Reviewing Potential One-Way Street Conversions in Established Neighbourhoods

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Abstract

The City of London has historically used one-way streets as a key component of the downtown roadway network; two parallel streets with opposing one-way vehicle flows provide motorists with a fast and convenient route across the City. Traffic signal co-ordination is typically used on these roadways, providing numerous benefits including reduced delay and congestion, in addition to increased traffic flow during peak periods. Similar one-way road configurations can be found within several older, established neighbourhoods throughout the City. These roads typically travel between arterial corridors and feature stop control at intersections and on-street parking. In recent years, the City of London has initiated studies to review the merits of maintaining one-way operations or converting these roadways to two-way operations.

It has been found that within a neighbourhood context, one-way streets do not provide the same operational benefits as noted in the downtown network and can actually confuse motorists unfamiliar with the area. This confusion occurs when a motorist must travel down one of the one-way streets then loop around the block and backtrack on the other parallel route in order to reach a destination. Local residents must also perform this manoeuvre when leaving or arriving at their property. The one-way street layout may also encourage motorists to use these roads as cut through routes between arterial roadways. Converting these routes to two-way operation has the potential to increase traffic safety and the accessibility of a neighbourhood through the elimination of this movement.

Traffic analysis revealed that no significant change in local operations would occur with the conversion to two-way, provided that the necessary additional infrastructure requirements (turn lanes, widening, reconfiguration of intersections, etc.) could be accommodated. Preliminary design of two-way configurations determined that a majority of the alterations required to convert these roadways involved sign and pavement marking additions or removals. More significant alterations were required at intersections with arterial roadways as new turning lanes had to be accommodated.

Overall, it was recommended that the one-way streets studied be converted to two-way operations. Doing so would increase the overall accessibility of these neighbourhoods which contained a mix of commercial, institutional and residential access points. These conversions could be completed with no significant impact to existing traffic operations and minimal capital investment. As these neighbourhoods were well established, pedestrian and cycling facilities were found to be less than ideal (i.e. curb face sidewalks, no bike lanes) and conversions could potentially provide an opportunity for upgrades to the corridors.

Introduction

Background

The City of London has historically used one-way streets as an integral component of its downtown roadway network; two parallel east-west streets with opposing vehicle flows provide motorists with a fast and convenient route across the City. These serve to compliment the numerous north-south arterial corridors which provide access to Provincial Highway 401 and old Highway 2. One-way streets have also been shown to increase traffic capacity while streamlining turning movements as there is no opposing traffic flow to interfere. Traffic signal coordination is utilized on the one-way streets to optimize traffic flow during peak periods, reducing delay and congestion. Delcan completed the Downtown Traffic Signal Coordination Study in 2009 to optimize signal timings at 65 intersections, including the one-way parallel routes on King Street and Queens Avenue.

Similar one-way road configurations can be found within numerous older, established neighbourhoods throughout the City. These roads typically travel between arterial corridors and feature stop control at internal intersections and on-street parking. It has been found that within a neighbourhood context, one-way streets do not provide the same operational benefits as noted in the downtown area and can be detrimental to the overall flow of vehicles through a community. Motorists unfamiliar with the one-way street layout in a neighbourhood can become confused as they must travel down one of the roadways and loop back on the opposing parallel route in order to reach a destination. This can also lead to motorists mistakenly travelling the wrong-way on a one-way route creating a safety issue. Local residents are inconvenienced as they must also perform a double back manoeuvre when leaving or arriving at their property. Additionally, emergency vehicles responding to these neighbourhoods can become delayed due to this layout. Converting these routes to two-way operation has the potential to increase safety and accessibility within the surrounding community.

Delcan has completed two conversion studies on behalf of the City of London:

- **Bruce Street and Elmwood Avenue Feasibility Study** reviewed the potential conversion of two local collector one-way streets located within an established mixed-use area and was initiated by City Council due to local safety concerns; and
- **South Street Campus Lands Redevelopment Study** considered the potential conversion of two one-way streets as part of a larger neighbourhood redevelopment initiative by the City of London.

This paper will focus on the Bruce Street and Elmwood Avenue Feasibility Study due to its concise scope and study area. The following sections will highlight the major geometric and operational components of the study and compare the existing conditions to the projected future conditions.

