Existing Conditions Final Report

Ainslie Wood Traffic Management Review
Hamilton, Ontario
Project # TPB186044

Prepared for:

City of Hamilton
330 Wentworth Street, Hamilton, ON

October 23, 2018

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City of Hamilton
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Prepared by:

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October 23, 2018

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1.0 INTRODUCTION

Wood Environment & Infrastructure Solutions ("Wood") was retained by the City of Hamilton (referred to as "City" hereinafter) to conduct a Traffic Management Study for the Ainslie Wood neighbourhood area. The primary objective of this study was to conduct a multi-modal review the transportation system within the Ainslie Wood neighbourhood and provide recommendations on potential transportation-related improvements which will address the needs of all road-user in a safe and efficient manner.

The study is being undertaken as an Ainslie Wood Traffic Management Study, addressing Phases 1 and 2 of a Municipal Class Environmental Assessment (MCEA) Master Plan process (under the Municipal Engineers Association Municipal Class EA (October 2000, as amended in 2007 & 2011). Ward 1, which encompasses the Ainslie Wood neighbourhood, employs a *Participatory Budget* process which provides constituents with an opportunity to advise the councilor on how to spend $1.5 million on local infrastructure projects.

This report describes the existing transportation context for Ainslie Wood including traffic operational and safety analyses as well as the characteristics of the current transit and active transportation networks.

1.1 Study Purpose

The main purpose of the Ainslie Wood Traffic Management Study is to identify issues and opportunities related to transportation planning and traffic operations within the neighbourhood. This study considers the concepts and policies as stated in the City-Wide Transportation Master Plan (approved August 2018). Additionally, a multi-modal approach has been adopted such that the proposed alternative solutions will consider the principles of Complete Streets to ensure designs are context-sensitive and balance the needs of all mode user types. In summary, the study will achieve the following objectives:

- **Identify transportation-related challenges** in the neighbourhood with the consideration of all types of road users (including users of HSR transit and potential LRT services);
- Develop **feasible and context-sensitive alternative solutions** to address localized concerns;
- Facilitate **public consultation and stakeholder engagement** to ensure a transparent and well-informed study process. This will include two public information centres; the first of which will focus on the study area's transportation challenges and opportunities and the second of which will present proposed alternatives, the evaluation process and selection of the technically preferred option;
- **Evaluate transportation options** in a transparent manner by developing an "evaluation matrix" (i.e. a menu of tools to address traffic issues) that will clearly and transparently demonstrate the most technically preferred option; and
- Prepare a **Phasing and Implementation Plan** to prioritize preferred alternative solutions into short, medium and long-term solutions to accommodate City's budgetary constraints.

The project involves review of background studies and planning context, multi-modal assessment, travel forecasting, traffic engineering, functional design, complete street design concepts and an enhanced public and stakeholder consultation program. In addition, the preferred alternative transportation options will be further examined to determine if additional studies are required through the Class EA process (e.g. Whether the preferred alternative requires additional phases of study if it is determined to be categorized as a Schedule 'C' undertaking).

1.2 Study Area

The Ainslie Wood Community is located in the City of Hamilton and is generally bounded by the King's Highway 403 to the south, Main Street West to the west, Cootes Drive to the north, and both Main Street West and Highway 403 to the east. The neighbourhood is largely low-density residential in nature, with medium to high density residential areas along Main Street West. The McMaster University campus extends to the north end of the study area. There are two schools within the study area (one (1) elementary and one (1) secondary school). Refer to **Figure 1** for an illustration of the study area.

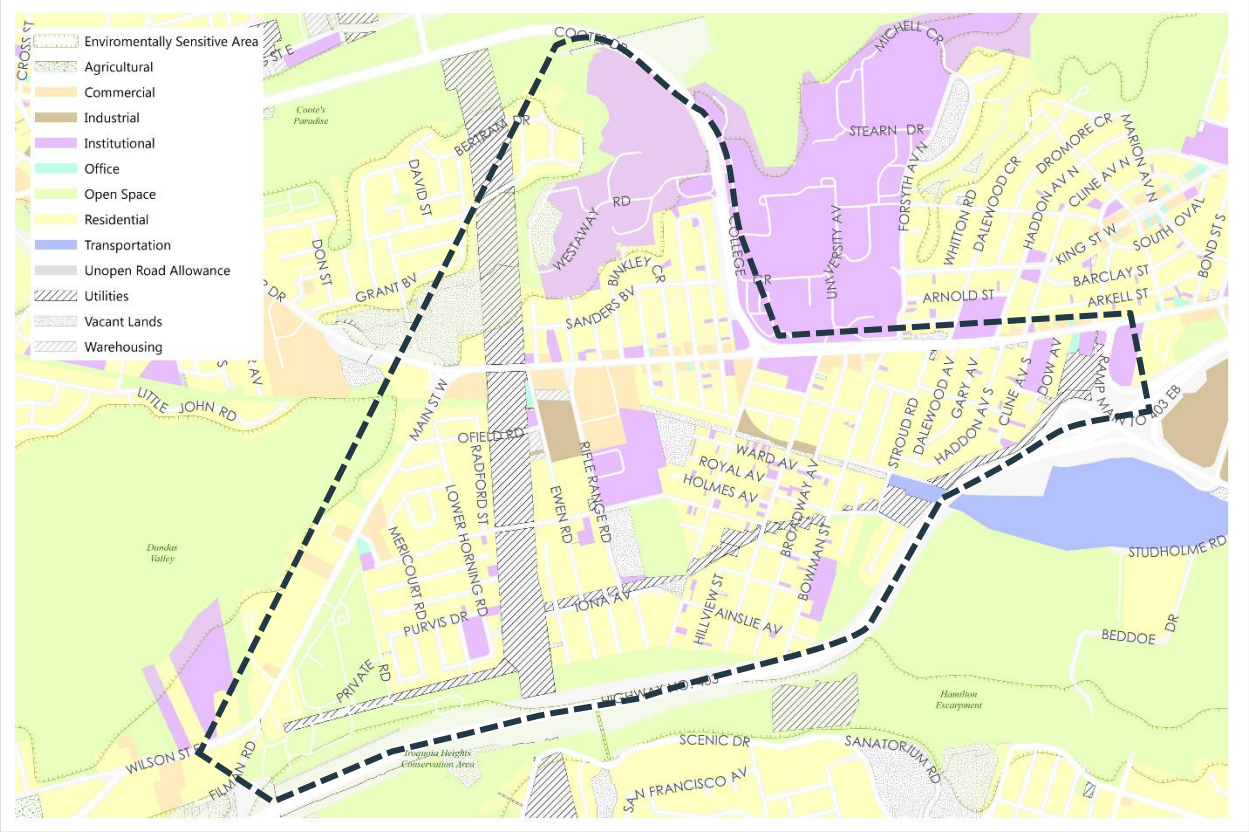


Figure 1: Study Area

According to the Urban Hamilton Official Plan Schedule C, Main Street West and Cootes Drive are major arterials within the study area. Whitney Avenue, Leland Street, and Emmerson Street are classified as collectors. The remainder of the streets are considered local roadways.

2.0 DATA COLLECTION AND PROCESSING

A wide range of data and information was used as part of the existing conditions assessment, as summarized in **Table 1**. The obtained information was reviewed, validated and processed to gain an in-depth understanding of the existing transportation conditions within the Ainslie Wood community.

Table 1: Data Collection List

Data	Objective/Purpose	Source
Traffic Data including signal timing plans and turning movement counts	Existing traffic conditions analysis	City of Hamilton
Speed surveys	Operating speeds analysis	City of Hamilton

Data	Objective/Purpose	Source
Collision Data	Safety assessment	City of Hamilton
Mode splits, trip lengths	Existing transportation conditions on travel patterns and behaviours (e.g. mode splits, trip lengths)	Transportation Tomorrow Survey 2016
Sidewalk and cycling facilities	Review of Active transportation network to assess existing connectivity and continuity	City of Hamilton
Bicycle count summary	High-level review of cyclist demand (daily volumes)	City of Hamilton
Background GIS layers	Provide information on road characteristics including road network, road class, number of lane and existing speed limits.	City of Hamilton
Hamilton LRT Environmental Study Report	General information on planned LRT alignments, service frequency and potential impacts on the study neighbourhood	City of Hamilton
Site Visits	Site observations for existing transportation conditions to inform desktop analysis	Wood's project team

3.0 SITE OBSERVATIONS

Multiple site visits were conducted to gain a general appreciation of the transportation characteristics and existing traffic conditions in the Ainslie Wood neighbourhood. The objective was to observe the operations and geometry of the study area and inform the desktop review of traffic and/or safety-related challenges.

Site visits were conducted in the Spring of 2018 and were intended to identify any deficiencies and opportunities for improvement. Furthermore, traffic operations throughout the study area were also observed to determine if any major operational concerns exist beyond what can be identified within the analyzed traffic data.

The initial site visit (April 5, 2018) was completed while McMaster University was still in session to capture the traffic generated by the institution and its impacts on the adjacent road network. Active transportation options were evident as a popular choice in the neighbourhood. High pedestrian volumes were observed throughout the Ainslie Wood neighbourhood, especially in close proximity to the University. Pedestrian activity was consistent throughout the day as students walk to and from classes.

3.1 Observed Traffic Demand

This section summarizes the general observations of traffic operations within the Ainslie Wood neighbourhood including observed traffic demand, traveling speeds, queues and delays.

As expected, traffic volumes were highest on Main Street West (i.e. major arterial within the study area) as it provides direct connection to Highway 403 as well as the downtown Hamilton core. Traffic movement was consistent with commuter patterns with the highest volumes occurring during the AM and PM peak hours.

3.1.1 AM Peak Hour

During the AM peak hour, the dominant direction of traffic is eastbound along Main Street West. Eastbound traffic generally experiences heaviest queuing at Cootes Drive, Emerson Street, and Longwood Road. At times, eastbound queues at Emerson Street will spill back to the previous intersection (Cootes Drive/Leland Street). In the westbound direction, vehicles wishing to make a westbound right movement from Main Street West onto Cootes Drive experience delays at times as they are often impeded by HSR

buses that are stationary at the bus stop located west of the University Avenue and Main Street West intersection. During the AM peak, traffic travelling northbound on Main Street West (presumably originating from the Ancaster area), use Whitney Avenue as a through street in order to avoid the signals on Main Street West. In general, traffic operates well throughout the Ainslie Wood neighbourhood during the AM peak period.

3.1.2 PM Peak Hour

During the PM peak hour, traffic distribution is fairly evenly split in the eastbound and westbound directions on Main Street West. Much of the eastbound traffic is composed of students and faculty exiting McMaster and employees leaving the businesses at which they work. The eastbound right turn movement onto the eastbound Highway 403 ramp experiences queueing at times as vehicles are forced to yield to a high volume of pedestrians using the crosswalk. These pedestrians are predominantly students and faculty at the Columbia International College. In the westbound direction traffic experiences heaviest queueing at Emerson Street, Cootes Drive, and Hollywood Street. Queues at Hollywood Street spill back and block two upstream streets (Thorndale Street and Norfolk Street). In general, traffic operates well throughout the Ainslie Wood neighbourhood during the PM peak period.

The dominant direction of traffic movement during the PM peak hour is also generally eastbound along Main Street West. This can be attributed in part to students and faculty exiting McMaster University and travelling eastbound along Main Street West towards the Highway 403 on-ramps. As with the AM peak, traffic making a westbound right movement from Main Street onto Cootes Drive is often impeded by HSR bus blockages at University Avenue.

3.2 Observed Safety Concerns

A number of issues and concerns related to crosswalks, pavement markings, and signage were observed at various locations throughout the Ainslie Wood neighbourhood, as summarized in **Table 2.**

Table 2: Summary of Observed Safety Concerns

Location	Potential Operational Concerns	Illustration
Main Street / Cootes Drive	This N-S crosswalk is missing on the east approach. Westbound right turn is channelized with a large radius resulting in high speed vehicles. Two uncontrolled pedestrian crossings exist whereby pedestrian must 'wait for gaps' to cross. *<u>Potential Concern</u>: high safety risk for pedestrian due to the lack of crosswalk delineation in the east approach and uncontrolled crossings at WBR channelization.*	

Location	Potential Operational Concerns	Illustration
Main Street / Dalewood Avenue	The signage showing "left-turn only" do not match with the southbound left-right lane marking on Dalewood Avenue. *<u>Potential Concern</u>: The ambiguity in signage and pavement marking may lead to improper guidance and cause driver's confusion.*	
Main Street / Dalewood Avenue	Three-stage pedestrian crossing and often ignored by road users due to circuitous design. Pedestrian crossing is unstriped at the north/west corner of the intersection. *<u>Potential Concern</u>: Moderate risk for unsafe crossing conditions as pedestrians are likely to walk across Main Street directly and ignore the 3-stage crossing.*	
Main Street / Emerson Avenue	Southbound traffic is prohibited from making right turns on red significantly reducing capacity as traffic must make right turns on green which conflicts with pedestrians crossing the street (very high volume of pedestrians was observed). *<u>Potential Concern</u>: Conflict point between southbound right-turning vehicles and N-S pedestrian activities due to right-turn prohibition.*	

Location	Potential Operational Concerns	Illustration
King Street / Haddon Avenue	*Zebra Striping on 3 approaches and 2 lines on west approach. East-West traffic is free flow at this minor-stop controlled intersection in which the N-S crosswalks give pedestrians false sense of security.* *Potential Concern: The provision of the N-S crosswalks at this minor-stop controlled intersection may lead pedestrian to misjudge the level of security at this intersection.* *The unstriped crosswalk in the east approach reduces visibility of the crosswalk.*	
Whitney Avenue / Mericourt Road	The intersection of Whitney Avenue and Mericourt Road incurs high pedestrian volumes but does not have pedestrian crosswalks. The land use in the area is medium to high density residential and bus stops are located on the north-east and south-west corners of the intersections. Potential Concern: Since this intersection is minor stop controlled with free flow traffic along Whitney Avenue, there are potential safety concerns for pedestrians from misjudging traffic gaps and competing with east-west traffic.	

The concerns as noted in **Table 2** provide real opportunities for improvements and enhancements. Potential solutions will be discussed within the Alternatives Memo.

These noted concerns provide opportunities for potential improvements and enhancements. All locations will be considered in the development of alternative transportation options during Phase 2 of the study. However, it is important to note that the potential implementation of the LRT is expected to alter the footprint and configuration of Main Street West within the study area. Thus, any improvements and enhancements along Main Street should be revisited and further reviewed during the LRT implementation stage by the City (beyond the scope of this study).

4.0 TRANSPORTATION CONDITIONS

The following section describes the travel patterns and behaviours within the neighbourhood. The findings provide a general understanding of the current travel demand, mode choices and how trips are attracted/produced within Ainslie Wood.

4.1 Travel Demand and Patterns

Based on the 2016 Transportation Tomorrow Survey (TTS), a total of approximately 16,340 daily trips from the study area are made during a typical day. Of the 16,340 trips, 66% were made by car, 21% by transit, and 13% by walking or cycling, as illustrated in **Figure 2**. Historical data also showed that a mode shift to transit and active modes of transportation can be observed from 2011 to 2016. The general planning direction for Ainslie Wood is to encourage a greater shift towards more sustainable transportation modes, including transit, walking and cycling.

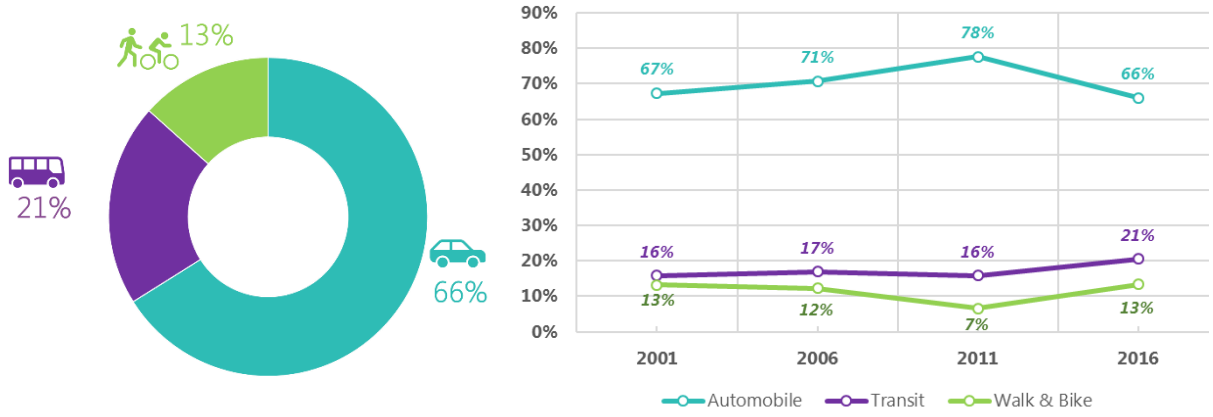
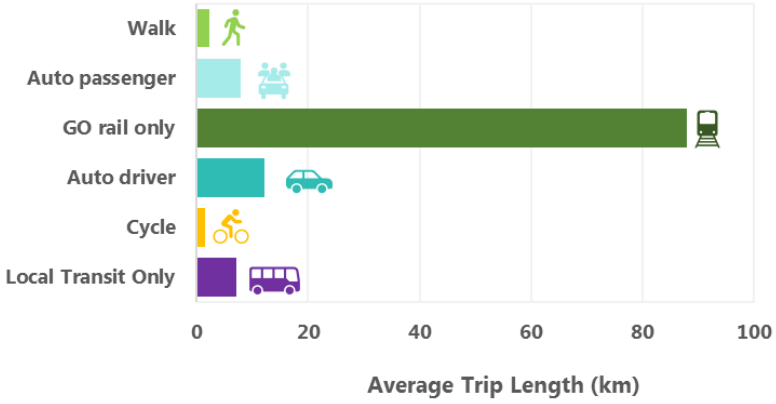


Figure 2: Travel Patterns in Ainslie Wood

4.2 Trip Length

The average trip length for all trips with an origin or destination within the study area is approximately 20 kilometres regardless of the mode taken. The average trip length for all trip types with an origin or destination within Ainslie Wood by mode is illustrated in **Figure 3**. Trips made using GO rail are approximately 88 kilometres on average and are the longest trips observed (consistent with the travel distance from Hamilton GO station to Downtown Toronto/Union Station via Lakeshore West GO line), whereas cycling and walking trips are one and two kilometres on average respectively and are the shortest trips observed as expected. Other than GO Rail, most trip lengths are within 15 kilometres in the study area.



Data Source: Transportation Tomorrow Survey 2016

Notes:
GO Rail: Park and ride or walk to GO station

Figure 3: Average Trip Lengths by Mode

Moreover, there are approximately 3,212 trips made within the study area which are less than or equal to 1 kilometre in length. Of these trips, 56% were made by car, 16% by transit, and 29% by active modes such as walking and/or cycling, as illustrated in **Figure 4.** The local population, which is mainly comprised of university students and permanent residents, tend to prefer local transit, walking and cycling as alternative modes to driving for short trips (i.e. ≤ 1 km) in Ainslie Wood. As such, it will be important to improve the pedestrian and cycling environments within the study area in order to create networks in which students and residents feel comfortable making these trips by foot or bicycle. In doing so, it may be possible to create a significant modal shift away from the single auto driver for these short trips and to improve the safety of all transportation network users.

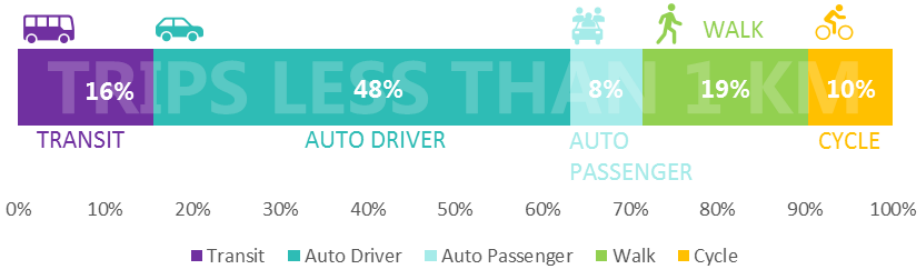


Figure 4: Trip Less Than or Equal to 1km by Mode (Data Source: TTS 2016)

5.0 Auto Environment

The auto environment was reviewed to understand the road characteristics, operating speeds, vehicular volumes and traffic operation performance in Ainslie Wood as described in the following sub-sections.

5.1 Road Characteristics

The existing number of lanes of the road network in the Ainslie Wood neighbourhood is illustrated in **Figure 5**. Main Street has a 6-lane cross-section between Cline Avenue and Paisley Avenue and transitions to 5 lanes for sections between Cootes Drive and Ewen Road. The local street network typically has a 2-lane cross-section. There are 14 signalized intersections within the Ainslie Wood study area, all located along Main Street. It should be noted that the potential implementation of the LRT will introduce changes to cross-sections and lane configuration along Main Street West.

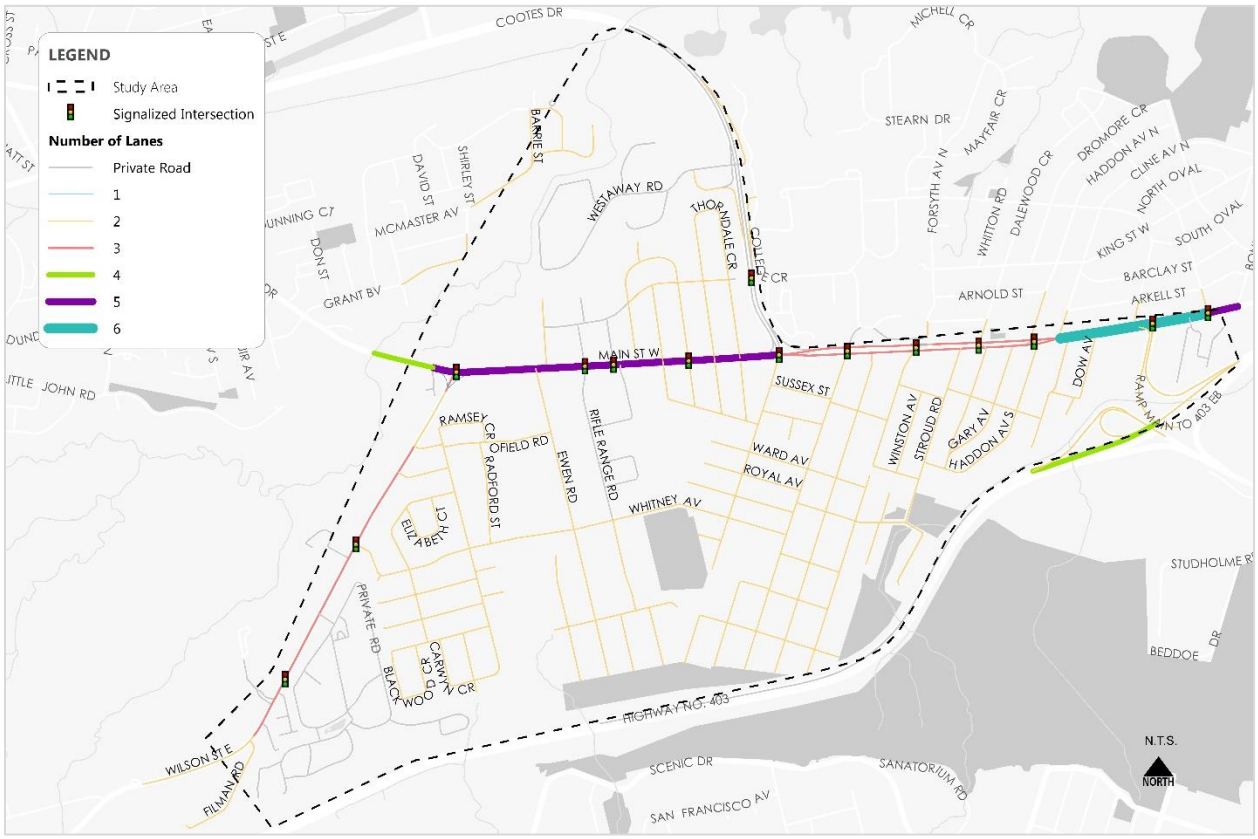


Figure 5: Number of Lanes and Signal Locations

The speed limit within Ainslie Wood varies between 30km/hr to 60km/hr, as presented in Figure 6. The posted speed limits for local street network south of Main Street (including Cootes Drive) are generally 40km/hr to 50km/hr. Other private roads in McMaster University campus (north of study area) and White Chapel Memorial Gardens (near Wilson Street) have posted speeds of less than 40km/hr.

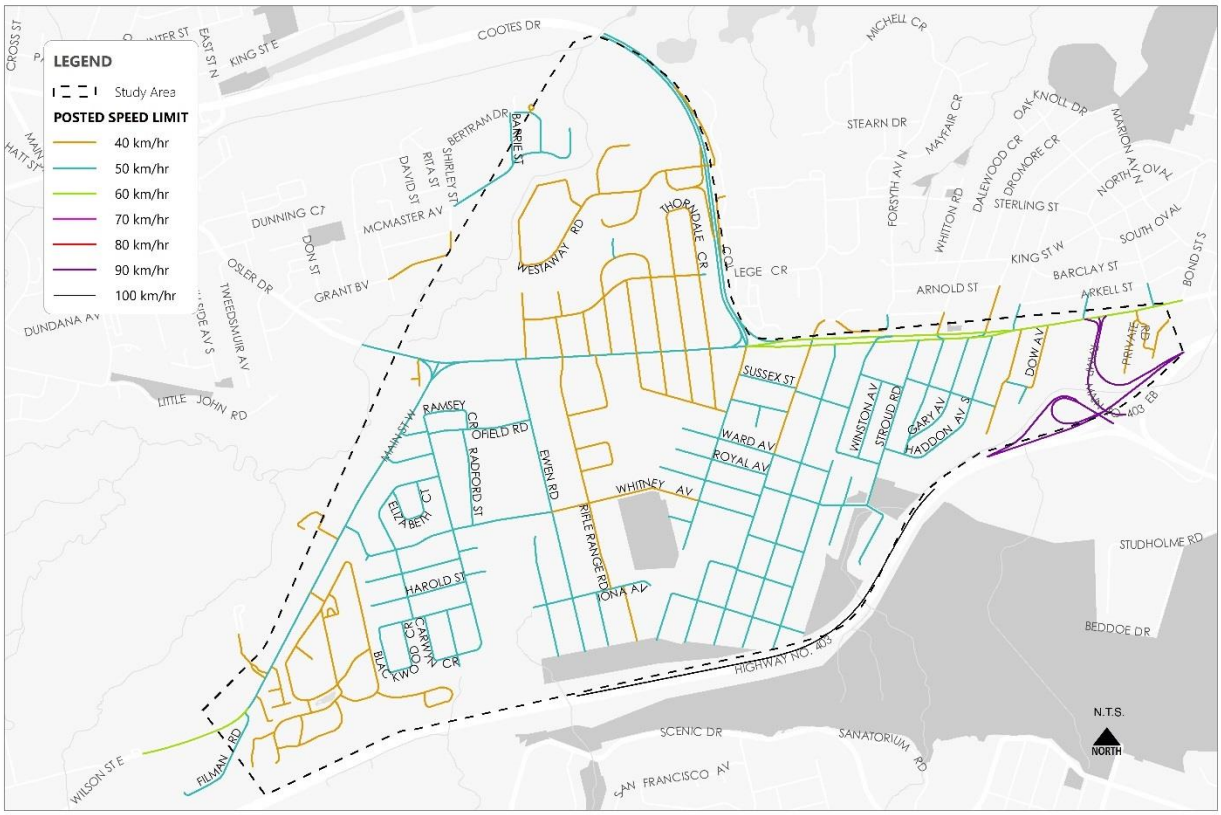


Figure 6: Posted Speed Limit in Ainslie Wood

5.2 Operating Speeds

A number of streets in the Ainslie Wood neighbourhood were identified as having issues with high speeds based on raised public concerns. In order to address these concerns with perceived speeding, speed surveys were conducted for each of the streets in question. Speed data was collected in 2008 for Sanders Boulevards and in 2017 for Leland Street, Glenmount Avenue, and Whitney Avenue. The data collected during the surveys was utilized to calculate weighted average speeds and 85th percentile speeds. According to OTM Book 1[1], operating speed is the speed at which the majority of vehicles are traveling, typically the 85th percentile. As such, a comparison between 85th percentile speed (i.e. operating speed) and the posted speed limit was completed. This comparison plays an important role in determining if perceived speeding issues are accurate, and if so, if any traffic calming measures may be required. A summary of the locations of concern, posted speed limits, weighted average speed and 85th percentile speed can be found in **Table 3**.

[1] Introduction to the Ontario Traffic Manual, OTM Book 1 (March 2005)

Table 3: Neighbourhood Speeds

Location	Speed Limit	Min. Speed	Max. Speed	Average Speed	85th Percentile Speed	% of Vehicles Compliant
Sanders Blvd	40 km/h (posted)	25km/hr	65km/hr	36.5 km/h	41 km/h	64%
Leland St (between Main St and Ward)	40 km/h (school zone)	27km/hr	72km/hr	42.7 km/h	50.8 km/h	37% (40km/hr)
Glenmount Ave (between Leland and Kingsmount)	40 km/h (posted)	35km/hr	55km/hr	41.6 km/h	47.7 km/h	42%
Whitney Ave (between Lower Horning and Ewen)	50 km/h (not posted)	34km/hr	64km/hr	49.0 km/h	54.9 km/h	51%

According to the Traffic Calming/Management Policy Update produced by the City of Hamilton the minimum vehicle speed threshold for which traffic calming becomes a consideration is when 85th percentile speeds are 8 km/h in excess of the speed limit. In all instances, 85th percentile speeds were within 8 km/hr of the posted speed limits and deemed to be satisfactory. Thus, observed 85th percentile speeds indicate that traffic is generally operating at safe speeds.

Instances of excessive travel speeds were noted for Leland St where the drivers have exceeded approximately 30km/hr over the posted speed limits. However, only three vehicles were recorded with such violations.

Observed speeds were delineated according to speed intervals of 10 km/h and are summarized in **Figure 7** through **Figure 10**.These figures provide an illustration of how vehicle speeds are distributed along each street. It should be noted that although 85th percentile speeds are satisfactory, the percentage of compliant vehicles on Sanders Boulevard, Leland Street, Glenmount Avenue, and Whitney Avenue are relatively low; with compliances of 64%, 37% (in school zone), 42%, and 51% respectively. The low compliance can be attributed to the fact that a high percentage of vehicles speeds that were measured were observed to be just in excess of the speed limit (i.e. within the 10 km/h interval above the speed limit). Therefore, although 85th percentile speeds are satisfactory, data indicates that there are a high percentage of non-compliant vehicles in which traffic calming measures may need to be considered.

