Final Report

Cawthra Road EA Traffic Operations Analysis

Prepared for the Region of Peel
by IBI Group

May 2020

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1 Overview

IBI Group is providing technical services to the Region of Peel in support of a Class Environmental Assessment (Class EA) to identify multi-modal improvements along the Cawthra Road corridor for pedestrians, cyclists, transit users, and motorists. This report details existing and future traffic conditions along the corridor and evaluates potential improvements to mitigate operational and safety concern.

1.1 Study Area

The primary study limits extend between Highway 403 / Eastgate Parkway and the South Service Road. While the traffic operations and safety analysis is limited to intersections along this section of Cawthra Road, the transportation planning component has been reviewed within the context of a broader study area that includes Hurontario Street, Dixie Road, Highway 403 and the Queen Elizabeth Way (QEW).

Signalized Intersections:

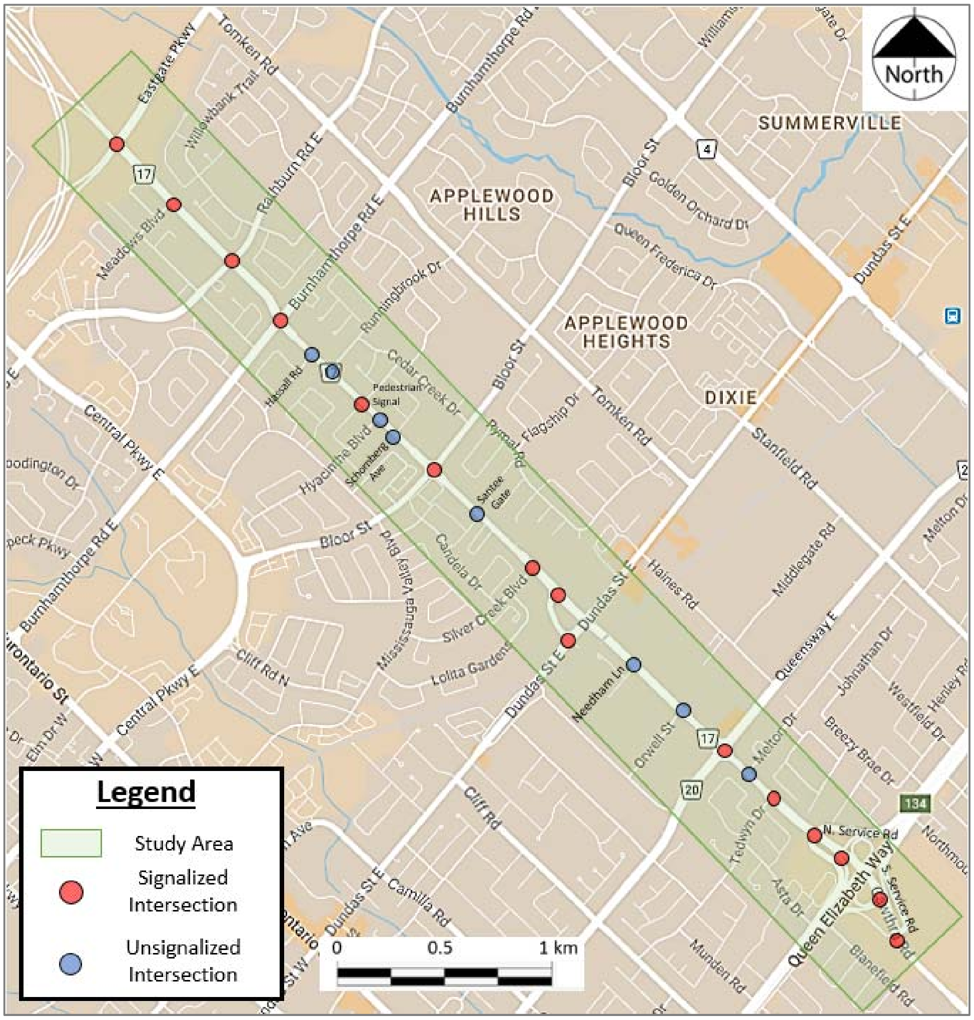
- Eastgate Parkway
- Meadows Boulevard
- Rathburn Road East
- Burnhamthorpe Road
- Breckenridge Road (pedestrian signal)
- Bloor Street
- Silver Creek Boulevard
- Cawthra Road at ramp to Dundas Street
- Queensway East
- Tedwyn Drive
- North Service Road
- QEW EB Off-Ramp
- QEW WB Off-Ramp
- South Service Road

Unsignalized Intersections:

- Hassall Road
- Runningbrook Drive
- Breckenridge Road
- Hyancinthe Boulevard
- Schomberg Avenue
- Santee Gate
- Needham Lane
- Orwell Street
- Melton Drive

Exhibit 1-1 illustrates the primary study area, including the above intersections.

Exhibit 1-1: Study Area



1.2 Policy and Planning Framework

There are several policy and planning documents for the local area which provide context and guidance to this study. These documents are summarized below:

- **Metrolinx The Big Move** (2008) – Represents the Greater Toronto and Hamilton Area (GTHA) multi-modal long-range regional transportation plan. The 25-year plan provides strategic direction for planning, designing and building a strong and efficient regional transportation network.
- **Region of Peel Official Plan** (2014 review) - Aims to develop an effective and efficient integrated transportation network and encourages an increased public transit modal share. Cawthra Road is under the jurisdiction of the Region of Peel.
- **City of Mississauga Official Plan** (2016) – Aims to direct growth in ways it will benefit the urban form and support a strong public transportation system. Cawthra Road intersects/crosses several important corridors, including Dundas Street which is designated for intensification and higher-order transit.

- **Peel Long Range Transportation Plan** (2012 Update) - Identifies Cawthra Road as being subject to potential widening from 4 to 6 lanes within the sections from the QEW to Dundas Street (2019), and from Burnhamthorpe Road to Eastgate Parkway (2030).
- **Peel Strategic Goods Movement Network Study** (2013) – Cawthra Road is designated as a primary truck route south of Dundas Street (to the QEW), and a connector truck route from north of Dundas Street to Eastgate Parkway.
- **Peel Road Characterization Study** (2013) – Designates road typologies to all Regional Roads. Cawthra Road is designated as an industrial connector between the Queensway and Dundas Street, and a suburban connector along the rest of the corridor.
- **Peel Active Transportation Plan** (2011) – Identifies Cawthra Road as part of the Regional pedestrian and cyclist network, and recommends that active transportation improvements are to be introduced along the corridor.
- **Moving Mississauga Interim Transportation Strategy** (2011) – Outlines the current and future transportation challenges and issues facing Mississauga, and introduces a number of strategic directions and associated action items to be pursued.
- **Peel Region Sustainable Transportation Strategy** (2018) – The Region's Sustainable Transportation Strategy (STS) recommends a strategy to achieve a 50% mode share target for sustainable modes by 2041, including a complete pedestrian and cycling network plan. The plan identifies Cawthra Road as part of the Regional pedestrian and cyclist network, and recommends that active transportation improvements be introduced along the corridor.
- **Mississauga Cycling Master Plan** (2018) – The City's updated cycling master plan identifies connecting routes in the vicinity of the Cawthra Road corridor, and incorporates the City's latest planning & design guidelines for cycling facilities.

1.3 Traffic Analysis Approach

Traffic analysis was performed using Synchro (version 9) as per the Highway Capacity Manual (HCM 2000) methodologies to evaluate overall intersection and individual movement performances. This analysis was undertaken for 2016 and 2031 AM peak hour and PM peak hour conditions.

As per the Region of Peel Traffic Impact Study (TIS) Guidelines, the analysis includes the identification of signalized intersections and unsignalized intersections where:

- Volume/capacity (V/C) ratios for overall intersection operations, through movements or shared through/turning movements exceed 0.90; and,
- V/C ratios for exclusive movements exceed 1.00.

Default parameter values listed in the Peel Region TIS Guidelines were also assumed, including ideal saturation flow rate (1900 vehicles per hour), peak hour factor (1.0), lane width for regional roads (3.7 metres), and lane width for intersecting streets/accesses (3.5 metres).

Operational concerns or deficiencies noted in the studied horizon years are identified and addressed through recommendations of potential mitigation measures and/or operational improvements.

2 Data Collection

There are two primary sources of traffic data for this project: Turning Movement Counts (TMC) provided by the City of Mississauga and the Ministry of Transportation (MTO); and Automatic Traffic Recorder (ATR) counts from the Region of Peel.

2.1 Turning Movement Counts

Turning movement counts for the majority of signalized intersections along the Cawthra Road corridor between Highway 403 / Eastgate Parkway and the South Service Road were provided by the Region of Peel (counts were conducted by Trans-Plan Inc. and MG8 Eng.). Counts for the QEW Off-Ramps, North Service Road, and South Service Road were obtained from MTO. While volumes for the QEW On-Ramps were not specifically provided, these volumes were able to be approximated by balancing volumes between adjacent intersections (i.e. between adjacent service roads / off-ramps).

Exhibit 2-1: Intersection Count Dates

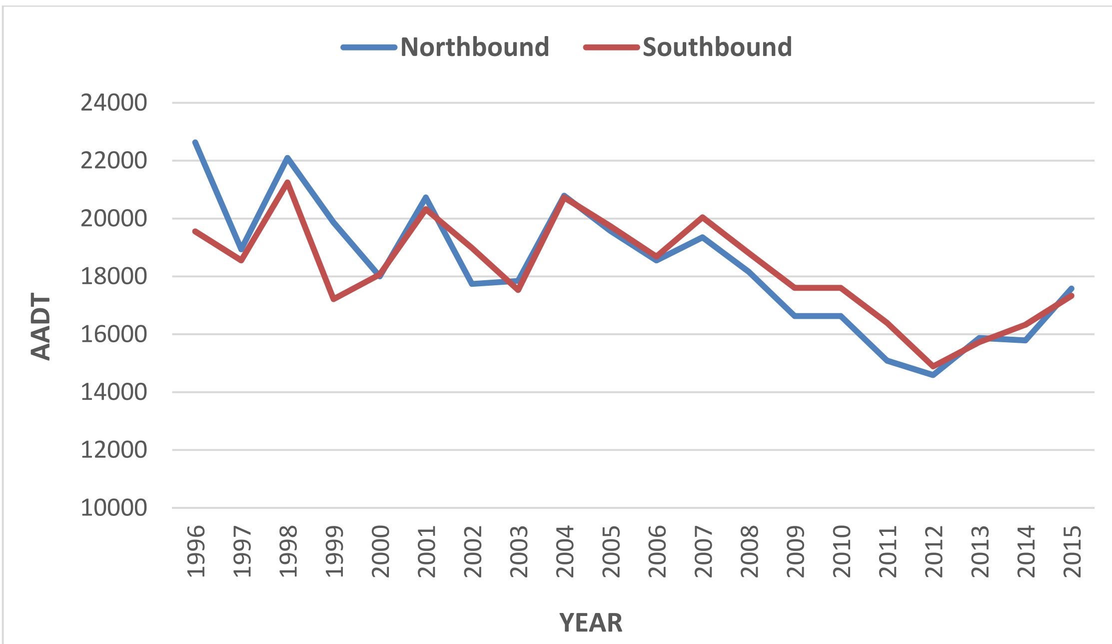
Intersection	Date	Counted By
Eastgate Pkwy	2013, March	MG8 Eng
Meadows Blvd	2015, May	Trans-Plan Inc.
Rathburn Rd	2013, March	MG8 Eng
Burnhamthorpe Rd	2015, May	Trans-Plan Inc.
Hassall Rd	2012, April	Region of Peel
Runningbrook Dr	2012, April	Region of Peel
Breckenridge Rd	2015, May	Trans-Plan Inc.
Hyacinthe Blvd	2015, May	Trans-Plan Inc.
Schomberg Ave	2014, November	Trans-Plan Inc.
Bloor St	2015, May	Trans-Plan Inc.
Santee Gt	2015, May	Trans-Plan Inc.
Silver Creek Blvd	2015, May	Trans-Plan Inc.
Cawthra Rd at Ramp to Dundas St	2015, May	Trans-Plan Inc.
Needham Ln	2014, April	Region of Peel
Orwell St	2013, June	MG8 Eng
The Queensway	2015, May	Trans-Plan Inc.
Melton Dr	2015, December	Trans-Plan Inc.
Tedwyn Dr	2015, September	Trans-Plan Inc.
North Service Rd	2013, June	MTO
QEW Westbound Off-Ramp	2013, June	MTO
QEW Eastbound Off-Ramp	2013, June	MTO
South Service Rd	2013, June	MTO

The counts provided by MTO appear to yield noticeably lower link volumes than those observed along the rest of the corridor – and at adjacent intersections. This may be a result of seasonal factors or other variables that were not consistent over the various count periods. The MTO counts were undertaken during summer conditions (June 2013), while the Region's counts were primarily undertaken in May or November (2014/2015). In an effort to balance link volumes with those observed along the rest of the corridor, an adjustment factor of 1.2 was applied to all MTO counts.

2.2 Historical Traffic Volumes

Exhibit 2-2 illustrates northbound and southbound Annual Average Daily Traffic (AADT) volumes along a Cawthra Road between 1996 and 2015 (recorded at a location immediately north of Bloor Street).

Exhibit 2-2: Traffic Volume Trends on Cawthra Road



Prior to 2007, volumes along this central portion of Cawthra Road generally trended sideways, with year-to-year fluctuations. Between 2008 and 2012, the counts reflect a significant annual decrease in link volumes along the corridor. This decrease is not fully understood, however may be associated with some or all of the following factors:

- A reduction in employment and commercial traffic in Mississauga due to the economic recession that took place between 2008 and 2012;
- Increasing congestion on Highway 403 between Hurontario Street and Highway 401 acting to restrict entry and exit volumes to Cawthra Road; and,
- Major construction projects undertaken during some of these years (e.g. the Mississauga Transitway) limiting traffic volumes entering/exiting the corridor.

Recent traffic volumes appear to be rebounding towards pre-2007 volumes, with an average yearly growth rate of approximately 5.8% per year (this growth rate is not assumed to represent background growth to be expected in future years).

2.3 Regional EMME Model

Traffic projections on Cawthra Road were derived using the Peel Region EMME model, which provides high level traffic and transit forecasts with consideration of major planned transportation undertakings. The model has undergone a number of updates for the purposes of this study, both to calibrate the model to better reflect existing conditions, as well as to model different future lane configuration options for Cawthra Road.

For the purposes of this study, existing and future scenarios modelled Cawthra Road based on its existing four-lane cross-section (i.e. two through lanes in both the northbound and southbound directions throughout the corridor, except for the southbound direction between the Queensway and the QEW which is modelled as three lanes).

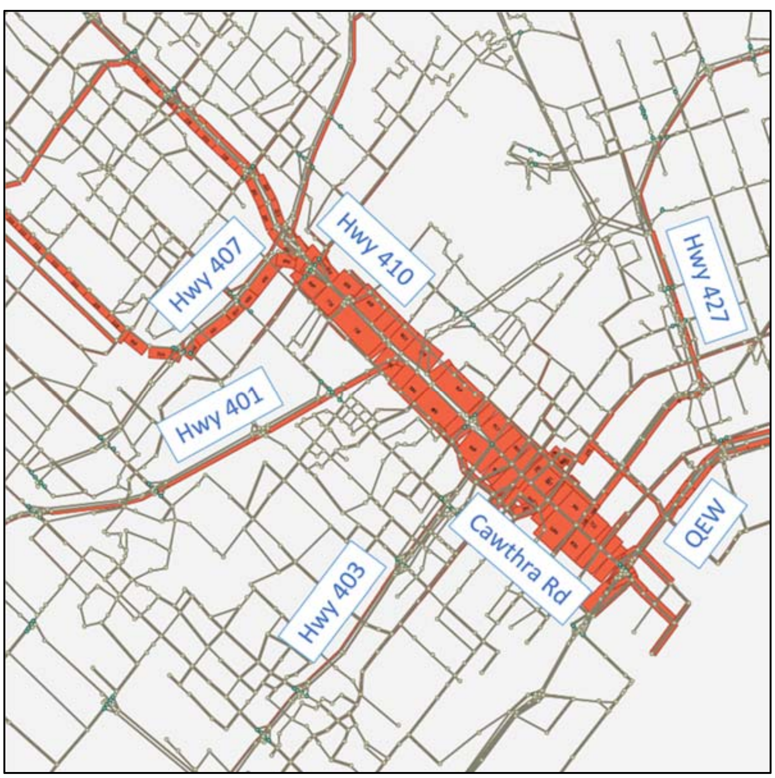
Volume projections were produced for the following scenarios:

- Existing volumes (modelled under base year 2011);
- Future (2031) projections (accounting for a base ridership estimate for Hurontario LRT), and;
- Future (2031) projections (assuming target mode share for Hurontario LRT).

2.3.1 EMME Base Year Model

The EMME model provides insights regarding on the nature of trips along Cawthra Road. **Exhibit 2-3** below shows the origin of traffic using Cawthra Road, as output from the base year model. The plot suggests that Cawthra Road is an important north-south link in the region, given that it represents a direct connection between Highways 403/410 and the QEW.

Exhibit 2-3: Origin of Traffic Utilizing Cawthra Road



2.3.2 EMME Future Year Models

The 2031 EMME model scenarios incorporate all planned transportation improvements as outlined in Region of Peel Road Improvement Program. The 2031 model scenarios also account for increased transit use in line with the development of rapid transit corridors in the Greater Toronto Area (GTA) through increased transit mode share (not including the Hurontario LRT).

A critical future improvement consists of the planned Light Rail Transit (LRT) line to be constructed on Hurontario Street. The Hurontario LRT will result in a reduced vehicle capacity on Hurontario Street, potentially causing traffic to be diverted onto parallel arterial roads, which includes Cawthra Road. The two future EMME model scenarios differ based on assumed modal split for the Hurontario LRT – a higher ridership estimate for the Hurontario LRT results in a reduction in traffic demand on Cawthra Road, as passenger vehicle mode share is in effect reduced.

2.4 Link Volume Comparisons

In comparing the available data, it was noted that the approach/link volumes derived from the TMC data were substantially higher throughout the corridor than those obtained from the EMME model outputs. In saying this, both sets of volume data have an important function in determining appropriate volumes to model in this analysis, as described below:

- Turning Movement Counts are taken to represent existing conditions (adjusted to base year 2016), and modelled in Synchro to analyze existing traffic operations. The existing conditions analysis is outlined in Section 3.4.
- EMME model outputs are used to derive an annual background growth rate that is representative for the study area. The compound annual growth rate is determined by comparing the 2011 base conditions EMME model with the 2031 future conditions (assuming target mode share) EMME model. This process is described in greater detail in Section 4.2.
- This annual growth rate (derived by comparing EMME scenarios) is applied to the existing Turning Movement Counts to estimate future traffic movements, which are modelled in Synchro to analyze future traffic operations. The future base conditions analysis is outlined in Section 4.3, and future mitigated conditions analysis outlined in Section 6.2.

3 Existing Conditions

3.1 Existing Road Network

The major roadways within the study area are outlined below:

- **Cawthra Road** is a four lane north-south arterial road located in Mississauga within the Regional Municipality of Peel, connecting Eastgate Parkway to Lakeshore Road. Within the study area, Cawthra Road primarily serves residential areas with the exception of the section from Dundas Street to the Queensway. There is a centre auxiliary turning lane throughout the corridor north of Dundas Street. A grade separated intersection exists at Dundas Street, where access is provided via a ramp. Cawthra Road has a posted speed limit of 50 km/h.
- **Highway 403** is a 400-series highway (freeway) that runs east-west through Mississauga and connects to Highway 401 immediately north of the study area. Full access is available to Highway 403 via the Cawthra Road - Eastgate Parkway intersection.
- **Eastgate Parkway** is a four lane road and is the northern terminus of Cawthra Road. At Cawthra Road, the north and west legs of the intersection provide access to/from Highway 403. Eastgate Parkway runs adjacent to a hydro corridor and the Mississauga Transitway, connecting Highway 403 and Eglinton Avenue East. There is a posted speed limit of 70 km/h.
- **Rathburn Road** is a four lane east-west arterial road that is confined by Creditview Road Burnhamthorpe Road. Within the study area, it has a posted speed limit of 50 km/h.
- **Burnhamthorpe Road** is a four lane east-west arterial road that spans throughout Mississauga, connecting the western Highway 403 boundary to the eastern Highway 427 boundary. It has a posted speed limit of 60 km/h.
- **Bloor Street** is a four lane east-west arterial road which extends easterly from Central Parkway within the City of Mississauga. Channelized right turns exist for all directions except for the northbound right turn. There is a posted speed limit of 50 km/h.
- **Dundas Street** is a six lane east-west arterial road that extends through Mississauga into both Oakville and Toronto on the west and east ends, respectively. Due to close proximity to the frequently used Galt sub rail line by Canadian Pacific and GO Transit operations, a ramp is used to connect Cawthra Road and Dundas Street (jug handle configuration). Both ramp intersections are signalized. Dundas Street has a posted speed limit of 60 km/h.
- **The Queensway** is a six lane east-west arterial road that connects Old Carriage Road (west of Mavis Road) to the Highway 427 border of Mississauga. It has channelized right turns for all directions at Cawthra Road. The Queensway has a posted speed limit of 60 km/h.
- **Queen Elizabeth Way (QEW)** is a 400-series highway (freeway) that links Toronto to Fort Erie. A full interchange is provided at the QEW-Cawthra Road.

A simplified representation of the existing configuration can be seen in **Exhibit 3-1**.

Exhibit 3-1: Existing Lane Configuration

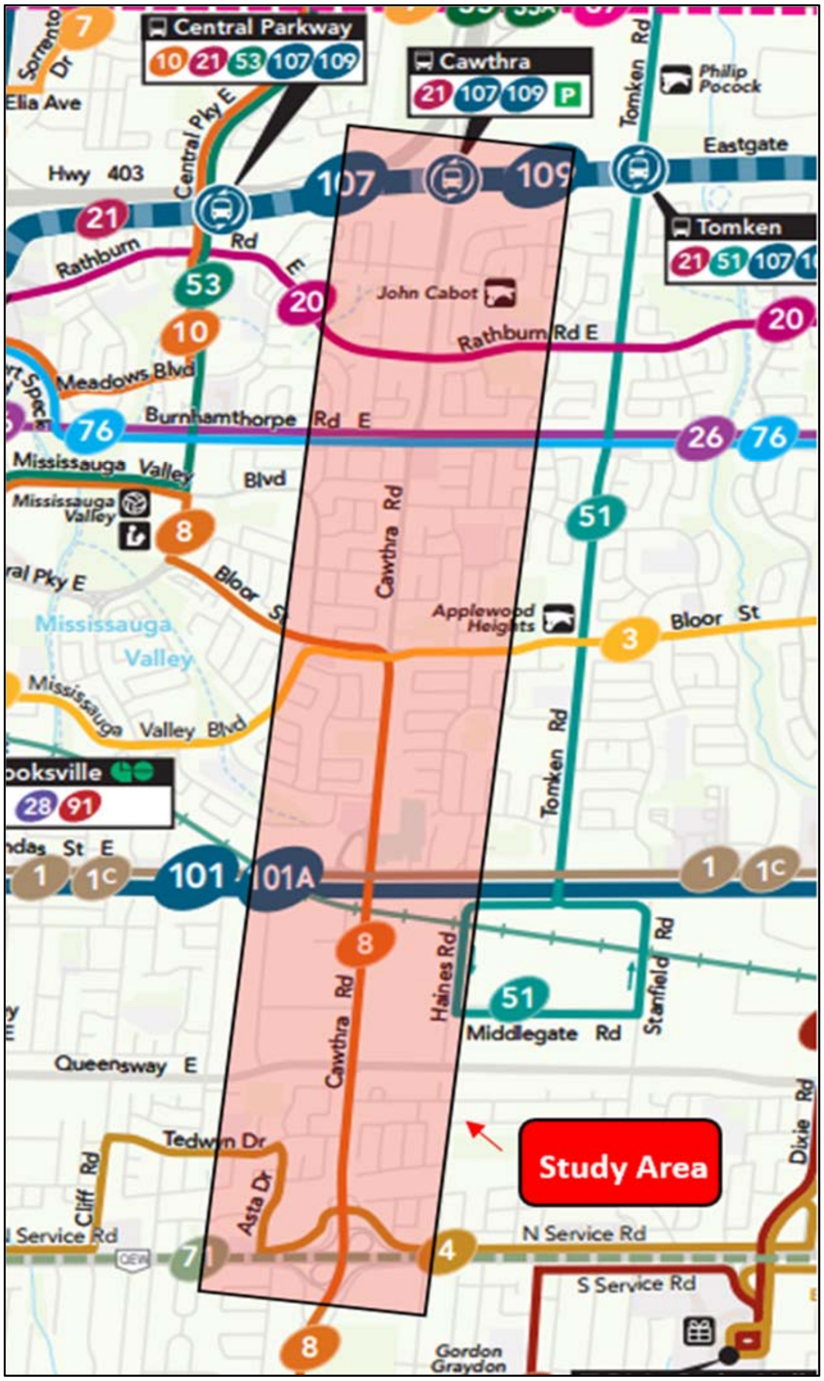
3.2 Transit Access

The Mississauga MiWay transit system serves the Greater Mississauga area, connecting to adjacent local transit systems of Oakville, Brampton, York, and Etobicoke (Toronto Transit Commission). The MiWay system comprises of two main services: MiLocal services (local transit routes that include frequent stops), and MiExpress (select express routes that connect major destinations). The various MiWay routes present within the study area are illustrated in **Exhibit 3-2**, and summarized below:

- The **Mississauga Transitway** is a Bus Rapid Transit (BRT) corridor running east-west across Mississauga, a large portion of which runs along Highway 403. The corridor intersects Cawthra Road at Eastgate Parkway, and includes 12 stations. The line connects the Winston Churchill GO Station to the west to Renforth Gateway to the east. The BRT line serves a number of MiExpress services.
- **MiWay Route 8 (Cawthra)** is a local service that operates along the length of Cawthra Road, connecting City Centre Transit Terminal (Square One) to Port Credit GO Station via Bloor Street. Buses run at approximately 20-minute headways during peak hours.
- **MiExpress Route 109 (Meadowvale Express)** is an express service that connects Meadowvale Town Centre (Mississauga) to Islington Subway Station (Toronto) via Winston Churchill Blvd, Highway 403, Mississauga Transitway, Highway 427, and Dundas St. Buses run at approximately 12-minute headways during peak hours.
- **MiExpress Route 107 (Malton Express)** is an express service that connects the Mississauga City Centre Transit Terminal to University of Guelph-Humber (Humber College, Toronto) via the Mississauga Transitway. Buses run at approximately 12-minute headways during peak hours.
- **MiExpress Route 101 (Dundas Express)** is an express service running from University of Toronto Mississauga Campus (UTM) to Islington Subway Station (Toronto), with a branch to Winston Churchill Blvd. Buses run at approximately 10-minute headways during peak hours.
- **MiWay Route 21 (Explorer)** is a local service that runs only during peak travel periods. The route connects City Centre Transit Terminal to Skymark Hub via the Mississauga Transitway. Buses run at approximately 20-minute headways.
- **MiWay Route 20 (Rathburn)** is a local service that connects Erindale GO Station (Mississauga) to Islington Subway Station (Toronto) on Rathburn Rd. Buses run at approximately 20-minute headways during peak hours.
- **MiWay Route 26 (Burnhamthorpe)** is a local service that travels along Burnhamthorpe Road between South Common Centre (Mississauga) and Islington Subway Station (Toronto). Buses run at approximately 15-minute headways during peak hours.
- **MiWay Route 76 (City Centre – Subway)** is a local service that connects City Centre Transit Terminal (Square One) to Islington Subway Station (Toronto) via Burnhamthorpe Road, Highway 427, and Dundas St. Buses run at approximately 15-minute headways during peak hours.
- **MiWay Route 3 (Bloor)** is a local service that connects City Centre Transit Terminal (Square One) to Islington Subway Station (Toronto) via Bloor St. Buses run at approximately 10-minute headways during peak hour;

- **MiWay Route 1 (Dundas)** is a local service that connects Winston Churchill Blvd to Islington Subway Station (Toronto) via Dundas St, with a branch that has a western terminus at UTM. Buses run at approximately 10-minute headways during peak hours.
- **MiWay Route 4 (Sherway Gardens)** is a local service that connects Dundas St W at Erindale Station Road to Sherway Gardens (Toronto) via North Service Road. Buses run at approximately 25-minute headways during peak hours.

Exhibit 3-2: Transit Routes Intersecting Study Area



MiWay provided input into the study regarding removal or relocation of existing stops along Cawthra Road, as well as preferred stop and/or bay locations. It was noted that MiWay anticipates more frequent bus level of service along Cawthra Road in the future and that local bus service will be extended along Cawthra Road north of Bloor Street, and connect to the new BRT station at Eastgate Parkway.

In addition to the above, MiWay requested that the Region give consideration to the following as part of the current study:

- Protect for future shelters at stop locations;
- Avoid conflict between transit users and cyclist at stop locations (further details regarding the cycle track configuration at bus stop locations is separately addressed in the Active Transportation Report);
- Provide traffic signals to accommodate pedestrians at Needham Lane and in the vicinity of Santee Gate, thus providing mid-block pedestrian crossing opportunities between key signalized intersections within the central section of the study area (further addressed in Section 6.4); and
- Provide for a far side ‘acceleride style’ bus bay (with option of queue jump lane) at several locations along Cawthra Road, i.e. generally where an exclusive right turn lane is available on the intersection approach and could be used by buses under exemption to by-pass through lane queues (to be clarified and addressed separately through consultation with MiWay as part of this study).

3.3 Traffic Safety

A traffic safety review has been undertaken along Cawthra Road as part of this study. The review was based on historical collision data for the study area, summarizing the reported intersection and midblock collisions along the corridor for the five-year period from January 1, 2008 through December 31, 2012. Vehicle speed, counts and classification data were also considered as part of the safety review, presented in ***Appendix A***. A summary of the conclusions are provided below:

In general:

- There were a total of 1007 collisions reported for the corridor over the 5-year analysis period, and the majority (890) occurred at intersections;
- There were 143 non-fatal injury collisions, most of which were rear end (53) or turning movement (53), and 2 fatal collisions, both of which were angle collisions;
- The dominant collision impact type throughout the corridor was rear-end collisions (45%), followed by turning movement collisions (33%); and,
- Weather and compromised road surface conditions were also a factor in a significant number of collisions, at 20% and 30%, respectively; however, these distributions may not constitute statistical over-representations.

Specific to individual intersections along the corridor:

- The intersection of Cawthra Road at Eastgate Parkway/Highway 403 exhibited the second highest frequency and rate of collisions over the five-year study period, contributed by a transition from highway to arterial speeds in both the north-south and east-west directions;

- Turning movement collisions were the dominant collision type at the intersection of Cawthra Road at Burnhamthorpe Road East, which differed from all other intersections. The southbound left turning vehicles colliding with northbound through vehicles comprised 70 of the 87 turning movement collisions at the intersection indicating a significant problem. Recent intersection geometry improvements could have partially addressed the southbound left problem; further study once several years of collision data are available is recommended to assess the new intersection geometry performance;
- The midblock segment at 3643 Cawthra Road, 120 metres south of Burnhamthorpe Road East, was found to have a high frequency of collisions at a plaza entrance, with left-turns into the plaza using a centre left-turn lane. Further analysis of midblock operations may determine if changes are warranted at this location;
- Excessive speeding, as observed along the entire corridor, was likely a factor contributing to the history of collisions at the intersection of Cawthra Road and Bloor Street, with 85th percentile speeds often reaching above 70 km/h;
- Inconsistent lane markings at the intersection of Cawthra Road and the Dundas Street ramp may be contributing to rear-end collisions caused by drivers misjudging the southbound merge from the right-turn channel. Clear merge lane markings would help alleviate the ambiguity of lane configuration and right-of-way;
- The midblock segment immediately north of Queensway East was found to have an exceptionally large number of left-turn collisions into the commercial driveway at 655 Queensway East. Similar to the other midblock segment noted above, there is a centre left-turn lane and an opposing lane configuration over 3 lanes wide;
- The intersection of Cawthra Road and Queensway East was found to have a large frequency and rate of collisions, with potential sightline issues related to the asymmetry of the left-turn lanes. Traffic operations should be analyzed to determine if volumes may warrant a reconfiguration of the left-turn lanes to fully protected, dual left-turns;
- Both the North and South Service Roads were identified to have a high incidence of collisions related to drivers misjudging the sharpness of the eastbound and westbound approach curves. Improved signage and the use of auxiliary signal heads may help to better warn drivers of the signalized intersection ahead;
- The downhill grade and right-hand bend on the southbound approach to the intersection of Cawthra Road and the eastbound QEW off-ramp may have contributed to the prevalence of southbound rear-end collisions at this location. Similar treatments as described for the service roads could be applied to mitigate the safety concerns at this intersection; and
- Corridor speed and volume data suggest that overall, excessive speeding is a concern along Cawthra Road, with 85th percentile speeds frequently reaching over 20 km/h above the posted speed limit. Recurring congestion was not found to be a crucial issue throughout the corridor. Therefore, caution should be exercised as to not create conditions that further encourage higher speeds in an effort to alleviate peak period congestion.

3.4 Existing Operations

TMC data was used to represent existing traffic volumes, however movements were adjusted to a consistent base year taken as 2016. In order to do this, an annual compound growth of 0.83% (derived in Section 2.4) was applied to ‘major’ movements, including all through movements along arterial roads and all turning between two arterial roads.

Traffic volumes along the corridor were balanced, in order to address differences between total approach volumes and the total volumes of the downstream receiving lanes. This was accomplished by applying the following general assumptions:

- Volume imbalances were anticipated at certain locations. If the adjacent land use and presence of accesses directly along sections of Cawthra Road indicate that a large number of vehicle trips originate / end at these locations, a volume imbalance between adjacent intersections is expected to some degree.
- All volume adjustments were applied to the through movements only, i.e. southbound through (SBT) and northbound through (NBT) movements.
- Volume adjustments were prioritized at minor intersections (i.e. intersecting local streets) rather than being made at major intersections (i.e. arterials or major collectors).
- Volumes at major intersections (i.e. intersecting arterials or major collectors) were never reduced; these intersections were limited to volume increases only.

The traffic volume adjustments made to the SBT and NBT movements at each intersection along Cawthra Road are summarized in **Exhibit 3-3.**

Exhibit 3-3: Volume Balancing Adjustments

Intersection	AM Peak Vehicle Balancing		PM Peak Vehicle Balancing	
	SB Thru	NB Thru	SB Thru	NB Thru
Eastgate Pkwy				
Meadows Blvd	300		500	
Rathburn Rd				
Burnhamthorpe Rd	200	100	200	100
Hassall Rd				
Runningbrook Dr		-200	-200	
Breckenridge Rd				
Hyacinthe Blvd				
Schomberg Ave	-400	-300	-900	-300
Bloor St	200		100	
Santee Gt				
Silver Creek Blvd				
Ramp to Dundas St				
Needham Ln	-200			
Orwell St				
The Queensway				
Melton Dr	-200			
Tedwyn Dr		-200	-400	-1000
North Service Rd				
QEW WB and EB Off-Ramps				
South Service Rd				

Analysis was conducted for weekday AM and PM peak hour conditions. Existing traffic volumes (including volume balancing adjustments) are illustrated in **Exhibit 3-4** and **Exhibit 3-5.**

Exhibit 3-4: Existing (2016) – Volumes from Eastgate Pkwy to Santee Gt

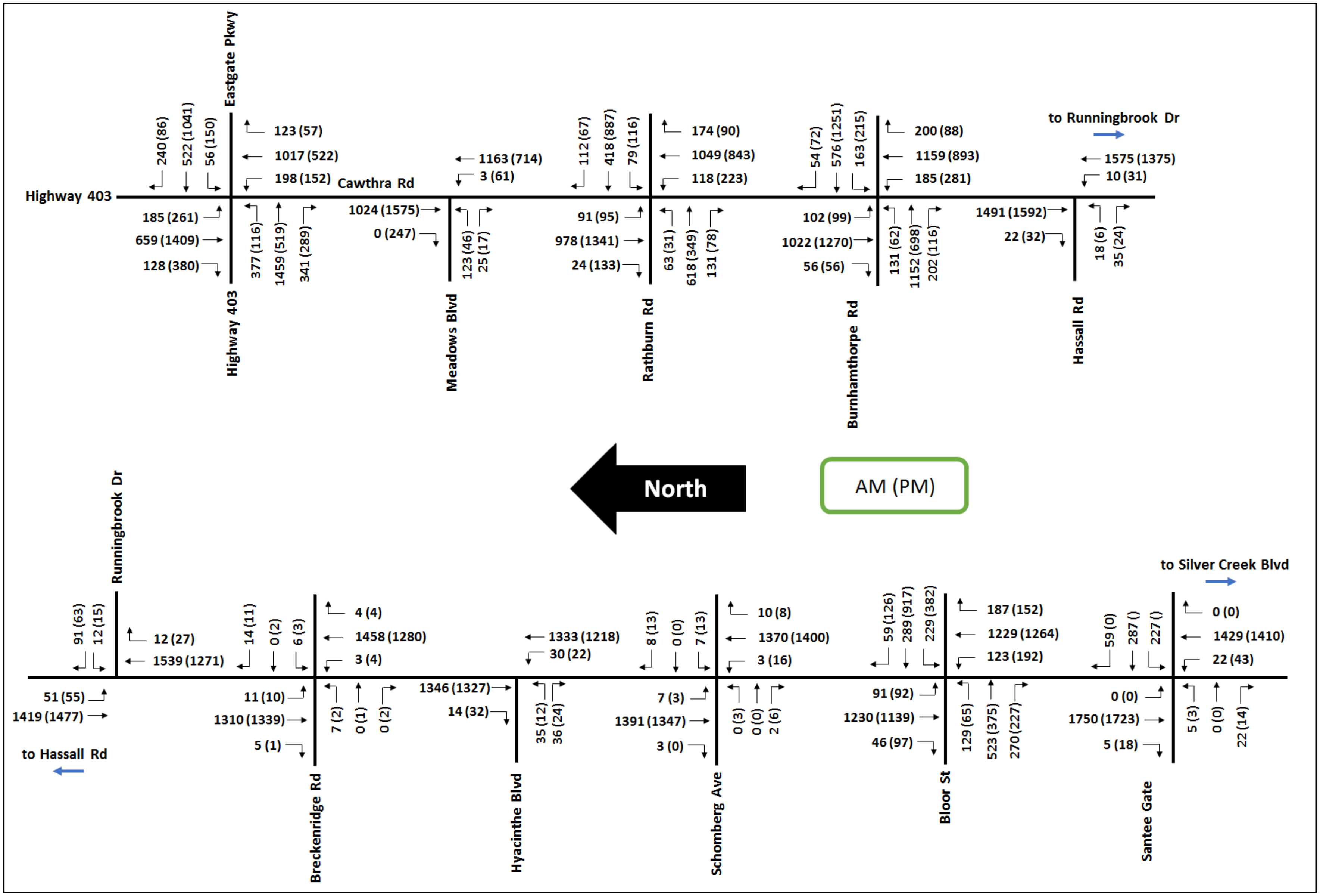
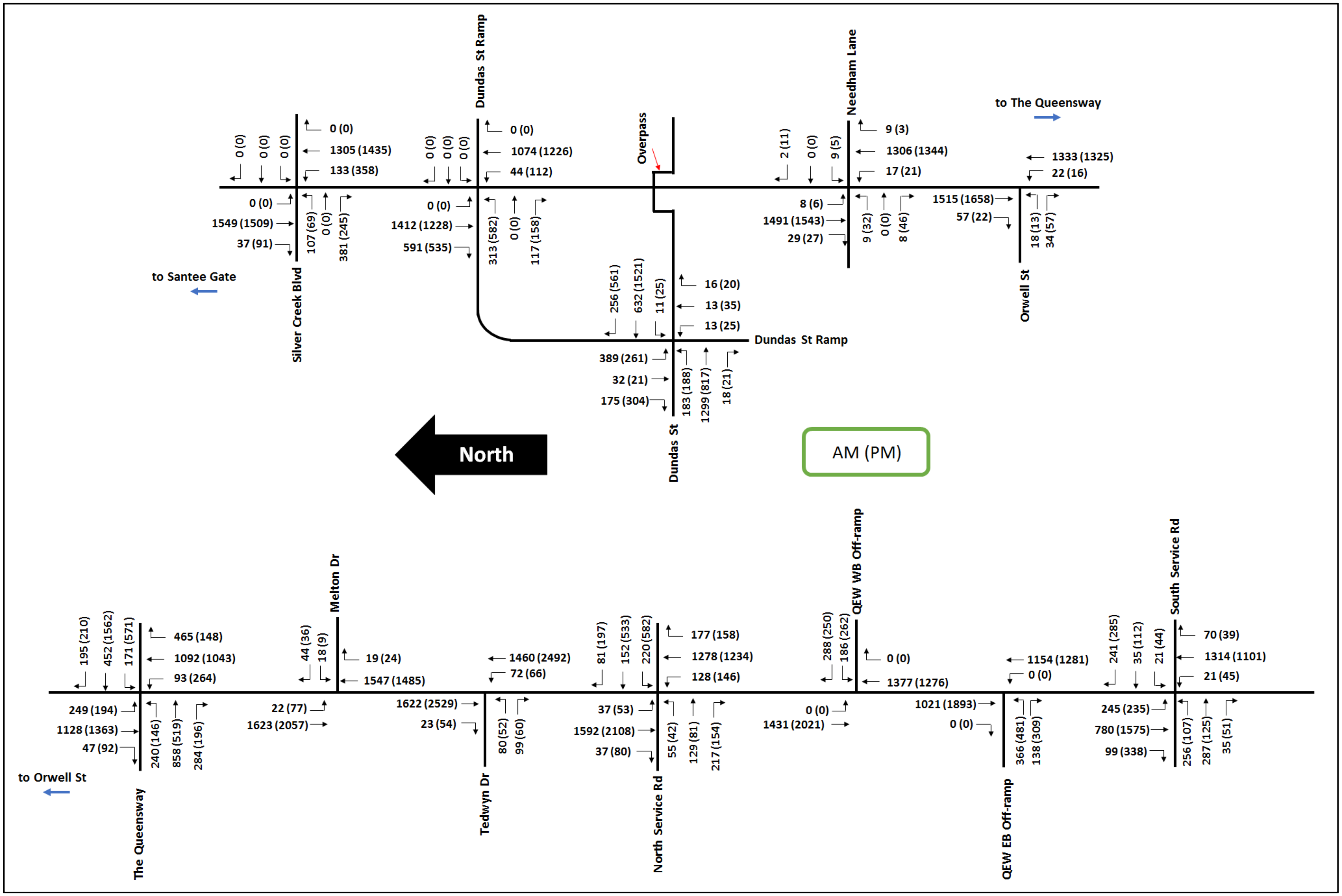


Exhibit 3-5: Existing (2016) – Volumes from Silver Creek to South Service Rd



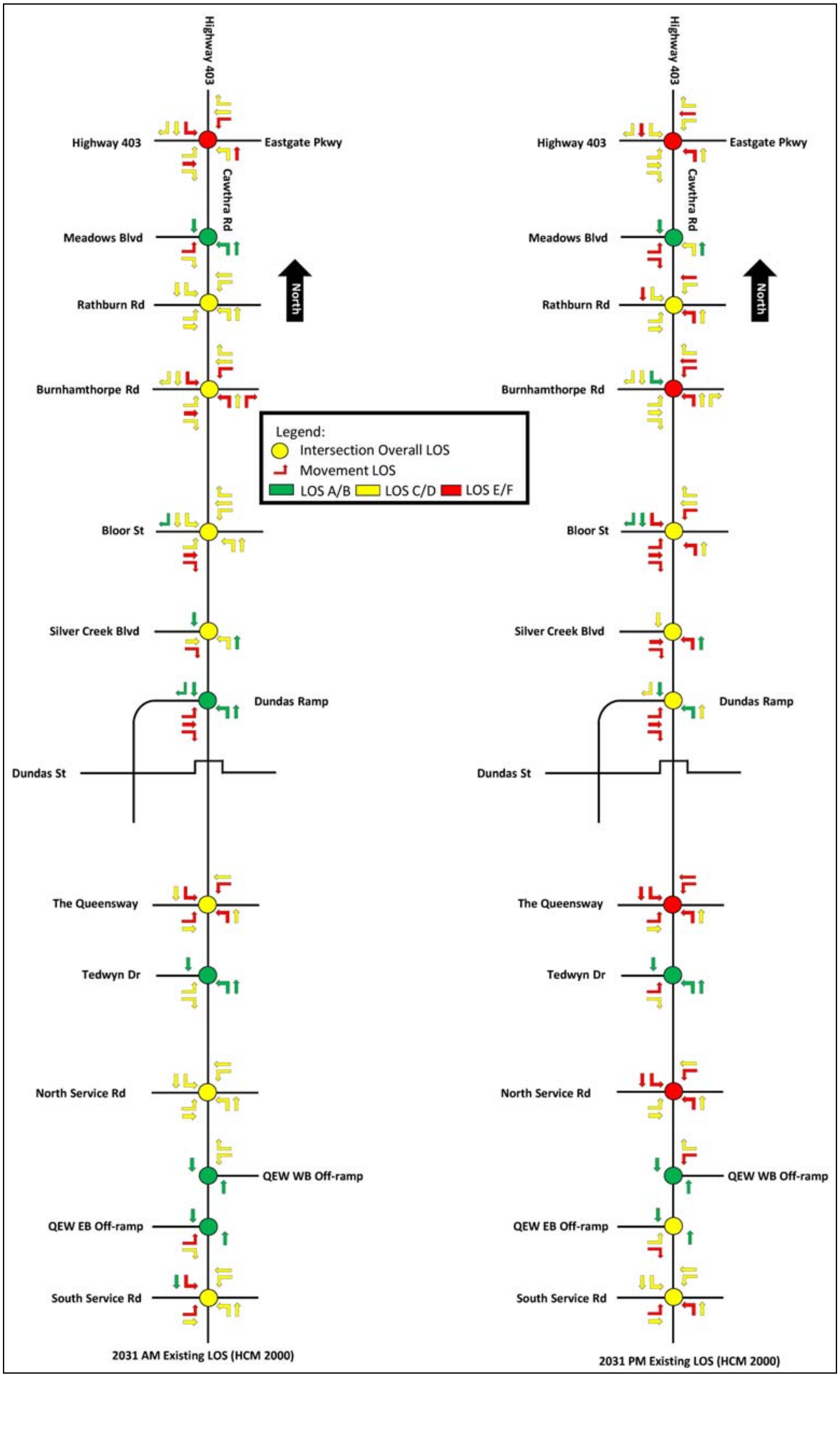
A summary of overall intersection operations for the existing base condition analysis is provided in **Exhibit 3-6**. Detailed output of the Synchro analysis is provided in ***Appendix B.***

Exhibit 3-6: Existing (2016) – Signalized Intersection Operations Summary

Cawthra Rd Intersection (Existing Condition)	2016 AM Peak Intersection Performance			2016 PM Peak Intersection Performance		
	LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
Eastgate Pkwy	E	60.7	1.04	E	56.8	0.97
Meadows Blvd	A	8.8	0.46	A	5.6	0.64
Rathburn Rd	C	32.1	0.73	D	54.1	0.96
Burnhamthorpe Rd	D	52.2	1.00	E	59.7	1.12
Bloor St	D	49.2	0.83	D	43.5	0.97
Silver Creek Blvd	C	21.1	0.74	C	25.4	0.81
Ramp to Dundas	B	14.3	0.63	C	30.2	0.69
Queensway	D	48.6	0.85	F	87.2	1.08
Tedwyn Dr	A	7.9	0.53	A	8.5	0.58
North Service Rd	C	31.1	0.86	F	85.9	1.24
South Service Rd	D	42.8	0.99	C	31.7	0.97

Overall LOS for each signalized intersection, as per the existing operations analysis, is illustrated in **Exhibit 3-7**.

