflicting volume	729	251	263			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	729	251	263			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	88	91			
cM capacity (veh/h)	357	788	1301			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	120	367	263
Volume Left	24	111	0
Volume Right	96	0	24
cSH	634	1301	1700
Volume to Capacity	0.19	0.09	0.15
Queue Length 95th (m)	5.2	2.1	0.0
Control Delay (s)	12.0	3.0	0.0
Lane LOS	B	A	
Approach Delay (s)	12.0	3.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	46.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	29	1	239	50	1	183
Future Volume (Veh/h)	29	1	239	50	1	183
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	32	1	266	56	1	203
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			201			
pX, platoon unblocked						
vC, conflicting volume	499	294			322	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	499	294			322	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	100			100	
cM capacity (veh/h)	531	745			1238	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	33	322	204
Volume Left	32	0	1
Volume Right	1	56	0
cSH	535	1700	1238
Volume to Capacity	0.06	0.19	0.00
Queue Length 95th (m)	1.5	0.0	0.0
Control Delay (s)	12.2	0.0	0.0
Lane LOS	B		A
Approach Delay (s)	12.2	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	25.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	15	31	195	165	1
Future Volume (Veh/h)	2	15	31	195	165	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	2	17	34	217	183	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	468	184	184			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	468	184	184			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	98			
cM capacity (veh/h)	540	859	1391			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	19	251	184
Volume Left	2	34	0
Volume Right	17	0	1
cSH	809	1391	1700
Volume to Capacity	0.02	0.02	0.11
Queue Length 95th (m)	0.5	0.6	0.0
Control Delay (s)	9.6	1.2	0.0
Lane LOS	A	A	
Approach Delay (s)	9.6	1.2	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	34.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	1	1	25	9	1	2	27	149	18	4	134	1
Future Volume (vph)	1	1	25	9	1	2	27	149	18	4	134	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	1	1	28	10	1	2	30	166	20	4	149	1

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	30	13	216	154
Volume Left (vph)	1	10	30	4
Volume Right (vph)	28	2	20	1
Hadj (s)	-0.52	0.10	0.01	0.04
Departure Headway (s)	4.2	4.8	4.2	4.2
Degree Utilization, x	0.04	0.02	0.25	0.18
Capacity (veh/h)	777	679	845	830
Control Delay (s)	7.4	7.9	8.5	8.2
Approach Delay (s)	7.4	7.9	8.5	8.2
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.3		
Level of Service	A		
Intersection Capacity Utilization	32.9%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix E:
2016 Signal Warrants

C.C. Tatham & Associates Ltd.
Consulting Engineers

8-HOUR TRAFFIC SIGNAL WARRANT

Project & No.: Church Street North Transportation Review 116057

GENERAL INFORMATION

Analyst	Stefan Hajgato	**Jurisdiction/Area**	Alliston	**Date**	20 Jun 2016
Agency or Company	CCTA	**East-West Street**	Dominion Street		
Analysis Period	2016	**North-South Street**	Church Street North		
Flow Conditions	Restricted flow (urban)	**Major Street**	North-South		
T Intersection	No	**Approach Lanes per Direction**	1		
		Hours of Traffic Volume Data	8 hours		

Additional Comments

TRAFFIC & PEDESTRIAN VOLUMES

		Hour of Data	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	AM + PM
		Hour Ending	**800**	**900**	**1000**	**1200**	**1300**	**1600**	**1700**	**1800**	**4**
MAJOR STREET											
	Northbound	right	4	10	14	8	11	10	12	9	
		thru	82	154	104	115	133	266	239	212	
		left	6	23	20	33	20	40	24	26	
	Southbound	right	8	15	19	14	18	23	15	13	
		thru	196	250	176	159	166	234	196	157	
		left	18	21	27	18	23	40	24	23	
MINOR STREET											
	Eastbound	right	3	15	29	44	44	32	36	30	
		thru	1	1	2	11	1	7	9	10	
		left	2	6	10	15	17	33	28	30	
	Westbound	right	12	36	33	37	57	77	98	70	
		thru	4	4	5	15	15	19	15	9	
		left	4	3	2	12	12	4	9	8	
PEDESTRIANS							31				
		crossing MAJOR street	4	40	30	37		65	40	25	
		crossing MINOR street	2	8	1	6	12	8	9	10	
APPROACH VOLUMES											
		major	314	473	360	347	371	613	510	440	
		minor	26	65	81	134	146	172	195	157	
		TOTAL	340	538	441	481	517	785	705	597	
CROSSING VOLUMES											
		TOTAL	14	53	47	79	44	121	92	73	
		note 1	6	9	12	27	29	37	37	38	
		note 2	4	4	5	15	15	19	15	10	
		note 3	0	0	0	0	0	0	0	0	
		3a	no	no	no	no	no	no	no	no	
		3b	no	no	no	no	no	no	no	no	
		note 4	4	40	30	37	0	65	40	25	

NOTES

Traffic crossing MAJOR street defined as:

note 1: Left turns from both minor street approaches
note 2: The heaviest through volume from the minor street
note 3: 50% of the heavier left turn movement from the major street when both of the following are met:
3a: the left turn volume > 120
3b: the left turn volume + opposing volume > 720
note 4: Pedestrians crossing the major street

ACCIDENT HISTORY

Reportable accidents over the past 36 months susceptible to correction by a traffic signal.	months 1 to 12	-
	months 13 to 24	1
	months 25 to 36	1

C.C. Tatham & Associates Ltd.
Consulting Engineers

8-HOUR TRAFFIC SIGNAL WARRANT

Project & No.: Church Street North Transportation Review 116057

GENERAL INFORMATION

Analyst	Stefan Hajgato	**Jurisdiction/Area**	Alliston	**Date**	20 Jun 2016
Agency or Company	CCTA	**East-West Street**	Dominion Street		
Analysis Period	2016	**North-South Street**	Church Street North		
Flow Conditions	Restricted flow (urban)	**Major Street**	Church Street North		
T Intersection	No	**Approach Lanes per Direction**	1		
		Hours of Traffic Volume Data	8 hours		
Additional Comments					

JUSTIFICATION 1 - MINIMUM VEHICLE VOLUME

JUSTIFICATION	GUIDANCE	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	No. of hours with compliance 100%	No. of hours with compliance 80%+	
1A	TOTAL TRAFFIC VOLUME ENTERING INTERSECTION (vph) (2 way Total)	**340**	**538**	**441**	**481**	**517**	**785**	**705**	**597**	100%	80%+	Average Compliance
1A	COMPLIANCE % VOL x 100 / 720 (1 lane approach on main road) OR VOL x 100 / 900 (2 or more lane approach on main road)	47%	75%	61%	67%	72%	100%	98%	83%	1	3	75%
1B	TRAFFIC VOLUME ON MINOR STREET (vph) (2 way Total)	**26**	**65**	**81**	**134**	**146**	**172**	**195**	**157**	100%	80%+	Average Compliance
1B	COMPLIANCE % VOL x 100 / 170 (full intersection) OR VOL x 100 / 255 (tee intersection)	15%	38%	48%	79%	86%	100%	100%	92%	2	4	70%

(RESTRICTED FLOW)	**BOTH 1A AND 1B 100% FULFILLED EACH OF 8 HOURS**	**NO**
SIGNAL JUSTIFICATION 1:	**LESSER OF 1A OR 1B AT LEAST 80% FULFILLED EACH OF 8 HOURS**	**NO**

JUSTIFICATION 2 - DELAY TO CROSS TRAFFIC

JUSTIFICATION	GUIDANCE	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	No. of hours with compliance 100%	No. of hours with compliance 80%+	
2A	MAIN ROAD TRAFFIC VOLUME (vph) (2 way Total)	**314**	**473**	**360**	**347**	**371**	**613**	**510**	**440**	100%	80%+	Average Compliance
2A	COMPLIANCE % VOL x 100 / 720 (1 lane approach on main road) OR VOL x 100 / 900 (2 or more lane approach on main road)	44%	66%	50%	48%	52%	85%	71%	61%	0	1	60%
2B	CROSSING TRAFFIC VOLUME (vph) (2 way Total)	**14**	**53**	**47**	**79**	**44**	**121**	**92**	**73**	100%	80%+	Average Compliance
2B	COMPLIANCE % VOL x 100 / 75	19%	71%	63%	100%	59%	100%	100%	97%	3	4	76%

(RESTRICTED FLOW)	**BOTH 2A AND 2B 100% FULFILLED EACH OF 8 HOURS**	**NO**
SIGNAL JUSTIFICATION 2:	**LESSER OF 2A OR 2B AT LEAST 80% FULFILLED EACH OF 8 HOURS**	**NO**

JUSTIFICATION 3 - COLLISION EXPERIENCE

	Preceding Months	Number of Collisions	% Fulfillment
A. Number of reportable collisions susceptible to prevention by a traffic signal.	1 - 12	-	-
	13 - 24	1	0%
	25 - 36	1	0%
	annual average	-	-
B. Adequate trial of less restrictive remedies has failed to reduce collision frequency.	☐ YES	☐ NO	n/a
C. Either Justification 1 (Minimum Vehicular Volume) or Justification 2 (Delay to Cross Traffic) satisfied to 80% or more.	☐ YES	☐ NO	n/a
SIGNAL JUSTIFICATION 3: **ALL OF 3A, 3B & 3C FULFILLED TO 100%?**	**NO**		

JUSTIFICATION 4 - COMBINATION JUSTIFICATION

JUSTIFICATION SATISFIED 80% OR MORE				Two Justifications Satisfied 80% or more
Justification 1	-	Minimum Vehicle Volume	NO	**NO**
Justification 2	-	Delay to Cross Traffic	NO	
Justification 3	-	Collision Experience	-	

JUSTIFICATION SUMMARY

ARE TRAFFFIC SIGNALS JUSTIFIED FOR THE INTERSECTION IN QUESTION?	**NO**

C.C. Tatham & Associates Ltd.
Consulting Engineers

8-HOUR TRAFFIC SIGNAL WARRANT

Project & No.: Church Street North Transportation Review 116057

GENERAL INFORMATION

Analyst	Stefan Hajgato	**Jurisdiction/Area**	Alliston
Date	20 Jun 2016		
Agency or Company	CCTA	**East-West Street**	Fletcher Crescent
Analysis Period	2016	**North-South Street**	Church Street North
Flow Conditions	Restricted flow (urban)	**Major Street**	North-South
T Intersection	Yes	**Approach Lanes per Direction**	1
		Hours of Traffic Volume Data	8 hours

Additional Comments

TRAFFIC & PEDESTRIAN VOLUMES

		Hour of Data	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	AM + PM
		Hour Ending	800	900	1000	1200	1300	1600	1700	1800	4
MAJOR STREET											
	Northbound	right	0	0	0	0	1	1	0	0	
		thru	59	139	88	103	124	230	233	226	
		left	39	62	51	52	49	100	101	85	
	Southbound	right	13	20	16	15	12	22	23	16	
		thru	161	230	155	127	115	185	159	147	
		left	0	0	0	0	0	0	0	0	
MINOR STREET											
	Eastbound	right	63	58	67	63	80	86	59	52	
		thru	0	0	0	0	0	0	0	0	
		left	6	18	12	24	11	22	24	19	
	Westbound	right									
		thru									
		left									
PEDESTRIANS											
		crossing MAJOR street	18	29	5	8	13	45	14	18	
		crossing MINOR street	8	2	1	2	0	0	1	7	
APPROACH VOLUMES											
		major	272	451	310	297	301	538	516	474	
		minor	69	76	79	87	91	108	83	71	
		TOTAL	341	527	389	384	392	646	599	545	
CROSSING VOLUMES											
		TOTAL	24	47	17	32	24	67	38	37	
		note 1	6	18	12	24	11	22	24	19	
		note 2	0	0	0	0	0	0	0	0	
		note 3	0	0	0	0	0	0	0	0	
		3a	no	no	no	no	no	no	no	no	
		3b	no	no	no	no	no	no	no	no	
		note 4	18	29	5	8	13	45	14	18	

NOTES

Traffic crossing MAJOR street defined as:

note 1: Left turns from both minor street approaches
note 2: The heaviest through volume from the minor street
note 3: 50% of the heavier left turn movement from the major street when both of the following are met:
3a: the left turn volume > 120
3b: the left turn volume + opposing volume > 720
note 4: Pedestrians crossing the major street

ACCIDENT HISTORY

Reportable accidents over the past 36 months susceptible to correction by a traffic signal.	months 1 to 12	**0**
	months 13 to 24	**0**
	months 25 to 36	**0**

C.C. Tatham & Associates Ltd.
Consulting Engineers

8-HOUR TRAFFIC SIGNAL WARRANT

Project & No.: Church Street North Transportation Review 116057

GENERAL INFORMATION

Analyst	Stefan Hajgato	**Jurisdiction/Area**	Alliston	**Date**	20 Jun 2016
Agency or Company	CCTA	**East-West Street**	Fletcher Crescent		
Analysis Period	2016	**North-South Street**	Church Street North		
Flow Conditions	Restricted flow (urban)	**Major Street**	Church Street North		
T Intersection	Yes	**Approach Lanes per Direction**	1		
		Hours of Traffic Volume Data	8 hours		
Additional Comments					

JUSTIFICATION 1 - MINIMUM VEHICLE VOLUME

JUSTIFICATION	GUIDANCE	HOUR ENDING Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	No. of hours with compliance 100%	80%+	
1A	TOTAL TRAFFIC VOLUME ENTERING INTERSECTION (vph) (2 way Total)	**341**	**527**	**389**	**384**	**392**	**646**	**599**	**545**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 720 (1 lane approach on main road) OR VOL x 100 / 900 (2 or more lane approach on main road)	47%	73%	54%	53%	54%	90%	83%	76%	0	2	66%
1B	TRAFFIC VOLUME ON MINOR STREET (vph) (2 way Total)	**69**	**76**	**79**	**87**	**91**	**108**	**83**	**71**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 170 (full intersection) OR VOL x 100 / 255 (tee intersection)	27%	30%	31%	34%	36%	42%	33%	28%	0	0	33%

(RESTRICTED FLOW)	**BOTH 1A AND 1B 100% FULFILLED EACH OF 8 HOURS**	**NO**
SIGNAL JUSTIFICATION 1:	**LESSER OF 1A OR 1B AT LEAST 80% FULFILLED EACH OF 8 HOURS**	**NO**

JUSTIFICATION 2 - DELAY TO CROSS TRAFFIC

JUSTIFICATION	GUIDANCE	HOUR ENDING Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	No. of hours with compliance 100%	80%+	
2A	MAIN ROAD TRAFFIC VOLUME (vph) (2 way Total)	**272**	**451**	**310**	**297**	**301**	**538**	**516**	**474**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 720 (1 lane approach on main road) OR VOL x 100 / 900 (2 or more lane approach on main road)	38%	63%	43%	41%	42%	75%	72%	66%	0	0	55%
2B	CROSSING TRAFFIC VOLUME (vph) (2 way Total)	**24**	**47**	**17**	**32**	**24**	**67**	**38**	**37**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 75	32%	63%	23%	43%	32%	89%	51%	49%	0	1	48%

(RESTRICTED FLOW)	**BOTH 2A AND 2B 100% FULFILLED EACH OF 8 HOURS**	**NO**
SIGNAL JUSTIFICATION 2:	**LESSER OF 2A OR 2B AT LEAST 80% FULFILLED EACH OF 8 HOURS**	**NO**

JUSTIFICATION 3 - COLLISION EXPERIENCE

	Preceding Months	Number of Collisions	% Fulfillment
A. Number of reportable collisions susceptible to prevention by a traffic signal.	1 - 12	0	0%
	13 - 24	0	0%
	25 - 36	0	0%
	annual average	0.00	0%
B. Adequate trial of less restrictive remedies has failed to reduce collision frequency.	☐ YES	☐ NO	n/a
C. Either Justification 1 (Minimum Vehicular Volume) or Justification 2 (Delay to Cross Traffic) satisfied to 80% or more.	☐ YES	☑ NO	0%
SIGNAL JUSTIFICATION 3: **ALL OF 3A, 3B & 3C FULFILLED TO 100%?**		**NO**	

JUSTIFICATION 4 - COMBINATION JUSTIFICATION

JUSTIFICATION SATISFIED 80% OR MORE				Two Justifications Satisfied 80% or more
Justification 1	-	Minimum Vehicle Volume	NO	**NO**
Justification 2	-	Delay to Cross Traffic	NO	
Justification 3	-	Collision Experience	NO	

JUSTIFICATION SUMMARY

ARE TRAFFFIC SIGNALS JUSTIFIED FOR THE INTERSECTION IN QUESTION?	**NO**

8-HOUR TRAFFIC SIGNAL WARRANT

C.C. Tatham & Associates Ltd.
Consulting Engineers

Project & No.: Church Street North Transportation Review 116057

GENERAL INFORMATION

Analyst	Stefan Hajgato	**Jurisdiction/Area**	Alliston	**Date**	20 Jun 2016
Agency or Company	CCTA	**East-West Street**	Evans Road		
Analysis Period	2016	**North-South Street**	Church Street North		
Flow Conditions	Restricted flow (urban)	**Major Street**	North-South		
T Intersection	Yes	**Approach Lanes per Direction**	1		
		Hours of Traffic Volume Data	8 hours		

Additional Comments

TRAFFIC & PEDESTRIAN VOLUMES

		Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	AM + PM
	Hour of Data	**Hour 1**	**Hour 2**	**Hour 3**	**Hour 4**	**Hour 5**	**Hour 6**	**Hour 7**	**Hour 8**	**AM + PM**
	Hour Ending	**800**	**900**	**1000**	**1200**	**1300**	**1600**	**1700**	**1800**	**4**
MAJOR STREET										
Northbound	right	5	21	28	25	34	48	40	39	
	thru	59	138	70	99	98	199	217	207	
	left	0	0	0	0	0	0	0	0	
Southbound	right	0	0	0	0	0	0	0	0	
	thru	157	222	136	111	105	162	148	136	
	left	0	0	1	1	1	4	1	0	
MINOR STREET										
Eastbound	right									
	thru									
	left									
Westbound	right	0	0	0	1	0	2	2	0	
	thru	0	0	0	0	0	0	0	0	
	left	18	31	32	30	20	42	35	24	
PEDESTRIANS										
	crossing MAJOR street	6	1	3	0	0	2	2	0	
	crossing MINOR street	7	3	2	0	3	3	2	7	
APPROACH VOLUMES										
	major	221	381	235	236	238	413	406	382	
	minor	18	31	32	31	20	44	37	24	
	TOTAL	239	412	267	267	258	457	443	406	
CROSSING VOLUMES										
	TOTAL	24	32	35	30	20	44	37	24	
	note 1	18	31	32	30	20	42	35	24	
	note 2	0	0	0	0	0	0	0	0	
	note 3	0	0	0	0	0	0	0	0	
	3a	no	no	no	no	no	no	no	no	
	3b	no	no	no	no	no	no	no	no	
	note 4	6	1	3	0	0	2	2	0	

NOTES

Traffic crossing MAJOR street defined as:

note 1: Left turns from both minor street approaches
note 2: The heaviest through volume from the minor street
note 3: 50% of the heavier left turn movement from the major street when both of the following are met:
3a: the left turn volume > 120
3b: the left turn volume + opposing volume > 720
note 4: Pedestrians crossing the major street

ACCIDENT HISTORY

Reportable accidents over the past 36 months susceptible to correction by a traffic signal.	months 1 to 12	**0**
	months 13 to 24	**0**
	months 25 to 36	**0**

C.C. Tatham & Associates Ltd.
Consulting Engineers

8-HOUR TRAFFIC SIGNAL WARRANT

Project & No.: Church Street North Transportation Review 116057

GENERAL INFORMATION

Analyst	Stefan Hajgato	**Jurisdiction/Area**	Alliston — **Date** 20 Jun 2016
Agency or Company	CCTA	**East-West Street**	Evans Road
Analysis Period	2016	**North-South Street**	Church Street North
Flow Conditions	Restricted flow (urban)	**Major Street**	Church Street North
T Intersection	Yes	**Approach Lanes per Direction**	1
		Hours of Traffic Volume Data	8 hours
Additional Comments			

JUSTIFICATION 1 - MINIMUM VEHICLE VOLUME

JUSTIFICATION	GUIDANCE	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	No. of hours with compliance 100%	80%+	
1A	TOTAL TRAFFIC VOLUME ENTERING INTERSECTION (vph) (2 way Total)	**239**	**412**	**267**	**267**	**258**	**457**	**443**	**406**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 720 (1 lane approach on main road) OR VOL x 100 / 900 (2 or more lane approach on main road)	33%	57%	37%	37%	36%	63%	62%	56%	0	0	48%
1B	TRAFFIC VOLUME ON MINOR STREET (vph) (2 way Total)	**18**	**31**	**32**	**31**	**20**	**44**	**37**	**24**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 170 (full intersection) OR VOL x 100 / 255 (tee intersection)	7%	12%	13%	12%	8%	17%	15%	9%	0	0	12%

(RESTRICTED FLOW)	**BOTH 1A AND 1B 100% FULFILLED EACH OF 8 HOURS**	**NO**
SIGNAL JUSTIFICATION 1:	**LESSER OF 1A OR 1B AT LEAST 80% FULFILLED EACH OF 8 HOURS**	**NO**

JUSTIFICATION 2 - DELAY TO CROSS TRAFFIC

JUSTIFICATION	GUIDANCE	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	No. of hours with compliance 100%	80%+	
2A	MAIN ROAD TRAFFIC VOLUME (vph) (2 way Total)	**221**	**381**	**235**	**236**	**238**	**413**	**406**	**382**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 720 (1 lane approach on main road) OR VOL x 100 / 900 (2 or more lane approach on main road)	31%	53%	33%	33%	33%	57%	56%	53%	0	0	44%
2B	CROSSING TRAFFIC VOLUME (vph) (2 way Total)	**24**	**32**	**35**	**30**	**20**	**44**	**37**	**24**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 75	32%	43%	47%	40%	27%	59%	49%	32%	0	0	41%

(RESTRICTED FLOW)	**BOTH 2A AND 2B 100% FULFILLED EACH OF 8 HOURS**	**NO**
SIGNAL JUSTIFICATION 2:	**LESSER OF 2A OR 2B AT LEAST 80% FULFILLED EACH OF 8 HOURS**	**NO**

JUSTIFICATION 3 - COLLISION EXPERIENCE

	Preceding Months	Number of Collisions	% Fulfillment
A. Number of reportable collisions susceptible to prevention by a traffic signal.	1 - 12	0	0%
	13 - 24	0	0%
	25 - 36	0	0%
	annual average	0.00	0%
B. Adequate trial of less restrictive remedies has failed to reduce collision frequency.	☐ YES	☐ NO	n/a
C. Either Justification 1 (Minimum Vehicular Volume) or Justification 2 (Delay to Cross Traffic) satisfied to 80% or more.	☐ YES	☑ NO	0%
SIGNAL JUSTIFICATION 3: **ALL OF 3A, 3B & 3C FULFILLED TO 100%?**	**NO**		