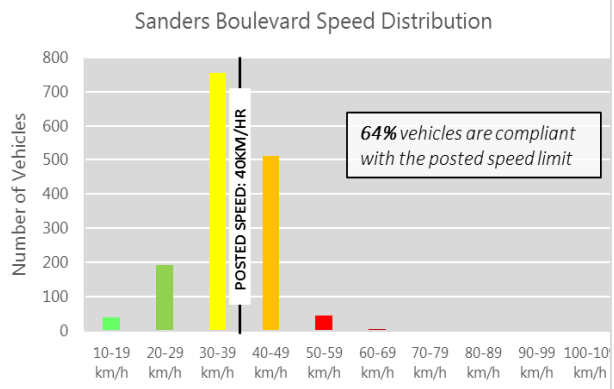


Figure 7: Sanders Boulevard Speed Distribution

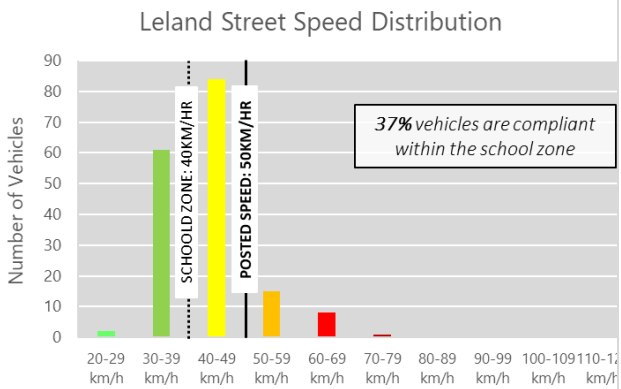


Figure 8: Leland Street Speed Distribution

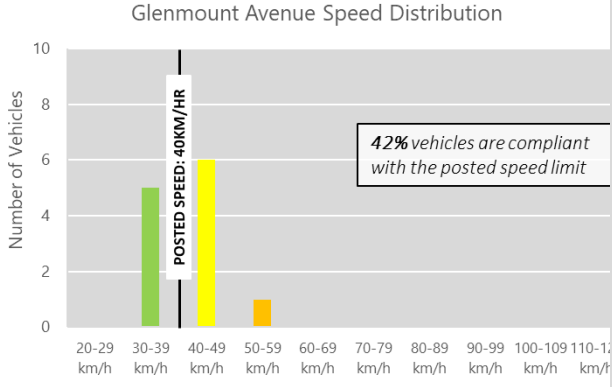


Figure 9: Glenmount Avenue Speed Distribution

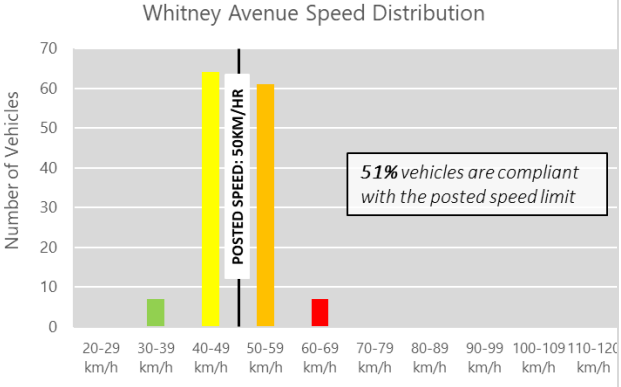


Figure 10: Whitney Avenue Speed Distribution

5.3 Vehicular Demand

Daily traffic volumes that were provided by the City in GIS shapefile format are presented in **Figure 11**. The volumes for small street segments no data (along Main Street) were interpolated based on upstream and downstream traffic demand. As shown, Main Street and Whitney Street are the two major corridors that are heavily utilized in the study area depicting daily volumes greater than 4,000 vehicle a day. In addition, Leland Street also exhibit moderate daily traffic volumes ranging from 2,500 to 3,000 vehicles, as this street provides direct connection to a major arterial (Main Street).

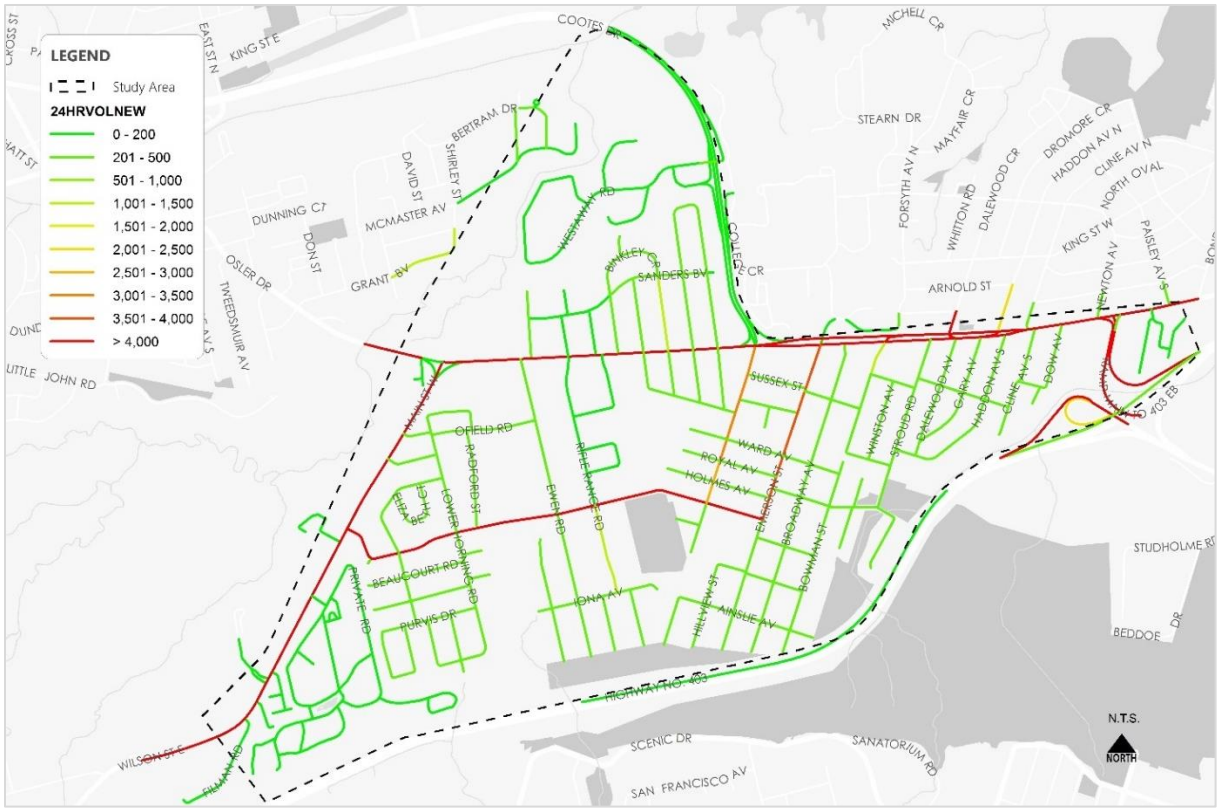


Figure 11: Daily Traffic Volumes

To assess existing traffic operations, turning movement counts (TMCs) were gathered from the City's Transportation Data Management System. The locations of these counts as well as the date on which each individual count was conducted are summarized in **Table 4**. Additional counts were requested for intersections at which concerns had been identified. Counts for these intersections were conducted on May 1, 2018.

Signal timing plans (STPs) were provided by the City in the form of AM and PM Synchro models. These received STPs are considered to be the most up-to-date timing plans and were used to analyze the existing traffic operations in the study area.

As per direction from the City, a 2% background growth rate was used to grow historical volumes to existing conditions (2018). It should be noted that some historical counts were in excess of 10+ years old and thus volumes were interpolated based on the demands at the upstream and downstream intersections.

Table 4: Turning Movement Count Locations and Dates

Count Location	Periods	Date
Main St W / Whitney Ave	Weekday AM & PM	September 12, 2012
Main St W / Osler Dr	Weekday AM & PM	March 4, 2011
Main St W / Rifle Range Rd	Weekday AM & PM	October 17, 2014
Main St W / Fortinos	Weekday AM & PM	October 20, 2014
Main St W / Hollywood St	Weekday AM & PM	April 25, 2016

Count Location	Periods	Date
Main St W / Cootes Dr	Weekday AM & PM	October 21, 2014
Main St W / Emerson St	Weekday AM & PM	October 7, 2009
Main St W / Bowman St	Weekday AM & PM	December 2, 2005
Main St W / Dalewood Ave	Weekday AM & PM	August 26, 2011
Main St W / Haddon Ave	Weekday AM & PM	November 24, 2014
Main St W / Hwy 403 Ramp	Weekday AM & PM	March 24, 2011
Westwood Ave / Gary Ave	Weekday AM & PM	May 1, 2018
Sussex St / Leland St	Weekday AM & PM	May 1, 2018
Iona Ave / Ewen Rd	Weekday AM & PM	May 1, 2018
Whitney Ave / Mericourt Rd	Weekday AM & PM	May 1, 2018
Sanders Blvd / Norfolk St	Weekday AM & PM	May 1, 2018

5.4 Vehicular Level of Service

Intersection operations were assessed using the software program Synchro 9, Version 9.2, Build 914, using the Highway Capacity Manual (HCM2000) methodology published by the Transportation Research Board National Research Council. Synchro 9 can analyze both signalized and unsignalized intersections in a road corridor or network taking into account the spacing, interaction, queues and operations between intersections.

Two separate measures of performance are considered in the signalized intersection analysis:

- volume to capacity (v/c) ratio; and
- Level of Service for all intersection movements.

Two separate measures of performance are considered in the two-way un-signalized intersection analysis:

- Volume to capacity (v/c) ratio and
- Level of Service for the critical movements.

Level of service is based on the average control delay per vehicle for a given movement. Delay is an indicator of how long a vehicle must wait to complete a movement and is represented by a letter between 'A' and 'F', with 'F' being the longest delay. The volume to capacity (v/c) ratio is a measure of the degree of capacity expected at an intersection.

The existing traffic volumes for the study area are shown in **Figure 5**.

A traffic analysis was undertaken using Synchro software based on the updated traffic counts and the signal timing plans provided by the City. The resulting existing intersections operations are illustrated graphically in **Figure 13** and summarized in **Table 5**. Detailed intersection operations with critical movements (defined as movements with LOS F, and/or with a v/c ratio greater than 1.00, highlighted in red) are provided in **Appendix A**. HCM Reports are included in **Appendix B**.

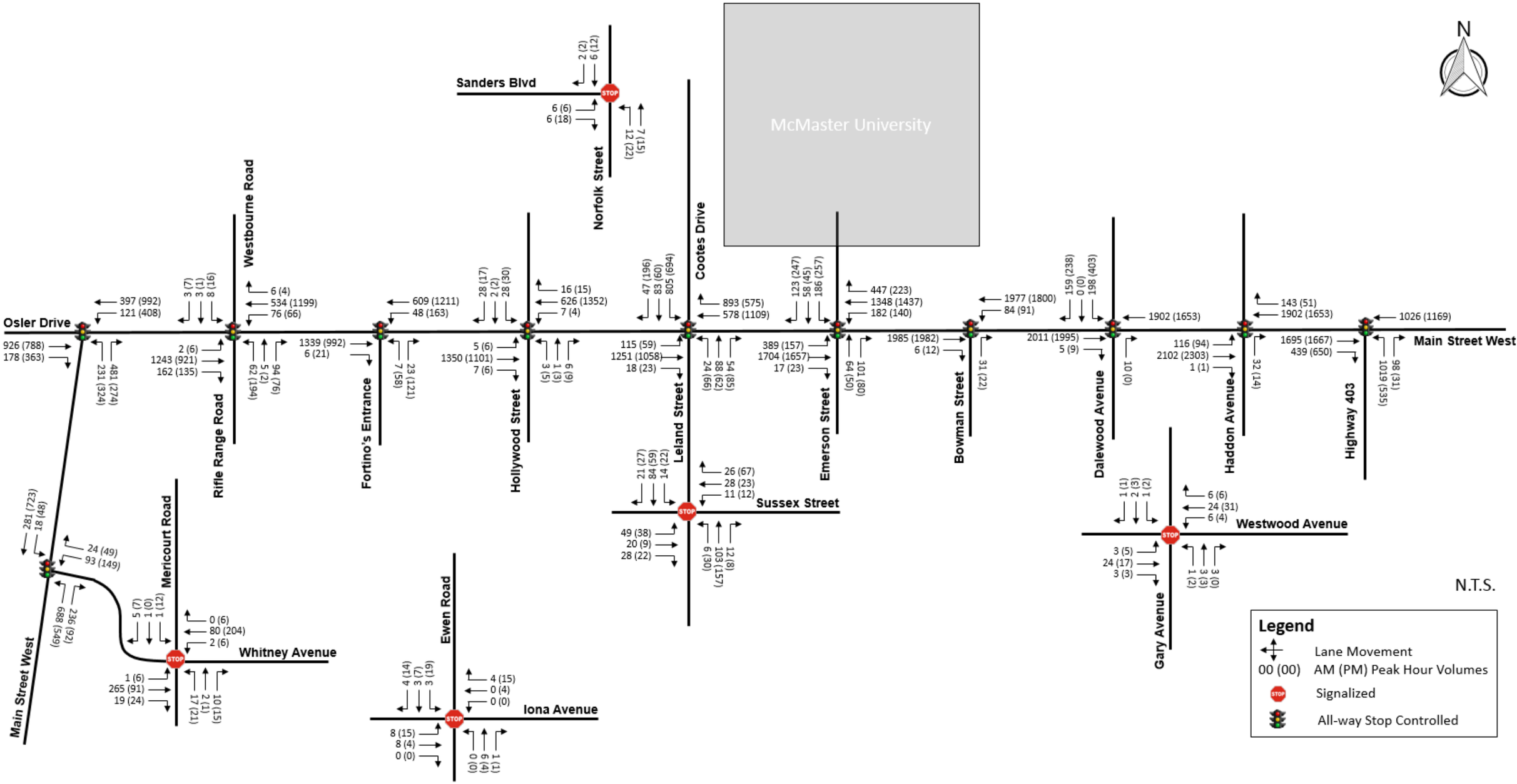


Figure 12: Existing Traffic Volumes (2018)

Table 5: Existing Intersection Operations

Intersection	AM Peak Hour		PM Peak Hour	
	LOS	v/c	LOS	v/c
Main St W / Whitney Ave	A	0.58	B	0.73
Main St W / Osler Dr	C	0.81	D	0.86
Main St W / Rifle Range Rd	B	0.71	B	0.66
Main St W / Fortinos	A	0.50	A	0.58
Main St W / Hollywood St	A	0.53	A	0.56
Main St W / Cootes Dr	C	0.93	C	0.81
Main St W / Emerson St	C	0.89	C	0.90
Main St W / Bowman St	B	0.74	A	0.70
Main St W / Dalewood Ave	B	0.85	B	0.78
Main St W / Haddon Ave	B	0.64	A	0.61
Main St W / Hwy 403 Ramp	C	0.82	B	0.63
Westwood Ave / Gary Ave	A	0.05	A	0.05
Sussex St / Leland St	A	0.18	A	0.27
Iona Ave / Ewen Rd	A	0.02	A	0.02
Whitney Ave / Mericourt Rd	A	0.06	A	0.06
Sanders Blvd / Norfolk St	A	0.03	A	0.05

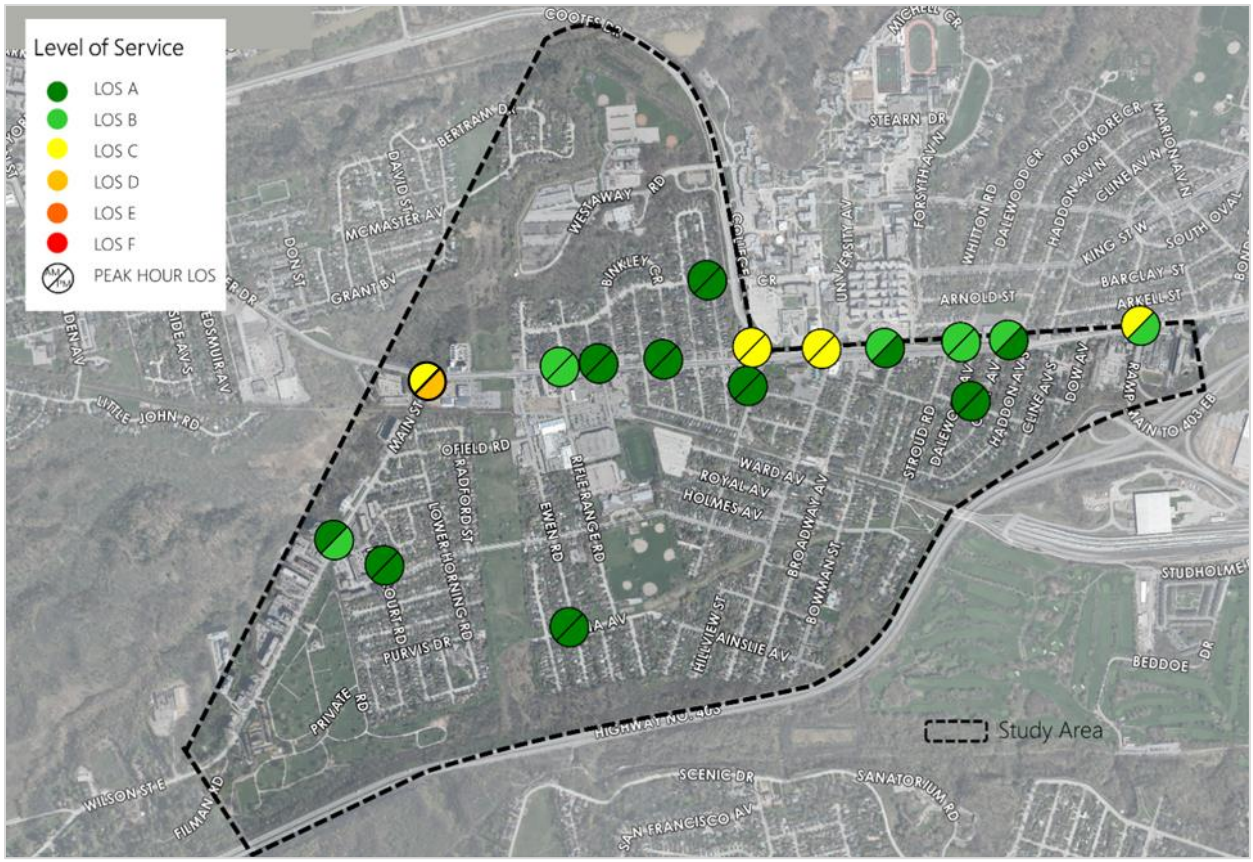
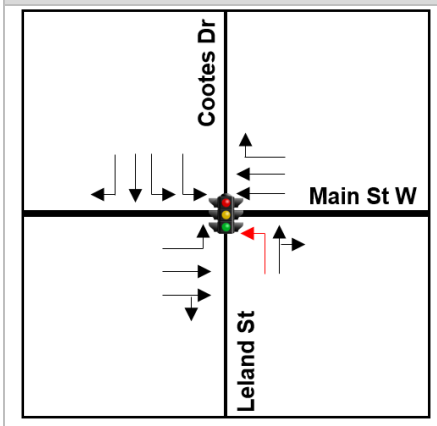
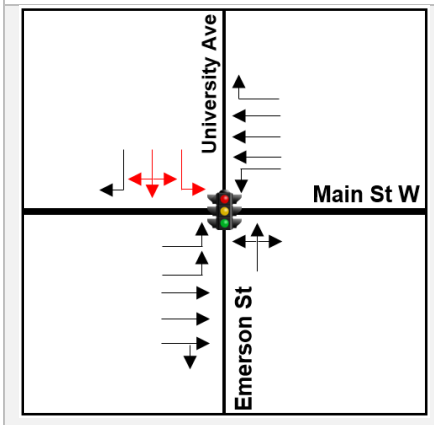
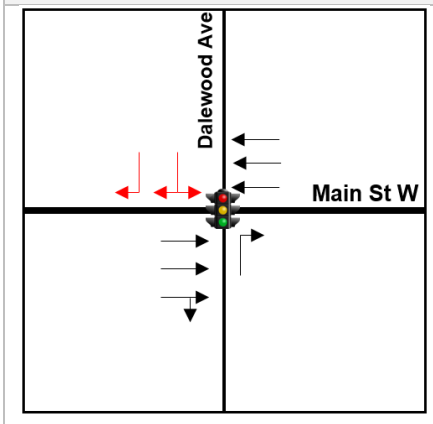


Figure 13: Existing Traffic Operations Map

Based on the results shown in **Table 5**, the intersections within the study area are currently operating with an overall acceptable level of service in both the AM and PM peak hours. All study intersections are operating with an overall LOS of "D" or better. Notwithstanding the overall LOS are deemed acceptable, several intersections have movements that operate with an LOS of "F" which are discussed in more detail below.

5.4.1 Intersections with Critical Movements

Intersection	Description
 ***Cootes Drive at Main Street West***	The intersection operates with an overall LOS "C" during both the AM and PM peak hours. During the PM peak hour, the northbound left-turn movement operates with a LOS of "F." The signal timing plan does not have a protected phase dedicated to this movement, hence the long delays.
 ***Emerson Street at Main Street West***	The intersection operates with an overall LOS "C" during both the AM and PM peak hours. During the AM peak hour, the southbound left-turn and southbound through movements operate with a LOS of "F". In this case, a high percentage of the available green time is dedicated towards the eastbound and westbound movements to maintain acceptable traffic operations along the Main Street corridor.
 ***Dalewood Avenue at Main Street West***	The intersection operates with an overall LOS "B" during both the AM and PM peak hours. During the PM peak hour, the southbound left-turn and southbound through movements operate above capacity with a LOS "F". Dalewood Avenue is a one-way southbound street between King Street West and Main Street West and high volumes of traffic use this street to exit the Westdale neighbourhood which is just north of the Ainslie Wood study area.

6.0 Truck Environment

Main Street West and Cootes Drive are currently designated as full-time trucks routes. Heavy trucks are required to utilize these routes to travel through the Ainslie Wood neighbourhood. Trucks may use alternate routes for deliveries only. Trucks typically use Main Street to access Highway 403 and make trips to/from external municipalities or cities. Truck percentages on Main Street West generally fall in the range of 4% to 6% of total volume. It should be noted that the currently identified full-time truck routes are illustrated in the *Goods Movement Review* which is part of the recently approved City-Wide Transportation Plan.

7.0 Transit Environment

The following sections documents the transit review that was conducted to identify the local transit network within the study area.

7.1 Hamilton Street Railway

Multiple transit routes run through or adjacent to the Ainslie Wood neighbourhood. The study area has the benefit of being located adjacent to McMaster University which provides four bus routes from the Hamilton Street Railway Company (HSR Transit) serving Main Street West and Whitney Avenue. In addition to HSR Transit, GO Transit also services the McMaster GO Station. It is important to note that the pending LRT will potentially alter bus routes in the future (both routes and headway). These services include the following:

- **HSR Route 1A King** operates weekdays between University Plaza and Eastgate Square from approximately 4:40 AM to 2:00 AM, along Main Street West through the study area. This route operates with headways of approximately 15 minutes during the peak hours.
- **HSR Route 5 Delaware** serves lower Hamilton including Dundas, Ancaster, and Stoney Creek from approximately 5:00 AM to 2:00 AM. The 5A and 5C routes generally utilize Whitney Avenue and Emerson Street through the study area, while the 5 and 5E routes travel along Main Street West through the study area. Each specific route operates with headways of approximately 30 minutes during the peak hours.
- **HSR Route 10 B-Line Express** operates generally along the future B-Line LRT route from University Plaza to Eastgate Square on Main Street West. The route operates weekdays from approximately 5:30 AM to 7:45 PM with headways of 10 minutes.
- **HSR Route 51 University** operates six days a week from the West Hamilton Loop to the Hamilton GO Station via Sterling Street. The service runs generally from 7:30 AM to 2:30 AM with headways of approximately 8 minutes. The route operates from the beginning of September to the end of April; predominantly in place to offer service for McMaster University students.
- **GO Transit Route 15 Brantford/Burlington** operates from approximately 5:30 AM to 12:00 AM between the Brantford Bus Terminal and Aldershot GO Station connecting to the Lakeshore West GO line.
- **GO Transit Route 47 407 West** operates between McMaster University and York University from approximately 5:30 AM to 12:00 AM.
- Two inter-regional bus services; Coach Canada/MegaBus and Greyhound, offer service to the McMaster University campus and select locations along Main Street West.

The existing transit network is illustrated in **Figure 14**.

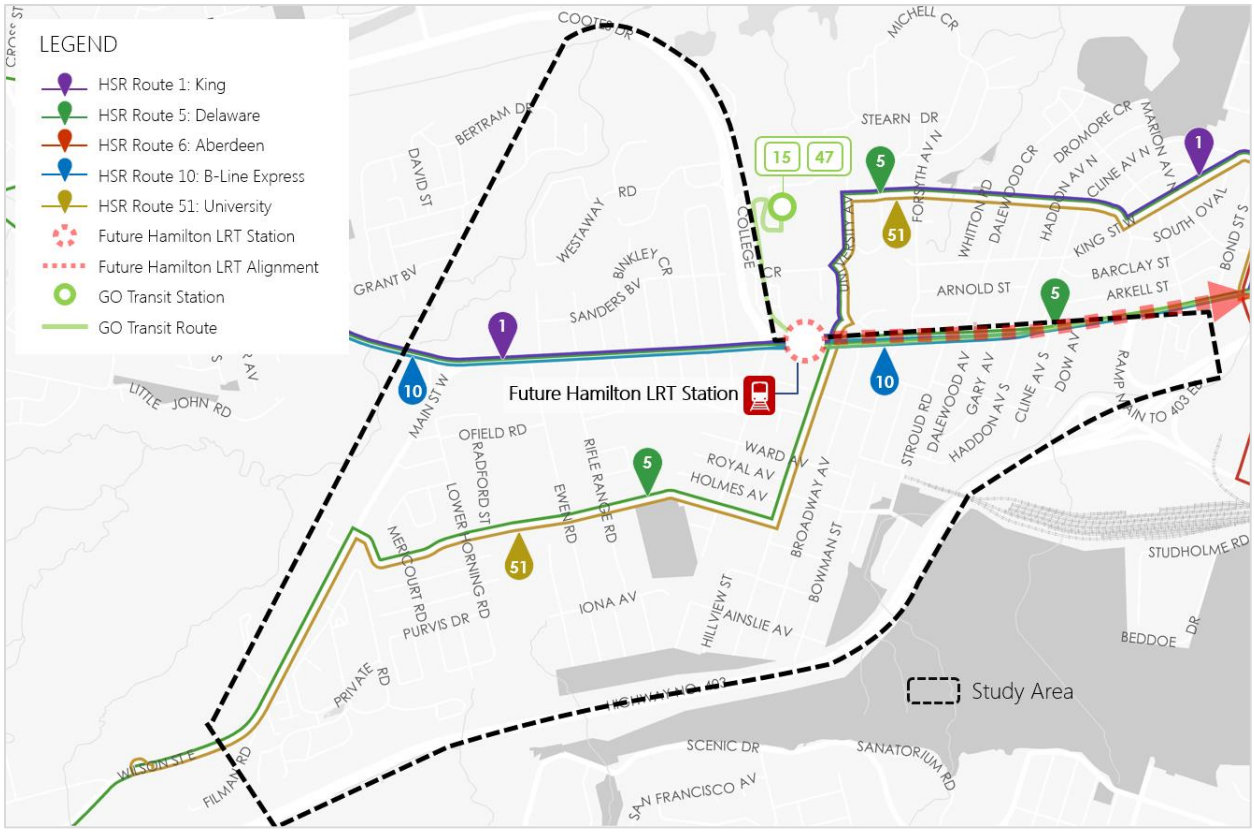


Figure 14: Existing Transit Network

Headways generally range from 10 minutes to 30 minutes for bus routes in the area. Multiple routes run along Main Street West, providing quick and reliable service. Refer to **Figure 15** for an illustration of the frequency of buses along each route during the AM and PM peak hours.

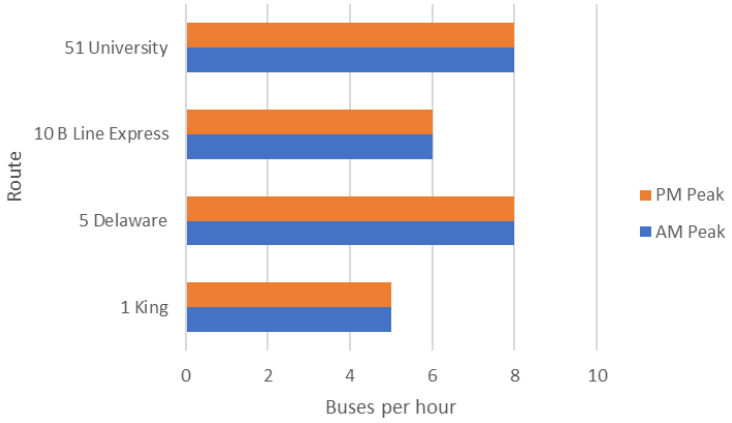


Figure 15: Buses per Hour (Weekday Peak Hours)

7.2 Hamilton Light Rail Transit

Subject to further studies, budget approval and implementation phasing, the expected completion of the Hamilton Light Rail Transit (LRT) is scheduled for 2024. The LRT will operate along Main Street West within the study area, with the western terminus of the B-Line LRT located adjacent to McMaster University.

Preliminary scenarios have the B-Line LRT operating with a 6-minute frequency. With the implementation of the LRT the following key changes could be made to traffic circulation:

- Between the western limit (i.e. McMaster stop, just east of Cootes Drive) and Dalewood Avenue, the LRT will operate on the north side of Main Street West in both directions. The existing turning movements will be maintained throughout this section of the corridor;
- East of Haddon Avenue, the shared centre left-turn lane will be eliminated and unsignalized intersections will be limited to right-in / right-out movements only.Between Haddon Avenue and Leland Street, one westbound through lane will be eliminated (i.e. 2 through lanes instead of 3 through lanes); and
- The one-way circulation (westbound on King Street West; eastbound on Main Street West) will be retained.