Exhibit 3-7: Existing (2016) – Signalized Intersection LOS Diagram



4 Future Base Conditions

4.1 Road Network & Transit Changes

There are several relevant transportation projects underway in the City of Mississauga which may influence transportation patterns in the City and along Cawthra Road. A short description of each is provided below. Additional information on these studies is available online.

- **The Mississauga Transitway:** The BRT transitway which runs along Highway 403 west of Cawthra Road and extends easterly to Commerce Boulevard (the Renforth Gateway), located on Eglinton Avenue West. The line was recently expanded to include 12 stations, including a station at the north end of Cawthra Road at Eastgate Parkway.
- **Hurontario-Main Light Rail Transit (LRT):** A Class EA study and preliminary design was undertaken for the Hurontario-Main Light Rail Transit (LRT) line, which will include 22 stops along Hurontario Street from Port Credit into Brampton. The design and construction is currently proceeding as a Public Private Partnership (P3).
- **Dundas Street Rapid Transit:** The Mississauga Official Plan identifies Dundas Street as a priority for intensification and upward growth. This coincides with the plan to introduce higher order transit to the Dundas corridor, likely in the form of Bus Rapid Transit (BRT).
- **MiWay Route 8 (Cawthra):** The MiWay Route 8 local service, which currently runs on Cawthra Road as far north as Bloor Street, will be extended north to the Mississauga Transitway Station at Eastgate Parkway. This local transit line will eventually serve as a link between the Mississauga Transitway and the future Dundas Street Rapid Transit line, and its extension may also coincide with increased service frequency.
- **Burnhamthorpe Road East Improvements:** A Class EA study was completed for future improvements along Burnhamthorpe Road East from Arista Way to Dixie Road by the City of Mississauga. The recommended solution consists of intersection improvements, transit queue jump lanes, enhancements to Burnhamthorpe trail and various cycle/pedestrian bridges across major watercourses, noise mitigation, and streetscape improvements.
- **Hanlan Water Project:** This project consist of watermain construction along a number of corridors, including Cawthra Road, Dixie Road, Eastgate Parkway, and Tomken Road.
- **Silverthorn Feedermain Construction:** The Region of Peel is planning to construct a watermain from Silverthorn Pumping Station on Bloor Street to an existing watermain on Queensway. Future consideration may be given to the possibility of coordinating construction schedules (it is slated to be constructed in 2023).
- **Multi-Use Trail Construction:** A multi-use trail has recently been constructed on the west side of Cawthra Road between Meadows Boulevard and Eastgate Parkway by the City of Mississauga and between Burnhamthorpe and Meadows Boulevard in conjunction with the MCC/Hanlan Watermain project. An additional multi-use trail is proposed as a local connection to the Cawthra BRT Station east of Cawthra Road.

4.2 Traffic Growth Projections

Turning Movement Counts were used to represent existing conditions (base year 2016), as discussed in Section 3.4. This section documents suitable growth rates to be applied to existing traffic volumes in order to estimate 2031 traffic projections.

4.2.1 EMME Model Growth

Northbound and southbound volumes were extracted from the EMME model for both the base year (2011) scenario, as well as the future year (2031) scenario (assuming target mode share for the Hurontario LRT). These volumes were compared at a number of locations along the Cawthra Road corridor, and corresponding annual compound growth rates were calculated. These average growth rates are summarized in **Exhibit 4-1.**

Exhibit 4-1: Modelled Growth Rates in EMME

Corridor Location	Base (2011) Link Volumes		Future (2031) Link Volumes		Average Annual Compound Growth		
	SB	NB	SB	NB	SB	NB	Link
S of Eastgate	1,071	1,288	1,283	1,473	0.91%	0.67%	0.79%
N of Burnhamthorpe	961	1,099	1,040	1,231	0.40%	0.57%	0.48%
S of Burnhamthorpe	993	721	1,142	870	0.70%	0.94%	0.82%
S of Bloor	1,157	884	1,368	1,066	0.84%	0.94%	0.89%
S of Dundas / N of Queensway	734	1,186	1,026	1,298	1.69%	0.45%	1.07%
N of North Service	668	980	982	1,175	1.95%	0.91%	1.43%
S of South Service	928	1,284	1,014	1,345	0.44%	0.23%	0.34%
TOTALS					**0.99%**	**0.67%**	**0.83%**

The results of the screenline analysis indicates that, on average, total link volumes across all corridor locations analyzed increase based on an average annual compound growth rate of 0.83%.

Since the future year (2031) EMME scenarios incorporate all major road widenings and other major transportation projects (including the Hurontario LRT), this growth rate can be taken to represent both potential background growth through the corridor, as well as diversions and induced demands due to changes along parallel corridors.

4.2.2 Review of Population Growth Forecasts

The City of Mississauga and Region of Peel population and trip-end growth forecasts were considered in the preparation of the traffic growth forecast. Relevant documents are listed as follows:

- **City of Mississauga –** “Mississauga Official Plan” (2016); “Population, Demographics & Housing” (2013); and “Moving Mississauga” (2011)
- **Region of Peel –** “Long Range Transportation Plan” (2012)

Review of the above documents showed that population growth is estimated to be 0.5% to 0.6% per year between 2011 and 2031, while trip ends are forecasted to increase by 0.9% to 1.0% per year during that time.

Comparing these figures with the EMME model results previously described, the average growth rate derived based on the comparison of EMME base and future scenarios – being 0.83% compounded annually – appears to be reasonable for the development of background forecasts.

4.3 Future Base Operations

Section 4.2 outlined the methodologies used to determine an appropriate background growth rate to apply to future model scenarios. Based on a review of EMME model scenarios, an annual compound growth rate of 0.83% was derived.

This background growth was applied to existing traffic volumes (outlined in Section 3) and carried out to future study year 2031. However, growth was only applied to ‘major’ movements, which were defined as: a) all through movements along arterial roads, and b) all turning movements between two arterial roads. Growth was not applied to any movements to and from intersecting local roads, as the connecting neighbourhoods/developments are assumed to be fully developed and should not see a significant increase in pass-through traffic.

Analysis was conducted for weekday AM and PM peak hour conditions. Future traffic volumes are illustrated in **Exhibit 4-2** and **Exhibit 4-3**.

Exhibit 4-2: Future (2031) – Volumes from Eastgate Pkwy to Santee Gate

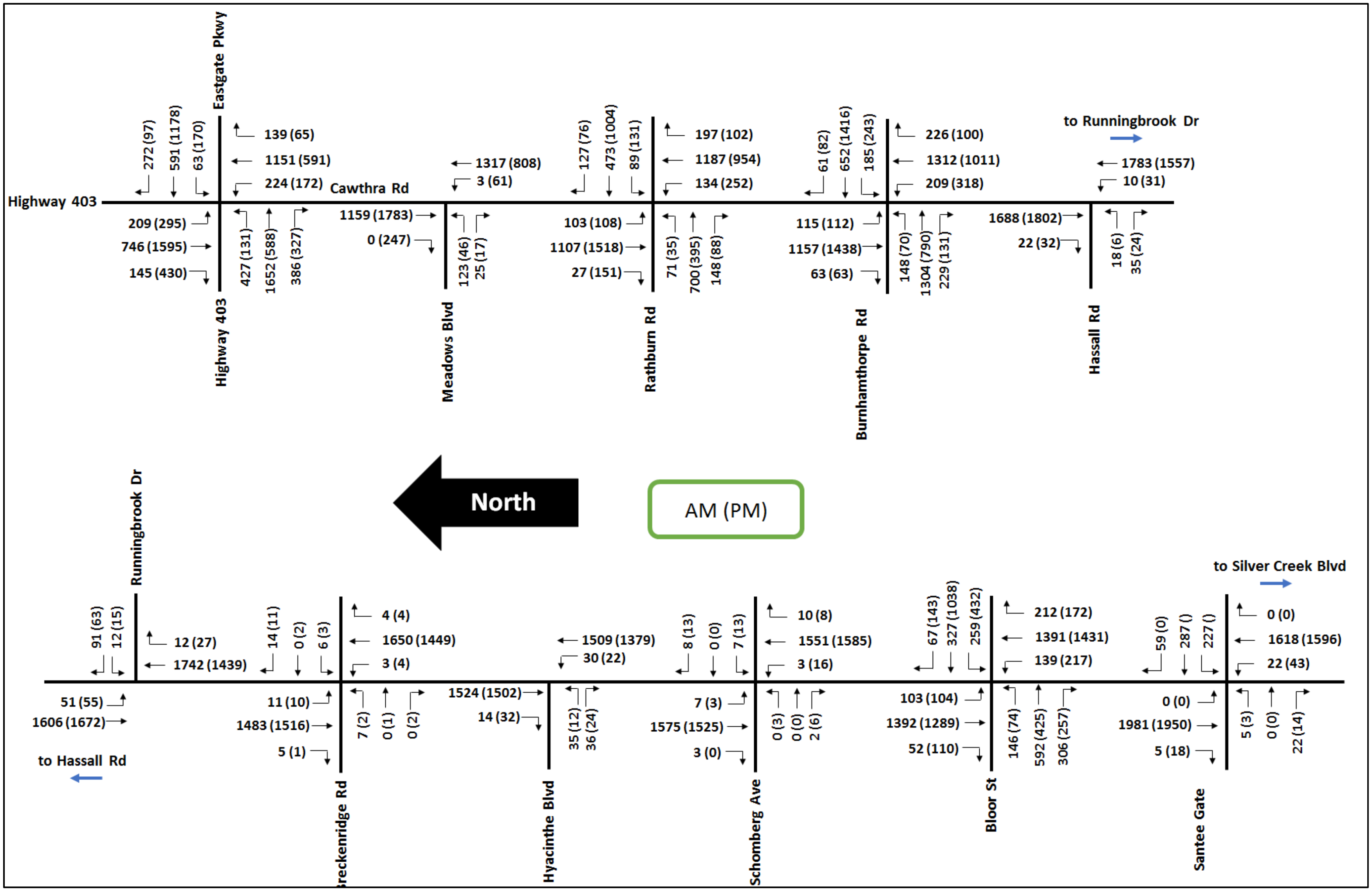
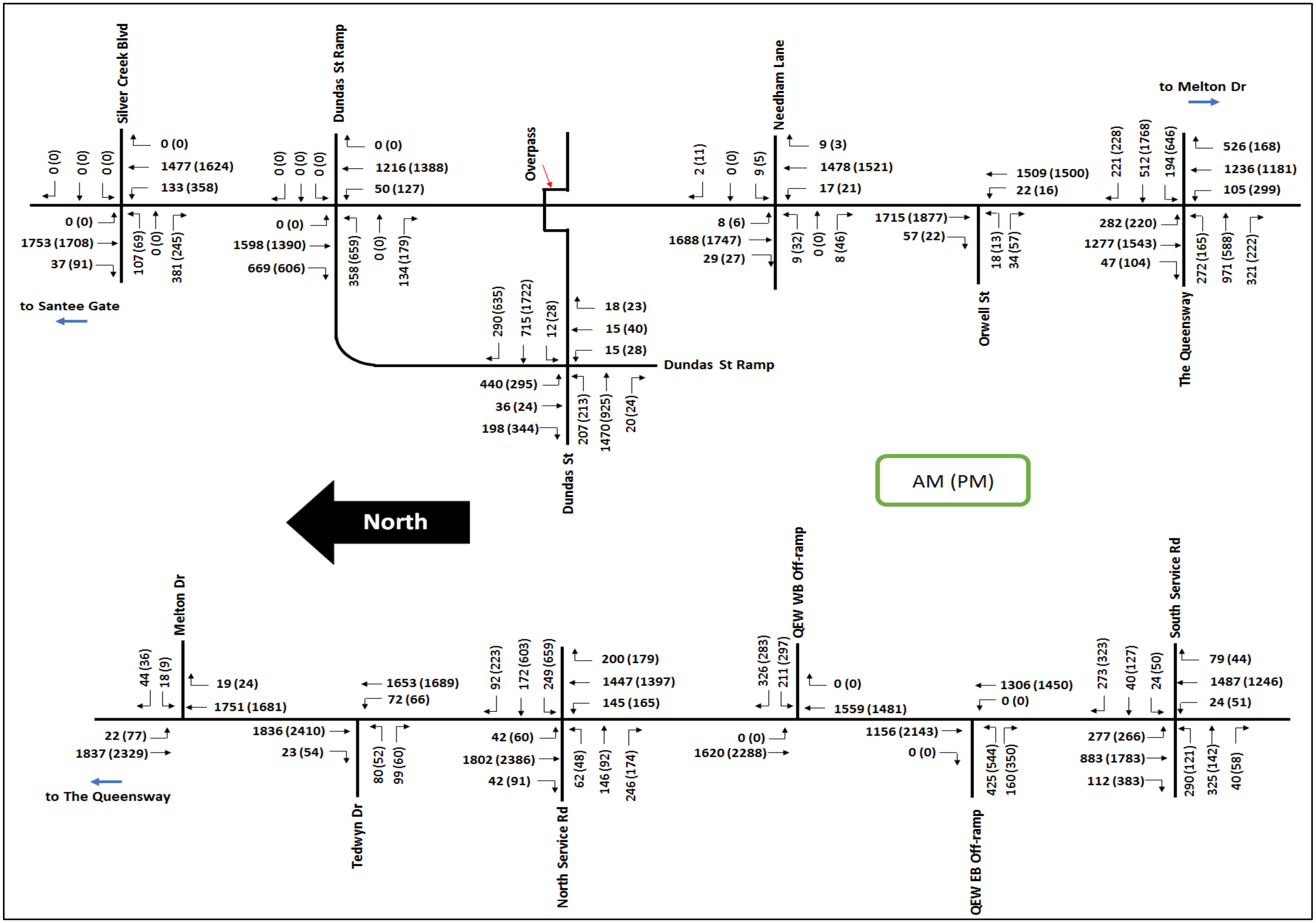


Exhibit 4-3: Future (2031) – Volumes from Silver Creek Blvd to South Service Rd



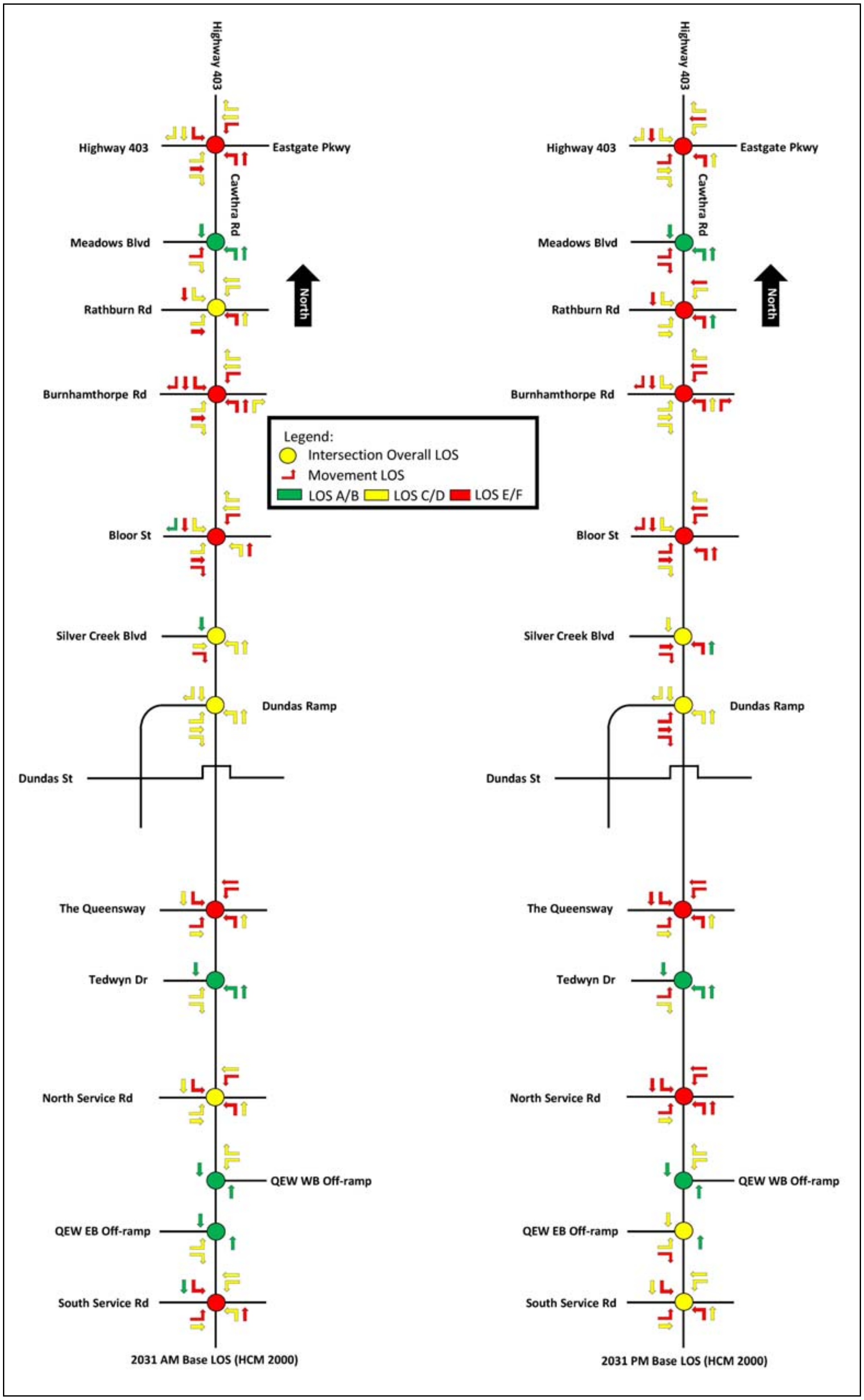
A summary of overall intersection operations for the future base conditions analysis is provided in **Exhibit 4-4.** Detailed output of the Synchro analysis provided in ***Appendix C.***

Exhibit 4-4: Future (2031) Base – Signalized Intersection Operations Summary

Cawthra Rd Intersection (Base Condition)	2031 AM Peak Intersection Performance			2031 PM Peak Intersection Performance		
	LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
Eastgate Pkwy	F	95.8	1.17	E	74.3	1.15
Meadows Blvd	A	7.1	0.51	A	9.6	0.71
Rathburn Rd	D	44.2	0.85	E	73.9	1.11
Burnhamthorpe Rd	F	81.2	1.14	F	105.6	1.39
Bloor St	E	62.4	0.99	E	76.4	1.12
Silver Creek Blvd	C	25.6	0.84	C	26.8	0.84
Ramp to Dundas	D	38.7	0.70	C	34.0	0.79
Queensway	E	58.8	0.96	F	118.5	1.22
Tedwyn Dr	A	8.5	0.60	A	9.4	0.65
North Service Rd	D	40.1	1.02	F	140.6	1.44
South Service Rd	E	67.3	1.21	E	64.0	1.10

Overall LOS for each signalized intersection, as per the future base operations analysis, is illustrated in **Exhibit 4-5.**

Exhibit 4-5: Future (2031) Base – Signalized Intersection LOS Diagram



5 Intersection Operations

This section provides discussion on the operational and safety performance of the signalized and unsignalized intersections along the Cawthra Road corridor. Overall Level of Service (LOS) between existing and future scenarios are stated and compared. For each signalized intersection, potential operational improvement measures are discussed; the performance of these measures is further outlined in Section **Error! Reference source not found.**.

5.1 Signalized Intersections

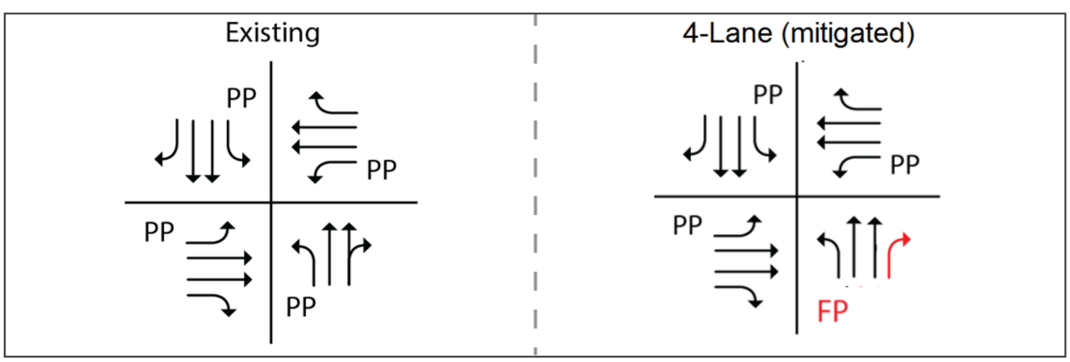
The existing signal control strategy for Cawthra Road is typically based on a 140 second cycle length (120 second cycle length for intersections south of Queensway, including QEW ramps, North and South Service Roads, and Tedwyn Drive) with protected-permissive turn phases provided at intersections when and where necessary. At minor intersections, side street green time is generally kept to the minimum required for pedestrian clearances to prioritize progression north-south.

5.1.1 Eastgate Parkway

Existing Conditions: The Eastgate Parkway intersection is a gateway intersection with the west and north legs providing direct access to and from Highway 403. The intersection operates at LOS E in both the AM and PM peak hours. Opposing through and left turn volumes are relatively high and compete for available green time. The northbound left-turn movement has had a high occurrence of left-turn collisions which appear to result from misjudging gaps in southbound traffic exiting from Highway 403. It is expected that southbound traffic speeds remain high despite a '50km/h ahead' posted speed limit sign in place upstream of the intersection.

Future Conditions: Intersection operations are anticipated to worsen to LOS F (v/c = 1.17) during the AM peak hour with the EBT, NBTR, and SBL movements all operating overcapacity. In the PM peak hour, overall intersection operations are expected to remain at LOS E (v/c = 1.15) with the EBL, WBT, NBL, and SBT all operating overcapacity.

Exhibit 5-1: Eastgate Pkwy Configuration and Potential Changes



* PP - Permissive Protected; FP -Fully Protected; ( ) denotes assumed phasing

Potential Improvements:

- ***Provide an exclusive NBR turn lane*** to improve northbound traffic operations. The NBTR movement currently operates at LOS F (v/c = 1.06) during the AM peak hour and is expected to worsen to LOS F (v/c = 1.32) with the addition of background growth. The forecast northbound right turn demands are 139 veh/hr during the 2031 AM peak hour and 65 veh/hr during the PM peak hour.

- ***Provide a fully protected NBL phase*** to reduce conflicts between northbound left and southbound through volumes, identified as a concern during the traffic safety review. The forecast northbound left turn demands are 224 veh/hr during the 2031 AM peak hour and 172 veh/hr during the PM peak hour. The option of providing a dual NBL (in conjunction with protected only left turn phasing) to minimize green time was considered; however results in significant impacts associated with widening Cawthra Road (including the existing BRT underpass north of the intersection) and therefore was not carried forward.

5.1.2 Meadows Boulevard

Existing Conditions: The intersection performs well overall, operating at LOS A in the AM and PM peak hours. However, the east approach movements experience significant delays as green phases are prioritized for the heavy north/south movements. Any increases to green phases for the minor street would come at the expense of operations on the Cawthra Road approaches.

Future Conditions: Intersection operations remain at LOS A based on 2031 demands (v/c = 0.51 and 0.71 during the AM and PM peak hours respectively).

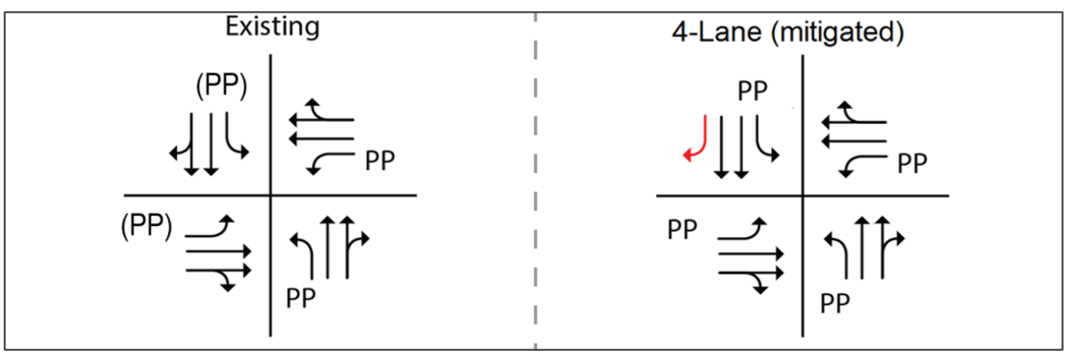
Potential Improvement: No improvements required.

5.1.3 Rathburn Road

Existing Conditions: The Rathburn Road intersection operates at LOS C in the AM peak hour and LOS D in the PM peak hour. All movements operate below capacity.

Future Conditions: Intersection operations are expected to worsen to LOS D (v/c = 0.85) and LOS E (v/c = 1.11) during the 2031 AM and PM peak hours respectively. In the AM peak hour, all movements remain below capacity. In the PM peak hour, critical movements will include SBTR, WBTR, and NBL.

Exhibit 5-2: Rathburn Rd Configuration and Potential Changes



* PP - Permissive Protected; FP -Fully Protected; ( ) denotes assumed phasing

Potential Improvements:

- ***Provide an exclusive SBR turn lane*** to improve southbound traffic operations. During the 2031 PM peak, the SBTR operates at LOS F (v/c = 1.12). The southbound through and right turn demands are 1518 veh/hr and 151 veh/hr respectively. This improvement is feasible within the available right-of-way and remains offset from adjacent houses.
- Given the heavy westbound demands during the PM peak (76 veh/hr right and 1004 veh/hr thru), an exclusive WBR turn lane was considered. However, given the constraints of the existing right of way (compared to limited benefits), the option of an exclusive right turn lane was not carried forward.

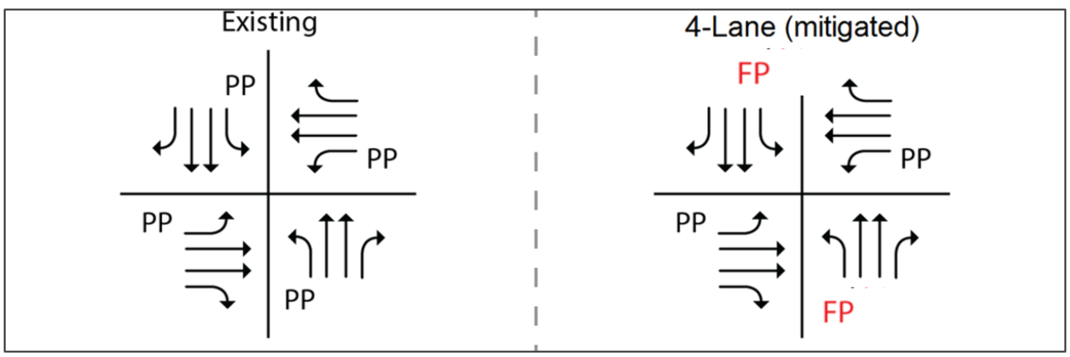
- During the 2031 PM peak, the NBL movement (252 veh/hr) operates overcapacity (v/c 1.14), however is opposed by a heavy southbound through volume (1518 veh/hr). No geometric improvements are recommended.

5.1.4 Burnhamthorpe Road

Existing Conditions: The Burnhamthorpe Road intersection operates at LOS D (v/c = 1.0) during the AM and LOS E (v/c = 1.12) during the PM peak hour. Critical movements include the WBL during the AM peak hour, and the WBT, NBL, and SBT movements during the PM peak hour. The dominant collision type at this intersection is turning related collisions, with the majority of conflicts occurring between the SBL and NBT movements (a movement that exceeds 90 degrees due to the existing intersection skew). The intersection was recently reconstructed during which channelized right turn lanes were replaced with dedicated right-turn lanes.

Future Conditions: Intersection operations are expected to worsen to LOS E (v/c 1.14) and LOS F (v/c = 1.39) during the AM and PM peak hours respectively. In the AM peak hour, critical movements will include EBT, WBL, NBL, and NBT. In the PM peak hour, critical movements will include WBL, WBT, NBL, and SBT.

Exhibit 5-3: Burnhamthorpe Rd Configuration and Potential Changes



* PP - Permissive Protected; FP -Fully Protected; ( ) denotes assumed phasing

Potential Improvements:

- The intersection is very congested on all approaches, and a number of geometric issues – including the presence of major hydro lines on the south and west boulevards, and the unnatural skew that the intersection possesses – limits the options available for improving operations. The intersection was recently reconstructed, and the resulting configuration represents the most ideal configuration from a multi-modal transportation perspective.
- ***Provide a fully protected NBL phase*** given the heavy NBL demands (318 veh/hr during 2031 PM peak), difficultly for NBL vehicles to perceive southbound through vehicles, and greater than 90 degree turning angle due to the significant intersection skew angle. The option of providing a dual NBL (in conjunction with protected only left turn phasing) was considered to minimize green time; however results in significant impacts (given property constraints and hydro lines along the west boulevard) and therefore was not carried forward.
- ***Provide a fully protected SBL phase*** to address the high instance of SBL and NBT conflicts, and in light of the greater than 90 degree turning angle.

To address concerns associated with the intersection skew and poor level of service, consideration was also given to reconfiguring the intersection as a Multi-lane Roundabout.

The capacity of a roundabout is quite varied as it is dependent on both the number of vehicles entering the roundabout and the number of circulating vehicles (as well as geometric properties). This intersection has multiple approaches with ~1600 to 1700 veh/hr demands versus a capacity of 1200 to 1600 veh/hr. The right-turn volume is high enough that by-pass lanes are effective in increasing the capacity, but not enough for a two-lane roundabout to be able to handle the remaining through/left traffic.

A traffic flow worksheet, which shows high-level results based on the HCM 2010 methodology is provided in ***Appendix D2***. Volume/ Capacity (v/c) ratios are between 1.23 and 2.32 for a double-lane roundabout (2 entering & circulating lanes).

To supplement the above, the results of an ARCADY 8 analysis completed for a two-lane roundabout configuration with by-pass lanes on all approaches is provided below. For the purposes of the analysis, no reductions are included for capacity, heavy vehicles, and/or pedestrians – all of which would artificially increase the theoretical capacity of the roundabout.

	AM							PM						
	Queue (PCU)	Delay (s)	RFC	LOS	Junction Delay (s)	Junction LOS	Network Residual Capacity	Queue (PCU)	Delay (s)	RFC	LOS	Junction Delay (s)	Junction LOS	Network Residual Capacity
	Cawthra & Burnhamthorpe - Scenario 1													
Burnhamthorpe EB	558.51	2161.56	1.67	F	1133.95	F	-38 % [Cawthra NB]	6.10	24.47	0.87	C	1612.14	F	-45 % [Cawthra SB]
Cawthra NB	413.25	1269.24	1.48	F				159.70	429.80	1.26	F			
Burnhamthorpe WB	7.77	32.37	0.90	D				770.82	2868.94	1.80	F			
Cawthra SB	145.88	403.95	1.25	F				661.89	2278.50	1.74	F			

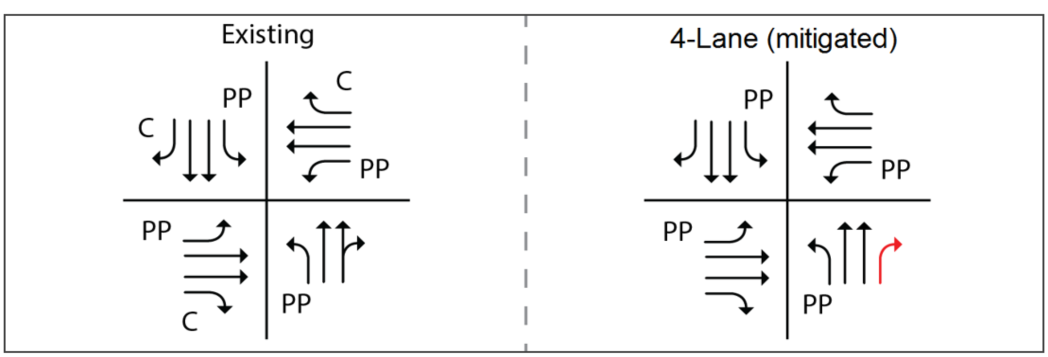
The above results confirm that roundabout is not feasible from a traffic operations perspective, the intersection volumes are too high for a roundabout of any size to function effectively.

5.1.5 Bloor Street

Existing Conditions: The Bloor Street intersection operates at LOS D during the AM and PM peak hours. All movement operate under capacity. Collisions at the intersection are largely rear-end type; likely due to excessive speeding along this section of the corridor. The safety analysis also notes that the majority of rear-end collisions are in the northbound direction which is the only direction without a dedicated right turn lane.

Future Conditions: Intersection operations are expected to worsen to LOS E (v/c = 0.99) and LOS E (v/c = 1.12) during the AM and PM peak hours respectively. In the AM peak hour, critical movements will include the NBTR. In the PM peak hour, critical movements will include WBL, WBT, NBL, and NBTR.

Exhibit 5-4: Bloor St Configuration and Potential Changes



* PP - Permissive Protected; FP -Fully Protected; ( ) denotes assumed phasing

Potential Improvements:

- ***Provide an exclusive NBR turn lane*** to accommodate right turn demands and reduce the number of slowing vehicles in the through lane and thereby assist in reducing rear-end collisions. Based on the existing intersection configuration, the NBTR will operate at LOS E (v/c = 1.04) during the 2031 AM peak hour and LOS F (v/c = 1.12) during the PM peak hour. The corresponding northbound right turn demands are 212 veh/hr and 172 veh/hr respectively.
- ***Remove channelized right turns*** to improve pedestrian safety and reduce vehicular conflicts.
- Consideration was given to potential re-configuration of the westbound approach (Bloor Street) to provide a dual WBL however was not carried forward. Average intersection delays remained largely unchanged in the AM peak and increased in the PM peak hour (analysis is provided in Appendix D2, Case I)

5.1.6 Silver Creek Boulevard

Existing Conditions: The Silver Creek intersection operates at LOS C during the AM and PM peak hours. Although a three-legged intersection (north, south & west legs) there are two driveways on the east side. A southbound left-turn lane is available to access these minor driveways and this movement does not affect signal phasing. The safety analysis indicates that the predominant type of collision at the intersection is southbound rear-end collisions, which may stem from drivers accelerating through the intersection to reach the Dundas Street ramp.

Future Conditions: Intersection operations are expected to remain at LOS C during the AM and PM peak hours. All movements will continue to operate well below capacity. The 2031 PM peak NBL demands (358 veh/hr) are expected to extend beyond the available left turn lane storage.

Potential Improvements: Apart from line painting modifications to increase the NBL storage lane length, no improvements are required.

5.1.7 Ramp to Dundas Street

Existing Conditions: The Dundas Ramp intersection operates at LOS B during the AM peak hour and LOS C during the PM peak hour. The intersection operates under split phasing for east-west movements, given the low demand on the east leg. The safety analysis indicates a visible trend of rear-end collisions immediately south of the ramp as vehicles merge into the southbound through lanes on Cawthra Road. It also appears that NBL turn vehicles may be misjudging gaps in southbound traffic likely due to the higher speeds along the downhill grade through the intersection.

Future Conditions: Intersection operations are anticipated to slight worsen to LOS D (v/c = 0.70) during the 2031 AM peak hour and LOS C (v/c = 0.79) during the PM peak hour. All movements operate below capacity.

Potential Improvements:

- Given concerns regarding the high volume merge of demands from the EBR channelized right turn onto Cawthra Road, consideration was given to reconfiguring the existing right turn channel as a “smart channel’, to establish a clearer yield point and better sight-lines for drivers attempting to merge into the SBT lane. Additionally, this improvement is desirable from an active transportation standpoint, as it reduces potential conflicts between vehicles and pedestrians/bicycles.

  A subsequent geometric feasibility review by the Region identified difficulties in accommodating a ‘smart channel configuration’ and therefore it is expected that the *existing channelized configuration will be maintained; however pavement markings are to be updated to clarify lane designations.*

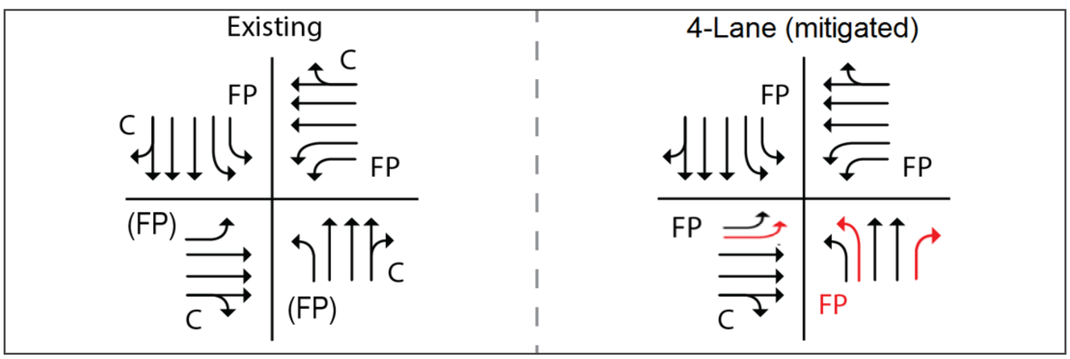
- ***Provide a fully protected NBL phase*** to reduce conflicts between northbound left and southbound through volumes, identified as a concern during the traffic safety review.

5.1.8 The Queensway

Existing Conditions: The Queensway intersection operates at LOS D in the AM peak hour and LOS F in the PM peak hour. The dual SBL and WBL movements operate under protected phasing only. During the PM peak hour, the EBL, WBTR, NBL, and SBTR movements all operate over capacity. Although three lanes are provided through the intersection in the eastbound and westbound directions, utilization of the curb lane is lower given the presence of downstream lane drops immediately beyond the intersection. A similar configuration also exists in the northbound direction on Cawthra Road; however for analysis purposes has been modelled as two through lanes plus an exclusive right turn lane.