Study Area

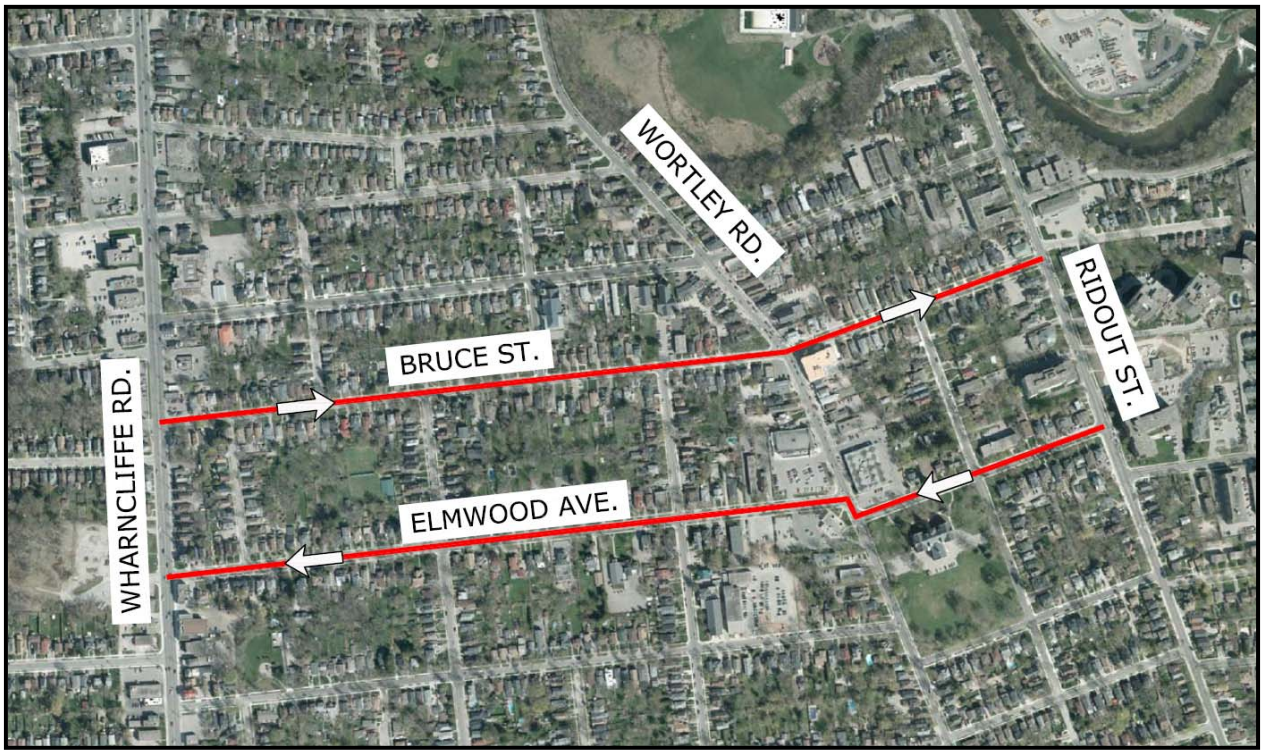
The study area for the feasibility study was defined as Bruce Street and Elmwood Avenue from Wharncliffe Road to Ridout Street (approximately 1.0km).

Bruce Street is a one-way eastbound secondary collector roadway with a posted speed limit of 50 km/h. On-street parking is currently permitted on the north side of the roadway and all intersections are two or all-way stop controlled. The intersections at Wharncliffe Road, Cathcart Street, Wortley Road, and Ridout Street will be analyzed as part of this assessment.

Elmwood Avenue is a one-way westbound secondary collector roadway with a posted speed limit of 50 km/h. On-street parking is currently permitted on the south side of the street between Wharncliffe Road and Wortley Road. East of Wortley Road, off-street parking bays are located on the south side of the roadway, allowing vehicles to park on both sides between Wortley Road and Ridout Street. A traffic control signal is in place at the intersection of Elmwood Avenue and Wharncliffe Road; all other intersections are two or all-way stop controlled. The intersections at Wharncliffe Road, Edward Street, Cathcart Street, Wortley Road, and Ridout Street will be analyzed as part of this assessment.

Figure 1 illustrates the study area.

Figure 1 – Study Area



Geometrics

Existing Conditions

An inventory of the existing geometric conditions at each one-way street was completed. It found that 7.5 to 9.0 metres of asphalt width was generally available for one-way traffic with on-street parking provided on one or both sides of the roadway. TAC standard 1.5m sidewalks were provided on both sides of the roadway but available right-of-way was typically limited beyond this. A section of Elmwood Avenue provided off-street parking bays as the existing asphalt width was insufficient to support on-street parking of both sides. Turn lanes are present at numerous intersections throughout the study area but are accommodated within the existing asphalt width.

Geometric Reconfiguration

Prior to assessing the traffic operations with two-way traffic, a conceptual geometric plan (see pages 6-9) was developed for each roadway to determine what facilities could be accommodated. Baseline assumptions were made to ensure that existing facilities were not removed unnecessarily. These assumptions were:

- On-street parking shall be maintained in some capacity;
- Where possible, existing turning lanes will be maintained; and
- Existing traffic control will remain.