JUSTIFICATION 4 - COMBINATION JUSTIFICATION

JUSTIFICATION SATISFIED 80% OR MORE				Two Justifications Satisfied 80% or more
Justification 1	-	Minimum Vehicle Volume	NO	**NO**
Justification 2	-	Delay to Cross Traffic	NO	
Justification 3	-	Collision Experience	NO	

JUSTIFICATION SUMMARY

ARE TRAFFFIC SIGNALS JUSTIFIED FOR THE INTERSECTION IN QUESTION?	**NO**

8-HOUR TRAFFIC SIGNAL WARRANT

C.C. Tatham & Associates Ltd. Consulting Engineers

Project & No.: Church Street North Transportation Review 116057

GENERAL INFORMATION

Analyst	Stefan Hajgato	**Jurisdiction/Area**	Alliston
		Date	20 Jun 2016
Agency or Company	CCTA	**East-West Street**	Doner Street
Analysis Period	2016	**North-South Street**	Church Street North
Flow Conditions	Restricted flow (urban)	**Major Street**	North-South
T Intersection	Yes	**Approach Lanes per Direction**	1
		Hours of Traffic Volume Data	8 hours
Additional Comments			

TRAFFIC & PEDESTRIAN VOLUMES

		Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	AM + PM
	Hour Ending	800	900	1000	1200	1300	1600	1700	1800	4
MAJOR STREET										
Northbound	right	0	0	0	0	0	0	0	0	
	thru	54	128	62	81	74	170	193	171	
	left	3	11	11	13	18	29	20	27	
Southbound	right	0	0	0	0	0	1	1	2	
	thru	145	204	119	95	88	147	121	128	
	left	0	0	0	0	0	0	0	0	
MINOR STREET										
Eastbound	right	18	15	14	13	17	19	21	7	
	thru	0	0	0	0	0	0	0	0	
	left	0	3	0	1	2	0	1	1	
Westbound	right									
	thru									
	left									
PEDESTRIANS										
	crossing MAJOR street	23	85	13	9	14	90	14	33	
	crossing MINOR street	1	0	0	0	0	0	0	2	
APPROACH VOLUMES										
	major	202	343	192	189	180	347	335	328	
	minor	18	18	14	14	19	19	22	8	
	TOTAL	220	361	206	203	199	366	357	336	
CROSSING VOLUMES										
	TOTAL	23	88	13	10	16	90	15	34	
	note 1	0	3	0	1	2	0	1	1	
	note 2	0	0	0	0	0	0	0	0	
	note 3	0	0	0	0	0	0	0	0	
	3a	no	no	no	no	no	no	no	no	
	3b	no	no	no	no	no	no	no	no	
	note 4	23	85	13	9	14	90	14	33	

NOTES

Traffic crossing MAJOR street defined as:

note 1: Left turns from both minor street approaches
note 2: The heaviest through volume from the minor street
note 3: 50% of the heavier left turn movement from the major street when both of the following are met:
3a: the left turn volume > 120
3b: the left turn volume + opposing volume > 720
note 4: Pedestrians crossing the major street

ACCIDENT HISTORY

Reportable accidents over the past 36 months susceptible to correction by a traffic signal.

months 1 to 12	**0**
months 13 to 24	**0**
months 25 to 36	**0**

8-HOUR TRAFFIC SIGNAL WARRANT

C.C. Tatham & Associates Ltd.
Consulting Engineers

Project & No.: Church Street North Transportation Review 116057

GENERAL INFORMATION

Analyst	Stefan Hajgato	**Jurisdiction/Area**	Alliston
		Date	20 Jun 2016
Agency or Company	CCTA	**East-West Street**	Doner Street
Analysis Period	08 July 1905	**North-South Street**	Church Street North
Flow Conditions	Restricted flow (urban)	**Major Street**	Church Street North
T Intersection	Yes	**Approach Lanes per Direction**	1
		Hours of Traffic Volume Data	8 hours
Additional Comments			

JUSTIFICATION 1 - MINIMUM VEHICLE VOLUME

JUSTIFICATION	GUIDANCE	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	No. of hours with compliance 100%	No. of hours with compliance 80%+	
1A	TOTAL TRAFFIC VOLUME ENTERING INTERSECTION (vph) (2 way Total)	**220**	**361**	**206**	**203**	**199**	**366**	**357**	**336**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 720 (1 lane approach on main road) OR VOL x 100 / 900 (2 or more lane approach on main road)	31%	50%	29%	28%	28%	51%	50%	47%	0	0	39%
1B	TRAFFIC VOLUME ON MINOR STREET (vph) (2 way Total)	**18**	**18**	**14**	**14**	**19**	**19**	**22**	**8**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 170 (full intersection) OR VOL x 100 / 255 (tee intersection)	7%	7%	5%	5%	7%	7%	9%	3%	0	0	6%
(RESTRICTED FLOW)		**BOTH 1A AND 1B 100% FULFILLED EACH OF 8 HOURS**										**NO**
SIGNAL JUSTIFICATION 1:		**LESSER OF 1A OR 1B AT LEAST 80% FULFILLED EACH OF 8 HOURS**										**NO**

JUSTIFICATION 2 - DELAY TO CROSS TRAFFIC

JUSTIFICATION	GUIDANCE	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	No. of hours with compliance 100%	No. of hours with compliance 80%+	
2A	MAIN ROAD TRAFFIC VOLUME (vph) (2 way Total)	**202**	**343**	**192**	**189**	**180**	**347**	**335**	**328**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 720 (1 lane approach on main road) OR VOL x 100 / 900 (2 or more lane approach on main road)	28%	48%	27%	26%	25%	48%	47%	46%	0	0	37%
2B	CROSSING TRAFFIC VOLUME (vph) (2 way Total)	**23**	**88**	**13**	**10**	**16**	**90**	**15**	**34**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 75	31%	100%	17%	13%	21%	100%	20%	45%	2	2	44%
(RESTRICTED FLOW)		**BOTH 2A AND 2B 100% FULFILLED EACH OF 8 HOURS**										**NO**
SIGNAL JUSTIFICATION 2:		**LESSER OF 2A OR 2B AT LEAST 80% FULFILLED EACH OF 8 HOURS**										**NO**

JUSTIFICATION 3 - COLLISION EXPERIENCE

	Preceding Months	Number of Collisions	% Fulfillment
A. Number of reportable collisions susceptible to prevention by a traffic signal.	1 - 12	0	0%
	13 - 24	0	0%
	25 - 36	0	0%
	annual average	0.00	0%
B. Adequate trial of less restrictive remedies has failed to reduce collision frequency.	☐ YES	☐ NO	n/a
C. Either Justification 1 (Minimum Vehicular Volume) or Justification 2 (Delay to Cross Traffic) satisfied to 80% or more.	☐ YES	☑ NO	0%
SIGNAL JUSTIFICATION 3: **ALL OF 3A, 3B & 3C FULFILLED TO 100%?**	**NO**		

JUSTIFICATION 4 - COMBINATION JUSTIFICATION

JUSTIFICATION SATISFIED 80% OR MORE				Two Justifications Satisfied 80% or more
Justification 1	-	Minimum Vehicle Volume	NO	**NO**
Justification 2	-	Delay to Cross Traffic	NO	
Justification 3	-	Collision Experience	NO	

JUSTIFICATION SUMMARY

ARE TRAFFFIC SIGNALS JUSTIFIED FOR THE INTERSECTION IN QUESTION?	**NO**

8-HOUR TRAFFIC SIGNAL WARRANT

C.C. Tatham & Associates Ltd. Consulting Engineers

Project & No.: Church Street North Transportation Review 116057

GENERAL INFORMATION

Analyst	Stefan Hajgato	**Jurisdiction/Area**	Alliston	**Date**	20 Jun 2016
Agency or Company	CCTA	**East-West Street**	Hussey Street		
Analysis Period	2016	**North-South Street**	Church Street North		
Flow Conditions	Restricted flow (urban)	**Major Street**	North-South		
T Intersection	No	**Approach Lanes per Direction**	1		
		Hours of Traffic Volume Data	8 hours		

Additional Comments

TRAFFIC & PEDESTRIAN VOLUMES

		Hour of Data	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	AM + PM
		Hour Ending	800	900	1000	1200	1300	1600	1700	1800	4
MAJOR STREET											
	Northbound	right	6	3	5	6	7	13	14	15	
		thru	42	108	43	54	54	126	137	131	
		left	4	15	13	20	13	30	34	22	
	Southbound	right	0	2	0	0	0	0	1	2	
		thru	109	141	77	59	53	102	91	99	
		left	0	2	2	2	2	3	2	3	
MINOR STREET											
	Eastbound	right	24	49	30	19	23	29	15	22	
		thru	0	4	1	1	1	0	0	2	
		left	1	2	1	1	2	1	0	0	
	Westbound	right	0	2	0	0	2	3	1	2	
		thru	1	1	2	1	6	2	1	1	
		left	9	11	11	11	8	12	10	10	
PEDESTRIANS											
		crossing MAJOR street	17	85	8	9	9	85	9	20	
		crossing MINOR street	8	73	4	5	5	76	7	13	
APPROACH VOLUMES											
		major	161	271	140	141	129	274	279	272	
		minor	35	69	45	33	42	47	27	37	
		TOTAL	196	340	185	174	171	321	306	309	
CROSSING VOLUMES											
		TOTAL	28	102	22	22	25	100	20	32	
		note 1	10	13	12	12	10	13	10	10	
		note 2	1	4	2	1	6	2	1	2	
		note 3	0	0	0	0	0	0	0	0	
		3a	no	no	no	no	no	no	no	no	
		3b	no	no	no	no	no	no	no	no	
		note 4	17	85	8	9	9	85	9	20	

NOTES

Traffic crossing MAJOR street defined as:

note 1: Left turns from both minor street approaches

note 2: The heaviest through volume from the minor street

note 3: 50% of the heavier left turn movement from the major street when both of the following are met:

3a: the left turn volume > 120

3b: the left turn volume + opposing volume > 720

note 4: Pedestrians crossing the major street

ACCIDENT HISTORY

Reportable accidents over the past 36 months susceptible to correction by a traffic signal.	months 1 to 12	**0**
	months 13 to 24	**0**
	months 25 to 36	**0**

C.C. Tatham & Associates Ltd.
Consulting Engineers

8-HOUR TRAFFIC SIGNAL WARRANT

Project & No.: Church Street North Transportation Review 116057

GENERAL INFORMATION

Analyst	Stefan Hajgato	**Jurisdiction/Area**	Alliston
		Date	20 Jun 2016
Agency or Company	CCTA	**East-West Street**	Hussey Street
Analysis Period	2016	**North-South Street**	Church Street North
Flow Conditions	Restricted flow (urban)	**Major Street**	Church Street North
T Intersection	No	**Approach Lanes per Direction**	1
		Hours of Traffic Volume Data	8 hours
Additional Comments			

JUSTIFICATION 1 - MINIMUM VEHICLE VOLUME

JUSTIFICATION	GUIDANCE	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	No. of hours with compliance 100%	No. of hours with compliance 80%+	
1A	TOTAL TRAFFIC VOLUME ENTERING INTERSECTION (vph) (2 way Total)	**196**	**340**	**185**	**174**	**171**	**321**	**306**	**309**	100%	80%+	Average Compliance
1A	COMPLIANCE % VOL x 100 / 720 (1 lane approach on main road) OR VOL x 100 / 900 (2 or more lane approach on main road)	27%	47%	26%	24%	24%	45%	43%	43%	0	0	35%
1B	TRAFFIC VOLUME ON MINOR STREET (vph) (2 way Total)	**35**	**69**	**45**	**33**	**42**	**47**	**27**	**37**	100%	80%+	Average Compliance
1B	COMPLIANCE % VOL x 100 / 170 (full intersection) OR VOL x 100 / 255 (tee intersection)	21%	41%	26%	19%	25%	28%	16%	22%	0	0	25%

(RESTRICTED FLOW)	**BOTH 1A AND 1B 100% FULFILLED EACH OF 8 HOURS**	**NO**
SIGNAL JUSTIFICATION 1:	**LESSER OF 1A OR 1B AT LEAST 80% FULFILLED EACH OF 8 HOURS**	**NO**

JUSTIFICATION 2 - DELAY TO CROSS TRAFFIC

JUSTIFICATION	GUIDANCE	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	No. of hours with compliance 100%	No. of hours with compliance 80%+	
2A	MAIN ROAD TRAFFIC VOLUME (vph) (2 way Total)	**161**	**271**	**140**	**141**	**129**	**274**	**279**	**272**	100%	80%+	Average Compliance
2A	COMPLIANCE % VOL x 100 / 720 (1 lane approach on main road) OR VOL x 100 / 900 (2 or more lane approach on main road)	22%	38%	19%	20%	18%	38%	39%	38%	0	0	29%
2B	CROSSING TRAFFIC VOLUME (vph) (2 way Total)	**28**	**102**	**22**	**22**	**25**	**100**	**20**	**32**	100%	80%+	Average Compliance
2B	COMPLIANCE % VOL x 100 / 75	37%	100%	29%	29%	33%	100%	27%	43%	2	2	50%

(RESTRICTED FLOW)	**BOTH 2A AND 2B 100% FULFILLED EACH OF 8 HOURS**	**NO**
SIGNAL JUSTIFICATION 2:	**LESSER OF 2A OR 2B AT LEAST 80% FULFILLED EACH OF 8 HOURS**	**NO**

JUSTIFICATION 3 - COLLISION EXPERIENCE

	Preceding Months	Number of Collisions	% Fulfillment
A. Number of reportable collisions susceptible to prevention by a traffic signal.	1 - 12	0	0%
	13 - 24	0	0%
	25 - 36	0	0%
	annual average	0.00	0%
B. Adequate trial of less restrictive remedies has failed to reduce collision frequency.	☐ YES	☐ NO	n/a
C. Either Justification 1 (Minimum Vehicular Volume) or Justification 2 (Delay to Cross Traffic) satisfied to 80% or more.	☐ YES	☑ NO	0%
SIGNAL JUSTIFICATION 3: **ALL OF 3A, 3B & 3C FULFILLED TO 100%?**	**NO**		

JUSTIFICATION 4 - COMBINATION JUSTIFICATION

JUSTIFICATION SATISFIED 80% OR MORE				Two Justifications Satisfied 80% or more
Justification 1	-	Minimum Vehicle Volume	NO	**NO**
Justification 2	-	Delay to Cross Traffic	NO	
Justification 3	-	Collision Experience	NO	

JUSTIFICATION SUMMARY

ARE TRAFFFIC SIGNALS JUSTIFIED FOR THE INTERSECTION IN QUESTION?	**NO**

C.C. Tatham & Associates Ltd.
Consulting Engineers

8-HOUR TRAFFIC SIGNAL WARRANT

Project & No.: Church Street North Transportation Review 116057

GENERAL INFORMATION

Analyst	Stefan Hajgato	**Jurisdiction/Area**	Alliston **Date** 23 Jun 2016
Agency or Company	CCTA	**East-West Street**	Realigned Evans Road and Fletcher Crescent
Analysis Period	2016	**North-South Street**	Church Street North
Flow Conditions	Restricted flow (urban)	**Major Street**	North-South
T Intersection	No	**Approach Lanes per Direction**	1
		Hours of Traffic Volume Data	8 hours

Additional Comments

TRAFFIC & PEDESTRIAN VOLUMES

Hour of Data	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	AM + PM
Hour Ending	**800**	**900**	**1000**	**1200**	**1300**	**1600**	**1700**	**1800**	**4**
MAJOR STREET									
Northbound right	4	18	26	20	32	44	35	35	
thru	59	138	70	99	98	199	217	207	
left	39	62	51	52	49	100	101	85	
Southbound right	12	17	13	13	10	18	19	13	
thru	143	199	123	97	95	143	124	123	
left	0	0	1	1	1	4	1	0	
MINOR STREET									
Eastbound right	63	58	67	63	80	86	59	52	
thru	1	3	2	5	2	4	5	4	
left	5	15	10	19	9	18	19	15	
Westbound right	0	0	0	1	0	2	2	0	
thru	1	3	3	2	2	4	4	3	
left	17	28	29	28	18	38	31	21	
PEDESTRIANS									
crossing MAJOR street	24	30	8	8	13	47	16	18	
crossing MINOR street	15	5	3	2	3	3	3	14	
APPROACH VOLUMES									
major	256	434	284	282	285	507	498	464	
minor	87	107	111	118	111	152	120	95	
TOTAL	343	541	395	400	396	659	618	559	
CROSSING VOLUMES									
TOTAL	47	76	50	60	42	107	71	58	
note 1	21	43	39	47	27	55	51	37	
note 2	1	3	3	5	2	4	5	4	
note 3	0	0	0	0	0	0	0	0	
3a	no	no	no	no	no	no	no	no	
3b	no	no	no	no	no	no	no	no	
note 4	24	30	8	8	13	47	16	18	

NOTES

Traffic crossing MAJOR street defined as:

note 1: Left turns from both minor street approaches
note 2: The heaviest through volume from the minor street
note 3: 50% of the heavier left turn movement from the major street when both of the following are met:
3a: the left turn volume > 120
3b: the left turn volume + opposing volume > 720
note 4: Pedestrians crossing the major street

ACCIDENT HISTORY

Reportable accidents over the past 36 months susceptible to correction by a traffic signal.

months 1 to 12	**0**
months 13 to 24	**0**
months 25 to 36	**0**

8-HOUR TRAFFIC SIGNAL WARRANT

C.C. Tatham & Associates Ltd. Consulting Engineers

Project & No.: Church Street North Transportation Review 116057

GENERAL INFORMATION

Analyst	Stefan Hajgato	**Jurisdiction/Area**	Alliston **Date** 23 Jun 2016
Agency or Company	CCTA	**East-West Street**	Realigned Evans Road and Fletcher Crescent
Analysis Period	2016	**North-South Street**	Church Street North
Flow Conditions	Restricted flow (urban)	**Major Street**	Church Street North
T Intersection	No	**Approach Lanes per Direction**	1
		Hours of Traffic Volume Data	8 hours
Additional Comments			

JUSTIFICATION 1 - MINIMUM VEHICLE VOLUME

JUSTIFICATION	GUIDANCE	HOUR ENDING Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	No. of hours with compliance 100%	80%+	
1A	TOTAL TRAFFIC VOLUME ENTERING INTERSECTION (vph) (2 way Total)	**343**	**541**	**395**	**400**	**396**	**659**	**618**	**559**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 720 (1 lane approach on main road) OR VOL x 100 / 900 (2 or more lane approach on main road)	48%	75%	55%	56%	55%	92%	86%	78%	0	2	68%
1B	TRAFFIC VOLUME ON MINOR STREET (vph) (2 way Total)	**87**	**107**	**111**	**118**	**111**	**152**	**120**	**95**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 170 (full intersection) OR VOL x 100 / 255 (tee intersection)	51%	63%	65%	69%	65%	89%	71%	56%	0	1	66%

(RESTRICTED FLOW)	**BOTH 1A AND 1B 100% FULFILLED EACH OF 8 HOURS**	**NO**
SIGNAL JUSTIFICATION 1:	**LESSER OF 1A OR 1B AT LEAST 80% FULFILLED EACH OF 8 HOURS**	**NO**

JUSTIFICATION 2 - DELAY TO CROSS TRAFFIC

JUSTIFICATION	GUIDANCE	HOUR ENDING Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	No. of hours with compliance 100%	80%+	
2A	MAIN ROAD TRAFFIC VOLUME (vph) (2 way Total)	**256**	**434**	**284**	**282**	**285**	**507**	**498**	**464**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 720 (1 lane approach on main road) OR VOL x 100 / 900 (2 or more lane approach on main road)	36%	60%	39%	39%	40%	70%	69%	64%	0	0	52%
2B	CROSSING TRAFFIC VOLUME (vph) (2 way Total)	**47**	**76**	**50**	**60**	**42**	**107**	**71**	**58**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 75	62%	100%	66%	79%	56%	100%	95%	78%	2	3	80%

(RESTRICTED FLOW)	**BOTH 2A AND 2B 100% FULFILLED EACH OF 8 HOURS**	**NO**
SIGNAL JUSTIFICATION 2:	**LESSER OF 2A OR 2B AT LEAST 80% FULFILLED EACH OF 8 HOURS**	**NO**

JUSTIFICATION 3 - COLLISION EXPERIENCE

	Preceding Months	Number of Collisions	% Fulfillment
A. Number of reportable collisions susceptible to prevention by a traffic signal.	1 - 12	0	0%
	13 - 24	0	0%
	25 - 36	0	0%
	annual average	0.00	0%
B. Adequate trial of less restrictive remedies has failed to reduce collision frequency.	☐ YES	☐ NO	n/a
C. Either Justification 1 (Minimum Vehicular Volume) or Justification 2 (Delay to Cross Traffic) satisfied to 80% or more.	☐ YES	☐ NO	n/a
SIGNAL JUSTIFICATION 3: **ALL OF 3A, 3B & 3C FULFILLED TO 100%?**	**NO**		

JUSTIFICATION 4 - COMBINATION JUSTIFICATION

JUSTIFICATION SATISFIED 80% OR MORE				Two Justifications Satisfied 80% or more
Justification 1	-	Minimum Vehicle Volume	NO	**NO**
Justification 2	-	Delay to Cross Traffic	NO	
Justification 3	-	Collision Experience	NO	

JUSTIFICATION SUMMARY

ARE TRAFFFIC SIGNALS JUSTIFIED FOR THE INTERSECTION IN QUESTION?	**NO**

Appendix F:
TAC Speed Limit Worksheet

Automated Speed Limit Guidelines

FORM A - Automated Speed Limit Guidelines Spreadsheet

Version: 10-Apr-09

Name of Corridor:	Church Street				
Segment Evaluated:	Victoria Street	to	Hussey Road		
Geographic Region:	Alliston				
Road Agency:	Town of New Tecumseth				
Road Classification:	Local	Length of Corridor:		620	m
Urban / Rural:	Urban	Design Speed: (Required for Freeway, Expressway, Highway)		60	km/h
Divided / Undivided:	Undivided	Current Posted Speed: (For information only)		50	km/h
Major / Minor:	Minor	Prevailing Speed: (85th Percentile - for information only)		55	km/h
# Through Lanes Per Direction:	1 lane	Policy: (Maximum Posted Speed)		10 km/h less than design speed	

		RISK	Score
A1	**GEOMETRY (Horizontal)**	Medium	2
A2	**GEOMETRY (Vertical)**	Lower	1
A3	**AVERAGE LANE WIDTH**	Medium	4
B	**ROADSIDE HAZARDS**	Lower	1
C1	**PEDESTRIAN EXPOSURE**	Lower	3
C2	**CYCLIST EXPOSURE**	Medium	6
D	**PAVEMENT SURFACE**	Lower	1
E1	**NUMBER OF INTERSECTIONS WITH PUBLIC ROADS**	*Number of Occurrences*	4
	STOP controlled intersection	1	
	Signalized intersection	1	
	Roundabout or traffic circle	0	
	Crosswalk	1	
	Active, at-grade railroad crossing	0	
	Sidestreet STOP-controlled or lane	3	
E2	**NUMBER OF INTERSECTIONS WITH PRIVATE ACCESS DRIVEWAYS**	*Number of Occurrences*	15
	Left turn movements permitted	31	
	Right-in / Right-out only	0	
E3	**NUMBER OF INTERCHANGES**	*Number of Occurrences*	0
	Number of interchanges along corridor	0	
F	**ON-STREET PARKING**	Higher	9

Total Risk Score: 46

Recommended Posted Speed Limit (km/h):

As determined by road characteristics: 40

As determined by policy: 50

The recommended posted speed limit may be checked against the prevailing speeds of the roadway and the road's safety performance.