Future Conditions: Based on 2031 demands, the intersection is expected to operate at LOS E (v/c = 0.96) during the AM peak hour and LOS F (v/c = 1.22) during the PM peak hour. In the AM peak hour, all movements will operate under capacity. In the PM peak hour, critical movements will include EBL, WBTR, NBL, SBL, and SBTR. The most critical of these is the NBL (299 veh/hr) operating at LOS F (v/c = 2.47).

Exhibit 5-5: Queensway Configuration and Potential Changes



* PP - Permissive Protected; FP -Fully Protected; ( ) denotes assumed phasing

Potential Improvements:

- ***Provide a fully protected dual NBL*** to accommodate future demands, limit queuing beyond Melton Road, and reduce the probability of turning movement collisions at the Queensway intersection, as motorists would no longer be attempting to turn through gaps in opposing traffic.
- ***Remove channelized right turns*** to improve pedestrian safety and reduce vehicular conflicts. Where the channelized right turn configuration cannot be removed due to existing constraints (i.e. south-west quadrant where utility impacts will be significant), it is recommended that a 'smart channel' configuration be provided.
- ***Provide a fully protected (dual) EBL phase*** (consistent with all other approaches) to improve pedestrian safety and reduce vehicular conflicts. As a secondary improvement measure, also consider converting the existing shadow left turn buffer lane to second left turn lane.
- Given the heavy northbound right turn demands (i.e. 526 veh/hr during the 2031 AM peak) and geometry which limits the effectiveness of the curb lane as a shared thru/right

turn lane, it is recommended that the outer lane be converted to an exclusive right turn lane in conjunction with removing the northbound right turn channelization (noted above).

- Downstream eastbound and westbound curb lanes are relatively short, and therefore are not being utilized to their fullest extent. Consideration was given to converting the shared thru/right turn lanes along Queensway to an exclusive right turn lane. However, further analysis confirmed that constraining the eastbound and westbound movements to two through-lanes would result in a significant deterioration of operations in the PM peak hour (refer to analysis in Appendix D2, Case III), and therefore was not carried forward.

  To improve lane utilization and downstream traffic operations, extension of the eastbound and westbound curb lanes should be considered if/when road improvements are separately undertaken along the Queensway in the future.

5.1.9 Tedwyn Drive

Existing Conditions: The intersection operates at LOS A in both the AM and PM peak hours. The east approach movements experience significant delays, as green phases are prioritized for the heavy north/south movements.

Future Conditions: Intersection operations remain at LOS A (v/c = 0.60 and 0.65 in both the AM and PM peak hours, respectively). All movements operate well below capacity.

Potential Improvements: No improvements are required.

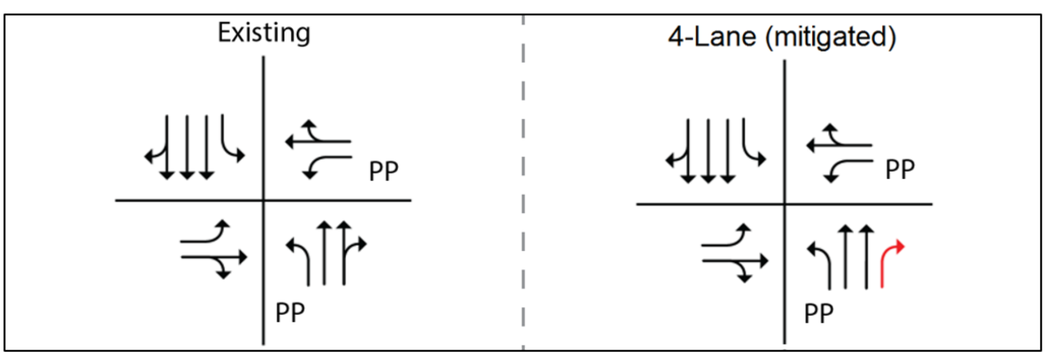
5.1.10 North Service Road

Existing Conditions: The North Service Road intersection operates at LOS C in AM peak hour and LOS F in the PM peak hour. The safety analysis indicates that many of the collisions are due to loss of control given the tight turn radii on the eastbound and westbound approaches.

Future Conditions: Intersection operations are expected to worsen to LOS D (v/c = 1.02) during the 2031 AM peak hour, and LOS F (v/c = 1.44) during the PM peak hour. In the AM peak hour, the WBL movement operates at/overcapacity. In the PM peak hour, overcapacity movements will include all westbound (WBL, WBTR), northbound (NBL, NBTR), and southbound (SBL, SBTR) movements.

It should be noted that traffic volumes are expected to change with the future reconstruction of the highway interchange at Dixie Road and a reduction in WBL demands is likely given the addition of an access to the QEW westbound lanes at Dixie Road.

Exhibit 5-6: North Service Rd Configuration and Potential Changes



* PP - Permissive Protected; FP -Fully Protected; ( ) denotes assumed phasing

Potential Improvements:

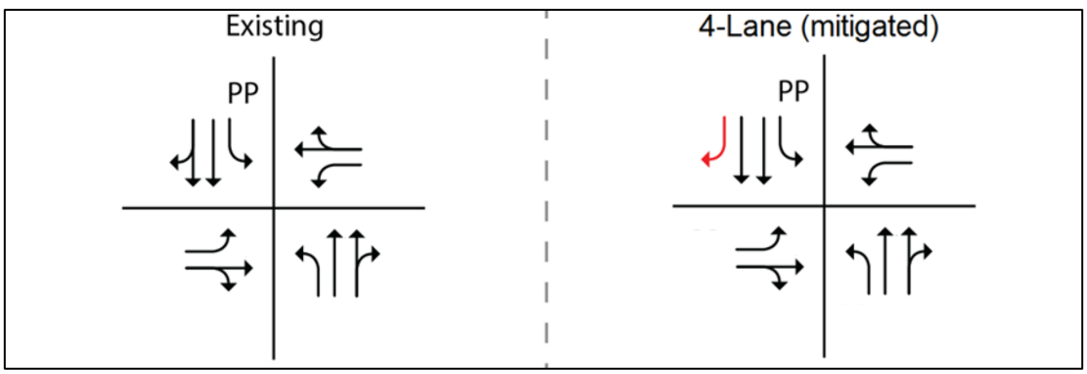
- ***Provide an exclusive NBR turn lane*** at this intersection (NBR demands = 200 veh/hr during the AM peak and 179 veh/hr during the PM peak).
- Consideration was also given to providing an exclusive WBR turn lane; however was not carried forward due to right-of-way constraints and potential encroachment to the adjacent utility corridor.
- ***Enhance signing on east and west approaches*** to warn drivers of the sharpness of curve and signalized intersection ahead.

5.1.11 South Service Road

Existing Conditions: The South Service Road intersection operates at LOS D in AM peak hour and LOS C in the PM peak hour. The safety analysis indicates that many of the collisions are due to loss of control given the tight turn radii on the eastbound and westbound approaches.

Future Conditions: Intersection operations are expected to worsen to LOS E (v/c = 1.21 and v/c 1.10 during both the 2031 AM and PM peak hours respectively). In the AM peak hour, overcapacity movements include the EBL and SBL. In the PM peak hour, the EBL, SBL, and SBTR operate at/overcapacity. Southbound thru/right turn demands are heaviest during the PM peak, during which period the SBTR movement is expected to operate at LOS E (v/c = 1.10), reflecting the need for an exclusive right turn lane.

Exhibit 5-7: South Service Rd Configuration and Potential Changes



* PP - Permissive Protected; FP -Fully Protected; ( ) denotes assumed phasing

Potential Improvements:

- ***Provide an exclusive SBR turn lane*** to accommodate the heavy southbound right turn and thru lane volumes and improve overall intersection operations.
- ***Enhance signing on east and west approaches*** to warn drivers of the sharpness of curve and signalized intersection ahead.

5.2 Unsignalized Intersections

A total of eight unsignalized intersections were modelled along the study area. Each of these intersections operate as a two-way stop, with the minor approaches stop controlled and major approaches (northbound and southbound on Cawthra Road) operating as free flow movements. None of the minor approaches are restricted to right-in/right-out movements.

The heavy NBT and SBT volumes operate under free flow conditions (LOS A), with left-turn movements from Cawthra Road experiencing limited delays (i.e. LOS C or less). However, while approach volumes on the minor intersecting roads are very low (and well below capacity), these vehicles must wait for sufficient gaps in traffic in order to turn onto Cawthra Road. As such, some of these movements experience long delays – particularly left-turn movements that must manoeuvre through two directions of heavy through traffic. **Exhibit 5-8** summarizes the average approach delay and corresponding LOS for each minor approach, for both existing and future base conditions.

Exhibit 5-8: Unsignalized Intersection Operations – Existing and Future Comparison

Unsignalized Intersection	Approach	Approach Delay (Sec) & Corresponding LOS			
		AM Peak Hour		PM Peak Hour	
		2016 Existing	2031 Base	2016 Existing	2031 Base
Hassall Rd	EB	15.8 (C)	18.3 (C)	13.3 (B)	15.1 (C)
Runningbrook Dr	WB	24.7 (C)	30.8 (D)	18.9 (C)	21.7 (C)
Breckenridge Rd	EB	33.1 (D)	41.5 (E)	24.7 (C)	29.8 (D)
	WB	22.9 (C)	27.9 (D)	19.5 (C)	22.7 (C)
Hyancinthe Blvd	EB	24.8 (C)	26.7 (D)	19.4 (C)	21.3 (C)
Schomberg Ave	EB	14.8 (B)	16.3 (C)	19.9 (C)	23.5 (C)
	WB	15.4 (C)	16.9 (C)	16.4 (C)	19.4 (C)
Santee Gt	EB	15.3 (C)	17.9 (C)	15.1 (C)	17.0 (C)
Needham Ln	EB	196.9 (F)	396.0 (F)	342.3 (F)	4114.5 (F)
	WB	594.1 (F)	1238.7 (F)	93.6 (F)	174.2 (F)
Orwell St	EB	25.9 (D)	32.1 (D)	24.2 (C)	29.6 (D)
Melton Rd	WB	15.8 (C)	15.4 (C)	14.9 (B)	15.0 (B)

Only Needham Lane and Orwell Street are wide enough to accommodate separate left-turn and right-turn lanes (although separate are not explicitly delineated at present). For all other approaches, left-turning and right-turning vehicles share a single lane. This presents some additional delays to right-turn movements, as these some of vehicles will be subject to additional delays incurred by left-turning vehicles when possibly otherwise free to make the right-turn movement. However, for the majority of unsignalized intersections, delays are acceptable.

Note: While delays for Needham Lane intersection are expected to be significant, the output delays shown in Synchro are implausible. The EBL and WBL volumes indicated in existing TMC data shows that vehicles are able to make these movements in some manner, and so it is possible that the Synchro model has not accurately reflected the presence of gaps in traffic along this section. Additional field studies can be conducted to observe true operating conditions and average delays experienced at this location.

Potential Improvements:

A signal warrant justification was completed for both Needham Lane and for Orwell Avenue, based on major and minor approach volumes. The TMC data was used, with an annual compound growth rate of 0.83% applied to the NBT and SBT movements to project background growth out to year 2031. The signal warrant calculations are provided in ***Appendix D4***, and indicate that the warrants for traffic signals are not met for either of these intersections.

6 Potential Improvements

The future (2031) mitigated scenario reflects the potential improvement measures outlined in Section 5. Further design review is required to ensure that certain improvement measures are not limited by other factors such as constructability and cost.

6.1 General Corridor

Potential Widening of Cawthra Road (QEW to Queensway)

The south section of Cawthra Road, between QEW Off-Ramp (westbound terminal) and the Queensway, currently operates with a lane imbalance as there exist three though-lanes in the southbound direction compared to only two in the northbound direction. Although traffic volumes in the northbound direction could benefit from a third northbound through lane along this south corridor section, the corridor the right-of-way is constrained and such a lane addition would result in induced demands along the south corridor section, which would cause significant bottlenecking where the subsequent lane reduction occurs (the central and north sections of the corridor already operate near or at capacity, and cannot accommodate these additional demands). As such, any potential benefits to traffic operations in the south corridor section need to be weighed against the worsening of operations further north along the corridor.

Furthermore, operational benefits to the south corridor section as a result of lane widening are unlikely to be as significant as they might appear. Cawthra Road represents a direct link and logical travel route between Highway 403 and QEW. For this specific reason, and given the volumes served by these two major highways, it can be argued that Cawthra Road will always operate near or at capacity regardless of any widening that is undertaken. Any additional capacity introduced along Cawthra Road will result in subsequent induced demands until this new capacity is again reached.

Based on the above, the addition of a third northbound through lane from the QEW Off-Ramp (westbound terminal) to north of the Queensway is not recommended from a traffic operations perspective.

6.2 Signalized Intersections

Traffic volumes for the future (2031) mitigated scenario are the same as those for the future (2031) base scenario (as outlined in Section 4.3). However, the potential improvement measures outlined in Section 5 were reflected in the Synchro model.

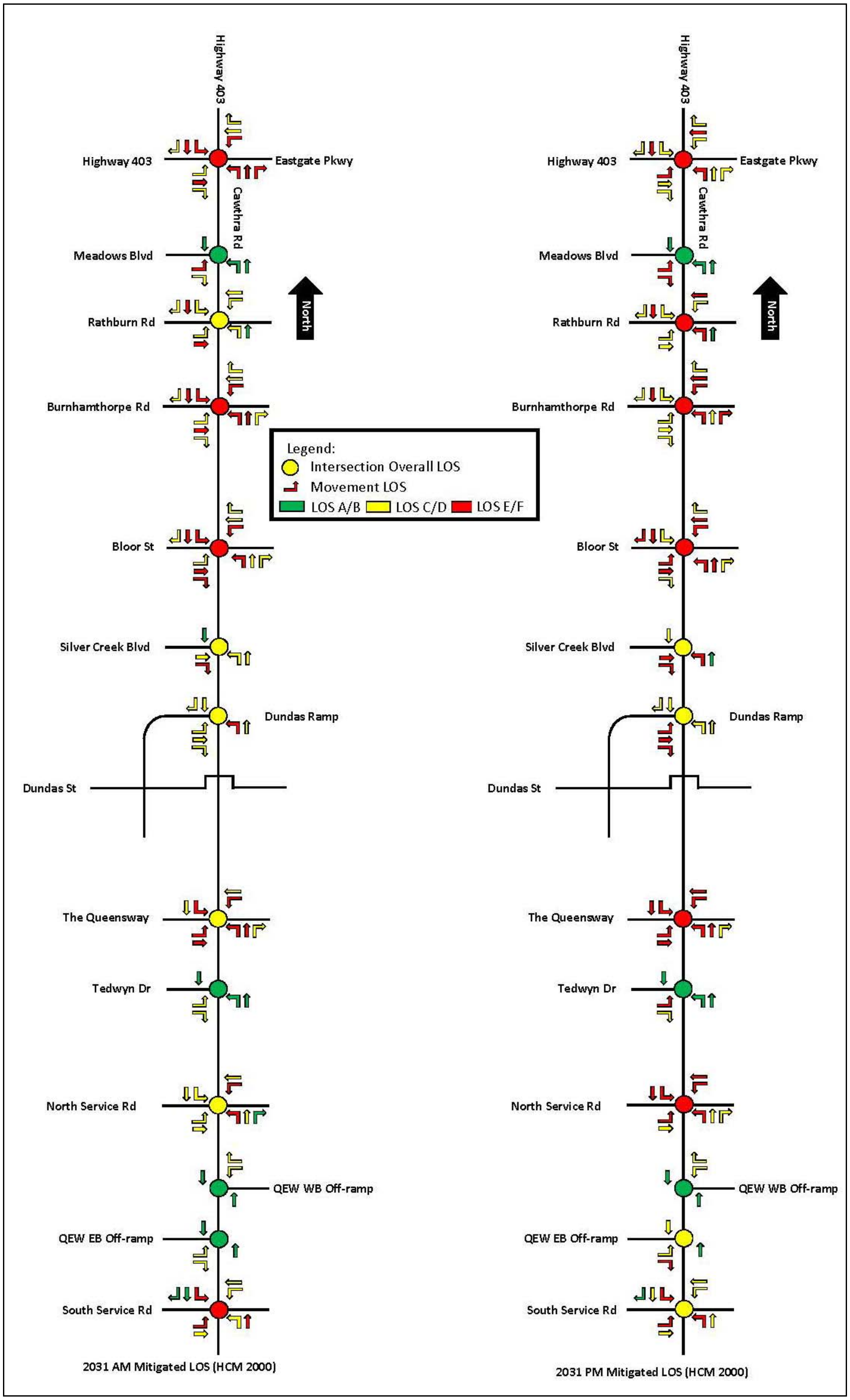
A summary of overall intersection operations for the future mitigated conditions analysis is provided in **Exhibit 6-1**. Complete tables showing critical movements (as per the Region of Peel TIS guidelines) and detailed output of the Synchro analysis provided in ***Appendix D3.***

Exhibit 6-1: Future (2031) Mitigated – Signalized Intersection Operations Summary

Cawthra Rd Intersection (Mitigated Condition)	2031 AM Peak Intersection Performance			2031 PM Peak Intersection Performance		
	LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
Eastgate Pkwy	F	81.3	1.20	E	82.6	1.17
Meadows Blvd	A	6.7	0.51	A	9.6	0.71
Rathburn Rd	D	41.6	0.84	E	58.6	1.11
Burnhamthorpe Rd	F	80.5	1.16	F	122.8	1.29
Bloor St	E	57.2	0.95	E	63.4	1.09
Silver Creek Blvd	C	25.5	0.84	C	28.3	0.85
Ramp to Dundas	D	35.9	0.82	C	32.9	0.79
Queensway	D	53.9	0.92	F	89.0	1.09
Tedwyn Dr	A	8.5	0.60	A	9.4	0.65
North Service Rd	D	36.3	0.98	F	133.3	1.44
South Service Rd	E	66.9	1.21	D	38.7	1.04

Overall LOS for each intersection, as per the future mitigated operations analysis, is illustrated in **Exhibit 6-2.**

Exhibit 6-2: Future (2031) Mitigated – Signalized Intersection LOS Diagram



Assessment of Mitigation Measures

Exhibit 6-3 provides a comparison of signalized intersection operations between the three analysis scenarios based on Intersection Delay. Intersection Delay is a measure of the overall average delay experienced at the intersection, calculated by taking a volume weighted average of all total delays for every intersection movement. Similarly, intersection V/C is a volume weighted average of all volume/capacity ratios for every intersection movement.

Exhibit 6-3: Signalized Intersection Operations – Comparison with Base Conditions

Signalized Intersection	Intersection Delay (Sec)					
	2016 Existing		2031 Base		2031 Mitigated	
	AM	PM	AM	PM	AM	PM
Eastgate Pkwy	60.7	56.8	95.8	74.3	81.3	82.6
Meadows Blvd	8.8	5.6	7.1	9.6	6.7	9.6
Rathburn Rd	32.1	54.1	44.2	73.9	41.6	58.6
Burnhamthorpe Rd	52.2	59.7	81.2	105.6	80.5	122.8
Bloor St	49.2	43.5	62.4	76.4	57.2	63.4
Silver Creek Blvd	21.1	25.4	25.6	26.8	25.5	28.3
Ramp to Dundas	14.3	30.2	38.7	34.0	35.9	32.9
Queensway	48.6	87.2	58.8	118.5	53.9	89.0
Tedwyn Dr	7.9	8.5	8.5	9.4	8.5	9.4
North Service Rd	31.1	85.9	40.1	140.6	36.3	133.3
South Service Rd	42.8	31.7	67.3	64.0	66.9	38.7
		Total	529.7	733.1	494.3	656.7
			Comparison with Base Condition		7.5% reduction	9.1% reduction

Comparing the existing scenario with the two future scenarios, it is can be observed that delays output from the future models are significantly greater than those output from the existing model due to increased traffic volumes through the corridor. Operational improvements at a few intersections were largely due to the optimization of signal phasing/timing splits.

Benefits of improvements when comparing the future mitigated scenario against the future base scenario are less clear. In most cases the benefits to operations due to geometric or phasing improvements are reflected in both the AM and PM peak conditions (although relatively minor). However in several cases, mitigation measures (i.e. fully protected left turn phasing to address safety concerns at Eastgate Parkway and Burnhamthorpe Road) may benefit operations during one peak hour (i.e. AM or PM) at the expense of operations during the other peak hour

6.3 Additional Mitigation Measures

Pedestrian Crossing Signal

Traffic signals along Cawthra Road are typically spaced at less than 400m. Exceptions include:

- Burnhamthorpe Road to Bloor Street (separated by 1055m). In this instance a pedestrian signal has recently been installed at Breckenridge Road, a location which connects to local parks and schools.
- Dundas Street to Queensway (separated by 1115m). No direct access is provided to Cawthra Road within the northern segment between Dundas Street and Needham Lane (525m).

Given the large gap between adjacent signal controlled pedestrian crossings, the warrants for an Intersection Pedestrian Signal (IPS) was reviewed at Needham Lane. Based on the results (provided in ***Appendix D4***), an IPS is not warranted; however it is recommended that this location be monitored for an Intersection Pedestrian Signal (IPS) in the future, similar to that recently installed on Cawthra Road at Breckenridge.

Protected Signal Phasing

As part of the Active Transportation analysis, a review was completed to identify signalized intersections where protected phasing or separate phases would be preferred from an Active Transportation perspective. Findings are documented separately in the Active Transportation Report. A key criteria relates to exposure and is a function of conflicting volume. Below is a summary of locations with heavier right and left turning vehicular volumes that warrant consideration of a fully protected left turn phase or right-turn-on-red (RTOR) restriction.

Exhibit 6-4: Protected Signal Phasing or Turn Lane Restrictions

Signalized Intersection (Cyclist Crossing)		Consideration of Protected Phase or RTOR Restriction (1)				
		West Side		East Side		Comments
		NBL	SBR	SBL	NBR	
Eastgate Pkwy	Multi-Use Trail (west side)	(P)	√	√	√	• Fully protected NBL recommended. Fully protected SB left can be accommodated with minimal delays.
Meadows Blvd	Multi-Use Trail (west side)	√	--	--	--	• Currently a shared SBR lane, so no opportunity to introduce a protected right turn
Rathburn Rd	Multi-Use Trail (west side)	√	√	--	--	• Consider fully protected NBL to avoid conflicts with cyclists
Burnhamthorpe Rd	Multi-Use Trail (west side)	(P)	√	(P)	--	• Fully protected NBL recommended. Fully protected SBL also recommended to mitigate to address safety concerns.
Bloor St	Cycle Track (both sides)	√	--	√	√	
Silver Creek Blvd	Cycle Track (both sides)	√	--	--	--	
Ramp to Dundas	Cycle Track (both sides)	(P)	√	--	--	• Fully protected NBL recommended.
Queensway	Cycle Track (both sides)	(P)	--	P	√	• Fully protected NBL and SBL provided in conjunction with dual left turns
Tedwyn Dr	Cycle Track (both sides)	√	--	--	--	• Currently a shared SBR lane, so no opportunity to introduce a protected right turn
North Service Rd	Cycle Track (both sides)	√	--	√	√	
South Service Rd	N/A	N/A	N/A	N/A	N/A	

(1) Guidance with respect to protected phases, based on volumes exceeding key threshold levels as outlined in on MassDOT's Separated Bike Lane Planning & Design Guide provides
(2) '(P)' reflects (new) protected left turn only phase already included with mitigation condition
(3) '√' reflects movements where protected phase is to be considered, in the future.

It is noted that, a fully protected NBL left turn phasing is already included as part of the mitigation proposed at Eastgate Parkway, Burnhamthorpe Road, Dundas Ramp, and Queensway intersections. In each case, it will also improve safety to pedestrians and cyclists. At the remaining locations (identified as '√') protected phase is to be considered in the future. Since providing these improvements can introduce significant delays to turning vehicles, it is recommended that the introduction of these phases be based on monitoring of operations in the future.

7 Conclusions and Recommendations

Based on the finding of the study and comparison of the Future Base and Future Mitigated scenarios presented in Section 6.3, as well as the additional mitigation traffic signal and signal phasing considerations presented in Section 6.4, the improvement measures as outlined in **Exhibit 7-1** are recommended.

Exhibit 7-1: Summary of Improvement Recommendations

Intersection	Improvement	Notes on Constructability
Eastgate Pkwy	• Add exclusive NBR turn lane	• Sufficient right-of-way available in the SE quadrant • Minor impacts include relocation of electrical manhole, light standards.
	• Provide fully protected NBL phase (to mitigate turning vehicle and pedestrian/ cyclist conflicts)	• Minor traffic signal adjustments.
Rathburn Rd	• Add exclusive SBR turn lane	• No significant impacts to residences fronting Cawthra Road. • Minor impacts include relocation of light standards.
Burnhamthorpe Rd	• Provide fully protected SBL and NBL phase (to mitigate turning vehicle and pedestrian/ cyclist conflicts)	• Minor traffic signal adjustments
Bloor St	• Add exclusive NBR turn lane • Eliminate channelized right turn in NE, NW, and SW quadrants	• Impacts to overhead hydro. • Property takings and impacts to residences to accommodate NBR • Minor impacts include relocation of Bell facilities, light standards.
Silver Creek Blvd	• Extend exclusive NBL lane storage	• Median area south of exclusive NBL already exists (currently hatched) and can be re-painted.
Dundas Ramp	• Provide fully protected, NBL phase (to mitigate turning vehicle and pedestrian/ cyclist conflicts) • Update pavement markings to clarify lane resignations (i.e. EBR merge)	• Minor traffic signal adjustments
Queensway	• Fully protected dual NBL turn lane. • Eliminate channelized right turn in SE, NE, and NW quadrants and convert existing right turn island to "Smart channel" for in the SW quadrant. • Fully protected dual EBL turn lane.	• NBL turning movements can be accommodated without overlapping opposing dual SBL. • Dual EBL involves signal modifications and line painting to convert the existing shadow buffer lane.
North Service Rd	• Add exclusive NBR turn lane • Enhance signing on east and west approaches to warn drivers of the sharpness of curve and signalized intersection ahead.	• Appears sufficiently offset from hydro lines on the east boulevard. • Protected Permissive SBL phase recently added to intersection.
South Service Rd	• Add exclusive SBR turn lane • Enhance signing on east and west approaches to warn drivers of the sharpness of curve and signalized intersection ahead.	• Re-location of minor hydro line may be required.

These improvements (recommended from a traffic operations and safety standpoint) are subject to further review and cost analysis, as part of the subsequent preliminary design development and evaluation as part of the overall Class EA Study.

APPENDIX A

TRAFFIC SAFETY ASSESSMENT

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Memorandum

To/Attention	Allan Ortlieb	**Date**	December 10, 2013 *Revision 1*
From	Matt Colwill	**Project No**	35245
cc	IBI Group	**Steno**	ar
Subject	**Cawthra Road Pre-EA - Safety Review**		

Safety Review

This memorandum presents a review of traffic safety along the Cawthra Road corridor between Eastgate Parkway/Highway 403 and the QEW South Service Road. The Region of Peel provided historical collision data for the study area, summarizing the reported intersection and midblock collisions along the corridor for the five-year period from January 1, 2008 through December 31, 2012.

Along with the collision data, vehicle speed, counts and classification data were provided for consideration as part of the safety review. The speed, volume and classification data were collected on September 10, 11 and 12, 2012 at the following six locations:

i. 100 m north of Arbor Street;

ii. 100 m north of Tedwyn Drive;

iii. 200 m north of Queensway East;

iv. 500 m north of Silver Creek Boulevard;

v. 200 m north of Bloor Street; and

vi. 1000 m north of Burnhamthorpe Road.

Safety performance analysis was provided for an earlier study period spanning from 2005 to 2009. This information provided a benchmark upon which the observed collision history for the current analysis period could be compared.

Analysis and findings related to the collision and speed data are presented in the following sections.

Overall Collision Analysis

Over the five-year analysis period, a total of 1007 reported collisions[1] were reviewed. **Exhibit 1** illustrates the annual distribution of collisions over the analysis period, with a mean of 201 collisions per year.

[1] Out of a total of 1051 collision reports provided. Of these 1051 reports, 41 reports were discarded as they referred to incorrectly filed collisions occurring outside the Cawthra Road corridor, and 3 reports contained insufficient collision information for analysis purposes.

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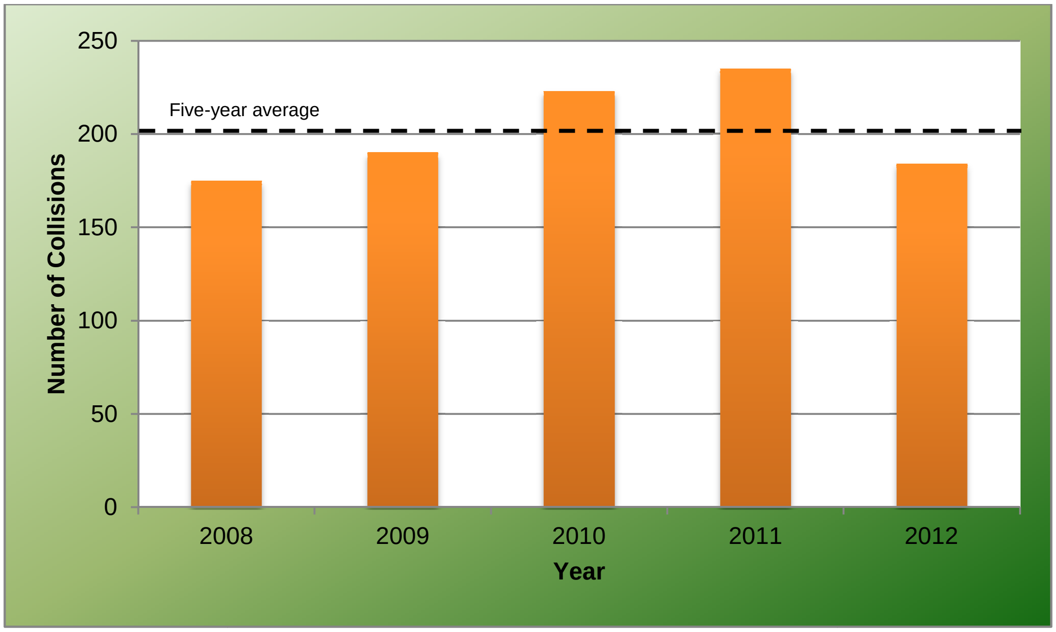
Exhibit 1: Five-year Collision Distribution

Year	2008	2009	2010	2011	2012	Total
Collisions	175	190	223	235	184	1007



Collision data obtained by IBI Group included all signalized intersections and midblock segments along Cawthra Road within the study area. There were no reported collisions the following intersections:

- Intersection of Schomberg Avenue and Cawthra Road;
- Midblock between Hyacinthe Boulevard and Schomberg Avenue;
- Midblock between Queensway East and Melton Drive; and
- Midblock between Melton Drive and Tedwyn Drive.

Exhibit 2 displays the distribution of collisions along Cawthra Road, divided into midblock and intersection collisions. It shows that most of the collisions (890 of 1007) occurred at or near intersections, particularly the intersections at Eastgate Parkway, Bloor Street, Queensway East, North Service Road and South Service Road. The remaining 117 collisions occurred between intersections. Two notable midblock locations were 3643 Cawthra Road, a plaza driveway immediately south of Burnhamthorpe Road East, where 16 collisions occurred, and 655 Queensway East (with access from Cawthra Road immediately north of Queensway East), a commercial driveway, with 35 collisions reported in the five-year study period.

Analysis of each notable intersection and midblock segment is provided later in this memorandum.

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Exhibit 2: Distribution of Collisions along Cawthra Road Corridor

Intersection	Collision Frequency	Midblock	Collision Frequency
Eastgate Parkway/Highway 403	128	Eastgate Parkway/Highway 403 and Meadows Blvd	2
Meadows Blvd	17	Meadows Blvd and Rathburn Road	9
Rathburn Road	37	Rathburn Road and Burnhamthorpe Road East	6
Burnhamthorpe Road East	169	Burnhamthorpe Road and Hassall Road	16
Hassall Road	2	Hassall Road and Runningbrook Drive	2
Runningbrook Drive	7	Runningbrook Drive and Breckenridge Road	1
Breckenridge Road	5	Breckenridge Road and Hyacinthe Blvd	1
Hyacinthe Blvd	1	Hyacinthe Blvd and Schomberg Avenue	0
Schomberg Avenue	0	Schomberg Avenue and Bloor Street	6
Bloor Street	84	Bloor Street and Santee Gate	2
Santee Gate	6	Santee Gate and Silver Creek Blvd	4
Silver Creek Blvd	36	Silver Creek Blvd and Dundas Street Ramp	3
Dundas Street Ramp	37	Dundas Street Ramp and Needham Lane	3
Needham Lane	8	Needham Lane and Orwell Street	7
Orwell Street	16	Orwell Street and Queensway East	45
Queensway East	123	Queensway East and Melton Drive	0
Melton Drive	9	Melton Drive and Tedwyn Drive	0
Tedwyn Drive	23	Tedwyn Drive and North Service Road	3
North Service Road	61	North Service Road and QEW Westbound Ramp	1
QEW Westbound Ramp	11	QEW Westbound Ramp and QEW Eastbound Ramp	3
QEW Eastbound Ramp	34	QEW Eastbound Ramp and South Service Road	3
South Service Road	76		

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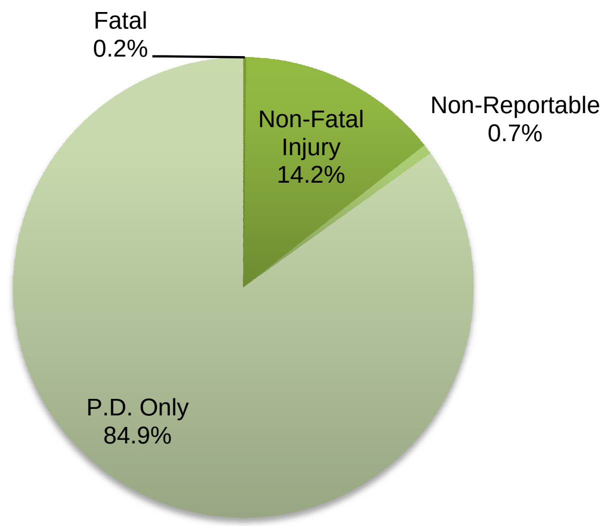
Collision Classification

Exhibit 3 presents a distribution of collisions based on severity. As regional collision distributions were not available for comparison, an analysis of collision over-representation could not be performed. However, as anticipated, the collisions were primarily classified as property damage only (P.D. Only). Non-fatal injury collisions (143) largely resulted from rear end (53) and turning movement (53) collisions. Two fatal collisions occurred along the corridor between 2008 and 2012, both of which were at intersections. These are discussed within the analysis for the intersections at Bloor Street and at the westbound QEW ramp.

Exhibit 3: Corridor Collision Distribution by Severity

Fatal	Non-Fatal Injury	Non-Reportable	P.D. Only
2	143	7	855



Initial Impact Type

Exhibit 4 shows the distribution of collisions by initial impact type. The dominant collision type along Cawthra Road, as anticipated of an urban commuter corridor, is rear-end collisions (45%); these are concentrated at the intersections (408 of 451 rear-end collisions), and generally occurred during periods of higher traffic demand. Rear-end collisions tended to be more common at intersections with significant queuing.

After rear-end collisions, the next most common impact type along the corridor was found to be turning movement collisions. This collision type is also concentrated at the corridor intersections, and is also likely to be influenced by traffic congestion. As gaps between vehicles become smaller and less frequent, and delays increase, drivers will tend to attempt more aggressive turning movements, and turning collisions subsequently tend to increase in frequency. Turning movement collisions represent approximately 33% of all collisions along the corridor, with a significant number reported at the intersections of Cawthra Road at Queensway East and Cawthra Road at Burnhamthorpe Road East, as discussed later within the intersection analysis.

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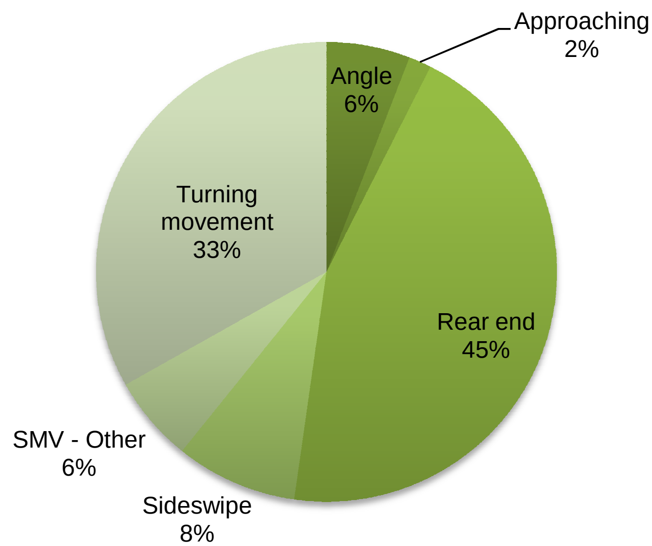
Exhibit 4: Corridor Collision Distribution by Initial Impact Type

Angle	Approaching	Rear end	Sideswipe	SMV Other	Turning
59	16	451	86	61	334



Time of Collision

Exhibit 5 shows the collision distribution for the corridor based on time-of-day. The data indicates that the vast majority of the collisions (775 of 1007) occurred between the hours of 7:00 AM and 7:00 PM. This information reinforces the observation that many of the collisions are a product of heavy congestion, as observed by the collision spikes associated with the AM (7:00 AM-10:00 AM) and PM (3:00 PM-7:00 PM) peak periods. The results further reinforce the connection between congestion and rear-end and turning vehicle collisions. These observations are most pronounced during the PM peak period, as approximately one third of all collisions occur between 3:00 PM and 7:00 PM.

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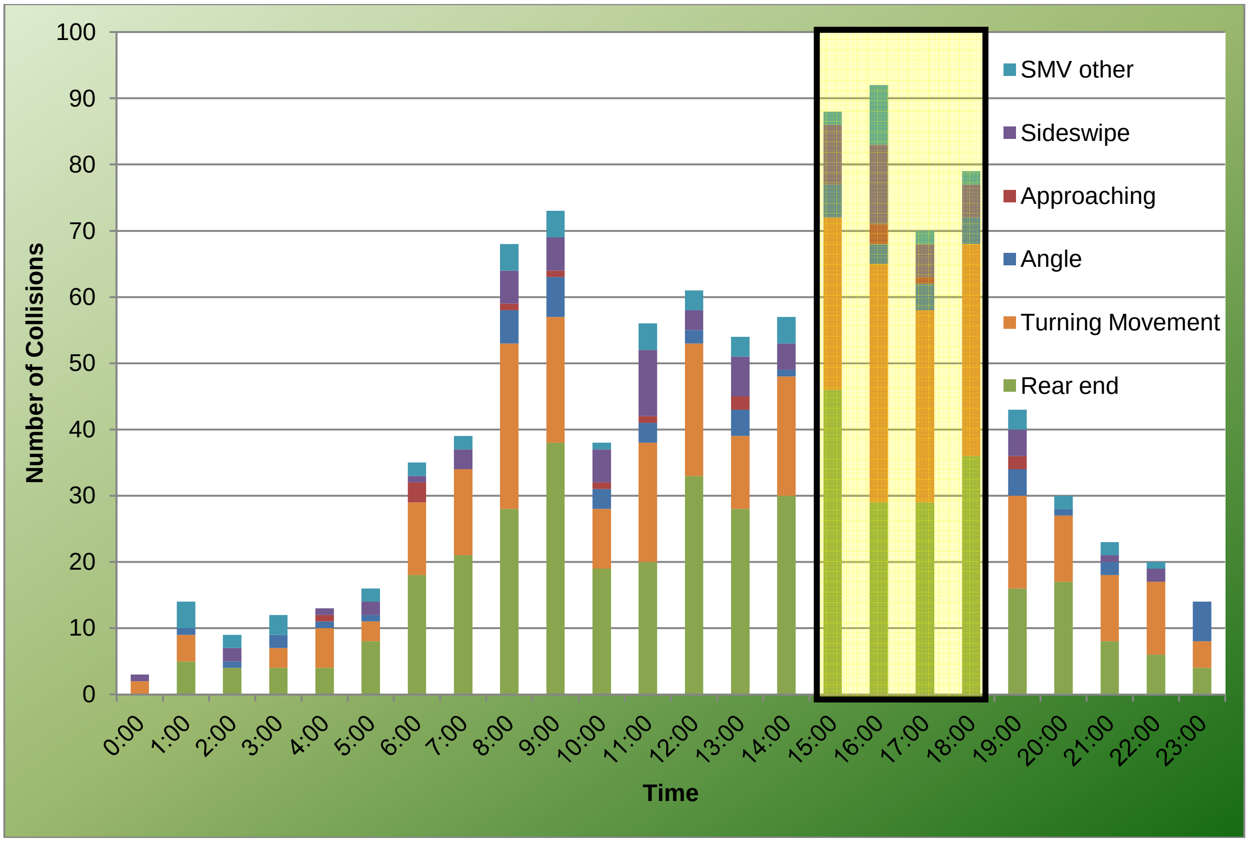
Exhibit 5: Hourly Collision Frequency by Type



Road and Weather Conditions

An analysis of road and weather conditions was conducted for all collisions, and the results suggest that weather, in addition to congestion, may be a contributing factor in the safety performance of the corridor. **Exhibit 6** shows the collision distribution under various road surface conditions, while **Exhibit 7** indicates the reported weather conditions at the time of collision.

It was found that approximately 30% of the reported collisions occurred under compromised (e.g., wet, icy, slushy, snow-covered, etc.) road surface conditions, and approximately 20% of collisions occurred during inclement weather. There was a higher representation of single vehicle collisions related to loss of control during periods of poor road and weather conditions. These trends were particularly pronounced at the North and South Service Roads of the QEW, where sharp curves and speeds on intersection approaches were found to be a factor in the collision history. Further analysis is provided for each of these intersections.