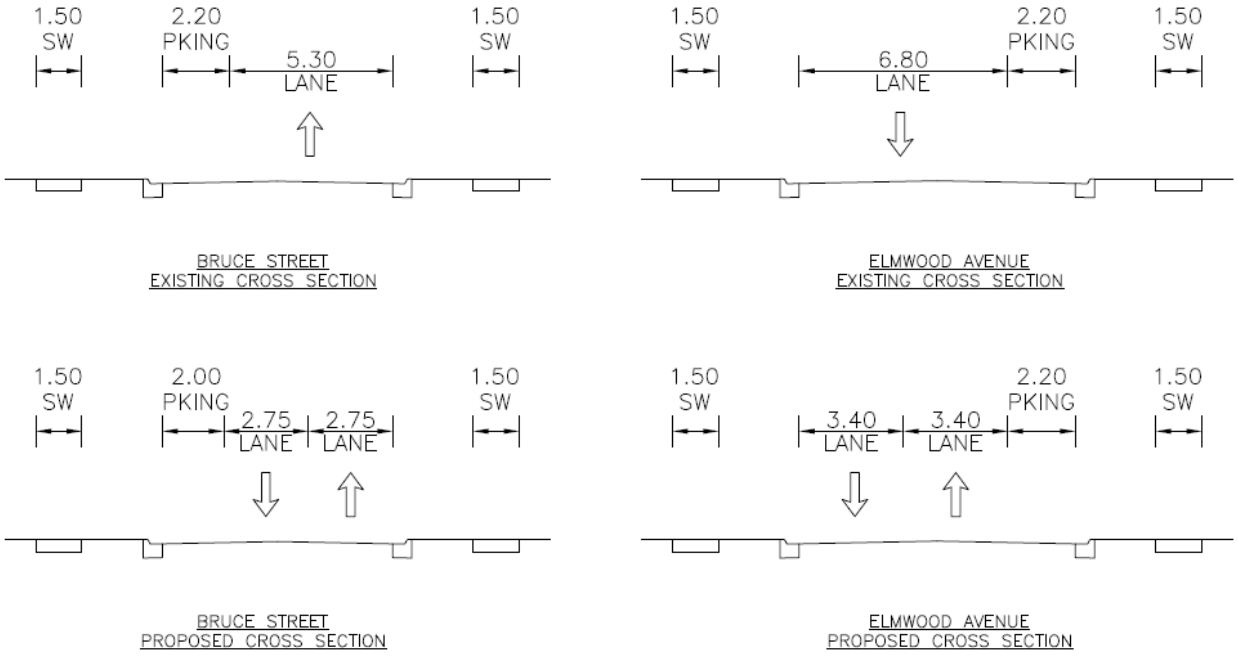
As these streets traverse well-established neighbourhoods, traffic control measures such as all-way stops and turning lanes have been implemented over the years for a variety of safety and operational reasons and their removal may cause concerns within the neighbourhood.

The City of London Design Specifications and Requirements Manual states that curb lanes shall be 4.0 metres wide unless a bike lane is present, through lanes shall be 3.5 metres wide and turning lanes shall be 3.0 metres wide. As these roadways are secondary collectors and service residential land uses, it was determined that a reduced curb lane width would be appropriate.

Based on the City standards, typical cross sections were developed for 7.5 metre and 9.0 metre asphalt widths (refer to Figure 2). A 7.5 metre wide roadway would consist of two 3.75 metre wide through lanes. In consultation with City of London staff it was determined that on-street parking could be provided on one side of the street as this would act as a traffic calming measure in the residential areas. As such, a 2.0 metre parking lane was provided with two 2.75 metre through lanes. A 9.0 metre wide roadway would consist of two 3.4 metre lanes with a marked dedicated parking lane on one side of the street. Alternatively, an option was explored to include bike lanes but doing so would require costly road widening with impacts to utilities, vegetation and property.

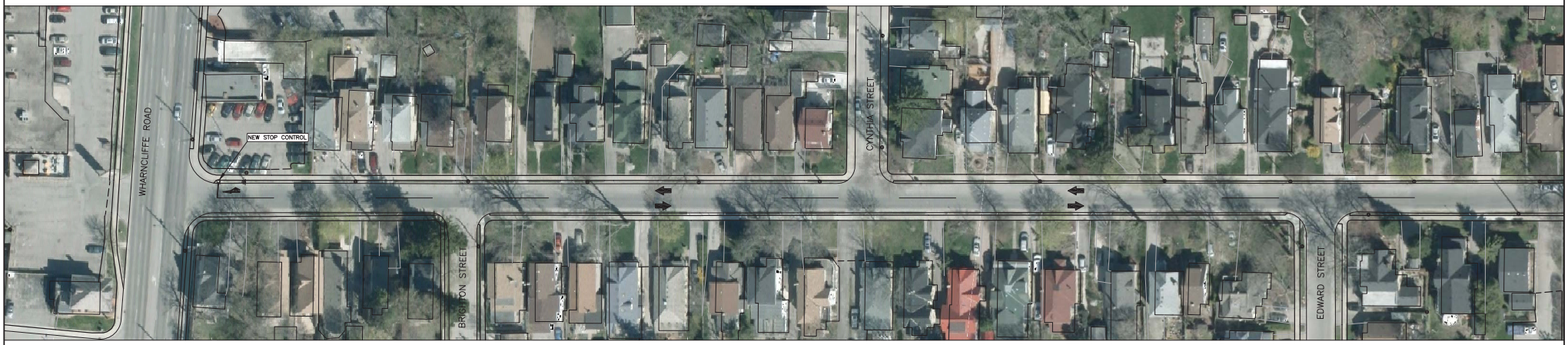
Figure 2 illustrates the existing and proposed cross sections.