As the LRT project is still in planning stages, this neighbourhood traffic review study will consider the potential impacts to the neighbourhood but it is not in the study scope to address specific issues with respect to the LRT.

8.0 Pedestrian Environment

Ainslie Wood consists of mostly residential uses with commercial strips along Main Street. High pedestrian activities are present throughout the neighbourhood. The existing pedestrian network is illustrated in **Figure 16.**

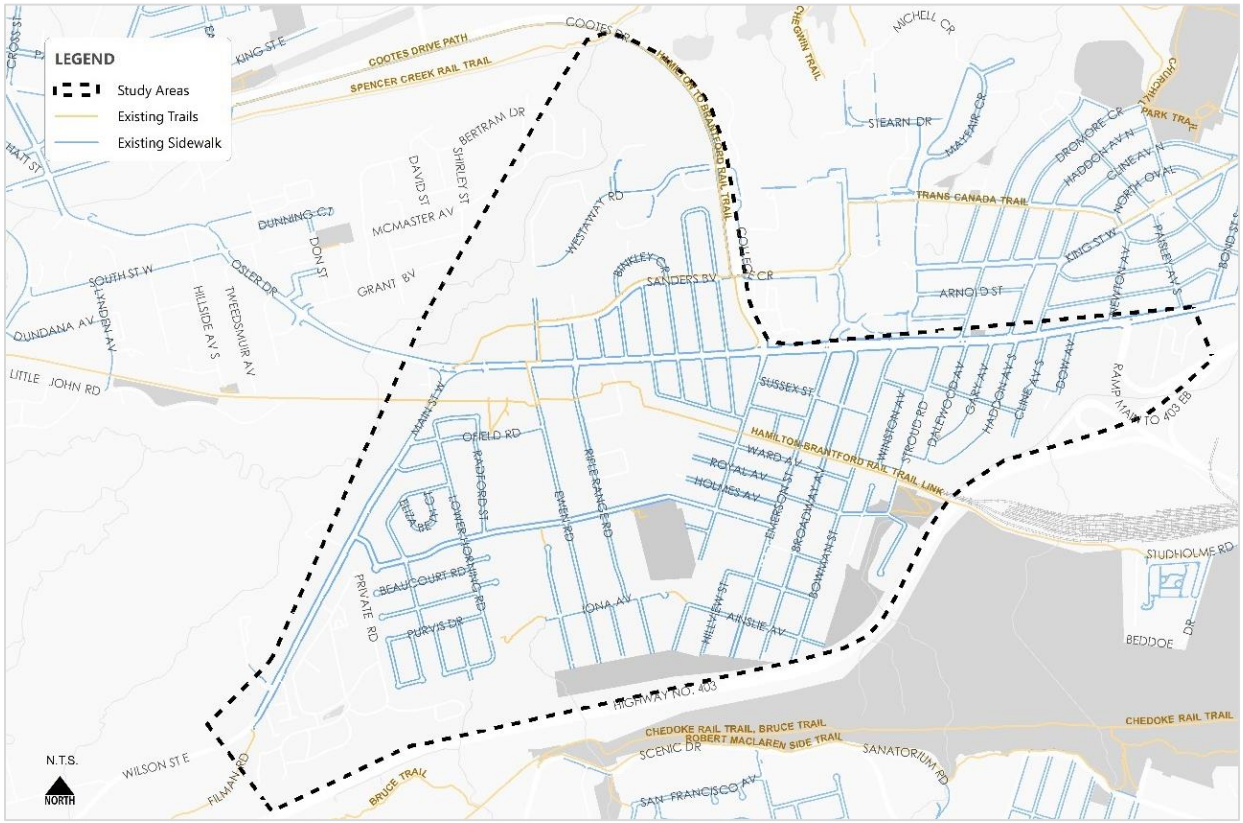


Figure 16: Existing Pedestrian Facilities

As shown, sidewalks are generally located on both sides of the streets in the current network, providing sufficient connectivity for pedestrians. Pedestrian crossings are provided at most intersections but missing at some locations such as at the east approach of Main Street and Cootes Drive. Pedestrian crosswalk pavement markings are noted as faded at several locations during site visits, including: Lower Horning Road and Purvis Drive, Main Street West and Whitney Avenue, Whitney Avenue and Emerson Street, Cline Avenue South and Paul Street, and Sanders Boulevard and Thorndale Street North.

Long crossing distances can be found at major intersections along the Main Street corridor. For instance, a three-stage pedestrian crossing with concrete crosswalks are present at major intersection including Main Street and Emerson Street. This creates potential conflict points with motorists due to the 8-lane cross-section and subsequently increase the travel time for pedestrians. Similar characteristics can also be found at Dalewood Avenue and Haddon Avenue.

8.1 Pedestrian Demand

In general, crosswalks are provided at all signalized intersections while pedestrian crossovers are provided at certain unsignalized intersections with high pedestrian volumes. A few minor stop-controlled intersections that incur high pedestrian activities but do not currently have pedestrian crossover treatments were noted during site visits as discussed in Section 3.2.

Additionally, the Hamilton Brantford Rail Trail also runs through the Ainslie Wood neighbourhood. Pedestrian crossing treatment is absent at all trail crossings within the study area. Additionally, no signage exists to inform motorists of the upcoming rail trail crossings.

Generally, shorter crossing distances, clearer delineation, slower vehicular speeds and multitude of street-facing businesses and residences can elevate pedestrian experience in the Ainslie Wood neighbourhood.

In summary, the major pedestrian generators in Ainslie Wood include:

- Institutional uses such as McMaster University, Columbia International College, St. Mary Catholic Secondary School and local middle schools;
- Recreational uses including Hamilton Brantford Rail Trail; and
- Commercial along Main Street and Rifle Range Road.

9.0 Cyclist Environment

This section describes the existing network and demand with respect to cycling within Ainslie Wood.

Currently, signed on-street bike lanes are present along some local streets, namely Ewen Road, Rifle Range Road, Dalewood Avenue and Haddon Avenue, providing connection to Ainslie Wood and recreational trails within the neighbourhood. Designated Bicycle lanes are present on Sanders Boulevard and are situated between an active lane of traffic and curb-side parking. SOBI bicycle hubs are located alongside the curb, adjacent to the bicycle lanes. Bicycle lanes also exist on Main Street West adjacent to the curb Bicycle hubs are located on the sidewalk so as to avoid encroaching on the bicycle lanes.

The bicycle hubs are found to be appropriately placed in Ainslie Wood, and do not introduce any safety concerns. Please refer to **Figure 17** for an illustration of the existing bicycle network and the SOBI bicycle hub locations. There are currently no cycling facilities built into the intersections – such as bike boxes or pocket turning lanes.

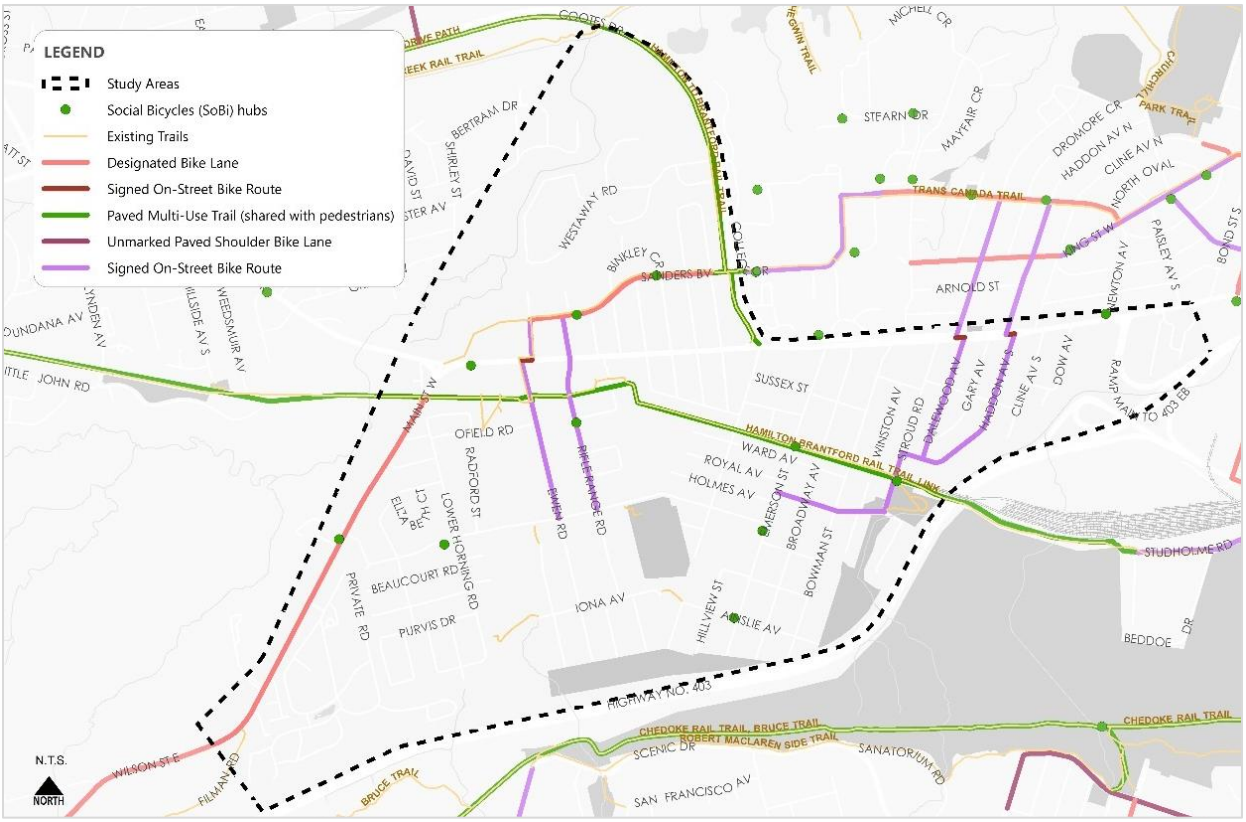


Figure 17: Existing Cycling Facilities

9.1 Cycling Demand

Significant cyclist volumes were also observed during site visits, with frequent users of the SOBI Hamilton service. Multiple SOBI bike stations are located in the neighbourhood, with the majority of them situated along the existing bicycle network (i.e. bicycle lanes and/or bicycle routes).

The City of Hamilton employs a data collection program known as the *Active Transportation Benchmarking Program*, which collects and documents pedestrian and cycling activity on trails and bicycle routes throughout the City. **Figure 18** illustrates the average number of daily users on select multi-use paths and bicycle lanes within the Ainslie Wood neighbourhood. A summary of data collected between 2011 and 2017 is provided in **Appendix C**. It is evident that the Hamilton-Brantford Rail Trail is heavily utilized throughout the year. This trail run east-west through the neighbourhood (roughly parallel to Main Street West), providing a safe route for both pedestrians and cyclists. The dedicated bike lanes on Sanders Boulevard are also quite heavily used as they provide direct access to McMaster University via the Cootes Drive pedestrian crossing.

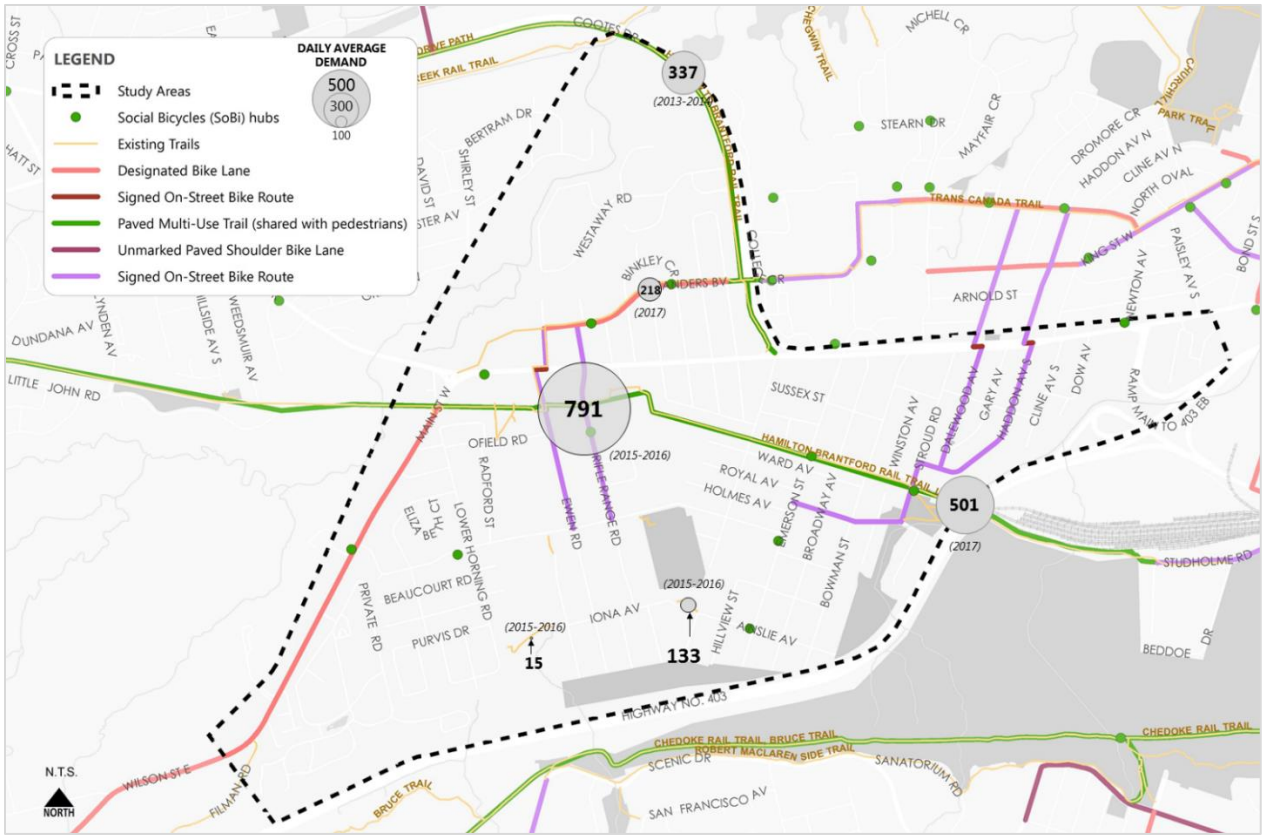


Figure 18: Daily Average Active Transportation Users

10.0 Parking Supply and Demand

On-street parking is permitted on most roads within the study area, with the main exception being Main Street West. Various parking restrictions exist on the through streets in the neighbourhood; those being Emerson Street and Whitney Avenue. For areas in close proximity to Main Street West, parking is generally limited to 1-hour durations during the week. On-street parking near McMaster University is generally fully utilized; presumably by students and faculty. Streets on which there is no parking time limit are also often fully utilized – arising from a combination of residents and students.

11.0 Road Safety

This section documents the traffic safety review conducted as part of the Ainslie Wood Traffic Management Study. The purpose was to identify collision patterns and hotspots, followed by detailed in-field investigation to confirm findings. The results will inform the development and assessment of alternative solutions in future study phases. Safety initiatives including Road Safety Action Plan, enforcement programs as delivered by the Hamilton Road Safety Committee will also be considered. The complete analysis results from the safety review can be found in **Appendix D**.

11.1 Collision by Locations

A heat map was developed to visualize the locations based on observed collision frequencies, as shown in **Figure 19.** In total, there are 268 collisions occurred within the neighbourhood with an annual average of 53.6 collisions in a five-year period. A more detailed trend analysis is provided in **Section 11.2**. Serving as the major arterial in the study area, Main Street exhibited the highest number of collisions (223 collisions

or 83%). The predominant impact type was rear-end collisions which correlates with the high traffic volumes along this corridor. Majority of the rear-end collisions have no patterns with weather conditions but are likely attributable to close traffic gaps or high traveling speed (abrupt braking).

Figure 19: Collisions Hotspots (All Collision Types)

Several intersections were identified as collision-prone locations which experienced relatively higher number of collisions than other locations within the study area are discussed below.

11.1.1 Local Neighbourhood

To provide a better understanding of road safety for the local neighbourhood, a detailed analysis was undertaken exclusive to Ainslie Wood (Main Street excluded). This resulted in 45 records of collisions within Ainslie Wood, of which 31% (or 14 out of 45) of these occurred Whitney Avenue which is a main collector road in the study area. The predominate impact type on Whitney was SMV collisions (64% or 9 out of 14). These SMV collisions were further re-classified based on vehicle type and driver's action as shown in **Table 6**. Approximately 50% of the SMV collisions took place under dark light (night time) conditions and wet or icy road surfaces. As such, SMV collisions were mainly attributed to insufficient visibility (illumination issue) and/or unfavourable road conditions.

Table 6: SMV Collisions on Whitney Avenue

Vehicle Type	Exceeding speed limit	Improper turn	Lost control	Other	Total
Auto station wagon	**-**	**-**	5	1	**6**
Intercity bus	**-**	-	-	1	**1**
Motorcycle	1	-	-	-	**1**

Vehicle Type	Exceeding speed limit	Improper turn	Lost control	Other	Total
Municipal bus	**-**	1	-	-	**1**
Total	**1**	**1**	**5**	**2**	**9**

11.2 Collision Trend Analysis

After the database has been reviewed and validated, collision analysis was conducted using the most recent five years of inclusive collision records, between 2013 and 2017. Collisions within the study area of Ainslie Wood neighbourhood are shown in **Figure 20**. The historical collision data was reviewed to gain an understanding of any identify potential issues, findings are summarized in the following sections.

Figure 20: Collisions in the Study Area (2013-2017)

11.2.1 Vision Zero Concept

In addressing safety concerns in the neighbourhood, the project team will consider Vision Zero concept which aims for no fatalities or serious injuries on roadways. A key strategy of Vision Zero is to encourage the use of active transportation modes by improving the level of comfort and safety for vulnerable road users of all ages and abilities. During the identification of alternative solutions stage, the Ainslie Wood Traffic Management Review study will explore the five elements of Vision Zero include engineering, education, enforcement, evaluation and engagement (**Figure 21**).

Figure 21: Vision Zero Elements

12.0 Conclusions

As part of the traffic management study, an existing conditions analysis was undertaken from a multi-modal perspective to assess the operational performance of the existing road network and assist in informing the future stages of this study. The key findings of the existing transportation conditions analysis are summarized as follows:

Travel Patterns and Behaviours: Current mode splits for the neighbourhood are 66% autos, 21% transit, and 13% walking or cycling. The longest trips are made by GO transit while most trip lengths are within 15 kilometres in the study area. The general planning direction for Ainslie Wood is to encourage a greater shift towards more sustainable transportation modes, including transit, walking and cycling.

Traffic Operations: Analysis showed that the road network within the Ainslie Wood neighbourhood is currently operating with an overall acceptable level of service. Critical individual movements noted at the following intersections with critical movements with LOS 'F' during both AM and PM peak hours:

- Cootes Drive at Main Street West (Northbound Left)
- Emerson Street at Main Street West (southbound left-turn and southbound through)
- Dalewood Avenue at Main Street West (southbound left-turn and southbound through)

During the AM peak hour, the dominant direction of traffic is eastbound along Main Street West. Eastbound traffic generally experiences heaviest queuing at Cootes Drive, Emerson Street, and Longwood Road. During the PM peak hour, traffic distribution is fairly evenly split in the eastbound and westbound directions on Main Street West. The dominant direction of traffic movement during the PM peak hour is also generally eastbound along Main Street West.

Transit: Multiple bus routes are present within the study area, providing frequent opportunities to use transit. Route 1 King, Route 5 Delaware, Route 10 B-Line Express, and Route 51 University all offer service within the neighbourhood. Headways generally range from 10 minutes to 30 minutes for these routes. Within the study area, transit routes are generally located on Main Street West, Whitney Avenue, and Emerson Street.

Pedestrians: There are sidewalks which are generally located on both sides of the streets in the current network, providing sufficient connectivity for pedestrians. More complex pedestrian crossing facilities at major intersections along Main Street (e.g. Emerson Street/University, Dalewood and Haddon Avenues). Pedestrian crossover treatments can be implemented and improved at minor stop-controlled streets within the neighbourhood where high pedestrian activities are incurred. Generally, shorter crossing distances, clearer delineation, slower vehicular speeds and multitude of street-facing businesses and residences can elevate pedestrian experience in the Ainslie Wood neighbourhood.

Cyclists: On-street bike lanes are present along some local streets providing connection to Westdale neighbourhood and recreational trails in the north. Bicycle lanes are present on Sanders Boulevard and are situated between an active lane of traffic and curb-side parking. SOBI bicycle hubs are located alongside the curb, adjacent to the bicycle lanes. Bicycle lanes also exist on Main Street West, south of its intersection with Osler Drive. Notable cyclist activities can be observed throughout the neighborhood with frequent SOBI Hamilton service users.

Travel Speeds: The percentage of compliant vehicles on Sanders Boulevard, Leland Street, Glenmount Avenue, and Whitney Avenue are relatively low; with compliances of 46%, 37% (in school zone), 42%, and 51% respectively.

Safety: During the five-year analysis period (2013-2017), there are 268 collisions recorded during the analysis period that resulted in 129 (or 48%) Property-Damage-Only (PDO), 138 (or 51%) injuries and 1 fatality. The location at which collisions occurred is relatively distributed in the study area with the exception of Main Street which experienced the the highest number of collisions. The collision-prone locations (as per the database reviewed) are summarized below.

- **Main Street & Cootes Drive** (27 collisions)
  - 27 collisions: 12 PDO and 15 Non-fatal injury
  - Predominant impact type: rear-ends and left-turns
- **Main Street & Emerson Street** (26 collisions)
  - 26 collisions: 11 PDO and 15 Non-fatal injury
  - Predominant impact type: rear-ends and pedestrian-related
- **Main Street & Newton Avenue** (19 collisions)
  - 26 collisions: 10 PDO and 9 Non-fatal injury
  - Predominant impact type: rear-ends and left-turns
- **Local Neighbourhood**
  - High proportion of collisions in the local neighbourhood occurred along Whitney Avenue
  - Predominant impact type: SMVs
  - SMV collisions were mainly attributed to insufficient visibility (illumination issue) and/or unfavourable road conditions
- Traffic volumes were highest on Main Street West (i.e. major arterial within the study area) as it provides direct connection to Highway 403 as well as the downtown Hamilton core.

There are opportunities for reducing high rear-end collisions within the neighbourhood, particularly along Main Street. The probable contributing factors for rear-end collisions were due to close traffic gaps, improper lane change or speeding too fast for conditions. With respect to vulnerable road users, approximately 65% of the pedestrian-related collisions occurred under dark light (night time) conditions indicating potential illumination issue. As part of the City's Vision Zero policy, minimizing vulnerable user-related collisions will be a key consideration for this study.

12.1 Draft Problem and Opportunity Statement

As part of the Phase 1 MCEA requirements, the first phase of this Neighbourhood Traffic Management Study process is to identify a clear statement of the problems or opportunities to be addressed, in order to justify the need for a change(s) or improvement(s). Based on our understanding of the transportation deficiencies and opportunities that exist in Ainslie Wood, the draft Problem and Opportunity Statement is as follows:

"As a result of existing and future growth within Ainslie Wood, there is a need to improve the safety, mobility and accessibility for all residents, students and employees, whether travelling by automobile, transit, cycling or walking."

This statement will be presented at the first public consultation meeting for comments and input. Received feedback will be reviewed and incorporated by the project team in finalizing the statement.

12.2 Next Steps

The opportunities and constraints discussed in this report sets the stage for future phases of the Traffic Management Study in conjunction with the public's input received through public consultation. Consideration for land use, transportation and environmental features will be warranted in developing and evaluating alternative solutions to achieve greatest outcomes for the Ainslie Wood neighbourhood. Once alternative solutions have been developed, a public information centre will be held in which residents of the study area can express thoughts and concerns related to the presented solutions. The study will conclude with a Final Report submitted to the City, wherein ultimate recommendations for improvements will be summarized.

Appendix A

Existing Intersection Operations

Intersection & Individual Movement	AM Peak Hour		PM Peak Hour		AM 95th Queue (m)	PM 95th Queue (m)
	LOS	v/c	LOS	v/c		
Main St W / Whitney Ave						
Overall	A	0.58	B	0.73		
Westbound Left-turn	C	0.37	B	0.53	20.6	20.0
Westbound Right-turn	B	0.02	B	0.05	3.8	3.7
Northbound Through	A	0.64	B	0.63	119.4	104.3
Northbound Right-turn	A	0.20	A	0.07	7.1	7.2
Southbound Left-turn	A	0.09	A	0.20	4.0	10.1
Southbound Through	A	0.30	B	0.84	39.9	158.6
Main St W / Osler Dr						
Overall	C	0.81	D	0.86		
Eastbound Through	C	0.88	E	1.03	138.5	129.0
Eastbound Right-turn	A	0.19	B	0.53	14.7	21.8
Westbound Left-turn	D	0.53	D	0.85	39.8	144.0
Westbound Through	A	0.23	B	0.50	27.1	121.0
Northbound Left-turn	C	0.32	D	0.64	29.1	45.3
Northbound Right-turn	C	0.76	B	0.34	95.5	41.1
Main St W / Rifle Range Rd						
Overall	B	0.71	B	0.66		
Eastbound Left-turn	A	0.01	A	0.10	0.3	0.7
Eastbound Through	A	0.66	A	0.56	61.6	28.5
Eastbound Right-turn	A	0.66	A	0.56	61.6	28.5
Westbound Left-turn	C	0.71	B	0.33	35.5	20.1
Westbound Through	A	0.31	B	0.59	8.0	118.7
Westbound Right-turn	A	0.31	B	0.59	8.0	118.7
Northbound Left-turn	D	0.67	D	0.82	12.3	35.7
Northbound Through	D	0.67	D	0.82	12.3	35.7
Northbound Right-turn	D	0.32	C	0.09	17.4	9.0
Southbound Left-turn	C	0.11	C	0.09	3.9	1.1
Southbound Through	C	0.11	C	0.09	3.9	1.1
Southbound Right-turn	C	0.11	C	0.09	3.9	1.1
Main St W / Fortino's						
Overall	A	0.50	A	0.58		
Eastbound Through	A	0.54	A	0.39	52.4	78.0
Eastbound Right-turn	A	0.54	A	0.39	52.4	78.0
Westbound Left-turn	A	0.30	A	0.62	10.4	3.6
Westbound Through	A	0.26	A	0.51	34.7	10.6
Northbound Left-turn	D	0.09	D	0.28	3.4	21.6
Northbound Right-turn	D	0.02	D	0.30	3.6	20.1
Main St W / Hollywood St						
Overall	A	0.53	A	0.56		
Eastbound Left-turn	A	0.03	A	0.03	0.5	0.4
Eastbound Through	A	0.57	A	0.45	119.1	19.3
Eastbound Right-turn	A	0.57	A	0.45	119.1	19.3
Westbound Left-turn	A	0.08	A	0.01	1.9	0.4
Westbound Through	A	0.29	A	0.60	45.1	87.9
Westbound Right-turn	A	0.29	A	0.60	45.1	87.9

Intersection & Individual Movement	AM Peak Hour		PM Peak Hour		AM 95th Queue (m)	PM 95th Queue (m)
	LOS	v/c	LOS	v/c		
Northbound Left-turn	D	0.11	D	0.06	1.1	6.8
Northbound Through	D	0.11	D	0.06	1.1	6.8
Northbound Right-turn	D	0.11	D	0.06	1.1	6.8
Southbound Left-turn	D	0.28	D	0.25	6.2	15.6
Southbound Through	D	0.28	D	0.25	6.2	15.6
Southbound Right-turn	D	0.28	D	0.25	6.2	15.6
Main St W / Cootes Dr						
Overall	C	0.93	C	0.81		
Eastbound Left-turn	C	0.48	C	0.60	39.2	8.8
Eastbound Through	D	0.92	B	0.72	210.2	42.5
Eastbound Right-turn	D	0.92	B	0.72	210.2	42.5
Westbound Left-turn	N/A	N/A	N/A	N/A	N/A	N/A
Westbound Through	A	0.42	C	0.70	9.3	159.0
Westbound Right-turn	A	0.72	A	0.46	0.0	0.0
Northbound Left-turn	D	0.26	F	0.79	14.8	30.8
Northbound Through	E	0.74	E	0.79	63.2	42.9
Northbound Right-turn	E	0.74	E	0.79	63.2	42.9
Southbound Left-turn	D	0.89	E	1.00	133.9	126.0
Southbound Through	B	0.19	C	0.69	28.2	52.3
Southbound Right-turn	B	0.19	C	0.69	28.2	52.3
Main St W / Emerson St						
Overall	C	0.89	C	0.90		
Eastbound Left-turn	D	0.76	D	0.55	55.5	22.5
Eastbound Through	C	0.91	D	1.00	159.6	163.8
Eastbound Right-turn	C	0.91	D	1.00	159.6	163.8
Westbound Left-turn	D	0.68	C	0.41	51.0	45.0
Westbound Through	A	0.72	A	0.63	26.4	23.2
Westbound Right-turn	A	0.68	A	0.24	149.1	74.0
Northbound Left-turn	N/A	N/A	N/A	N/A	N/A	N/A
Northbound Through	D	0.58	D	0.35	47.9	28.7
Northbound Right-turn	D	0.58	D	0.35	47.9	28.7
Southbound Left-turn	F	0.86	E	0.79	65.3	70.6
Southbound Through	F	0.88	E	0.87	65.3	81.4
Southbound Right-turn	E	0.74	E	0.81	46.8	79.0
Main St W / Bowman St						
Overall	B	0.74	A	0.70		
Eastbound Through	A	0.64	A	0.64	0.6	4.5
Eastbound Right-turn	A	0.64	A	0.64	0.6	4.5
Westbound Left-turn	D	0.32	C	0.25	35.4	30.1
Westbound Through	C	0.73	B	0.65	150.2	94.5
Northbound Right-turn	D	0.09	C	0.10	12.2	7.2
Main St W / Dalewood Ave						
Overall	B	0.85	B	0.78		
Eastbound Through	C	0.98	A	0.68	226.1	49.5
Eastbound Right-turn	C	0.98	A	0.68	226.1	49.5
Westbound Through	A	0.70	A	0.58	6.3	4.8
Northbound Right-turn	C	0.02	C	0.02	0.7	0.7
Southbound Left-turn	D	0.51	F	1.03	67.4	149.3