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Exhibit 6: Collision Frequency by Road Surface Condition

Dry	Loose Snow	Ice	Other	Packed Snow	Slush	Wet
719	22	10	11	4	13	228

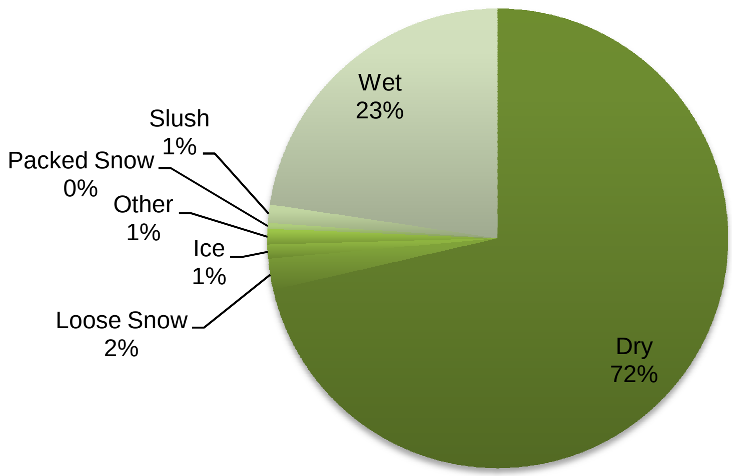
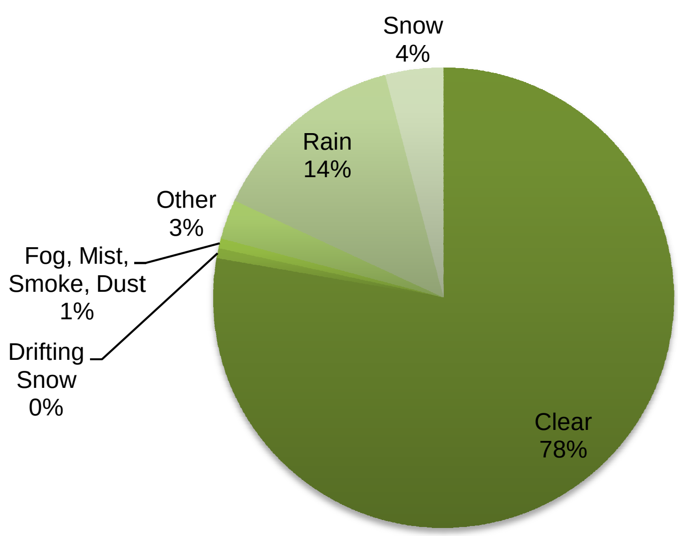


Exhibit 7: Collision Frequency by Weather Conditions

Clear	Drifting Snow	Fog, Mist, Smoke, Dust	Other	Rain	Snow
783	7	7	28	141	41



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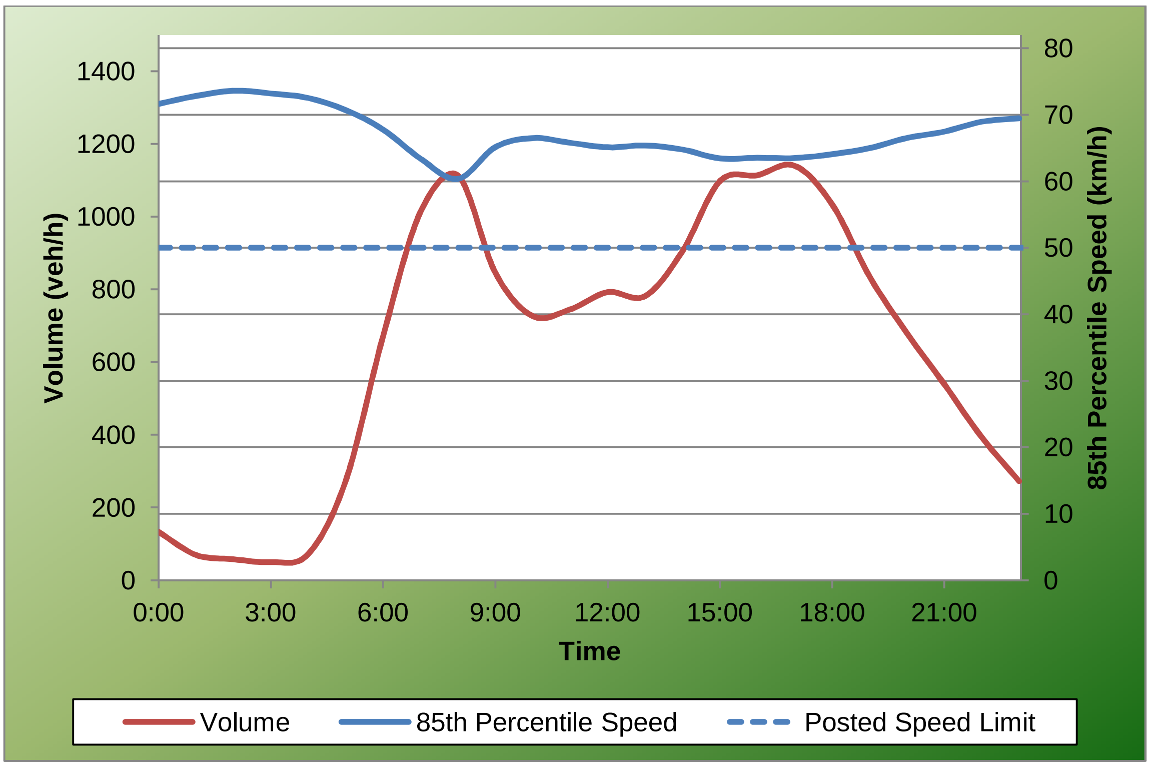
Traffic Volume and Operating Speed Analysis

Exhibit 8 provides a summary of the 24-hour speed and traffic volume observations from September 10-12, 2012, averaged throughout the corridor for northbound and southbound directions.

Exhibit 8: Hourly Corridor Traffic Volume and Speed



It can be seen that speeds well above the 50 km/h posted limit are maintained throughout the day, with the most excessive speeds in the overnight hours reaching well over 70 km/h.

Two clear bi-directional volume peaks in the AM and PM peak periods are observed between the hours of 7:00 AM and 9:00 AM, and between 3:00 PM and 7:00 PM. While a consistent decrease in AM peak period speed occurred around 8:00 AM, PM speeds generally remained consistent despite the peaking in traffic volumes. Complete speed and traffic volume data can be found in **Appendix B**.

Historical traffic volumes indicate a decline in demand on Cawthra Road over recent years, as shown in **Exhibit 9**. Specifically, annual average daily traffic (AADT) on the corridor has decreased from 2005 to 2012 by 24%. Traffic volume well below capacity is consistent with high speeds observed along the corridor, which may be a contributing factor in areas of safety underperformance.

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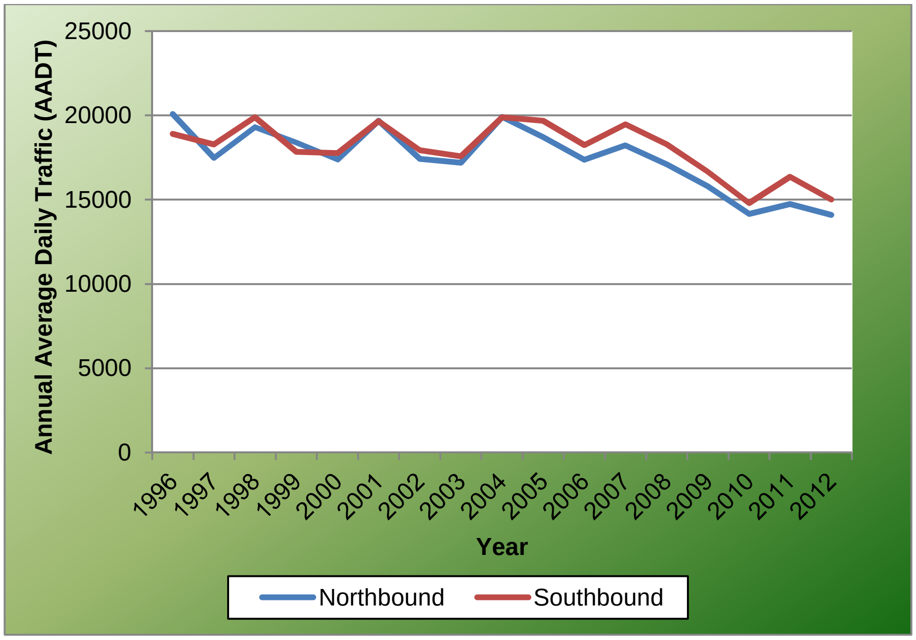
Exhibit 9: Cawthra Road AADT, 1996-2012



Historical Safety Performance

The Region of Peel provided a history of safety performance along the Cawthra Road corridor since 2005, categorized into two study periods: 2005-2009 and 2008-2012. During the period from 2005 to 2009, an annual collision frequency of 133 collisions per year was reported. In the 2008-2012 study period, the collision frequency increased to 168 collisions per year (26% increase), potentially indicative of worsening safety performance along the corridor. However, it should be noted that the study periods overlapped by two years (2008 and 2009), resulting in the increase being largely attributed to two above-average years of collisions in 2010 and 2011 (shown earlier in **Exhibit 1**).

Exhibit 10 presents a comparison of historical safety performance from 2005 to 2012, indicating that six (6) of the 15 major intersections and midblock segments had an increase in collision frequency from the 2005-2009 to the 2008-2012 study period. While potential for safety improvement (PSI) values could not be generated for the latter study period due to data constraints, it can be seen that six (6) intersections underperformed during the 2005-2009 study period with PSI values ranging from 8 to 36; these values represent the excess number of collisions observed over the study period as compared to predicted 5-year collision frequency for intersections of similar configuration.

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Exhibit 10: Summary of Intersection Collision Data

Intersection	Observed Collisions, 2005-2009 *Total (PDO, F+I)*	Potential for Safety Improvement (PSI), 2005-2009	Observed Collisions, 2008-2012 *Total (PDO, F+I)*	Collision Rate, 2008-2012[1]	Percent Change in Collision Frequency (2005-2009 vs. 2008-2012)
Eastgate Parkway / Highway 403	110 (100, 10)	0	128 (109, 19)	1.27	16%
Meadows Boulevard	14 (9, 5)	7.71	17 (12, 5)	0.28	21%
Rathburn Road East	38 (34, 4)	0	37 (32, 5)	0.42	-3%
Burnhamthorpe Road East	147 (130, 17)	0	169 (149, 20)	1.43	15%
3643 Cawthra Road	N/A	N/A	16 (13, 3)	N/A	N/A
Bloor Street	63 (52, 11)	0	84 (72, 12)	0.81	33%
Silver Creek Boulevard	37 (27, 10)	35.59	36 (33, 3)	0.46	-3%
Ramp to Dundas Street East	64 (62, 2)	35.16	77 (68, 9)	0.78	20%
655 Queensway East	N/A	N/A	35 (29, 6)	N/A	N/A
Queensway East	139 (121, 18)	14	123 (106, 17)	1.02	-12%
Tedwyn Drive	26 (21, 5)	11.87	23 (19, 4)	0.31	-12%
North Service Road	53 (44, 9)	0	61 (57, 4)	0.66	15%
QEW Westbound Ramp	8 (6, 2)	0	11 (8, 3)	0.16	38%
QEW Eastbound Ramp	35 (31, 4)	10.59	34 (28, 6)	0.47	-3%
South Service Road	46 (38, 8)	0	76 (64, 12)	0.77	65%

[1]Collisions per million intersecting vehicles.

The collision rates calculated for the Eastgate Parkway, Burnhamthorpe Road East and Queensway East intersections with Cawthra Road were significantly higher than the other intersections; potential reasons for these high collision rates are examined later within the intersection analysis.

For each of the intersections and midblock segments listed above, a review of safety operations is presented below.

Intersection Collision Analysis.

The following sections describe the analysis and findings related to collisions at each of the study area intersections and midblock segments previously identified. For locations with significant traffic volume and/or collision trends, a collision diagram is provided in **Appendix A**. The diagrams illustrate collision trends and concentrations along the corridor, and depict the vehicle movements and initial directions of travel of the involved vehicles for each reported collision.

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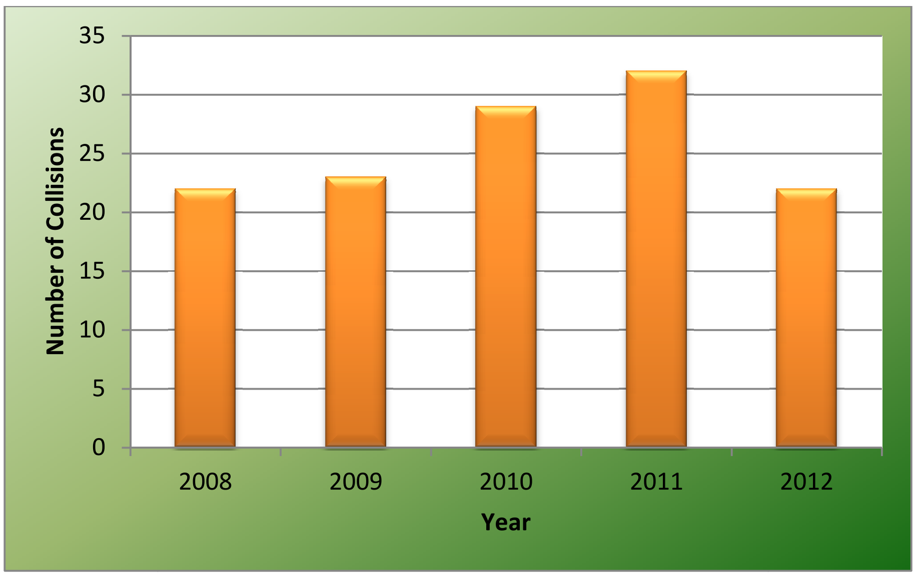
Eastgate Parkway / Highway 403

Cawthra Road reaches its northern terminus at the intersection of Eastgate Parkway and two ramps from Highway 403. As a major 4-way signalized intersection, heavy traffic volumes and potentially high speeds have contributed to the collision history as the road transitions between freeway and arterial character.

A total of 128 collisions were reported over the five-year period from 2008 to 2012, representing an increase of 16% from the previous study period of 2005 to 2009. **Exhibit 11** indicates the annual distribution of collisions over the analysis period. The intersection had the second highest collision frequency of all intersections along the corridor. The collision rate, normalized against traffic volume, was also second highest among all intersections studied (1.27 collisions per million intersecting vehicles), indicative of the relatively poor traffic safety performance at this intersection.

Exhibit 11: Eastgate Parkway/Highway 403 Annual Collision Frequency



An analysis of collision impact types reveals a prevalence of rear-end collisions (55%) followed by turning movement collisions (34%), with low occurrence of other collision types as illustrated in **Exhibit 12**.

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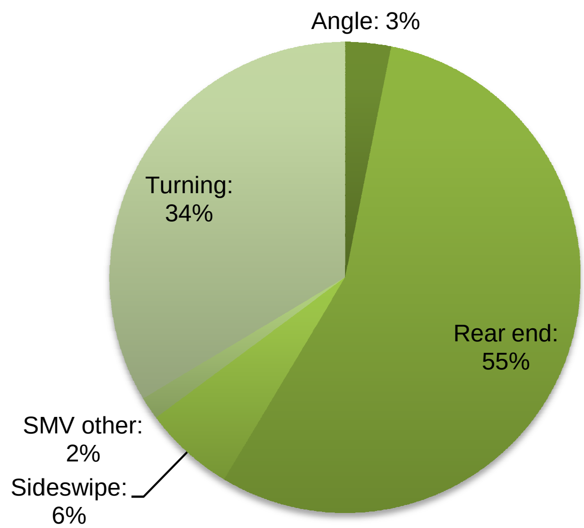
Exhibit 12: Eastgate Parkway/Highway 403 Collisions by Initial Impact Type

Angle	Approaching	Rear-end	Sideswipe	SMV other	Turning	N/A
4	0	71	8	2	43	0



The data show that 85% of the collisions resulted in property damage only, with the remaining 15% comprised of non-fatal injuries. The large number of rear-end collisions is consistent with the character of the intersection, with a 140 second traffic signal cycle length and long queues in all directions. Most of these rear-end collisions were relatively minor, resulting in property damage only. Of the 43 turning movement collisions reported, the clearest trends were observed in left-turn collisions, illustrated in the collision diagram in **Appendix A**. Left-turns from northbound Cawthra Road to westbound Highway 403 had the highest frequency of turning movement collisions, with the majority likely resulting from gap misjudgment by the left-turning vehicle. All four directions of left-turns are given protected and permitted signal phases.

It was found that five (5) left-turn collisions were the fault of the through traffic disobeying the traffic signal; all five of these were attributed to eastbound or southbound vehicles which originated from Highway 403. With no apparent sightline issues, it should be investigated whether the ramp traffic is given sufficient warning to slow from the highway speed limit of 100 km/h to the arterial speed limit of 50 km/h (Cawthra Road) or 70 km/h (Eastgate Parkway). Current signage advises a ramp speed of 90 km/h on the southbound approach, with a “50 km/h ahead” sign placed immediately upstream of the intersection.

Meadows Boulevard

The intersection of Cawthra Road and Meadows Boulevard is a signalized three-leg intersection 400 m south of Eastgate Parkway, south of which Cawthra Road is abutted on both sides by residential land uses. From 2008 to 2012, there were 17 reported collisions, five (5) of which resulted in non-fatal injuries (29%). The five-year distribution of collisions is illustrated in **Exhibit 13**, showing an absence of collisions in 2009.

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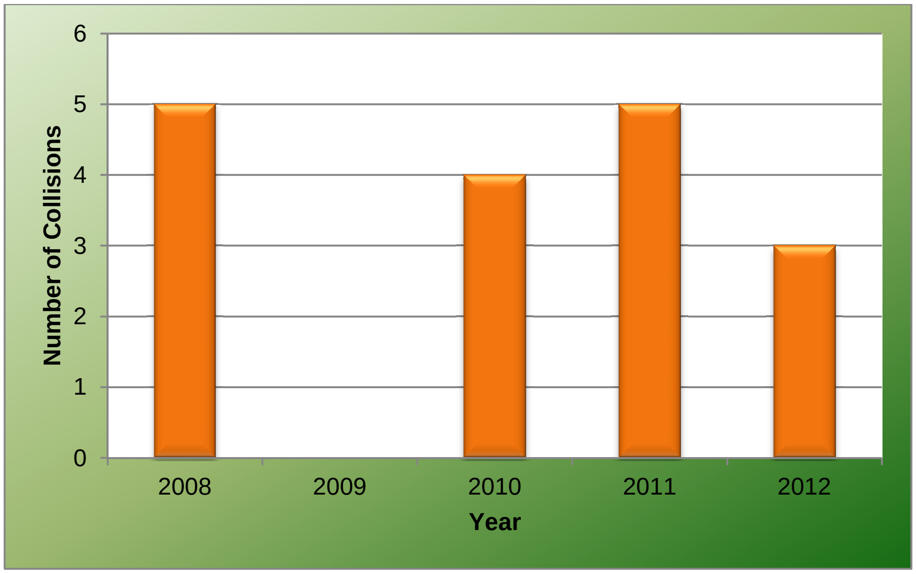
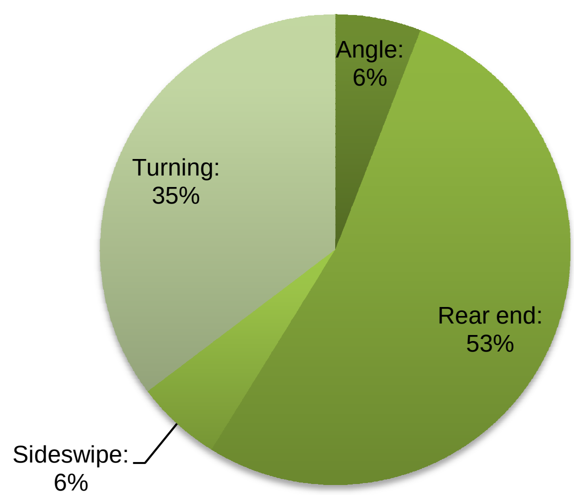
Exhibit 13: Meadows Boulevard Annual Collision Frequency



The most frequent collision type was rear-ends (53%), again followed by turning movement collisions (35%) as shown in **Exhibit 14**.

Exhibit 14: Meadows Boulevard Collisions by Initial Impact Type

Angle	Approaching	Rear-end	Sideswipe	SMV other	Turning	N/A
1	0	9	1	0	6	0



The collision frequency (3.4 per year) and collision rate (0.28 collisions per million intersecting vehicles) are among the lowest of signalized intersections within the Cawthra Road corridor, with a typical pattern of collisions observed.

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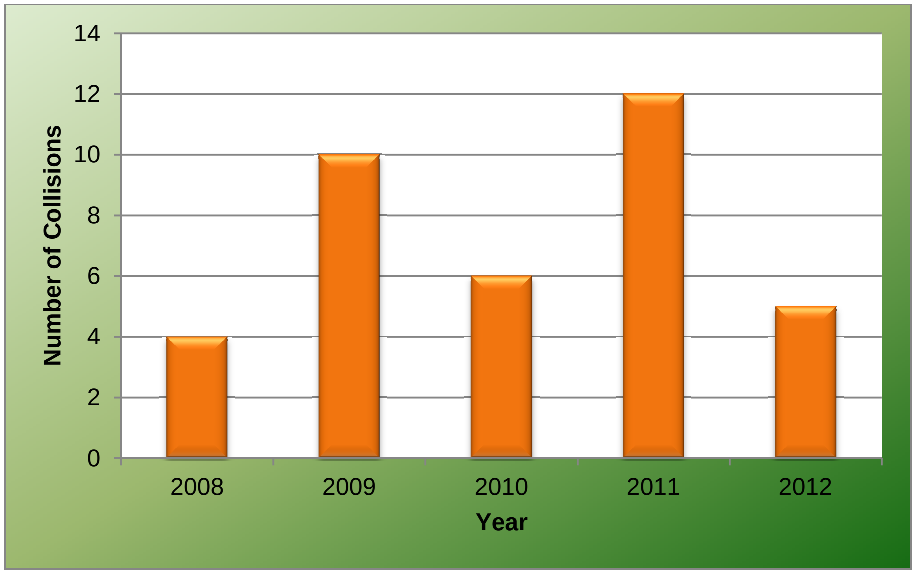
Rathburn Road East

Cawthra Road and Rathburn Road East intersect at a 4-leg signalized intersection in a predominantly residential area. There were 37 collisions reported in the five-year period ending in 2012, with an annual frequency illustrated in **Exhibit 15**. Since 2005, there was a 2.6% decrease in collision frequency. Five (5) out of the 37 collisions resulted in personal injury (14%).

Exhibit 15: Rathburn Road East Annual Collision Frequency



While rear-end collisions were the most frequently reported type of initial impact (43%), turning movement (22%), angle (16%), and sideswipe (14%) collisions also represented a relatively even proportion of collisions (**Exhibit 16**).

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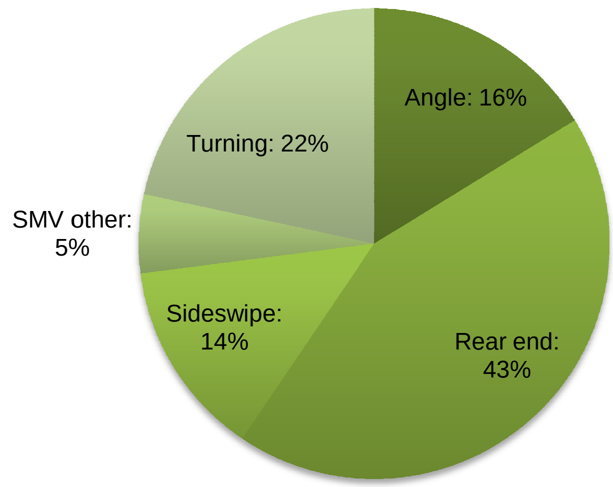
Exhibit 16: Rathburn Road East Collisions by Initial Impact Type

Angle	Approaching	Rear-end	Sideswipe	SMV other	Turning	N/A
6	0	16	5	2	8	0



Rear-end collisions were most prevalent on the southbound approach, followed by the northbound approach. Angle collisions were most frequent among the southbound and eastbound approaches, with an even split of at-fault drivers between these two approaches. Overall, the intersection performed significantly better than predicted by safety performance models, and had a collision rate of only 0.4 collisions per million intersecting vehicles.

Burnhamthorpe Road East

Cawthra Road and Burnhamthorpe Road East intersect at a 4-leg signalized intersection in a predominantly residential area. There were 169 collisions reported in the five-year period ending in 2012, with an annual frequency illustrated in **Exhibit 17**. Since 2005, there was a 15% increase in collision frequency. The intersection had the highest collision frequency of any intersection along the corridor. The collision rate, normalized against traffic volume, was also highest among all intersections studied (1.43 collisions per million intersecting vehicles), indicative of the relatively poor traffic safety performance at this intersection. Twenty (20) out of the 169 collisions resulted in personal injury (12%).

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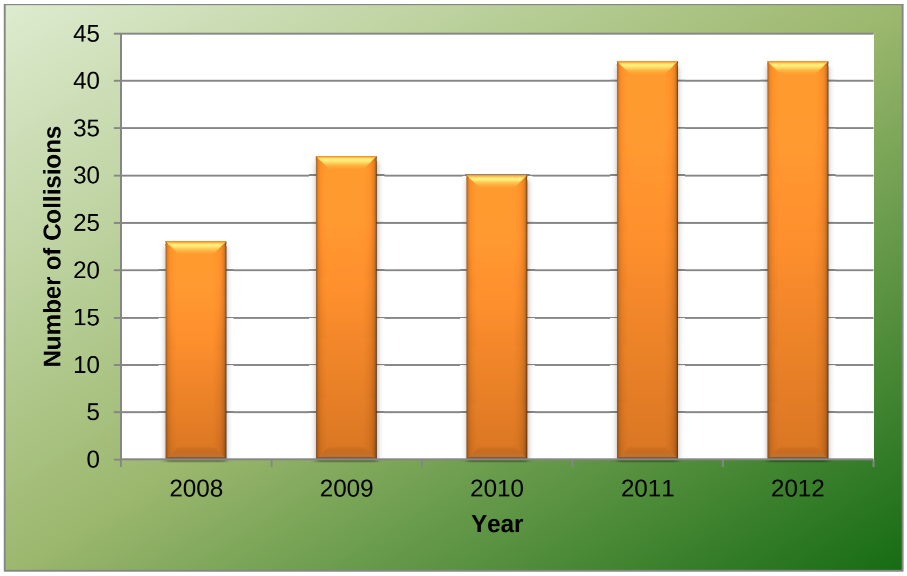
Exhibit 17: Burnhamthorpe Road East Annual Collision Frequency



While rear end collisions still comprised a significant proportion (30%) of collisions at the Burnhamthorpe Road East intersection, they did not represent the dominant collision type; which is unlike all other intersections along Cawthra Road. Turning movement collisions were the dominant collision type (52%). Seventy (70) of the 87 turning movement collisions were between southbound left turning vehicle and a northbound through vehicle indicating a significant problem. Sight lines were not observed to be problematic and there is a dedicated southbound left-turn phase; albeit only a 12 second phase (including amber). The short duration of the dedicated left-turn phase suggests that a significant portion of left turning vehicles are completing the turns during the permitted phase, which is likely contributing to the high collision frequency. Additionally, the intersection geometry is skewed leading to a larger-than-90-degree southbound left-turn, which is uncommon.

The intersection of Burnhamthorpe Road East and Cawthra Road has recently undergone geometric improvements. The channelized right-turn lanes have been replaced with dedicated right-turn lanes. Additionally, the intersection skew has been slightly corrected using the extra space provided by the removed channelized right-turns. These intersection geometric improvements could have partially addressed the factors contributing to the large number of southbound left turning movement collisions. Therefore, it may be several years before it is know whether or not the new intersection geometry has improved safety performance.

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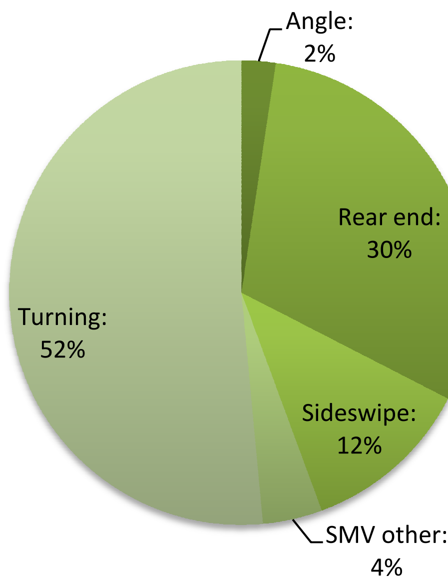
Exhibit 18: Burnhamthorpe Road East Collisions by Initial Impact Type

Angle	Approaching	Rear-end	Sideswipe	SMV other	Turning	N/A
4	0	51	20	7	87	0



3643 Cawthra Road (Plaza Driveway 120 metres south of Burnhamthorpe Road East)

The commercial plaza located at 3643 Cawthra Road was identified as having a higher than predicted collision frequency. The plaza is located on the east side of Cawthra Road 120 m south of Burnhamthorpe Road East. Left-turns into the plaza parking lot are facilitated by a centre two-way left-turn lane. Left-turns in and out of the plaza must cross 3 northbound lanes, consisting of two through lanes and one right-turn storage lane for Burnhamthorpe Road East, as well as the taper of a downstream left-turn lane.

A total of 16 collisions were reported in the vicinity of this driveway, including three (3) injury collisions (19%). The five-year history of collision frequency is shown in **Exhibit 19**.

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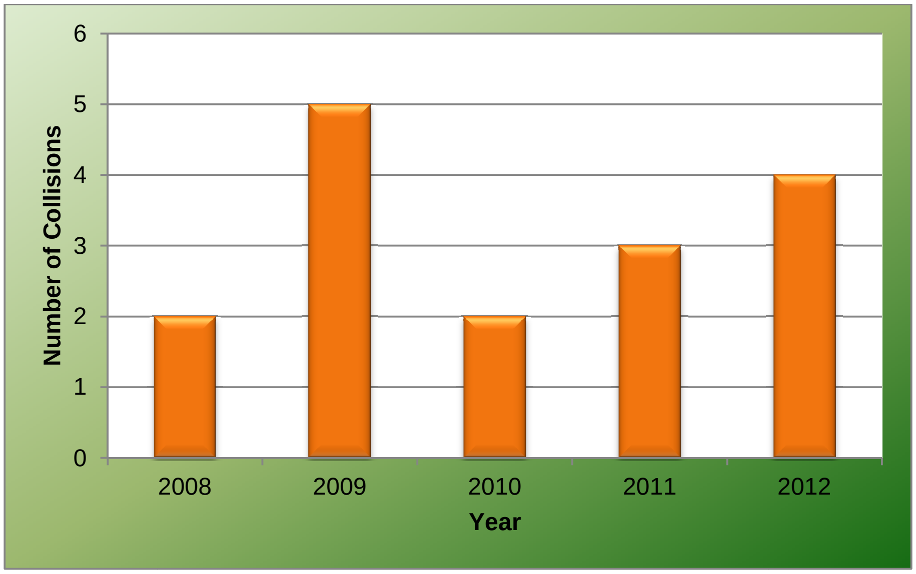
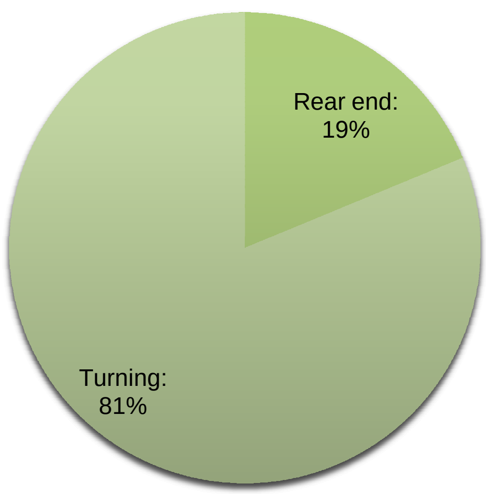
Exhibit 19: 3643 Cawthra Road Annual Collision Frequency



Most of the reported collisions were related to turning movements (81%), as shown in **Exhibit 20**.

Exhibit 20: 3643 Cawthra Road Collisions by Initial Impact Type

Angle	Approaching	Rear-end	Sideswipe	SMV other	Turning	N/A
0	0	3	0	0	13	0



With northbound queues for Burnhamthorpe Road East potentially stretching back to this midblock driveway, the rear-end collisions can likely be attributed to these queues.

Signage indicating “Left Turns: Centre Lane Only” is placed immediately upstream of the plaza in both directions, alluding to a possible history of safety concerns identified at this location. The collision diagram in **Appendix A** illustrates how the majority of turning movement collisions (7 out of 12) were caused by left-turns from southbound Cawthra Road into the plaza, while four (4)

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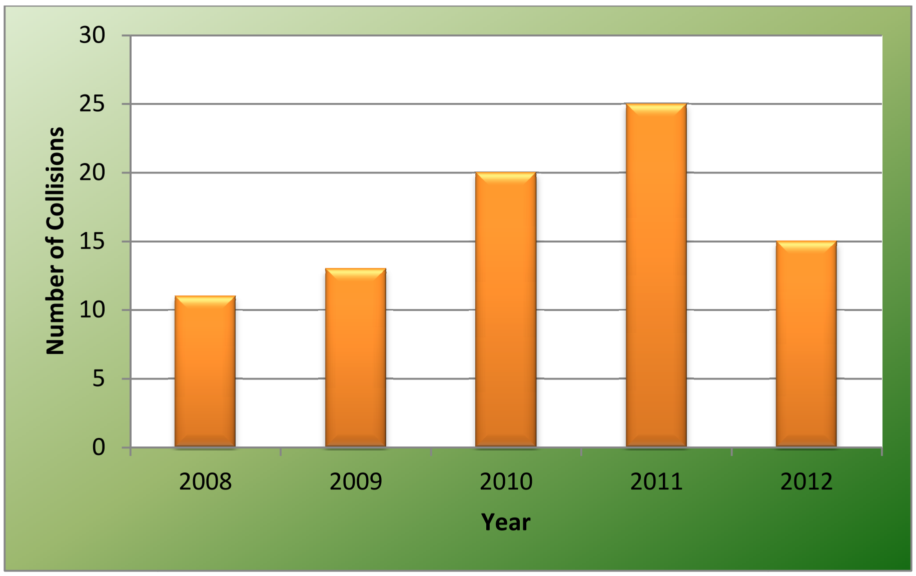
others were caused by left-turns exiting the plaza. The centre left-turn lane transitions to a raised concrete median approximately 30 m north of the driveway entrance, causing the centre left-turn lane to narrow and limit the left-turn storage length available. Potential treatments (e.g., banning certain left-turn movements) should be considered to mitigate the risk of collision at this location.

Bloor Street

The intersection of Cawthra Road at Bloor Street is a 4-leg signalized intersection located in a largely residential area. There were 84 collisions reported in the five-year period ending in 2012, with a gradually increasing yearly collision frequency as indicated in **Exhibit 21**.

Exhibit 21: Bloor Street Annual Collision Frequency



The distribution of collisions by initial impact type shows that the majority of collisions were rear-ends, as illustrated in **Exhibit 22**. This is followed by turning movement collisions, the majority of which were related to left-turning movements.

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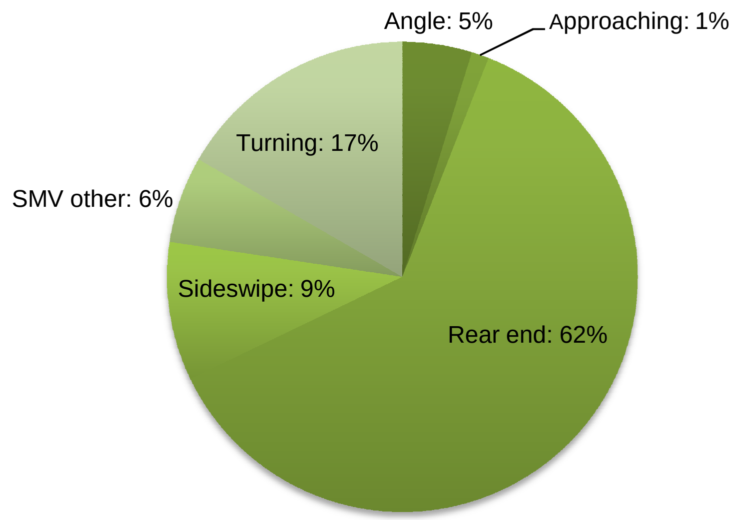
Exhibit 22: Bloor Street Collisions by Initial Impact Type

Angle	Approaching	Rear-end	Sideswipe	SMV other	Turning	N/A
4	1	52	8	5	14	0



The traffic operations analysis indicates the presence of long queues, most notably in the northbound direction. As indicated in the collision diagram in **Appendix A**, this is consistent with a pattern of northbound rear-end collisions (21 over five years). A distribution of traffic speeds indicates widespread non-compliance with the 50 km/h speed limit, with an 85^{th} percentile speed varying throughout the day from 64 km/h to 72 km/h northbound, and from 66 km/h to 79 km/h southbound. Excessive speeding was generally found to occur between the hours of 8:00 pm and 6:00 am.

The distribution of collisions by severity indicates that 85% of collisions resulted in property damage only (70 collisions), and 13% resulted in personal injury (11 collisions). A fatal collision occurred in 2009 when a northbound driver disobeyed the traffic signal, colliding with a westbound driver in an angle collision.

With a collision rate of 0.81 per million intersecting vehicles, the intersection was found to perform better than predicted by the safety performance model. Nevertheless, factors such as excessive speed and heavy turning volumes may have contributed to the high number of collisions at this intersection.

Silver Creek Boulevard

Cawthra Road at Silver Creek Boulevard is a signalized three-leg intersection where Cawthra Road begins to transition from residential towards commercial and industrial land uses. There were 36 collisions reported at this intersection between 2008 and 2012, with no clear increasing or decreasing trend, as shown in **Exhibit 23**.

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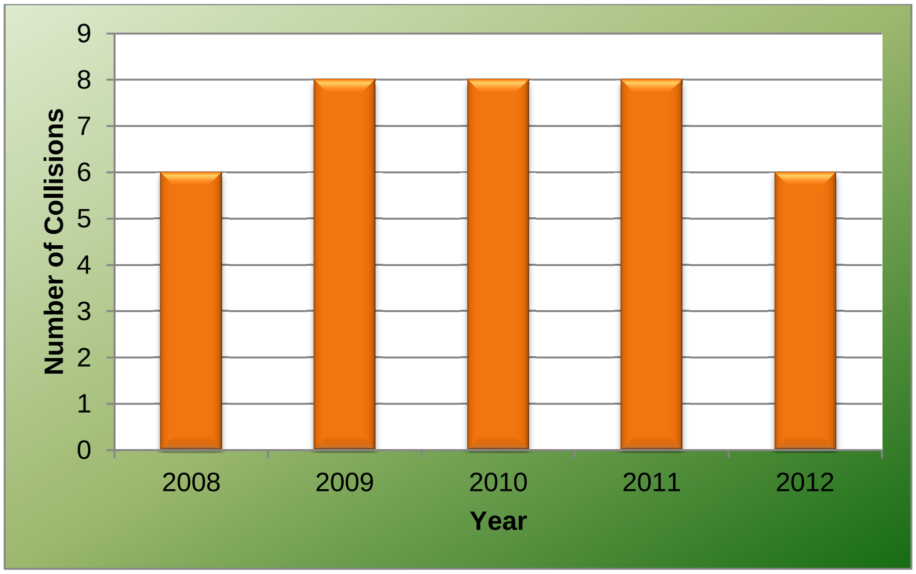
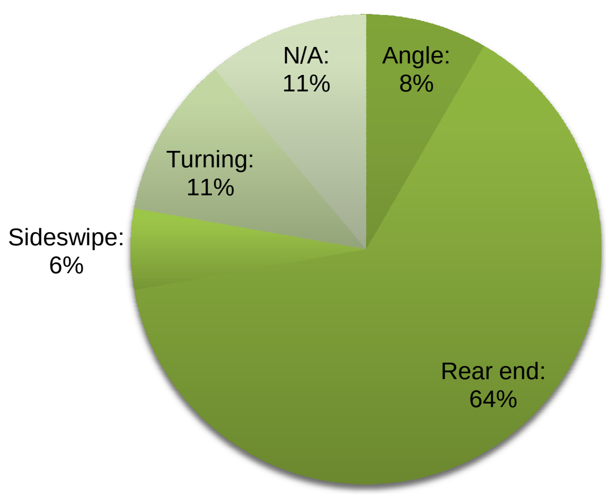
Exhibit 23: Silver Creek Boulevard Annual Collision Frequency



The intersection was found to have almost three times as many PDO (property damage only) collisions as was predicted over this five-year time span, with a particularly large incidence of southbound rear-end collisions. The complete distribution by initial impact type is shown in **Exhibit 24**.

Exhibit 24: Silver Creek Boulevard Collisions by Initial Impact Type

Angle	Approaching	Rear-end	Sideswipe	SMV other	Turning	N/A
3	0	23	2	0	4	4



The predominance of southbound rear-end collisions is consistent with the larger southbound volumes throughout the day, with AM and PM peak period volume of 1400 vehicles per hour, compared to the northbound AM and PM peak period volumes of 1100 vehicles per hour.

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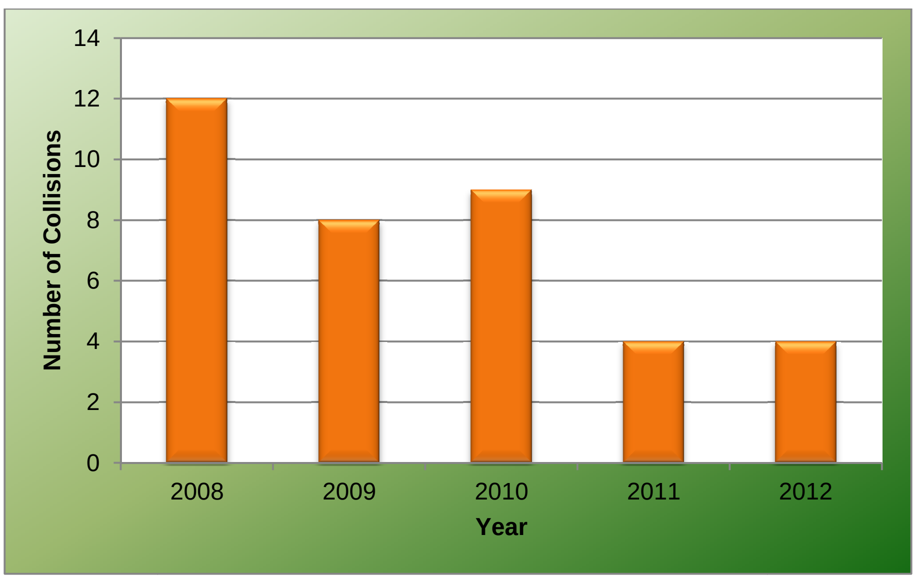
Furthermore, the intersection is closely spaced to the Dundas Street ramp intersection, located 170 m south of Silver Creek Boulevard. This short spacing may encourage drivers to accelerate through Silver Creek Boulevard to reach Dundas Street, and may be a factor in explaining the history of collisions at this intersection.

Ramp to Dundas Street East

Dundas Street East and Cawthra Road are grade separated, and are connected via a signalized ramp. The intersection of Cawthra Road and the ramp to Dundas Street is 4-way with a church driveway comprising the westbound approach. Right-turns to and from the ramp are channelized, and the character of the road is conducive to high speeds as similarly observed at Silver Creek Boulevard.