Figure 2 – Cross Sections

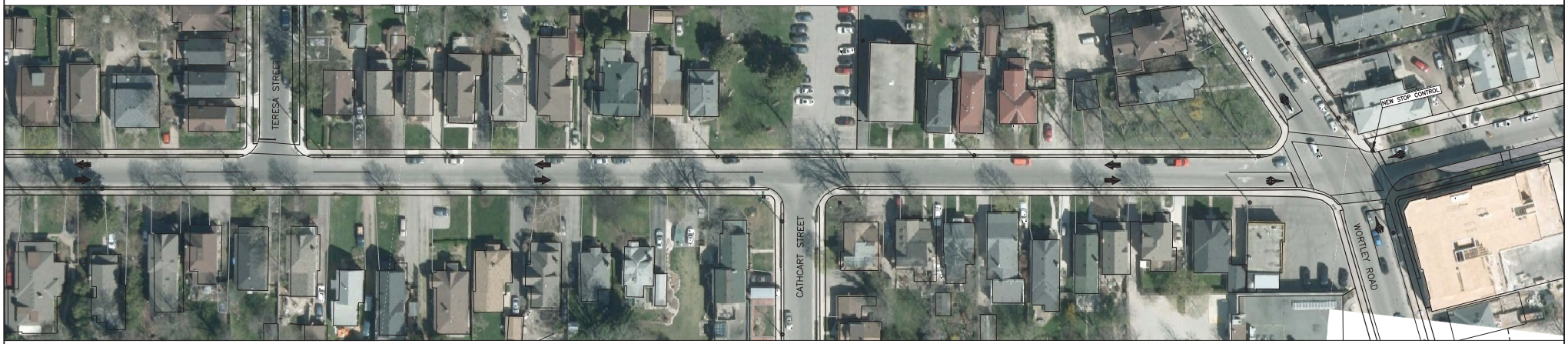


Turning lanes at internal intersections along Bruce Street were unable to be maintained due to the narrow asphalt width however; existing turn lanes on Elmwood Avenue were retained through the use of 3.0 metre lane widths on the 9.0 metre cross section. On the arterial roadways, turning lanes would be required to facilitate access with two-way operations; these were only considered at existing signalized intersections as these were noted as significant access points during the existing conditions review. At the intersection of Wharncliffe Road and Elmwood Avenue, the possibility of implementing a southbound left turn lane was explored; however, it was found that insufficient property existed to fit a standard turning lane. As a turning lane was already in place at Wharncliffe Road and Bruce Street, it was determined that a southbound left turn lane at Elmwood Avenue was not a necessity.

In addition to the geometric requirements stated above, modifications to the existing signage and pavement markings would be required to convert these streets from one-way to two-way operation.



BRUCE STREET



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London CANADA

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TWO-WAY TRAFFIC CONEPT PLAN

BRUCE STREET

PROJECT No.

SHEET No.
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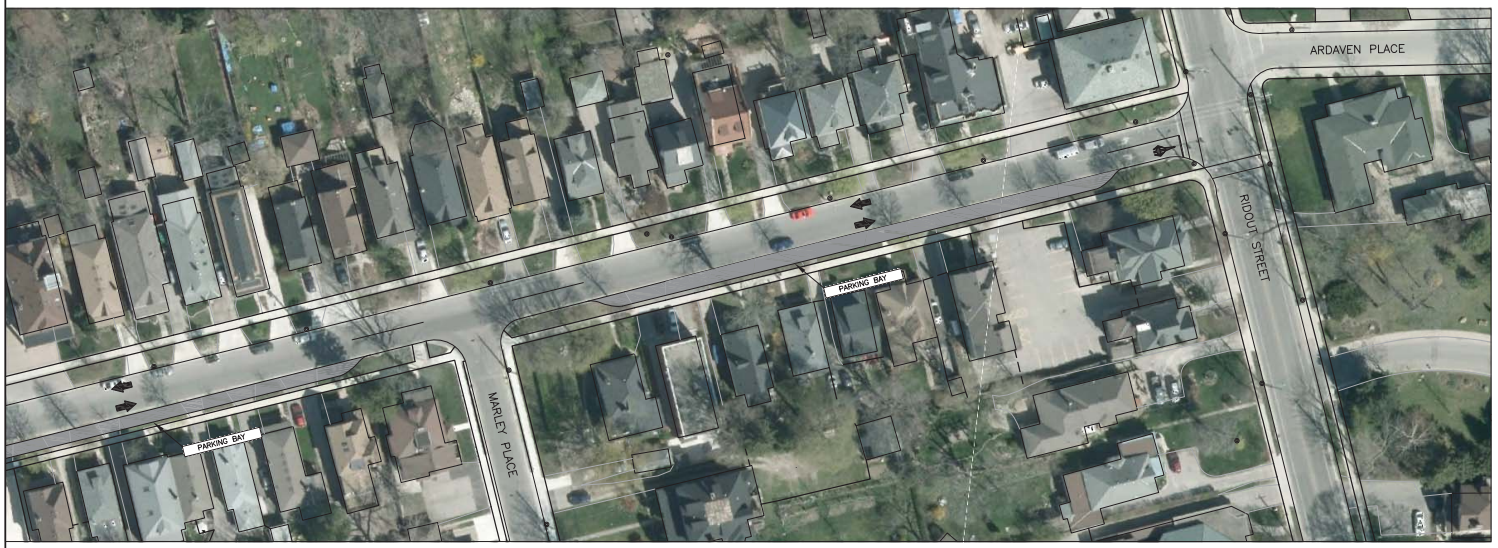
PLAN FILE No.