Comments:

Appendix G:
Future Intersection Operations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	220	25	55	285	60	15	125	45	95	155	100
Future Volume (vph)	65	220	25	55	285	60	15	125	45	95	155	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.97		1.00	0.97		1.00	0.97		1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.99	1.00		0.99	1.00		0.99	1.00		0.98	1.00
Satd. Flow (prot)		1818	1515		1825	1515		1830	1515		1801	1515
Flt Permitted		0.74	1.00		0.88	1.00		0.95	1.00		0.81	1.00
Satd. Flow (perm)		1364	1515		1622	1515		1746	1515		1493	1515
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	72	244	28	61	317	67	17	139	50	106	172	111
RTOR Reduction (vph)	0	0	19	0	0	44	0	0	30	0	0	66
Lane Group Flow (vph)	0	316	9	0	378	23	0	156	20	0	278	45
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		14.8	14.8		14.8	14.8		18.1	18.1		18.1	18.1
Effective Green, g (s)		14.8	14.8		14.8	14.8		18.1	18.1		18.1	18.1
Actuated g/C Ratio		0.33	0.33		0.33	0.33		0.40	0.40		0.40	0.40
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		449	499		534	499		703	610		601	610
v/s Ratio Prot												
v/s Ratio Perm		0.23	0.01		c0.23	0.02		0.09	0.01		c0.19	0.03
v/c Ratio		0.70	0.02		0.71	0.05		0.22	0.03		0.46	0.07
Uniform Delay, d1		13.1	10.2		13.2	10.2		8.8	8.1		9.8	8.2
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		5.0	0.0		4.3	0.0		0.7	0.1		2.6	0.2
Delay (s)		18.1	10.2		17.4	10.3		9.5	8.2		12.4	8.5
Level of Service		B	B		B	B		A	A		B	A
Approach Delay (s)		17.5			16.4			9.2			11.3	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM 2000 Control Delay	14.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	44.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	83.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	5	20	5	10	55	30	220	15	35	320	25
Future Volume (Veh/h)	15	5	20	5	10	55	30	220	15	35	320	25
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	17	6	22	6	11	61	33	244	17	39	356	28
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								48				
pX, platoon unblocked	0.96	0.96		0.96	0.96	0.96				0.96		
vC, conflicting volume	819	761	356	778	780	252	384			261		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	794	734	356	751	754	206	384			215		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	98	97	98	96	92	97			97		
cM capacity (veh/h)	254	316	688	288	308	804	1174			1306		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2
Volume Total	45	78	294	395	28
Volume Left	17	6	33	39	0
Volume Right	22	61	17	0	28
cSH	382	589	1174	1306	1700
Volume to Capacity	0.12	0.13	0.03	0.03	0.02
Queue Length 95th (m)	3.0	3.4	0.7	0.7	0.0
Control Delay (s)	15.7	12.0	1.2	1.0	0.0
Lane LOS	C	B	A	A	
Approach Delay (s)	15.7	12.0	1.2	1.0	
Approach LOS	C	B			

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	50.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	25	85	95	200	295	30
Future Volume (Veh/h)	25	85	95	200	295	30
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	28	94	106	222	328	33
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				182		
pX, platoon unblocked						
vC, conflicting volume	778	344	361			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	778	344	361			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	92	87	91			
cM capacity (veh/h)	332	698	1198			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	122	328	361
Volume Left	28	106	0
Volume Right	94	0	33
cSH	557	1198	1700
Volume to Capacity	0.22	0.09	0.21
Queue Length 95th (m)	6.2	2.2	0.0
Control Delay (s)	13.3	3.3	0.0
Lane LOS	B	A	
Approach Delay (s)	13.3	3.3	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	49.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	40	5	180	45	2	285
Future Volume (Veh/h)	40	5	180	45	2	285
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	44	6	200	50	2	317
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			201			
pX, platoon unblocked						
vC, conflicting volume	546	225			250	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	546	225			250	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	99			100	
cM capacity (veh/h)	498	814			1316	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	50	250	319
Volume Left	44	0	2
Volume Right	6	50	0
cSH	522	1700	1316
Volume to Capacity	0.10	0.15	0.00
Queue Length 95th (m)	2.4	0.0	0.0
Control Delay (s)	12.6	0.0	0.1
Lane LOS	B		A
Approach Delay (s)	12.6	0.0	0.1
Approach LOS	B		

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	26.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	20	15	150	255	5
Future Volume (Veh/h)	5	20	15	150	255	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	22	17	167	283	6
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	487	286	289			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	487	286	289			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	97	99			
cM capacity (veh/h)	532	753	1273			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	28	184	289
Volume Left	6	17	0
Volume Right	22	0	6
cSH	692	1273	1700
Volume to Capacity	0.04	0.01	0.17
Queue Length 95th (m)	0.9	0.3	0.0
Control Delay (s)	10.4	0.8	0.0
Lane LOS	B	A	
Approach Delay (s)	10.4	0.8	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	30.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	5	55	25	5	5	20	125	10	5	175	5
Future Volume (vph)	5	5	55	25	5	5	20	125	10	5	175	5
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	6	61	28	6	6	22	139	11	6	194	6

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	73	40	172	206
Volume Left (vph)	6	28	22	6
Volume Right (vph)	61	6	11	6
Hadj (s)	-0.45	0.08	0.02	0.02
Departure Headway (s)	4.4	4.9	4.4	4.4
Degree Utilization, x	0.09	0.05	0.21	0.25
Capacity (veh/h)	750	664	783	788
Control Delay (s)	7.8	8.2	8.6	8.8
Approach Delay (s)	7.8	8.2	8.6	8.8
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.5		
Level of Service	A		
Intersection Capacity Utilization	32.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	220	25	55	285	60	15	125	45	95	155	100
Future Volume (vph)	65	220	25	55	285	60	15	125	45	95	155	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.97		1.00	0.97		1.00	0.97		1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.99	1.00		0.99	1.00		0.99	1.00		0.98	1.00
Satd. Flow (prot)		1818	1514		1825	1514		1830	1514		1800	1514
Flt Permitted		0.74	1.00		0.88	1.00		0.95	1.00		0.82	1.00
Satd. Flow (perm)		1359	1514		1626	1514		1750	1514		1498	1514
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	72	244	28	61	317	67	17	139	50	106	172	111
RTOR Reduction (vph)	0	0	19	0	0	40	0	0	29	0	0	65
Lane Group Flow (vph)	0	316	9	0	378	27	0	156	21	0	278	46
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		16.1	16.1		16.1	16.1		20.2	20.2		20.2	20.2
Effective Green, g (s)		16.1	16.1		16.1	16.1		20.2	20.2		20.2	20.2
Actuated g/C Ratio		0.33	0.33		0.33	0.33		0.42	0.42		0.42	0.42
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		453	504		542	504		731	633		626	633
v/s Ratio Prot												
v/s Ratio Perm		c0.23	0.01		0.23	0.02		0.09	0.01		c0.19	0.03
v/c Ratio		0.70	0.02		0.70	0.05		0.21	0.03		0.44	0.07
Uniform Delay, d1		14.0	10.8		14.0	10.9		9.0	8.3		10.0	8.4
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		4.6	0.0		3.9	0.0		0.7	0.1		2.3	0.2
Delay (s)		18.6	10.8		17.9	11.0		9.6	8.4		12.3	8.7
Level of Service		B	B		B	B		A	A		B	A
Approach Delay (s)		18.0			16.8			9.3			11.3	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM 2000 Control Delay	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	48.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	83.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	365	40	40	420	85	65	220	80	180	90	85
Future Volume (vph)	55	365	40	40	420	85	65	220	80	180	90	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.97		1.00	0.97		1.00	0.97		1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		0.99	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.99	1.00		1.00	1.00		0.99	1.00		0.97	1.00
Satd. Flow (prot)		1829	1514		1833	1514		1818	1514		1772	1514
Flt Permitted		0.73	1.00		0.90	1.00		0.85	1.00		0.60	1.00
Satd. Flow (perm)		1338	1514		1658	1514		1560	1514		1106	1514
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	61	406	44	44	467	94	72	244	89	200	100	94
RTOR Reduction (vph)	0	0	27	0	0	41	0	0	56	0	0	59
Lane Group Flow (vph)	0	467	17	0	511	53	0	316	33	0	300	35
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		18.6	18.6		18.6	18.6		18.0	18.0		18.0	18.0
Effective Green, g (s)		18.6	18.6		18.6	18.6		18.0	18.0		18.0	18.0
Actuated g/C Ratio		0.38	0.38		0.38	0.38		0.37	0.37		0.37	0.37
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		512	579		634	579		577	560		409	560
v/s Ratio Prot												
v/s Ratio Perm		c0.35	0.01		0.31	0.04		0.20	0.02		c0.27	0.02
v/c Ratio		0.91	0.03		0.81	0.09		0.55	0.06		0.73	0.06
Uniform Delay, d1		14.2	9.4		13.4	9.6		12.1	9.8		13.2	9.9
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		20.6	0.0		7.4	0.1		3.7	0.2		11.1	0.2
Delay (s)		34.8	9.4		20.8	9.7		15.8	10.0		24.3	10.1
Level of Service		C	A		C	A		B	B		C	B
Approach Delay (s)		32.6			19.1			14.5			20.9	
Approach LOS		C			B			B			C	

Intersection Summary			
HCM 2000 Control Delay	22.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	48.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	10	40	5	25	90	45	325	15	45	315	30
Future Volume (Veh/h)	40	10	40	5	25	90	45	325	15	45	315	30
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	44	11	44	6	28	100	50	361	17	50	350	33
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								48				
pX, platoon unblocked	0.89	0.89		0.89	0.89	0.89				0.89		
vC, conflicting volume	1034	928	350	969	952	370	383			378		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	977	859	350	905	886	233	383			243		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	71	95	94	97	88	86	96			96		
cM capacity (veh/h)	150	241	693	195	232	719	1175			1181		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2
Volume Total	99	134	428	400	33
Volume Left	44	6	50	50	0
Volume Right	44	100	17	0	33
cSH	246	461	1175	1181	1700
Volume to Capacity	0.40	0.29	0.04	0.04	0.02
Queue Length 95th (m)	13.7	9.0	1.0	1.0	0.0
Control Delay (s)	29.1	16.0	1.4	1.4	0.0
Lane LOS	D	C	A	A	
Approach Delay (s)	29.1	16.0	1.4	1.3	
Approach LOS	D	C			

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	30	100	115	285	255	25
Future Volume (Veh/h)	30	100	115	285	255	25
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	33	111	128	317	283	28
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				182		
pX, platoon unblocked						
vC, conflicting volume	870	297	311			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	870	297	311			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	89	85	90			
cM capacity (veh/h)	289	742	1249			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	144	445	311
Volume Left	33	128	0
Volume Right	111	0	28
cSH	546	1249	1700
Volume to Capacity	0.26	0.10	0.18
Queue Length 95th (m)	7.9	2.6	0.0
Control Delay (s)	13.9	3.1	0.0
Lane LOS	B	A	
Approach Delay (s)	13.9	3.1	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	35	5	295	66	5	220
Future Volume (Veh/h)	35	5	295	66	5	220
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	39	6	328	73	6	244
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			201			
pX, platoon unblocked						
vC, conflicting volume	620	364			401	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	620	364			401	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	99			99	
cM capacity (veh/h)	449	680			1158	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	45	401	250
Volume Left	39	0	6
Volume Right	6	73	0
cSH	470	1700	1158
Volume to Capacity	0.10	0.24	0.01
Queue Length 95th (m)	2.4	0.0	0.1
Control Delay (s)	13.5	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	13.5	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	29.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	20	35	245	200	5
Future Volume (Veh/h)	5	20	35	245	200	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	22	39	272	222	6
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	575	225	228			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	575	225	228			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	97	97			
cM capacity (veh/h)	466	814	1340			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	28	311	228
Volume Left	6	39	0
Volume Right	22	0	6
cSH	702	1340	1700
Volume to Capacity	0.04	0.03	0.13
Queue Length 95th (m)	0.9	0.7	0.0
Control Delay (s)	10.3	1.2	0.0
Lane LOS	B	A	
Approach Delay (s)	10.3	1.2	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	39.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	5	30	20	5	5	30	180	35	5	155	5
Future Volume (vph)	5	5	30	20	5	5	30	180	35	5	155	5
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	6	33	22	6	6	33	200	39	6	172	6

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	45	34	272	184
Volume Left (vph)	6	22	33	6
Volume Right (vph)	33	6	39	6
Hadj (s)	-0.38	0.06	-0.03	0.02
Departure Headway (s)	4.6	5.0	4.3	4.4
Degree Utilization, x	0.06	0.05	0.32	0.22
Capacity (veh/h)	704	643	821	786
Control Delay (s)	7.9	8.3	9.3	8.7
Approach Delay (s)	7.9	8.3	9.3	8.7
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.9		
Level of Service	A		
Intersection Capacity Utilization	38.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	365	40	40	420	85	65	220	80	180	90	85
Future Volume (vph)	55	365	40	40	420	85	65	220	80	180	90	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.97		1.00	0.97		1.00	0.97		1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		0.99	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.99	1.00		1.00	1.00		0.99	1.00		0.97	1.00
Satd. Flow (prot)		1829	1512		1833	1512		1817	1512		1772	1512
Flt Permitted		0.72	1.00		0.89	1.00		0.85	1.00		0.60	1.00
Satd. Flow (perm)		1321	1512		1640	1512		1566	1512		1091	1512
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	61	406	44	44	467	94	72	244	89	200	100	94
RTOR Reduction (vph)	0	0	27	0	0	38	0	0	47	0	0	58
Lane Group Flow (vph)	0	467	17	0	511	56	0	316	42	0	300	36
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		20.1	20.1		20.1	20.1		20.2	20.2		20.2	20.2
Effective Green, g (s)		20.1	20.1		20.1	20.1		20.2	20.2		20.2	20.2
Actuated g/C Ratio		0.38	0.38		0.38	0.38		0.39	0.39		0.39	0.39
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		507	581		630	581		604	583		421	583
v/s Ratio Prot												
v/s Ratio Perm		c0.35	0.01		0.31	0.04		0.20	0.03		c0.27	0.02
v/c Ratio		0.92	0.03		0.81	0.10		0.52	0.07		0.71	0.06
Uniform Delay, d1		15.3	10.0		14.4	10.3		12.3	10.1		13.6	10.1
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		22.2	0.0		7.8	0.1		3.2	0.2		9.9	0.2
Delay (s)		37.6	10.0		22.2	10.4		15.6	10.4		23.4	10.3
Level of Service		D	B		C	B		B	B		C	B
Approach Delay (s)		35.2			20.4			14.4			20.3	
Approach LOS		D			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	23.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	52.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	240	25	60	315	65	15	140	50	105	170	110
Future Volume (vph)	75	240	25	60	315	65	15	140	50	105	170	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.97		1.00	0.97		1.00	0.97		1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.99	1.00		0.99	1.00		1.00	1.00		0.98	1.00
Satd. Flow (prot)		1818	1515		1825	1515		1832	1515		1801	1515
Flt Permitted		0.67	1.00		0.87	1.00		0.95	1.00		0.80	1.00
Satd. Flow (perm)		1227	1515		1608	1515		1750	1515		1469	1515
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	83	267	28	67	350	72	17	156	56	117	189	122
RTOR Reduction (vph)	0	0	18	0	0	43	0	0	34	0	0	74
Lane Group Flow (vph)	0	350	10	0	417	29	0	173	22	0	306	48
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		15.8	15.8		15.8	15.8		18.1	18.1		18.1	18.1
Effective Green, g (s)		15.8	15.8		15.8	15.8		18.1	18.1		18.1	18.1
Actuated g/C Ratio		0.34	0.34		0.34	0.34		0.39	0.39		0.39	0.39
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		422	521		553	521		690	597		579	597
v/s Ratio Prot												
v/s Ratio Perm		c0.29	0.01		0.26	0.02		0.10	0.01		c0.21	0.03
v/c Ratio		0.83	0.02		0.75	0.06		0.25	0.04		0.53	0.08
Uniform Delay, d1		13.8	9.9		13.3	10.1		9.3	8.5		10.6	8.7
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		12.7	0.0		5.8	0.0		0.9	0.1		3.4	0.3
Delay (s)		26.5	9.9		19.1	10.1		10.2	8.7		14.1	9.0
Level of Service		C	A		B	B		B	A		B	A
Approach Delay (s)		25.3			17.8			9.8			12.6	
Approach LOS		C			B			A			B	

Intersection Summary			
HCM 2000 Control Delay	17.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	45.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	5	25	5	10	60	30	240	20	35	350	30
Future Volume (Veh/h)	15	5	25	5	10	60	30	240	20	35	350	30
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	17	6	28	6	11	67	33	267	22	39	389	33
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								48				
pX, platoon unblocked	0.95	0.95		0.95	0.95	0.95				0.95		
vC, conflicting volume	884	822	389	842	844	278	422			289		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	853	789	389	810	812	218	422			229		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	98	96	98	96	91	97			97		
cM capacity (veh/h)	225	290	659	256	281	783	1137			1276		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2
Volume Total	51	84	322	428	33
Volume Left	17	6	33	39	0
Volume Right	28	67	22	0	33
cSH	368	567	1137	1276	1700
Volume to Capacity	0.14	0.15	0.03	0.03	0.02
Queue Length 95th (m)	3.6	3.9	0.7	0.7	0.0
Control Delay (s)	16.3	12.4	1.1	1.0	0.0
Lane LOS	C	B	A	A	
Approach Delay (s)	16.3	12.4	1.1	0.9	
Approach LOS	C	B			

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	53.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	25	95	105	220	325	35
Future Volume (Veh/h)	25	95	105	220	325	35
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	28	106	117	244	361	39
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				182		
pX, platoon unblocked						
vC, conflicting volume	858	380	400			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	858	380	400			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	84	90			
cM capacity (veh/h)	294	667	1159			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	134	361	400
Volume Left	28	117	0
Volume Right	106	0	39
cSH	527	1159	1700
Volume to Capacity	0.25	0.10	0.24
Queue Length 95th (m)	7.5	2.5	0.0
Control Delay (s)	14.1	3.4	0.0
Lane LOS	B	A	
Approach Delay (s)	14.1	3.4	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	45	5	195	50	5	315
Future Volume (Veh/h)	45	5	195	50	5	315
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	50	6	217	56	6	350
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			201			
pX, platoon unblocked						
vC, conflicting volume	607	245			273	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	607	245			273	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	89	99			100	
cM capacity (veh/h)	457	794			1290	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	56	273	356
Volume Left	50	0	6
Volume Right	6	56	0
cSH	479	1700	1290
Volume to Capacity	0.12	0.16	0.00
Queue Length 95th (m)	3.0	0.0	0.1
Control Delay (s)	13.5	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	13.5	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	30.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	20	15	165	280	5
Future Volume (Veh/h)	5	20	15	165	280	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	22	17	183	311	6
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	531	314	317			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	531	314	317			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	97	99			
cM capacity (veh/h)	502	726	1243			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	28	200	317
Volume Left	6	17	0
Volume Right	22	0	6
cSH	663	1243	1700
Volume to Capacity	0.04	0.01	0.19
Queue Length 95th (m)	1.0	0.3	0.0
Control Delay (s)	10.7	0.8	0.0
Lane LOS	B	A	
Approach Delay (s)	10.7	0.8	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	31.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	5	65	25	5	5	20	140	10	5	190	5
Future Volume (vph)	5	5	65	25	5	5	20	140	10	5	190	5
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	6	72	28	6	6	22	156	11	6	211	6

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	84	40	189	223
Volume Left (vph)	6	28	22	6
Volume Right (vph)	72	6	11	6
Hadj (s)	-0.47	0.08	0.02	0.02
Departure Headway (s)	4.4	5.0	4.5	4.4
Degree Utilization, x	0.10	0.06	0.23	0.27
Capacity (veh/h)	736	645	773	777
Control Delay (s)	7.9	8.3	8.8	9.1
Approach Delay (s)	7.9	8.3	8.8	9.1
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.8		
Level of Service	A		
Intersection Capacity Utilization	33.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	240	25	60	315	65	15	140	50	105	170	110
Future Volume (vph)	75	240	25	60	315	65	15	140	50	105	170	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.97		1.00	0.97		1.00	0.97		1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.99	1.00		0.99	1.00		1.00	1.00		0.98	1.00
Satd. Flow (prot)		1817	1513		1825	1513		1831	1513		1800	1513
Flt Permitted		0.67	1.00		0.87	1.00		0.95	1.00		0.80	1.00
Satd. Flow (perm)		1237	1513		1610	1513		1753	1513		1475	1513
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	83	267	28	67	350	72	17	156	56	117	189	122
RTOR Reduction (vph)	0	0	18	0	0	38	0	0	33	0	0	72
Lane Group Flow (vph)	0	350	10	0	417	34	0	173	23	0	306	50
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		17.6	17.6		17.6	17.6		20.3	20.3		20.3	20.3
Effective Green, g (s)		17.6	17.6		17.6	17.6		20.3	20.3		20.3	20.3
Actuated g/C Ratio		0.35	0.35		0.35	0.35		0.41	0.41		0.41	0.41
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		436	533		567	533		713	615		600	615
v/s Ratio Prot												
v/s Ratio Perm		c0.28	0.01		0.26	0.02		0.10	0.02		c0.21	0.03
v/c Ratio		0.80	0.02		0.74	0.06		0.24	0.04		0.51	0.08
Uniform Delay, d1		14.6	10.5		14.1	10.7		9.7	8.9		11.1	9.1
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		10.2	0.0		4.9	0.1		0.8	0.1		3.1	0.3
Delay (s)		24.8	10.5		19.0	10.7		10.5	9.0		14.2	9.3
Level of Service		C	B		B	B		B	A		B	A
Approach Delay (s)		23.8			17.8			10.2			12.8	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	49.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	400	40	40	460	95	75	245	85	200	105	90
Future Volume (vph)	60	400	40	40	460	95	75	245	85	200	105	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.96		1.00	0.96		1.00	0.96		1.00	0.96
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		0.99	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.99	1.00		1.00	1.00		0.99	1.00		0.97	1.00
Satd. Flow (prot)		1829	1507		1834	1507		1816	1507		1772	1507
Flt Permitted		0.68	1.00		0.87	1.00		0.81	1.00		0.52	1.00
Satd. Flow (perm)		1247	1507		1606	1507		1488	1507		950	1507
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	67	444	44	44	511	106	83	272	94	222	117	100
RTOR Reduction (vph)	0	0	25	0	0	32	0	0	43	0	0	61
Lane Group Flow (vph)	0	511	19	0	555	74	0	355	51	0	339	39
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		27.1	27.1		27.1	27.1		25.0	25.0		25.0	25.0
Effective Green, g (s)		27.1	27.1		27.1	27.1		25.0	25.0		25.0	25.0
Actuated g/C Ratio		0.42	0.42		0.42	0.42		0.39	0.39		0.39	0.39
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		527	637		678	637		580	587		370	587
v/s Ratio Prot												
v/s Ratio Perm		c0.41	0.01		0.35	0.05		0.24	0.03		c0.36	0.03
v/c Ratio		0.97	0.03		0.82	0.12		0.61	0.09		0.92	0.07
Uniform Delay, d1		18.1	10.8		16.3	11.2		15.7	12.3		18.6	12.2
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		31.1	0.0		7.6	0.1		4.8	0.3		29.7	0.2
Delay (s)		49.2	10.8		24.0	11.3		20.4	12.6		48.3	12.5
Level of Service		D	B		C	B		C	B		D	B
Approach Delay (s)		46.2			21.9			18.8			40.1	
Approach LOS		D			C			B			D	