Intersection & Individual Movement	AM Peak Hour		PM Peak Hour		AM 95th Queue (m)	PM 95th Queue (m)
	LOS	v/c	LOS	v/c		
Southbound Through	D	0.51	F	1.03	67.4	149.3
Southbound Right-turn	D	0.55	D	0.58	48.9	70.6
Main St W / Haddon Ave						
Overall	B	0.64	A	0.61		
Eastbound Left-turn	C	0.34	C	0.22	35.1	33.7
Eastbound Through	B	0.78	A	0.82	75.8	56.1
Eastbound Right-turn	B	0.78	A	0.82	75.8	56.1
Westbound Through	A	0.73	B	0.60	42.2	43.4
Westbound Right-turn	A	0.73	B	0.60	42.2	43.4
Northbound Right-turn	C	0.08	C	0.01	9.0	2.7
Main St W / Hwy 403						
Overall	C	0.82	B	0.63		
Eastbound Through	B	0.68	A	0.63	40.4	37.8
Eastbound Right-turn	E	0.76	E	0.56	61.2	148.5
Westbound Through	A	0.65	A	0.64	11.5	13.4
Northbound Left-turn	D	0.89	C	0.59	164.6	70.1
Northbound Right-turn	C	0.21	C	0.08	30.1	10.6
Westwood Ave / Gary Ave						
Overall	A	0.04	A	0.05		
Eastbound Left-turn	A	0.04	A	0.03	0.8	0.7
Eastbound Through	A	0.04	A	0.03	0.8	0.7
Eastbound Right-turn	A	0.04	A	0.03	0.8	0.7
Westbound Left-turn	A	0.04	A	0.05	1.1	1.2
Westbound Through	A	0.04	A	0.05	1.1	1.2
Westbound Right-turn	A	0.04	A	0.05	1.1	1.2
Northbound Left-turn	A	0.00	A	0.00	0.0	0.0
Northbound Through	A	0.00	A	0.00	0.0	0.0
Northbound Right-turn	A	0.00	-	-	0.0	-
Southbound Left-turn	A	0.00	A	0.00	0.0	0.0
Southbound Through	A	0.00	A	0.00	0.0	0.0
Southbound Right-turn	A	0.00	A	0.00	0.0	0.0
Sussex St / Leland St						
Overall	A	0.17	A	0.27		
Eastbound Left-turn	A	0.13	A	0.10	-	-
Eastbound Through	A	0.13	A	0.10	-	-
Eastbound Right-turn	A	0.13	A	0.10	-	-
Westbound Left-turn	A	0.09	A	0.14	-	-
Westbound Through	A	0.09	A	0.14	-	-
Westbound Right-turn	A	0.09	A	0.14	-	-
Northbound Left-turn	A	0.17	A	0.27	-	-
Northbound Through	A	0.17	A	0.27	-	-
Northbound Right-turn	A	0.17	A	0.27	-	-
Southbound Left-turn	A	0.16	A	0.15	-	-
Southbound Through	A	0.16	A	0.15	-	-
Southbound Right-turn	A	0.16	A	0.15	-	-
Iona Ave / Ewen Rd						
Overall	A	0.02	A	0.02		
Eastbound Left-turn	A	0.02	A	0.02	0.5	0.5

Intersection & Individual Movement	AM Peak Hour		PM Peak Hour		AM 95th Queue (m)	PM 95th Queue (m)
	LOS	v/c	LOS	v/c		
Eastbound Through	A	0.02	A	0.02	0.5	0.5
Eastbound Right-turn	-	-	-	-	-	-
Westbound Left-turn	-	-	-	-	-	-
Westbound Through	-	-	A	0.02	-	0.5
Westbound Right-turn	A	0.00	A	0.02	0.1	0.5
Northbound Left-turn	-	-	-	-	-	-
Northbound Through	A	0.00	A	0.00	0.0	0.0
Northbound Right-turn	A	0.00	A	0.00	0.0	0.0
Southbound Left-turn	A	0.00	A	0.01	0.0	0.3
Southbound Through	A	0.00	A	0.01	0.0	0.3
Southbound Right-turn	A	0.00	A	0.01	0.0	0.3
Whitney Ave / Mericourt Rd						
Overall	A	0.05	A	0.06		
Eastbound Left-turn	A	0.00	A	0.01	0.0	0.1
Eastbound Through	A	0.00	A	0.01	0.0	0.1
Eastbound Right-turn	A	0.00	A	0.01	0.0	0.1
Westbound Left-turn	A	0.00	A	0.00	0.0	0.1
Westbound Through	A	0.00	A	0.00	0.0	0.1
Westbound Right-turn	-	-	A	0.00	-	0.1
Northbound Left-turn	B	0.05	B	0.06	1.3	1.5
Northbound Through	B	0.05	B	0.06	1.3	1.5
Northbound Right-turn	B	0.05	B	0.06	1.3	1.5
Southbound Left-turn	A	0.01	B	0.04	0.2	0.8
Southbound Through	A	0.01	-	-	0.2	-
Southbound Right-turn	A	0.01	B	0.04	0.2	0.8
Sanders Blvd / Norfolk St						
Overall	A	0.03	A	0.05		
Eastbound Left-turn	A	0.00	A	0.00	0.1	0.1
Eastbound Right-turn	A	0.00	A	0.00	0.1	0.1
Northbound Left-turn	A	0.03	B	0.05	0.6	1.3
Northbound Through	A	0.03	B	0.05	0.6	1.3
Southbound Through	A	0.01	B	0.02	0.3	0.5
Southbound Right-turn	A	0.01	B	0.02	0.3	0.5

Appendix B

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	926	178	121	397	231	481
Future Volume (vph)	926	178	121	397	231	481
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3	4.5	6.3	6.0	4.5
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3400	1507	1653	3216	3267	1566
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3400	1507	1653	3216	3267	1566
Peak-hour factor, PHF	0.83	0.79	0.76	0.88	0.80	0.88
Adj. Flow (vph)	1116	225	159	451	289	547
RTOR Reduction (vph)	0	20	0	0	0	4
Lane Group Flow (vph)	1116	205	159	451	289	543
Heavy Vehicles (%)	5%	6%	8%	11%	6%	2%
Turn Type	NA	pt+ov	Prot	NA	Prot	pt+ov
Protected Phases	2	2 4	1	6	4	1 4
Permitted Phases						
Actuated Green, G (s)	37.3	71.4	18.1	59.9	27.8	51.9
Effective Green, g (s)	37.3	71.4	18.1	59.9	27.8	45.9
Actuated g/C Ratio	0.37	0.71	0.18	0.60	0.28	0.46
Clearance Time (s)	6.3		4.5	6.3	6.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1268	1075	299	1926	908	718
v/s Ratio Prot	c0.33	0.14	0.10	0.14	0.09	c0.35
v/s Ratio Perm						
v/c Ratio	0.88	0.19	0.53	0.23	0.32	0.76
Uniform Delay, d1	29.3	4.7	37.1	9.4	28.6	22.4
Progression Factor	1.00	1.00	1.06	0.88	1.00	1.00
Incremental Delay, d2	8.9	0.1	1.7	0.3	0.2	4.5
Delay (s)	38.2	4.8	41.1	8.5	28.8	27.0
Level of Service	D	A	D	A	C	C
Approach Delay (s)	32.6			17.0	27.6	
Approach LOS	C			B	C	

Intersection Summary			
HCM 2000 Control Delay	27.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.8
Intersection Capacity Utilization	64.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	93	24	688	236	18	281
Future Volume (vph)	93	24	688	236	18	281
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7	5.7	5.7	5.7	5.7	5.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.96	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1500	1528	1824	1443	1677	1756
Flt Permitted	0.95	1.00	1.00	1.00	0.29	1.00
Satd. Flow (perm)	1500	1528	1824	1443	520	1756
Peak-hour factor, PHF	0.93	0.75	0.96	0.81	0.64	0.87
Adj. Flow (vph)	100	32	717	291	28	323
RTOR Reduction (vph)	0	26	0	113	0	0
Lane Group Flow (vph)	100	6	717	178	28	323
Confl. Peds. (#/hr)	40	22		11	11	
Heavy Vehicles (%)	19%	0%	3%	7%	6%	7%
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	4		2			6
Permitted Phases		4		2	6	
Actuated Green, G (s)	9.7	9.7	33.1	33.1	33.1	33.1
Effective Green, g (s)	9.7	9.7	33.1	33.1	33.1	33.1
Actuated g/C Ratio	0.18	0.18	0.61	0.61	0.61	0.61
Clearance Time (s)	5.7	5.7	5.7	5.7	5.7	5.7
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	268	273	1113	881	317	1072
v/s Ratio Prot	c0.07		c0.39			0.18
v/s Ratio Perm		0.00		0.12	0.05	
v/c Ratio	0.37	0.02	0.64	0.20	0.09	0.30
Uniform Delay, d1	19.6	18.3	6.8	4.7	4.3	5.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	0.0	1.3	0.1	0.1	0.2
Delay (s)	20.5	18.4	8.1	4.8	4.5	5.2
Level of Service	C	B	A	A	A	A
Approach Delay (s)	19.9		7.1			5.1
Approach LOS	B		A			A

Intersection Summary			
HCM 2000 Control Delay	7.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	54.2	Sum of lost time (s)	11.4
Intersection Capacity Utilization	60.5%	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 (vph)	116	2102	1	0	1902	143	0	0	32	0	0	0
Future Volume (vph)	116	2102	1	0	1902	143	0	0	32	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5			5.5				4.5			
Lane Util. Factor	1.00	0.91			0.91				1.00			
Frpb, ped/bikes	1.00	1.00			0.97				0.91			
Flpb, ped/bikes	1.00	1.00			1.00				1.00			
Frt	1.00	1.00			0.99				0.86			
Flt Protected	0.95	1.00			1.00				1.00			
Satd. Flow (prot)	1700	4837			4666				1473			
Flt Permitted	0.95	1.00			1.00				1.00			
Satd. Flow (perm)	1700	4837			4666				1473			
Peak-hour factor, PHF	0.71	0.88	0.25	0.92	0.95	0.76	0.92	0.92	0.67	0.92	0.92	0.92
Adj. Flow (vph)	163	2389	4	0	2002	188	0	0	48	0	0	0
RTOR Reduction (vph)	0	0	0	0	9	0	0	0	17	0	0	0
Lane Group Flow (vph)	163	2393	0	0	2181	0	0	0	31	0	0	0
Confl. Peds. (#/hr)	96		62			96			72			
Heavy Vehicles (%)	5%	6%	0%	0%	6%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA			NA				Perm			
Protected Phases	4	2			6							
Permitted Phases									4			
Actuated Green, G (s)	33.5	76.5			76.5				33.5			
Effective Green, g (s)	33.5	76.5			76.5				33.5			
Actuated g/C Ratio	0.28	0.64			0.64				0.28			
Clearance Time (s)	4.5	5.5			5.5				4.5			
Lane Grp Cap (vph)	474	3083			2974				411			
v/s Ratio Prot	c0.10	c0.49			0.47							
v/s Ratio Perm									0.02			
v/c Ratio	0.34	0.78			0.73				0.08			
Uniform Delay, d1	34.5	15.6			14.8				31.9			
Progression Factor	0.87	0.67			0.59				1.00			
Incremental Delay, d2	0.8	0.8			1.0				0.4			
Delay (s)	30.9	11.2			9.7				32.2			
Level of Service	C	B			A				C			
Approach Delay (s)		12.5			9.7			32.2			0.0	
Approach LOS		B			A			C			A	

Intersection Summary			
HCM 2000 Control Delay	11.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
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)	115	1251	18	0	578	893	24	88	54	805	83	47
Future Volume (vph)	115	1251	18	0	578	893	24	88	54	805	83	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.4	6.4			6.4	4.0	6.1	6.1		4.5	6.1	
Lane Util. Factor	1.00	*0.91			0.95	1.00	1.00	1.00		0.97	1.00	
Frpb, ped/bikes	1.00	1.00			1.00	0.84	1.00	0.99		1.00	0.91	
Flpb, ped/bikes	0.84	1.00			1.00	1.00	0.79	1.00		1.00	1.00	
Frt	1.00	1.00			1.00	0.85	1.00	0.94		1.00	0.95	
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1425	3280			3275	1231	1248	1581		3236	1442	
Flt Permitted	0.36	1.00			1.00	1.00	0.67	1.00		0.95	1.00	
Satd. Flow (perm)	533	3280			3275	1231	879	1581		3236	1442	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	122	1331	19	0	615	950	26	94	57	856	88	50
RTOR Reduction (vph)	0	1	0	0	0	0	0	16	0	0	17	0
Lane Group Flow (vph)	122	1349	0	0	615	950	26	135	0	856	121	0
Confl. Peds. (#/hr)	226		27	27		286	226		1	1		226
Heavy Vehicles (%)	5%	4%	0%	0%	9%	9%	13%	7%	19%	7%	13%	9%
Turn Type	Perm	NA			NA	Free	Perm	NA		Prot	NA	
Protected Phases		2			6			4		3	8	
Permitted Phases	2					Free	4					
Actuated Green, G (s)	53.6	53.6			53.6	120.0	13.9	13.9		35.5	53.9	
Effective Green, g (s)	53.6	53.6			53.6	120.0	13.9	13.9		35.5	53.9	
Actuated g/C Ratio	0.45	0.45			0.45	1.00	0.12	0.12		0.30	0.45	
Clearance Time (s)	6.4	6.4			6.4		6.1	6.1		4.5	6.1	
Lane Grp Cap (vph)	238	1465			1462	1231	101	183		957	647	
v/s Ratio Prot		c0.41			0.19			0.09		c0.26	0.08	
v/s Ratio Perm	0.23					c0.77	0.03					
v/c Ratio	0.51	0.92			0.42	0.77	0.26	0.74		0.89	0.19	
Uniform Delay, d1	23.8	31.2			22.6	0.0	48.3	51.3		40.5	19.9	
Progression Factor	1.00	1.00			0.14	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.7	11.0			0.6	3.3	6.1	23.2		12.6	0.6	
Delay (s)	31.5	42.2			3.7	3.3	54.4	74.5		53.1	20.5	
Level of Service	C	D			A	A	D	E		D	C	
Approach Delay (s)		41.3			3.5			71.5			48.5	
Approach LOS		D			A			E			D	

Intersection Summary			
HCM 2000 Control Delay	30.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	90.0%	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)	389	1704	17	182	1348	447	0	64	101	186	58	123
Future Volume (vph)	389	1704	17	182	1348	447	0	64	101	186	58	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	6.8		4.5	6.8	6.8		7.1		7.1	7.1	7.1
Lane Util. Factor	0.97	0.91		1.00	0.91	1.00		1.00		0.95	0.91	0.95
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.96		0.80		1.00	0.97	0.66
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.92		1.00	0.98	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00		0.95	0.98	1.00
Satd. Flow (prot)	3429	4866		1716	4885	1489		1263		1615	1411	951
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00		0.51	0.61	1.00
Satd. Flow (perm)	3429	4866		1716	4885	1489		1263		864	885	951
Peak-hour factor, PHF	0.89	0.90	0.71	0.80	0.87	0.89	0.92	0.80	0.81	0.79	0.76	0.73
Adj. Flow (vph)	437	1893	24	228	1549	502	0	80	125	235	76	168
RTOR Reduction (vph)	0	1	0	0	0	55	0	47	0	0	0	0
Lane Group Flow (vph)	437	1916	0	228	1549	447	0	158	0	160	168	151
Confl. Peds. (#/hr)			40			21			124			347
Heavy Vehicles (%)	1%	5%	6%	4%	5%	3%	0%	19%	2%	5%	22%	5%
Turn Type	Prot	NA		Prot	NA	Perm		NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases						6				8		8
Actuated Green, G (s)	20.2	52.2		23.5	53.2	53.2		25.9		25.9	25.9	25.9
Effective Green, g (s)	20.2	52.2		23.5	53.2	53.2		25.9		25.9	25.9	25.9
Actuated g/C Ratio	0.17	0.44		0.20	0.44	0.44		0.22		0.22	0.22	0.22
Clearance Time (s)	6.8	6.8		4.5	6.8	6.8		7.1		7.1	7.1	7.1
Lane Grp Cap (vph)	577	2116		336	2165	660		272		186	191	205
v/s Ratio Prot	0.13	c0.39		0.13	c0.32			0.13				
v/s Ratio Perm						0.30				0.19	c0.19	0.16
v/c Ratio	0.76	0.91		0.68	0.72	0.68		0.58		0.86	0.88	0.74
Uniform Delay, d1	47.6	31.6		44.7	27.2	26.6		42.2		45.3	45.5	43.9
Progression Factor	0.78	0.67		0.69	0.19	0.22		1.00		1.00	1.00	1.00
Incremental Delay, d2	4.4	3.6		7.6	1.5	3.9		8.8		37.4	39.7	20.9
Delay (s)	41.5	24.6		38.5	6.7	9.7		50.9		82.7	85.3	64.7
Level of Service	D	C		D	A	A		D		F	F	E
Approach Delay (s)		27.8			10.5			50.9			77.9	
Approach LOS		C			B			D			E	

Intersection Summary			
HCM 2000 Control Delay	25.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.7
Intersection Capacity Utilization	87.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	1985	6	84	1977	0	31
Future Volume (vph)	1985	6	84	1977	0	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.2		5.8	5.8		5.8
Lane Util. Factor	0.91		1.00	0.86		1.00
Frt	1.00		1.00	1.00		0.86
Flt Protected	1.00		0.95	1.00		1.00
Satd. Flow (prot)	4929		1653	6215		1260
Flt Permitted	1.00		0.95	1.00		1.00
Satd. Flow (perm)	4929		1653	6215		1260
Peak-hour factor, PHF	0.91	0.50	0.75	0.91	0.92	0.86
Adj. Flow (vph)	2181	12	112	2173	0	36
RTOR Reduction (vph)	1	0	0	0	0	12
Lane Group Flow (vph)	2192	0	112	2173	0	24
Heavy Vehicles (%)	4%	0%	8%	4%	0%	29%
Turn Type	NA		Prot	NA		Perm
Protected Phases	6		8	1 4		
Permitted Phases						8
Actuated Green, G (s)	83.8		25.2	57.4		25.2
Effective Green, g (s)	83.8		25.2	57.4		25.2
Actuated g/C Ratio	0.70		0.21	0.48		0.21
Clearance Time (s)	5.2		5.8			5.8
Lane Grp Cap (vph)	3442		347	2972		264
v/s Ratio Prot	c0.44		0.07	c0.35		
v/s Ratio Perm						0.02
v/c Ratio	0.64		0.32	0.73		0.09
Uniform Delay, d1	9.8		40.2	25.1		38.2
Progression Factor	0.10		0.93	0.86		1.00
Incremental Delay, d2	0.4		1.8	1.2		0.7
Delay (s)	1.4		39.0	22.8		38.9
Level of Service	A		D	C		D
Approach Delay (s)	1.4			23.6	38.9	
Approach LOS	A			C	D	

Intersection Summary			
HCM 2000 Control Delay	12.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.6
Intersection Capacity Utilization	56.0%	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 (vph)	0	2011	5	0	1902	0	0	0	10	198	0	159
Future Volume (vph)	0	2011	5	0	1902	0	0	0	10	198	0	159
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7			5.7				5.0		6.6	6.6
Lane Util. Factor		0.91			0.91				1.00		1.00	1.00
Frpb, ped/bikes		1.00			1.00				0.97		1.00	0.92
Flpb, ped/bikes		1.00			1.00				1.00		1.00	1.00
Frt		1.00			1.00				0.86		1.00	0.85
Flt Protected		1.00			1.00				1.00		0.95	1.00
Satd. Flow (prot)		3663			4839				1355		1733	1402
Flt Permitted		1.00			1.00				1.00		0.95	1.00
Satd. Flow (perm)		3663			4839				1355		1733	1402
Peak-hour factor, PHF	0.92	0.89	0.25	0.92	0.88	0.92	0.92	0.92	0.44	0.86	0.86	0.72
Adj. Flow (vph)	0	2260	20	0	2161	0	0	0	23	230	0	221
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	17	0	0	18
Lane Group Flow (vph)	0	2279	0	0	2161	0	0	0	6	0	230	203
Confl. Peds. (#/hr)			48						16			32
Heavy Vehicles (%)	0%	40%	2%	0%	6%	0%	0%	0%	16%	3%	0%	5%
Turn Type		NA			NA				Perm	Perm	NA	Perm
Protected Phases		2			6						8	
Permitted Phases									4	8		8
Actuated Green, G (s)		76.3			76.3				33.0		31.4	31.4
Effective Green, g (s)		76.3			76.3				33.0		31.4	31.4
Actuated g/C Ratio		0.64			0.64				0.28		0.26	0.26
Clearance Time (s)		5.7			5.7				5.0		6.6	6.6
Lane Grp Cap (vph)		2329			3076				372		453	366
v/s Ratio Prot		c0.62			0.45							
v/s Ratio Perm									0.00		0.13	c0.14
v/c Ratio		0.98			0.70				0.02		0.51	0.55
Uniform Delay, d1		21.1			14.4				31.7		37.7	38.2
Progression Factor		0.49			0.07				1.00		1.00	1.00
Incremental Delay, d2		12.4			1.0				0.1		4.0	5.9
Delay (s)		22.7			2.0				31.8		41.7	44.2
Level of Service		C			A				C		D	D
Approach Delay (s)		22.7			2.0			31.8			42.9	
Approach LOS		C			A			C			D	

Intersection Summary			
HCM 2000 Control Delay	15.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.3
Intersection Capacity Utilization	81.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	79	17	12	231	7	5	5	2	0	14	2
Future Volume (vph)	0	79	17	12	231	7	5	5	2	0	14	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	86	18	13	251	8	5	5	2	0	15	2

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	104	272	12	17
Volume Left (vph)	0	13	5	0
Volume Right (vph)	18	8	2	2
Hadj (s)	0.12	0.08	-0.02	-0.07
Departure Headway (s)	4.4	4.2	4.7	4.7
Degree Utilization, x	0.13	0.31	0.02	0.02
Capacity (veh/h)	807	856	698	702
Control Delay (s)	8.0	9.0	7.8	7.8
Approach Delay (s)	8.0	9.0	7.8	7.8
Approach LOS	A	A	A	A

Intersection Summary				
Delay	8.7			
Level of Service	A			
Intersection Capacity Utilization	34.8%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	20	1773	1023	12	1	3
Future Volume (vph)	20	1773	1023	12	1	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.6	5.6	5.6		5.0	
Lane Util. Factor	1.00	0.91	0.95		1.00	
Frt	1.00	1.00	1.00		0.91	
Flt Protected	0.95	1.00	1.00		0.98	
Satd. Flow (prot)	1487	4706	3301		1682	
Flt Permitted	0.20	1.00	1.00		0.98	
Satd. Flow (perm)	309	4706	3301		1682	
Peak-hour factor, PHF	0.83	0.92	0.88	0.60	0.25	0.38
Adj. Flow (vph)	24	1927	1162	20	4	8
RTOR Reduction (vph)	0	0	1	0	6	0
Lane Group Flow (vph)	24	1927	1182	0	6	0
Heavy Vehicles (%)	20%	9%	8%	0%	0%	0%
Turn Type	Perm	NA	NA		Prot	
Protected Phases		2	6		8	
Permitted Phases	2					
Actuated Green, G (s)	82.4	82.4	82.4		27.0	
Effective Green, g (s)	82.4	82.4	82.4		27.0	
Actuated g/C Ratio	0.69	0.69	0.69		0.22	
Clearance Time (s)	5.6	5.6	5.6		5.0	
Lane Grp Cap (vph)	212	3231	2266		378	
v/s Ratio Prot		c0.41	0.36		c0.00	
v/s Ratio Perm	0.08					
v/c Ratio	0.11	0.60	0.52		0.02	
Uniform Delay, d1	6.4	10.0	9.2		36.2	
Progression Factor	0.31	0.25	1.67		1.00	
Incremental Delay, d2	0.8	0.6	0.6		0.1	
Delay (s)	2.8	3.1	16.0		36.2	
Level of Service	A	A	B		D	
Approach Delay (s)		3.1	16.0		36.2	
Approach LOS		A	B		D	

Intersection Summary			
HCM 2000 Control Delay	8.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.6
Intersection Capacity Utilization	51.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Intersection Sign configuration not allowed in HCM analysis.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	60	1610	0	0	216	0
Future Volume (vph)	60	1610	0	0	216	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7			5.7	
Lane Util. Factor		0.86			1.00	
Frpb, ped/bikes		1.00			1.00	
Flpb, ped/bikes		1.00			1.00	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		6171			1653	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		6171			1653	
Peak-hour factor, PHF	0.68	0.81	0.92	0.92	0.81	0.92
Adj. Flow (vph)	88	1988	0	0	267	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	2076	0	0	267	0
Confl. Peds. (#/hr)	32				4	
Heavy Vehicles (%)	8%	4%	0%	0%	8%	0%
Turn Type	Perm	NA			Prot	
Protected Phases		2			8	
Permitted Phases	2					
Actuated Green, G (s)		72.3			36.3	
Effective Green, g (s)		72.3			36.3	
Actuated g/C Ratio		0.60			0.30	
Clearance Time (s)		5.7			5.7	
Lane Grp Cap (vph)		3718			500	
v/s Ratio Prot					c0.16	
v/s Ratio Perm		0.34				
v/c Ratio		0.56			0.53	
Uniform Delay, d1		14.3			34.8	
Progression Factor		0.37			1.00	
Incremental Delay, d2		0.4			4.0	
Delay (s)		5.7			38.9	
Level of Service		A			D	
Approach Delay (s)		5.7	0.0		38.9	
Approach LOS		A	A		D	

Intersection Summary			
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	11.4
Intersection Capacity Utilization	45.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1695	439	0	1026	1019	98
Future Volume (vph)	1695	439	0	1026	1019	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2		6.2	5.7	5.7
Lane Util. Factor	0.91	1.00		0.95	0.97	1.00
Frpb, ped/bikes	1.00	0.45		1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	4932	698		3433	3395	1416
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	4932	698		3433	3395	1416
Peak-hour factor, PHF	0.95	0.92	0.92	0.87	0.91	0.88
Adj. Flow (vph)	1784	477	0	1179	1120	111
RTOR Reduction (vph)	0	195	0	0	0	1
Lane Group Flow (vph)	1784	282	0	1179	1120	110
Confl. Peds. (#/hr)		338				19
Heavy Vehicles (%)	4%	2%	0%	4%	2%	9%
Turn Type	NA	Perm		NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2				4
Actuated Green, G (s)	63.7	63.7		63.7	44.4	44.4
Effective Green, g (s)	63.7	63.7		63.7	44.4	44.4
Actuated g/C Ratio	0.53	0.53		0.53	0.37	0.37
Clearance Time (s)	6.2	6.2		6.2	5.7	5.7
Lane Grp Cap (vph)	2618	370		1822	1256	523
v/s Ratio Prot	0.36			0.34	c0.33	
v/s Ratio Perm		c0.40				0.08
v/c Ratio	0.68	0.76		0.65	0.89	0.21
Uniform Delay, d1	20.7	22.2		20.1	35.5	25.8
Progression Factor	0.56	2.49		0.15	1.00	1.00
Incremental Delay, d2	0.9	9.0		1.6	9.8	0.9
Delay (s)	12.5	64.2		4.6	45.4	26.7
Level of Service	B	E		A	D	C
Approach Delay (s)	23.4			4.6	43.7	
Approach LOS	C			A	D	

Intersection Summary			
HCM 2000 Control Delay	24.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	11.9
Intersection Capacity Utilization	71.7%	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)	81	1264	429	0	315	39	696	284	115	38	242	24
Future Volume (vph)	81	1264	429	0	315	39	696	284	115	38	242	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		4.5	5.9			5.9	
Lane Util. Factor	1.00	0.91			0.95		0.97	1.00			0.95	
Frpb, ped/bikes	1.00	0.92			0.98		1.00	0.91			1.00	
Flpb, ped/bikes	0.94	1.00			1.00		1.00	1.00			0.98	
Frt	1.00	0.96			0.97		1.00	0.96			0.99	
Flt Protected	0.95	1.00			1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1590	4304			3140		3362	1579			3219	
Flt Permitted	0.45	1.00			1.00		0.95	1.00			0.81	
Satd. Flow (perm)	747	4304			3140		3362	1579			2633	
Peak-hour factor, PHF	0.68	0.90	0.95	0.92	0.81	0.49	0.94	0.76	0.74	0.73	0.67	0.60
Adj. Flow (vph)	119	1404	452	0	389	80	740	374	155	52	361	40
RTOR Reduction (vph)	0	48	0	0	14	0	0	1	0	0	6	0
Lane Group Flow (vph)	119	1808	0	0	455	0	740	528	0	0	447	0
Confl. Peds. (#/hr)	66		341			66	1		341	341		1
Heavy Vehicles (%)	6%	6%	6%	0%	9%	5%	3%	3%	3%	26%	4%	7%
Turn Type	Perm	NA			NA		Prot	NA		Perm	NA	
Protected Phases		2			6		7	4			8	
Permitted Phases	2									8		
Actuated Green, G (s)	53.5	53.5			53.5		31.5	54.1			18.1	
Effective Green, g (s)	53.5	53.5			53.5		31.5	54.1			18.1	
Actuated g/C Ratio	0.45	0.45			0.45		0.26	0.45			0.15	
Clearance Time (s)	6.5	6.5			6.5		4.5	5.9			5.9	
Lane Grp Cap (vph)	333	1918			1399		882	711			397	
v/s Ratio Prot		c0.42			0.14		c0.22	0.33				
v/s Ratio Perm	0.16										c0.17	
v/c Ratio	0.36	0.94			0.32		0.84	0.74			1.13	
Uniform Delay, d1	21.9	31.8			21.5		41.9	27.2			51.0	
Progression Factor	0.45	0.47			1.00		1.00	1.00			1.00	
Incremental Delay, d2	2.4	9.3			0.6		9.4	6.9			84.1	
Delay (s)	12.4	24.4			22.2		51.3	34.1			135.0	
Level of Service	B	C			C		D	C			F	
Approach Delay (s)		23.6			22.2			44.1			135.0	
Approach LOS		C			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	41.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.9
Intersection Capacity Utilization	93.4%	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)	2	1243	162	76	534	6	62	5	94	8	3	3
Future Volume (vph)	2	1243	162	76	534	6	62	5	94	8	3	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7	5.7		5.3	5.3			5.7	5.7		5.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			1.00	0.96		0.99	
Flpb, ped/bikes	0.98	1.00		1.00	1.00			0.99	1.00		0.99	
Frt	1.00	0.97		1.00	1.00			1.00	0.85		0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.97	
Satd. Flow (prot)	1754	3334		1667	3264			1598	1373		1744	
Flt Permitted	0.36	1.00		0.12	1.00			0.72	1.00		0.81	
Satd. Flow (perm)	673	3334		207	3264			1207	1373		1448	
Peak-hour factor, PHF	0.50	0.97	0.57	0.73	0.75	0.75	0.47	0.31	0.73	0.40	0.38	0.38
Adj. Flow (vph)	4	1281	284	104	712	8	132	16	129	20	8	8
RTOR Reduction (vph)	0	14	0	0	1	0	0	0	49	0	7	0
Lane Group Flow (vph)	4	1551	0	104	719	0	0	148	80	0	29	0
Confl. Peds. (#/hr)	29		7	7		29	11		25	25		11
Heavy Vehicles (%)	0%	3%	6%	7%	9%	17%	8%	40%	12%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)	70.3	70.3		70.7	70.7			18.3	18.3		18.3	
Effective Green, g (s)	70.3	70.3		70.7	70.7			18.3	18.3		18.3	
Actuated g/C Ratio	0.70	0.70		0.71	0.71			0.18	0.18		0.18	
Clearance Time (s)	5.7	5.7		5.3	5.3			5.7	5.7		5.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	473	2343		146	2307			220	251		264	
v/s Ratio Prot		0.47			0.22							
v/s Ratio Perm	0.01			c0.50				c0.12	0.06		0.02	
v/c Ratio	0.01	0.66		0.71	0.31			0.67	0.32		0.11	
Uniform Delay, d1	4.4	8.2		8.6	5.5			38.1	35.4		34.1	
Progression Factor	0.58	0.60		0.92	0.55			1.00	1.00		1.00	
Incremental Delay, d2	0.0	0.9		25.3	0.3			7.9	0.7		0.2	
Delay (s)	2.6	5.8		33.2	3.4			45.9	36.2		34.3	
Level of Service	A	A		C	A			D	D		C	
Approach Delay (s)		5.8			7.1			41.4			34.3	
Approach LOS		A			A			D			C	