JOB No. DWG No. JOB NAME



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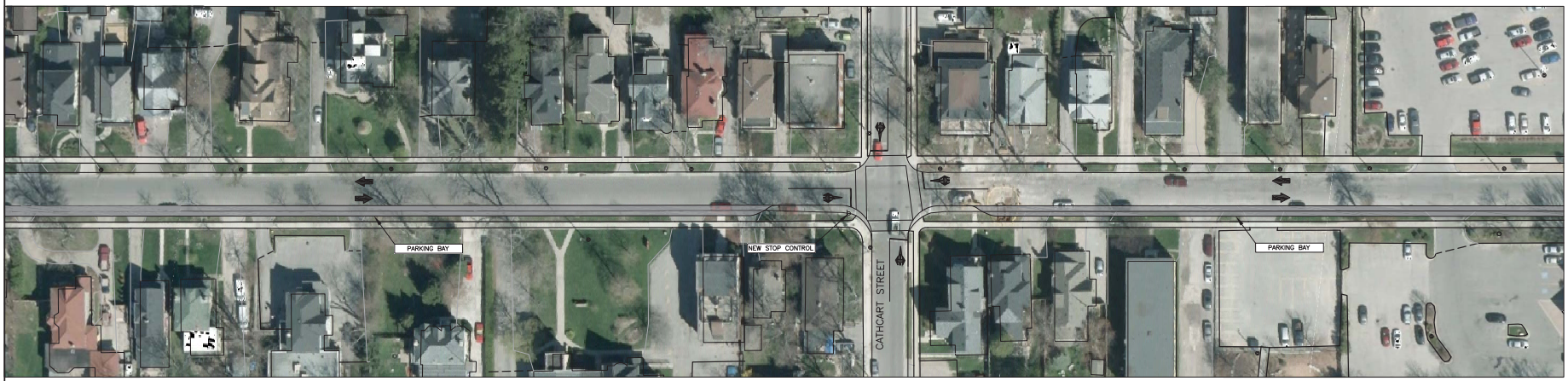
ELMWOOD AVENUE



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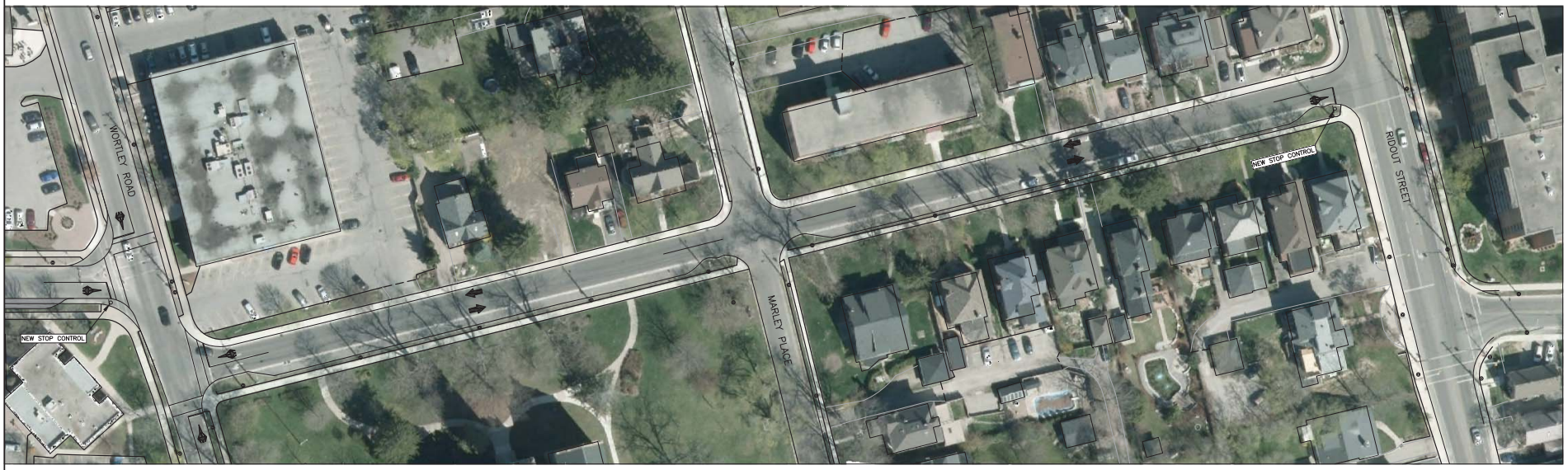

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Operations

Figure 3 illustrates the existing operational conditions within the study area.

Safety Concerns

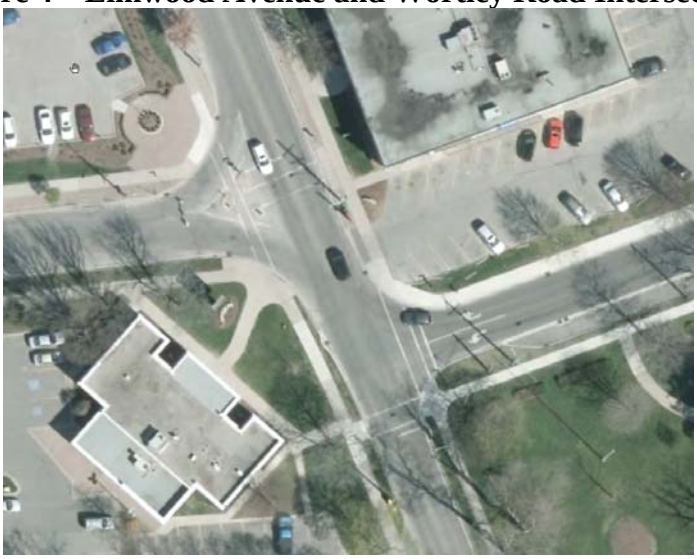
The request for study came from the Ward Councillor in response to residents' complaints regarding increased vehicular traffic in the neighbourhood which has led to safety issues including daily instances of wrong-way traffic on the one-way streets.