Intersection Summary			
HCM 2000 Control Delay	31.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	64.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	104.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	45	10	40	5	25	100	50	360	15	5	345	30
Future Volume (Veh/h)	45	10	40	5	25	100	50	360	15	5	345	30
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	50	11	44	6	28	111	56	400	17	6	383	33
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								48				
pX, platoon unblocked	0.87	0.87		0.87	0.87	0.87				0.87		
vC, conflicting volume	1040	924	383	965	948	408	416			417		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	972	839	383	886	867	247	416			256		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	66	96	93	97	88	84	95			99		
cM capacity (veh/h)	148	249	664	200	240	690	1143			1139		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2
Volume Total	105	145	473	389	33
Volume Left	50	6	56	6	0
Volume Right	44	111	17	0	33
cSH	234	471	1143	1139	1700
Volume to Capacity	0.45	0.31	0.05	0.01	0.02
Queue Length 95th (m)	16.1	9.7	1.2	0.1	0.0
Control Delay (s)	32.3	16.0	1.5	0.2	0.0
Lane LOS	D	C	A	A	
Approach Delay (s)	32.3	16.0	1.5	0.2	
Approach LOS	D	C			

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	67.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	30	115	130	310	280	30
Future Volume (Veh/h)	30	115	130	310	280	30
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	33	128	144	344	311	33
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				182		
pX, platoon unblocked						
vC, conflicting volume	960	328	344			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	960	328	344			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	87	82	88			
cM capacity (veh/h)	251	714	1215			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	161	488	344
Volume Left	33	144	0
Volume Right	128	0	33
cSH	518	1215	1700
Volume to Capacity	0.31	0.12	0.20
Queue Length 95th (m)	9.9	3.0	0.0
Control Delay (s)	15.0	3.3	0.0
Lane LOS	C	A	
Approach Delay (s)	15.0	3.3	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	40	5	325	65	5	240
Future Volume (Veh/h)	40	5	325	65	5	240
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	44	6	361	72	6	267
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			201			
pX, platoon unblocked						
vC, conflicting volume	676	397			433	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	676	397			433	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	89	99			99	
cM capacity (veh/h)	417	652			1127	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	50	433	273
Volume Left	44	0	6
Volume Right	6	72	0
cSH	435	1700	1127
Volume to Capacity	0.11	0.25	0.01
Queue Length 95th (m)	2.9	0.0	0.1
Control Delay (s)	14.3	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	14.3	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	31.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	20	40	270	220	5
Future Volume (Veh/h)	5	20	40	270	220	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	22	44	300	244	6
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	635	247	250			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	635	247	250			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	97	97			
cM capacity (veh/h)	428	792	1316			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	28	344	250
Volume Left	6	44	0
Volume Right	22	0	6
cSH	670	1316	1700
Volume to Capacity	0.04	0.03	0.15
Queue Length 95th (m)	1.0	0.8	0.0
Control Delay (s)	10.6	1.3	0.0
Lane LOS	B	A	
Approach Delay (s)	10.6	1.3	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	41.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	5	35	25	5	5	35	200	40	5	170	5
Future Volume (vph)	5	5	35	25	5	5	35	200	40	5	170	5
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	6	39	28	6	6	39	222	44	6	189	6

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	51	40	305	201
Volume Left (vph)	6	28	39	6
Volume Right (vph)	39	6	44	6
Hadj (s)	-0.40	0.08	-0.03	0.02
Departure Headway (s)	4.7	5.2	4.3	4.5
Degree Utilization, x	0.07	0.06	0.37	0.25
Capacity (veh/h)	682	619	808	771
Control Delay (s)	8.0	8.5	9.8	9.0
Approach Delay (s)	8.0	8.5	9.8	9.0
Approach LOS	A	A	A	A

Intersection Summary			
Delay	9.3		
Level of Service	A		
Intersection Capacity Utilization	42.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	400	40	40	460	95	75	245	85	200	105	90
Future Volume (vph)	60	400	40	40	460	95	75	245	85	200	105	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.96		1.00	0.96		1.00	0.96		1.00	0.96
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		0.99	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.99	1.00		1.00	1.00		0.99	1.00		0.97	1.00
Satd. Flow (prot)		1829	1511		1834	1511		1817	1511		1773	1511
Flt Permitted		0.70	1.00		0.89	1.00		0.80	1.00		0.53	1.00
Satd. Flow (perm)		1282	1511		1644	1511		1469	1511		966	1511
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	67	444	44	44	511	106	83	272	94	222	117	100
RTOR Reduction (vph)	0	0	26	0	0	37	0	0	45	0	0	64
Lane Group Flow (vph)	0	511	18	0	555	69	0	355	49	0	339	36
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		23.2	23.2		23.2	23.2		20.2	20.2		20.2	20.2
Effective Green, g (s)		23.2	23.2		23.2	23.2		20.2	20.2		20.2	20.2
Actuated g/C Ratio		0.42	0.42		0.42	0.42		0.36	0.36		0.36	0.36
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		536	632		688	632		535	550		352	550
v/s Ratio Prot												
v/s Ratio Perm		c0.40	0.01		0.34	0.05		0.24	0.03		c0.35	0.02
v/c Ratio		0.95	0.03		0.81	0.11		0.66	0.09		0.96	0.07
Uniform Delay, d1		15.6	9.5		14.1	9.8		14.8	11.6		17.2	11.5
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		27.4	0.0		6.9	0.1		6.4	0.3		39.5	0.2
Delay (s)		43.0	9.5		21.0	9.9		21.1	11.9		56.7	11.7
Level of Service		D	A		C	A		C	B		E	B
Approach Delay (s)		40.3			19.2			19.2			46.5	
Approach LOS		D			B			B			D	

Intersection Summary			
HCM 2000 Control Delay	30.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	55.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	104.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	295	30	70	385	80	20	175	60	130	210	130
Future Volume (vph)	90	295	30	70	385	80	20	175	60	130	210	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.96		1.00	0.96		1.00	0.96		1.00	0.96
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.99	1.00		0.99	1.00		0.99	1.00		0.98	1.00
Satd. Flow (prot)		1818	1510		1826	1510		1831	1510		1800	1510
Flt Permitted		0.60	1.00		0.81	1.00		0.94	1.00		0.78	1.00
Satd. Flow (perm)		1096	1510		1489	1510		1728	1510		1436	1510
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	100	328	33	78	428	89	22	194	67	144	233	144
RTOR Reduction (vph)	0	0	19	0	0	34	0	0	42	0	0	90
Lane Group Flow (vph)	0	428	14	0	506	55	0	216	25	0	377	54
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		23.2	23.2		23.2	23.2		21.2	21.2		21.2	21.2
Effective Green, g (s)		23.2	23.2		23.2	23.2		21.2	21.2		21.2	21.2
Actuated g/C Ratio		0.41	0.41		0.41	0.41		0.38	0.38		0.38	0.38
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		450	621		612	621		649	567		539	567
v/s Ratio Prot												
v/s Ratio Perm		c0.39	0.01		0.34	0.04		0.12	0.02		c0.26	0.04
v/c Ratio		0.95	0.02		0.83	0.09		0.33	0.04		0.70	0.10
Uniform Delay, d1		16.1	9.9		14.8	10.1		12.6	11.2		14.9	11.4
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		30.2	0.0		9.0	0.1		1.4	0.1		7.4	0.3
Delay (s)		46.2	9.9		23.8	10.2		13.9	11.3		22.3	11.7
Level of Service		D	A		C	B		B	B		C	B
Approach Delay (s)		43.6			21.7			13.3			19.4	
Approach LOS		D			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	25.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	56.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	97.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	5	30	5	10	75	35	300	20	45	430	35
Future Volume (Veh/h)	15	5	30	5	10	75	35	300	20	45	430	35
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	17	6	33	6	11	83	39	333	22	50	478	39
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								48				
pX, platoon unblocked	0.93	0.93		0.93	0.93	0.93				0.93		
vC, conflicting volume	1088	1011	478	1036	1039	344	517			355		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1056	972	478	999	1002	252	517			264		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	89	97	94	97	95	89	96			96		
cM capacity (veh/h)	151	216	587	179	207	729	1049			1204		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2
Volume Total	56	100	394	528	39
Volume Left	17	6	39	50	0
Volume Right	33	83	22	0	39
cSH	285	499	1049	1204	1700
Volume to Capacity	0.20	0.20	0.04	0.04	0.02
Queue Length 95th (m)	5.4	5.6	0.9	1.0	0.0
Control Delay (s)	20.7	14.0	1.2	1.2	0.0
Lane LOS	C	B	A	A	
Approach Delay (s)	20.7	14.0	1.2	1.1	
Approach LOS	C	B			

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	61.5%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	35	120	140	265	390	45
Future Volume (Veh/h)	35	120	140	265	390	45
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	39	133	156	294	433	50
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				182		
pX, platoon unblocked						
vC, conflicting volume	1064	458	483			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1064	458	483			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	82	78	86			
cM capacity (veh/h)	211	603	1080			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	172	450	483
Volume Left	39	156	0
Volume Right	133	0	50
cSH	424	1080	1700
Volume to Capacity	0.41	0.14	0.28
Queue Length 95th (m)	14.5	3.8	0.0
Control Delay (s)	19.1	4.1	0.0
Lane LOS	C	A	
Approach Delay (s)	19.1	4.1	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	64.3%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	55	5	240	60	5	380
Future Volume (Veh/h)	55	5	240	60	5	380
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	61	6	267	67	6	422
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			201			
pX, platoon unblocked						
vC, conflicting volume	734	300			334	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	734	300			334	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	84	99			100	
cM capacity (veh/h)	385	739			1225	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	67	334	428
Volume Left	61	0	6
Volume Right	6	67	0
cSH	402	1700	1225
Volume to Capacity	0.17	0.20	0.00
Queue Length 95th (m)	4.4	0.0	0.1
Control Delay (s)	15.7	0.0	0.2
Lane LOS	C		A
Approach Delay (s)	15.7	0.0	0.2
Approach LOS	C		

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	34.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	25	20	205	340	5
Future Volume (Veh/h)	5	25	20	205	340	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	28	22	228	378	6
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	653	381	384			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	653	381	384			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	96	98			
cM capacity (veh/h)	424	666	1174			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	34	250	384
Volume Left	6	22	0
Volume Right	28	0	6
cSH	605	1174	1700
Volume to Capacity	0.06	0.02	0.23
Queue Length 95th (m)	1.3	0.4	0.0
Control Delay (s)	11.3	0.9	0.0
Lane LOS	B	A	
Approach Delay (s)	11.3	0.9	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	37.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	10	75	30	5	5	25	170	10	5	230	5
Future Volume (vph)	5	10	75	30	5	5	25	170	10	5	230	5
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	11	83	33	6	6	28	189	11	6	256	6

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	100	45	228	268
Volume Left (vph)	6	33	28	6
Volume Right (vph)	83	6	11	6
Hadj (s)	-0.45	0.10	0.03	0.03
Departure Headway (s)	4.7	5.3	4.6	4.6
Degree Utilization, x	0.13	0.07	0.29	0.34
Capacity (veh/h)	690	603	748	755
Control Delay (s)	8.4	8.7	9.5	9.9
Approach Delay (s)	8.4	8.7	9.5	9.9
Approach LOS	A	A	A	A

Intersection Summary			
Delay	9.4		
Level of Service	A		
Intersection Capacity Utilization	38.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	295	30	70	385	80	20	175	60	130	210	130
Future Volume (vph)	90	295	30	70	385	80	20	175	60	130	210	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.97		1.00	0.97		1.00	0.97		1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.99	1.00		0.99	1.00		0.99	1.00		0.98	1.00
Satd. Flow (prot)		1818	1511		1826	1511		1831	1511		1800	1511
Flt Permitted		0.60	1.00		0.81	1.00		0.94	1.00		0.78	1.00
Satd. Flow (perm)		1102	1511		1497	1511		1727	1511		1436	1511
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	100	328	33	78	428	89	22	194	67	144	233	144
RTOR Reduction (vph)	0	0	19	0	0	35	0	0	42	0	0	91
Lane Group Flow (vph)	0	428	14	0	506	54	0	216	25	0	377	53
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		22.4	22.4		22.4	22.4		20.2	20.2		20.2	20.2
Effective Green, g (s)		22.4	22.4		22.4	22.4		20.2	20.2		20.2	20.2
Actuated g/C Ratio		0.41	0.41		0.41	0.41		0.37	0.37		0.37	0.37
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		452	619		614	619		638	559		531	559
v/s Ratio Prot												
v/s Ratio Perm		c0.39	0.01		0.34	0.04		0.13	0.02		c0.26	0.04
v/c Ratio		0.95	0.02		0.82	0.09		0.34	0.04		0.71	0.10
Uniform Delay, d1		15.5	9.6		14.3	9.8		12.4	11.0		14.7	11.2
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		29.0	0.0		8.8	0.1		1.4	0.1		7.8	0.3
Delay (s)		44.5	9.6		23.1	9.9		13.8	11.2		22.5	11.6
Level of Service		D	A		C	A		B	B		C	B
Approach Delay (s)		42.0			21.2			13.2			19.5	
Approach LOS		D			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	24.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	54.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	97.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	490	50	50	565	115	90	300	105	250	130	110
Future Volume (vph)	70	490	50	50	565	115	90	300	105	250	130	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		0.99	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.99	1.00		1.00	1.00		0.99	1.00		0.97	1.00
Satd. Flow (prot)		1831	1483		1835	1483		1817	1483		1772	1483
Flt Permitted		0.49	1.00		0.67	1.00		0.58	1.00		0.38	1.00
Satd. Flow (perm)		903	1483		1234	1483		1058	1483		691	1483
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	78	544	56	56	628	128	100	333	117	278	144	122
RTOR Reduction (vph)	0	0	14	0	0	17	0	0	24	0	0	72
Lane Group Flow (vph)	0	622	42	0	684	111	0	433	93	0	422	50
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		59.0	59.0		59.0	59.0		49.0	49.0		49.0	49.0
Effective Green, g (s)		59.0	59.0		59.0	59.0		49.0	49.0		49.0	49.0
Actuated g/C Ratio		0.49	0.49		0.49	0.49		0.41	0.41		0.41	0.41
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		443	729		606	729		432	605		282	605
v/s Ratio Prot												
v/s Ratio Perm		c0.69	0.03		0.55	0.07		0.41	0.06		c0.61	0.03
v/c Ratio		1.40	0.06		1.13	0.15		1.00	0.15		1.50	0.08
Uniform Delay, d1		30.5	16.0		30.5	16.8		35.5	22.4		35.5	21.7
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		195.0	0.0		77.4	0.1		43.9	0.5		241.2	0.3
Delay (s)		225.5	16.0		107.9	16.9		79.4	22.9		276.7	22.0
Level of Service		F	B		F	B		E	C		F	C
Approach Delay (s)		208.2			93.6			67.4			219.6	
Approach LOS		F			F			E			F	

Intersection Summary			
HCM 2000 Control Delay	144.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.44		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	123.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	15	50	10	30	120	60	435	15	65	430	40
Future Volume (Veh/h)	55	15	50	10	30	120	60	435	15	65	430	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	61	17	56	11	33	133	67	483	17	72	478	44
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								48				
pX, platoon unblocked	0.82	0.82		0.82	0.82	0.82				0.82		
vC, conflicting volume	1397	1256	478	1312	1292	492	522			500		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1375	1204	478	1272	1247	277	522			288		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	87	90	87	74	79	94			93		
cM capacity (veh/h)	57	132	587	88	125	628	1044			1051		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2
Volume Total	134	177	567	550	44
Volume Left	61	11	67	72	0
Volume Right	56	133	17	0	44
cSH	104	294	1044	1051	1700
Volume to Capacity	1.29	0.60	0.06	0.07	0.03
Queue Length 95th (m)	68.9	27.2	1.5	1.7	0.0
Control Delay (s)	258.9	34.1	1.7	1.9	0.0
Lane LOS	F	D	A	A	
Approach Delay (s)	258.9	34.1	1.7	1.7	
Approach LOS	F	D			

Intersection Summary			
Average Delay	29.0		
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	40	155	165	370	335	40
Future Volume (Veh/h)	40	155	165	370	335	40
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	44	172	183	411	372	44
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				182		
pX, platoon unblocked	0.92					
vC, conflicting volume	1171	394	416			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1143	394	416			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	74	74	84			
cM capacity (veh/h)	171	655	1143			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	216	594	416
Volume Left	44	183	0
Volume Right	172	0	44
cSH	416	1143	1700
Volume to Capacity	0.52	0.16	0.24
Queue Length 95th (m)	21.8	4.3	0.0
Control Delay (s)	22.6	4.0	0.0
Lane LOS	C	A	
Approach Delay (s)	22.6	4.0	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	5.9		
Intersection Capacity Utilization	70.4%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	45	5	390	80	5	290
Future Volume (Veh/h)	45	5	390	80	5	290
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	50	6	433	89	6	322
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			201			
pX, platoon unblocked						
vC, conflicting volume	812	478			522	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	812	478			522	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	86	99			99	
cM capacity (veh/h)	347	588			1044	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	56	522	328
Volume Left	50	0	6
Volume Right	6	89	0
cSH	363	1700	1044
Volume to Capacity	0.15	0.31	0.01
Queue Length 95th (m)	4.1	0.0	0.1
Control Delay (s)	16.7	0.0	0.2
Lane LOS	C		A
Approach Delay (s)	16.7	0.0	0.2
Approach LOS	C		

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	35.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	25	50	325	265	5
Future Volume (Veh/h)	5	25	50	325	265	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	28	56	361	294	6
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	770	297	300			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	770	297	300			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	96	96			
cM capacity (veh/h)	352	742	1261			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	34	417	300
Volume Left	6	56	0
Volume Right	28	0	6
cSH	621	1261	1700
Volume to Capacity	0.05	0.04	0.18
Queue Length 95th (m)	1.3	1.0	0.0
Control Delay (s)	11.1	1.5	0.0
Lane LOS	B	A	
Approach Delay (s)	11.1	1.5	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	47.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	5	40	25	5	5	45	240	45	10	210	5
Future Volume (vph)	5	5	40	25	5	5	45	240	45	10	210	5
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	6	44	28	6	6	50	267	50	11	233	6

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	56	40	367	250
Volume Left (vph)	6	28	50	11
Volume Right (vph)	44	6	50	6
Hadj (s)	-0.42	0.08	-0.02	0.03
Departure Headway (s)	4.9	5.5	4.4	4.6
Degree Utilization, x	0.08	0.06	0.45	0.32
Capacity (veh/h)	638	578	792	753
Control Delay (s)	8.4	8.8	11.0	9.7
Approach Delay (s)	8.4	8.8	11.0	9.7
Approach LOS	A	A	B	A

Intersection Summary			
Delay	10.2		
Level of Service	B		
Intersection Capacity Utilization	48.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	490	50	50	565	115	90	300	105	250	130	110
Future Volume (vph)	70	490	50	50	565	115	90	300	105	250	130	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00	0.96		1.00	0.96		1.00	0.96		1.00	0.96
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.99	1.00		1.00	1.00		0.99	1.00		0.97	1.00
Satd. Flow (prot)		1830	1509		1834	1509		1818	1509		1775	1509
Flt Permitted		0.57	1.00		0.77	1.00		0.55	1.00		0.38	1.00
Satd. Flow (perm)		1049	1509		1409	1509		1013	1509		695	1509
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	78	544	56	56	628	128	100	333	117	278	144	122
RTOR Reduction (vph)	0	0	29	0	0	34	0	0	49	0	0	81
Lane Group Flow (vph)	0	622	27	0	684	94	0	433	68	0	422	41
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		28.0	28.0		28.0	28.0		20.0	20.0		20.0	20.0
Effective Green, g (s)		28.0	28.0		28.0	28.0		20.0	20.0		20.0	20.0
Actuated g/C Ratio		0.47	0.47		0.47	0.47		0.33	0.33		0.33	0.33
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		489	704		657	704		337	503		231	503
v/s Ratio Prot												
v/s Ratio Perm		c0.59	0.02		0.49	0.06		0.43	0.05		c0.61	0.03
v/c Ratio		1.27	0.04		1.04	0.13		1.28	0.14		1.83	0.08
Uniform Delay, d1		16.0	8.7		16.0	9.1		20.0	14.0		20.0	13.7
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		137.7	0.0		46.2	0.1		148.9	0.6		388.6	0.3
Delay (s)		153.7	8.7		62.2	9.2		168.9	14.5		408.6	14.0
Level of Service		F	A		E	A		F	B		F	B
Approach Delay (s)		141.7			53.9			136.1			320.1	
Approach LOS		F			D			F			F	

Intersection Summary			
HCM 2000 Control Delay	150.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.50		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	123.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	295	30	70	385	80	20	175	60	130	210	130
Future Volume (vph)	90	295	30	70	385	80	20	175	60	130	210	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0		2.0	2.0		6.0	6.0		2.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	0.99		1.00	0.97		1.00	0.96		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1748	1810		1744	1783		1731	1754		1740	1711	
Flt Permitted	0.23	1.00		0.39	1.00		0.54	1.00		0.50	1.00	
Satd. Flow (perm)	426	1810		712	1783		980	1754		920	1711	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	100	328	33	78	428	89	22	194	67	144	233	144
RTOR Reduction (vph)	0	5	0	0	11	0	0	16	0	0	30	0
Lane Group Flow (vph)	100	356	0	78	506	0	22	245	0	144	347	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		pm+pt	NA	
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	23.5	17.3		26.7	20.9		21.3	21.3		29.8	29.8	
Effective Green, g (s)	23.5	17.3		26.7	20.9		21.3	21.3		29.8	29.8	
Actuated g/C Ratio	0.35	0.26		0.40	0.31		0.32	0.32		0.45	0.45	
Clearance Time (s)	2.0	6.0		2.0	2.0		6.0	6.0		2.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	272	468		373	557		312	558		489	762	
v/s Ratio Prot	c0.03	0.20		0.02	c0.28			0.14		0.03	c0.20	
v/s Ratio Perm	0.10			0.07			0.02			0.10		
v/c Ratio	0.37	0.76		0.21	0.91		0.07	0.44		0.29	0.46	
Uniform Delay, d1	16.3	22.9		12.9	22.1		15.9	18.1		11.3	12.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	7.1		0.3	18.6		0.4	2.5		0.3	2.0	
Delay (s)	17.2	30.0		13.2	40.6		16.3	20.6		11.7	14.9	
Level of Service	B	C		B	D		B	C		B	B	
Approach Delay (s)		27.2			37.1			20.2			14.0	
Approach LOS		C			D			C			B	