Through the assessment of the 87 collisions occurring at the Dundas Street and Cawthra Road ramp, 40 collisions were observed to occur at the Dundas Street ramp terminal intersection rather than the Cawthra Road ramp terminal intersection. As such, these collisions are outside the scope of this study and were not included within this assessment. There were 37 collisions reported between 2008 and 2012, and a year-to-year comparison indicates a drop in collision frequency over this period as shown in **Exhibit 25**, as well as a drop since the previous five-year study period.

Exhibit 25: Dundas Street Ramp Annual Collision Frequency



Of these 37 collisions, 33 resulted in property damage only (89%), while the remainder involved non-fatal injuries. As illustrated in **Exhibit 26**, the majority of collisions (57%) were rear-end, while turning movement (24%) and sideswipe (16%) collisions made up the bulk of the other collision types.

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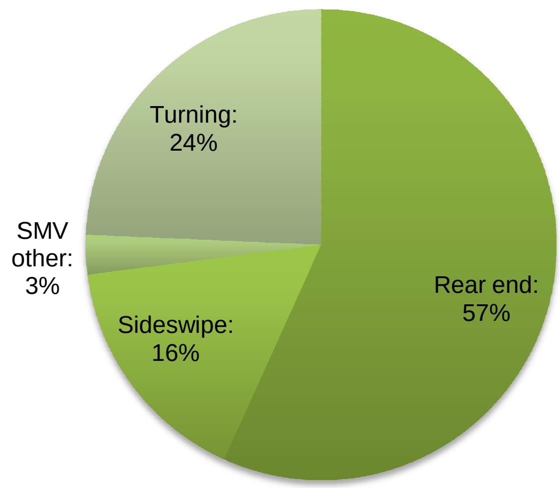
Exhibit 26: Dundas Street Ramp Collisions by Initial Impact Type

Angle	Approaching	Rear-end	Sideswipe	SMV other	Turning	N/A
0	0	21	6	1	9	0



The collision diagram in **Appendix A** shows a clear trend of rear-end collisions immediately south of the intersection, where vehicles turning right from the Dundas Street ramp to southbound Cawthra Road must merge out of the channelized right-turn. Despite a yield sign warning drivers to wait for a gap, it is ambiguous to drivers whether a complete merge lane exists following the channel, or whether drivers must immediately enter the right lane of through traffic. No pavement markings exist to indicate the end of the right-turn channel, which is inconsistent with other nearby intersections that clearly indicate the presence of a right-turn merge lane.

The other clear pattern of collisions is northbound left-turns colliding with southbound through traffic. Analysis of collision reports indicates that all seven (7) of these collisions were the fault of improper turns by northbound traffic destined for Dundas Street. It should be noted that the character of southbound Cawthra Road is highly conducive to speeding, with a downhill section immediately downstream of the intersection towards the Dundas Street underpass, and an extended stretch of road with no accesses or signals. Therefore, while northbound left-turns may be at fault for these collisions, the issue of gap identification may be a contributing factor.

655 Queensway East (Gas Station Driveway on Cawthra Road 90 m north of Queensway East)

With the highest frequency of midblock collisions along the entire corridor, the driveway to 655 Queensway East was found to be significantly underperforming from a safety perspective. The driveway provides access to a gas station and plaza on the north-west corner of the intersection of Cawthra Road and Queensway East and, similar to the midblock access at 3643 Cawthra Road, left-turns from Cawthra Road are facilitated by a centre two-way left-turn lane.

There were 35 collisions reported in the vicinity of this driveway between 2008 and 2012. Annual collision frequency is illustrated in **Exhibit 27**, and it indicates high variability in collision frequency from year to year. Compared to the predicted collision frequency for this midblock segment, there were five times as many collisions observed as were predicted.

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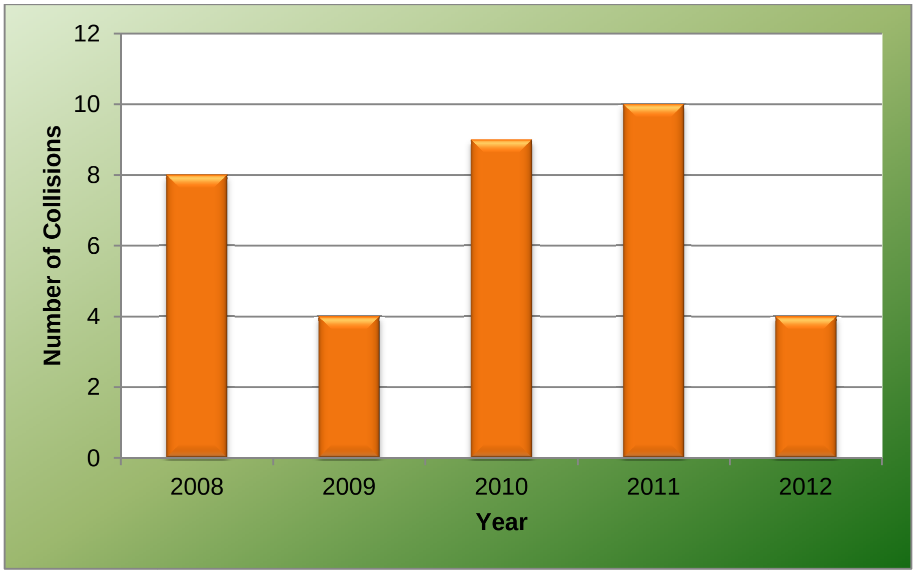
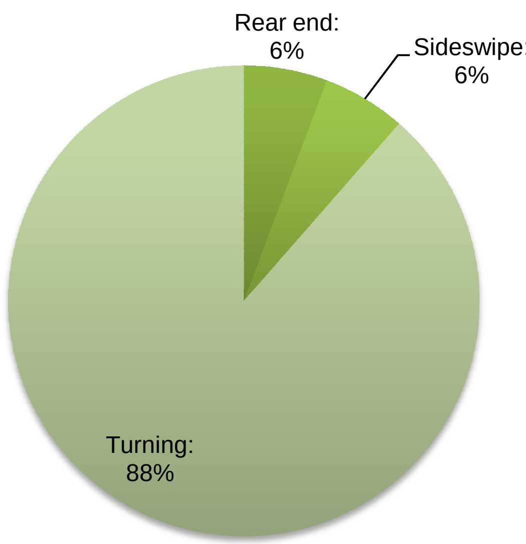
Exhibit 27: 655 Queensway East Annual Collision Frequency



The distribution of collisions by initial impact type, shown in **Exhibit 28**, clearly indicates that turning movements at this driveway are the predominant concern. The collision diagram in **Appendix A** shows that 18 of the 31 turning movement collisions were between northbound left-turns and southbound through traffic, and that improper turns and failure to yield right-of-way were the contributing driver actions in most of these collisions. The other significant trend was 12 other turning movement collisions, between eastbound left-turns exiting the driveway and southbound through traffic. Both turning movements must cross three southbound lanes, plus the taper of the dual left-turn lane for Queensway East.

Exhibit 28: 655 Queensway East Collisions by Initial Impact Type

Angle	Approaching	Rear-end	Sideswipe	SMV other	Turning	N/A
0	0	2	2	0	31	0

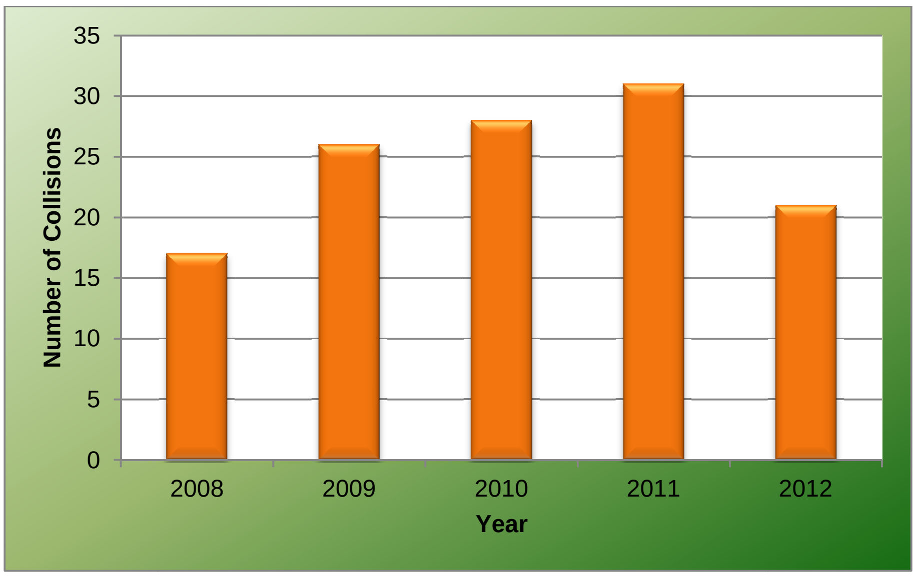


Considering the existing dual access to this plaza (from Cawthra Road and from Queensway East), it should be investigated whether certain left-turn restrictions can be applied to improve the safety performance of this currently underperforming segment.

Queensway East

The intersection of Cawthra Road and Queensway East was found to have among the highest five-year collision frequencies of any intersection along the corridor with 123 collisions reported between 2008 and 2012. As a major 4-way signalized intersection, it had the highest average daily traffic volume along the corridor. Despite the high volumes, the normalized collision rate was still among the highest within the corridor, with a rate of 1.02 collisions per million intersecting vehicles. The annual collision frequency from 2008 to 2012 is shown in **Exhibit 29**.

Exhibit 29: Queensway East Annual Collision Frequency



Of the 123 collisions, 106 resulted in property damage only (86%), while the remaining 17 involved personal injury. There were two clear trends in collision type, as illustrated in **Exhibit 30**, with rear-end and turning movement collisions comprising 86% of the collisions.

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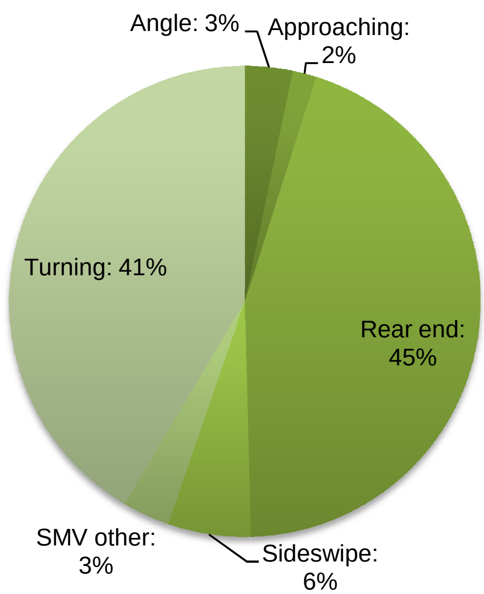
Exhibit 30: Queensway East Collisions by Initial Impact Type

Angle	Approaching	Rear-end	Sideswipe	SMV other	Turning	N/A
4	2	55	7	4	51	0



As shown in the collision diagram in **Appendix A**, rear-end collisions were most prevalent on the southbound approach (19), followed by the northbound approach (17). Despite the large number of rear-end collisions, only four (4) resulted in injury.

The other stark trend evident in the collision diagram is the turning movement collisions between eastbound left-turn and westbound through vehicles, and between northbound left-turn and southbound through vehicles. The northbound and eastbound left-turn movements are given protected and permissive phasings, with single left-turn lanes. This is in contrast to the westbound and southbound left-turn movements, which are given dual turn lanes and protected-only phasing.

Because of this asymmetry, there exists the potential for sightline issues during the permitted phase of the northbound and eastbound left-turns, which may have an obstructed view of the oncoming traffic adjacent to two left-turn lanes. Shadow lanes are used to mitigate the effects of this asymmetry, but the history of collisions indicates that this is not necessarily sufficient to ensure the safety of these turning movements. Of the 41 turning movement collisions related to these movements, almost all were determined to be the fault of the left-turning vehicle, indicating a systematic issue with the ability for drivers to judge gaps in oncoming traffic. Reconfiguration of the northbound and eastbound approaches to include dual left-turn lanes should be investigated as a potential treatment at this intersection.

Tedwyn Drive

South of Queensway East, Cawthra Road adjacent land uses are again predominantly residential. The intersection of Cawthra Road and Tedwyn Drive is located 350 m south of Queensway East, and is a three-way signalized intersection.

There were 23 collisions reported between 2008 and 2012, with decreasing frequency since 2005. Yearly collision frequency from 2008 to 2012 is shown in **Exhibit 31**.

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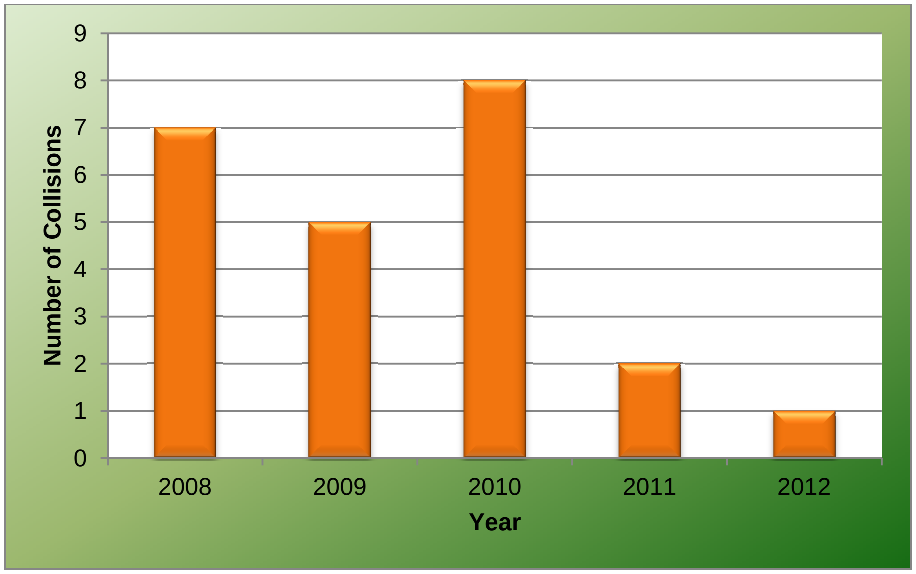
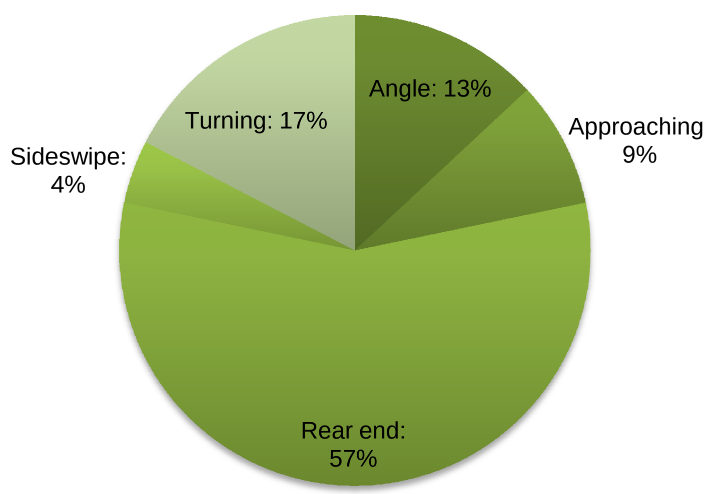
Exhibit 31: Tedwyn Drive Annual Collision Frequency



The majority of collisions were rear-ends, predominantly in the northbound direction. A complete distribution of collisions by initial impact type is shown in **Exhibit 32**.

Exhibit 32: Tedwyn Drive Collisions by Initial Impact Type

Angle	Approaching	Rear-end	Sideswipe	SMV other	Turning	N/A
3	2	13	1	0	4	0



It was found that four (4) collisions were the result of a driver disobeying the traffic signal; all four of these were southbound drivers at fault. Further review of right angle collisions and screening for the use of red-light cameras (based on current Region guidelines) as a means to reduce the frequency of such infractions should be considered. It should be noted that the cross-section of Cawthra Road is asymmetric between Queensway East and the QEW, with three southbound and two northbound lanes. The wide southbound cross-section on this stretch of flat, straight

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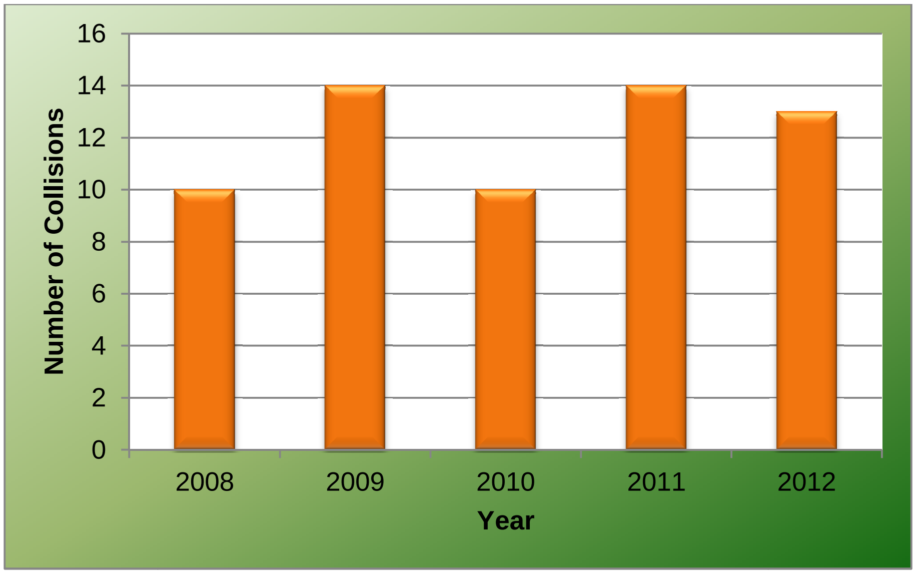
roadway is conducive to high speeds, as evidenced by 85th percentile speeds at or above 70 km/h for most of the day. Complete 24-hour speed data is shown in **Appendix B**.

North Service Road

North Service Road is a two-lane road that parallels the QEW and provides access to properties adjacent to the highway. It intersects Cawthra Road 150 m north of the westbound QEW off-ramp signalized intersection. A total of 61 collisions were reported at this intersection between 2008 and 2012. Yearly collision frequency from 2008 to 2012 is shown in **Exhibit 33**.

Exhibit 33: Tedwyn Drive Annual Collision Frequency



Analysis of collisions by initial impact type reveals a varied distribution in collision types, as shown in **Exhibit 34**. Rear-end collisions were the most common (33%), followed by turning movements (21%).

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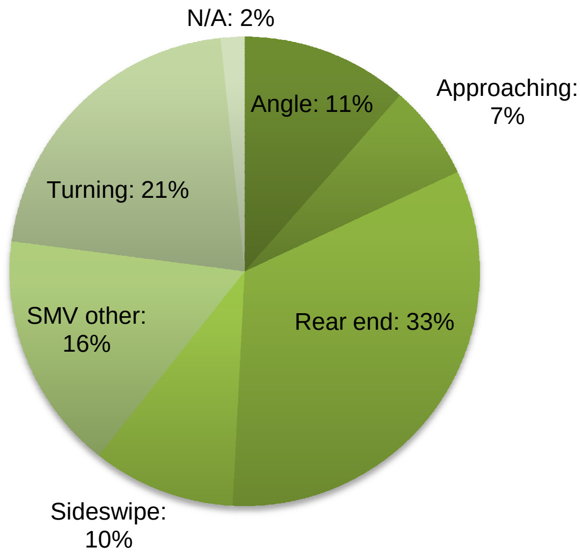
Exhibit 34: North Service Road Collisions by Initial Impact Type

Angle	Approaching	Rear-end	Sideswipe	SMV other	Turning	N/A
7	4	20	6	10	13	1



This intersection had the largest number of approaching (head-on) collisions along the corridor, all four (4) of which occurred in wet or snowy conditions and were due to speeding or loss of control by a vehicle on North Service Road at Cawthra Road. There was a similarly high incidence of single motor vehicle (SMV) collisions. The roadway alignment is such that both eastbound and westbound drivers must negotiate a sharp bend on the approach to the intersection. With a posted speed limit of 60 km/h on North Service Road, it is possible that speeding drivers may misjudge the tightness of the curve or have difficulty seeing the traffic signal heads. It is recommended that further investigation be done to explore the benefits of treatments such as improved signage or auxiliary signal heads for the eastbound and westbound approaches.

It was found that seven (7) collisions were the fault of a driver disobeying the traffic signal, most of which were northbound or southbound drivers (6 out of 7). As the intersection is immediately north of the QEW interchange, southbound drivers may be prone to disobeying the signal as it is the last signal before the westbound QEW on-ramp; similarly, northbound drivers originating from the QEW may be accustomed to high speed and more likely to disobey or misjudge the signal. Further review of right angle collisions and screening for the use of red-light cameras (based on current Region guidelines) as a means to reduce the frequency of such infractions should be considered.

QEW West Ramp

The westbound QEW exit ramp terminates at a signalized 3-leg intersection with Cawthra Road. Over the five-year period from 2008 to 2012, only 11 collisions were observed, representing fewer than half as many collisions as was predicted over this period. The annual breakdown of collision frequency is shown in **Exhibit 35**.

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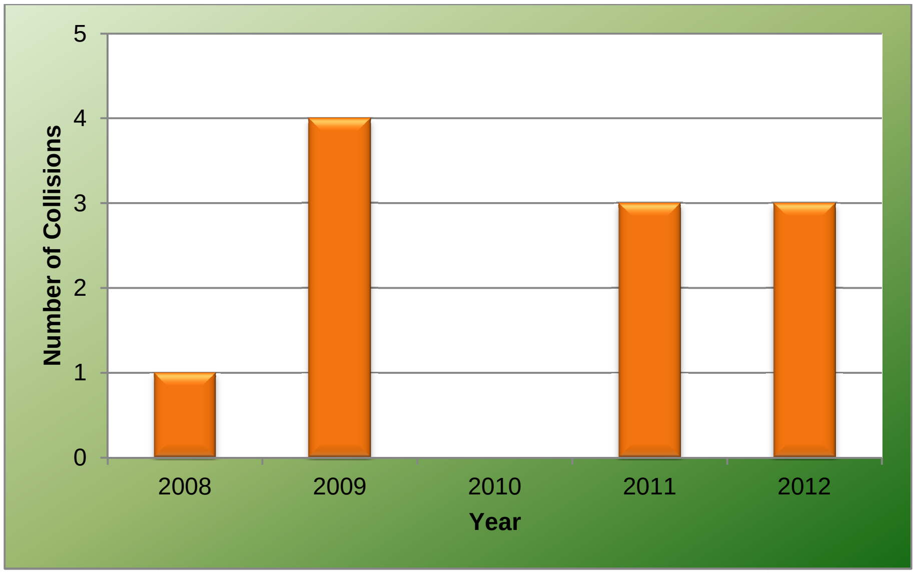
Exhibit 35: QEW West Ramp Annual Collision Frequency



A fatality occurred in 2011 as the result of an angle collision. A northbound drunk driver disobeyed the traffic signal and struck a westbound vehicle turning left from the QEW ramp.

The types of collisions reported at this intersection were predominantly rear-end and turning movement collisions, as shown in **Exhibit 36**. All four (4) rear-end collisions involved northbound vehicles, and two of these resulted in personal injury. There is a gentle left-hand bend in the northbound approach as Cawthra Road passes over the QEW, and this stretch of road is wide open and conducive to high speeds. Close spacing of the four intersections in this stretch of Cawthra Road (two ramp intersections and two service roads) may be contributing factors to the collision history in this area.

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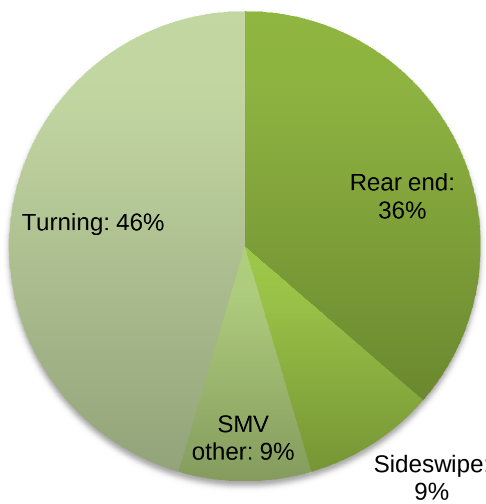
Exhibit 36: QEW West Ramp Collisions by Initial Impact Type

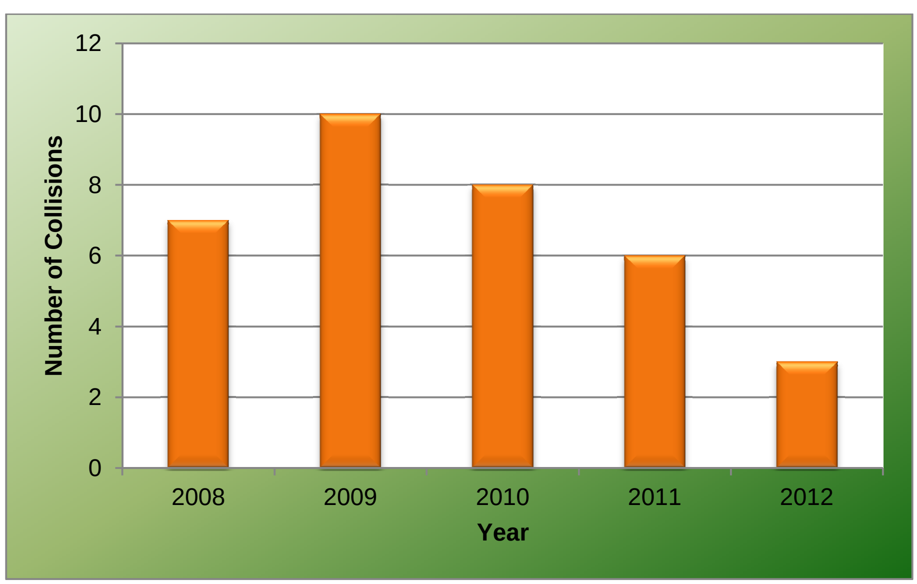
Angle	Approaching	Rear-end	Sideswipe	SMV other	Turning	N/A
0	0	4	1	1	5	0



QEW East Ramp

Similar to the geometry of the westbound QEW exit ramp, the eastbound QEW exit ramp terminates at a 3-leg intersection. Over the five-year period from 2008 to 2012, a total of 34 collisions were reported. The annual breakdown of collision frequency is shown in **Exhibit 37**. On average, the frequency has been mostly decreasing, with a slight decrease since the previous study period from 2005 to 2009.

Exhibit 37: QEW East Ramp Annual Collision Frequency



As illustrated in the collision diagram in **Appendix A**, the overwhelming majority of collisions at this intersection were rear-ends on the southbound approach. The complete distribution of

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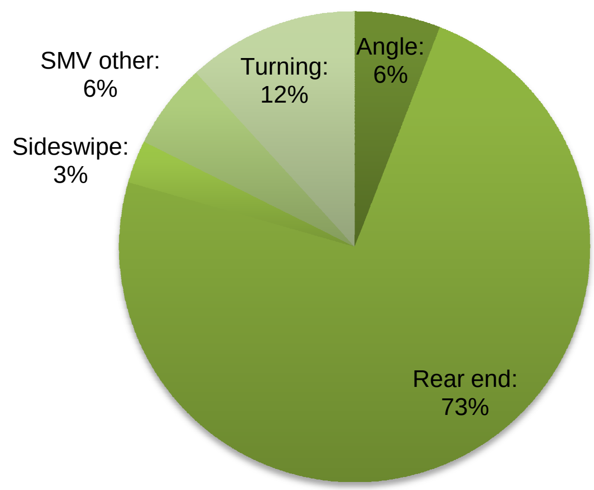
collisions by initial impact type is shown in **Exhibit 38**. The two-lane southbound approach is characterized by a slight downhill and gentle right-hand bend downstream of the QEW overpass. There is little signage to indicate a speed limit of 50 km/h in this area, especially considering drivers originating from the westbound QEW may not be accustomed to, or aware of, the slower speed limit. Similar to the westbound QEW exit ramp and North Service Road, the eastbound ramp intersection is closely adjacent to the South Service Road, with an intersection spacing of 160 metres.

Exhibit 38: QEW East Ramp Collisions by Initial Impact Type

Angle	Approaching	Rear-end	Sideswipe	SMV other	Turning	N/A
2	0	25	1	2	4	0



Furthermore, the right-most (third) southbound lane on Cawthra Road exits to the eastbound QEW immediately upstream of the traffic signal, resulting in this lane maintaining high speeds while the left two lanes serve as queue storage. The differential in speed across the three southbound lanes may be a contributing factor to the prevalence of rear-end collisions on the approach to this intersection.

It is recommended to consider the implementation of an auxiliary signal head for the southbound approach on the north side (near-side) of the intersection in order to address possible sightline issues given the downhill right-hand bend along the southbound approach.

South Service Road

The South Service Road parallels the QEW and provides access to properties adjacent to the highway. It intersects Cawthra Road 160 metres south of the eastbound QEW exit ramp at a 4-leg signalized intersection. This intersection marks the southern end of the study area.

Between 2008 and 2012, a total of 76 collisions were reported. This marks a significant increase (65%) since the 2005 to 2009 study period, and is worse than predicted by models. The yearly breakdown of collision frequency is shown in **Exhibit 39**.

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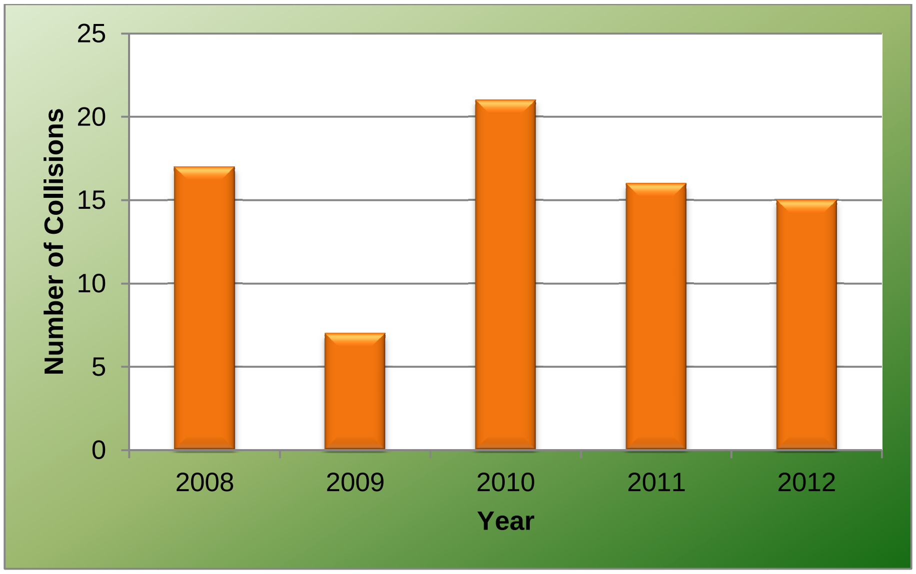
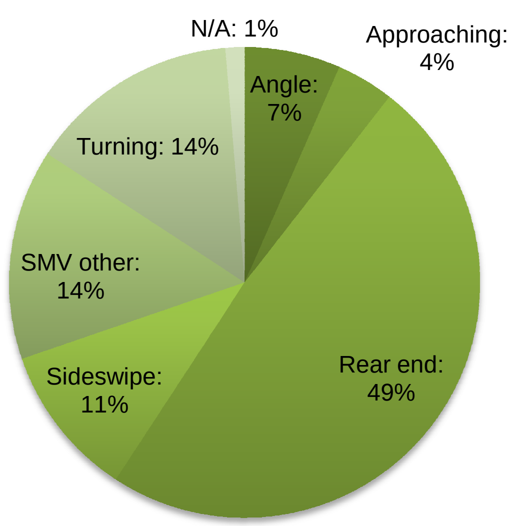
Exhibit 39: South Service Road Annual Collision Frequency



As illustrated in **Exhibit 40**, approximately half of the 76 collisions were rear-ends. Most of these occurred on the southbound approach, with similar character to the southbound approach at the westbound QEW exit ramp which also had a high incidence of southbound rear-end collisions.

Exhibit 40: South Service Road Collisions by Initial Impact Type

Angle	Approaching	Rear-end	Sideswipe	SMV other	Turning	N/A
5	3	37	8	11	11	1



There was also a relatively high prevalence of single motor vehicle (SMV) collisions caused by loss of control on the eastbound and westbound approaches to this intersection. Much like the North Service Road, these approaches have sharp bends as illustrated in the collision diagram in **Appendix A**. Given that almost all of the loss-of-control collisions at this intersection occurred in wet, snowy or otherwise inclement weather conditions, it should be investigated how the safety performance of these approaches can be improved (e.g., geometric improvements, warning signs and/or speed management). Improved signage and auxiliary (near-side) signal heads may offer safety benefits to drivers on South Service Road.

Of the 76 collisions, nine (9) were the fault of drivers disobeying the traffic signal. Most of these nine collisions were caused by southbound drivers failing to stop at the red light, and resulted in turning movement, angle, and sideswipe collisions. Further review of right angle collisions and screening for the use of red-light cameras (based on current Region guidelines) as a means to reduce the frequency of such infractions should be considered.

Conclusions and Recommendations

Based on the analysis presented above, the following conclusions were reached:

- There were a total of 1007 collisions reported for the corridor over the 5-year analysis period, and the majority (890) occurred at intersections;
- There were 143 non-fatal injury collisions, most of which were rear end (53) or turning movement (53), and 2 fatal collisions, both of which were angle collisions;
- The dominant collision impact type throughout the corridor was rear-end collisions (45%), followed by turning movement collisions (33%);
- Weather and compromised road surface conditions were also a factor in a significant number of collisions, at 20% and 30%, respectively; however, these distributions may not constitute statistical over-representations.
- In addition to the above, the following conclusions apply to individual intersections along the corridor:
    - The intersection of Cawthra Road at Eastgate Parkway/Highway 403 exhibited the second highest frequency and rate of collisions over the five-year study period, contributed by a transition from highway to arterial speeds in both the north-south and east-west directions;
    - Turning movement collisions was the dominant collision type at the intersection of Cawthra Road at Burnhamthorpe Road East, which differed from all other intersections. The southbound left turning vehicles colliding with northbound through vehicles comprised 70 and the 87 turning movement collisions at the intersection indicating a significant problem. Recent intersection geometry improvements could have partially addressed the southbound left problem; further study once several years of collision data are available is recommended to assess the new intersection geometry performance.
    - The midblock segment at 3643 Cawthra Road, 120 metres south of Burnhamthorpe Road East, was found to have a high frequency of collisions at a plaza entrance, with left-turns into the plaza using a centre left-turn lane. Further analysis of midblock operations may determine if changes are warranted at this location;
    - Excessive speeding, as observed along the entire corridor, was likely a factor contributing to the history of collisions at the intersection of Cawthra Road and Bloor Street, with 85^{th} percentile speeds often reaching above 70 km/h;
    - Inconsistent lane markings at the intersection of Cawthra Road and the Dundas Street ramp have may be contributing to rear-end collisions caused by drivers misjudging the southbound merge from the right-turn channel.

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Clear merge lane markings would help alleviate the ambiguity of lane configuration and right-of-way;

- The midblock segment immediately north of Queensway East was found to have an exceptionally large number of left-turn collisions into the commercial driveway at 655 Queensway East. Similar to the other midblock segment noted above, there is a centre left-turn lane and an opposing lane configuration over 3 lanes wide;
- The intersection of Cawthra Road and Queensway East was found to have a large frequency and rate of collisions, with potential sightline issues related to the asymmetry of the left-turn lanes. Traffic operations should be further analyzed to determine if turning volumes may warrant a reconfiguration of the left-turn lanes to fully protected, dual left-turns;
- Both the North and South Service Roads were identified to have a high incidence of collisions related to drivers misjudging the sharpness of the eastbound and westbound approach curves. Improved signage and the use of auxiliary signal heads may help to better warn drivers of the signalized intersection ahead; and
- The downhill grade and right-hand bend on the southbound approach to the intersection of Cawthra Road and the eastbound QEW off-ramp may have contributed to the prevalence of southbound rear-end collisions at this location. Similar treatments as described for the Service Roads could be applied to mitigate the safety concerns at this intersection.

- Corridor speed and volume data suggest that overall, excessive speeding is a concern along Cawthra Road, with 85^{th} percentile speeds frequently reaching over 20 km/h above the posted speed limit. Recurring congestion was not found to be a crucial issue throughout the corridor. Therefore, caution should be exercised as to not create conditions that further encourage higher speeds in an effort to alleviate peak period congestion.

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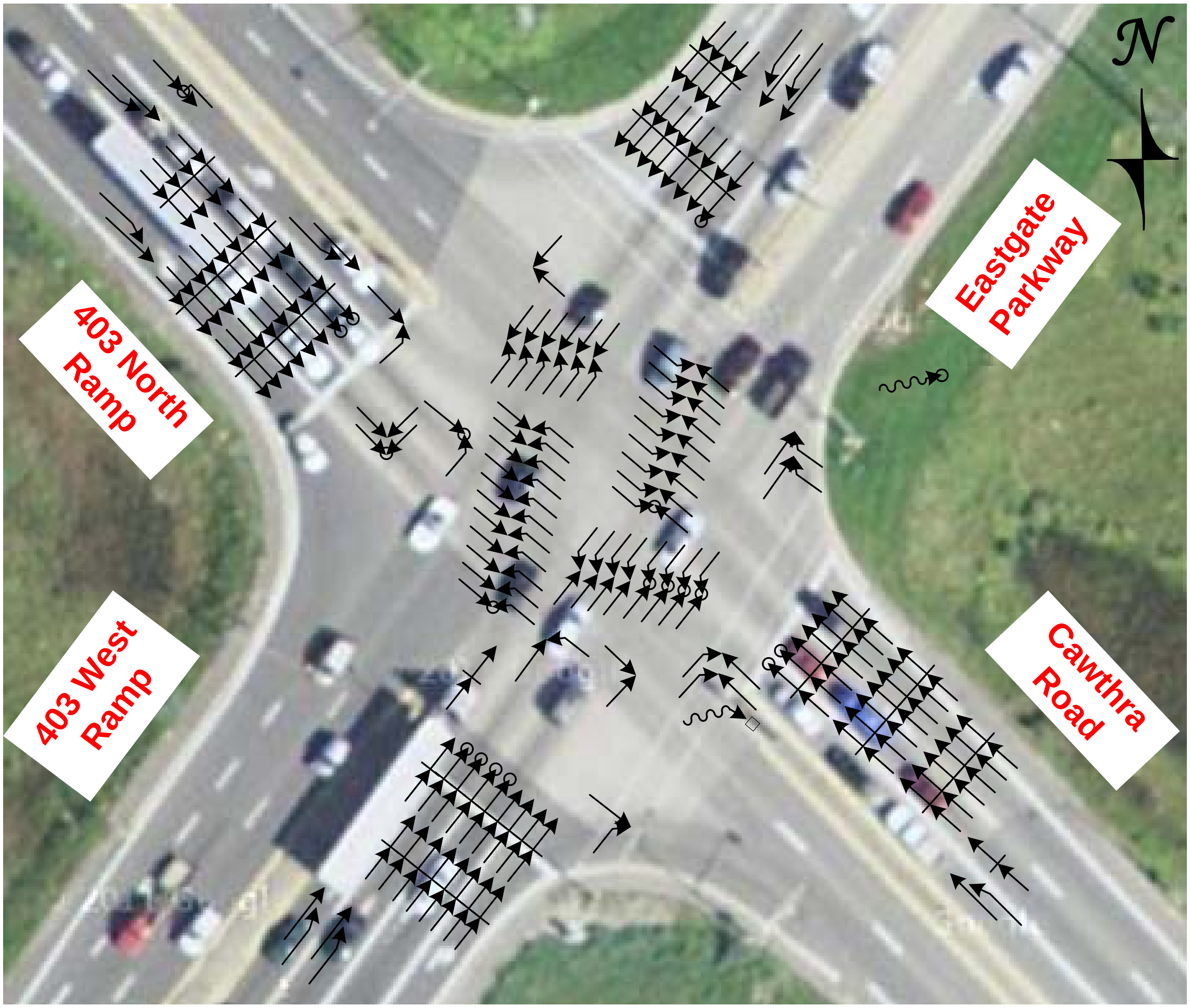
APPENDIX A

COLLISION DIAGRAMS



COLLISION DIAGRAM

Location: Cawthra Road and Eastgate Parkway

Period: January 1, 2008 to December 31, 2012

SYMBOLS:		*ACCIDENT TYPES:*		
Moving Vehicle	Fixed Object Collision	Lost Control	Sideswipe	Turning Movement
Cyclist	Animal Collision	Rear-End	Approaching	Angle
Pedestrian	Injury Collision			
	Fatal Collision			

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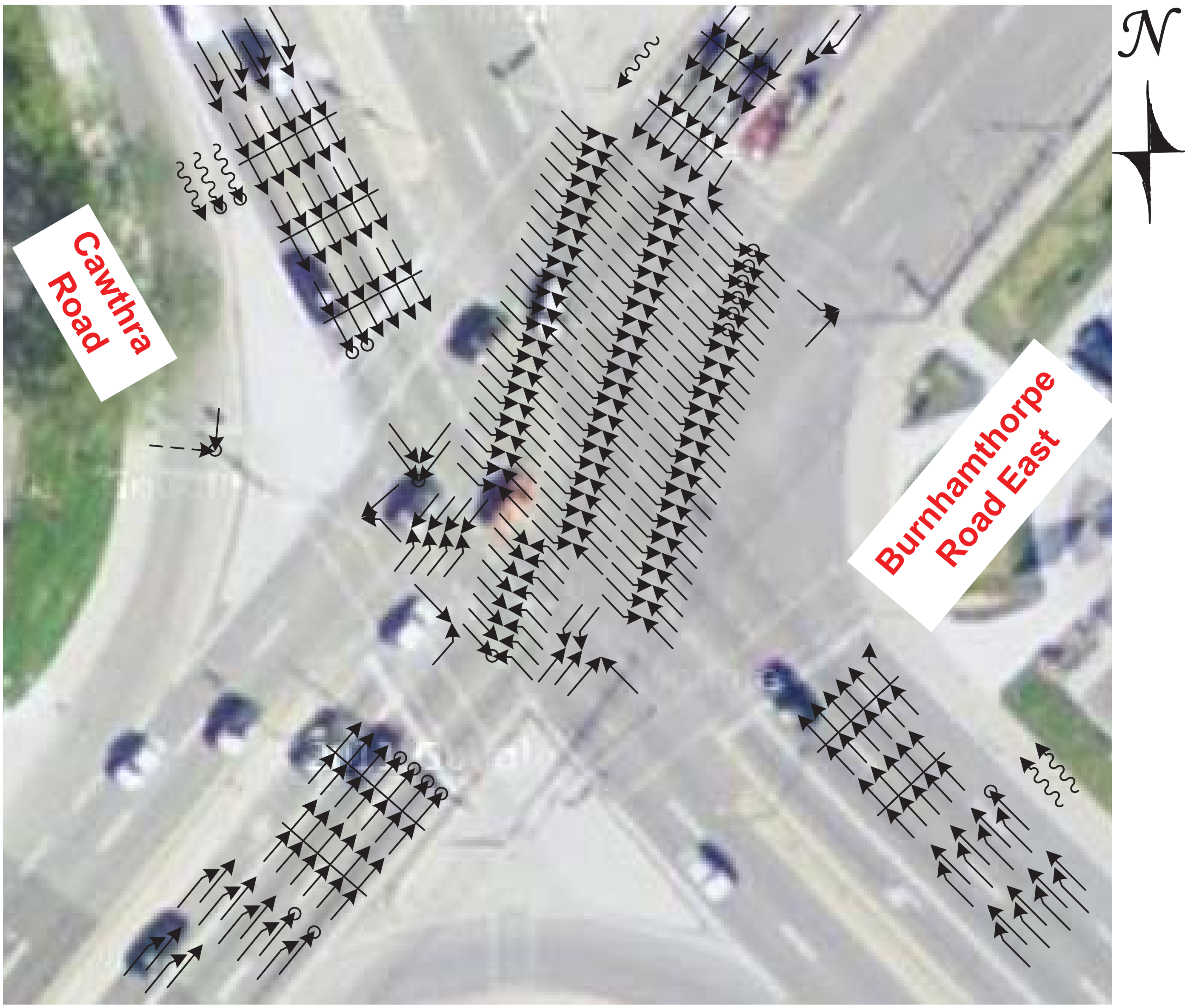