During the traffic volume surveys completed by Delcan (6:00-9:00 am and 3:00-6:00 pm) at the study area intersections, a total of approximately 25 vehicles were noted turning the wrong-way on Bruce Street and Elmwood Avenue. These movements are likely made by motorists with local knowledge of the area who wish to shortcut their route rather the circle the block, or motorists from outside the area who are unfamiliar with the one-way street layout. A significant portion of the wrong-way traffic was observed on the eastbound right turn movement at the intersection of Elmwood Avenue and Ridout Street. These vehicles are likely destined to a commercial plaza located on the northeast corner, a short distance from the intersection.

In addition to the vehicular traffic, a number of cyclists were also observed travelling the wrong-way on these roadways. Cyclists are unlikely to adhere to the one-way street pattern as they typically take the most direct route regardless of traffic prohibitions in place.

Observations at the intersection of Elmwood Avenue and Wortley Road (see **Figure 4**) noted that the skewed configuration seemed to confuse a number of motorists. Vehicles travelling southbound failed, on occasion, to yield to motorists travelling through on Elmwood Avenue as they assumed that vehicles were turning right and did not expect them to subsequently turn left in front of them. In addition, a number of northbound vehicles have become confused, and turned into the southbound channelization.

Figure 4 – Elmwood Avenue and Wortley Road Intersection



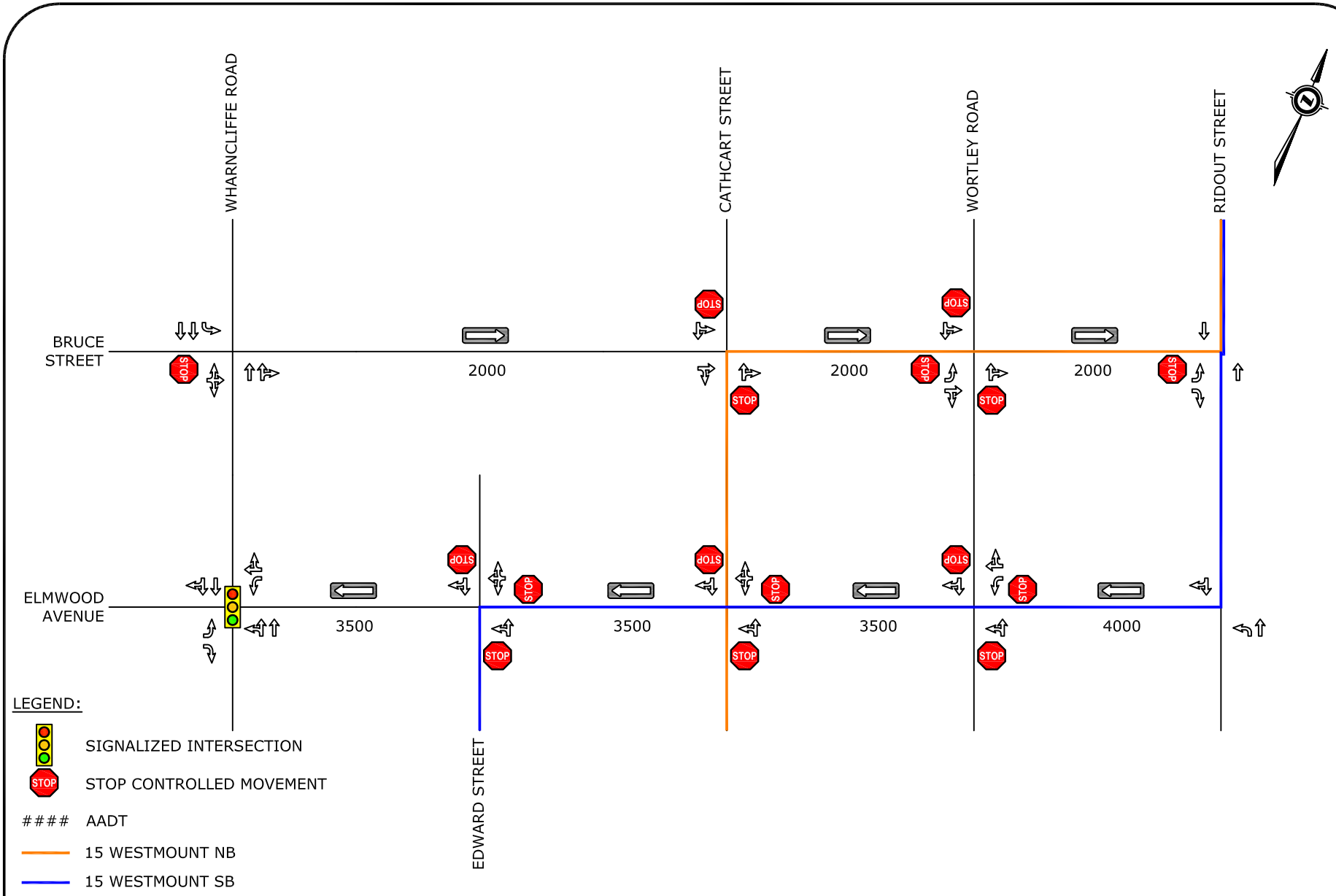


FIGURE 3 - Existing Conditions

Feasibility Study, One-Way Street Conversion
Bruce Street and Elmwood Avenue

During a site visit, numerous northbound vehicles proceeded into the intersection while pedestrians were crossing on the northern leg. This led to northbound vehicles stopping in the middle of the intersection while the pedestrians finished crossing. No other significant pedestrian issues were noted within the study area.

Traffic Volumes

Average Annual Daily Traffic (AADT) along Bruce Street and Elmwood Avenue was found to be 2,000 and 3,500 respectively. The higher volume on Elmwood Avenue could be attributed to the increased presence of commercial buildings whereas Bruce Street is primarily residential. AM and PM peak hour turning movement data was obtained for significant intersections within the study area to determine existing traffic operations. It should be noted that minimal data was collected for cyclist travel patterns within the study areas; however, the data available indicated that cyclists do not adhere to the one-way street layout and instead use the most convenient route.

In order to determine the traffic operations with two-way streets in place, the existing surveyed traffic volumes must be adjusted. As a detailed trip origin-destination survey was unavailable, a first principles approach was taken. To determine two-way traffic volumes, it was assumed that all trips utilized a one-way street to both enter and exit the neighbourhood and therefore, would be inconvenienced by the one-way layout on one leg of their journey. Based on this, 50% of vehicles on each one-way street were shifted to the opposing corridor.

Traffic Operations

An analysis of the existing traffic operations was undertaken using the Synchro 8 software package. As noted in Figure 3, the majority of intersections are stop controlled with one signalized intersection located at Wharncliffe Road and Elmwood Avenue.

Through the analysis, it was determined that existing intersections were generally operating well. Unsignalized intersections were found to operate at Level of Service (LOS) C or better while signalized intersections were found to operate at LOS A with no significant capacity issues. This would indicate that capacity is available for a potential conversion to two-way operations.

Using the geometric layout and reconfigured traffic volumes previously discussed, an additional Synchro analysis was undertaken to determine the traffic operations with two-way traffic allowed. This analysis concluded that overall operations at each intersection would not significantly change with the conversion to two-way traffic assuming existing traffic control measures remain in place.

Figure 5 illustrates the before and after operations of each intersection during the worst peak hour.