Intersection Summary			
HCM 2000 Control Delay	25.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	66.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	490	50	50	565	115	90	300	105	250	130	10
Future Volume (vph)	70	490	50	50	565	115	90	300	105	250	130	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	6.0		2.0	2.0		6.0	6.0		2.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.98	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.97		1.00	0.96		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	1808		1750	1781		1712	1749		1750	1816	
Flt Permitted	0.11	1.00		0.19	1.00		0.66	1.00		0.17	1.00	
Satd. Flow (perm)	196	1808		346	1781		1187	1749		307	1816	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	78	544	56	56	628	128	100	333	117	278	144	11
RTOR Reduction (vph)	0	4	0	0	7	0	0	12	0	0	3	0
Lane Group Flow (vph)	78	596	0	56	749	0	100	438	0	278	152	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		pm+pt	NA	
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	43.9	37.6		46.9	41.1		27.1	27.1		40.1	40.1	
Effective Green, g (s)	43.9	37.6		46.9	41.1		27.1	27.1		40.1	40.1	
Actuated g/C Ratio	0.45	0.39		0.48	0.42		0.28	0.28		0.41	0.41	
Clearance Time (s)	2.0	6.0		2.0	2.0		6.0	6.0		2.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	188	697		249	750		329	486		289	746	
v/s Ratio Prot	c0.03	0.33		0.01	c0.42			c0.25		c0.11	0.08	
v/s Ratio Perm	0.16			0.09			0.08			0.29		
v/c Ratio	0.41	0.86		0.22	1.00		0.30	0.90		0.96	0.20	
Uniform Delay, d1	21.5	27.5		16.6	28.2		27.8	33.9		22.9	18.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.5	10.1		0.5	32.3		2.4	22.4		42.4	0.6	
Delay (s)	23.0	37.5		17.1	60.5		30.1	56.3		65.3	19.1	
Level of Service	C	D		B	E		C	E		E	B	
Approach Delay (s)		35.8			57.5			51.5			48.7	
Approach LOS		D			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	48.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	97.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	92.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Appendix H:
Future Signal Warrants

8-HOUR TRAFFIC SIGNAL WARRANT

C.C. Tatham & Associates Ltd. Consulting Engineers

Project & No.: Church Street North Transportation Review 116057

GENERAL INFORMATION

Analyst	Stefan Hajgato	**Jurisdiction/Area**	Alliston
Agency or Company	CCTA	**East-West Street**	Dominion Street
Analysis Period	2036 Forecast	**North-South Street**	Church Street North
Flow Conditions	Restricted flow (urban)	**Major Street**	North-South
T Intersection	No	**Approach Lanes per Direction**	1
		Hours of Traffic Volume Data	AM & PM peaks only

Date 20 Jun 2016

Additional Comments

TRAFFIC & PEDESTRIAN VOLUMES

Hour of Data	AM Peak							PM Peak	AM + PM
Hour Ending	**800**							**1800**	**4**
MAJOR STREET									
Northbound right	20							15	**9**
thru	300							435	**184**
left	35							60	**24**
Southbound right	35							40	**19**
thru	430							430	**215**
left	45							65	**28**
MINOR STREET									
Eastbound right	30							50	**20**
thru	5							15	**5**
left	15							55	**18**
Westbound right	75							120	**49**
thru	10							30	**10**
left	5							10	**4**
PEDESTRIANS									
crossing MAJOR street	4							25	**7**
crossing MINOR street	2							10	**3**
APPROACH VOLUMES									
major	865							1045	478
minor	140							280	105
TOTAL	1005							1325	583
CROSSING VOLUMES									
TOTAL	34							120	39
note 1	20							65	
note 2	10							30	
note 3	0							0	
3a	no							no	
3b	no							no	
note 4	4							25	

NOTES

Traffic crossing MAJOR street defined as:

note 1: Left turns from both minor street approaches
note 2: The heaviest through volume from the minor street
note 3: 50% of the heavier left turn movement from the major street when both of the following are met:
3a: the left turn volume > 120
3b: the left turn volume + opposing volume > 720
note 4: Pedestrians crossing the major street

ACCIDENT HISTORY

Reportable accidents over the past 36 months susceptible to correction by a traffic signal.

months 1 to 12	-
months 13 to 24	1
months 25 to 36	1

8-HOUR TRAFFIC SIGNAL WARRANT

Project & No.: Church Street North Transportation Review 116057

GENERAL INFORMATION

Analyst	Stefan Hajgato	**Jurisdiction/Area**	Alliston **Date** 20 Jun 2016
Agency or Company	CCTA	**East-West Street**	Dominion Street
Analysis Period	2036 Forecast	**North-South Street**	Church Street North
Flow Conditions	Restricted flow (urban)	**Major Street**	Church Street North
T Intersection	No	**Approach Lanes per Direction**	1
		Hours of Traffic Volume Data	AM & PM peaks only
Additional Comments			

JUSTIFICATION 1 - MINIMUM VEHICLE VOLUME

JUSTIFICATION	GUIDANCE	HOUR ENDING								No. of hours with compliance		
		AM Peak	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	PM Peak			
1A	TOTAL TRAFFIC VOLUME ENTERING INTERSECTION (vph) (2 way Total)	**1005**	**583**	**583**	**583**	**583**	**583**	**583**	**1325**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 720 (1 lane approach on main road) OR VOL x 100 / 900 (2 or more lane approach on main road)	100%	81%	81%	81%	81%	81%	81%	100%	2	8	86%
1B	TRAFFIC VOLUME ON MINOR STREET (vph) (2 way Total)	**140**	**105**	**105**	**105**	**105**	**105**	**105**	**280**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 170 (full intersection) OR VOL x 100 / 255 (tee intersection)	82%	62%	62%	62%	62%	62%	62%	100%	1	2	69%

(RESTRICTED FLOW)	**BOTH 1A AND 1B 100% FULFILLED EACH OF 8 HOURS**	**NO**
SIGNAL JUSTIFICATION 1:	**LESSER OF 1A OR 1B AT LEAST 80% FULFILLED EACH OF 8 HOURS**	**NO**

JUSTIFICATION 2 - DELAY TO CROSS TRAFFIC

JUSTIFICATION	GUIDANCE	HOUR ENDING								No. of hours with compliance		
		Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8			
2A	MAIN ROAD TRAFFIC VOLUME (vph) (2 way Total)	**865**	**478**	**478**	**478**	**478**	**478**	**478**	**1045**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 720 (1 lane approach on main road) OR VOL x 100 / 900 (2 or more lane approach on main road)	100%	66%	66%	66%	66%	66%	66%	100%	2	2	75%
2B	CROSSING TRAFFIC VOLUME (vph) (2 way Total)	**34**	**39**	**39**	**39**	**39**	**39**	**39**	**120**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 75	45%	51%	51%	51%	51%	51%	51%	100%	1	1	57%

(RESTRICTED FLOW)	**BOTH 2A AND 2B 100% FULFILLED EACH OF 8 HOURS**	**NO**
SIGNAL JUSTIFICATION 2:	**LESSER OF 2A OR 2B AT LEAST 80% FULFILLED EACH OF 8 HOURS**	**NO**

JUSTIFICATION 3 - COLLISION EXPERIENCE

	Preceding Months	Number of Collisions	% Fulfillment
A. Number of reportable collisions susceptible to prevention by a traffic signal.	1 - 12	-	-
	13 - 24	1	0%
	25 - 36	1	0%
	annual average	-	-
B. Adequate trial of less restrictive remedies has failed to reduce collision frequency.	☐ YES	☐ NO	n/a
C. Either Justification 1 (Minimum Vehicular Volume) or Justification 2 (Delay to Cross Traffic) satisfied to 80% or more.	☐ YES	☐ NO	n/a
SIGNAL JUSTIFICATION 3: **ALL OF 3A, 3B & 3C FULFILLED TO 100%?**	**NO**		

JUSTIFICATION 4 - COMBINATION JUSTIFICATION

JUSTIFICATION SATISFIED 80% OR MORE				Two Justifications Satisfied 80% or more
Justification 1	-	Minimum Vehicle Volume	NO	**NO**
Justification 2	-	Delay to Cross Traffic	NO	
Justification 3	-	Collision Experience	-	

JUSTIFICATION SUMMARY

ARE TRAFFFIC SIGNALS JUSTIFIED FOR THE INTERSECTION IN QUESTION?	**NO**

8-HOUR TRAFFIC SIGNAL WARRANT

C.C. Tatham & Associates Ltd.
Consulting Engineers

Project & No.: Church Street North Transportation Review 116057

GENERAL INFORMATION

Analyst	Stefan Hajgato	**Jurisdiction/Area**	Alliston	**Date**	20 Jun 2016
Agency or Company	CCTA	**East-West Street**	Fletcher Crescent		
Analysis Period	2036 Forecast	**North-South Street**	Church Street North		
Flow Conditions	Restricted flow (urban)	**Major Street**	North-South		
T Intersection	Yes	**Approach Lanes per Direction**	1		
		Hours of Traffic Volume Data	AM & PM peaks only		

Additional Comments

TRAFFIC & PEDESTRIAN VOLUMES

Hour of Data	AM Peak						PM Peak	AM + PM
Hour Ending								4
MAJOR STREET								
Northbound right								**0**
thru	265						370	**159**
left	140						165	**76**
Southbound right								**0**
thru	390						335	**181**
left	45						40	**21**
MINOR STREET								
Eastbound right	120						155	**69**
thru								**0**
left	35						40	**19**
Westbound right								**0**
thru								**0**
left								**0**
PEDESTRIANS								
crossing MAJOR street	5						5	**3**
crossing MINOR street	20						45	**16**
APPROACH VOLUMES								
major	840						910	438
minor	155						195	88
TOTAL	995						1105	525
CROSSING VOLUMES								
TOTAL	40						45	21
note 1	35						40	
note 2	0						0	
note 3	0						0	
3a	yes						yes	
3b	no						no	
note 4	5						5	

NOTES

Traffic crossing MAJOR street defined as:

note 1: Left turns from both minor street approaches
note 2: The heaviest through volume from the minor street
note 3: 50% of the heavier left turn movement from the major street when both of the following are met:
3a: the left turn volume > 120
3b: the left turn volume + opposing volume > 720
note 4: Pedestrians crossing the major street

ACCIDENT HISTORY

Reportable accidents over the past 36 months susceptible to correction by a traffic signal.	months 1 to 12	0
	months 13 to 24	0
	months 25 to 36	0

C.C. Tatham & Associates Ltd.
Consulting Engineers

8-HOUR TRAFFIC SIGNAL WARRANT

Project & No.: Church Street North Transportation Review 116057

GENERAL INFORMATION

Analyst	Stefan Hajgato	**Jurisdiction/Area**	Alliston
		Date	20 Jun 2016
Agency or Company	CCTA	**East-West Street**	Fletcher Crescent
Analysis Period	2036 Forecast	**North-South Street**	Church Street North
Flow Conditions	Restricted flow (urban)	**Major Street**	Church Street North
T Intersection	Yes	**Approach Lanes per Direction**	1
		Hours of Traffic Volume Data	AM & PM peaks only
Additional Comments			

JUSTIFICATION 1 - MINIMUM VEHICLE VOLUME

JUSTIFICATION	GUIDANCE	HOUR ENDING: AM Peak	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	PM Peak	No. of hours with compliance: 100%	80%+	
1A	TOTAL TRAFFIC VOLUME ENTERING INTERSECTION (vph) (2 way Total)	**995**	**525**	**525**	**525**	**525**	**525**	**525**	**1105**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 720 (1 lane approach on main road) OR VOL x 100 / 900 (2 or more lane approach on main road)	100%	73%	73%	73%	73%	73%	73%	100%	2	2	80%
1B	TRAFFIC VOLUME ON MINOR STREET (vph) (2 way Total)	**155**	**88**	**88**	**88**	**88**	**88**	**88**	**195**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 170 (full intersection) OR VOL x 100 / 255 (tee intersection)	61%	34%	34%	34%	34%	34%	34%	76%	0	0	43%

(RESTRICTED FLOW)	**BOTH 1A AND 1B 100% FULFILLED EACH OF 8 HOURS**	**NO**
SIGNAL JUSTIFICATION 1:	**LESSER OF 1A OR 1B AT LEAST 80% FULFILLED EACH OF 8 HOURS**	**NO**

JUSTIFICATION 2 - DELAY TO CROSS TRAFFIC

JUSTIFICATION	GUIDANCE	HOUR ENDING: Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	No. of hours with compliance: 100%	80%+	
2A	MAIN ROAD TRAFFIC VOLUME (vph) (2 way Total)	**840**	**438**	**438**	**438**	**438**	**438**	**438**	**910**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 720 (1 lane approach on main road) OR VOL x 100 / 900 (2 or more lane approach on main road)	100%	61%	61%	61%	61%	61%	61%	100%	2	2	71%
2B	CROSSING TRAFFIC VOLUME (vph) (2 way Total)	**40**	**21**	**21**	**21**	**21**	**21**	**21**	**45**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 75	53%	28%	28%	28%	28%	28%	28%	60%	0	0	35%

(RESTRICTED FLOW)	**BOTH 2A AND 2B 100% FULFILLED EACH OF 8 HOURS**	**NO**
SIGNAL JUSTIFICATION 2:	**LESSER OF 2A OR 2B AT LEAST 80% FULFILLED EACH OF 8 HOURS**	**NO**

JUSTIFICATION 3 - COLLISION EXPERIENCE

	Preceding Months	Number of Collisions	% Fulfillment
A. Number of reportable collisions susceptible to prevention by a traffic signal.	1 - 12	0	0%
	13 - 24	0	0%
	25 - 36	0	0%
	annual average	0.00	0%
B. Adequate trial of less restrictive remedies has failed to reduce collision frequency.	☐ YES	☑ NO	0%
C. Either Justification 1 (Minimum Vehicular Volume) or Justification 2 (Delay to Cross Traffic) satisfied to 80% or more.	☐ YES	☑ NO	0%
SIGNAL JUSTIFICATION 3:	**ALL OF 3A, 3B & 3C FULFILLED TO 100%?**	**NO**	

JUSTIFICATION 4 - COMBINATION JUSTIFICATION

JUSTIFICATION SATISFIED 80% OR MORE				Two Justifications Satisfied 80% or more
Justification 1	-	Minimum Vehicle Volume	NO	**NO**
Justification 2	-	Delay to Cross Traffic	NO	
Justification 3	-	Collision Experience	NO	

JUSTIFICATION SUMMARY

ARE TRAFFFIC SIGNALS JUSTIFIED FOR THE INTERSECTION IN QUESTION?	**NO**

C.C. Tatham & Associates Ltd. Consulting Engineers

8-HOUR TRAFFIC SIGNAL WARRANT

Project & No.: Church Street North Transportation Review 116057

GENERAL INFORMATION

Analyst	Stefan Hajgato	**Jurisdiction/Area**	Alliston
Agency or Company	CCTA	**East-West Street**	Realigned Fletcher Crescent and Evans Road
Analysis Period	2036 Forecast	**North-South Street**	Church Street North
Flow Conditions	Restricted flow (urban)	**Major Street**	North-South
T Intersection	Yes	**Approach Lanes per Direction**	1
		Hours of Traffic Volume Data	AM & PM peaks only

Date 04 Jul 2016

Additional Comments Assumed 2% growth rate annually over 20 years and added forecasted hospital volumes

TRAFFIC & PEDESTRIAN VOLUMES

Hour of Data		AM Peak							PM Peak	AM + PM
Hour Ending		900							1600	4
MAJOR STREET										
Northbound	right	53							73	**32**
	thru	212							297	**127**
	left	140							165	**76**
Southbound	right	39							35	**19**
	thru	341							255	**149**
	left	5							5	**3**
MINOR STREET										
Eastbound	right	120							155	**69**
	thru	7							7	**3**
	left	28							33	**15**
Westbound	right	5							5	**3**
	thru	6							5	**3**
	left	49							40	**22**
PEDESTRIANS										
	crossing MAJOR street	5							5	**3**
	crossing MINOR street	20							45	**16**
APPROACH VOLUMES										
	major	790							830	405
	minor	215							245	115
	TOTAL	1005							1075	520
CROSSING VOLUMES										
	TOTAL	89							85	44
	note 1	77							73	
	note 2	7							7	
	note 3	0							0	
	3a	yes							yes	
	3b	no							no	
	note 4	5							5	

NOTES

Traffic crossing MAJOR street defined as:

note 1: Left turns from both minor street approaches
note 2: The heaviest through volume from the minor street
note 3: 50% of the heavier left turn movement from the major street when both of the following are met:
3a: the left turn volume > 120
3b: the left turn volume + opposing volume > 720
note 4: Pedestrians crossing the major street

ACCIDENT HISTORY

Reportable accidents over the past 36 months susceptible to correction by a traffic signal.

months 1 to 12	0
months 13 to 24	0
months 25 to 36	0

C.C. Tatham & Associates Ltd.
Consulting Engineers

8-HOUR TRAFFIC SIGNAL WARRANT

Project & No.: Church Street North Transportation Review 116057

GENERAL INFORMATION

Analyst	Stefan Hajgato	**Jurisdiction/Area**	Alliston	**Date**	04 Jul 2016
Agency or Company	CCTA	**East-West Street**	Realigned Fletcher Crescent and Evans Road		
Analysis Period	2036 Forecast	**North-South Street**	Church Street North		
Flow Conditions	Restricted flow (urban)	**Major Street**	Church Street North		
T Intersection	Yes	**Approach Lanes per Direction**	1		
		Hours of Traffic Volume Data	AM & PM peaks only		
Additional Comments	Assumed 2% growth rate annually over 20 years and added forecasted hospital volumes				

JUSTIFICATION 1 - MINIMUM VEHICLE VOLUME

JUSTIFICATION	GUIDANCE	HOUR ENDING								No. of hours with compliance		
		AM Peak	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	PM Peak			
1A	TOTAL TRAFFIC VOLUME ENTERING INTERSECTION (vph) (2 way Total)	**1005**	**520**	**520**	**520**	**520**	**520**	**520**	**1075**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 720 (1 lane approach on main road) OR VOL x 100 / 900 (2 or more lane approach on main road)	100%	72%	72%	72%	72%	72%	72%	100%	2	2	79%
1B	TRAFFIC VOLUME ON MINOR STREET (vph) (2 way Total)	**215**	**115**	**115**	**115**	**115**	**115**	**115**	**245**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 170 (full intersection) OR VOL x 100 / 255 (tee intersection)	84%	45%	45%	45%	45%	45%	45%	96%	0	2	56%

(RESTRICTED FLOW)	**BOTH 1A AND 1B 100% FULFILLED EACH OF 8 HOURS**	**NO**
SIGNAL JUSTIFICATION 1:	**LESSER OF 1A OR 1B AT LEAST 80% FULFILLED EACH OF 8 HOURS**	**NO**

JUSTIFICATION 2 - DELAY TO CROSS TRAFFIC

JUSTIFICATION	GUIDANCE	HOUR ENDING								No. of hours with compliance		
		Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8			
2A	MAIN ROAD TRAFFIC VOLUME (vph) (2 way Total)	**790**	**405**	**405**	**405**	**405**	**405**	**405**	**830**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 720 (1 lane approach on main road) OR VOL x 100 / 900 (2 or more lane approach on main road)	100%	56%	56%	56%	56%	56%	56%	100%	2	2	67%
2B	CROSSING TRAFFIC VOLUME (vph) (2 way Total)	**89**	**44**	**44**	**44**	**44**	**44**	**44**	**85**	100%	80%+	Average Compliance
	COMPLIANCE % VOL x 100 / 75	100%	58%	58%	58%	58%	58%	58%	100%	2	2	69%

(RESTRICTED FLOW)	**BOTH 2A AND 2B 100% FULFILLED EACH OF 8 HOURS**	**NO**
SIGNAL JUSTIFICATION 2:	**LESSER OF 2A OR 2B AT LEAST 80% FULFILLED EACH OF 8 HOURS**	**NO**

JUSTIFICATION 3 - COLLISION EXPERIENCE

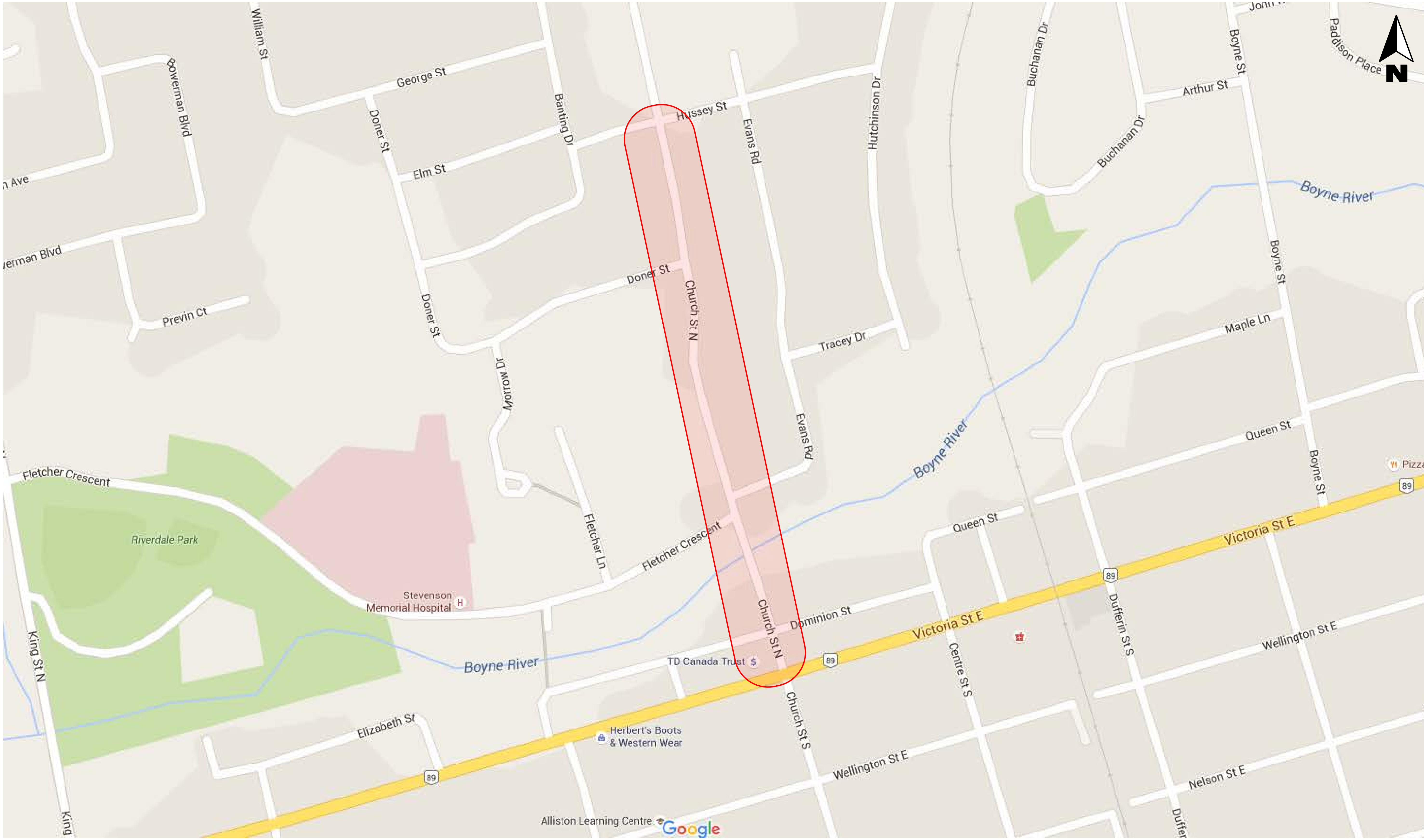
	Preceding Months	Number of Collisions	% Fulfillment
A. Number of reportable collisions susceptible to prevention by a traffic signal.	1 - 12	0	0%
	13 - 24	0	0%
	25 - 36	0	0%
	annual average	0.00	0%
B. Adequate trial of less restrictive remedies has failed to reduce collision frequency.	☐ YES	☑ NO	0%
C. Either Justification 1 (Minimum Vehicular Volume) or Justification 2 (Delay to Cross Traffic) satisfied to 80% or more.	☐ YES	☑ NO	0%
SIGNAL JUSTIFICATION 3: **ALL OF 3A, 3B & 3C FULFILLED TO 100%?**	**NO**		