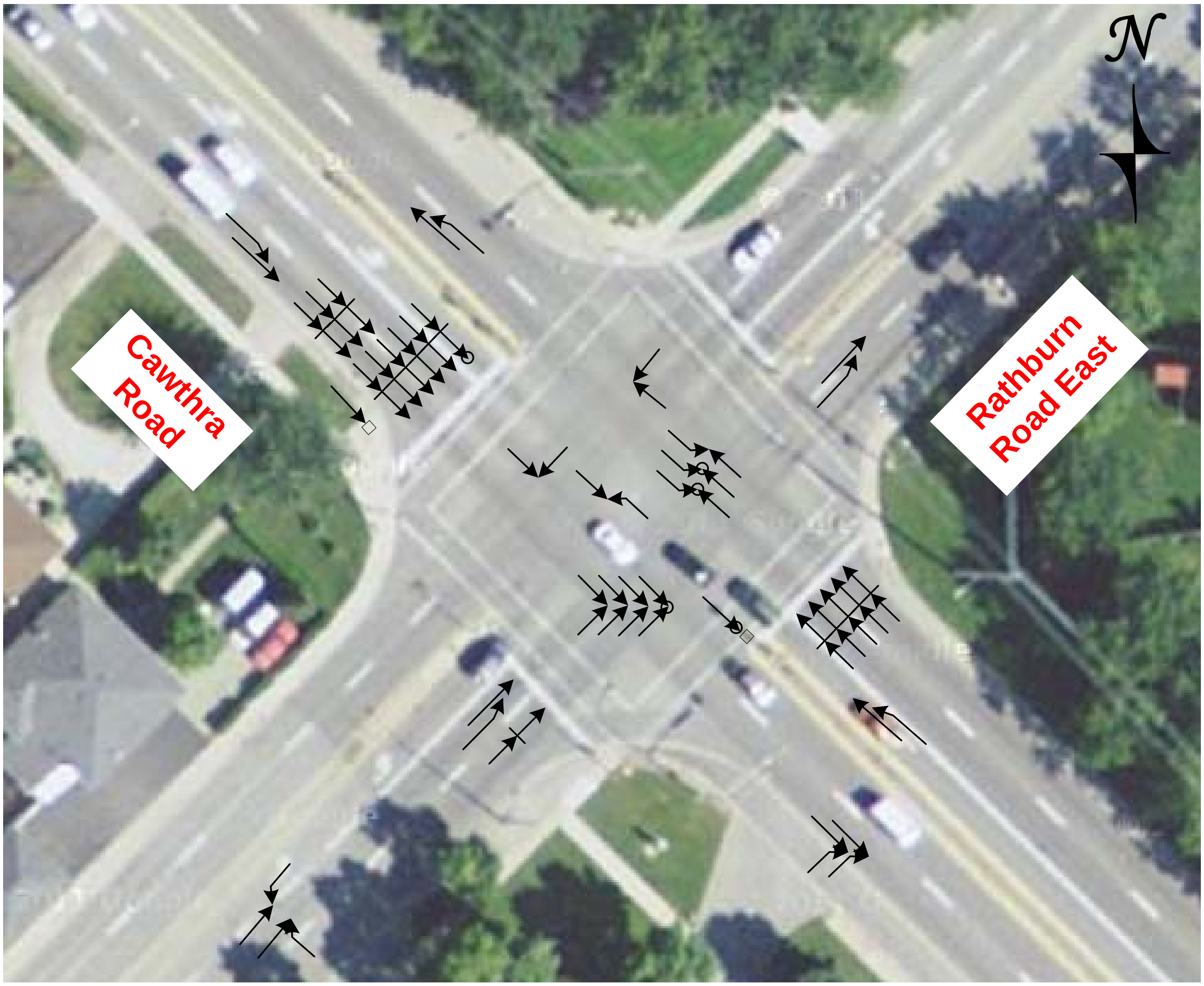
COLLISION DIAGRAM

Location: Cawthra Road and Burnhamthorpe Road East

Period: January 1, 2008 to December 31, 2012

SYMBOLS:		*ACCIDENT TYPES:*		
Moving Vehicle	Fixed Object Collision	Lost Control	Sideswipe	Turning Movement
Cyclist	Animal Collision	Rear-End	Approaching	Angle
Pedestrian	Injury Collision			
	Fatal Collision			

IBI GROUP



COLLISION DIAGRAM

Location: Cawthra Road and Rathburn Road East

Period: January 1, 2008 to December 31, 2012

SYMBOLS:		*ACCIDENT TYPES:*		
Moving Vehicle	Fixed Object Collision	Lost Control	Sideswipe	Turning Movement
Cyclist	Animal Collision	Rear-End	Approaching	Angle
Pedestrian	Injury Collision			
	Fatal Collision			

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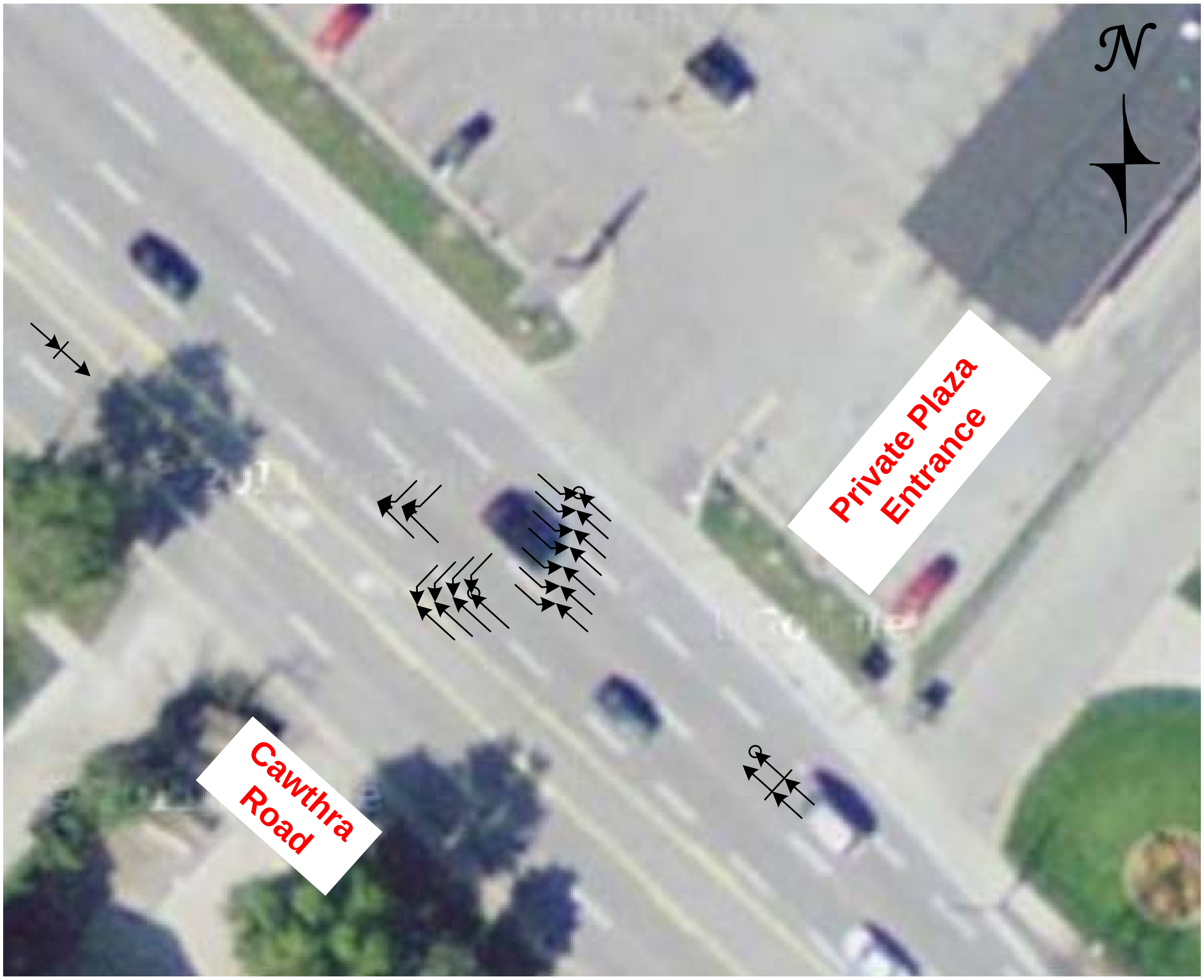

COLLISION DIAGRAM

Location: Private Driveway at 3643 Cawthra Road

Period: January 1, 2008 to December 31, 2012

SYMBOLS:		*ACCIDENT TYPES:*		
Moving Vehicle	Fixed Object Collision	Lost Control	Sideswipe	Turning Movement
Cyclist	Animal Collision	Rear-End	Approaching	Angle
Pedestrian	Injury Collision			
	Fatal Collision			

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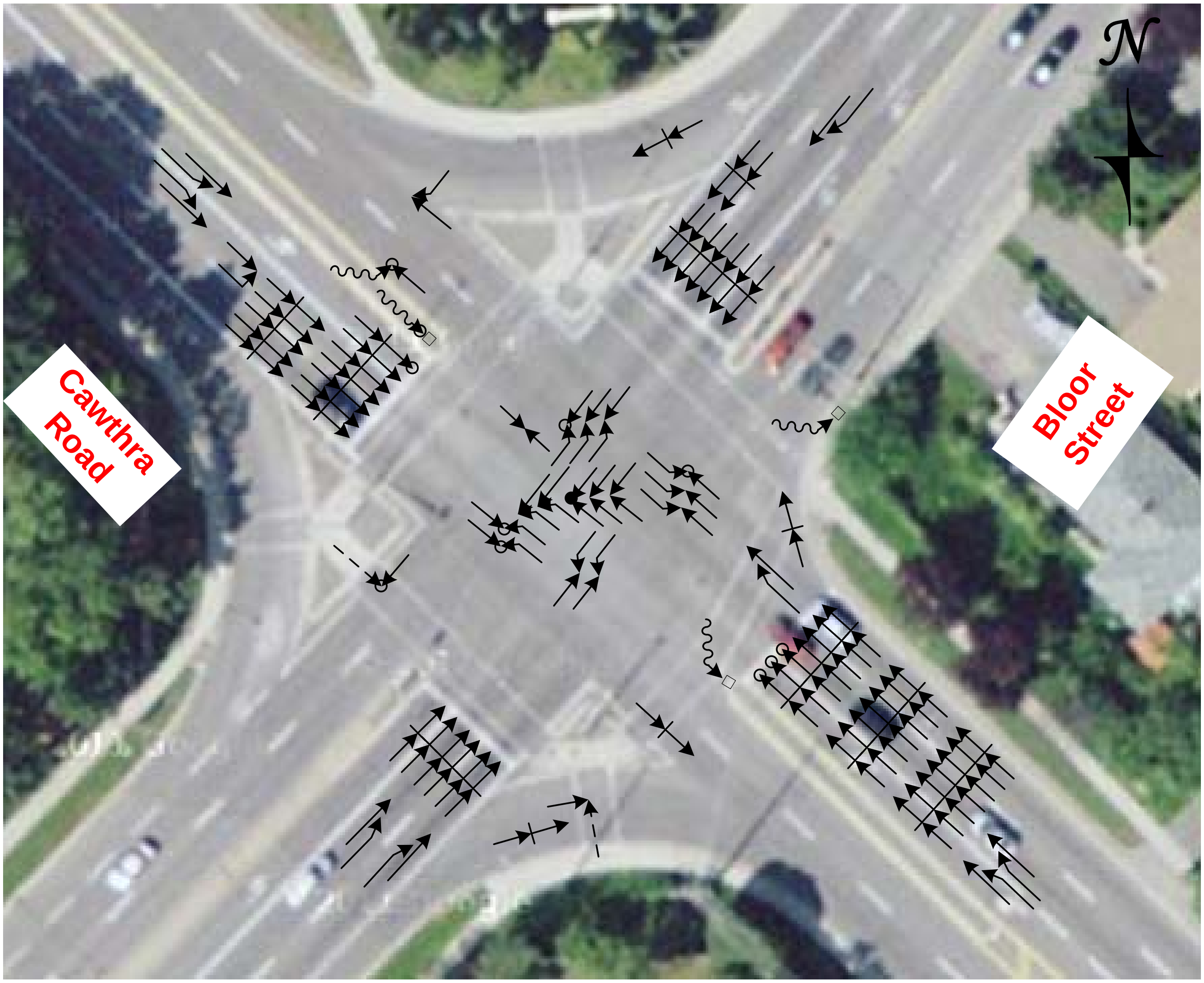

COLLISION DIAGRAM

Location: Cawthra Road and Bloor Street

Period: January 1, 2008 to December 31, 2012

SYMBOLS:		ACCIDENT TYPES:		
Moving Vehicle	Fixed Object Collision	Lost Control	Sideswipe	Turning Movement
Cyclist	Animal Collision	Rear-End	Approaching	Angle
Pedestrian	Injury Collision			
	Fatal Collision			

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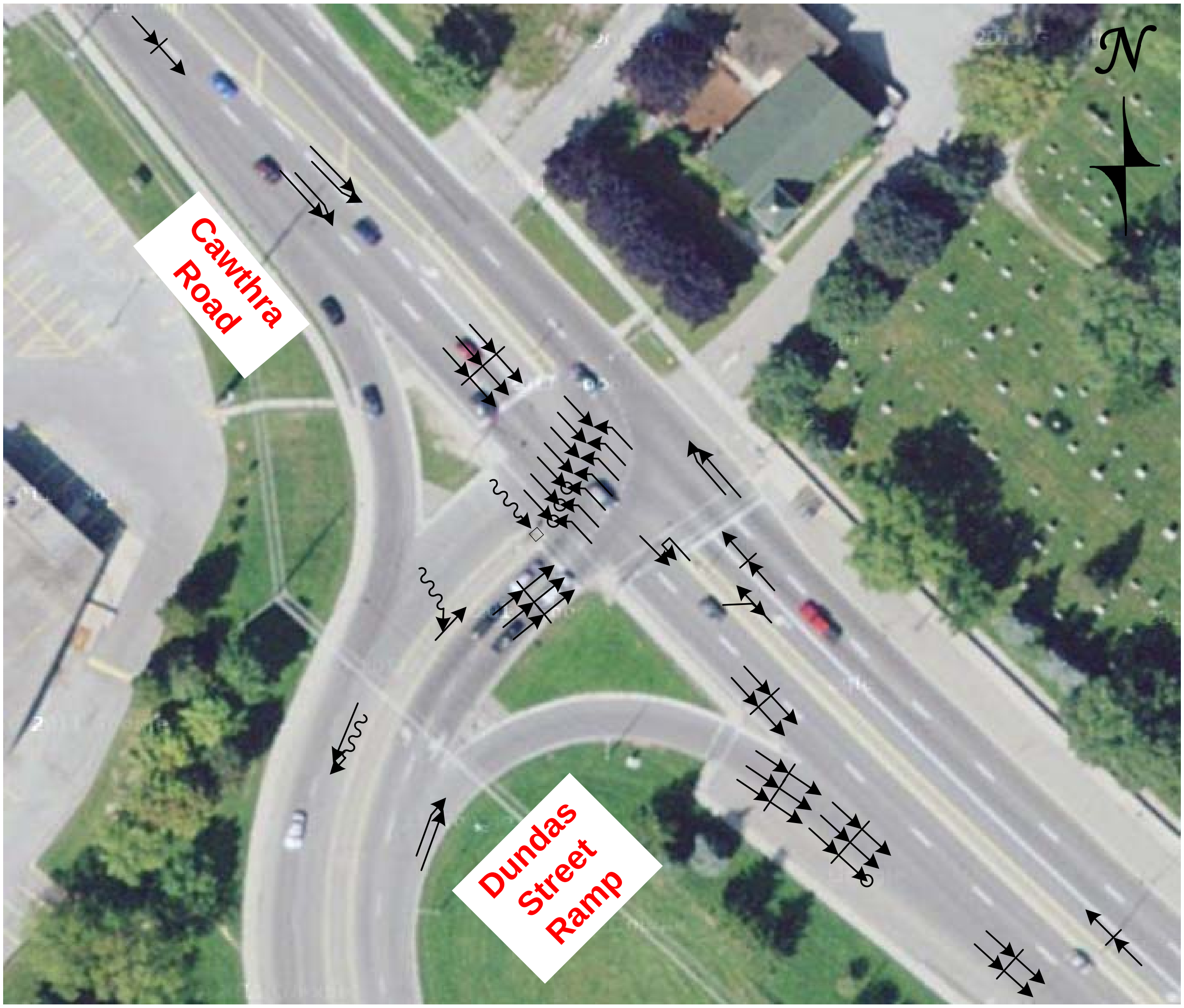

COLLISION DIAGRAM

Location: Cawthra Road and Dundas Street Ramp

Period: January 1, 2008 to December 31, 2012

SYMBOLS:		ACCIDENT TYPES:		
Moving Vehicle	Fixed Object Collision	Lost Control	Sideswipe	Turning Movement
Cyclist	Animal Collision	Rear-End	Approaching	Angle
Pedestrian	Injury Collision			
	Fatal Collision			

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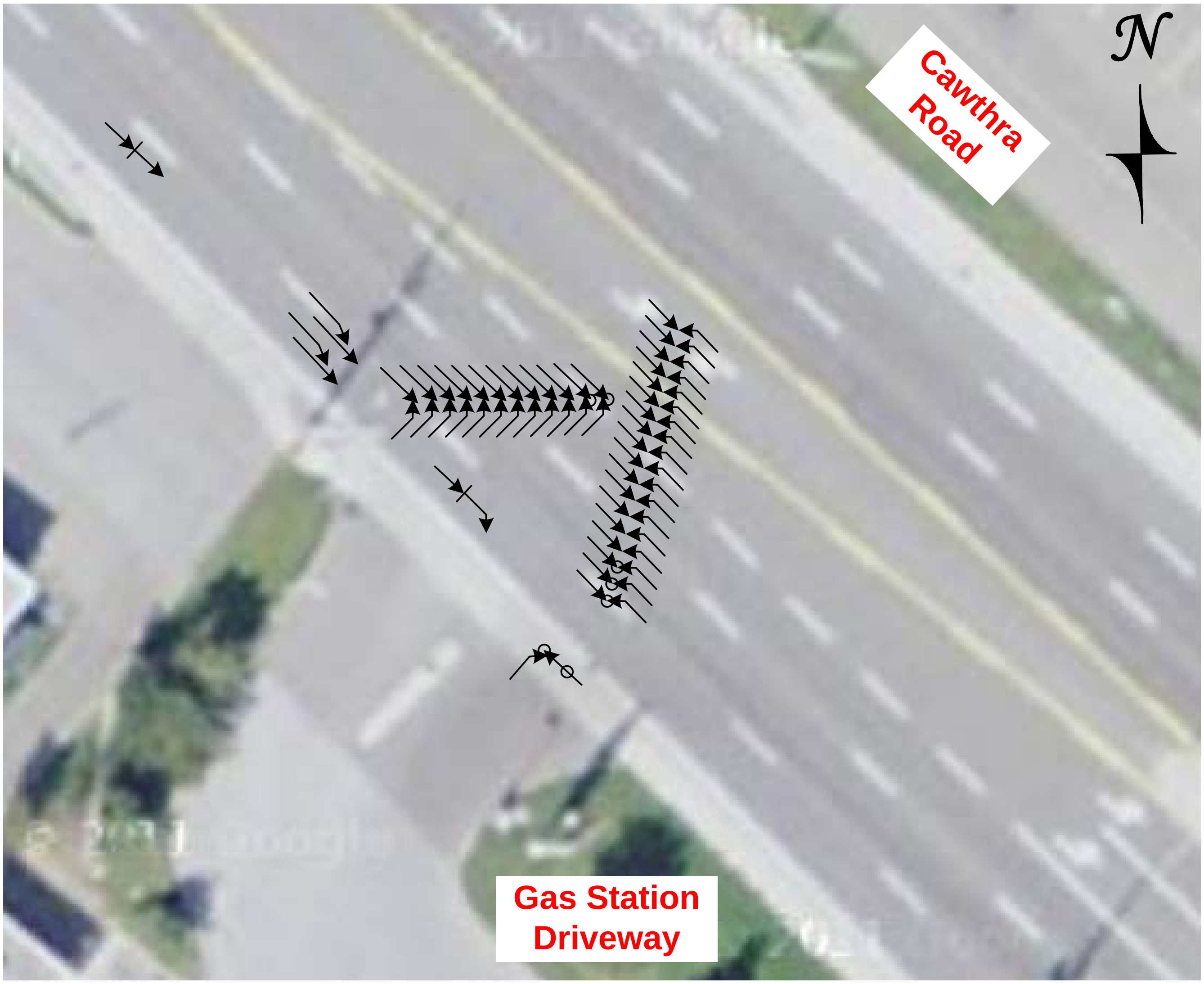


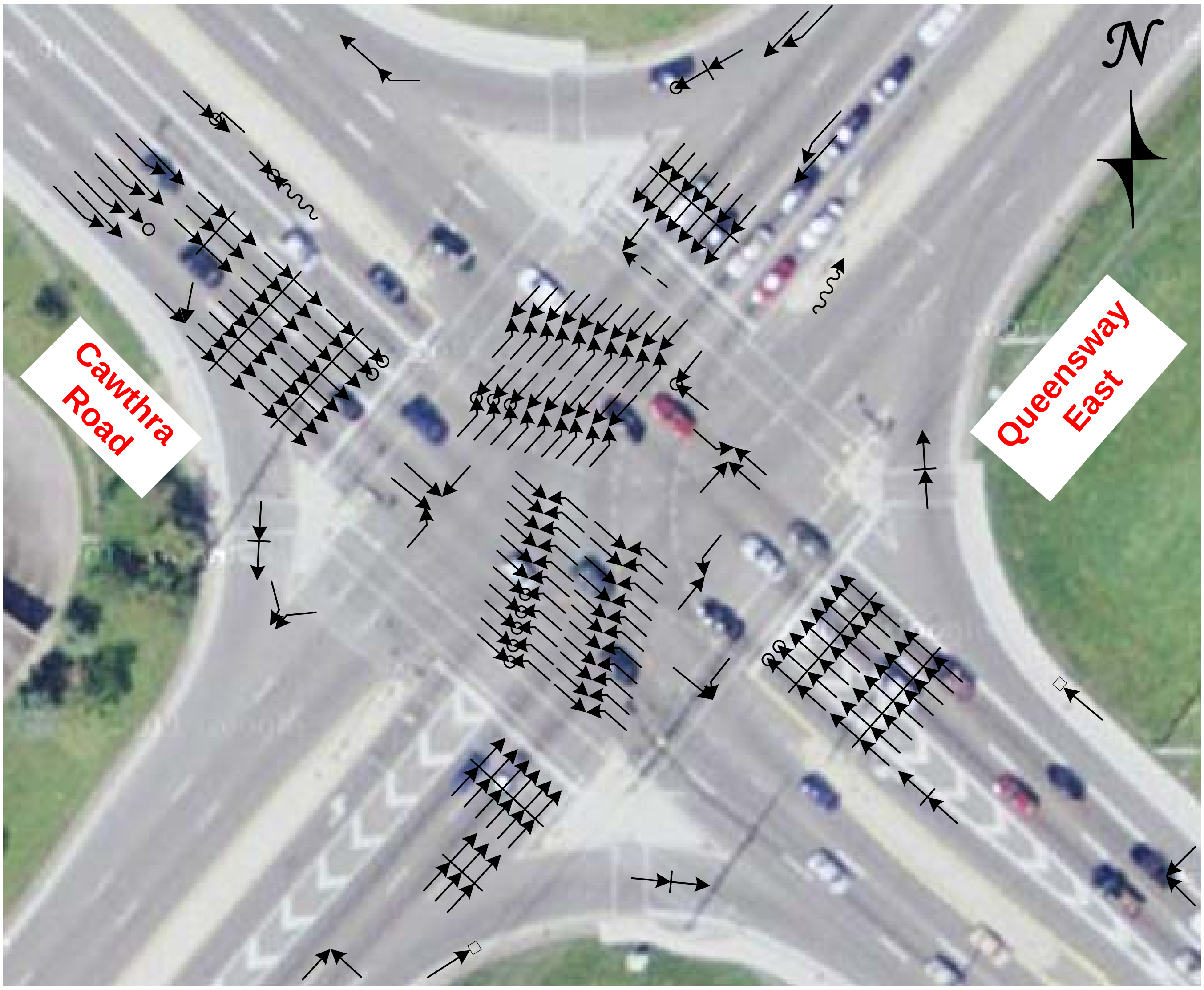
COLLISION DIAGRAM

Location: Private Driveway at 655 Queensway East

Period: January 1, 2008 to December 31, 2012

SYMBOLS:		ACCIDENT TYPES:		
Moving Vehicle	Fixed Object Collision	Lost Control	Sideswipe	Turning Movement
Cyclist	Animal Collision	Rear-End	Approaching	Angle
Pedestrian	Injury Collision			
	Fatal Collision			

IBI GROUP



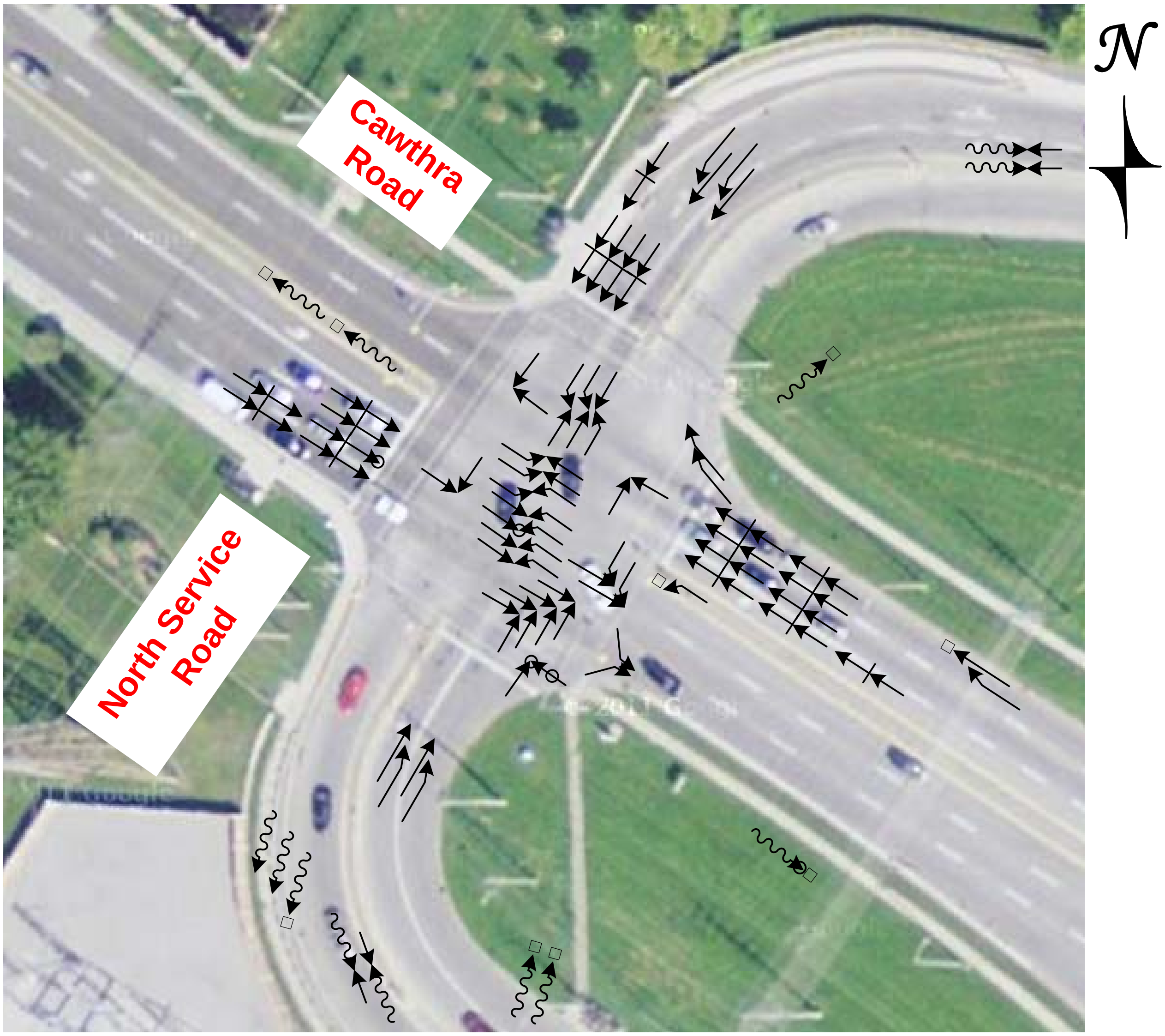
COLLISION DIAGRAM

Location: Cawthra Road and Queensway East

Period: January 1, 2008 to December 31, 2012

SYMBOLS:		*ACCIDENT TYPES:*		
Moving Vehicle	Fixed Object Collision	Lost Control	Sideswipe	Turning Movement
Cyclist	Animal Collision	Rear-End	Approaching	Angle
Pedestrian	Injury Collision			
	Fatal Collision			

IBI GROUP



COLLISION DIAGRAM

Location: Cawthra Road and North Service Road

Period: January 1, 2008 to December 31, 2012

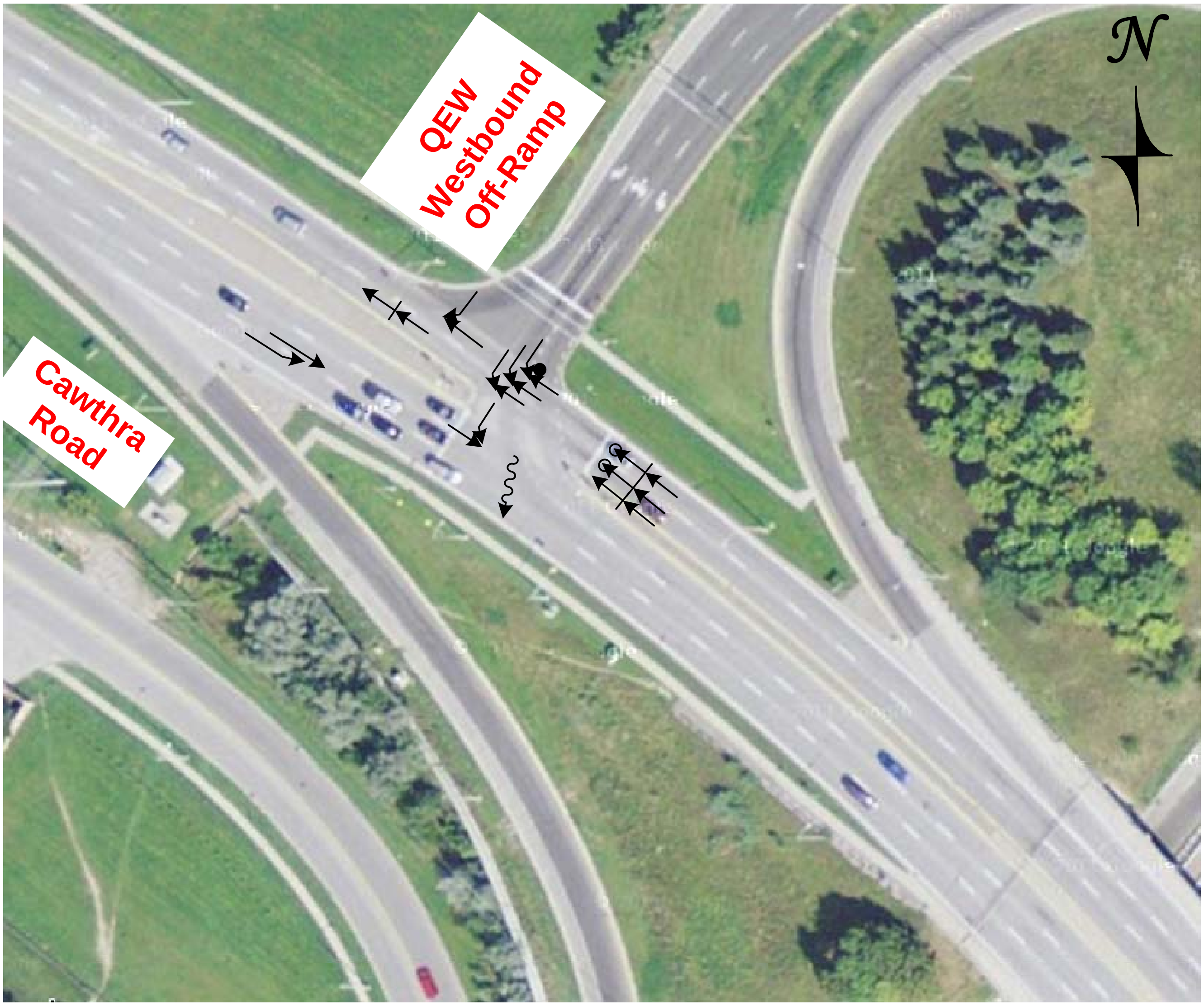
SYMBOLS:

Moving Vehicle
Cyclist
Pedestrian
Fixed Object Collision
Animal Collision
Injury Collision
Fatal Collision

ACCIDENT TYPES:

Lost Control
Sideswipe
Turning Movement
Rear-End
Approaching
Angle

IBI GROUP



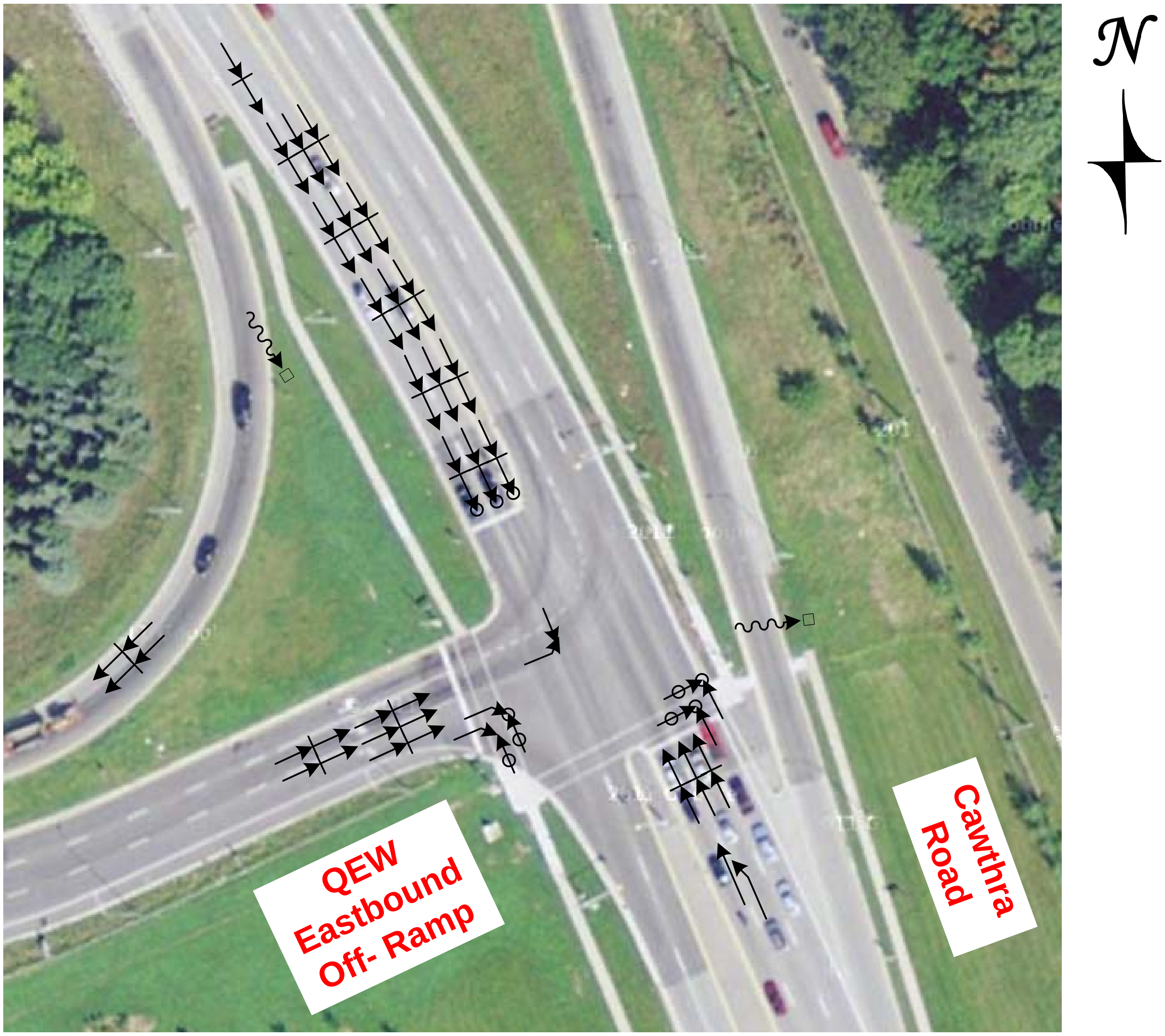
COLLISION DIAGRAM

Location: Cawthra Road and QEW Westbound Ramp

Period: January 1, 2008 to December 31, 2012

SYMBOLS:		*ACCIDENT TYPES:*		
Moving Vehicle	Fixed Object Collision	Lost Control	Sideswipe	Turning Movement
Cyclist	Animal Collision	Rear-End	Approaching	Angle
Pedestrian	Injury Collision			
	Fatal Collision			

IBI GROUP



COLLISION DIAGRAM

Location: Cawthra Road and QEW Eastbound Ramp

Period: January 1, 2008 to December 31, 2012

SYMBOLS:		*ACCIDENT TYPES:*		
Moving Vehicle	Fixed Object Collision	Lost Control	Sideswipe	Turning Movement
Cyclist	Animal Collision	Rear-End	Approaching	Angle
Pedestrian	Injury Collision			
	Fatal Collision			

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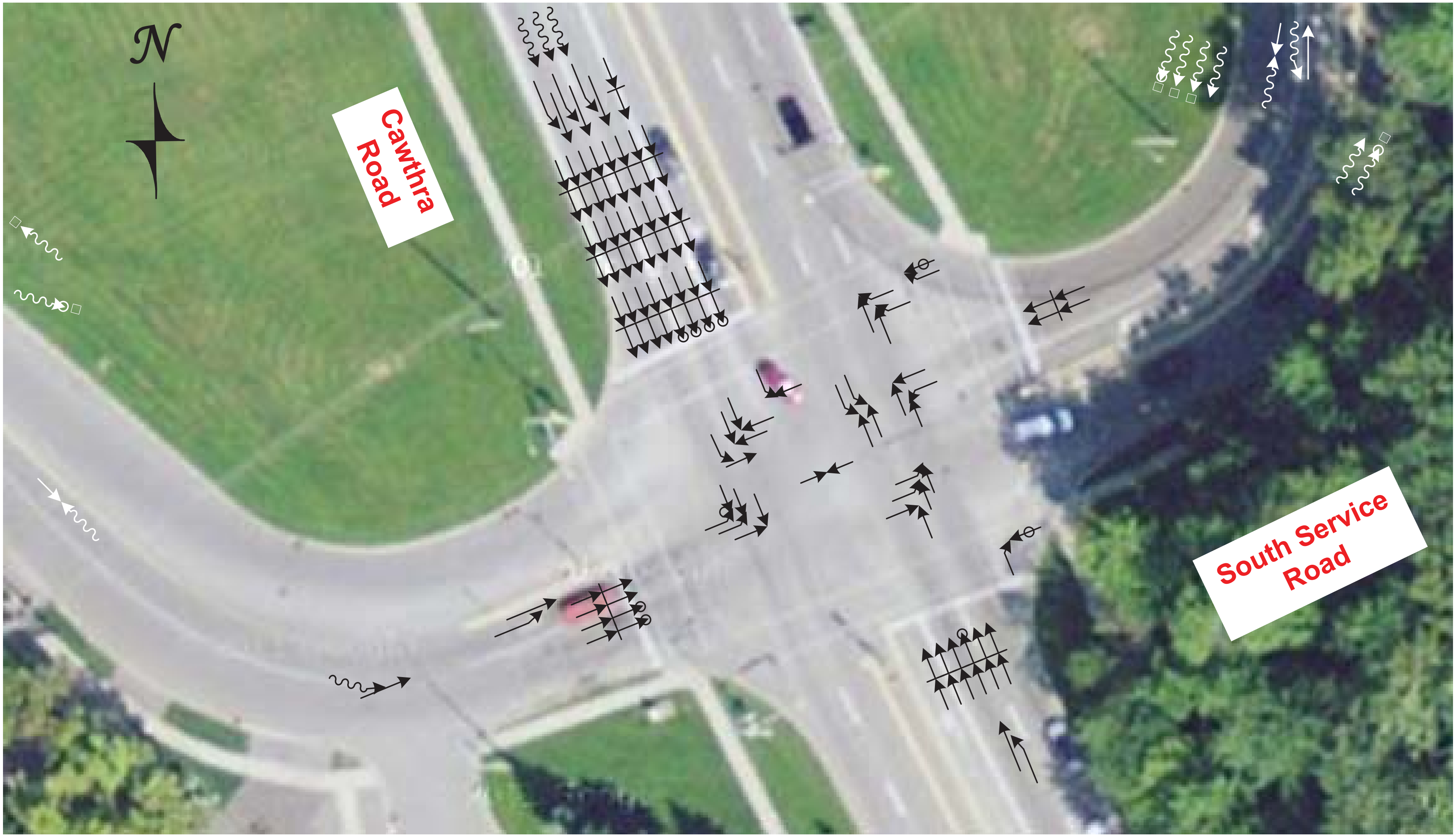