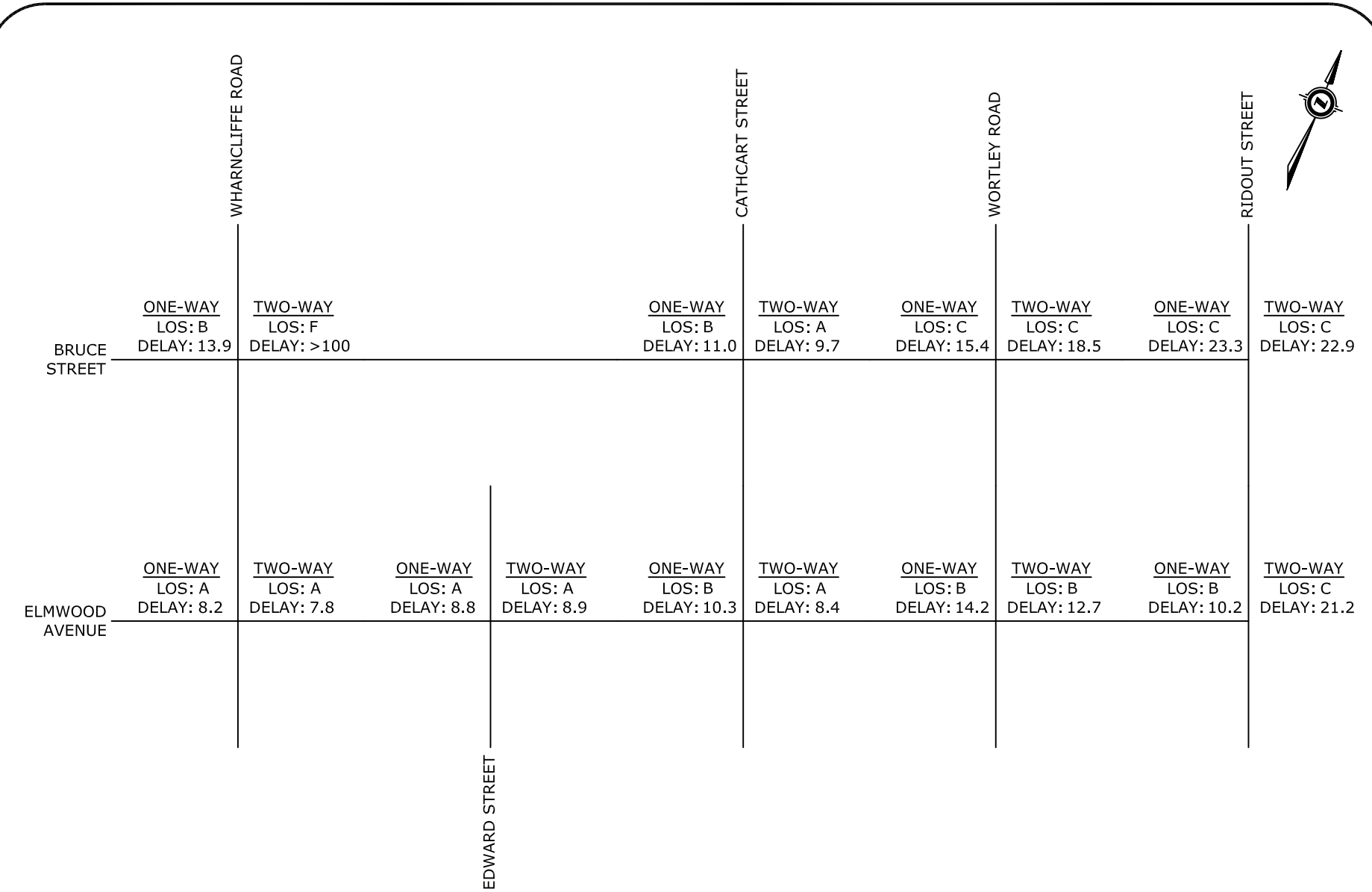


FIGURE 5 - Traffic Operations, Worst Peak Hour

Feasibility Study, One-Way Street Conversion
Bruce Street and Elmwood Avenue

It should be noted that the intersection of Wharncliffe Road and Bruce Street is projected to operate poorly with two-way operation in place. This is due to the number of left turns that were shifted to this intersection as part of the previously discussed volume adjustment. In reality, left turns to Wharncliffe Road will likely utilize the signal at Elmwood Avenue.

Transit Service

London Transit Commission currently operates the 15 Westmount bus route in the study area. Originating in the downtown core, Route 15 travels south on Ridout Street before turning west onto Elmwood Avenue followed by a turn south on Edward Street, eventually terminating at the Westmount Mall. On the return trip, the route travels north on Cathcart Street, east on Bruce Street and north on Ridout Street.

London Transit Route 15 travels eastbound on Bruce Street from Cathcart Street to Ridout Street. In this area, Bruce Street is approximately 7.5 metres wide with stops located at Wortley Road and Marley Place. With on-street parking permitted on Bruce Street, buses may be impeded due to parked cars along the roadway. Parking should be prohibited on both sides of the roadway in the vicinity of the bus stops to ensure adequate passing space for through vehicles.

With two-way traffic in place on Bruce Street and Elmwood Avenue, it would be possible to change the routing of the 15 Westmount bus so only Elmwood is utilized due to the wider pavement width.

Collision History

A five year summary of collisions within the study area was provided by City of London staff at locations where more than three collisions occurred. A review of this data revealed no apparent collisions which involved a motorist travelling the wrong way on either Bruce Street or Elmwood Avenue. A number of sideswipe collisions were noted along these streets, likely due to vehicles pulling out of parking spots into through vehicles.

At intersections within the study area, a number of rear end, and T-bone collisions were noted however, these are typical of stop-controlled intersections.

Conclusions

Based on our observations and analysis, it was concluded that:

- Bruce Street and Elmwood Avenue operate well during the AM and PM peak hours with one-way operations in place;