JUSTIFICATION 4 - COMBINATION JUSTIFICATION

JUSTIFICATION SATISFIED 80% OR MORE				Two Justifications Satisfied 80% or more
Justification 1	-	Minimum Vehicle Volume	NO	**NO**
Justification 2	-	Delay to Cross Traffic	NO	
Justification 3	-	Collision Experience	NO	

JUSTIFICATION SUMMARY

ARE TRAFFFIC SIGNALS JUSTIFIED FOR THE INTERSECTION IN QUESTION?	**NO**



C.C. Tatham & Associates Ltd.
Consulting Engineers

Church Street North Transportation Review

Study Area

Figure

1

source: Simcoe Maps, Google Street View

Church St. N at Victoria St. looking north

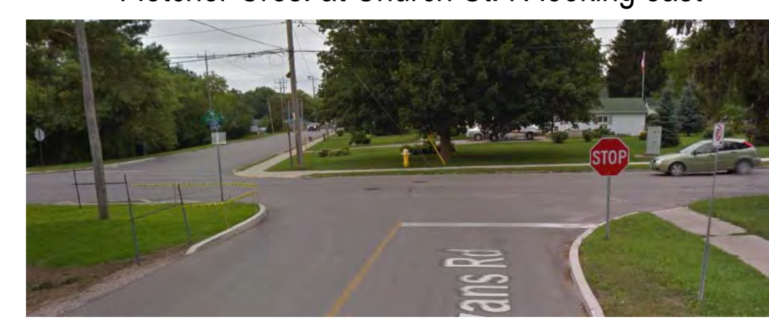
Victoria St. at Church St. N looking East

Church St. N at Dominion St. looking south

Dominion St. at Church St. N looking west

Church St. N at Fletcher Cres. and Evans Rd. looking north

Fletcher Cres. at Church St. N looking east

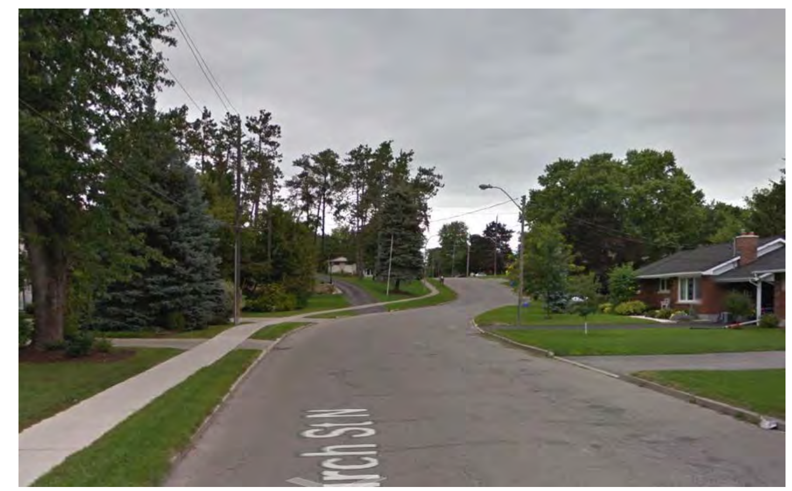


Evans Rd. at Church St. N looking west

source: Simcoe Maps, Google Street View

Church St. N at Doner St. looking south

Doner St. at Church St. N looking east



Church St. N south of Doner St. looking north at reverse bend

Church St. N at Doner St. looking south at reverse bend

Church St. N at Hussey St. looking north

Hussey St. at Church St. N looking east

source: Simcoe Maps, Google Street View

Looking south into the reverse curve from Doner Street

Looking north into the reverse curve

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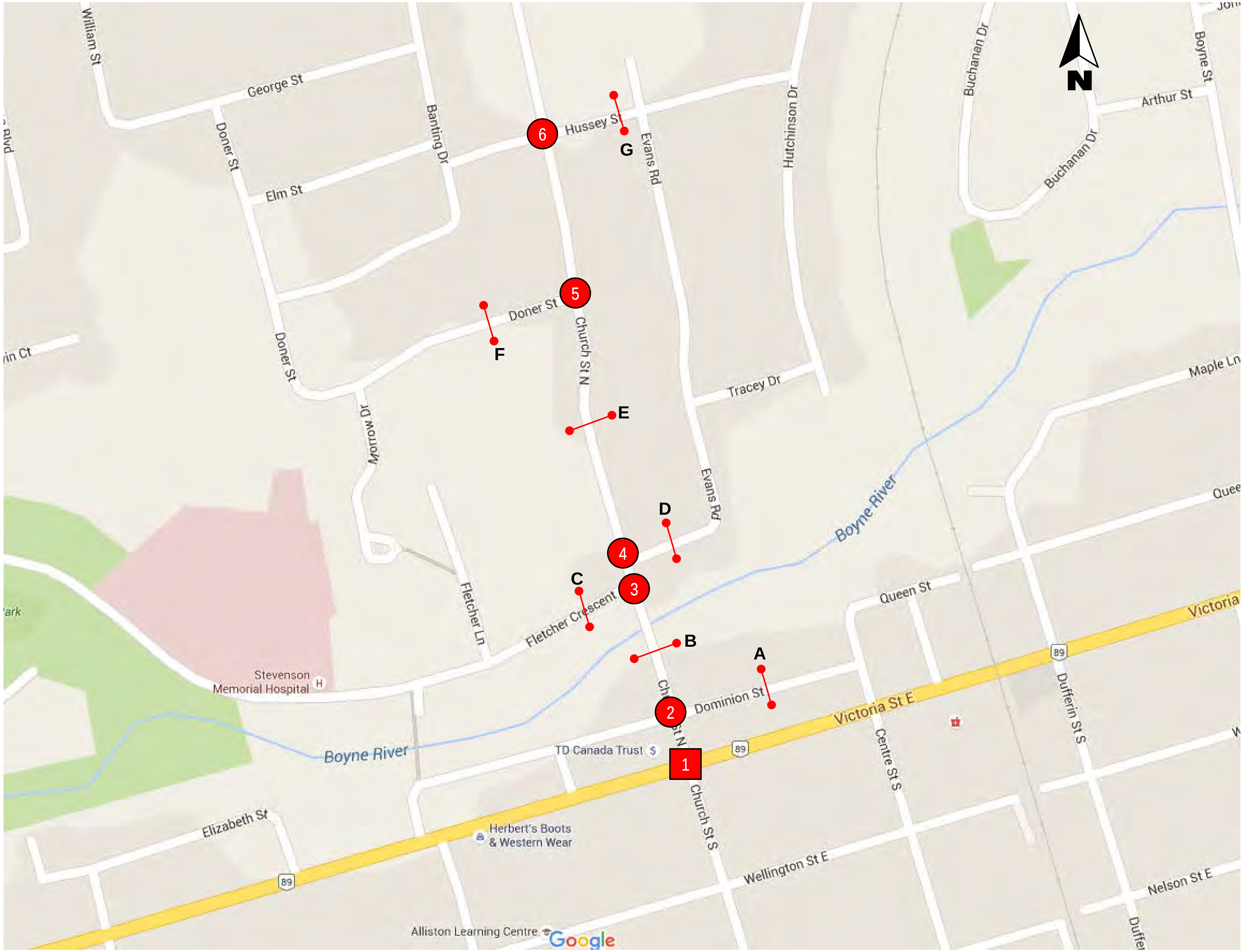
Church Street North Transportation Review

Reverse Curve

Figure
3

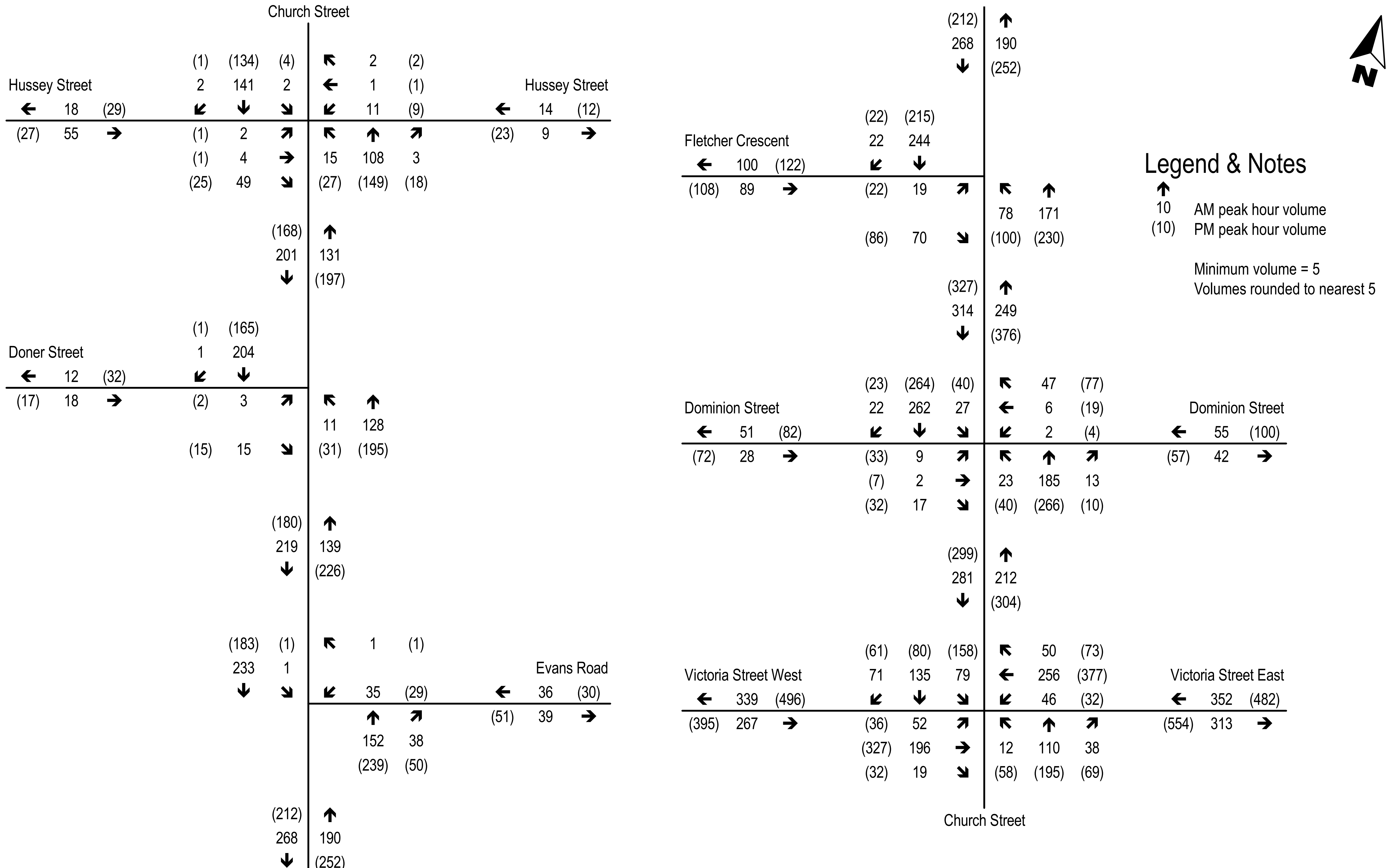


Intersections

1. Church Street North and Victoria Street
2. Church Street North and Dominion Street
3. Church Street North and Fletcher Crescent
4. Church Street North and Evans Road
5. Church Street North and Doner Street
6. Church Street North and Hussey Street

Traffic Count

- Intersection Count – unsignalized intersection
- Intersection Count – unsignalized intersection
- Automatic Traffic Recorder (ATR) count



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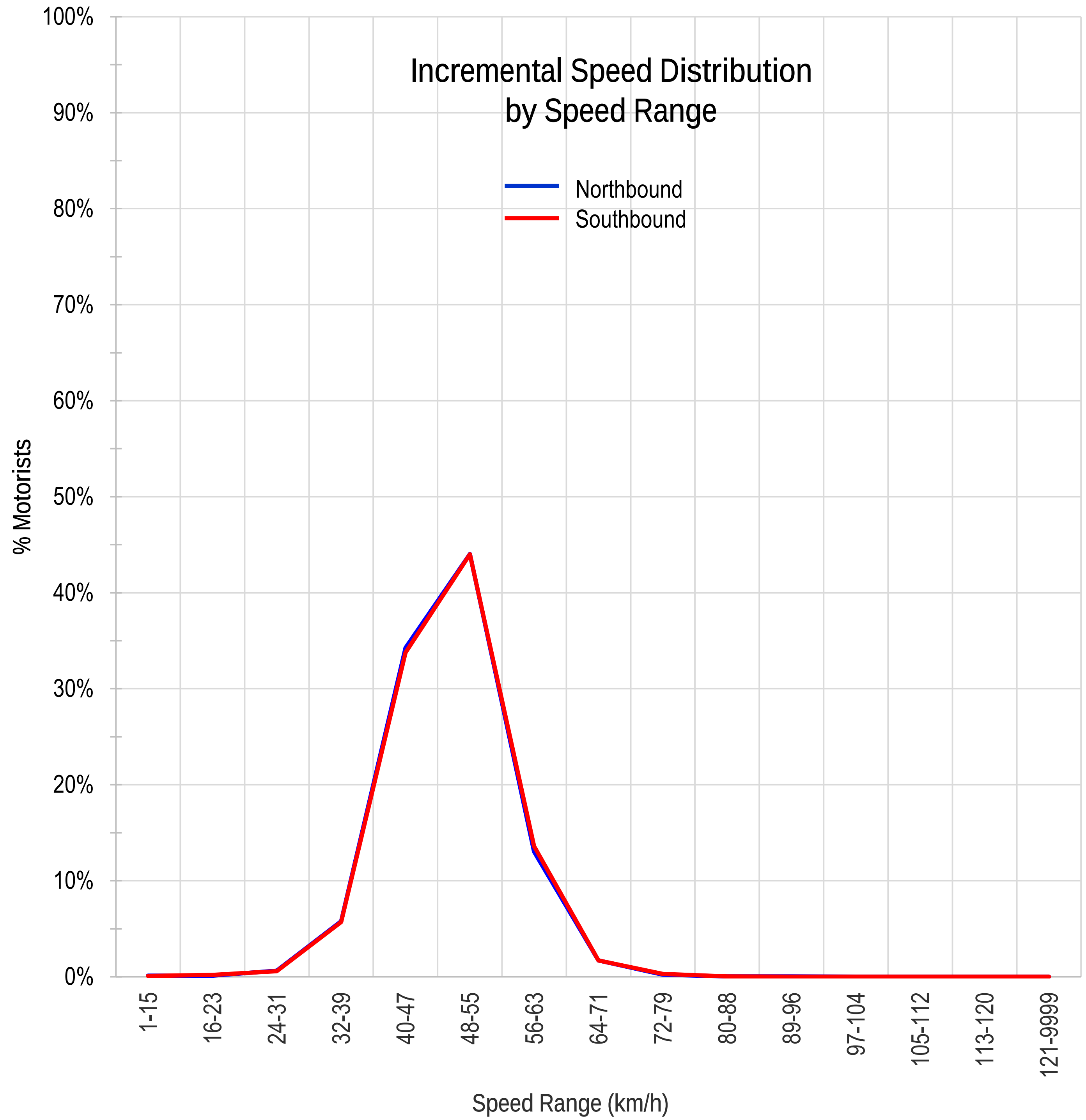
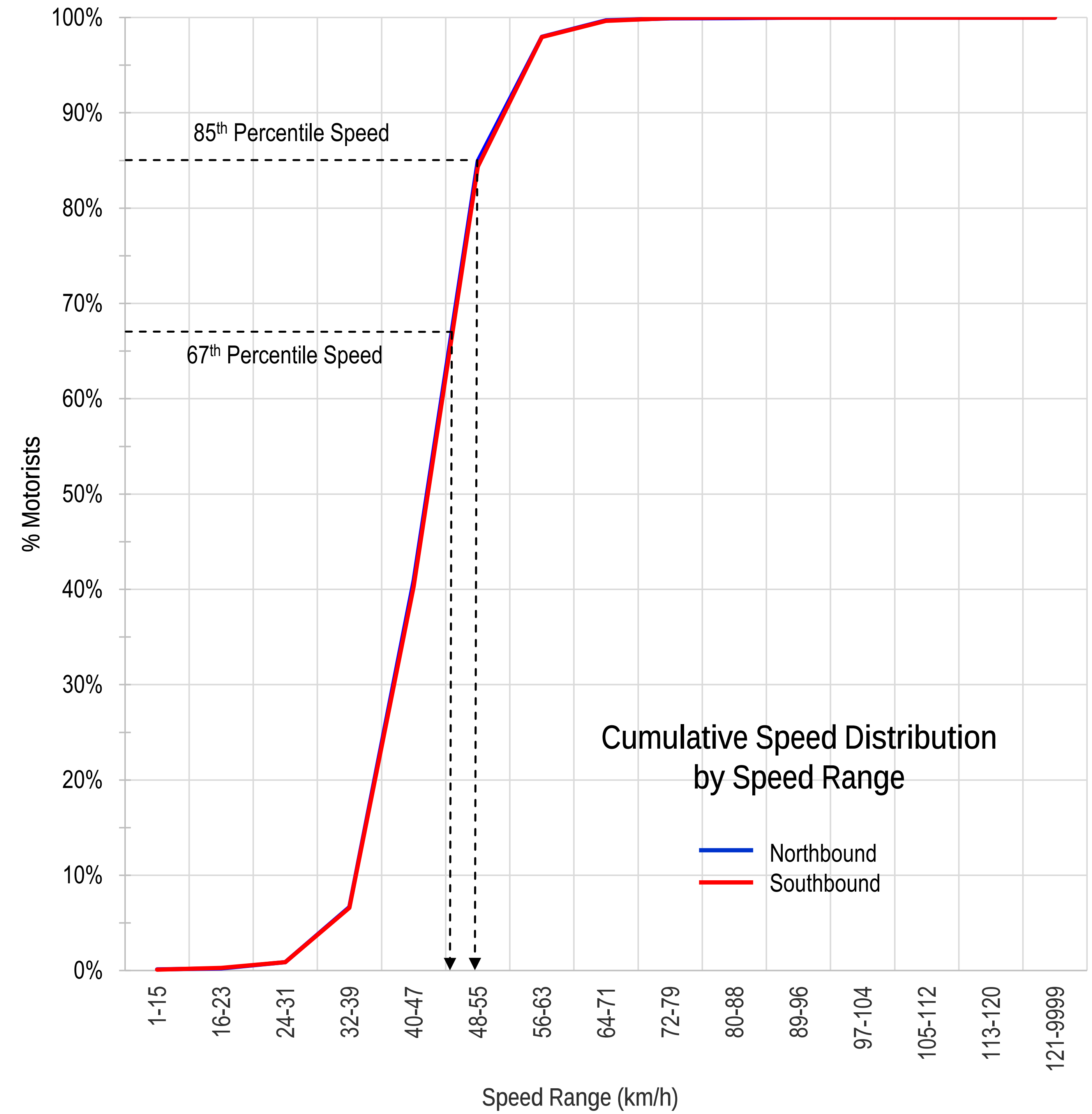
Church Street North Transportation Review