Intersection Summary			
HCM 2000 Control Delay	10.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	11.4
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1339	6	48	609	7	23
Future Volume (vph)	1339	6	48	609	7	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5		5.5	5.5	5.5	5.5
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3463		1680	3275	1785	1504
Flt Permitted	1.00		0.15	1.00	0.95	1.00
Satd. Flow (perm)	3463		267	3275	1785	1504
Peak-hour factor, PHF	0.90	0.75	0.75	0.89	0.44	0.64
Adj. Flow (vph)	1488	8	64	684	16	36
RTOR Reduction (vph)	0	0	0	0	0	33
Lane Group Flow (vph)	1496	0	64	684	16	3
Confl. Peds. (#/hr)		15	15		9	8
Heavy Vehicles (%)	3%	0%	6%	9%	0%	4%
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases			6			4
Actuated Green, G (s)	79.4		79.4	79.4	9.6	9.6
Effective Green, g (s)	79.4		79.4	79.4	9.6	9.6
Actuated g/C Ratio	0.79		0.79	0.79	0.10	0.10
Clearance Time (s)	5.5		5.5	5.5	5.5	5.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2749		211	2600	171	144
v/s Ratio Prot	c0.43			0.21	c0.01	
v/s Ratio Perm			0.24			0.00
v/c Ratio	0.54		0.30	0.26	0.09	0.02
Uniform Delay, d1	3.7		2.8	2.7	41.2	41.0
Progression Factor	0.68		1.31	0.90	1.00	1.00
Incremental Delay, d2	0.6		3.6	0.2	0.2	0.1
Delay (s)	3.2		7.2	2.7	41.5	41.0
Level of Service	A		A	A	D	D
Approach Delay (s)	3.2			3.1	41.2	
Approach LOS	A			A	D	

Intersection Summary			
HCM 2000 Control Delay	4.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	60.9%	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 (vph)	5	1350	7	7	626	16	3	1	6	28	2	28
Future Volume (vph)	5	1350	7	7	626	16	3	1	6	28	2	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.2	5.2		5.2	5.2			5.0			5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	1.00		1.00	0.99			0.94			0.93	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.98	
Satd. Flow (prot)	1785	3430		1785	3165			1516			1561	
Flt Permitted	0.37	1.00		0.14	1.00			0.88			0.84	
Satd. Flow (perm)	704	3430		271	3165			1360			1344	
Peak-hour factor, PHF	0.31	0.90	0.58	0.44	0.90	0.67	0.25	0.25	0.50	0.78	0.50	0.70
Adj. Flow (vph)	16	1500	12	16	696	24	12	4	12	36	4	40
RTOR Reduction (vph)	0	0	0	0	1	0	0	11	0	0	35	0
Lane Group Flow (vph)	16	1512	0	16	719	0	0	17	0	0	45	0
Heavy Vehicles (%)	0%	4%	0%	0%	12%	19%	0%	100%	0%	4%	50%	11%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	77.9	77.9		77.9	77.9			11.9			11.9	
Effective Green, g (s)	77.9	77.9		77.9	77.9			11.9			11.9	
Actuated g/C Ratio	0.78	0.78		0.78	0.78			0.12			0.12	
Clearance Time (s)	5.2	5.2		5.2	5.2			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	548	2671		211	2465			161			159	
v/s Ratio Prot		c0.44			0.23							
v/s Ratio Perm	0.02			0.06				0.01			c0.03	
v/c Ratio	0.03	0.57		0.08	0.29			0.11			0.28	
Uniform Delay, d1	2.5	4.4		2.6	3.2			39.3			40.2	
Progression Factor	0.33	0.61		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.1	0.8		0.7	0.3			0.3			1.0	
Delay (s)	0.9	3.5		3.3	3.5			39.6			41.1	
Level of Service	A	A		A	A			D			D	
Approach Delay (s)		3.4			3.5			39.6			41.1	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	5.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	54.4%	ICU Level of Service	A
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)	1	84	45	159	241	11	0	0	0	1	62	1
Future Volume (vph)	1	84	45	159	241	11	0	0	0	1	62	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.1	5.1		3.0	5.1						5.6	
Lane Util. Factor	1.00	1.00		1.00	1.00						1.00	
Frpb, ped/bikes	1.00	0.96		1.00	0.99						1.00	
Flpb, ped/bikes	0.95	1.00		0.96	1.00						1.00	
Frt	1.00	0.94		1.00	0.99						0.99	
Flt Protected	0.95	1.00		0.95	1.00						1.00	
Satd. Flow (prot)	1699	1691		1622	1817						1827	
Flt Permitted	0.57	1.00		0.59	1.00						1.00	
Satd. Flow (perm)	1028	1691		1013	1817						1827	
Peak-hour factor, PHF	0.25	0.88	0.66	0.85	0.86	0.46	0.92	0.92	0.92	0.25	0.74	0.25
Adj. Flow (vph)	4	95	68	187	280	24	0	0	0	4	84	4
RTOR Reduction (vph)	0	37	0	0	4	0	0	0	0	0	2	0
Lane Group Flow (vph)	4	126	0	187	300	0	0	0	0	0	90	0
Confl. Peds. (#/hr)	61		117	117		61	12		13	13		12
Heavy Vehicles (%)	0%	0%	0%	6%	0%	18%	0%	0%	0%	0%	2%	0%
Turn Type	Perm	NA		pm+pt	NA					Perm	NA	
Protected Phases		2		1	6						8	
Permitted Phases	2			6						8		
Actuated Green, G (s)	29.3	29.3		37.3	37.3						22.0	
Effective Green, g (s)	29.3	29.3		37.3	37.3						22.0	
Actuated g/C Ratio	0.42	0.42		0.53	0.53						0.31	
Clearance Time (s)	5.1	5.1		3.0	5.1						5.6	
Lane Grp Cap (vph)	430	707		583	968						574	
v/s Ratio Prot		0.07		c0.02	0.16							
v/s Ratio Perm	0.00			c0.15							0.05	
v/c Ratio	0.01	0.18		0.32	0.31						0.16	
Uniform Delay, d1	11.9	12.8		8.7	9.1						17.3	
Progression Factor	1.00	1.00		1.00	1.00						1.00	
Incremental Delay, d2	0.0	0.6		1.5	0.8						0.6	
Delay (s)	11.9	13.3		10.2	10.0						17.9	
Level of Service	B	B		B	A						B	
Approach Delay (s)		13.3			10.0			0.0			17.9	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	13.7
Intersection Capacity Utilization	64.0%	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												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	20	3	113	55	74	9	150	52	58	83	2
Future Volume (vph)	0	20	3	113	55	74	9	150	52	58	83	2
Peak Hour Factor	0.92	0.63	0.38	0.81	0.86	0.80	0.56	0.83	0.81	0.97	0.86	0.50
Hourly flow rate (vph)	0	32	8	140	64	93	16	181	64	60	97	4

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	40	140	157	261	161
Volume Left (vph)	0	140	0	16	60
Volume Right (vph)	8	0	93	64	4
Hadj (s)	-0.12	0.60	-0.40	-0.09	0.13
Departure Headway (s)	5.5	6.3	5.3	4.9	5.3
Degree Utilization, x	0.06	0.24	0.23	0.36	0.24
Capacity (veh/h)	586	544	648	694	636
Control Delay (s)	8.8	10.1	8.6	10.7	9.9
Approach Delay (s)	8.8	9.3		10.7	9.9
Approach LOS	A	A		B	A

Intersection Summary				
Delay	9.9			
Level of Service	A			
Intersection Capacity Utilization	Err%	ICU Level of Service		H
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	113	84	13	298	17	228	17	26	11	16	8
Future Volume (vph)	2	113	84	13	298	17	228	17	26	11	16	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	123	91	14	324	18	248	18	28	12	17	9

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	216	176	180	294	38
Volume Left (vph)	2	14	0	248	12
Volume Right (vph)	91	0	18	28	9
Hadj (s)	-0.22	0.07	-0.04	0.15	-0.04
Departure Headway (s)	5.3	5.8	5.7	5.5	5.9
Degree Utilization, x	0.32	0.29	0.29	0.45	0.06
Capacity (veh/h)	633	585	598	606	531
Control Delay (s)	10.7	10.0	9.8	13.1	9.3
Approach Delay (s)	10.7	9.9		13.1	9.3
Approach LOS	B	A		B	A

Intersection Summary				
Delay	11.1			
Level of Service	B			
Intersection Capacity Utilization	45.4%	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)	7	197	4	7	349	279	6	48	9	101	19	1
Future Volume (vph)	7	197	4	7	349	279	6	48	9	101	19	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.4	5.4		5.4	5.4		5.4			5.4	
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00			1.00	
Frpb, ped/bikes		1.00	0.90		1.00	0.89		0.99			1.00	
Flpb, ped/bikes		1.00	1.00		1.00	1.00		1.00			0.95	
Frt		1.00	0.85		1.00	0.85		0.98			1.00	
Flt Protected		1.00	1.00		1.00	1.00		1.00			0.96	
Satd. Flow (prot)		1802	1431		1812	1326		1789			1478	
Flt Permitted		0.98	1.00		0.99	1.00		0.98			0.68	
Satd. Flow (perm)		1767	1431		1796	1326		1761			1050	
Peak-hour factor, PHF	0.58	0.82	0.33	0.58	0.92	0.79	0.75	0.48	0.56	0.66	0.68	0.25
Adj. Flow (vph)	12	240	12	12	379	353	8	100	16	153	28	4
RTOR Reduction (vph)	0	0	6	0	0	161	0	5	0	0	1	0
Lane Group Flow (vph)	0	252	6	0	391	192	0	119	0	0	184	0
Confl. Peds. (#/hr)	45		41	41		45	22		37	37		22
Heavy Vehicles (%)	0%	4%	0%	14%	3%	7%	0%	0%	11%	16%	16%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			4	
Permitted Phases	2		2	6		6	4			4		
Actuated Green, G (s)		52.6	52.6		52.6	52.6		31.6			31.6	
Effective Green, g (s)		52.6	52.6		52.6	52.6		31.6			31.6	
Actuated g/C Ratio		0.53	0.53		0.53	0.53		0.32			0.32	
Clearance Time (s)		5.4	5.4		5.4	5.4		5.4			5.4	
Lane Grp Cap (vph)		929	752		944	697		556			331	
v/s Ratio Prot												
v/s Ratio Perm		0.14	0.00		c0.22	0.15		0.07			c0.18	
v/c Ratio		0.27	0.01		0.41	0.28		0.21			0.56	
Uniform Delay, d1		13.1	11.3		14.4	13.1		25.1			28.4	
Progression Factor		1.00	1.00		0.40	0.81		1.00			1.00	
Incremental Delay, d2		0.7	0.0		1.1	0.8		0.9			6.6	
Delay (s)		13.8	11.3		6.8	11.5		26.0			35.0	
Level of Service		B	B		A	B		C			D	
Approach Delay (s)		13.7			9.1			26.0			35.0	
Approach LOS		B			A			C			D	

Intersection Summary			
HCM 2000 Control Delay	15.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.8
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
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)	0	0	0	51	657	66	22	0	38	0	165	20
Future Volume (vph)	0	0	0	51	657	66	22	0	38	0	165	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0			5.4			5.4	
Lane Util. Factor					0.91			1.00			1.00	
Frpb, ped/bikes					0.99			0.94			0.99	
Flpb, ped/bikes					1.00			0.99			1.00	
Frt					0.99			0.92			0.98	
Flt Protected					1.00			0.98			1.00	
Satd. Flow (prot)					4581			1493			1604	
Flt Permitted					1.00			0.70			1.00	
Satd. Flow (perm)					4581			1067			1604	
Peak-hour factor, PHF	0.92	0.92	0.92	0.75	0.85	0.72	0.79	0.69	0.92	0.92	0.77	0.63
Adj. Flow (vph)	0	0	0	68	773	92	28	0	41	0	214	32
RTOR Reduction (vph)	0	0	0	0	10	0	0	33	0	0	6	0
Lane Group Flow (vph)	0	0	0	0	923	0	0	36	0	0	240	0
Confl. Peds. (#/hr)	51		10	10		51	28		38	38		28
Heavy Vehicles (%)	0%	0%	0%	4%	7%	20%	14%	8%	0%	0%	12%	30%
Turn Type				Perm	NA		Perm	NA			NA	
Protected Phases					6			4			8	
Permitted Phases				6			4					
Actuated Green, G (s)					69.4			20.2			20.2	
Effective Green, g (s)					69.4			20.2			20.2	
Actuated g/C Ratio					0.69			0.20			0.20	
Clearance Time (s)					5.0			5.4			5.4	
Vehicle Extension (s)					3.0			3.0			3.0	
Lane Grp Cap (vph)					3179			215			324	
v/s Ratio Prot											c0.15	
v/s Ratio Perm					0.20			0.03				
v/c Ratio					0.29			0.17			0.74	
Uniform Delay, d1					5.9			33.0			37.4	
Progression Factor					1.00			1.00			1.00	
Incremental Delay, d2					0.2			0.4			8.6	
Delay (s)					6.1			33.3			46.0	
Level of Service					A			C			D	
Approach Delay (s)		0.0			6.1			33.3			46.0	
Approach LOS		A			A			C			D	

Intersection Summary			
HCM 2000 Control Delay	15.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.4
Intersection Capacity Utilization	52.3%	ICU Level of Service	A
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)	29	204	81	122	287	17	315	68	42	82	91	56
Future Volume (vph)	29	204	81	122	287	17	315	68	42	82	91	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.2	5.2		5.2	5.2		3.0	5.4			5.4	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.98		1.00	0.99		1.00	0.91			0.99	
Flpb, ped/bikes	0.94	1.00		0.97	1.00		0.99	1.00			0.94	
Frt	1.00	0.96		1.00	0.98		1.00	0.94			0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1685	1672		1624	1737		1757	1520			1636	
Flt Permitted	0.48	1.00		0.47	1.00		0.44	1.00			0.82	
Satd. Flow (perm)	854	1672		810	1737		810	1520			1371	
Peak-hour factor, PHF	0.60	0.79	0.84	0.56	0.93	0.47	0.94	0.71	0.66	0.71	0.57	0.88
Adj. Flow (vph)	48	258	96	218	309	36	335	96	64	115	160	64
RTOR Reduction (vph)	0	13	0	0	4	0	0	24	0	0	8	0
Lane Group Flow (vph)	48	341	0	218	341	0	335	136	0	0	331	0
Confl. Peds. (#/hr)	52		25	25		52	18		117	117		18
Heavy Vehicles (%)	0%	2%	16%	7%	5%	6%	1%	9%	0%	2%	2%	5%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		6			2		3	8			4	
Permitted Phases	6			2			8			4		
Actuated Green, G (s)	50.4	50.4		50.4	50.4		39.0	39.0			27.0	
Effective Green, g (s)	50.4	50.4		50.4	50.4		39.0	39.0			27.0	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.39	0.39			0.27	
Clearance Time (s)	5.2	5.2		5.2	5.2		3.0	5.4			5.4	
Lane Grp Cap (vph)	430	842		408	875		401	592			370	
v/s Ratio Prot		0.20			0.20		c0.08	0.09				
v/s Ratio Perm	0.06			c0.27			c0.25				0.24	
v/c Ratio	0.11	0.40		0.53	0.39		0.84	0.23			0.89	
Uniform Delay, d1	13.0	15.5		16.8	15.3		29.5	20.4			35.1	
Progression Factor	1.04	0.99		0.90	0.90		1.00	1.00			1.00	
Incremental Delay, d2	0.5	1.4		4.9	1.3		18.3	0.9			26.5	
Delay (s)	14.0	16.7		20.0	15.1		47.7	21.3			61.6	
Level of Service	B	B		B	B		D	C			E	
Approach Delay (s)		16.4			17.0			39.2			61.6	
Approach LOS		B			B			D			E	

Intersection Summary			
HCM 2000 Control Delay	31.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.6
Intersection Capacity Utilization	83.4%	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)	0	0	328	0	407	13	0	0	0	0	0	19
Future Volume (Veh/h)	0	0	328	0	407	13	0	0	0	0	0	19
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	357	0	442	14	0	0	0	0	0	21
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		174										
pX, platoon unblocked												
vC, conflicting volume	456			0			463	456	0	620	442	442
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	456			0			463	456	0	620	442	442
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	100	100	97
cM capacity (veh/h)	1105			1623			492	501	1085	400	510	615

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	357	442	14	21
Volume Left	0	0	0	0
Volume Right	357	0	14	21
cSH	1700	1700	1700	615
Volume to Capacity	0.21	0.26	0.01	0.03
Queue Length 95th (m)	0.0	0.0	0.0	0.8
Control Delay (s)	0.0	0.0	0.0	11.1
Lane LOS				B
Approach Delay (s)	0.0	0.0		11.1
Approach LOS				B

Intersection Summary				
Average Delay	0.3			
Intersection Capacity Utilization	31.4%	ICU Level of Service		A
Analysis Period (min)	15			

Intersection Sign configuration not allowed in HCM analysis.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL2	SBL	SBR	NWL	NWR	NWR2
Lane Configurations												
Traffic Volume (vph)	18	272	17	15	614	29	22	15	2	19	6	20
Future Volume (vph)	18	272	17	15	614	29	22	15	2	19	6	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2	5.2		5.2	5.2	5.5	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.92		1.00	0.74	1.00	0.98		1.00	0.89	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	0.91	1.00		0.90	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	0.98		1.00	0.85	
Flt Protected		1.00	1.00		1.00	1.00	0.95	0.96		0.95	1.00	
Satd. Flow (prot)		1706	1462		1784	1185	1552	1633		1600	1341	
Flt Permitted		0.91	1.00		0.98	1.00	0.73	1.00		0.74	1.00	
Satd. Flow (perm)		1554	1462		1757	1185	1194	1703		1244	1341	
Peak-hour factor, PHF	0.50	0.76	0.61	0.70	0.90	0.52	0.69	0.63	0.50	0.59	0.38	0.83
Adj. Flow (vph)	36	358	28	21	682	56	32	24	4	32	16	24
RTOR Reduction (vph)	0	0	10	0	0	14	0	18	0	0	18	0
Lane Group Flow (vph)	0	394	18	0	703	42	32	10	0	32	22	0
Confl. Peds. (#/hr)	107		29	29		107	46		54	54		46
Heavy Vehicles (%)	0%	10%	0%	7%	5%	0%	5%	7%	0%	0%	0%	10%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	Perm		Perm	Perm	
Protected Phases		2			6							
Permitted Phases	2		2	6		6	8	8		4	4	
Actuated Green, G (s)		63.8	63.8		63.8	63.8	25.5	25.5		25.5	25.5	
Effective Green, g (s)		63.8	63.8		63.8	63.8	25.5	25.5		25.5	25.5	
Actuated g/C Ratio		0.64	0.64		0.64	0.64	0.26	0.26		0.26	0.26	
Clearance Time (s)		5.2	5.2		5.2	5.2	5.5	5.5		5.5	5.5	
Lane Grp Cap (vph)		991	932		1120	756	304	434		317	341	
v/s Ratio Prot												
v/s Ratio Perm		0.25	0.01		c0.40	0.04	c0.03	0.01		0.03	0.02	
v/c Ratio		0.40	0.02		0.63	0.06	0.11	0.02		0.10	0.06	
Uniform Delay, d1		8.8	6.6		10.9	6.8	28.5	27.9		28.5	28.2	
Progression Factor		0.58	0.31		1.28	1.33	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.2	0.0		2.2	0.1	0.7	0.1		0.6	0.4	
Delay (s)		6.2	2.1		16.1	9.2	29.2	28.0		29.1	28.6	
Level of Service		A	A		B	A	C	C		C	C	
Approach Delay (s)		5.9			15.6			28.7		28.8		
Approach LOS		A			B			C		C		

Intersection Summary			
HCM 2000 Control Delay	13.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.7
Intersection Capacity Utilization	99.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑	↑↑↑			
Traffic Volume (veh/h)	0	2016	2061	0	0	0
Future Volume (Veh/h)	0	2016	2061	0	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	2191	2240	0	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		85	127			
pX, platoon unblocked	0.71				0.83	0.71
vC, conflicting volume	2240				2970	747
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1311				671	0
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	371				324	768

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3
Volume Total	730	730	730	747	747	747
Volume Left	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.43	0.43	0.43	0.44	0.44	0.44
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS						
Approach Delay (s)	0.0			0.0		
Approach LOS						

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	43.2%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection Sign configuration not allowed in HCM analysis.

Intersection Sign configuration not allowed in HCM analysis.

Intersection Sign configuration not allowed in HCM analysis.

Intersection Sign configuration not allowed in HCM analysis.

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↑			↑
Traffic Volume (vph)	0	0	1023	0	0	459
Future Volume (vph)	0	0	1023	0	0	459
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			5.1			5.1
Lane Util. Factor			1.00			1.00
Frt			1.00			1.00
Flt Protected			1.00			1.00
Satd. Flow (prot)			1842			1842
Flt Permitted			1.00			1.00
Satd. Flow (perm)			1842			1842
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	1112	0	0	499
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	1112	0	0	499
Turn Type			NA			NA
Protected Phases			2			6
Permitted Phases						
Actuated Green, G (s)			74.9			74.9
Effective Green, g (s)			74.9			74.9
Actuated g/C Ratio			0.85			0.85
Clearance Time (s)			5.1			5.1
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)			1560			1560
v/s Ratio Prot			c0.60			0.27
v/s Ratio Perm						
v/c Ratio			0.71			0.32
Uniform Delay, d1			2.6			1.4
Progression Factor			1.00			1.00
Incremental Delay, d2			2.8			0.5
Delay (s)			5.4			2.0
Level of Service			A			A
Approach Delay (s)	0.0		5.4			2.0
Approach LOS	A		A			A

Intersection Summary			
HCM 2000 Control Delay	4.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	88.4	Sum of lost time (s)	10.1
Intersection Capacity Utilization	58.1%	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)	8	8	0	0	0	4	0	6	1	3	3	4
Future Volume (Veh/h)	8	8	0	0	0	4	0	6	1	3	3	4
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	9	0	0	0	4	0	7	1	3	3	4
Pedestrians		5			3			2				
Lane Width (m)		3.5			3.5			3.5				
Walking Speed (m/s)		1.2			1.2			1.2				
Percent Blockage		0			0			0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	28	27	12	28	28	10	12			11		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	28	27	12	28	28	10	12			11		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.4		
p0 queue free %	99	99	100	100	100	100	100			100		
cM capacity (veh/h)	973	863	1068	968	861	1074	1614			1467		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	18	4	8	10
Volume Left	9	0	0	3
Volume Right	0	4	1	4
cSH	915	1074	1614	1467
Volume to Capacity	0.02	0.00	0.00	0.00
Queue Length 95th (m)	0.5	0.1	0.0	0.0
Control Delay (s)	9.0	8.4	0.0	2.2
Lane LOS	A	A		A
Approach Delay (s)	9.0	8.4	0.0	2.2
Approach LOS	A	A		

Intersection Summary				
Average Delay	5.5			
Intersection Capacity Utilization	19.5%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	4	10	2	12	8	9
Future Volume (vph)	4	10	2	12	8	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	11	2	13	9	10

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	15	15	19
Volume Left (vph)	4	2	0
Volume Right (vph)	11	0	10
Hadj (s)	-0.21	0.03	-0.23
Departure Headway (s)	3.8	4.0	3.7
Degree Utilization, x	0.02	0.02	0.02
Capacity (veh/h)	943	888	958
Control Delay (s)	6.8	7.0	6.8
Approach Delay (s)	6.8	7.0	6.8
Approach LOS	A	A	A

Intersection Summary			
Delay	6.9		
Level of Service	A		
Intersection Capacity Utilization	14.3%	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 (veh/h)	3	24	3	6	24	6	1	3	3	1	2	1
Future Volume (Veh/h)	3	24	3	6	24	6	1	3	3	1	2	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	26	3	7	26	7	1	3	3	1	2	1
Pedestrians		5			1			7			6	
Lane Width (m)		3.5			3.5			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	42	18	14	35	18	12	8			7		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	42	18	14	35	18	12	8			7		
tC, single (s)	7.1	6.5	6.2	7.1	6.6	6.3	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.1	3.4	2.2			2.2		
p0 queue free %	100	97	100	99	97	99	100			100		
cM capacity (veh/h)	925	874	1061	941	854	1029	1619			1626		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	32	40	7	4
Volume Left	3	7	1	1
Volume Right	3	7	3	1
cSH	893	895	1619	1626
Volume to Capacity	0.04	0.04	0.00	0.00
Queue Length 95th (m)	0.8	1.1	0.0	0.0
Control Delay (s)	9.2	9.2	1.0	1.8
Lane LOS	A	A	A	A
Approach Delay (s)	9.2	9.2	1.0	1.8
Approach LOS	A	A		

Intersection Summary				
Average Delay	8.2			
Intersection Capacity Utilization	16.9%	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 (veh/h)	0	85	0	0	354	2	50	19	123	0	0	7
Future Volume (Veh/h)	0	85	0	0	354	2	50	19	123	0	0	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	92	0	0	385	2	54	21	134	0	0	8
Pedestrians		53			7			62			55	
Lane Width (m)		3.5			3.5			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		4			1			5			4	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		177			323							
pX, platoon unblocked												
vC, conflicting volume	442			154			408	596	161	684	595	302
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	442			154			408	596	161	684	595	302
tC, single (s)	4.1			4.1			7.5	6.5	7.0	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			88	94	83	100	100	99
cM capacity (veh/h)	1078			1366			440	381	802	238	381	641

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total	92	257	130	54	155	8
Volume Left	0	0	0	54	0	0
Volume Right	0	0	2	0	134	8
cSH	1078	1700	1700	440	697	641
Volume to Capacity	0.00	0.15	0.08	0.12	0.22	0.01
Queue Length 95th (m)	0.0	0.0	0.0	3.2	6.4	0.3
Control Delay (s)	0.0	0.0	0.0	14.3	11.6	10.7
Lane LOS				B	B	B
Approach Delay (s)	0.0	0.0		12.3		10.7
Approach LOS				B		B

Intersection Summary				
Average Delay	3.8			
Intersection Capacity Utilization	31.3%	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 (veh/h)	0	307	0	0	635	0	0	0	0	0	0	0
Future Volume (Veh/h)	0	307	0	0	635	0	0	0	0	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	334	0	0	690	0	0	0	0	0	0	0
Pedestrians		10			22			46			30	
Lane Width (m)		3.5			3.5			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			2			4			2	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		130			68							
pX, platoon unblocked	0.76			0.95			0.79	0.79	0.95	0.79	0.79	0.76
vC, conflicting volume	720			380			1080	1100	402	1076	1100	730
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	477			324			830	855	347	825	855	490
tC, single (s)	4.1			4.1			7.1	6.6	6.2	7.2	6.8	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.1	3.3	3.6	4.2	3.3
p0 queue free %	100			100			100	100	100	100	100	100
cM capacity (veh/h)	815			1143			209	209	631	200	200	430

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	334	0	690	0	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	815	1700	1143	1700	1700
Volume to Capacity	0.00	0.00	0.00	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS				A	A
Approach Delay (s)	0.0		0.0	0.0	0.0
Approach LOS				A	A

Intersection Summary				
Average Delay	0.0			
Intersection Capacity Utilization	51.4%	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)	49	20	28	11	28	26	6	103	12	14	82	21
Future Volume (vph)	49	20	28	11	28	26	6	103	12	14	82	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	53	22	30	12	30	28	7	112	13	15	89	23

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	105	70	132	127
Volume Left (vph)	53	12	7	15
Volume Right (vph)	30	28	13	23
Hadj (s)	-0.07	-0.12	0.05	0.07
Departure Headway (s)	4.5	4.5	4.5	4.5
Degree Utilization, x	0.13	0.09	0.17	0.16
Capacity (veh/h)	740	738	759	750
Control Delay (s)	8.2	8.0	8.4	8.4
Approach Delay (s)	8.2	8.0	8.4	8.4
Approach LOS	A	A	A	A