COLLISION DIAGRAM

Location: Cawthra Road and South Service Road

Period: January 1, 2008 to December 31, 2012

SYMBOLS:

- Moving Vehicle
- Cyclist
- Pedestrian
- Fixed Object Collision
- Animal Collision
- Injury Collision
- Fatal Collision

ACCIDENT TYPES:

- Lost Control
- Rear-End
- Sideswipe
- Approaching
- Turning Movement
- Angle

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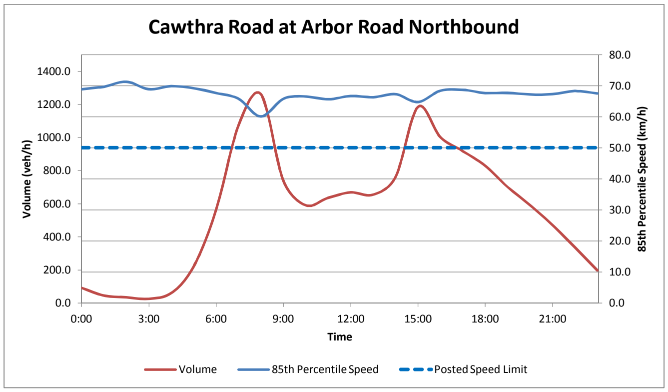
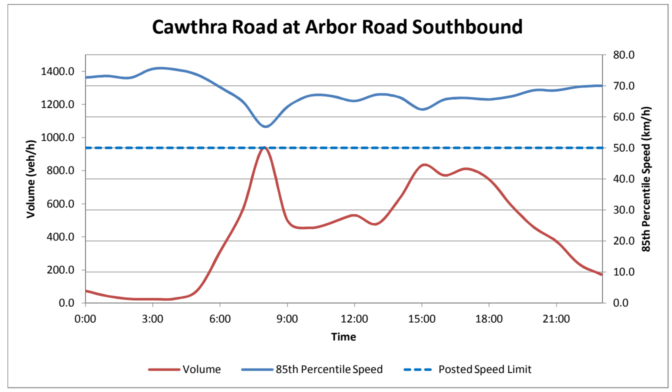
APPENDIX B

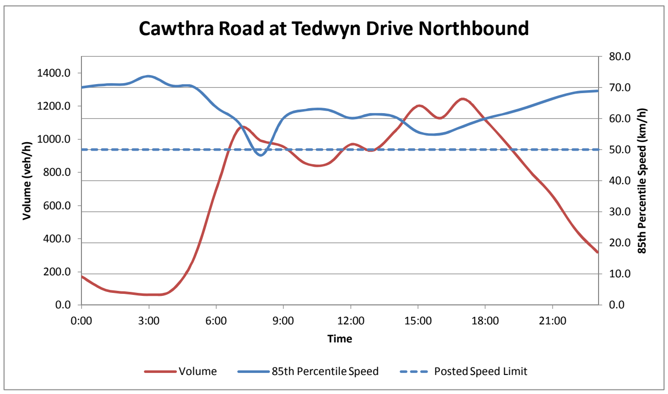
CORRIDOR SPEED AND TRAFFIC DATA

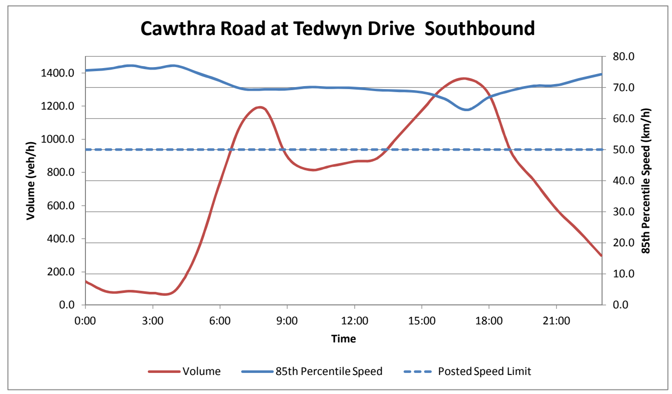
85th Percentile Speed		Cawthra Road at Arbor Road		Cawthra Road at Tedwyn Drive		Cawthra Road at Queensway East		Cawthra Road at Silver Creek Boulevard		Cawthra Road at Bloor Street		Cawthra Road at Burnhamthorpe Road East	
Start	End	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
0:00	**1:00**	68.9	72.7	70.0	75.5	70.5	69.9	70.2	69.7	70.0	72.5	77.2	72.6
1:00	**2:00**	69.7	73.1	70.9	76.0	72.6	68.9	74.3	69.9	71.9	73.2	80.1	73.7
2:00	**3:00**	71.3	72.6	71.1	77.0	74.8	70.4	70.1	72.7	69.7	78.6	80.0	74.9
3:00	**4:00**	68.9	75.4	73.6	76.1	74.1	70.9	70.4	72.8	69.7	75.9	75.5	75.3
4:00	**5:00**	69.9	75.2	70.6	77.0	71.7	69.3	72.0	69.0	69.6	75.7	75.5	75.0
5:00	**6:00**	69.2	73.5	70.2	74.6	70.7	68.6	70.3	68.0	69.6	71.2	71.8	70.7
6:00	**7:00**	67.7	69.5	63.7	72.1	68.1	66.8	68.8	66.9	68.3	70.3	59.3	72.0
7:00	**8:00**	65.8	65.0	58.7	69.5	66.1	61.4	59.8	64.1	66.0	67.7	47.0	69.8
8:00	**9:00**	60.1	56.8	48.2	69.3	64.1	60.3	56.8	62.9	63.9	67.8	42.9	71.1
9:00	**10:00**	65.8	63.2	60.1	69.4	65.5	61.0	62.2	63.9	65.1	68.5	64.5	72.4
10:00	**11:00**	66.5	66.8	62.7	70.1	65.9	61.1	64.0	64.1	66.5	68.8	68.2	73.1
11:00	**12:00**	65.6	66.6	62.7	69.9	65.6	59.9	62.7	64.0	65.4	68.9	65.2	72.9
12:00	**13:00**	66.7	65.1	60.1	69.8	64.3	60.4	61.2	65.0	66.2	69.1	60.8	72.6
13:00	**14:00**	66.3	67.2	61.4	69.1	65.8	61.0	61.7	65.4	66.6	69.4	58.7	72.0
14:00	**15:00**	67.3	66.3	60.4	68.9	64.5	60.1	59.6	64.5	66.0	68.8	60.1	70.7
15:00	**16:00**	64.7	62.4	55.6	68.4	64.7	60.4	57.1	63.8	65.8	67.8	56.1	74.2
16:00	**17:00**	68.4	65.6	55.0	66.4	65.6	59.9	57.9	62.9	65.3	66.7	57.4	71.2
17:00	**18:00**	68.7	66.1	57.4	62.7	65.6	58.8	58.0	64.0	65.4	65.9	58.0	71.0
18:00	**19:00**	67.7	65.6	60.0	66.8	64.8	59.9	59.5	63.1	64.5	67.1	57.7	72.0
19:00	**20:00**	67.7	66.6	61.7	69.0	66.2	61.1	61.1	65.0	65.3	68.6	56.5	70.8
20:00	**21:00**	67.2	68.6	63.9	70.5	67.6	64.1	64.6	66.8	66.9	69.3	59.0	69.6
21:00	**22:00**	67.3	68.5	66.4	70.7	68.0	65.3	67.6	67.2	68.3	70.1	60.2	70.1
22:00	**23:00**	68.3	69.7	68.3	72.6	69.7	68.0	69.2	67.8	69.4	71.0	62.3	71.2
23:00	**0:00**	67.6	70.0	68.8	74.2	70.0	69.0	70.2	68.8	69.3	70.9	63.1	71.5

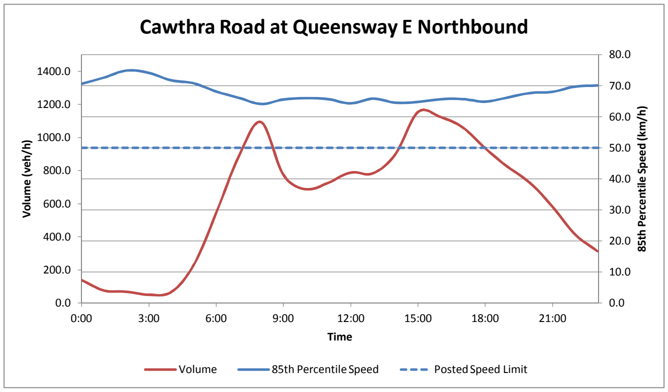
Hourly Traffic Volume		Cawthra Road at Arbor Road		Cawthra Road at Tedwyn Drive		Cawthra Road at Queensway East		Cawthra Road at Silver Creek Boulevard		Cawthra Road at Bloor Street		Cawthra Road at Burnhamthorpe Road East	
Start	End	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
0:00	**1:00**	91.0	74.3	172.3	142.7	138.7	120.3	152.7	122.7	152.0	130.3	130.7	170.7
1:00	**2:00**	44.7	42.3	94.0	80.0	75.0	54.0	84.7	57.7	79.0	65.7	67.0	91.7
2:00	**3:00**	34.0	26.0	74.3	84.3	67.7	63.3	64.0	46.0	61.7	53.3	58.7	62.0
3:00	**4:00**	25.3	24.0	63.3	72.7	49.7	49.3	55.7	43.7	54.7	46.3	67.3	49.3
4:00	**5:00**	60.3	27.3	87.3	88.0	66.3	70.3	74.3	63.7	85.3	65.7	112.7	66.3
5:00	**6:00**	220.7	79.3	279.3	326.7	229.0	318.0	246.0	312.7	312.7	293.3	428.3	236.0
6:00	**7:00**	563.3	311.3	694.7	740.7	542.7	828.7	589.3	836.0	720.3	712.7	879.7	643.0
7:00	**8:00**	1073.3	561.0	1060.7	1104.0	883.3	1190.7	918.0	1302.7	1071.0	1081.7	887.3	1025.7
8:00	**9:00**	1259.7	939.7	991.0	1183.3	1093.3	1280.0	1124.7	1371.0	1150.7	1115.0	839.3	1009.7
9:00	**10:00**	737.3	500.3	954.7	895.3	774.3	977.7	794.7	1098.7	797.3	929.3	804.3	886.7
10:00	**11:00**	589.7	455.0	853.7	816.7	687.7	812.7	706.7	910.0	694.3	791.0	677.0	723.3
11:00	**12:00**	635.0	487.0	853.3	840.7	726.3	815.0	768.7	916.7	751.7	778.0	640.0	727.0
12:00	**13:00**	668.0	530.7	969.0	866.0	788.3	863.7	848.0	935.0	788.0	789.3	687.7	774.7
13:00	**14:00**	654.0	478.7	932.7	885.7	783.3	851.3	843.0	922.7	796.7	783.7	679.3	765.7
14:00	**15:00**	761.0	631.0	1051.0	1026.0	900.7	984.7	950.7	1058.3	921.3	904.3	763.0	905.7
15:00	**16:00**	1184.0	832.0	1201.0	1174.3	1154.0	1121.3	1135.3	1321.7	1044.7	1055.7	782.0	1162.7
16:00	**17:00**	1001.3	772.0	1126.3	1316.7	1124.3	1323.7	1132.0	1357.7	1062.3	1145.7	686.0	1317.7
17:00	**18:00**	917.0	811.7	1243.0	1365.3	1061.0	1413.7	1115.7	1372.7	1051.7	1255.3	652.3	1419.7
18:00	**19:00**	828.3	747.0	1117.0	1270.3	935.0	1194.7	990.7	1307.7	946.3	1124.7	643.3	1301.0
19:00	**20:00**	700.0	588.0	967.0	919.7	822.7	872.0	900.7	988.3	866.3	836.3	657.0	910.7
20:00	**21:00**	590.3	457.7	806.0	752.7	725.7	677.0	776.0	716.7	733.7	633.7	581.7	704.7
21:00	**22:00**	470.3	373.0	658.7	579.0	581.7	532.7	586.3	553.0	569.3	529.0	446.3	588.0
22:00	**23:00**	335.3	237.0	459.7	446.0	415.0	381.7	444.0	400.3	427.7	383.7	357.7	435.3
23:00	**0:00**	197.3	173.0	319.3	299.7	313.3	251.0	296.0	266.7	290.7	272.3	220.0	370.0

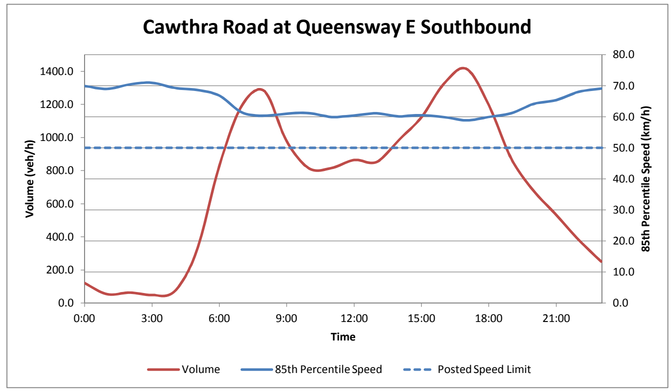

Cawthra Road at Arbor Road Northbound
Volume (veh/h)
85th Percentile Speed (km/h)
Time
Volume
85th Percentile Speed
Posted Speed Limit

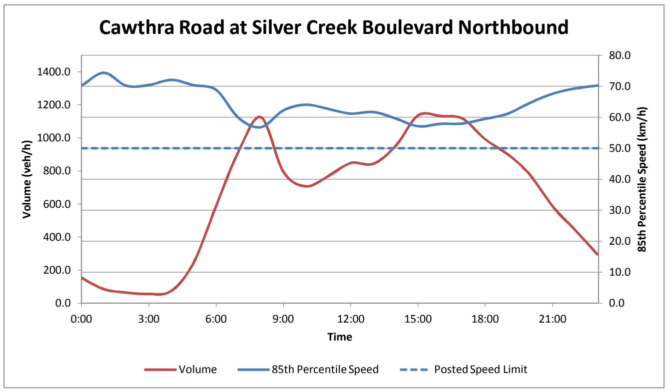

Cawthra Road at Arbor Road Southbound
Volume (veh/h)
85th Percentile Speed (km/h)
Time
Volume
85th Percentile Speed
Posted Speed Limit

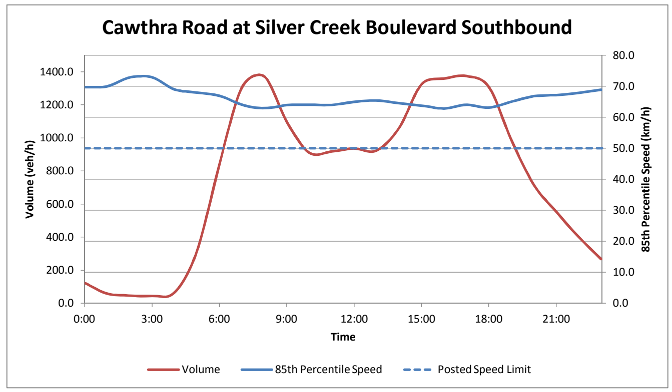

Cawthra Road at Tedwyn Drive Northbound
Volume (veh/h)
85th Percentile Speed (km/h)
Time
Volume
85th Percentile Speed
Posted Speed Limit

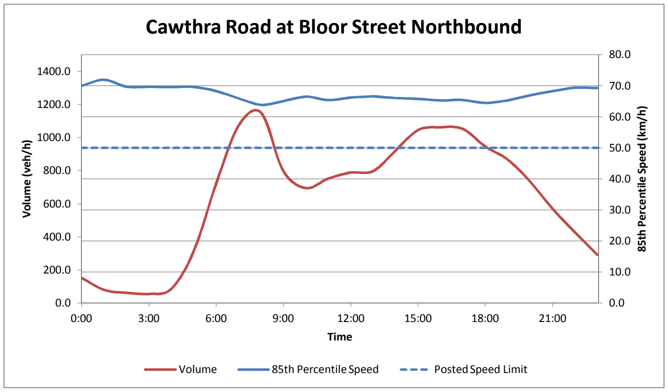

Cawthra Road at Tedwyn Drive Southbound
Volume (veh/h)
85th Percentile Speed (km/h)
Time
Volume
85th Percentile Speed
Posted Speed Limit

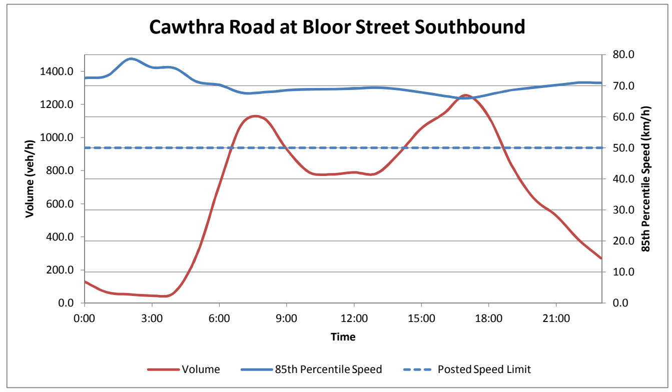

Cawthra Road at Queensway E Northbound
Volume (veh/h)
85th Percentile Speed (km/h)
Time
Volume
85th Percentile Speed
Posted Speed Limit

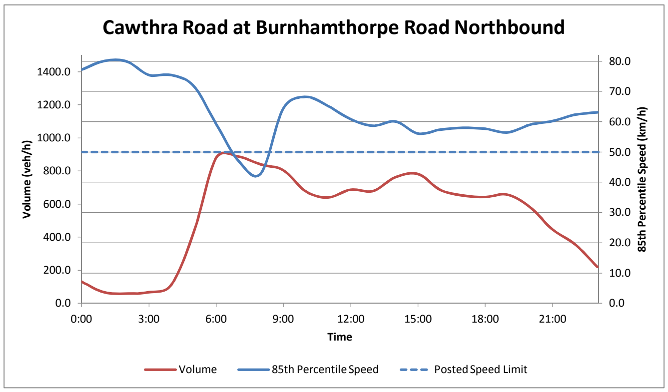

Cawthra Road at Queensway E Southbound
Volume (veh/h)
85th Percentile Speed (km/h)
Time
Volume
85th Percentile Speed
Posted Speed Limit

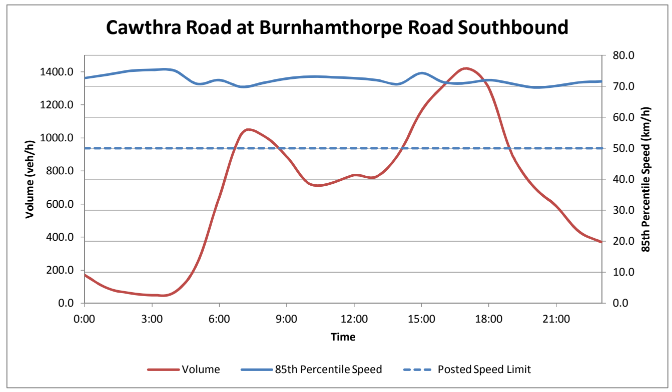

Cawthra Road at Silver Creek Boulevard Northbound
Volume (veh/h)
85th Percentile Speed (km/h)
Time
Volume
85th Percentile Speed
Posted Speed Limit


Cawthra Road at Silver Creek Boulevard Southbound
Volume (veh/h)
85th Percentile Speed (km/h)
Time
Volume
85th Percentile Speed
Posted Speed Limit


Cawthra Road at Bloor Street Northbound
Volume (veh/h)
85th Percentile Speed (km/h)
Time
Volume
85th Percentile Speed
Posted Speed Limit


Cawthra Road at Bloor Street Southbound
Volume (veh/h)
85th Percentile Speed (km/h)
Time
Volume
85th Percentile Speed
Posted Speed Limit


Cawthra Road at Burnhamthorpe Road Northbound
Volume (veh/h)
85th Percentile Speed (km/h)
Time
Volume
85th Percentile Speed
Posted Speed Limit


Cawthra Road at Burnhamthorpe Road Southbound
Volume (veh/h)
85th Percentile Speed (km/h)
Time
Volume
85th Percentile Speed
Posted Speed Limit

APPENDIX B

EXISTING (2016) AM & PM PEAK HOUR LEVEL OF SERVICE ANALYSIS

(SYNCHRO 9 OUTPUT)

APPENDIX B1

SIGNALIZED INTERSECTIONS

2016 AM PEAK HOUR

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	256	287	35	21	35	241	21	1314	70	245	780	99
Future Volume (vph)	256	287	35	21	35	241	21	1314	70	245	780	99
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	7.3	7.3		7.3	7.3		6.7	6.7		3.0	6.7	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.87		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1700	1789		1700	1564		1700	3450		1594	3418	
Flt Permitted	0.47	1.00		0.41	1.00		0.32	1.00		0.08	1.00	
Satd. Flow (perm)	843	1789		727	1564		578	3450		126	3418	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	256	287	35	21	35	241	21	1314	70	245	780	99
RTOR Reduction (vph)	0	3	0	0	165	0	0	3	0	0	8	0
Lane Group Flow (vph)	256	319	0	21	111	0	21	1381	0	245	871	0
Heavy Vehicles (%)	5%	5%	11%	5%	5%	7%	5%	5%	5%	12%	5%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		8			4			6		5	2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)	37.7	37.7		37.7	37.7		50.3	50.3		68.3	68.3	
Effective Green, g (s)	37.7	37.7		37.7	37.7		50.3	50.3		68.3	68.3	
Actuated g/C Ratio	0.31	0.31		0.31	0.31		0.42	0.42		0.57	0.57	
Clearance Time (s)	7.3	7.3		7.3	7.3		6.7	6.7		3.0	6.7	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	264	562		228	491		242	1446		255	1945	
v/s Ratio Prot		0.18			0.07			0.40		c0.12	0.25	
v/s Ratio Perm	c0.30			0.03			0.04			c0.43		
v/c Ratio	0.97	0.57		0.09	0.23		0.09	0.96		0.96	0.45	
Uniform Delay, d1	40.6	34.3		29.1	30.4		21.0	33.8		37.6	14.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	47.1	2.2		0.4	0.5		0.7	15.1		46.0	0.7	
Delay (s)	87.6	36.5		29.4	30.9		21.7	48.9		83.6	15.7	
Level of Service	F	D		C	C		C	D		F	B	
Approach Delay (s)		59.1			30.8			48.5			30.5	
Approach LOS		E			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	42.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	104.1%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	375	141	0	1154	1021	0
Future Volume (vph)	375	141	0	1154	1021	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.7	3.7	3.7	3.7
Total Lost time (s)	6.3	6.3		6.0	6.0	
Lane Util. Factor	0.97	0.91		0.91	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	0.99	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3164	1247		4995	3476	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3164	1247		4995	3476	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	375	141	0	1154	1021	0
RTOR Reduction (vph)	3	107	0	0	0	0
Lane Group Flow (vph)	386	20	0	1154	1021	0
Confl. Peds. (#/hr)	5	5	5			5
Heavy Vehicles (%)	9%	14%	5%	5%	5%	5%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	2	
Permitted Phases		4				
Actuated Green, G (s)	18.4	18.4		88.8	88.8	
Effective Green, g (s)	18.4	18.4		88.8	88.8	
Actuated g/C Ratio	0.15	0.15		0.74	0.74	
Clearance Time (s)	6.3	6.3		6.0	6.0	
Vehicle Extension (s)	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	487	192		3711	2583	
v/s Ratio Prot	c0.12			0.23	c0.29	
v/s Ratio Perm		0.02				
v/c Ratio	0.79	0.10		0.31	0.40	
Uniform Delay, d1	48.7	43.4		5.1	5.6	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	9.9	0.5		0.2	0.5	
Delay (s)	58.6	43.9		5.3	6.0	
Level of Service	E	D		A	A	
Approach Delay (s)	55.0			5.3	6.0	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	15.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	119.5	Sum of lost time (s)	12.3
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	186	288	1377	0	0	1431
Future Volume (vph)	186	288	1377	0	0	1431
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.7	3.7	3.7	3.7
Total Lost time (s)	6.3	6.3	6.0			6.0
Lane Util. Factor	0.97	0.91	0.95			0.91
Frpb, ped/bikes	0.98	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	0.94	0.85	1.00			1.00
Flt Protected	0.97	1.00	1.00			1.00
Satd. Flow (prot)	3106	1350	3476			4995
Flt Permitted	0.97	1.00	1.00			1.00
Satd. Flow (perm)	3106	1350	3476			4995
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	186	288	1377	0	0	1431
RTOR Reduction (vph)	82	82	0	0	0	0
Lane Group Flow (vph)	239	71	1377	0	0	1431
Confl. Peds. (#/hr)	5	5		5	5	
Confl. Bikes (#/hr)		1		5		
Turn Type	Prot	Perm	NA			NA
Protected Phases	4		2			2
Permitted Phases		4				
Actuated Green, G (s)	15.4	15.4	90.0			90.0
Effective Green, g (s)	15.4	15.4	90.0			90.0
Actuated g/C Ratio	0.13	0.13	0.76			0.76
Clearance Time (s)	6.3	6.3	6.0			6.0
Vehicle Extension (s)	5.0	5.0	5.0			5.0
Lane Grp Cap (vph)	406	176	2657			3819
v/s Ratio Prot	c0.08		c0.40			0.29
v/s Ratio Perm		0.05				
v/c Ratio	0.59	0.41	0.52			0.37
Uniform Delay, d1	48.2	46.9	5.4			4.6
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	3.4	3.2	0.7			0.3
Delay (s)	51.5	50.1	6.1			4.9
Level of Service	D	D	A			A
Approach Delay (s)	51.1		6.1			4.9
Approach LOS	D		A			A

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	117.7	Sum of lost time (s)	12.3
Intersection Capacity Utilization	60.7%	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)	55	129	217	220	152	81	128	1278	177	37	1592	37
Future Volume (vph)	55	129	217	220	152	81	128	1278	177	37	1592	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	6.6	6.6		3.0	6.6		3.0	6.3		6.3	6.3	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.91	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.95		1.00	0.98		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1694	1640		1699	1724		1700	3401		1699	4972	
Flt Permitted	0.61	1.00		0.24	1.00		0.08	1.00		0.10	1.00	
Satd. Flow (perm)	1094	1640		426	1724		142	3401		185	4972	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	55	129	217	220	152	81	128	1278	177	37	1592	37
RTOR Reduction (vph)	0	54	0	0	17	0	0	8	0	0	2	0
Lane Group Flow (vph)	55	292	0	220	216	0	128	1447	0	37	1627	0
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	7%
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA		Perm	NA	
Protected Phases		8		7	4		1	6			2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)	26.3	26.3		39.3	39.3		59.3	59.3		47.3	47.3	
Effective Green, g (s)	26.3	26.3		39.3	39.3		59.3	59.3		47.3	47.3	
Actuated g/C Ratio	0.24	0.24		0.35	0.35		0.53	0.53		0.42	0.42	
Clearance Time (s)	6.6	6.6		3.0	6.6		3.0	6.3		6.3	6.3	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	258	386		264	607		201	1808		78	2109	
v/s Ratio Prot		0.18		c0.07	0.12		0.05	c0.43			0.33	
v/s Ratio Perm	0.05			c0.22			0.29			0.20		
v/c Ratio	0.21	0.76		0.83	0.36		0.64	0.80		0.47	0.77	
Uniform Delay, d1	34.3	39.6		29.4	26.7		19.2	21.3		23.1	27.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	9.7		21.6	0.7		8.9	3.8		19.3	2.8	
Delay (s)	35.1	49.3		51.0	27.5		28.1	25.1		42.4	30.3	
Level of Service	D	D		D	C		C	C		D	C	
Approach Delay (s)		47.4			38.9			25.3			30.6	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	31.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	111.5	Sum of lost time (s)	18.9
Intersection Capacity Utilization	101.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	80	99	72	1460	1622	23
Future Volume (vph)	80	99	72	1460	1622	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.5	3.7	3.7	3.5
Total Lost time (s)	7.1	7.1	6.3	6.3	6.3	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.91	
Frpb, ped/bikes	1.00	0.98	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	1.00	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1700	1494	1698	3476	4982	
Flt Permitted	0.95	1.00	0.13	1.00	1.00	
Satd. Flow (perm)	1700	1494	230	3476	4982	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	80	99	72	1460	1622	23
RTOR Reduction (vph)	0	32	0	0	1	0
Lane Group Flow (vph)	80	67	72	1460	1644	0
Confl. Peds. (#/hr)	5	5	5			5
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	8			6	2	
Permitted Phases		8	6			
Actuated Green, G (s)	13.1	13.1	93.5	93.5	93.5	
Effective Green, g (s)	13.1	13.1	93.5	93.5	93.5	
Actuated g/C Ratio	0.11	0.11	0.78	0.78	0.78	
Clearance Time (s)	7.1	7.1	6.3	6.3	6.3	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	185	163	179	2708	3881	
v/s Ratio Prot	c0.05			c0.42	0.33	
v/s Ratio Perm		0.04	0.31			
v/c Ratio	0.43	0.41	0.40	0.54	0.42	
Uniform Delay, d1	50.0	49.8	4.3	5.0	4.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.4	3.5	6.6	0.8	0.3	
Delay (s)	53.3	53.3	10.9	5.8	4.7	
Level of Service	D	D	B	A	A	
Approach Delay (s)	53.3			6.1	4.7	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	7.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.4
Intersection Capacity Utilization	64.3%	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												
Traffic Volume (vph)	240	858	284	171	452	195	93	1092	465	249	1128	47
Future Volume (vph)	240	858	284	171	452	195	93	1092	465	249	1128	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	5.0	6.9		5.0	6.9		5.0	7.5	7.5	5.0	7.5	
Lane Util. Factor	1.00	0.91		0.97	0.91		1.00	0.95	1.00	0.97	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.95		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1700	4785		3298	4661		1700	3476	1491	3298	4961	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1700	4785		3298	4661		1700	3476	1491	3298	4961	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	240	858	284	171	452	195	93	1092	465	249	1128	47
RTOR Reduction (vph)	0	43	0	0	56	0	0	0	129	0	3	0
Lane Group Flow (vph)	240	1099	0	171	591	0	93	1092	336	249	1172	0
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
Heavy Vehicles (%)	5%	5%	5%	5%	5%	11%	5%	5%	5%	5%	5%	5%
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases									6			
Actuated Green, G (s)	23.1	41.4		10.0	28.3		13.5	49.5	49.5	14.7	50.7	
Effective Green, g (s)	23.1	41.4		10.0	28.3		13.5	49.5	49.5	14.7	50.7	
Actuated g/C Ratio	0.17	0.30		0.07	0.20		0.10	0.35	0.35	0.10	0.36	
Clearance Time (s)	5.0	6.9		5.0	6.9		5.0	7.5	7.5	5.0	7.5	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	280	1414		235	942		163	1229	527	346	1796	
v/s Ratio Prot	c0.14	c0.23		0.05	0.13		0.05	c0.31		c0.08	0.24	
v/s Ratio Perm									0.23			
v/c Ratio	0.86	0.78		0.73	0.63		0.57	0.89	0.64	0.72	0.65	
Uniform Delay, d1	56.8	45.1		63.7	51.0		60.5	42.6	37.8	60.7	37.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.29	0.63	
Incremental Delay, d2	23.7	3.2		13.0	1.9		7.5	9.8	5.8	7.3	1.6	
Delay (s)	80.5	48.3		76.6	52.9		68.0	52.4	43.6	85.3	24.9	
Level of Service	F	D		E	D		E	D	D	F	C	
Approach Delay (s)		53.9			57.9			50.8			35.4	
Approach LOS		D			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	48.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	24.4
Intersection Capacity Utilization	87.4%	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 (vph)	316	1	118	0	1	0	44	1074	0	0	1412	591
Future Volume (vph)	316	1	118	0	1	0	44	1074	0	0	1412	591
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.7	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	6.4	6.4	6.4		6.4		3.0	6.4			6.4	6.4
Lane Util. Factor	0.95	0.95	1.00		1.00		1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.93		1.00		1.00	1.00			1.00	0.95
Flpb, ped/bikes	1.00	1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85		1.00		1.00	1.00			1.00	0.85
Flt Protected	0.95	0.95	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1615	1656	1407		1830		1638	3476			3476	1446
Flt Permitted	0.95	0.95	1.00		1.00		0.12	1.00			1.00	1.00
Satd. Flow (perm)	1615	1656	1407		1830		199	3476			3476	1446
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	316	1	118	0	1	0	44	1074	0	0	1412	591
RTOR Reduction (vph)	0	0	98	0	0	0	0	0	0	0	0	145
Lane Group Flow (vph)	158	159	20	0	1	0	44	1074	0	0	1412	446
Confl. Peds. (#/hr)			35	16					7			19
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	9%	5%	5%	5%	5%	5%
Turn Type	Split	NA	Perm		NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	4	4			3		1	6			2	
Permitted Phases			4	3			6			2		2
Actuated Green, G (s)	24.1	24.1	24.1		1.6		95.1	95.1			85.9	85.9
Effective Green, g (s)	24.1	24.1	24.1		1.6		95.1	95.1			85.9	85.9
Actuated g/C Ratio	0.17	0.17	0.17		0.01		0.68	0.68			0.61	0.61
Clearance Time (s)	6.4	6.4	6.4		6.4		3.0	6.4			6.4	6.4
Vehicle Extension (s)	5.0	5.0	5.0		5.0		5.0	5.0			5.0	5.0
Lane Grp Cap (vph)	278	285	242		20		198	2361			2132	887
v/s Ratio Prot	c0.10	0.10			c0.00		0.01	c0.31			c0.41	
v/s Ratio Perm			0.01				0.14					0.31
v/c Ratio	0.57	0.56	0.08		0.05		0.22	0.45			0.66	0.50
Uniform Delay, d1	53.2	53.1	48.7		68.4		12.4	10.4			17.6	15.1
Progression Factor	1.04	1.04	1.97		1.00		0.81	0.77			0.34	0.06
Incremental Delay, d2	4.2	3.9	0.3		2.2		0.6	0.3			1.1	1.4
Delay (s)	59.4	58.8	96.2		70.6		10.7	8.3			7.1	2.3
Level of Service	E	E	F		E		B	A			A	A
Approach Delay (s)		69.2			70.6			8.4			5.7	
Approach LOS		E			E			A			A	

Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	22.2
Intersection Capacity Utilization	80.9%	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)	107	0	381	0	0	0	133	1305	0	0	1549	37
Future Volume (vph)	107	0	381	0	0	0	133	1305	0	0	1549	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.7	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.7
Total Lost time (s)		6.0	6.0				3.0	6.0			6.0	
Lane Util. Factor		1.00	1.00				1.00	0.95			0.95	
Frpb, ped/bikes		1.00	0.98				1.00	1.00			1.00	
Flpb, ped/bikes		0.99	1.00				1.00	1.00			1.00	
Frt		1.00	0.85				1.00	1.00			1.00	
Flt Protected		0.95	1.00				0.95	1.00			1.00	
Satd. Flow (prot)		1728	1486				1700	3476			3457	
Flt Permitted		0.76	1.00				0.08	1.00			1.00	
Satd. Flow (perm)		1377	1486				142	3476			3457	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	107	0	381	0	0	0	133	1305	0	0	1549	37
RTOR Reduction (vph)	0	0	152	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	107	229	0	0	0	133	1305	0	0	1585	0
Confl. Peds. (#/hr)	3		6	6		3	7					7
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	10%
Turn Type	Perm	NA	Perm				pm+pt	NA		Perm	NA	
Protected Phases		4			4		1	6			2	
Permitted Phases	4		4	4			6			2		
Actuated Green, G (s)		27.6	27.6				100.4	100.4			85.3	
Effective Green, g (s)		27.6	27.6				100.4	100.4			85.3	
Actuated g/C Ratio		0.20	0.20				0.72	0.72			0.61	
Clearance Time (s)		6.0	6.0				3.0	6.0			6.0	
Vehicle Extension (s)		5.0	5.0				5.0	5.0			5.0	
Lane Grp Cap (vph)		271	292				236	2492			2106	
v/s Ratio Prot							c0.05	0.38			c0.46	
v/s Ratio Perm		0.08	c0.15				0.36					
v/c Ratio		0.39	0.79				0.56	0.52			0.75	
Uniform Delay, d1		48.9	53.4				19.2	9.0			19.7	
Progression Factor		1.00	1.00				1.51	0.90			0.76	
Incremental Delay, d2		2.0	14.8				4.6	0.7			1.8	
Delay (s)		50.9	68.2				33.7	8.8			16.9	
Level of Service		D	E				C	A			B	
Approach Delay (s)		64.4			0.0			11.1			16.9	
Approach LOS		E			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	21.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	78.2%	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)	129	523	270	229	289	59	123	1229	187	91	1230	46
Future Volume (vph)	129	523	270	229	289	59	123	1229	187	91	1230	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.9	6.9	3.0	6.9	6.9	3.0	7.0		3.0	7.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00		1.00	1.00	0.99
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1680	3476	1488	1700	3476	1455	1700	3407		1700	3476	1501
Flt Permitted	0.57	1.00	1.00	0.19	1.00	1.00	0.12	1.00		0.07	1.00	1.00
Satd. Flow (perm)	1016	3476	1488	342	3476	1455	214	3407		128	3476	1501
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	129	523	270	229	289	59	123	1229	187	91	1230	46
RTOR Reduction (vph)	0	0	115	0	0	44	0	9	0	0	0	0
Lane Group Flow (vph)	129	523	155	229	289	15	123	1407	0	91	1230	46
Confl. Peds. (#/hr)	16		5			16	5					5
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Free
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6			2		Free
Actuated Green, G (s)	33.7	25.7	25.7	46.6	34.6	34.6	76.6	69.2		76.4	69.1	140.0
Effective Green, g (s)	33.7	25.7	25.7	46.6	34.6	34.6	76.6	69.2		76.4	69.1	140.0
Actuated g/C Ratio	0.24	0.18	0.18	0.33	0.25	0.25	0.55	0.49		0.55	0.49	1.00
Clearance Time (s)	4.0	6.9	6.9	3.0	6.9	6.9	3.0	7.0		3.0	7.0	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	282	638	273	287	859	359	195	1684		151	1715	1501
v/s Ratio Prot	0.03	0.15		c0.10	0.08		c0.03	c0.41		0.03	0.35	
v/s Ratio Perm	0.08		0.10	c0.16		0.01	0.31			0.30		c0.03
v/c Ratio	0.46	0.82	0.57	0.80	0.34	0.04	0.63	0.84		0.60	0.72	0.03
Uniform Delay, d1	43.7	54.9	52.1	37.4	43.3	40.1	21.0	30.5		24.3	27.8	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.61	1.29		1.73	1.77	1.00
Incremental Delay, d2	2.5	9.1	4.4	16.2	0.5	0.1	8.1	4.6		7.4	2.0	0.0
Delay (s)	46.2	64.1	56.5	53.6	43.8	40.2	41.9	43.9		49.6	51.1	0.0
Level of Service	D	E	E	D	D	D	D	D		D	D	A
Approach Delay (s)		59.3			47.3			43.7			49.3	
Approach LOS		E			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	49.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	20.9
Intersection Capacity Utilization	90.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	131	1152	202	163	576	54	185	1159	200	102	1022	56
Future Volume (vph)	131	1152	202	163	576	54	185	1159	200	102	1022	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	3.0	7.5	7.5	3.0	7.5	7.5	3.0	8.0	8.0	4.0	8.0	8.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1697	3476	1501	1700	3476	1483	1700	3476	1501	1700	3476	1495
Flt Permitted	0.34	1.00	1.00	0.08	1.00	1.00	0.10	1.00	1.00	0.09	1.00	1.00
Satd. Flow (perm)	607	3476	1501	145	3476	1483	176	3476	1501	160	3476	1495
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	131	1152	202	163	576	54	185	1159	200	102	1022	56
RTOR Reduction (vph)	0	0	94	0	0	35	0	0	93	0	0	36
Lane Group Flow (vph)	131	1152	108	163	576	19	185	1159	107	102	1022	20
Confl. Peds. (#/hr)	14		1	1		14	11		1	1		5
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6		6	2		2
Actuated Green, G (s)	58.5	49.5	49.5	58.5	49.5	49.5	63.0	54.0	54.0	54.0	49.0	49.0
Effective Green, g (s)	58.5	49.5	49.5	58.5	49.5	49.5	63.0	54.0	54.0	54.0	49.0	49.0
Actuated g/C Ratio	0.42	0.35	0.35	0.42	0.35	0.35	0.45	0.39	0.39	0.39	0.35	0.35
Clearance Time (s)	3.0	7.5	7.5	3.0	7.5	7.5	3.0	8.0	8.0	4.0	8.0	8.0
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	323	1229	530	160	1229	524	198	1340	578	116	1216	523
v/s Ratio Prot	0.03	0.33		c0.07	0.17		c0.07	0.33		0.03	0.29	
v/s Ratio Perm	0.14		0.07	c0.36		0.01	c0.35		0.07	0.31		0.01
v/c Ratio	0.41	0.94	0.20	1.02	0.47	0.04	0.93	0.86	0.19	0.88	0.84	0.04
Uniform Delay, d1	26.2	43.8	31.5	36.2	35.1	29.6	31.8	39.6	28.5	34.9	41.9	30.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.10	1.17	1.97	1.90	0.93	1.00
Incremental Delay, d2	1.7	13.7	0.4	76.2	0.6	0.1	40.3	6.2	0.6	42.3	5.6	0.1
Delay (s)	27.9	57.5	31.9	112.4	35.7	29.7	75.2	52.5	56.5	108.7	44.6	30.1
Level of Service	C	E	C	F	D	C	E	D	E	F	D	C
Approach Delay (s)		51.4			51.0			55.8			49.4	
Approach LOS		D			D			E			D	