2016 Traffic Volumes

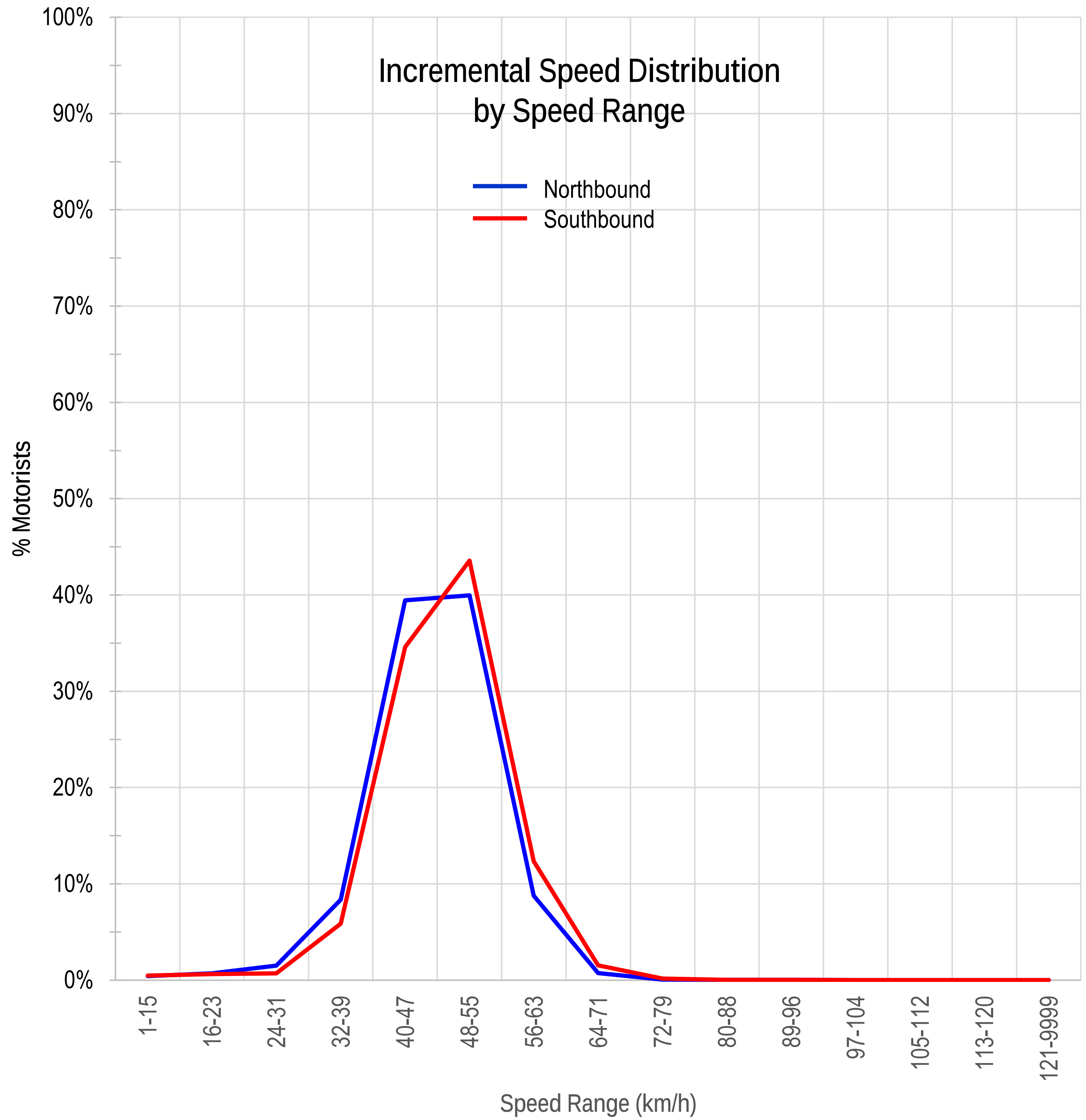
Figure 5

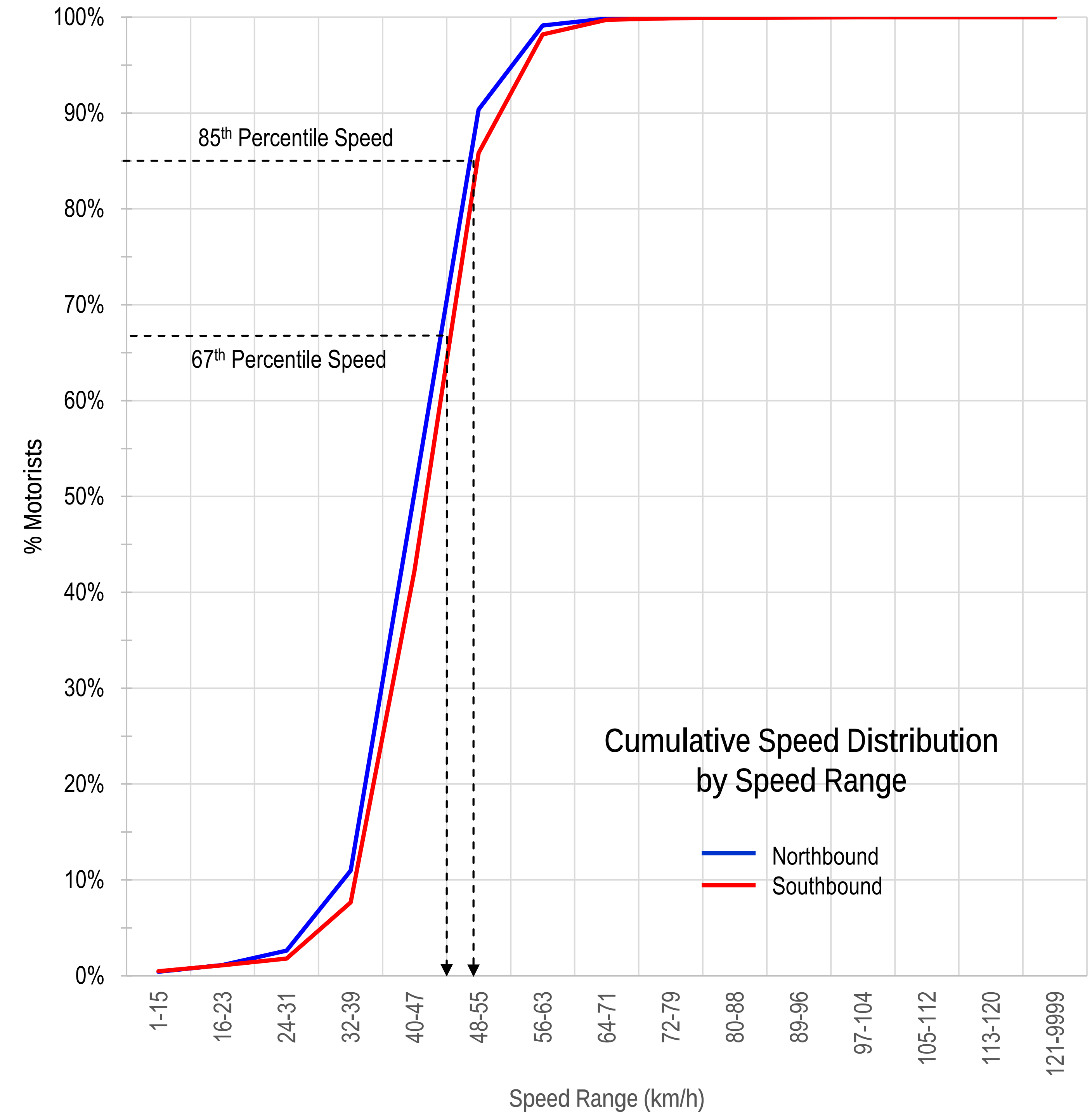
Location: south of Fletcher Crescent
Count Period: May 24-30, 2016

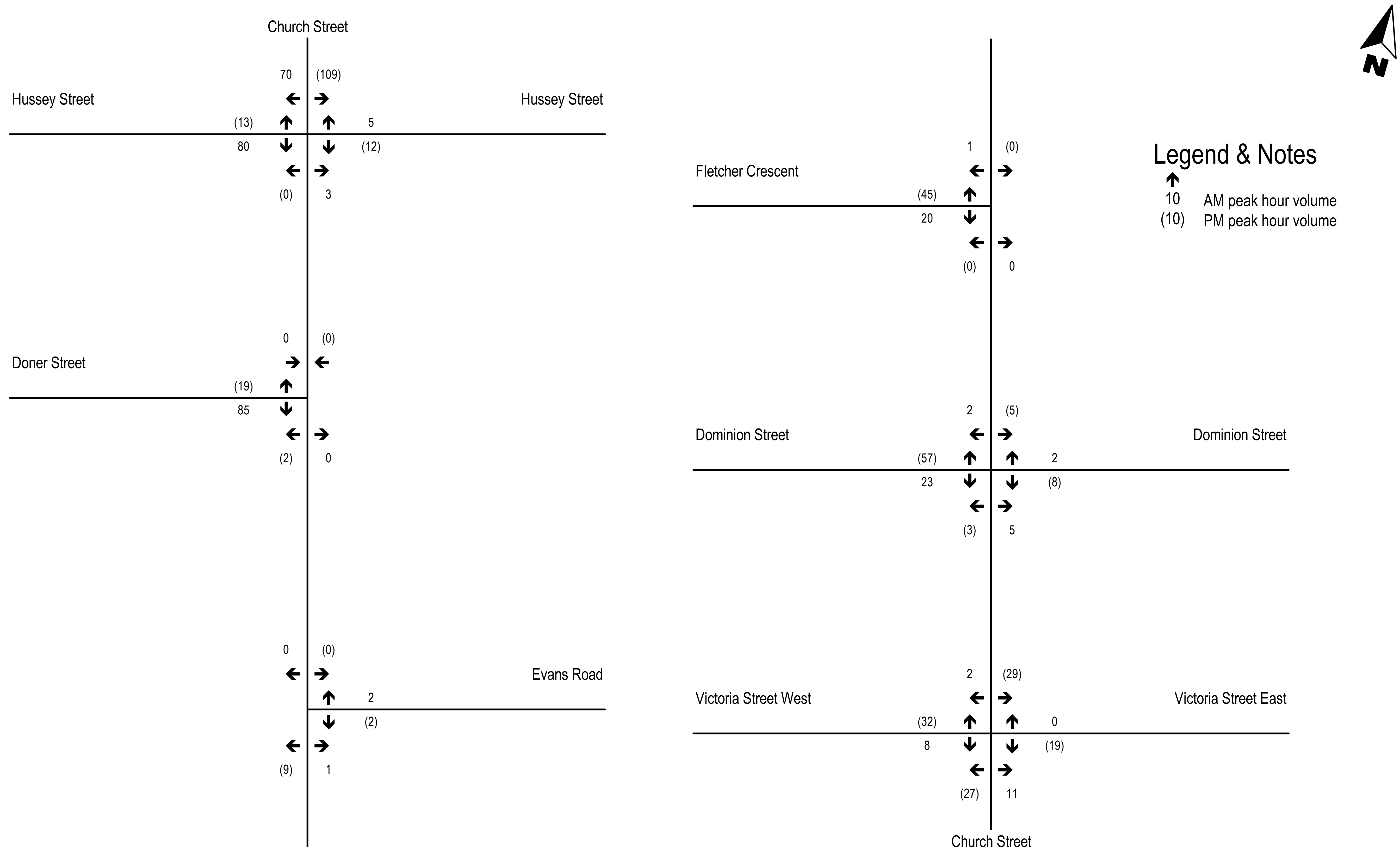




Location: south of Doner Street (within reverse curve)
Count Period: May 24-30, 2016






Church Street
Hussey Street
Hussey Street
70
(109)
(13)
5
80
(12)
(0)
3
Doner Street
0
(0)
(19)
85
(2)
0
Evans Road
0
(0)
2
(2)
(9)
1
Fletcher Crescent
1
(0)
(45)
20
(0)
0
Legend & Notes
10 AM peak hour volume
(10) PM peak hour volume
Dominion Street
Dominion Street
2
(5)
(57)
2
23
(8)
(3)
5
Victoria Street West
Victoria Street East
2
(29)
(32)
0
8
(19)
(27)
11
Church Street

1. Street furniture in clear zone

2. Reduced sidewalk width around hydro pole

3. Stop sign on Dominion Street in clear zone (<0.5m from EOP) and improper installation

4. Sidewalk discontinuous across commercial driveway

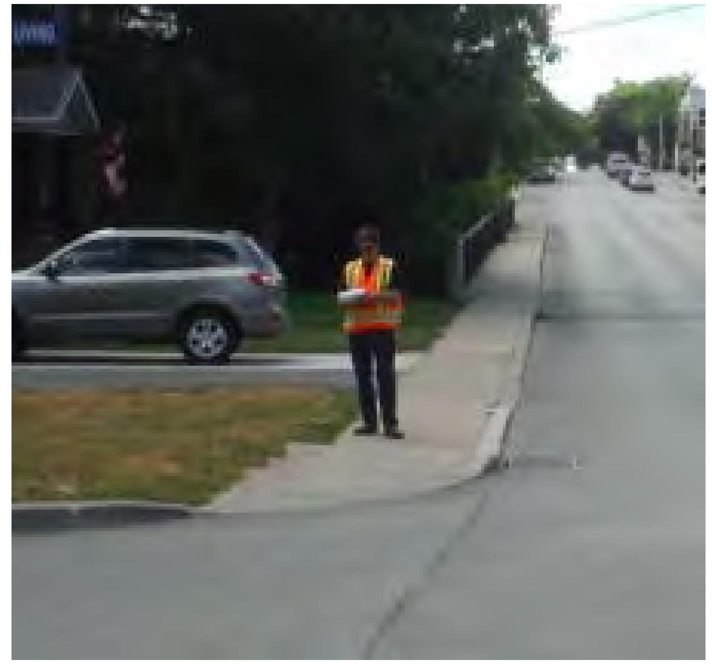
5. Sidewalk discontinuous across commercial driveway

6. Sidewalk discontinuous across commercial driveway

7. Missing No Parking signs

8. No guiderail end treatments at the bridge corners

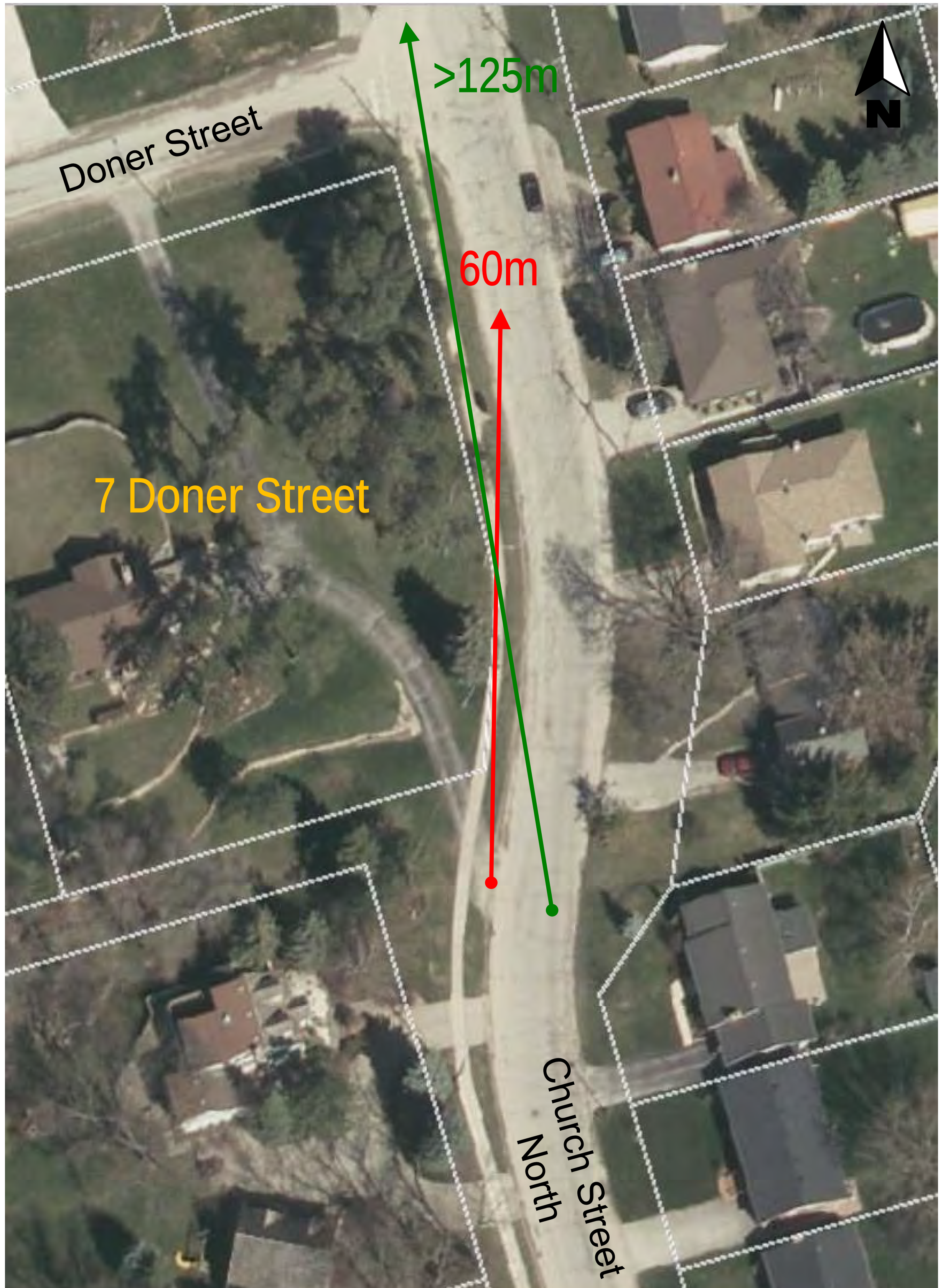

9. Substandard end treatment on bridge


10. Inconsistent and deficient sidewalk width


11. No sidewalk extension on the west side of Church Street to match N-S sidewalk; sidewalk does not align with the east sidewalk on Church Street.


12. Vehicles parked at mailbox could obstruct sightlines (relocated mailbox)

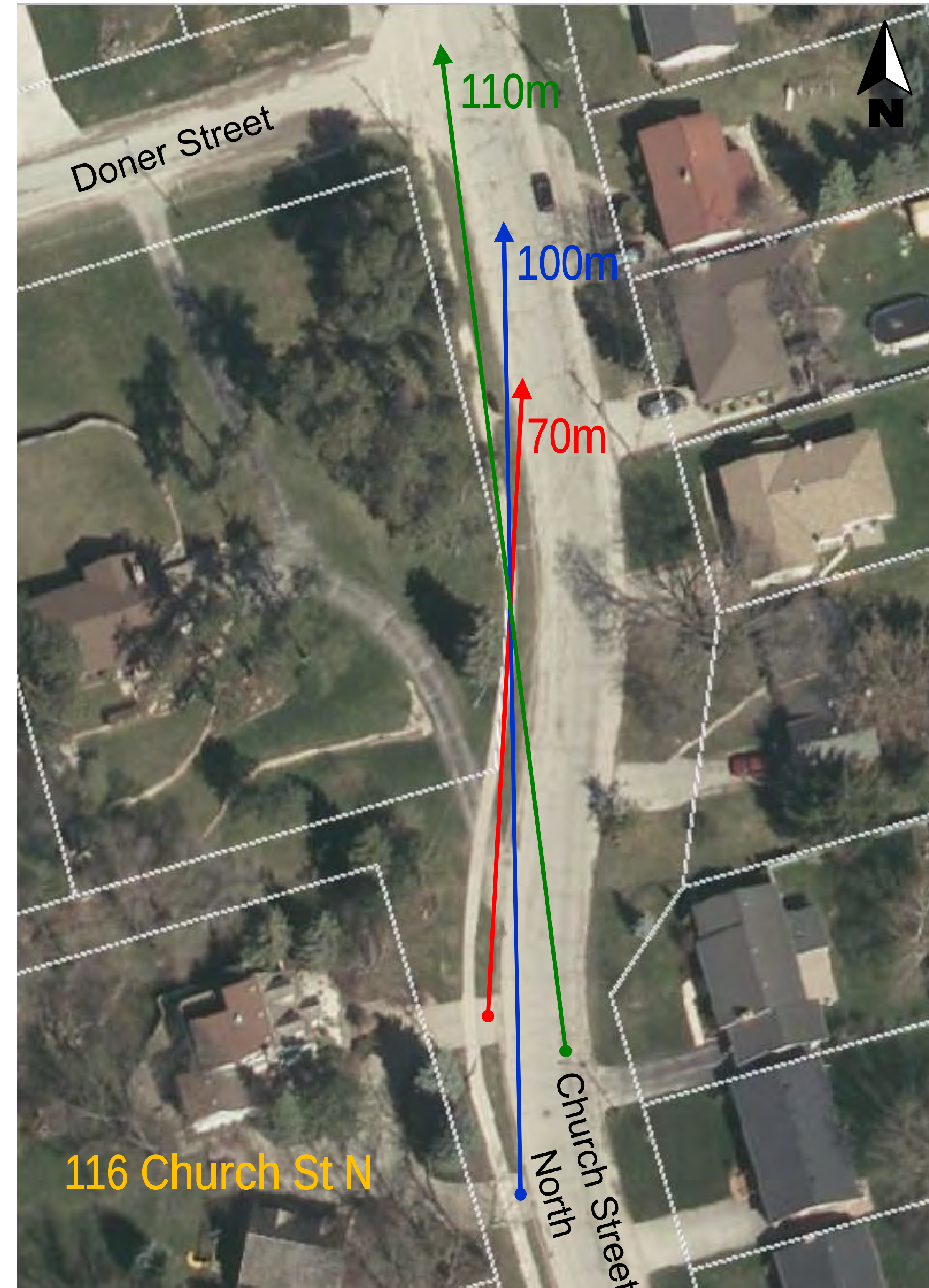

13. Obstructions are within the line of sight for vehicles approaching at Doner St.



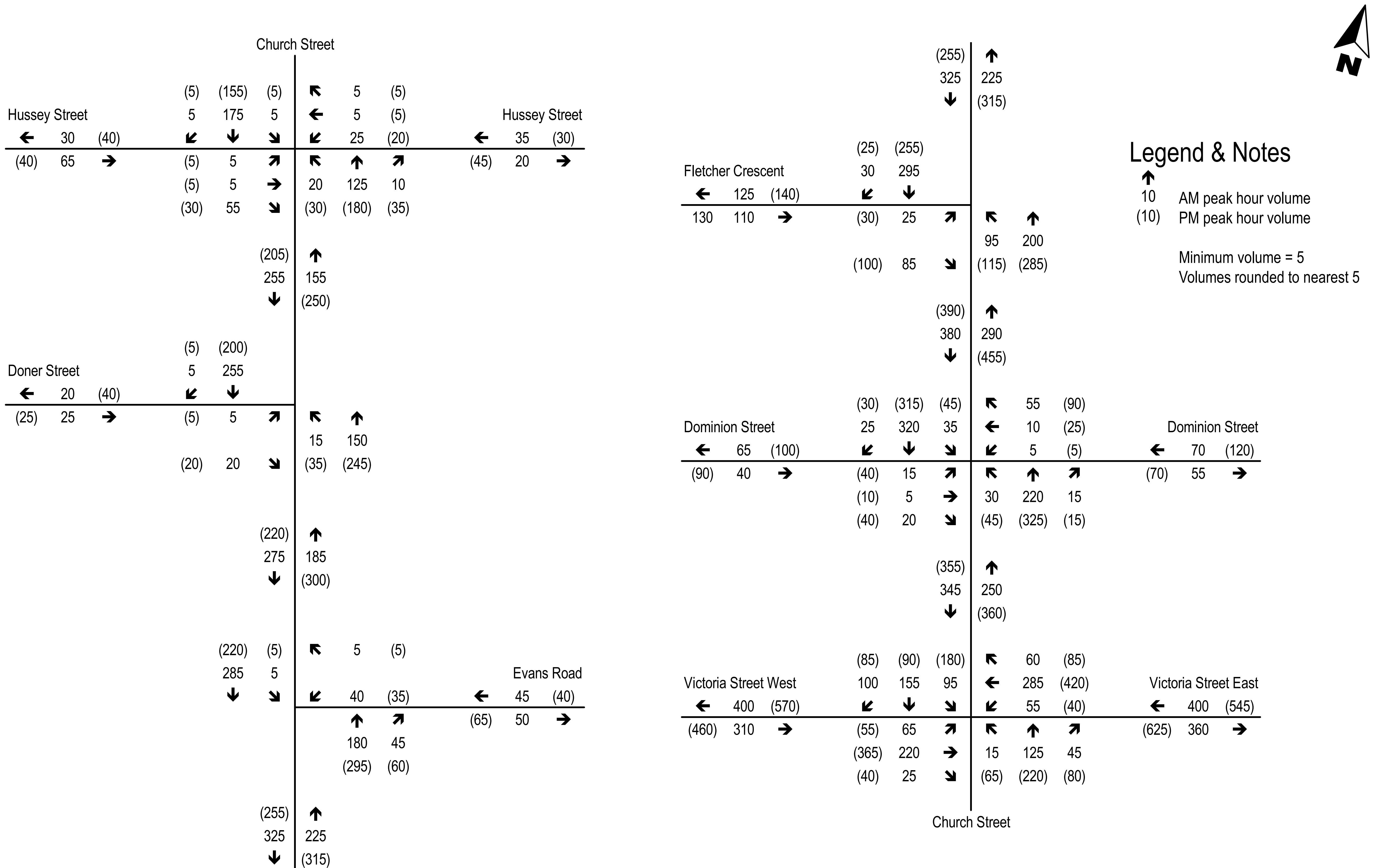
Sight line for vehicles exiting the access with limited sight lines