Intersection Summary				
Delay		8.3		
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 (veh/h)	1	265	19	2	80	0	17	2	10	1	1	5
Future Volume (Veh/h)	1	265	19	2	80	0	17	2	10	1	1	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	288	21	2	87	0	18	2	11	1	1	5
Pedestrians		26			4			9			8	
Lane Width (m)		3.5			3.5			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		2			0			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		241										
pX, platoon unblocked												
vC, conflicting volume	95			318			432	408	312	416	419	121
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	95			318			432	408	312	416	419	121
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			100			96	100	98	100	100	99
cM capacity (veh/h)	1502			1244			512	527	705	529	520	910

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	310	89	31	7
Volume Left	1	2	18	1
Volume Right	21	0	11	5
cSH	1502	1244	568	752
Volume to Capacity	0.00	0.00	0.05	0.01
Queue Length 95th (m)	0.0	0.0	1.3	0.2
Control Delay (s)	0.0	0.2	11.7	9.8
Lane LOS	A	A	B	A
Approach Delay (s)	0.0	0.2	11.7	9.8
Approach LOS			B	A

Intersection Summary				
Average Delay	1.0			
Intersection Capacity Utilization	31.4%	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 (veh/h)	0	1	19	14	5	0	8	8	7	1	2	1
Future Volume (Veh/h)	0	1	19	14	5	0	8	8	7	1	2	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1	21	15	5	0	9	9	8	1	2	1
Pedestrians		8			10			1			11	
Lane Width (m)		3.5			3.5			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			1			0			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	57	58	12	68	54	34	11			27		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	57	58	12	68	54	34	11			27		
tC, single (s)	7.1	6.5	6.2	7.1	6.7	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.2	3.3	2.2			2.2		
p0 queue free %	100	100	98	98	99	100	99			100		
cM capacity (veh/h)	911	820	1067	888	787	1027	1611			1587		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	22	20	26	4
Volume Left	0	15	9	1
Volume Right	21	0	8	1
cSH	1053	860	1611	1587
Volume to Capacity	0.02	0.02	0.01	0.00
Queue Length 95th (m)	0.5	0.5	0.1	0.0
Control Delay (s)	8.5	9.3	2.5	1.8
Lane LOS	A	A	A	A
Approach Delay (s)	8.5	9.3	2.5	1.8
Approach LOS	A	A		

Intersection Summary				
Average Delay	6.2			
Intersection Capacity Utilization	22.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	6	12	7	6	2
Future Volume (Veh/h)	6	6	12	7	6	2
Sign Control	Free			Stop	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	7	13	8	7	2
Pedestrians				46	26	
Lane Width (m)				3.5	3.5	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				4	2	
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	26		69	90	93	26
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	26		69	90	93	26
tC, single (s)	4.1		7.1	6.5	6.5	6.2
tC, 2 stage (s)						
tF (s)	2.2		3.5	4.0	4.0	3.3
p0 queue free %	100		98	99	99	100
cM capacity (veh/h)	1568		844	755	751	1033

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	14	21	9
Volume Left	7	13	0
Volume Right	7	0	2
cSH	1568	807	800
Volume to Capacity	0.00	0.03	0.01
Queue Length 95th (m)	0.1	0.6	0.3
Control Delay (s)	3.7	9.6	9.6
Lane LOS	A	A	A
Approach Delay (s)	3.7	9.6	9.6
Approach LOS		A	A

Intersection Summary			
Average Delay	7.7		
Intersection Capacity Utilization	25.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	788	363	408	992	324	274
Future Volume (vph)	788	363	408	992	324	274
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3	4.5	6.3	6.0	4.5
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3400	1507	1653	3216	3267	1566
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3400	1507	1653	3216	3267	1566
Peak-hour factor, PHF	0.83	0.79	0.76	0.88	0.80	0.88
Adj. Flow (vph)	949	459	537	1127	405	311
RTOR Reduction (vph)	0	47	0	0	0	3
Lane Group Flow (vph)	949	412	537	1127	405	308
Confl. Peds. (#/hr)		28	28			
Heavy Vehicles (%)	5%	6%	8%	11%	6%	2%
Turn Type	NA	pt+ov	Prot	NA	Prot	pt+ov
Protected Phases	2	2 4	1	6	4	1 4
Permitted Phases						
Actuated Green, G (s)	29.7	57.2	42.3	76.5	21.2	69.5
Effective Green, g (s)	29.7	57.2	42.3	76.5	21.2	63.5
Actuated g/C Ratio	0.27	0.52	0.38	0.70	0.19	0.58
Clearance Time (s)	6.3		4.5	6.3	6.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	918	783	635	2236	629	904
v/s Ratio Prot	c0.28	0.27	c0.32	0.35	c0.12	0.20
v/s Ratio Perm						
v/c Ratio	1.03	0.53	0.85	0.50	0.64	0.34
Uniform Delay, d1	40.1	17.4	30.9	7.9	40.9	12.2
Progression Factor	1.00	1.00	1.13	1.59	1.00	1.00
Incremental Delay, d2	38.7	0.6	8.6	0.7	2.3	0.2
Delay (s)	78.9	18.1	43.5	13.2	43.2	12.5
Level of Service	E	B	D	B	D	B
Approach Delay (s)	59.1			23.0	29.8	
Approach LOS	E			C	C	

Intersection Summary			
HCM 2000 Control Delay	37.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.8
Intersection Capacity Utilization	67.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	149	49	549	92	48	723
Future Volume (vph)	149	49	549	92	48	723
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7	5.7	5.7	5.7	5.7	5.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.96	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1653	1419	1807	1402	1712	1824
Flt Permitted	0.95	1.00	1.00	1.00	0.34	1.00
Satd. Flow (perm)	1653	1419	1807	1402	615	1824
Peak-hour factor, PHF	0.64	0.72	0.95	0.88	0.75	0.92
Adj. Flow (vph)	233	68	578	105	64	786
RTOR Reduction (vph)	0	50	0	51	0	0
Lane Group Flow (vph)	233	18	578	54	64	786
Confl. Peds. (#/hr)	14	20		5	5	
Heavy Vehicles (%)	8%	8%	4%	11%	4%	3%
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	4		2			6
Permitted Phases		4		2	6	
Actuated Green, G (s)	13.9	13.9	26.5	26.5	26.5	26.5
Effective Green, g (s)	13.9	13.9	26.5	26.5	26.5	26.5
Actuated g/C Ratio	0.27	0.27	0.51	0.51	0.51	0.51
Clearance Time (s)	5.7	5.7	5.7	5.7	5.7	5.7
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	443	380	924	717	314	933
v/s Ratio Prot	c0.14		0.32			c0.43
v/s Ratio Perm		0.01		0.04	0.10	
v/c Ratio	0.53	0.05	0.63	0.07	0.20	0.84
Uniform Delay, d1	16.1	14.0	9.1	6.4	6.9	10.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1	0.1	1.3	0.0	0.3	7.0
Delay (s)	17.3	14.1	10.4	6.5	7.2	17.8
Level of Service	B	B	B	A	A	B
Approach Delay (s)	16.6		9.8			17.0
Approach LOS	B		A			B

Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	51.8	Sum of lost time (s)	11.4
Intersection Capacity Utilization	63.8%	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 (vph)	94	2303	1	0	1653	51	0	0	14	0	0	0
Future Volume (vph)	94	2303	1	0	1653	51	0	0	14	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5			5.5				4.5			
Lane Util. Factor	1.00	0.91			0.91				1.00			
Frpb, ped/bikes	1.00	1.00			0.99				1.00			
Flpb, ped/bikes	1.00	1.00			1.00				1.00			
Frt	1.00	1.00			0.99				0.86			
Flt Protected	0.95	1.00			1.00				1.00			
Satd. Flow (prot)	1767	4977			4924				1625			
Flt Permitted	0.95	1.00			1.00				1.00			
Satd. Flow (perm)	1767	4977			4924				1625			
Peak-hour factor, PHF	0.78	0.95	0.25	0.92	0.98	0.80	0.92	0.92	0.70	0.92	0.92	0.92
Adj. Flow (vph)	121	2424	4	0	1687	64	0	0	20	0	0	0
RTOR Reduction (vph)	0	0	0	0	4	0	0	0	14	0	0	0
Lane Group Flow (vph)	121	2428	0	0	1747	0	0	0	6	0	0	0
Confl. Peds. (#/hr)			63			59						
Heavy Vehicles (%)	1%	3%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA			NA				Perm			
Protected Phases	4	2			6							
Permitted Phases									4			
Actuated Green, G (s)	34.5	65.5			65.5				34.5			
Effective Green, g (s)	34.5	65.5			65.5				34.5			
Actuated g/C Ratio	0.31	0.60			0.60				0.31			
Clearance Time (s)	4.5	5.5			5.5				4.5			
Lane Grp Cap (vph)	554	2963			2932				509			
v/s Ratio Prot	c0.07	c0.49			0.35							
v/s Ratio Perm									0.00			
v/c Ratio	0.22	0.82			0.60				0.01			
Uniform Delay, d1	27.8	17.6			14.0				26.0			
Progression Factor	1.18	0.32			0.76				1.00			
Incremental Delay, d2	0.6	1.8			0.7				0.0			
Delay (s)	33.4	7.4			11.4				26.1			
Level of Service	C	A			B				C			
Approach Delay (s)		8.6			11.4			26.1			0.0	
Approach LOS		A			B			C			A	

Intersection Summary			
HCM 2000 Control Delay	9.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	61.2%	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 (vph)	59	1058	23	0	1109	575	66	62	85	694	60	196
Future Volume (vph)	59	1058	23	0	1109	575	66	62	85	694	60	196
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.4	6.4			6.4	4.0	6.1	6.1		4.5	6.1	
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00		0.97	1.00	
Frpb, ped/bikes	1.00	1.00			1.00	0.88	1.00	1.00		1.00	0.85	
Flpb, ped/bikes	0.95	1.00			1.00	1.00	0.89	1.00		1.00	1.00	
Frt	1.00	1.00			1.00	0.85	1.00	0.92		1.00	0.89	
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1700	3444			3466	1340	1549	1665		3330	1409	
Flt Permitted	0.14	1.00			1.00	1.00	0.52	1.00		0.95	1.00	
Satd. Flow (perm)	254	3444			3466	1340	848	1665		3330	1409	
Peak-hour factor, PHF	0.82	0.94	0.72	0.92	0.98	0.89	0.69	0.65	0.73	0.90	0.56	0.64
Adj. Flow (vph)	72	1126	32	0	1132	646	96	95	116	771	107	306
RTOR Reduction (vph)	0	2	0	0	0	0	0	21	0	0	7	0
Lane Group Flow (vph)	72	1156	0	0	1132	646	96	190	0	771	406	0
Confl. Peds. (#/hr)	202		51	51		202	183					183
Heavy Vehicles (%)	0%	3%	0%	0%	3%	5%	3%	3%	4%	4%	2%	1%
Turn Type	Perm	NA			NA	Free	Perm	NA		Prot	NA	
Protected Phases		2			6			4		3	8	
Permitted Phases	2					Free	4					
Actuated Green, G (s)	51.6	51.6			51.6	110.0	15.9	15.9		25.5	45.9	
Effective Green, g (s)	51.6	51.6			51.6	110.0	15.9	15.9		25.5	45.9	
Actuated g/C Ratio	0.47	0.47			0.47	1.00	0.14	0.14		0.23	0.42	
Clearance Time (s)	6.4	6.4			6.4		6.1	6.1		4.5	6.1	
Lane Grp Cap (vph)	119	1615			1625	1340	122	240		771	587	
v/s Ratio Prot		c0.34			0.33			0.11		c0.23	c0.29	
v/s Ratio Perm	0.28					0.48	0.11					
v/c Ratio	0.61	0.72			0.70	0.48	0.79	0.79		1.00	0.69	
Uniform Delay, d1	21.6	23.3			23.0	0.0	45.4	45.4		42.2	26.3	
Progression Factor	0.36	0.33			0.80	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	19.2	2.5			1.9	0.9	38.8	22.7		32.4	6.6	
Delay (s)	27.1	10.2			20.2	0.9	84.2	68.2		74.7	32.8	
Level of Service	C	B			C	A	F	E		E	C	
Approach Delay (s)		11.2			13.2			73.2			60.1	
Approach LOS		B			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	29.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	94.8%	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)	157	1657	23	140	1437	223	0	50	80	257	45	247
Future Volume (vph)	157	1657	23	140	1437	223	0	50	80	257	45	247
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	6.8		4.5	6.8	6.8		7.1		7.1	7.1	7.1
Lane Util. Factor	0.97	0.91		1.00	0.91	1.00		1.00		0.95	0.91	0.95
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.93		0.79		1.00	0.91	0.70
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.92		1.00	0.95	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00		0.95	0.98	1.00
Satd. Flow (prot)	3429	4935		1785	5029	1441		1281		1662	1351	1066
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00		0.63	0.75	1.00
Satd. Flow (perm)	3429	4935		1785	5029	1441		1281		1097	1037	1066
Peak-hour factor, PHF	0.91	0.94	0.70	0.90	0.98	0.90	0.92	0.78	0.80	0.80	0.80	0.85
Adj. Flow (vph)	173	1763	33	156	1466	248	0	64	100	321	56	291
RTOR Reduction (vph)	0	2	0	0	0	87	0	51	0	0	0	0
Lane Group Flow (vph)	173	1794	0	156	1466	161	0	113	0	221	229	218
Confl. Peds. (#/hr)			118			49			138			246
Heavy Vehicles (%)	1%	3%	0%	0%	2%	3%	0%	18%	0%	2%	24%	0%
Turn Type	Prot	NA		Prot	NA	Perm		NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases						6				8		8
Actuated Green, G (s)	10.2	40.2		23.5	51.2	51.2		27.9		27.9	27.9	27.9
Effective Green, g (s)	10.2	40.2		23.5	51.2	51.2		27.9		27.9	27.9	27.9
Actuated g/C Ratio	0.09	0.37		0.21	0.47	0.47		0.25		0.25	0.25	0.25
Clearance Time (s)	6.8	6.8		4.5	6.8	6.8		7.1		7.1	7.1	7.1
Lane Grp Cap (vph)	317	1803		381	2340	670		324		278	263	270
v/s Ratio Prot	0.05	c0.36		0.09	c0.29			0.09				
v/s Ratio Perm						0.11				0.20	c0.22	0.20
v/c Ratio	0.55	1.00		0.41	0.63	0.24		0.35		0.79	0.87	0.81
Uniform Delay, d1	47.7	34.8		37.3	22.2	17.7		33.6		38.4	39.3	38.5
Progression Factor	0.93	0.87		0.61	0.14	0.11		1.00		1.00	1.00	1.00
Incremental Delay, d2	3.5	14.3		2.4	1.0	0.6		2.9		20.5	30.3	22.2
Delay (s)	47.9	44.5		25.2	4.2	2.6		36.5		58.9	69.6	60.8
Level of Service	D	D		C	A	A		D		E	E	E
Approach Delay (s)		44.8			5.7			36.5			63.2	
Approach LOS		D			A			D			E	

Intersection Summary			
HCM 2000 Control Delay	31.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	20.7
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	1982	12	91	1800	0	22
Future Volume (vph)	1982	12	91	1800	0	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.2		5.8	5.8		5.8
Lane Util. Factor	0.91		1.00	0.86		1.00
Frpb, ped/bikes	1.00		1.00	1.00		1.00
Flpb, ped/bikes	1.00		1.00	1.00		1.00
Frt	1.00		1.00	1.00		0.86
Flt Protected	1.00		0.95	1.00		1.00
Satd. Flow (prot)	4967		1785	6337		1548
Flt Permitted	1.00		0.95	1.00		1.00
Satd. Flow (perm)	4967		1785	6337		1548
Peak-hour factor, PHF	0.94	0.50	0.91	0.92	0.92	0.51
Adj. Flow (vph)	2109	24	100	1957	0	43
RTOR Reduction (vph)	1	0	0	0	0	9
Lane Group Flow (vph)	2132	0	100	1957	0	34
Confl. Peds. (#/hr)		45				
Heavy Vehicles (%)	3%	0%	0%	2%	0%	5%
Turn Type	NA		Prot	NA		Perm
Protected Phases	6		8	1 4		
Permitted Phases						8
Actuated Green, G (s)	73.8		25.2	52.2		25.2
Effective Green, g (s)	73.8		25.2	52.2		25.2
Actuated g/C Ratio	0.67		0.23	0.47		0.23
Clearance Time (s)	5.2		5.8			5.8
Lane Grp Cap (vph)	3332		408	3007		354
v/s Ratio Prot	c0.43		0.06	c0.31		
v/s Ratio Perm						0.02
v/c Ratio	0.64		0.25	0.65		0.10
Uniform Delay, d1	10.4		34.6	22.0		33.4
Progression Factor	0.10		0.76	0.64		1.00
Incremental Delay, d2	0.3		1.2	0.9		0.5
Delay (s)	1.3		27.3	14.9		34.0
Level of Service	A		C	B		C
Approach Delay (s)	1.3			15.5	34.0	
Approach LOS	A			B	C	

Intersection Summary			
HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.6
Intersection Capacity Utilization	56.1%	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 (vph)	0	1995	9	0	1653	0	0	0	0	403	0	238
Future Volume (vph)	0	1995	9	0	1653	0	0	0	0	403	0	238
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7			5.7						6.6	6.6
Lane Util. Factor		0.91			0.91						1.00	1.00
Frpb, ped/bikes		1.00			1.00						1.00	1.00
Flpb, ped/bikes		1.00			1.00						0.92	1.00
Frt		1.00			1.00						1.00	0.85
Flt Protected		1.00			1.00						0.95	1.00
Satd. Flow (prot)		4973			4980						1646	1597
Flt Permitted		1.00			1.00						0.95	1.00
Satd. Flow (perm)		4973			4980						1646	1597
Peak-hour factor, PHF	0.92	0.94	0.69	0.92	0.91	0.92	0.92	0.92	0.45	0.92	0.86	0.92
Adj. Flow (vph)	0	2122	13	0	1816	0	0	0	0	438	0	259
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	20
Lane Group Flow (vph)	0	2135	0	0	1816	0	0	0	0	0	438	239
Confl. Peds. (#/hr)			41							40		
Heavy Vehicles (%)	0%	3%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%
Turn Type		NA			NA				Perm	Perm	NA	Perm
Protected Phases		2			6						8	
Permitted Phases									4	8		8
Actuated Green, G (s)		69.3			69.3						28.4	28.4
Effective Green, g (s)		69.3			69.3						28.4	28.4
Actuated g/C Ratio		0.63			0.63						0.26	0.26
Clearance Time (s)		5.7			5.7						6.6	6.6
Lane Grp Cap (vph)		3132			3137						424	412
v/s Ratio Prot		c0.43			0.36							
v/s Ratio Perm											0.27	0.15
v/c Ratio		0.68			0.58						1.03	0.58
Uniform Delay, d1		13.2			11.9						40.8	35.6
Progression Factor		0.39			0.05						1.00	1.00
Incremental Delay, d2		1.0			0.7						52.5	5.9
Delay (s)		6.1			1.3						93.3	41.4
Level of Service		A			A						F	D
Approach Delay (s)		6.1			1.3			0.0			74.0	
Approach LOS		A			A			A			E	

Intersection Summary			
HCM 2000 Control Delay	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.3
Intersection Capacity Utilization	71.3%	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												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	11	157	61	18	130	6	6	4	2	4	12	6
Future Volume (vph)	11	157	61	18	130	6	6	4	2	4	12	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	171	66	20	141	7	7	4	2	4	13	7

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	249	168	13	24
Volume Left (vph)	12	20	7	4
Volume Right (vph)	66	7	2	7
Hadj (s)	-0.08	0.08	0.02	-0.08
Departure Headway (s)	4.1	4.3	4.8	4.7
Degree Utilization, x	0.28	0.20	0.02	0.03
Capacity (veh/h)	865	808	677	689
Control Delay (s)	8.7	8.4	7.9	7.9
Approach Delay (s)	8.7	8.4	7.9	7.9
Approach LOS	A	A	A	A

Intersection Summary				
Delay	8.5			
Level of Service	A			
Intersection Capacity Utilization	30.2%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	32	1666	1136	19	10	33
Future Volume (vph)	32	1666	1136	19	10	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.6	5.6	5.6		5.0	
Lane Util. Factor	1.00	0.91	0.95		1.00	
Frpb, ped/bikes	1.00	1.00	1.00		1.00	
Flpb, ped/bikes	1.00	1.00	1.00		1.00	
Frt	1.00	1.00	1.00		0.90	
Flt Protected	0.95	1.00	1.00		0.99	
Satd. Flow (prot)	1785	4885	3418		1523	
Flt Permitted	0.16	1.00	1.00		0.99	
Satd. Flow (perm)	307	4885	3418		1523	
Peak-hour factor, PHF	0.89	0.90	0.90	0.68	0.63	0.69
Adj. Flow (vph)	36	1851	1262	28	16	48
RTOR Reduction (vph)	0	0	1	0	36	0
Lane Group Flow (vph)	36	1851	1289	0	28	0
Confl. Peds. (#/hr)	25			25		
Heavy Vehicles (%)	0%	5%	4%	5%	20%	6%
Turn Type	Perm	NA	NA		Prot	
Protected Phases		2	6		8	
Permitted Phases	2					
Actuated Green, G (s)	72.4	72.4	72.4		27.0	
Effective Green, g (s)	72.4	72.4	72.4		27.0	
Actuated g/C Ratio	0.66	0.66	0.66		0.25	
Clearance Time (s)	5.6	5.6	5.6		5.0	
Lane Grp Cap (vph)	202	3215	2249		373	
v/s Ratio Prot		c0.38	0.38		c0.02	
v/s Ratio Perm	0.12					
v/c Ratio	0.18	0.58	0.57		0.07	
Uniform Delay, d1	7.3	10.3	10.3		31.9	
Progression Factor	0.95	0.74	0.97		1.00	
Incremental Delay, d2	1.5	0.6	0.8		0.4	
Delay (s)	8.5	8.2	10.8		32.3	
Level of Service	A	A	B		C	
Approach Delay (s)		8.2	10.8		32.3	
Approach LOS		A	B		C	

Intersection Summary			
HCM 2000 Control Delay	9.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.6
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection Sign configuration not allowed in HCM analysis.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	64	1268	0	0	185	0
Future Volume (vph)	64	1268	0	0	185	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7			5.7	
Lane Util. Factor		0.86			1.00	
Frpb, ped/bikes		1.00			1.00	
Flpb, ped/bikes		1.00			1.00	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		6199			1733	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		6199			1733	
Peak-hour factor, PHF	0.76	0.92	0.92	0.92	0.71	0.92
Adj. Flow (vph)	84	1378	0	0	261	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	1462	0	0	261	0
Confl. Peds. (#/hr)	15				24	
Heavy Vehicles (%)	0%	4%	0%	0%	3%	0%
Turn Type	Perm	NA			Prot	
Protected Phases		2			8	
Permitted Phases	2					
Actuated Green, G (s)		61.3			37.3	
Effective Green, g (s)		61.3			37.3	
Actuated g/C Ratio		0.56			0.34	
Clearance Time (s)		5.7			5.7	
Lane Grp Cap (vph)		3454			587	
v/s Ratio Prot					c0.15	
v/s Ratio Perm		0.24				
v/c Ratio		0.42			0.44	
Uniform Delay, d1		14.1			28.3	
Progression Factor		0.46			1.00	
Incremental Delay, d2		0.3			2.4	
Delay (s)		6.8			30.7	
Level of Service		A			C	
Approach Delay (s)		6.8	0.0		30.7	
Approach LOS		A	A		C	

Intersection Summary			
HCM 2000 Control Delay	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.4
Intersection Capacity Utilization	39.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1667	650	0	1169	535	31
Future Volume (vph)	1667	650	0	1169	535	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2		6.2	5.7	5.7
Lane Util. Factor	0.91	1.00		0.95	0.97	1.00
Frpb, ped/bikes	1.00	0.80		1.00	1.00	0.96
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	1.00	1.00		1.00	0.95	1.00
Satd. Flow (prot)	5029	1239		3535	3395	1249
Flt Permitted	1.00	1.00		1.00	0.95	1.00
Satd. Flow (perm)	5029	1239		3535	3395	1249
Peak-hour factor, PHF	0.92	0.93	0.92	0.90	0.83	0.78
Adj. Flow (vph)	1812	699	0	1299	645	40
RTOR Reduction (vph)	0	300	0	0	0	6
Lane Group Flow (vph)	1812	399	0	1299	645	34
Confl. Peds. (#/hr)		94				25
Heavy Vehicles (%)	2%	3%	0%	1%	2%	23%
Turn Type	NA	Perm		NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2				4
Actuated Green, G (s)	62.8	62.8		62.8	35.3	35.3
Effective Green, g (s)	62.8	62.8		62.8	35.3	35.3
Actuated g/C Ratio	0.57	0.57		0.57	0.32	0.32
Clearance Time (s)	6.2	6.2		6.2	5.7	5.7
Lane Grp Cap (vph)	2871	707		2018	1089	400
v/s Ratio Prot	0.36			c0.37	c0.19	
v/s Ratio Perm		0.32				0.03
v/c Ratio	0.63	0.56		0.64	0.59	0.08
Uniform Delay, d1	15.8	14.9		16.0	31.3	26.1
Progression Factor	0.42	3.82		0.23	1.00	1.00
Incremental Delay, d2	0.6	1.9		1.3	2.4	0.4
Delay (s)	7.2	59.0		5.1	33.7	26.5
Level of Service	A	E		A	C	C
Approach Delay (s)	21.6			5.1	33.3	
Approach LOS	C			A	C	

Intersection Summary			
HCM 2000 Control Delay	18.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.9
Intersection Capacity Utilization	68.1%	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)	48	891	737	0	564	9	544	170	80	57	336	47
Future Volume (vph)	48	891	737	0	564	9	544	170	80	57	336	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5			6.5		4.5	5.9			5.9	
Lane Util. Factor	1.00	0.91			0.95		0.97	1.00			0.95	
Frpb, ped/bikes	1.00	0.97			1.00		1.00	0.97			1.00	
Flpb, ped/bikes	0.99	1.00			1.00		1.00	1.00			0.99	
Frt	1.00	0.93			1.00		1.00	0.94			0.98	
Flt Protected	0.95	1.00			1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1763	4537			3484		3429	1697			3303	
Flt Permitted	0.32	1.00			1.00		0.95	1.00			0.83	
Satd. Flow (perm)	601	4537			3484		3429	1697			2777	
Peak-hour factor, PHF	0.92	0.95	0.96	0.25	0.87	0.56	0.91	0.87	0.71	0.71	0.86	0.73
Adj. Flow (vph)	52	938	768	0	648	16	598	195	113	80	391	64
RTOR Reduction (vph)	0	135	0	0	2	0	0	19	0	0	10	0
Lane Group Flow (vph)	52	1571	0	0	662	0	598	289	0	0	525	0
Confl. Peds. (#/hr)	23		63	63		23			82	82		
Heavy Vehicles (%)	0%	3%	1%	0%	2%	0%	1%	1%	1%	25%	1%	0%
Turn Type	Perm	NA			NA		Prot	NA		Perm	NA	
Protected Phases		2			6		7	4			8	
Permitted Phases	2									8		
Actuated Green, G (s)	46.5	46.5			46.5		25.5	51.1			21.1	
Effective Green, g (s)	46.5	46.5			46.5		25.5	51.1			21.1	
Actuated g/C Ratio	0.42	0.42			0.42		0.23	0.46			0.19	
Clearance Time (s)	6.5	6.5			6.5		4.5	5.9			5.9	
Lane Grp Cap (vph)	254	1917			1472		794	788			532	
v/s Ratio Prot		c0.35			0.19		c0.17	0.17				
v/s Ratio Perm	0.09										c0.19	
v/c Ratio	0.20	0.98dr			0.45		0.75	0.37			0.99	
Uniform Delay, d1	20.1	28.0			22.6		39.3	19.0			44.3	
Progression Factor	0.47	0.37			1.00		1.00	1.00			1.00	
Incremental Delay, d2	1.5	3.4			1.0		6.5	1.3			36.0	
Delay (s)	10.8	13.7			23.6		45.9	20.3			80.4	
Level of Service	B	B			C		D	C			F	
Approach Delay (s)		13.7			23.6			37.2			80.4	
Approach LOS		B			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	30.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.9
Intersection Capacity Utilization	94.2%	ICU Level of Service	F
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	921	135	66	1199	4	194	2	76	16	1	7
Future Volume (vph)	6	921	135	66	1199	4	194	2	76	16	1	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.7	5.7		5.3	5.3			5.7	5.7		5.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			1.00	0.96		0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.95	1.00		0.99	
Frt	1.00	0.98		1.00	1.00			1.00	0.85		0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00		0.98	
Satd. Flow (prot)	1518	3363		1741	3494			1702	1515		1668	
Flt Permitted	0.15	1.00		0.18	1.00			0.69	1.00		0.79	
Satd. Flow (perm)	245	3363		328	3494			1240	1515		1359	
Peak-hour factor, PHF	0.38	0.91	0.70	0.97	0.93	0.33	0.73	0.50	0.76	0.67	0.25	0.35
Adj. Flow (vph)	16	1012	193	68	1289	12	266	4	100	24	4	20
RTOR Reduction (vph)	0	12	0	0	0	0	0	0	63	0	15	0
Lane Group Flow (vph)	16	1193	0	68	1301	0	0	270	37	0	33	0
Confl. Peds. (#/hr)	24		19	19		24	47		27	27		47
Heavy Vehicles (%)	17%	3%	1%	2%	2%	0%	0%	0%	1%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)	69.5	69.5		69.9	69.9			29.1	29.1		29.1	
Effective Green, g (s)	69.5	69.5		69.9	69.9			29.1	29.1		29.1	
Actuated g/C Ratio	0.63	0.63		0.64	0.64			0.26	0.26		0.26	
Clearance Time (s)	5.7	5.7		5.3	5.3			5.7	5.7		5.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	154	2124		208	2220			328	400		359	
v/s Ratio Prot		0.35			c0.37							
v/s Ratio Perm	0.07			0.21				c0.22	0.02		0.02	
v/c Ratio	0.10	0.56		0.33	0.59			0.82	0.09		0.09	
Uniform Delay, d1	8.0	11.6		9.2	11.6			38.0	30.5		30.5	
Progression Factor	0.54	0.52		1.06	0.98			1.00	1.00		1.00	
Incremental Delay, d2	0.7	0.5		3.7	1.0			15.3	0.1		0.1	
Delay (s)	5.0	6.6		13.5	12.4			53.3	30.6		30.6	
Level of Service	A	A		B	B			D	C		C	
Approach Delay (s)		6.5			12.5			47.2			30.6	
Approach LOS		A			B			D			C	