- Safety concerns currently exist with vehicles and cyclists travelling the wrong-way on these roadways as well as the layout of the Elmwood Avenue / Wortley Road intersection;
- Bruce Street and Elmwood Avenue are expected to continue operating well if converted to two-way operation; and
- Both streets could be converted to two-way operation with minimal capital cost (approximately $70,000 total).

Based on these conclusions, we recommended that discussions take place with local residents and businesses to determine the potential impact of these modifications including the loss of on-street parking. A second recommendation was made to consult with London Transit Commission regarding the potential to re-route the 15 Westmount Route to use Elmwood Avenue exclusively.

Overall, it was recommended that the one-way streets studied be converted to two-way operations. Doing so would increase the overall accessibility of these neighbourhoods which contained a mix of commercial, institutional and residential access points. These conversions could be completed with no significant impact to existing traffic operations and minimal capital investment. As these neighbourhoods were well established, pedestrian and cycling facilities were found to be less than ideal (i.e. curb face sidewalks, no bike lanes) and conversions could potentially provide an opportunity for future upgrades to the corridors. Conversion would also serve to eliminate wrong-way movements on the existing one-way streets while providing greater flexibility to emergency services response routes in the neighbourhood.

Follow-up

Following the submission of the above feasibility study, the City of London Civic Works Committee received a number of comments from local residents regarding the potential conversion of Bruce Street and Elmwood Avenue. The majority of responses supported maintaining the one-way configuration on both streets but some supported conversion in hopes of achieving a level of traffic calming.

In response, Civic Works Committee and later London City Council passed a resolution directing that:

a) no action be taken to convert Bruce Street and Elmwood Avenue to two-way operation; and
b) Civic Administration be requested to review the potential for improving signage, bike paths and traffic calming measures on Bruce Street and Elmwood Avenue, taking into consideration the effect any such changes may have on the surrounding area.