Sight line for vehicles exiting the access with increased sight lines

Sight line for vehicles entering the access with limited sight lines



source: Simcoe Maps, Google Street View



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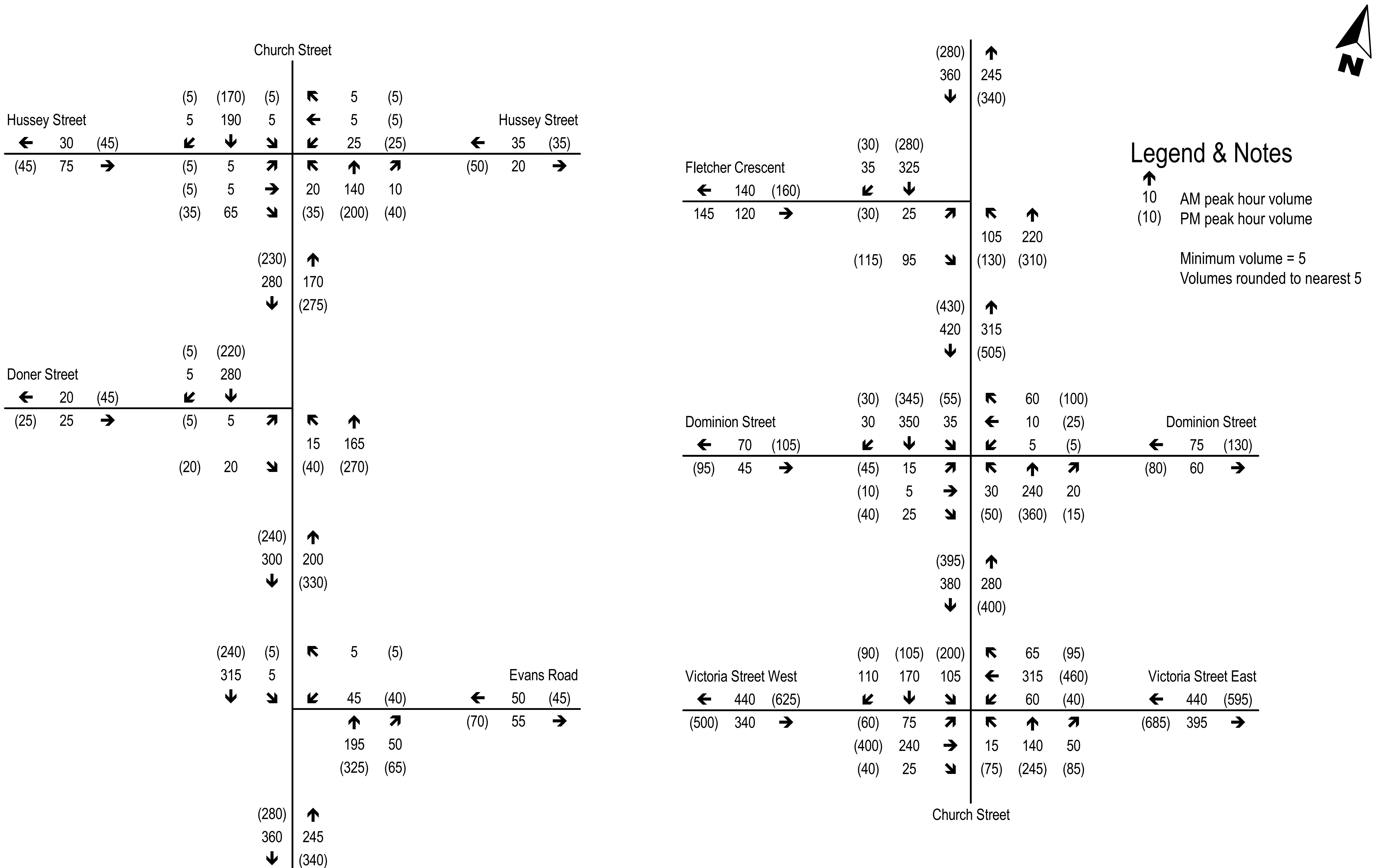
Church Street North Transportation Review

2021 Traffic Volumes

Figure 10



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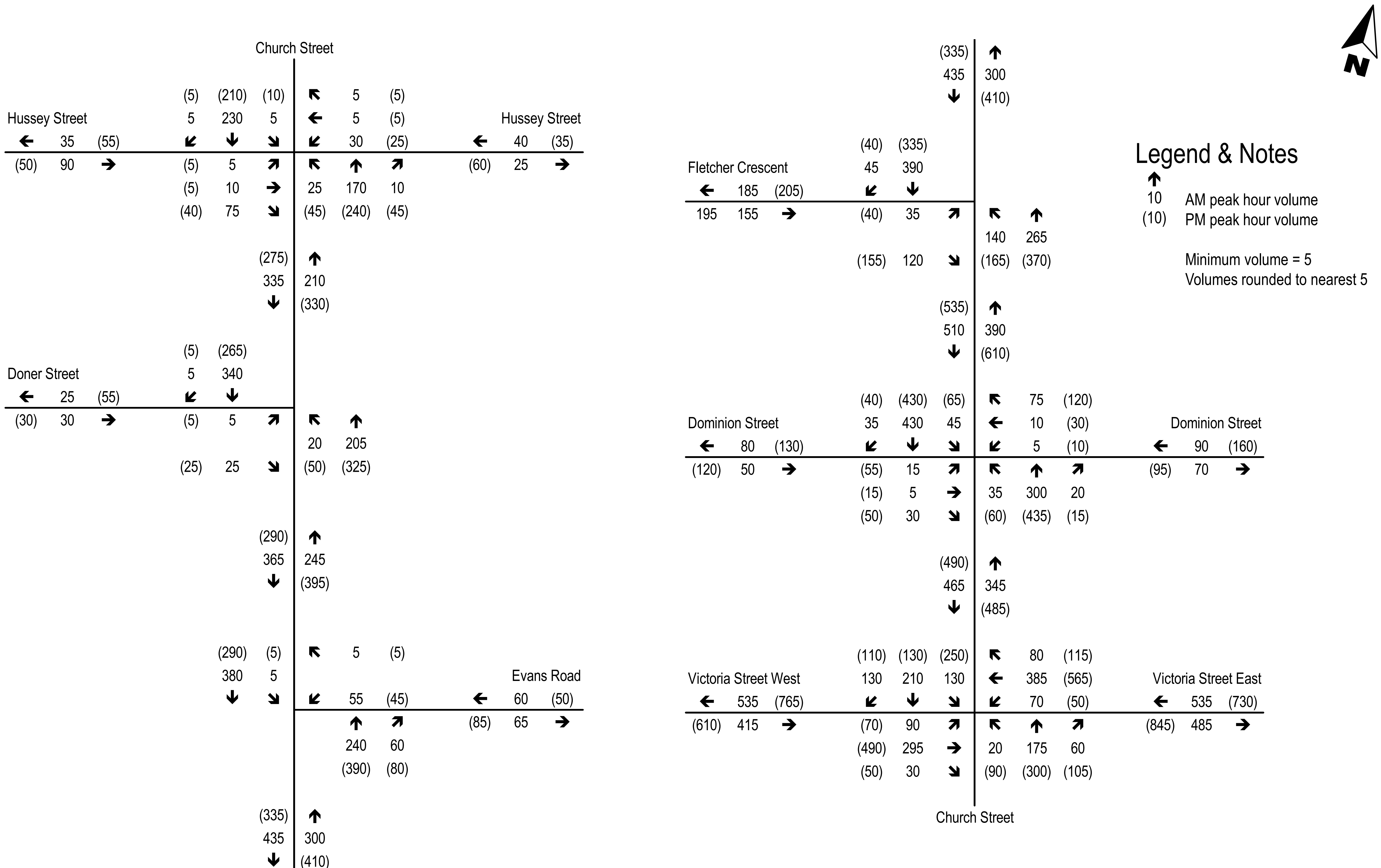
Church Street North Transportation Review

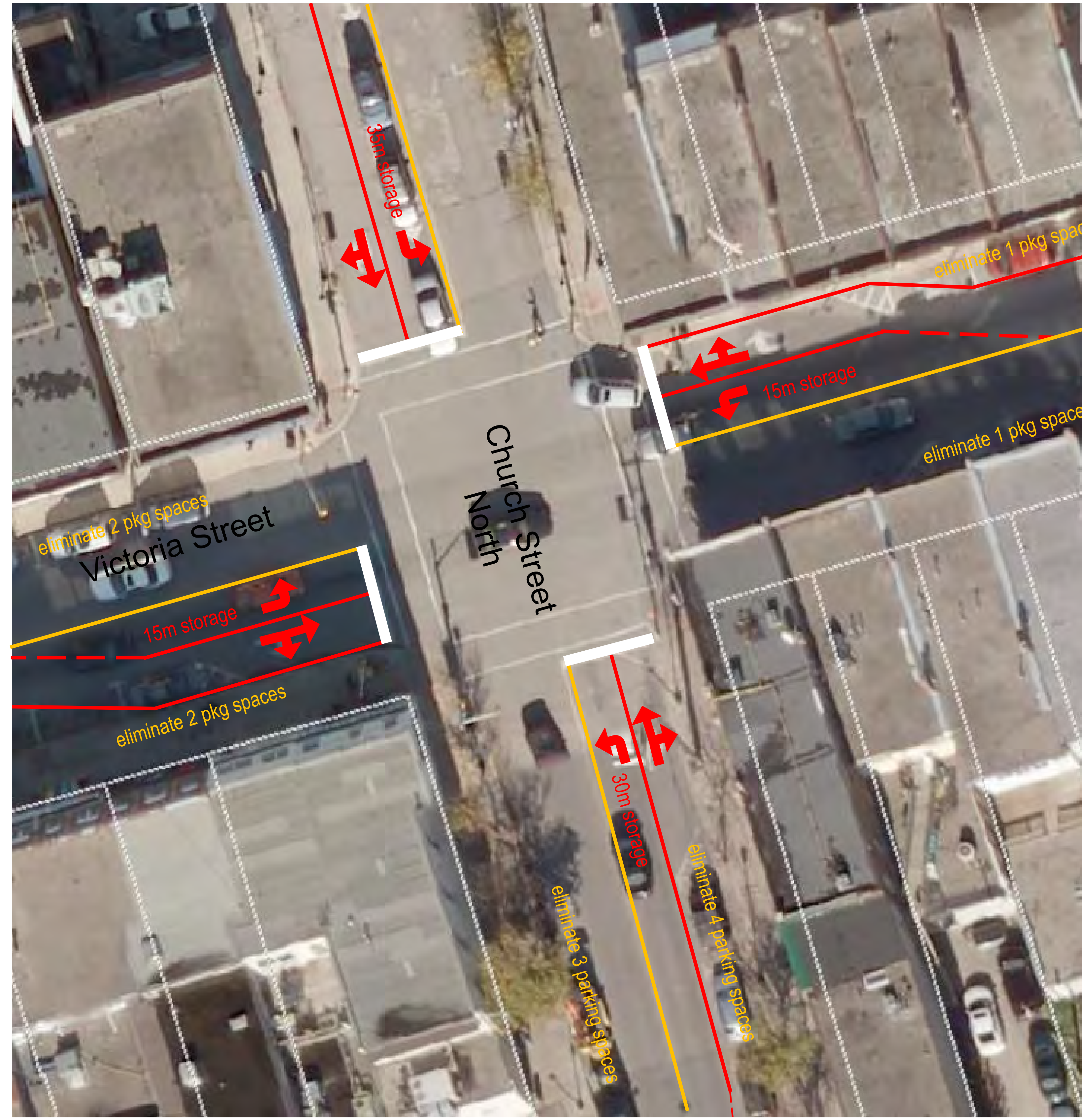
2026 Traffic Volumes

Figure 11


Church Street
(5) (210) (10) 5 (5)
Hussey Street 5 230 5 5 (5) Hussey Street
35 (55) 30 (25) 40 (35)
(50) 90 (5) 5 (60) 25
(5) 10 25 170 10
(40) 75 (45) (240) (45)
(275)
335 210
(330)
(5) (265)
Doner Street 5 340
25 (55)
(30) 30 (5) 5
20 205
(25) 25 (50) (325)
(290)
365 245
(395)
(290) (5) 5 (5)
380 5 Evans Road
55 (45) 60 (50)
(85) 65
240 60
(390) (80)
(335)
435 300
(410)
(335)
435 300
(410)
(40) (335)
Fletcher Crescent 45 390
185 (205)
195 155 (40) 35
140 265
(155) 120 (165) (370)
(535)
510 390
(610)
(40) (430) (65) 75 (120)
Dominion Street 35 430 45 10 (30) Dominion Street
80 (130) 5 (10) 90 (160)
(120) 50 (55) 15 (95) 70
(15) 5 35 300 20
(50) 30 (60) (435) (15)
(490)
465 345
(485)
(110) (130) (250) 80 (115)
Victoria Street West 130 210 130 385 (565) Victoria Street East
535 (765) 70 (50) 535 (730)
(610) 415 (70) 90 (845) 485
(490) 295 20 175 60
(50) 30 (90) (300) (105)
Church Street
N
Legend & Notes
10 AM peak hour volume
(10) PM peak hour volume
Minimum volume = 5
Volumes rounded to nearest 5

2026-2031: Convert right turn lanes to shared right/through lanes and create pocket left turn lanes to better accommodate travel demands for 2026 and beyond. Left turn lanes are offset from one another.

Implement advance green signal phase for left turn movements..



source: Simcoe Maps

source: Simcoe Maps

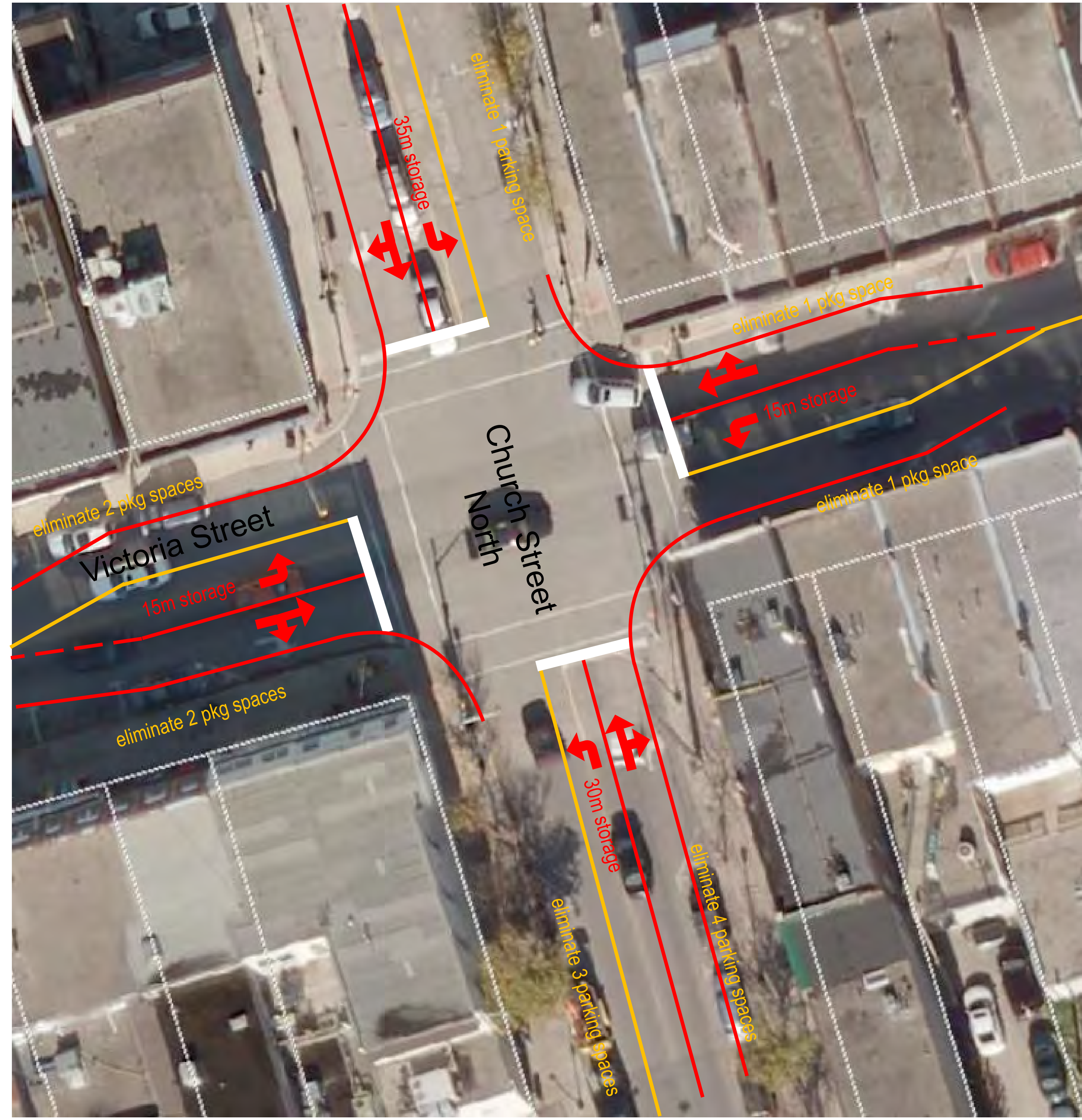
Road System Improvements – Victoria Street (off-set left turns)

Figure 13

2026-2031: Convert right turn lanes to shared right/through lanes and create pocket left turn lanes to better accommodate travel demands for 2026 and beyond. Left turn lanes are opposing one another.

Implement advance green signal phase for left turn movements.

Lane configurations are centred in the right-of-way, thereby impacting parking on both sides of Church Street and Victoria Street.



source: Simcoe Maps

source: Simcoe Maps

Road System Improvements – Victoria Street (opposing left turns, centred alignment)

Figure 14

2026-2031: Convert right turn lanes to shared right/through lanes and create pocket left turn lanes to better accommodate travel demands for 2026 and beyond. Left turn lanes are opposing one another.

Implement advance green signal phase for left turn movements.

Lane configurations are shifted to one side of the road, thereby impacting parking on only one side of Church Street and Victoria Street, and allowing right turn lanes to remain on some of the approaches.

source: Simcoe Maps

source: Simcoe Maps

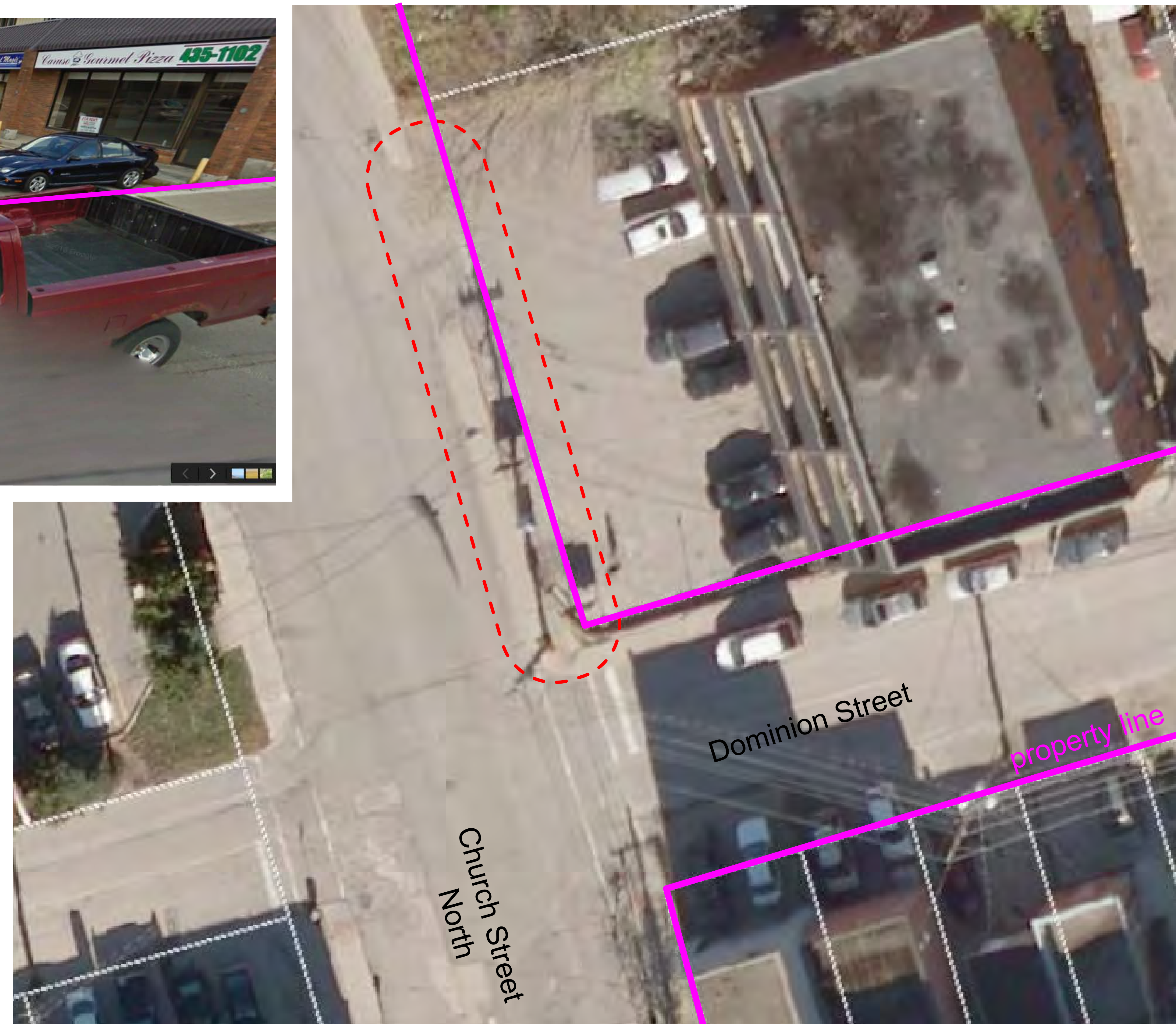
Provide crosswalks at Hussey Street intersection and ensure proper sidewalk alignments and pedestrian standing areas to facilitate crossings.

Provide crosswalks at Evans Road intersection and ensure proper sidewalk alignments and pedestrian standing areas to facilitate crossings.

source: Simcoe Maps

Reclaim the boulevard space within the right-of-way to improve sidewalk facilities and negate the need to relocate the hydro pole. Will result in the loss of 2 parking spaces currently on Town property)

Extend the sidewalk though the commercial access.



source: Google Streetview, Simcoe Maps

Improve the southwest corner of the intersection to better delineate driving lane, private parking area and pedestrian facilities.

Consider one-way operations to reduce overall road width within the constrained Dominion Street right-of-way.

source: Google Streetview, Simcoe Maps

Road System Improvements – SW Corner Dominion Street

Figure 18

source: Simcoe Maps

source: Simcoe Maps

Road System Improvements – Dominion Street

Figure 19