Intersection Summary			
HCM 2000 Control Delay	14.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.4
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	992	21	163	1211	58	121
Future Volume (vph)	992	21	163	1211	58	121
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5		5.5	5.5	5.5	5.5
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	0.93
Flpb, ped/bikes	1.00		0.99	1.00	1.00	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3418		1749	3500	1785	1478
Flt Permitted	1.00		0.26	1.00	0.95	1.00
Satd. Flow (perm)	3418		477	3500	1785	1478
Peak-hour factor, PHF	0.98	0.88	0.71	0.87	0.91	0.84
Adj. Flow (vph)	1012	24	230	1392	64	144
RTOR Reduction (vph)	1	0	0	0	0	88
Lane Group Flow (vph)	1035	0	230	1392	64	56
Confl. Peds. (#/hr)		28	28		12	46
Heavy Vehicles (%)	4%	0%	1%	2%	0%	1%
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases			6			4
Actuated Green, G (s)	85.1		85.1	85.1	13.9	13.9
Effective Green, g (s)	85.1		85.1	85.1	13.9	13.9
Actuated g/C Ratio	0.77		0.77	0.77	0.13	0.13
Clearance Time (s)	5.5		5.5	5.5	5.5	5.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2644		369	2707	225	186
v/s Ratio Prot	0.30			0.40	0.04	
v/s Ratio Perm			c0.48			c0.04
v/c Ratio	0.39		0.62	0.51	0.28	0.30
Uniform Delay, d1	4.0		5.4	4.7	43.5	43.6
Progression Factor	0.92		0.47	0.29	1.00	1.00
Incremental Delay, d2	0.4		6.6	0.6	0.7	0.9
Delay (s)	4.1		9.2	2.0	44.2	44.5
Level of Service	A		A	A	D	D
Approach Delay (s)	4.1			3.0	44.4	
Approach LOS	A			A	D	

Intersection Summary			
HCM 2000 Control Delay	6.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	71.0%	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)	6	1101	6	4	1352	15	5	3	9	30	2	17
Future Volume (vph)	6	1101	6	4	1352	15	5	3	9	30	2	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.2	5.2		5.2	5.2			5.0			5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.97			0.99	
Flpb, ped/bikes	1.00	1.00		0.97	1.00			1.00			0.97	
Frt	1.00	1.00		1.00	1.00			0.93			0.95	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.97	
Satd. Flow (prot)	1750	3429		1702	3184			1626			1648	
Flt Permitted	0.15	1.00		0.21	1.00			0.93			0.80	
Satd. Flow (perm)	270	3429		375	3184			1527			1359	
Peak-hour factor, PHF	0.92	0.90	0.92	0.92	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	1223	7	4	1502	16	5	3	10	33	2	18
RTOR Reduction (vph)	0	0	0	0	0	0	0	9	0	0	16	0
Lane Group Flow (vph)	7	1230	0	4	1518	0	0	9	0	0	37	0
Confl. Peds. (#/hr)	41		43	43		41	4		40	40		4
Heavy Vehicles (%)	2%	4%	2%	2%	12%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	88.0	88.0		88.0	88.0			11.8			11.8	
Effective Green, g (s)	88.0	88.0		88.0	88.0			11.8			11.8	
Actuated g/C Ratio	0.80	0.80		0.80	0.80			0.11			0.11	
Clearance Time (s)	5.2	5.2		5.2	5.2			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	216	2743		300	2547			163			145	
v/s Ratio Prot		0.36			c0.48							
v/s Ratio Perm	0.03			0.01				0.01			c0.03	
v/c Ratio	0.03	0.45		0.01	0.60			0.06			0.25	
Uniform Delay, d1	2.3	3.4		2.2	4.2			44.1			45.1	
Progression Factor	0.25	0.18		1.44	1.31			1.00			1.00	
Incremental Delay, d2	0.3	0.5		0.1	0.7			0.1			0.9	
Delay (s)	0.8	1.1		3.3	6.2			44.2			46.0	
Level of Service	A	A		A	A			D			D	
Approach Delay (s)		1.1			6.2			44.2			46.0	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	5.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	66.4%	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)	7	134	222	211	194	4	0	0	0	2	99	1
Future Volume (vph)	7	134	222	211	194	4	0	0	0	2	99	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.1	5.1		3.0	5.1						5.6	
Lane Util. Factor	1.00	1.00		1.00	1.00						1.00	
Frpb, ped/bikes	1.00	0.95		1.00	1.00						1.00	
Flpb, ped/bikes	0.93	1.00		0.99	1.00						1.00	
Frt	1.00	0.91		1.00	0.99						1.00	
Flt Protected	0.95	1.00		0.95	1.00						1.00	
Satd. Flow (prot)	1665	1628		1766	1844						1833	
Flt Permitted	0.62	1.00		0.36	1.00						1.00	
Satd. Flow (perm)	1084	1628		676	1844						1833	
Peak-hour factor, PHF	0.58	0.83	0.90	0.89	0.90	0.50	0.92	0.92	0.92	0.50	0.71	0.25
Adj. Flow (vph)	12	161	247	237	216	8	0	0	0	4	139	4
RTOR Reduction (vph)	0	79	0	0	2	0	0	0	0	0	1	0
Lane Group Flow (vph)	12	329	0	237	222	0	0	0	0	0	146	0
Confl. Peds. (#/hr)	76		93	93		76				14		5
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	2%	0%
Turn Type	Perm	NA		pm+pt	NA					Perm	NA	
Protected Phases		2		1	6						8	
Permitted Phases	2			6						8		
Actuated Green, G (s)	29.3	29.3		37.3	37.3						22.0	
Effective Green, g (s)	29.3	29.3		37.3	37.3						22.0	
Actuated g/C Ratio	0.42	0.42		0.53	0.53						0.31	
Clearance Time (s)	5.1	5.1		3.0	5.1						5.6	
Lane Grp Cap (vph)	453	681		438	982						576	
v/s Ratio Prot		0.20		c0.04	0.12							
v/s Ratio Perm	0.01			c0.25							0.08	
v/c Ratio	0.03	0.48		0.54	0.23						0.25	
Uniform Delay, d1	12.0	14.8		9.8	8.7						17.9	
Progression Factor	1.00	1.00		1.00	1.00						1.00	
Incremental Delay, d2	0.1	2.4		4.7	0.5						1.1	
Delay (s)	12.1	17.3		14.6	9.2						18.9	
Level of Service	B	B		B	A						B	
Approach Delay (s)		17.1			12.0			0.0			18.9	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM 2000 Control Delay	15.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	13.7
Intersection Capacity Utilization	66.5%	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												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	4	136	12	87	17	91	2	250	143	84	173	1
Future Volume (vph)	4	136	12	87	17	91	2	250	143	84	173	1
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	5	160	14	102	20	107	2	294	168	99	204	1

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	179	122	107	464	304
Volume Left (vph)	5	102	0	2	99
Volume Right (vph)	14	0	107	168	1
Hadj (s)	-0.04	0.45	-0.65	-0.18	0.09
Departure Headway (s)	6.9	7.7	6.5	5.7	6.2
Degree Utilization, x	0.34	0.26	0.19	0.74	0.53
Capacity (veh/h)	454	418	475	609	531
Control Delay (s)	13.4	12.1	9.9	22.9	16.0
Approach Delay (s)	13.4	11.1		22.9	16.0
Approach LOS	B	B		C	C

Intersection Summary				
Delay	17.4			
Level of Service	C			
Intersection Capacity Utilization	74.3%	ICU Level of Service		D
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)	3	136	78	17	107	14	113	16	15	19	29	5
Future Volume (vph)	3	136	78	17	107	14	113	16	15	19	29	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	148	85	18	116	15	123	17	16	21	32	5

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	236	76	73	156	58
Volume Left (vph)	3	18	0	123	21
Volume Right (vph)	85	0	15	16	5
Hadj (s)	-0.18	0.15	-0.11	0.13	0.05
Departure Headway (s)	4.6	5.4	5.2	5.0	5.1
Degree Utilization, x	0.30	0.11	0.11	0.22	0.08
Capacity (veh/h)	741	624	657	668	638
Control Delay (s)	9.5	8.0	7.6	9.4	8.6
Approach Delay (s)	9.5	7.8		9.4	8.6
Approach LOS	A	A		A	A

Intersection Summary				
Delay	9.0			
Level of Service	A			
Intersection Capacity Utilization	38.9%	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)	6	232	8	19	355	149	9	30	23	207	9	4
Future Volume (vph)	6	232	8	19	355	149	9	30	23	207	9	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.4	5.4		5.4	5.4		5.4			5.4	
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00			1.00	
Frpb, ped/bikes		1.00	0.88		1.00	0.88		0.97			1.00	
Flpb, ped/bikes		1.00	1.00		1.00	1.00		0.99			0.95	
Frt		1.00	0.85		1.00	0.85		0.95			1.00	
Flt Protected		1.00	1.00		1.00	1.00		0.99			0.96	
Satd. Flow (prot)		1853	1410		1845	1276		1703			1579	
Flt Permitted		0.97	1.00		0.95	1.00		0.92			0.71	
Satd. Flow (perm)		1799	1410		1753	1276		1577			1178	
Peak-hour factor, PHF	0.38	0.75	0.50	0.43	0.75	0.85	0.45	0.75	0.64	0.92	0.45	0.50
Adj. Flow (vph)	16	309	16	44	473	175	20	40	36	225	20	8
RTOR Reduction (vph)	0	0	9	0	0	67	0	23	0	0	1	0
Lane Group Flow (vph)	0	325	7	0	517	108	0	73	0	0	252	0
Confl. Peds. (#/hr)	55		53	53		55	27		33	33		27
Heavy Vehicles (%)	0%	1%	0%	11%	0%	10%	0%	0%	0%	9%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			4	
Permitted Phases	2		2	6		6	4			4		
Actuated Green, G (s)		40.6	40.6		40.6	40.6		33.6			33.6	
Effective Green, g (s)		40.6	40.6		40.6	40.6		33.6			33.6	
Actuated g/C Ratio		0.45	0.45		0.45	0.45		0.37			0.37	
Clearance Time (s)		5.4	5.4		5.4	5.4		5.4			5.4	
Lane Grp Cap (vph)		811	636		790	575		588			439	
v/s Ratio Prot												
v/s Ratio Perm		0.18	0.01		c0.29	0.08		0.05			c0.21	
v/c Ratio		0.40	0.01		0.65	0.19		0.12			0.57	
Uniform Delay, d1		16.5	13.6		19.2	14.8		18.5			22.5	
Progression Factor		1.00	1.00		0.64	0.34		1.00			1.00	
Incremental Delay, d2		1.5	0.0		3.9	0.7		0.4			5.4	
Delay (s)		18.0	13.7		16.2	5.7		19.0			27.8	
Level of Service		B	B		B	A		B			C	
Approach Delay (s)		17.8			13.5			19.0			27.8	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM 2000 Control Delay	17.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.8
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
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)	0	0	0	54	1099	47	36	12	0	0	36	26
Future Volume (vph)	0	0	0	54	1099	47	36	12	0	0	36	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0			5.4			5.4	
Lane Util. Factor					0.91			1.00			1.00	
Frpb, ped/bikes					0.99			1.00			0.99	
Flpb, ped/bikes					1.00			0.99			1.00	
Frt					0.99			1.00			0.94	
Flt Protected					1.00			0.97			1.00	
Satd. Flow (prot)					4861			1803			1637	
Flt Permitted					1.00			0.76			1.00	
Satd. Flow (perm)					4861			1408			1637	
Peak-hour factor, PHF	0.92	0.92	0.92	0.75	0.98	0.78	0.75	0.50	0.92	0.92	0.90	0.81
Adj. Flow (vph)	0	0	0	72	1121	60	48	24	0	0	40	32
RTOR Reduction (vph)	0	0	0	0	3	0	0	0	0	0	28	0
Lane Group Flow (vph)	0	0	0	0	1250	0	0	72	0	0	44	0
Confl. Peds. (#/hr)				5		51	12		31	31		12
Heavy Vehicles (%)	0%	0%	0%	2%	4%	0%	0%	0%	0%	0%	0%	15%
Turn Type				Perm	NA		Perm	NA			NA	
Protected Phases					6			4			8	
Permitted Phases				6			4					
Actuated Green, G (s)					68.7			10.9			10.9	
Effective Green, g (s)					68.7			10.9			10.9	
Actuated g/C Ratio					0.76			0.12			0.12	
Clearance Time (s)					5.0			5.4			5.4	
Vehicle Extension (s)					3.0			3.0			3.0	
Lane Grp Cap (vph)					3710			170			198	
v/s Ratio Prot											0.03	
v/s Ratio Perm					0.26			c0.05				
v/c Ratio					0.34			0.42			0.22	
Uniform Delay, d1					3.4			36.6			35.7	
Progression Factor					1.00			1.00			1.00	
Incremental Delay, d2					0.2			1.7			0.6	
Delay (s)					3.6			38.3			36.3	
Level of Service					A			D			D	
Approach Delay (s)		0.0			3.6			38.3			36.3	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	7.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.4
Intersection Capacity Utilization	47.9%	ICU Level of Service	A
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)	71	200	174	105	400	33	123	117	24	55	100	23
Future Volume (vph)	71	200	174	105	400	33	123	117	24	55	100	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.2	5.2		5.2	5.2		3.0	5.4			5.4	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.91		1.00	0.99		1.00	0.97			0.99	
Flpb, ped/bikes	0.97	1.00		0.93	1.00		0.98	1.00			0.97	
Frt	1.00	0.93		1.00	0.99		1.00	0.97			0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1689	1439		1530	1750		1639	1715			1648	
Flt Permitted	0.32	1.00		0.40	1.00		0.55	1.00			0.85	
Satd. Flow (perm)	573	1439		637	1750		947	1715			1420	
Peak-hour factor, PHF	0.89	0.88	0.82	0.91	0.82	0.92	0.90	0.91	0.67	0.81	0.89	0.72
Adj. Flow (vph)	80	227	212	115	488	36	137	129	36	68	112	32
RTOR Reduction (vph)	0	37	0	0	3	0	0	11	0	0	7	0
Lane Group Flow (vph)	80	402	0	115	521	0	137	154	0	0	205	0
Confl. Peds. (#/hr)	40		94	94		40	33		60	60		33
Heavy Vehicles (%)	3%	2%	19%	8%	6%	0%	7%	3%	4%	2%	10%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		6			2		3	8			4	
Permitted Phases	6			2			8			4		
Actuated Green, G (s)	43.8	43.8		43.8	43.8		35.6	35.6			27.6	
Effective Green, g (s)	43.8	43.8		43.8	43.8		35.6	35.6			27.6	
Actuated g/C Ratio	0.49	0.49		0.49	0.49		0.40	0.40			0.31	
Clearance Time (s)	5.2	5.2		5.2	5.2		3.0	5.4			5.4	
Lane Grp Cap (vph)	278	700		310	851		413	678			435	
v/s Ratio Prot		0.28			c0.30		c0.02	0.09				
v/s Ratio Perm	0.14			0.18			0.11				c0.14	
v/c Ratio	0.29	0.57		0.37	0.61		0.33	0.23			0.47	
Uniform Delay, d1	13.8	16.5		14.5	16.9		18.5	18.1			25.3	
Progression Factor	0.95	1.00		0.79	0.86		1.00	1.00			1.00	
Incremental Delay, d2	2.4	3.2		3.3	3.2		2.1	0.8			3.6	
Delay (s)	15.6	19.7		14.8	17.7		20.7	18.8			28.9	
Level of Service	B	B		B	B		C	B			C	
Approach Delay (s)		19.1			17.1			19.7			28.9	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM 2000 Control Delay	19.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.6
Intersection Capacity Utilization	94.9%	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)	0	0	279	0	527	36	0	0	0	0	0	11
Future Volume (Veh/h)	0	0	279	0	527	36	0	0	0	0	0	11
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	303	0	573	39	0	0	0	0	0	12
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		174										
pX, platoon unblocked												
vC, conflicting volume	612			0			585	612	0	724	573	573
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	612			0			585	612	0	724	573	573
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	100	100	98
cM capacity (veh/h)	967			1623			413	408	1085	341	430	519

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	303	573	39	12
Volume Left	0	0	0	0
Volume Right	303	0	39	12
cSH	1700	1700	1700	519
Volume to Capacity	0.18	0.34	0.02	0.02
Queue Length 95th (m)	0.0	0.0	0.0	0.5
Control Delay (s)	0.0	0.0	0.0	12.1
Lane LOS				B
Approach Delay (s)	0.0	0.0		12.1
Approach LOS				B

Intersection Summary				
Average Delay			0.2	
Intersection Capacity Utilization			37.7%	ICU Level of Service
Analysis Period (min)			15	

Intersection Sign configuration not allowed in HCM analysis.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL2	SBL	SBR	NWL	NWR	NWR2
Lane Configurations												
Traffic Volume (vph)	21	415	26	14	499	33	12	13	4	20	23	18
Future Volume (vph)	21	415	26	14	499	33	12	13	4	20	23	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2	5.2		5.2	5.2	5.5	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.73		1.00	0.86	1.00	0.93		1.00	0.72	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	0.76	1.00		0.86	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	0.94		1.00	0.85	
Flt Protected		1.00	1.00		1.00	1.00	0.95	0.97		0.95	1.00	
Satd. Flow (prot)		1801	1159		1799	1373	1363	1436		1535	1084	
Flt Permitted		0.95	1.00		0.98	1.00	0.71	1.00		0.74	1.00	
Satd. Flow (perm)		1715	1159		1766	1373	1019	1477		1194	1084	
Peak-hour factor, PHF	0.75	0.96	0.72	0.70	0.86	0.63	0.60	0.81	0.33	0.71	0.52	0.64
Adj. Flow (vph)	28	432	36	20	580	52	20	16	12	28	44	28
RTOR Reduction (vph)	0	0	14	0	0	17	0	20	0	0	20	0
Lane Group Flow (vph)	0	460	22	0	600	35	20	9	0	28	52	0
Confl. Peds. (#/hr)	60		127	127		60	145		81	81		145
Heavy Vehicles (%)	0%	4%	0%	0%	4%	0%	0%	0%	25%	0%	4%	11%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	Perm		Perm	Perm	
Protected Phases		2			6							
Permitted Phases	2		2	6		6	8	8		4	4	
Actuated Green, G (s)		54.3	54.3		54.3	54.3	25.0	25.0		25.0	25.0	
Effective Green, g (s)		54.3	54.3		54.3	54.3	25.0	25.0		25.0	25.0	
Actuated g/C Ratio		0.60	0.60		0.60	0.60	0.28	0.28		0.28	0.28	
Clearance Time (s)		5.2	5.2		5.2	5.2	5.5	5.5		5.5	5.5	
Lane Grp Cap (vph)		1034	699		1065	828	283	410		331	301	
v/s Ratio Prot												
v/s Ratio Perm		0.27	0.02		c0.34	0.03	0.02	0.01		0.02	c0.05	
v/c Ratio		0.44	0.03		0.56	0.04	0.07	0.02		0.08	0.17	
Uniform Delay, d1		9.7	7.2		10.7	7.3	23.9	23.6		24.0	24.7	
Progression Factor		0.53	0.46		0.61	0.12	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.3	0.1		1.8	0.1	0.5	0.1		0.5	1.2	
Delay (s)		6.4	3.4		8.3	1.0	24.4	23.7		24.5	25.9	
Level of Service		A	A		A	A	C	C		C	C	
Approach Delay (s)		6.2			7.7			24.0		25.5		
Approach LOS		A			A			C		C		

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.7
Intersection Capacity Utilization	94.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑	↑↑↑			
Traffic Volume (veh/h)	0	2004	1891	0	0	0
Future Volume (Veh/h)	0	2004	1891	0	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	2178	2055	0	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		85	127			
pX, platoon unblocked	0.79				0.86	0.79
vC, conflicting volume	2055				2781	685
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1394				811	0
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	383				272	854

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3
Volume Total	726	726	726	685	685	685
Volume Left	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.43	0.43	0.43	0.40	0.40	0.40
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS						
Approach Delay (s)	0.0			0.0		
Approach LOS						

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection Sign configuration not allowed in HCM analysis.

Intersection Sign configuration not allowed in HCM analysis.

Intersection Sign configuration not allowed in HCM analysis.

Intersection Sign configuration not allowed in HCM analysis.

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↑			↑
Traffic Volume (vph)	0	0	596	0	0	547
Future Volume (vph)	0	0	596	0	0	547
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			5.1			5.1
Lane Util. Factor			1.00			1.00
Frt			1.00			1.00
Flt Protected			1.00			1.00
Satd. Flow (prot)			1842			1842
Flt Permitted			1.00			1.00
Satd. Flow (perm)			1842			1842
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	648	0	0	595
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	648	0	0	595
Turn Type			NA			NA
Protected Phases			2			6
Permitted Phases						
Actuated Green, G (s)			45.2			45.2
Effective Green, g (s)			45.2			45.2
Actuated g/C Ratio			0.78			0.78
Clearance Time (s)			5.1			5.1
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)			1428			1428
v/s Ratio Prot			c0.35			0.32
v/s Ratio Perm						
v/c Ratio			0.45			0.42
Uniform Delay, d1			2.3			2.2
Progression Factor			1.00			1.00
Incremental Delay, d2			1.0			0.9
Delay (s)			3.3			3.1
Level of Service			A			A
Approach Delay (s)	0.0		3.3			3.1
Approach LOS	A		A			A

Intersection Summary			
HCM 2000 Control Delay	3.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	58.3	Sum of lost time (s)	10.1
Intersection Capacity Utilization	35.6%	ICU Level of Service	A
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	4	0	0	4	15	0	4	1	19	7	14
Future Volume (Veh/h)	15	4	0	0	4	15	0	4	1	19	7	14
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	4	0	0	4	16	0	4	1	21	8	15
Pedestrians								2			5	
Lane Width (m)								3.5			3.5	
Walking Speed (m/s)								1.2			1.2	
Percent Blockage								0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	85	62	18	66	70	10	23			5		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	85	62	18	66	70	10	23			5		
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 %	98	100	100	100	100	99	100			99		
cM capacity (veh/h)	877	821	1065	918	814	1074	1605			1597		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	20	20	5	44
Volume Left	16	0	0	21
Volume Right	0	16	1	15
cSH	865	1009	1605	1597
Volume to Capacity	0.02	0.02	0.00	0.01
Queue Length 95th (m)	0.5	0.5	0.0	0.3
Control Delay (s)	9.3	8.6	0.0	3.5
Lane LOS	A	A		A
Approach Delay (s)	9.3	8.6	0.0	3.5
Approach LOS	A	A		

Intersection Summary				
Average Delay	5.8			
Intersection Capacity Utilization	23.7%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	12	8	10	13	5	8
Future Volume (vph)	12	8	10	13	5	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	9	11	14	5	9

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	22	25	14
Volume Left (vph)	13	11	0
Volume Right (vph)	9	0	9
Hadj (s)	-0.13	0.09	-0.39
Departure Headway (s)	3.9	4.0	3.6
Degree Utilization, x	0.02	0.03	0.01
Capacity (veh/h)	918	872	991
Control Delay (s)	6.9	7.2	6.6
Approach Delay (s)	6.9	7.2	6.6
Approach LOS	A	A	A

Intersection Summary			
Delay	7.0		
Level of Service	A		
Intersection Capacity Utilization	17.9%	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)	38	9	22	12	23	67	30	157	8	22	59	27
Future Volume (vph)	38	9	22	12	23	67	30	157	8	22	59	27
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	41	10	24	13	25	73	33	171	9	24	64	29

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	75	111	213	117
Volume Left (vph)	41	13	33	24
Volume Right (vph)	24	73	9	29
Hadj (s)	-0.05	-0.29	0.03	-0.11
Departure Headway (s)	4.8	4.5	4.5	4.5
Degree Utilization, x	0.10	0.14	0.27	0.15
Capacity (veh/h)	693	738	762	752
Control Delay (s)	8.3	8.2	9.2	8.3
Approach Delay (s)	8.3	8.2	9.2	8.3
Approach LOS	A	A	A	A

Intersection Summary				
Delay	8.6			
Level of Service	A			
Intersection Capacity Utilization	30.7%	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 (veh/h)	5	17	3	4	31	6	2	3	0	2	3	1
Future Volume (Veh/h)	5	17	3	4	31	6	2	3	0	2	3	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	18	3	4	34	7	2	3	0	2	3	1
Pedestrians		4			7			15			11	
Lane Width (m)		3.5			3.5			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			1			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	54	26	22	48	26	21	8			10		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	54	26	22	48	26	21	8			10		
tC, single (s)	7.4	6.6	6.5	7.1	6.6	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.8	4.1	3.5	3.5	4.1	3.3	2.2			2.2		
p0 queue free %	99	98	100	100	96	99	100			100		
cM capacity (veh/h)	832	850	977	914	850	1047	1620			1614		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	26	45	5	6
Volume Left	5	4	2	2
Volume Right	3	7	0	1
cSH	859	881	1620	1614
Volume to Capacity	0.03	0.05	0.00	0.00
Queue Length 95th (m)	0.7	1.2	0.0	0.0
Control Delay (s)	9.3	9.3	2.9	2.4
Lane LOS	A	A	A	A
Approach Delay (s)	9.3	9.3	2.9	2.4
Approach LOS	A	A		

Intersection Summary				
Average Delay	8.4			
Intersection Capacity Utilization	19.3%	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 (veh/h)	3	133	0	0	365	3	36	33	104	9	0	8
Future Volume (Veh/h)	3	133	0	0	365	3	36	33	104	9	0	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	145	0	0	397	3	39	36	113	10	0	9
Pedestrians		14			12			40			47	
Lane Width (m)		3.5			3.5			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			1			3			4	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		172			328							
pX, platoon unblocked												
vC, conflicting volume	447			185			412	638	197	740	636	261
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	447			185			412	638	197	740	636	261
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.7	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.6	4.0	3.3
p0 queue free %	100			100			92	90	86	95	100	99
cM capacity (veh/h)	1081			1356			472	369	783	206	369	707

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total	148	265	135	39	149	19
Volume Left	3	0	0	39	0	10
Volume Right	0	0	3	0	113	9
cSH	1081	1700	1700	472	616	311
Volume to Capacity	0.00	0.16	0.08	0.08	0.24	0.06
Queue Length 95th (m)	0.1	0.0	0.0	2.0	7.2	1.5
Control Delay (s)	0.2	0.0	0.0	13.3	12.7	17.3
Lane LOS	A			B	B	C
Approach Delay (s)	0.2	0.0		12.8		17.3
Approach LOS				B		C

Intersection Summary				
Average Delay	3.7			
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												
Traffic Volume (veh/h)	6	91	24	6	204	6	21	1	15	12	0	7
Future Volume (Veh/h)	6	91	24	6	204	6	21	1	15	12	0	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	99	26	7	222	7	23	1	16	13	0	8
Pedestrians					1			13			13	
Lane Width (m)					3.5			3.5			3.5	
Walking Speed (m/s)					1.2			1.2			1.2	
Percent Blockage					0			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		233										
pX, platoon unblocked												
vC, conflicting volume	242			138			386	395	126	396	404	238
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	242			138			386	395	126	396	404	238
tC, single (s)	4.3			4.1			7.1	6.5	6.2	7.1	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.4			2.2			3.5	4.0	3.3	3.5	4.0	3.6
p0 queue free %	99			100			96	100	98	98	100	99
cM capacity (veh/h)	1188			1443			550	528	919	537	521	728

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	132	236	40	21
Volume Left	7	7	23	13
Volume Right	26	7	16	8
cSH	1188	1443	654	597
Volume to Capacity	0.01	0.00	0.06	0.04
Queue Length 95th (m)	0.1	0.1	1.5	0.8
Control Delay (s)	0.5	0.3	10.9	11.3
Lane LOS	A	A	B	B
Approach Delay (s)	0.5	0.3	10.9	11.3
Approach LOS			B	B

Intersection Summary				
Average Delay	1.9			
Intersection Capacity Utilization	23.5%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	3	8	15	5	0	19	16	17	0	16	1
Future Volume (Veh/h)	1	3	8	15	5	0	19	16	17	0	16	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	3	9	16	5	0	21	17	18	0	17	1
Pedestrians		9			6						16	
Lane Width (m)		3.5			3.5						3.5	
Walking Speed (m/s)		1.2			1.2						1.2	
Percent Blockage		1			0						1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	113	110	26	102	101	48	27			41		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	113	110	26	102	101	48	27			41		
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 %	100	100	99	98	99	100	99			100		
cM capacity (veh/h)	831	765	1047	852	773	1008	1588			1574		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	13	21	56	18
Volume Left	1	16	21	0
Volume Right	9	0	18	1
cSH	947	832	1588	1574
Volume to Capacity	0.01	0.03	0.01	0.00
Queue Length 95th (m)	0.3	0.6	0.3	0.0
Control Delay (s)	8.9	9.4	2.8	0.0
Lane LOS	A	A	A	
Approach Delay (s)	8.9	9.4	2.8	0.0
Approach LOS	A	A		

Intersection Summary				
Average Delay	4.4			
Intersection Capacity Utilization	25.9%	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 (veh/h)	0	462	0	0	523	0	0	0	0	0	0	0
Future Volume (Veh/h)	0	462	0	0	523	0	0	0	0	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	502	0	0	568	0	0	0	0	0	0	0
Pedestrians		31			22			52			76	
Lane Width (m)		3.5			3.5			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		3			2			4			6	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)		123			74							
pX, platoon unblocked	0.81			0.90			0.86	0.86	0.90	0.86	0.86	0.81
vC, conflicting volume	644			554			1153	1198	576	1168	1198	675
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	438			449			833	885	474	850	885	476
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	100	100	100
cM capacity (veh/h)	857			949			214	220	504	206	220	437

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	502	0	568	0	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	857	1700	949	1700	1700
Volume to Capacity	0.00	0.00	0.00	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS				A	A
Approach Delay (s)	0.0		0.0	0.0	0.0
Approach LOS				A	A

Intersection Summary				
Average Delay	0.0			
Intersection Capacity Utilization	45.9%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	18	22	15	12	2
Future Volume (Veh/h)	6	18	22	15	12	2
Sign Control	Free			Stop	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	20	24	16	13	2
Pedestrians	3			67	32	
Lane Width (m)	3.5			3.5	3.5	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			5	3	
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	32		102	123	133	35
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	32		102	123	133	35
tC, single (s)	4.1		7.1	6.5	6.5	6.2
tC, 2 stage (s)						
tF (s)	2.2		3.5	4.0	4.0	3.3
p0 queue free %	100		97	98	98	100
cM capacity (veh/h)	1552		768	707	698	1014

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	27	40	15
Volume Left	7	24	0
Volume Right	20	0	2
cSH	1552	742	729
Volume to Capacity	0.00	0.05	0.02
Queue Length 95th (m)	0.1	1.3	0.5
Control Delay (s)	1.9	10.1	10.0
Lane LOS	A	B	B
Approach Delay (s)	1.9	10.1	10.0
Approach LOS		B	B

Intersection Summary			
Average Delay	7.4		
Intersection Capacity Utilization	27.8%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix C

Bicycle Count Summary

Location	Count Days	Spring	Summer	Fall	Total	Daily Average
	2013					
King Street West (W of 403 on ramps)	7	1,926	-	-	1,926	275
Main Street West (W of 403 off ramps)	7	519	-	-	519	74
	2014					
King Street West (W of 403 on ramps)	17	747	3,113	2,029	5,889	346
Main Street West (W of 403 off ramps)	17	47	423	408	879	52
Sanders Blvd (W of Cootes Trail)	7	-	2,891	-	2,891	413
	2015					
Sanders Blvd (W of Cootes Trail)	7	3,930	-	-	3,930	561
	2016					
Main Street West (W of 403 off ramps)	7	-	-	488	488	70
	2017					
King Street West (E of Dalewood)	14	1,417	-	3,353	4,770	341
Main Street West (W of 403 off ramps)	14	716	-	299	1,015	73
Sanders Blvd (E of Kingsmount)	14	-	858	2,195	3,053	218
Sterling Street (E of Forsyth)	21	6,968	-	4,857	11,825	563

Data Source: City of Hamilton's Active Transportation Benchmarking Program

Multi-Use Recreational Trails Summary

Location	Count Days	Fall	Winter	Spring	Summer	Total	Daily Average
	2011-2012						
Hamilton-Brantford Rail Trail (403 Crossing)	28	2,023	1,238	3,307	3,682	10,250	366
Cootes Drive Trail (near Spencer's Creek)	20	-	2,799	3,177	3,182	9,158	458
	2012-2013						
Hamilton-Brantford Rail trail (403 Crossing)	7	-	-	-	4,165	4,165	598
Cootes Drive Trail (near McMaster)	7	1,318	-	-	-	1,318	188
	2013-2014						
Hamilton-Brantford Rail Trail (403 Crossing)	28	1,133	1,166	4,997	4,441	11,737	419
Hamilton-Brantford Rail Trail (Rifle Range)	7	-	-	-	7,165	7,165	1,024
Cootes Drive Trail (near McMaster)	28	1,851	1,454	2,487	3,639	9,431	337
Cootes Drive Trail (Sanders Blvd Trailhead)	7	-	-	-	8,315	8,315	1,188
	2014-2015						
Hamilton-Brantford Rail Trail (403 Crossing)	7	-	-	-	4,449	4,449	636
Hamilton-Brantford Rail Trail (Rifle Range)	7	-	-	-	5,951	5,591	850
Cootes Drive Trail (East of Dundas)	14	1,378	1,506	-	-	2,884	206
Ainslie Woods Footpath (Ainslie Avenue)	7	-	-	-	319	319	46
Ainslie Woods Footpath (Lower Horning)	7	-	-	-	204	204	29
Sanders Boulevard Footpath (near McMaster)	21	27,588	22,007	10,314	-	59,909	2,853
	2015-2016						
Hamilton-Brantford Rail Trail (403 Crossing)	21	2,750	1,953	4,328	-	9,031	430
Hamilton-Brantford Rail Trail (Rifle Range)	21	7,458	3,441	5,702	-	16,601	791
Ainslie Wood Footpath (Ainslie Avenue)	21	1,010	905	871	-	2,786	133
Ainslie Wood Footpath (Lower Horning)	21	150	73	101	-	324	15
	2017						
Hamilton-Brantford Rail Trail (403 Crossing)	318	159,180				159,180	501

Data Source: City of Hamilton's Active Transportation Benchmarking Program

Appendix D

Memo

To: Alan Kirkpatrick – City

From: Ravi Bhim – Wood, Joseph Gowrie – Wood, Tavia Chow – Wood

Date: October 23, 2018

File: TPB 186044

cc:

Re: **Ainslie Wood Traffic Management Review – Road Safety**

Road Safety

This memo documents the traffic safety review conducted as part of the Ainslie Wood Traffic Management Study. The purpose was to identify collision patterns and hotspots, followed by detailed in-field investigation to confirm findings. The results will inform the development and assessment of alternative solutions in future study phases. Safety initiatives including Road Safety Action Plan, enforcement programs as delivered by the Hamilton Road Safety Committee will also be considered.

1. Collision Data Validation

The Neighbourhood Traffic Management Review for the Ainslie Wood and Westdale neighbourhoods are being undertaken as two separate studies. However, given the similar scope and proximity of both study areas, historical collision data was provided by the City between 2013 and 2018 for both Ainslie Wood and Westdale neighbourhoods in a single database.

Data validation was completed to accurately identify collisions corresponding to each neighbourhood. The two study area boundaries partially overlap along Main Street and Cootes Drive, collisions that occurred in this overlapped region are included in the safety analysis of both neighbourhoods as illustrated in **Figure 1.**

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Figure 1: Study Areas and Overlapping Region

Moreover, the data for the current year (2018) is not yet complete, collision records occurred in 2018 were excluded from the analysis. As a result, the total of collisions identified in each study area are summarized in **Table 1.**

Table 1: Collision Data Validation

Neighbourhood	Original Database (2013-2018)	Main Street	Exclude 2018	Total Collisions (2013-2017)
Ainslie Wood	138	+142	-12	**268**
Westdale	195		-10	**327**

2. Collision by Locations

A heat map was developed to visualize the locations based on observed collision frequencies, as shown in **Figure 2.** In total, there are 268 collisions occurred within the neighbourhood with an annual average of 53.6 collisions in a five-year period. A more detailed trend analysis is provided in **Section 3**. Serving as the major arterial in the study area, Main Street exhibited the highest number of collisions (223 collisions or 83%). The predominant impact type was rear-end collisions which correlates with the high traffic volumes along this corridor. Majority of the rear-end collisions have no patterns with weather conditions but are likely attributable to close traffic gaps or high traveling speed (abrupt braking).

Figure 2: Collisions Hotspots (All Collision Types)

Several intersections were identified as collision-prone locations which experienced relatively higher number of collisions than other locations within the study area are discussed below.

2.1 Main Street & Cootes Drive

The predominate impact types at Main Street and Cootes Drive are rear-end (11 out of 27) and left-turns (8 out of 27).

Rear-end collisions at this intersection mainly occurred in the northbound direction (5 out of 11) followed by southbound and eastbound. The casual factors are vehicles following too closely to each other. Since 50% of the rear-end collisions resulted in injuries, there is a high likelihood that the vehicles were traveling too fast for conditions thus were unable to stop in time.

Left-turning collisions generally involved vehicles colliding with opposite approaching vehicles due to improper turning or disobeying traffic control and are more susceptible to injuries. Two of eight collisions involved cyclists making improper turns at the intersection and collided with through vehicles in the north-south direction on Cootes Drive.

2.2 Main Street & Emerson Street

The predominate impact type at Main Street and Emerson Street intersection is rear-end (14 out of 26) followed by pedestrian (5 out of 26). All rear-end collisions occurred in the eastbound or westbound directions with casual factors recorded as vehicles were following too close, speeding too fast for conditions or losing control.

All of the pedestrian/vehicle collisions were recorded under dark light (night time) conditions, which impede the visibility of pedestrian crossing at the intersection. Illumination at this intersection should be reviewed more closely in field investigation.

2.3 Main Street & Newton Ave

Main Street and Newton Avenue is a T-intersection located just west of the Highway 403 ramp terminal. The predominate impact type for this intersection are rear-end (8 out of 19) followed by left turn collisions (6 out of 19).

The main casual factors for rear-end collisions were vehicles losing making improper lane change or turns, losing control or following too closely. Left turning collisions were caused by drivers making improper turns or lane changes mainly along Main Street (one incident occurred in northbound direction at the driveway access). The improper lane change could be attributed to vehicles using the centre-left-turn-lane for turning onto Newton Avenue; however, additional information is required to further confirm.

2.4 Local Neighbourhood

To provide a better understanding of road safety for the local neighbourhood, a detailed analysis was undertaken exclusive to Ainslie Wood (Main Street excluded). This resulted in 45 records of collisions within Ainslie Wood, of which 31% (or 14 out of 45) of these occurred Whitney Avenue which is a main collector road in the study area. The predominate impact type on Whitney was SMV collisions (64% or 9 out of 14). These SMV collisions were further re-classified based on vehicle type and driver's action as shown in **Table 2**. Approximately 50% of the SMV collisions took place under dark light (night time) conditions and wet or icy road surfaces. As such, SMV collisions were mainly attributed to insufficient visibility (illumination issue) and/or unfavourable road conditions.

Table 2: SMV Collisions on Whitney Avenue

Vehicle Type	Exceeding speed limit	Improper turn	Lost control	Other	Total
Auto station wagon	-	-	5	1	**6**
Intercity bus	-	-	-	1	**1**
Motorcycle	1	-	-	-	**1**
Municipal bus	-	1	-	-	**1**

Vehicle Type	Exceeding speed limit	Improper turn	Lost control	Other	Total
Total	**1**	**1**	**5**	**2**	**9**

3. Collision Trend Analysis

After the database has been reviewed and validated, collision analysis was conducted using the most recent five years of inclusive collision records, between 2013 and 2017. Collisions within the study area of Ainslie Wood neighbourhood are shown in **Figure 3**. The historical collision data was reviewed to gain an understanding of any identify potential issues, findings are summarized in the following sections.

Figure 3: Collisions in the Study Area (2013-2017)

3.1 Collisions by Year, Day of Year, and Month

On average, the study area experienced an average of 53.6 collisions per year in a five-year period. A summary of the total number of reported collisions by year and severity are presented in **Table 3** and **Figure 4**. In total, there are 268 collisions recorded during the analysis period that resulted in 129 (or 48%) Property-Damage-Only (PDO), 138 (or 51%) injuries and 1 fatality. Ainslie Wood exhibited similar proportion of PDO and injury collisions with injuries being 3% higher. The neighbourhood experienced higher number of collisions from 2014 to 2016 relative to 2013 and 2017. An increase in non-fatal injury collisions can be observed between 2014 and 2016.

Table 3: Collision by Year and Severity (January 2013 to December 2017)

	2013	2014	2015	2016	2017	Total	Percentage
PDO	15	29	33	26	26	**129**	**48%**
Non-Fatal Injury	20	35	26	39	18	**138**	**51%**
Fatal	-	1	-	-	-	**1**	**0%**
Total	**35**	**65**	**59**	**65**	**44**	**268**	**100%**
Percentage	**13%**	**24%**	**22%**	**24%**	**16%**	**100%**	

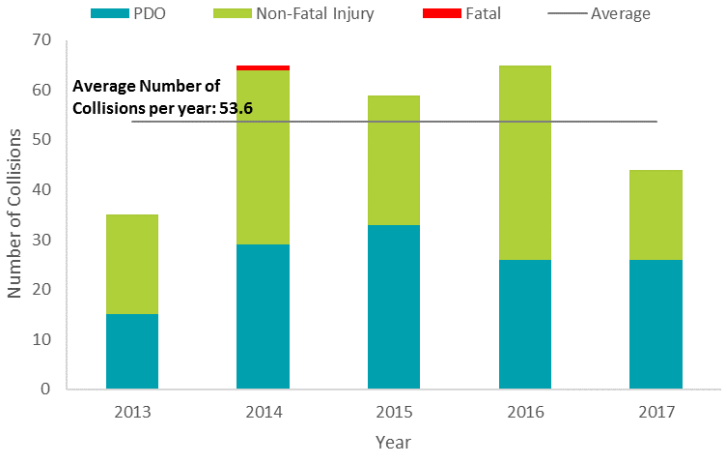

Figure 4: Collisions by Severity and Year

The number of collisions by day of the week and severity is provided in **Table 4** and **Figure 5**. Majority of collisions occurred on Monday through Friday which correlates with typical commuter traffic demand. The highest number of incidents was recorded on Thursday.

Table 4: Collision by Severity and Weekday

	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total	Percentage
PDO	9	21	21	22	24	21	11	**129**	**48%**
Non-Fatal Injury	4	22	19	32	34	15	12	**138**	**51%**
Fatal	-	1	-	-	-	-	-	**1**	**0.4%**
Total	**13**	**44**	**40**	**54**	**58**	**36**	**23**	**268**	**100%**
Percentage	**5%**	**16%**	**15%**	**20%**	**22%**	**13%**	**9%**	**100%**	

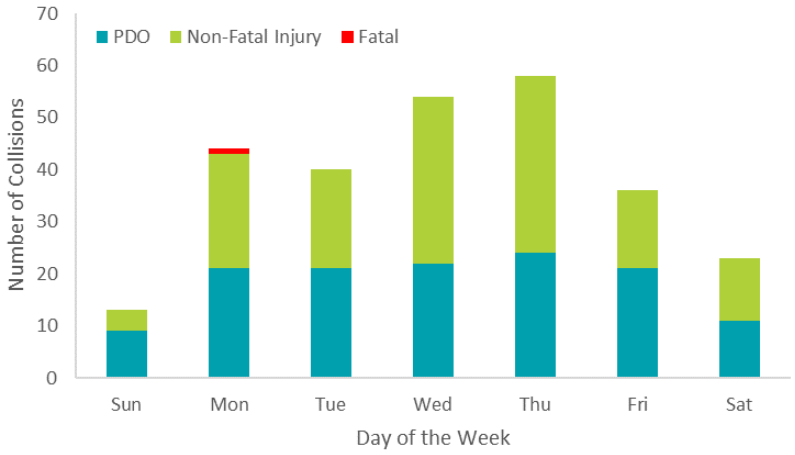

Figure 5: Collisions by Severity and Weekday

The number of collision are summarized by month in **Figure 6**. Higher proportion of collisions can be observed during the winter months from September to January and March likely due to inclement weather conditions (i.e. snow and/or slippery road surface). August has the lowest number of collisions.

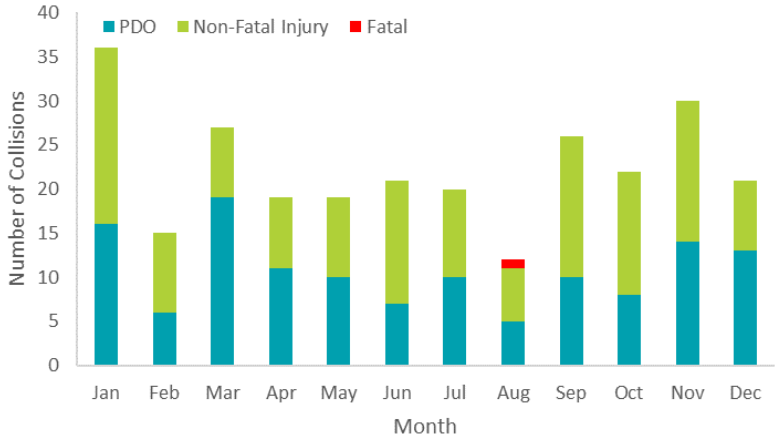

Figure 6: Number of Collisions by Month and Severity

The number of collisions by hour is shown in **Figure 7**. Higher proportion of collisions can be observed throughout the day commencing at 8:00AM to 8:00PM with the highest number of collisions occurring during the 1:00PM hour. The fatal collision occurred at 1:00AM under dark light condition.

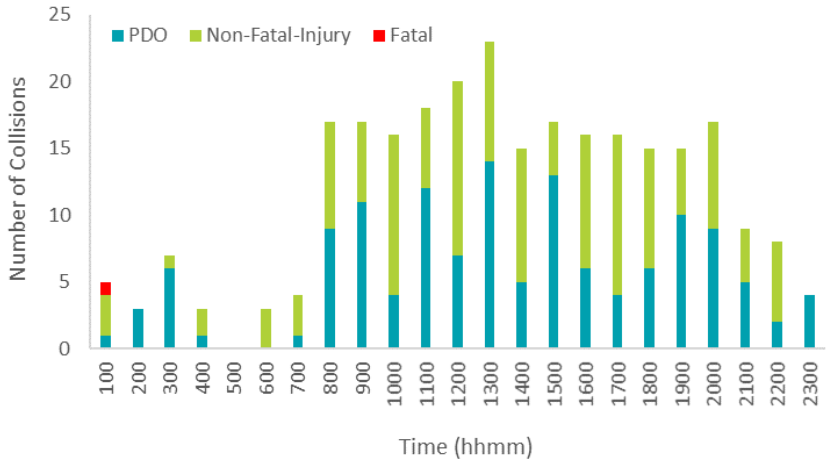

Figure 7: Number of collisions by Time of Day and Severity

The summary of the total number of reported collisions by impact type are summarized in **Table 5** and **Figure 8**. As shown, rear-end collisions (40%), single-motor-vehicle (SMV) collisions (20%) and left-turn collisions (16%) are the predominant impact types in Ainslie Wood. It was also found that rear-end and pedestrian collisions are more susceptible to non-fatal injuries.

Table 5: Collisions by Impact Type and Year

	2013	2014	2015	2016	2017	Total	Percentage
Rear-end	13	24	25	28	18	**108**	**40%**
SMV	4	16	12	11	10	**53**	**20%**
Left-turn	5	7	10	14	6	**42**	**16%**
Pedestrian	6	6	1	4	3	**20**	**7%**
Angle	5	3	4	2	1	**15**	**6%**
Side swipe	1	1	3	3	3	**11**	**4%**
Right-turn	1	5	1	0	2	**9**	**3%**
Over-taking	0	2	2	2	0	**6**	**2%**
Other	0	1	1	1	1	**4**	**1%**
Total	**35**	**65**	**59**	**65**	**44**	**268**	**100%**

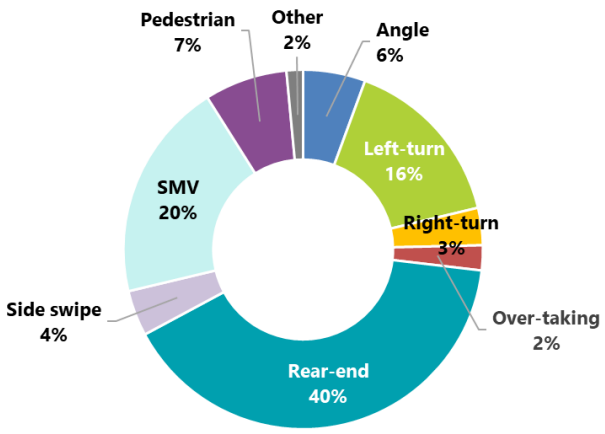

Figure 8: Collisions by Initial Impact Type

The three predominant impact types warranted further analysis to review any patterns or underlying safety concerns, as discussed in the next sections.

Rear-end Collisions

In total, there were 102 rear-end collisions recorded within the study area of which 96% (or 104 out of 108) occurred along Main Street in the east-west directions. The intersection that experienced the highest number of rear-end collisions is Main St & Emerson St (15 out of 108). This intersection was operating with a LOS 'C' with 95th percentile eastbound queues extending up to 164 metres in the PM peak hour. Another intersection that exhibited higher proportion of rear-end collisions compared to other locations is Main St & Cootes where long queue of up to 210 metres can be observed in the eastbound direction. The long queue and delays at these intersections could be attributable to rear-end collision due to close traffic gaps, vehicles speeding too fast for conditions and/or vehicles following each other too closely. The distribution of driver's actions for rear-end collisions are summarized in **Figure 9**.

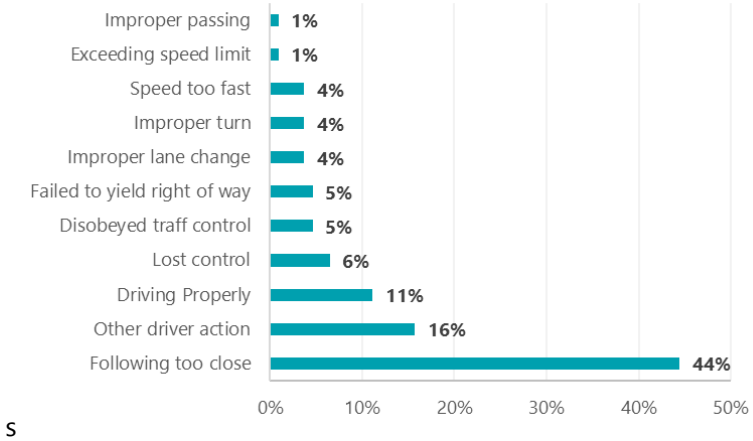

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Figure 9: Driver's Action for Rear-end Collisions

Left-Turn Collisions

Almost all of the left-turning collisions occurred at a Main Street intersection except for one incident that occurred at Whitney Ave and Leland St. The intersection that had the highest number of left-turn collision is Main Street and Cootes. As documented in the traffic analysis results, this intersection exhibited critical LOS of 'F' for the northbound left movements. The absence of a protected northbound left-turn phase could be a contributing factor to long delays whereby drivers could potentially attempt to clear the intersection despite the close gaps and insufficient clearance times. In fact, 67% of the left-turn collisions were attributed to drivers failing to yield right-of-way or making improper turn, as shown in **Figure 10**. Moreover, left-turn collisions were found to be more susceptible to non-fatal injuries (67% or 28 out of 42).

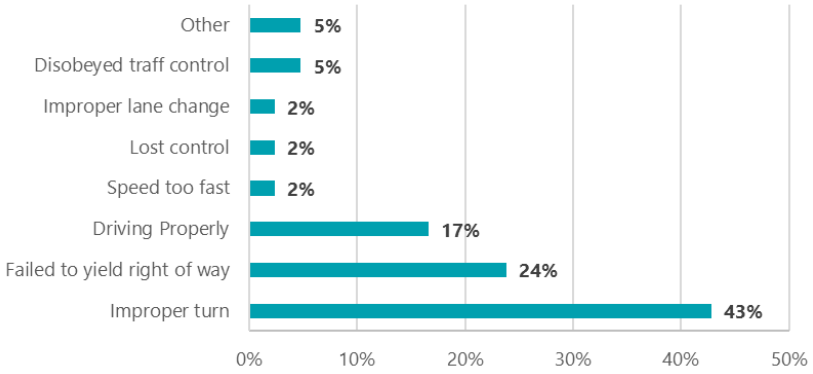

Figure 10: Driver's Action for Left-Turn Collisions

Single-Motor-Vehicle Collisions

The SMV collisions exhibited in the neighhourhood were further examined to identify any potential roadside safety concerns. A summary of severity and vehicle types are provided in **Table 6**. Majority of the SMV collisions resulted in PDO (79%) with 1 fatality recorded in 2014 due to alcohol impaired driving. The fatal collision involved a truck driver traveling in the southbound direction at Mapes Avenue and Emerson Street after midnight at 1:31AM. In fact, approximately 19% and 11% of SMV collisions involved van or truck vehicles respectively.

No particular locations are found to be more prone to SMV incidents. Road surface condition seemed to be a potential contributing factor to SMV collisions as approximately 34% (or 18 out of 35) of the incidents occurred on non-dry road conditions including icy, wet surfaces caused by rain or snow. This is echoed by the fact that 60% of the SMV collisions occurred during the winter months (from October to April).

Table 6: SMV Collisions by Severity and Vehicle Types

Vehicle Type	Non-Fatal injury	PDO	Fatal	Total	Percentage
Auto	7	23	0	**30**	**57%**
Motorcycle	1	0	0	**1**	**2%**
Van	0	6	0	**6**	**11%**
Truck	1	8	1	**10**	**19%**
Bus	0	3	0	**3**	**6%**
Bicycle	1	0	0	**1**	**2%**

Vehicle Type	Non-Fatal injury	PDO	Fatal	Total	Percentage
Other	0	2	0	**2**	**4%**
Total	**10**	**42**	**1**	**53**	**100%**
Percentage	**19%**	**79%**	**2%**	**100%**	

3.2 Vulnerable-Users Related Collisions

This section discusses the collision related to vulnerable users which include pedestrians and cyclists. However, the collision database only classifies pedestrian-related collisions as a separate impact type whilst cyclists are categorized as one of the vehicle classes. A more detailed review was conducted to extract collisions that involved both pedestrians and cyclists (both 'bicycle' and 'e-bike'). As a result, there were 36 records (out of 268 or 13%) of incidents involving vulnerable road users. These collisions were found to be more susceptible to injuries in which 92% resulted in non-fatal injuries (or 33 out of 36).

As presented in **Figure 11**, the highest numbers of pedestrian collisions were noted on Monday, Wednesday and Thursday, showing a potential correlation with the school demographics in this neighbourhood. Additionally, approximately 50% of the pedestrian related collision occurred during dark light (night time) conditions, indicative of potential issues related to lack of illumination.

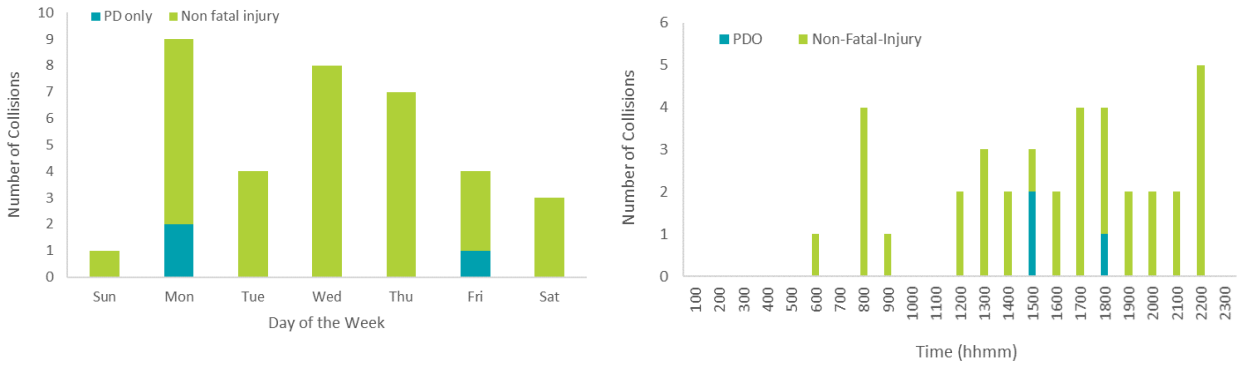

Figure 11: Vulnerable Road User Related Collisions by Weekday and Time of Day

Amongst the locations of pedestrian collisions mapped in **Figure 12**, majority of the incidents occurred along Main street at Emerson Street/University, Cootes Drive and Binley Road intersections. High pedestrian volumes were noted at Main street and Emerson Street intersection during site visits. As such, high pedestrian traffic exposure increases the risks for pedestrian related collisions at these intersections.

Figure 12: Vulnerable Road User Related Collisions

Furthermore, historical data showed that one of the main factors for pedestrian-vehicle related collisions are attributed to pedestrian crossing without the right-of-way or without traffic controls, as shown in **Figure 13**. In particular, these collisions are recorded at Main Street & Newton Avenue (no traffic control) and Cootes Drive & Main Street, Longwood Avenue & King Street, Main Street & Binkley Road, Main Street & Emerson Avenue (without right-of-way).

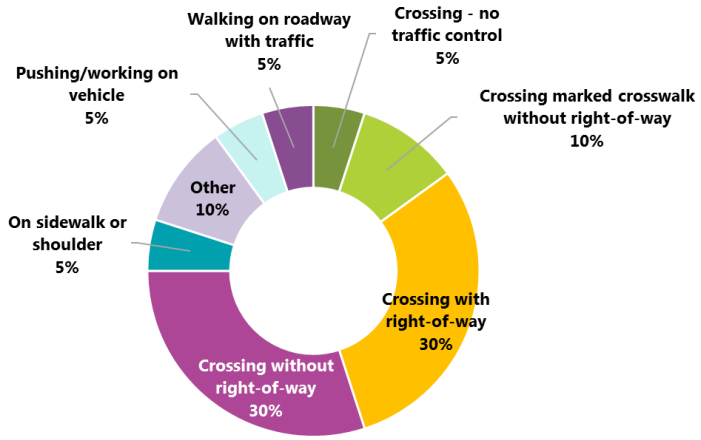

Figure 13: Pedestrian Actions for Pedestrian-Vehicle Collisions

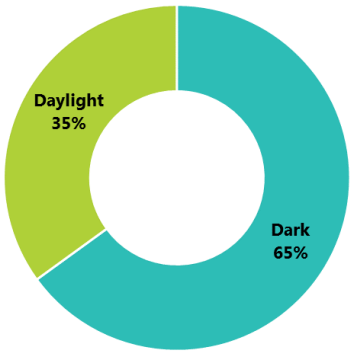

Figure 14: Lighting Conditions for Pedestrian-Vehicle Collisions

In general, there are opportunities for reducing high rear-end collisions within the neighbourhood, particularly along Main Street. Based on the driver's action information, the casual factors for the rear-end collisions were due to close traffic gaps, improper lane change or speeding too fast for conditions. Approximately 65% of the pedestrian-related collisions occurred under dark light (night time) conditions in which illumination could be a potential contributing factor (**Figure 14**). The implementation of the LRT will alter the configuration of many of the intersections along Main Street. It is necessary to remain cognizant of this fact when considering opportunities to improve safety on Main Street. Reducing vulnerable user-related collisions will be a key consideration for this study as part of the Vision Zero policy, as described in the next section.

3.3 Vision Zero Concept

In addressing safety concerns in the neighbourhood, the project team will consider Vision Zero concept which aims for no fatalities or serious injuries on roadways. A key strategy of Vision Zero is to encourage the use of active transportation modes by improving the level of comfort and safety for vulnerable road users of all ages and abilities. During the identification of alternative solutions stage, the Ainslie Wood Traffic Management Review study will explore the five elements of Vision Zero include engineering, education, enforcement, evaluation and engagement (**Figure 15**).

Figure 15: Vision Zero Elements