Intersection Summary			
HCM 2000 Control Delay	52.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	22.5
Intersection Capacity Utilization	103.4%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	63	618	131	79	418	112	118	1049	174	91	978	24
Future Volume (vph)	63	618	131	79	418	112	118	1049	174	91	978	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	6.4	6.4		3.0	6.4		3.0	6.5		3.0	6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.98	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.97		1.00	0.98		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1670	3369		1699	3327		1699	3393		1700	3456	
Flt Permitted	0.32	1.00		0.17	1.00		0.17	1.00		0.10	1.00	
Satd. Flow (perm)	562	3369		303	3327		308	3393		178	3456	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	63	618	131	79	418	112	118	1049	174	91	978	24
RTOR Reduction (vph)	0	13	0	0	17	0	0	9	0	0	1	0
Lane Group Flow (vph)	63	736	0	79	513	0	118	1214	0	91	1001	0
Confl. Peds. (#/hr)	36		12	12		36	12		6	6		12
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	12%
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4		3	4		1	6		5	2	
Permitted Phases	4			4			6			2		
Actuated Green, G (s)	40.1	40.1		47.8	40.1		73.4	63.6		73.2	63.5	
Effective Green, g (s)	40.1	40.1		47.8	40.1		73.4	63.6		73.2	63.5	
Actuated g/C Ratio	0.29	0.29		0.34	0.29		0.52	0.45		0.52	0.45	
Clearance Time (s)	6.4	6.4		3.0	6.4		3.0	6.5		3.0	6.5	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	160	964		180	952		258	1541		198	1567	
v/s Ratio Prot		c0.22		c0.02	0.15		c0.03	c0.36		0.03	0.29	
v/s Ratio Perm	0.11			0.13			0.21			0.21		
v/c Ratio	0.39	0.76		0.44	0.54		0.46	0.79		0.46	0.64	
Uniform Delay, d1	40.2	45.6		33.7	42.1		20.0	32.5		22.8	29.4	
Progression Factor	1.00	1.00		1.00	1.00		1.22	0.54		1.64	0.82	
Incremental Delay, d2	3.3	4.3		3.5	1.1		1.6	2.5		3.3	1.9	
Delay (s)	43.5	49.9		37.3	43.2		26.0	20.1		40.7	26.2	
Level of Service	D	D		D	D		C	C		D	C	
Approach Delay (s)		49.4			42.5			20.6			27.4	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	32.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	90.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	123	25	3	1163	1024	0
Future Volume (vph)	123	25	3	1163	1024	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.5	3.7	3.7	3.5
Total Lost time (s)	6.2	6.2	3.0	6.0	6.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	1.00	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1700	1521	1699	3476	3476	
Flt Permitted	0.95	1.00	0.25	1.00	1.00	
Satd. Flow (perm)	1700	1521	448	3476	3476	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	123	25	3	1163	1024	0
RTOR Reduction (vph)	0	22	0	0	0	0
Lane Group Flow (vph)	123	3	3	1163	1024	0
Confl. Peds. (#/hr)			2			2
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6			
Actuated Green, G (s)	17.3	17.3	110.5	110.5	106.0	
Effective Green, g (s)	17.3	17.3	110.5	110.5	106.0	
Actuated g/C Ratio	0.12	0.12	0.79	0.79	0.76	
Clearance Time (s)	6.2	6.2	3.0	6.0	6.0	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	210	187	367	2743	2631	
v/s Ratio Prot	c0.07		0.00	c0.33	0.29	
v/s Ratio Perm		0.00	0.01			
v/c Ratio	0.59	0.02	0.01	0.42	0.39	
Uniform Delay, d1	58.0	53.9	3.6	4.7	5.9	
Progression Factor	1.00	1.00	0.88	0.85	1.00	
Incremental Delay, d2	6.3	0.1	0.0	0.3	0.4	
Delay (s)	64.3	54.0	3.2	4.3	6.3	
Level of Service	E	D	A	A	A	
Approach Delay (s)	62.5			4.3	6.3	
Approach LOS	E			A	A	

Intersection Summary			
HCM 2000 Control Delay	8.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	49.1%	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)	377	1459	341	56	522	240	198	1017	123	185	659	128
Future Volume (vph)	377	1459	341	56	522	240	198	1017	123	185	659	128
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	3.0	7.9	7.9	4.0	7.9	7.9	3.0	8.4		3.0	8.4	8.4
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1700	3476	1521	1580	3476	1521	1700	3420		1700	3476	1268
Flt Permitted	0.31	1.00	1.00	0.10	1.00	1.00	0.27	1.00		0.09	1.00	1.00
Satd. Flow (perm)	559	3476	1521	170	3476	1521	479	3420		162	3476	1268
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	377	1459	341	56	522	240	198	1017	123	185	659	128
RTOR Reduction (vph)	0	0	147	0	0	149	0	7	0	0	0	88
Lane Group Flow (vph)	377	1459	194	56	522	91	198	1133	0	185	659	40
Confl. Peds. (#/hr)												
Heavy Vehicles (%)	5%	5%	5%	13%	5%	5%	5%	5%	5%	5%	5%	26%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6			2		2
Actuated Green, G (s)	67.5	59.5	59.5	43.1	39.1	39.1	54.2	44.2		54.2	44.2	44.2
Effective Green, g (s)	67.5	59.5	59.5	43.1	39.1	39.1	54.2	44.2		54.2	44.2	44.2
Actuated g/C Ratio	0.48	0.42	0.42	0.31	0.28	0.28	0.38	0.31		0.38	0.31	0.31
Clearance Time (s)	3.0	7.9	7.9	4.0	7.9	7.9	3.0	8.4		3.0	8.4	8.4
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Lane Grp Cap (vph)	473	1466	641	91	963	421	270	1072		171	1089	397
v/s Ratio Prot	c0.14	c0.42		0.02	0.15		0.05	0.33		c0.08	0.19	
v/s Ratio Perm	0.24		0.13	0.17		0.06	0.23			c0.34		0.03
v/c Ratio	0.80	1.00	0.30	0.62	0.54	0.22	0.73	1.06		1.08	0.61	0.10
Uniform Delay, d1	25.8	40.6	27.0	39.2	43.3	39.2	33.0	48.4		37.6	41.0	34.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	10.3	22.3	0.6	16.5	1.1	0.5	11.8	43.9		92.3	2.5	0.5
Delay (s)	36.1	62.9	27.6	55.7	44.4	39.7	44.8	92.3		130.0	43.5	34.8
Level of Service	D	E	C	E	D	D	D	F		F	D	C
Approach Delay (s)		52.7			43.8			85.2			58.8	
Approach LOS		D			D			F			E	

Intersection Summary			
HCM 2000 Control Delay	60.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	141.0	Sum of lost time (s)	23.3
Intersection Capacity Utilization	107.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

2016 PM PEAK HOUR

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	107	125	51	44	112	285	45	1101	39	235	1575	338
Future Volume (vph)	107	125	51	44	112	285	45	1101	39	235	1575	338
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.7
Total Lost time (s)	7.3	7.3		7.3	7.3		6.7	6.7		3.0	6.7	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.96		1.00	0.89		1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1700	1750		1700	1633		1700	3458		1700	3384	
Flt Permitted	0.23	1.00		0.60	1.00		0.07	1.00		0.15	1.00	
Satd. Flow (perm)	406	1750		1077	1633		120	3458		269	3384	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	107	125	51	44	112	285	45	1101	39	235	1575	338
RTOR Reduction (vph)	0	13	0	0	79	0	0	2	0	0	14	0
Lane Group Flow (vph)	107	163	0	44	318	0	45	1138	0	235	1899	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		8			4			6		5	2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)	30.1	30.1		30.1	30.1		59.5	59.5		72.5	72.5	
Effective Green, g (s)	30.1	30.1		30.1	30.1		59.5	59.5		72.5	72.5	
Actuated g/C Ratio	0.26	0.26		0.26	0.26		0.51	0.51		0.62	0.62	
Clearance Time (s)	7.3	7.3		7.3	7.3		6.7	6.7		3.0	6.7	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	104	451		278	421		61	1764		289	2104	
v/s Ratio Prot		0.09			0.20			0.33		0.07	c0.56	
v/s Ratio Perm	c0.26			0.04			0.37			0.43		
v/c Ratio	1.03	0.36		0.16	0.76		0.74	0.65		0.81	0.90	
Uniform Delay, d1	43.2	35.4		33.5	39.9		22.4	20.8		15.3	19.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	96.2	1.0		0.6	9.0		56.2	1.8		17.7	6.8	
Delay (s)	139.5	36.4		34.0	48.8		78.6	22.7		33.0	25.8	
Level of Service	F	D		C	D		E	C		C	C	
Approach Delay (s)		75.4			47.3			24.8			26.6	
Approach LOS		E			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	31.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	116.6	Sum of lost time (s)	17.0
Intersection Capacity Utilization	120.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	481	309	0	1281	1893	0
Future Volume (vph)	481	309	0	1281	1893	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.7	3.7	3.7	3.7
Total Lost time (s)	6.3	6.3		6.0	6.0	
Lane Util. Factor	0.97	0.91		0.91	0.95	
Frt	0.98	0.85		1.00	1.00	
Flt Protected	0.96	1.00		1.00	1.00	
Satd. Flow (prot)	3267	1384		4995	3476	
Flt Permitted	0.96	1.00		1.00	1.00	
Satd. Flow (perm)	3267	1384		4995	3476	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	481	309	0	1281	1893	0
RTOR Reduction (vph)	9	20	0	0	0	0
Lane Group Flow (vph)	534	227	0	1281	1893	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	24.9	24.9		81.6	81.6	
Effective Green, g (s)	24.9	24.9		81.6	81.6	
Actuated g/C Ratio	0.21	0.21		0.69	0.69	
Clearance Time (s)	6.3	6.3		6.0	6.0	
Vehicle Extension (s)	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	684	290		3430	2387	
v/s Ratio Prot	0.16	c0.16		0.26	c0.54	
v/s Ratio Perm						
v/c Ratio	0.78	0.78		0.37	0.79	
Uniform Delay, d1	44.4	44.4		7.8	12.8	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.7	14.8		0.3	2.8	
Delay (s)	51.1	59.2		8.1	15.6	
Level of Service	D	E		A	B	
Approach Delay (s)	53.6			8.1	15.6	
Approach LOS	D			A	B	

Intersection Summary			
HCM 2000 Control Delay	20.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	118.8	Sum of lost time (s)	12.3
Intersection Capacity Utilization	79.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	262	250	1308	0	0	2021
Future Volume (vph)	262	250	1308	0	0	2021
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.7	3.7	3.7	3.7
Total Lost time (s)	6.3	6.3	6.0			6.0
Lane Util. Factor	0.97	0.91	0.95			0.91
Frt	0.96	0.85	1.00			1.00
Flt Protected	0.96	1.00	1.00			1.00
Satd. Flow (prot)	3220	1384	3476			4995
Flt Permitted	0.96	1.00	1.00			1.00
Satd. Flow (perm)	3220	1384	3476			4995
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	262	250	1308	0	0	2021
RTOR Reduction (vph)	29	93	0	0	0	0
Lane Group Flow (vph)	321	69	1308	0	0	2021
Turn Type	Prot	Prot	NA			NA
Protected Phases	4	4	2			2
Permitted Phases						
Actuated Green, G (s)	16.7	16.7	90.0			90.0
Effective Green, g (s)	16.7	16.7	90.0			90.0
Actuated g/C Ratio	0.14	0.14	0.76			0.76
Clearance Time (s)	6.3	6.3	6.0			6.0
Vehicle Extension (s)	5.0	5.0	5.0			5.0
Lane Grp Cap (vph)	451	194	2628			3777
v/s Ratio Prot	c0.10	0.05	0.38			c0.40
v/s Ratio Perm						
v/c Ratio	0.71	0.36	0.50			0.54
Uniform Delay, d1	48.8	46.3	5.7			5.9
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	6.5	2.3	0.7			0.5
Delay (s)	55.3	48.6	6.3			6.5
Level of Service	E	D	A			A
Approach Delay (s)	53.2		6.3			6.5
Approach LOS	D		A			A

Intersection Summary			
HCM 2000 Control Delay	12.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	119.0	Sum of lost time (s)	12.3
Intersection Capacity Utilization	59.4%	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)	42	81	154	582	533	197	146	1234	158	53	2108	80
Future Volume (vph)	42	81	154	582	533	197	146	1234	158	53	2108	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	6.6	6.6		3.0	6.6		3.0	6.3		6.3	6.3	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.91	
Frt	1.00	0.90		1.00	0.96		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1700	1650		1700	1756		1700	3417		1700	4967	
Flt Permitted	0.14	1.00		0.48	1.00		0.08	1.00		0.09	1.00	
Satd. Flow (perm)	250	1650		859	1756		148	3417		158	4967	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	42	81	154	582	533	197	146	1234	158	53	2108	80
RTOR Reduction (vph)	0	58	0	0	11	0	0	8	0	0	3	0
Lane Group Flow (vph)	42	177	0	582	719	0	146	1384	0	53	2185	0
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA		Perm	NA	
Protected Phases		8		7	4		1	6			2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)	36.7	36.7		51.7	51.7		53.2	53.2		45.2	45.2	
Effective Green, g (s)	36.7	36.7		51.7	51.7		53.2	53.2		45.2	45.2	
Actuated g/C Ratio	0.31	0.31		0.44	0.44		0.45	0.45		0.38	0.38	
Clearance Time (s)	6.6	6.6		3.0	6.6		3.0	6.3		6.3	6.3	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	77	514		462	770		132	1543		60	1905	
v/s Ratio Prot		0.11		c0.13	0.41		c0.05	0.40			0.44	
v/s Ratio Perm	0.17			c0.42			c0.45			0.33		
v/c Ratio	0.55	0.34		1.26	0.93		1.11	0.90		0.88	1.15	
Uniform Delay, d1	33.6	31.3		32.0	31.4		30.3	29.8		33.8	36.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	13.2	0.8		133.4	18.8		109.6	8.6		86.1	72.8	
Delay (s)	46.8	32.1		165.5	50.2		139.9	38.3		119.9	109.1	
Level of Service	D	C		F	D		F	D		F	F	
Approach Delay (s)		34.3			101.3			48.0			109.4	
Approach LOS		C			F			D			F	

Intersection Summary			
HCM 2000 Control Delay	85.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.24		
Actuated Cycle Length (s)	117.8	Sum of lost time (s)	18.9
Intersection Capacity Utilization	116.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	52	60	66	1492	2129	54
Future Volume (vph)	52	60	66	1492	2129	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.5	3.7	3.7	3.5
Total Lost time (s)	7.1	7.1	3.0	6.3	6.3	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.91	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	1.00	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1689	1521	1700	3476	4972	
Flt Permitted	0.95	1.00	0.06	1.00	1.00	
Satd. Flow (perm)	1689	1521	103	3476	4972	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	52	60	66	1492	2129	54
RTOR Reduction (vph)	0	55	0	0	1	0
Lane Group Flow (vph)	52	5	66	1492	2182	0
Confl. Peds. (#/hr)	5	5	5			5
Turn Type	Perm	Prot	pm+pt	NA	NA	
Protected Phases		8	1	6	2	
Permitted Phases	8		6			
Actuated Green, G (s)	9.5	9.5	97.1	97.1	86.9	
Effective Green, g (s)	9.5	9.5	97.1	97.1	86.9	
Actuated g/C Ratio	0.08	0.08	0.81	0.81	0.72	
Clearance Time (s)	7.1	7.1	3.0	6.3	6.3	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	133	120	179	2812	3600	
v/s Ratio Prot		0.00	0.02	c0.43	c0.44	
v/s Ratio Perm	c0.03		0.28			
v/c Ratio	0.39	0.04	0.37	0.53	0.61	
Uniform Delay, d1	52.5	51.0	6.5	3.8	8.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.9	0.3	2.7	0.7	0.8	
Delay (s)	56.4	51.3	9.2	4.5	8.9	
Level of Service	E	D	A	A	A	
Approach Delay (s)	53.7			4.7	8.9	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	70.4%	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)	146	519	196	571	1562	201	264	1043	148	194	1363	92
Future Volume (vph)	146	519	196	571	1562	201	264	1043	148	194	1363	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	5.0	6.9		5.0	6.9		5.0	7.5	7.5	5.0	7.5	
Lane Util. Factor	1.00	0.91		0.97	0.91		1.00	0.95	1.00	0.97	0.91	
Frt	1.00	0.96		1.00	0.98		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1700	4790		3298	4909		1700	3476	1521	3298	4948	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1700	4790		3298	4909		1700	3476	1521	3298	4948	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	146	519	196	571	1562	201	264	1043	148	194	1363	92
RTOR Reduction (vph)	0	49	0	0	12	0	0	0	95	0	5	0
Lane Group Flow (vph)	146	666	0	571	1751	0	264	1043	53	194	1450	0
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases									6			
Actuated Green, G (s)	11.0	29.4		26.8	45.2		20.0	49.4	49.4	10.0	39.4	
Effective Green, g (s)	11.0	29.4		26.8	45.2		20.0	49.4	49.4	10.0	39.4	
Actuated g/C Ratio	0.08	0.21		0.19	0.32		0.14	0.35	0.35	0.07	0.28	
Clearance Time (s)	5.0	6.9		5.0	6.9		5.0	7.5	7.5	5.0	7.5	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	133	1005		631	1584		242	1226	536	235	1392	
v/s Ratio Prot	0.09	0.14		c0.17	c0.36		c0.16	0.30		0.06	c0.29	
v/s Ratio Perm									0.03			
v/c Ratio	1.10	0.66		0.90	1.11		1.09	0.85	0.10	0.83	1.04	
Uniform Delay, d1	64.5	50.7		55.4	47.4		60.0	41.9	30.4	64.1	50.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	0.75	1.40	
Incremental Delay, d2	106.7	2.2		17.4	57.4		84.2	7.5	0.4	20.7	34.5	
Delay (s)	171.2	52.9		72.7	104.8		144.2	49.4	30.7	68.9	104.8	
Level of Service	F	D		E	F		F	D	C	E	F	
Approach Delay (s)		73.0			97.0			64.7			100.6	
Approach LOS		E			F			E			F	

Intersection Summary			
HCM 2000 Control Delay	87.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	24.4
Intersection Capacity Utilization	106.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	582	1	158	0	1	0	112	1226	0	0	1228	535
Future Volume (vph)	582	1	158	0	1	0	112	1226	0	0	1228	535
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.7	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.5
Total Lost time (s)	6.4	6.4	6.4		6.4		3.0	6.4			6.4	6.4
Lane Util. Factor	0.95	0.95	1.00		1.00		1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.96		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			1.00	1.00
Frt	1.00	1.00	0.85		1.00		1.00	1.00			1.00	0.85
Flt Protected	0.95	0.95	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1615	1656	1467		1830		1700	3476			3476	1521
Flt Permitted	0.95	0.95	1.00		1.00		0.13	1.00			1.00	1.00
Satd. Flow (perm)	1615	1656	1467		1830		224	3476			3476	1521
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	582	1	158	0	1	0	112	1226	0	0	1228	535
RTOR Reduction (vph)	0	0	107	0	0	0	0	0	0	0	0	154
Lane Group Flow (vph)	291	292	52	0	1	0	112	1226	0	0	1228	381
Confl. Peds. (#/hr)			13	13		2						
Turn Type	Split	NA	Perm		NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	4	4			3		1	6			2	
Permitted Phases			4	3			6			2		2
Actuated Green, G (s)	33.5	33.5	33.5		1.6		85.7	85.7			72.8	72.8
Effective Green, g (s)	33.5	33.5	33.5		1.6		85.7	85.7			72.8	72.8
Actuated g/C Ratio	0.24	0.24	0.24		0.01		0.61	0.61			0.52	0.52
Clearance Time (s)	6.4	6.4	6.4		6.4		3.0	6.4			6.4	6.4
Vehicle Extension (s)	5.0	5.0	5.0		5.0		5.0	5.0			5.0	5.0
Lane Grp Cap (vph)	386	396	351		20		241	2127			1807	790
v/s Ratio Prot	c0.18	0.18			c0.00		0.03	c0.35			c0.35	
v/s Ratio Perm			0.04				0.25					0.25
v/c Ratio	0.75	0.74	0.15		0.05		0.46	0.58			0.68	0.48
Uniform Delay, d1	49.4	49.2	42.0		68.4		17.0	16.3			24.9	21.5
Progression Factor	1.18	1.18	1.92		1.00		1.08	1.31			0.72	1.05
Incremental Delay, d2	7.2	6.4	0.3		2.2		1.4	0.6			1.3	1.3
Delay (s)	65.5	64.4	81.1		70.6		19.8	21.9			19.1	23.9
Level of Service	E	E	F		E		B	C			B	C
Approach Delay (s)		68.4			70.6			21.7			20.6	
Approach LOS		E			E			C			C	

Intersection Summary			
HCM 2000 Control Delay	30.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	22.2
Intersection Capacity Utilization	79.4%	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)	69	0	245	0	0	0	358	1435	0	0	1509	91
Future Volume (vph)	69	0	245	0	0	0	358	1435	0	0	1509	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.7	3.7	3.5	3.7	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)		6.0	6.0				3.0	6.0			6.0	
Lane Util. Factor		1.00	1.00				1.00	0.95			0.95	
Frpb, ped/bikes		1.00	0.97				1.00	1.00			1.00	
Flpb, ped/bikes		1.00	1.00				1.00	1.00			1.00	
Frt		1.00	0.85				1.00	1.00			0.99	
Flt Protected		0.95	1.00				0.95	1.00			1.00	
Satd. Flow (prot)		1735	1483				1700	3476			3441	
Flt Permitted		0.76	1.00				0.06	1.00			1.00	
Satd. Flow (perm)		1383	1483				115	3476			3441	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	69	0	245	0	0	0	358	1435	0	0	1509	91
RTOR Reduction (vph)	0	0	219	0	0	0	0	0	0	0	3	0
Lane Group Flow (vph)	0	69	26	0	0	0	358	1435	0	0	1597	0
Confl. Peds. (#/hr)	1		7	7		1	3					3
Turn Type	Perm	NA	Perm				pm+pt	NA		Perm	NA	
Protected Phases		4			4		1	6			2	
Permitted Phases	4		4	4			6			2		
Actuated Green, G (s)		14.8	14.8				113.2	113.2			80.5	
Effective Green, g (s)		14.8	14.8				113.2	113.2			80.5	
Actuated g/C Ratio		0.11	0.11				0.81	0.81			0.58	
Clearance Time (s)		6.0	6.0				3.0	6.0			6.0	
Vehicle Extension (s)		5.0	5.0				5.0	5.0			5.0	
Lane Grp Cap (vph)		146	156				429	2810			1978	
v/s Ratio Prot							c0.18	0.41			0.46	
v/s Ratio Perm		c0.05	0.02				c0.50					
v/c Ratio		0.47	0.17				0.83	0.51			0.81	
Uniform Delay, d1		58.9	57.0				41.7	4.4			23.6	
Progression Factor		1.00	1.00				1.40	0.76			1.08	
Incremental Delay, d2		5.0	1.1				12.1	0.5			2.5	
Delay (s)		63.9	58.0				70.3	3.9			28.0	
Level of Service		E	E				E	A			C	
Approach Delay (s)		59.3			0.0			17.1			28.0	
Approach LOS		E			A			B			C	

Intersection Summary			
HCM 2000 Control Delay	25.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	87.0%	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)	65	375	227	382	917	126	192	1264	152	92	1139	97
Future Volume (vph)	65	375	227	382	917	126	192	1264	152	92	1139	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.5
Total Lost time (s)	4.0	6.9	6.9	3.0	6.9	6.9	3.0	7.0		3.0	7.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1699	3476	1500	1700	3476	1473	1700	3420		1700	3476	1502
Flt Permitted	0.22	1.00	1.00	0.30	1.00	1.00	0.13	1.00		0.06	1.00	1.00
Satd. Flow (perm)	391	3476	1500	536	3476	1473	228	3420		112	3476	1502
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	65	375	227	382	917	126	192	1264	152	92	1139	97
RTOR Reduction (vph)	0	0	123	0	0	73	0	7	0	0	0	0
Lane Group Flow (vph)	65	375	104	382	917	53	192	1409	0	92	1139	97
Confl. Peds. (#/hr)	10		1	1		10	2					2
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Free
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6			2		Free
Actuated Green, G (s)	25.6	21.6	21.6	51.6	43.6	43.6	71.8	64.1		71.2	63.8	140.0
Effective Green, g (s)	25.6	21.6	21.6	51.6	43.6	43.6	71.8	64.1		71.2	63.8	140.0
Actuated g/C Ratio	0.18	0.15	0.15	0.37	0.31	0.31	0.51	0.46		0.51	0.46	1.00
Clearance Time (s)	4.0	6.9	6.9	3.0	6.9	6.9	3.0	7.0		3.0	7.0	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	108	536	231	422	1082	458	197	1565		140	1584	1502
v/s Ratio Prot	0.02	0.11		c0.17	0.26		c0.05	0.41		0.03	0.33	
v/s Ratio Perm	0.09		0.07	c0.16		0.04	c0.44			0.30		c0.06
v/c Ratio	0.60	0.70	0.45	0.91	0.85	0.12	0.97	0.90		0.66	0.72	0.06
Uniform Delay, d1	49.6	56.1	53.8	36.7	45.1	34.4	28.1	35.0		27.8	30.8	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.38	1.03		1.85	0.46	1.00
Incremental Delay, d2	13.1	5.0	2.9	23.6	7.0	0.2	54.2	8.1		6.9	1.4	0.0
Delay (s)	62.7	61.2	56.7	60.3	52.0	34.7	92.8	44.3		58.3	15.7	0.0
Level of Service	E	E	E	E	D	C	F	D		E	B	A
Approach Delay (s)		59.8			52.7			50.1			17.5	
Approach LOS		E			D			D			B	

Intersection Summary			
HCM 2000 Control Delay	43.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	20.9
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 (vph)	62	698	116	215	1251	72	281	893	88	99	1270	56
Future Volume (vph)	62	698	116	215	1251	72	281	893	88	99	1270	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	3.0	7.5	7.5	3.0	7.5	7.5	3.0	7.5	7.5	3.0	7.5	7.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1700	3476	1521	1700	3476	1471	1700	3476	1485	1699	3476	1485
Flt Permitted	0.08	1.00	1.00	0.25	1.00	1.00	0.08	1.00	1.00	0.22	1.00	1.00
Satd. Flow (perm)	149	3476	1521	451	3476	1471	135	3476	1485	400	3476	1485
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	62	698	116	215	1251	72	281	893	88	99	1270	56
RTOR Reduction (vph)	0	0	76	0	0	47	0	0	52	0	0	36
Lane Group Flow (vph)	62	698	40	215	1251	25	281	893	36	99	1270	20
Confl. Peds. (#/hr)	22					22	11		11	11		11
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6		6	2		2
Actuated Green, G (s)	52.1	48.1	48.1	54.1	49.1	49.1	68.9	56.9	56.9	58.9	49.9	49.9
Effective Green, g (s)	52.1	48.1	48.1	54.1	49.1	49.1	68.9	56.9	56.9	58.9	49.9	49.9
Actuated g/C Ratio	0.37	0.34	0.34	0.39	0.35	0.35	0.49	0.41	0.41	0.42	0.36	0.36
Clearance Time (s)	3.0	7.5	7.5	3.0	7.5	7.5	3.0	7.5	7.5	3.0	7.5	7.5
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	99	1194	522	218	1219	515	245	1412	603	251	1238	529
v/s Ratio Prot	0.02	0.20		c0.04	c0.36		c0.13	0.26		0.03	0.37	
v/s Ratio Perm	0.21		0.03	0.34		0.02	c0.43		0.02	0.14		0.01
v/c Ratio	0.63	0.58	0.08	0.99	1.03	0.05	1.15	0.63	0.06	0.39	1.03	0.04
Uniform Delay, d1	35.8	37.7	31.0	43.7	45.5	30.0	45.0	33.2	25.3	25.9	45.0	29.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.51	1.03	2.08	0.36	0.60	1.00
Incremental Delay, d2	16.2	1.1	0.1	56.9	32.7	0.1	95.1	1.6	0.1	0.9	23.3	0.1
Delay (s)	52.0	38.9	31.1	100.6	78.1	30.1	163.0	35.7	52.7	10.2	50.3	29.4
Level of Service	D	D	C	F	E	C	F	D	D	B	D	C
Approach Delay (s)		38.8			79.0			65.3			46.7	
Approach LOS		D			E			E			D	

Intersection Summary			
HCM 2000 Control Delay	59.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	109.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	349	78	116	887	67	223	843	90	95	1341	133
Future Volume (vph)	31	349	78	116	887	67	223	843	90	95	1341	133
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	3.0	6.4		3.0	6.4		3.0	6.5		4.0	6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	0.99		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1700	3381		1700	3440		1700	3426		1700	3429	
Flt Permitted	0.10	1.00		0.39	1.00		0.06	1.00		0.24	1.00	
Satd. Flow (perm)	178	3381		691	3440		113	3426		425	3429	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	31	349	78	116	887	67	223	843	90	95	1341	133
RTOR Reduction (vph)	0	14	0	0	4	0	0	6	0	0	5	0
Lane Group Flow (vph)	31	413	0	116	950	0	223	927	0	95	1469	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)	43.3	40.3		47.3	42.3		78.8	67.5		67.7	60.4	
Effective Green, g (s)	43.3	40.3		47.3	42.3		78.8	67.5		67.7	60.4	
Actuated g/C Ratio	0.31	0.29		0.34	0.30		0.56	0.48		0.48	0.43	
Clearance Time (s)	3.0	6.4		3.0	6.4		3.0	6.5		4.0	6.5	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	87	973		269	1039		238	1651		272	1479	
v/s Ratio Prot	0.01	0.12		c0.02	c0.28		c0.10	0.27		0.02	c0.43	
v/s Ratio Perm	0.10			0.13			0.42			0.15		
v/c Ratio	0.36	0.42		0.43	0.91		0.94	0.56		0.35	0.99	
Uniform Delay, d1	37.3	40.4		35.5	47.1		45.3	25.7		20.6	39.6	
Progression Factor	1.00	1.00		1.00	1.00		0.76	1.74		1.44	1.03	
Incremental Delay, d2	5.2	0.6		2.3	12.6		38.4	1.2		1.2	18.6	
Delay (s)	42.4	41.1		37.8	59.7		73.0	46.1		30.8	59.4	
Level of Service	D	D		D	E		E	D		C	E	
Approach Delay (s)		41.2			57.4			51.2			57.7	
Approach LOS		D			E			D			E	

Intersection Summary			
HCM 2000 Control Delay	54.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	101.9%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	46	17	61	714	1575	247
Future Volume (vph)	46	17	61	714	1575	247
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.7	3.7	3.5	3.7	3.7	3.7
Total Lost time (s)	6.2	6.2	3.0	6.0	6.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	
Frt	1.00	0.85	1.00	1.00	0.98	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1738	1555	1700	3476	3406	
Flt Permitted	0.95	1.00	0.09	1.00	1.00	
Satd. Flow (perm)	1738	1555	157	3476	3406	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	46	17	61	714	1575	247
RTOR Reduction (vph)	0	16	0	0	6	0
Lane Group Flow (vph)	46	1	61	714	1816	0
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6			
Actuated Green, G (s)	9.5	9.5	118.3	118.3	108.5	
Effective Green, g (s)	9.5	9.5	118.3	118.3	108.5	
Actuated g/C Ratio	0.07	0.07	0.84	0.84	0.78	
Clearance Time (s)	6.2	6.2	3.0	6.0	6.0	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	117	105	207	2937	2639	
v/s Ratio Prot	c0.03		c0.01	0.21	c0.53	
v/s Ratio Perm		0.00	0.23			
v/c Ratio	0.39	0.01	0.29	0.24	0.69	
Uniform Delay, d1	62.5	60.9	7.1	2.1	7.6	
Progression Factor	1.00	1.00	7.05	0.28	0.44	
Incremental Delay, d2	4.5	0.1	1.4	0.2	0.7	
Delay (s)	67.0	61.0	51.2	0.8	4.0	
Level of Service	E	E	D	A	A	
Approach Delay (s)	65.4			4.7	4.0	
Approach LOS	E			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	68.2%	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)	116	519	289	150	1041	86	152	522	57	261	1409	380
Future Volume (vph)	116	519	289	150	1041	86	152	522	57	261	1409	380
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.7	3.5	3.7	3.5
Total Lost time (s)	3.0	7.9	7.9	3.0	7.9	7.9	3.0	8.4		3.0	8.4	8.4
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1700	3476	1521	1700	3476	1521	1700	3425		1700	3476	1487
Flt Permitted	0.10	1.00	1.00	0.35	1.00	1.00	0.07	1.00		0.37	1.00	1.00
Satd. Flow (perm)	172	3476	1521	632	3476	1521	128	3425		656	3476	1487
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	116	519	289	150	1041	86	152	522	57	261	1409	380
RTOR Reduction (vph)	0	0	147	0	0	60	0	6	0	0	0	119
Lane Group Flow (vph)	116	519	142	150	1041	26	152	573	0	261	1409	261
Confl. Peds. (#/hr)							8					8
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6			2		2
Actuated Green, G (s)	50.7	41.7	41.7	50.7	41.7	41.7	67.0	56.0		67.0	56.0	56.0
Effective Green, g (s)	50.7	41.7	41.7	50.7	41.7	41.7	67.0	56.0		67.0	56.0	56.0
Actuated g/C Ratio	0.36	0.30	0.30	0.36	0.30	0.30	0.48	0.40		0.48	0.40	0.40
Clearance Time (s)	3.0	7.9	7.9	3.0	7.9	7.9	3.0	8.4		3.0	8.4	8.4
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Lane Grp Cap (vph)	160	1035	453	297	1035	453	184	1370		395	1390	594
v/s Ratio Prot	c0.05	0.15		0.03	c0.30		c0.06	0.17		0.05	c0.41	
v/s Ratio Perm	0.22		0.09	0.15		0.02	0.33			0.26		0.18
v/c Ratio	0.72	0.50	0.31	0.51	1.01	0.06	0.83	0.42		0.66	1.01	0.44
Uniform Delay, d1	35.5	40.6	38.1	31.6	49.1	35.1	36.3	30.3		24.2	42.0	30.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.04	1.45		1.00	1.00	1.00
Incremental Delay, d2	18.1	0.8	0.8	2.8	29.4	0.1	27.3	0.9		5.4	27.6	2.4
Delay (s)	53.6	41.4	38.9	34.5	78.5	35.2	65.0	44.9		29.6	69.6	32.9
Level of Service	D	D	D	C	E	D	E	D		C	E	C
Approach Delay (s)		42.1			70.4			49.1			57.7	
Approach LOS		D			E			D			E	

Intersection Summary			
HCM 2000 Control Delay	56.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	22.3
Intersection Capacity Utilization	102.8%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX B2

UNSIGNALIZED INTERSECTIONS

2016 AM PEAK HOUR

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	18	44	1547	19	22	1623
Future Volume (Veh/h)	18	44	1547	19	22	1623
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	18	44	1547	19	22	1623
Pedestrians	5		5			5
Lane Width (m)	3.5		3.7			3.6
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)			168			166
pX, platoon unblocked	0.90	0.83			0.83	
vC, conflicting volume	2152	793			1571	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	872	330			1271	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	92			95	
cM capacity (veh/h)	240	539			433	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3	SB 4
Volume Total	62	1031	535	22	541	541	541
Volume Left	18	0	0	22	0	0	0
Volume Right	44	0	19	0	0	0	0
cSH	396	1700	1700	433	1700	1700	1700
Volume to Capacity	0.16	0.61	0.31	0.05	0.32	0.32	0.32
Queue Length 95th (m)	3.8	0.0	0.0	1.1	0.0	0.0	0.0
Control Delay (s)	15.8	0.0	0.0	13.8	0.0	0.0	0.0
Lane LOS	C			B			
Approach Delay (s)	15.8	0.0		0.2			
Approach LOS	C						

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	55.5%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	18	34	22	1333	1515	57
Future Volume (Veh/h)	18	34	22	1333	1515	57
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	18	34	22	1333	1515	57
Pedestrians	10			5	5	
Lane Width (m)	3.5			3.6	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	1			0	0	
Right turn flare (veh)						
Median type				Raised	None	
Median storage veh)				1		
Upstream signal (m)				276		
pX, platoon unblocked	0.72					
vC, conflicting volume	2269	801	1582			
vC1, stage 1 conf vol	1554					
vC2, stage 2 conf vol	716					
vCu, unblocked vol	1984	801	1582			
tC, single (s)	7.0	7.0	4.3			
tC, 2 stage (s)	6.0					
tF (s)	3.6	3.4	2.3			
p0 queue free %	85	89	94			
cM capacity (veh/h)	117	315	373			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	18	34	22	666	666	1010	562
Volume Left	18	0	22	0	0	0	0
Volume Right	0	34	0	0	0	0	57
cSH	117	315	373	1700	1700	1700	1700
Volume to Capacity	0.15	0.11	0.06	0.39	0.39	0.59	0.33
Queue Length 95th (m)	3.7	2.5	1.3	0.0	0.0	0.0	0.0
Control Delay (s)	41.2	17.8	15.3	0.0	0.0	0.0	0.0
Lane LOS	E	C	C				
Approach Delay (s)	25.9		0.2			0.0	
Approach LOS	D						

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	0	8	9	0	2	17	1306	9	8	1491	29
Future Volume (Veh/h)	9	0	8	9	0	2	17	1306	9	8	1491	29
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	9	0	8	9	0	2	17	1306	9	8	1491	29
Pedestrians		6			5			5			5	
Lane Width (m)		3.6			3.5			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	2222	2882	771	2124	2892	668	1526			1320		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2222	2882	771	2124	2892	668	1526			1320		
tC, single (s)	7.9	6.6	7.7	9.1	6.6	7.9	4.2			4.9		
tC, 2 stage (s)												
tF (s)	3.7	4.0	3.7	4.3	4.0	3.8	2.2			2.6		
p0 queue free %	47	100	97	10	100	99	96			98		
cM capacity (veh/h)	17	14	272	10	14	303	416			362		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	9	8	9	2	17	871	444	8	994	526
Volume Left	9	0	9	0	17	0	0	8	0	0
Volume Right	0	8	0	2	0	0	9	0	0	29
cSH	17	272	10	303	416	1700	1700	362	1700	1700
Volume to Capacity	0.53	0.03	0.90	0.01	0.04	0.51	0.26	0.02	0.58	0.31
Queue Length 95th (m)	9.8	0.6	12.4	0.1	0.9	0.0	0.0	0.5	0.0	0.0
Control Delay (s)	355.4	18.7	722.3	17.0	14.0	0.0	0.0	15.2	0.0	0.0
Lane LOS	F	C	F	C	B			C		
Approach Delay (s)	196.9		594.1		0.2			0.1		
Approach LOS	F		F							

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	0	22	0	0	0	22	1429	0	0	1750	5
Future Volume (Veh/h)	5	0	22	0	0	0	22	1429	0	0	1750	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	0	22	0	0	0	22	1429	0	0	1750	5
Pedestrians		6			5			5			5	
Lane Width (m)		3.7			3.7			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			0			0	
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)								368			327	
pX, platoon unblocked	0.80	0.80	0.71	0.80	0.80	0.82	0.71			0.82		
vC, conflicting volume	2522	3236	888	2380	3239	724	1761			1434		
vC1, stage 1 conf vol	1758	1758		1478	1478							
vC2, stage 2 conf vol	764	1478		902	1761							
vCu, unblocked vol	1404	2296	38	1227	2299	232	1262			1095		
tC, single (s)	7.6	6.6	7.0	7.6	6.6	7.0	4.2			4.2		
tC, 2 stage (s)	6.6	5.6		6.6	5.6							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	100	97	100	100	100	94			100		
cM capacity (veh/h)	121	128	718	154	117	621	376			504		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	27	0	22	714	714	0	1167	588
Volume Left	5	0	22	0	0	0	0	0
Volume Right	22	0	0	0	0	0	0	5
cSH	376	1700	376	1700	1700	1700	1700	1700
Volume to Capacity	0.07	0.00	0.06	0.42	0.42	0.00	0.69	0.35
Queue Length 95th (m)	1.6	0.0	1.3	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	15.3	0.0	15.2	0.0	0.0	0.0	0.0	0.0
Lane LOS	C	A	C					
Approach Delay (s)	15.3	0.0	0.2			0.0		
Approach LOS	C	A						

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	2	7	0	8	3	1370	10	7	1391	3
Future Volume (Veh/h)	0	0	2	7	0	8	3	1370	10	7	1391	3
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	2	7	0	8	3	1370	10	7	1391	3
Pedestrians		5			6			5			5	
Lane Width (m)		3.7			3.7			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			1			0			0	
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)								251				
pX, platoon unblocked	0.66	0.66		0.66	0.66	0.66				0.66		
vC, conflicting volume	2116	2804	707	2104	2800	701	1399			1386		
vC1, stage 1 conf vol	1412	1412		1387	1387							
vC2, stage 2 conf vol	704	1392		716	1413							
vCu, unblocked vol	1653	2701	707	1635	2696	0	1399			543		
tC, single (s)	7.6	6.6	7.0	7.6	6.6	7.0	4.2			4.2		
tC, 2 stage (s)	6.6	5.6		6.6	5.6							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	99	97	100	99	99			99		
cM capacity (veh/h)	134	158	368	233	157	699	467			655		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	2	15	3	913	467	7	927	467
Volume Left	0	7	3	0	0	7	0	0
Volume Right	2	8	0	0	10	0	0	3
cSH	368	362	467	1700	1700	655	1700	1700
Volume to Capacity	0.01	0.04	0.01	0.54	0.27	0.01	0.55	0.27
Queue Length 95th (m)	0.1	0.9	0.1	0.0	0.0	0.2	0.0	0.0
Control Delay (s)	14.8	15.4	12.8	0.0	0.0	10.6	0.0	0.0
Lane LOS	B	C	B			B		
Approach Delay (s)	14.8	15.4	0.0			0.1		
Approach LOS	B	C						

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	35	36	30	1333	1346	14
Future Volume (Veh/h)	35	36	30	1333	1346	14
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	35	36	30	1333	1346	14
Pedestrians	4			5	5	
Lane Width (m)	3.5			3.6	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	0	
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (m)				366		
pX, platoon unblocked	0.67					
vC, conflicting volume	2088	689	1364			
vC1, stage 1 conf vol	1357					
vC2, stage 2 conf vol	732					
vCu, unblocked vol	1648	689	1364			
tC, single (s)	6.9	7.0	4.2			
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.3	2.2			
p0 queue free %	81	90	94			
cM capacity (veh/h)	187	378	483			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	71	30	666	666	897	463
Volume Left	35	30	0	0	0	0
Volume Right	36	0	0	0	0	14
cSH	252	483	1700	1700	1700	1700
Volume to Capacity	0.28	0.06	0.39	0.39	0.53	0.27
Queue Length 95th (m)	7.9	1.4	0.0	0.0	0.0	0.0
Control Delay (s)	24.8	13.0	0.0	0.0	0.0	0.0
Lane LOS	C	B				
Approach Delay (s)	24.8	0.3			0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	48.5%	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)	7	0	0	6	0	14	3	1458	4	11	1310	5
Future Volume (Veh/h)	7	0	0	6	0	14	3	1458	4	11	1310	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	7	0	0	6	0	14	3	1458	4	11	1310	5
Pedestrians		5			5			5			5	
Lane Width (m)		3.7			3.7			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	2094	2812	668	2153	2813	741	1320			1467		
vC1, stage 1 conf vol	1340	1340		1471	1471							
vC2, stage 2 conf vol	754	1473		682	1342							
vCu, unblocked vol	2094	2812	668	2153	2813	741	1320			1467		
tC, single (s)	7.6	6.6	7.0	7.6	6.6	7.0	4.2			4.4		
tC, 2 stage (s)	6.6	5.6		6.6	5.6							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	95	100	100	95	100	96	99			97		
cM capacity (veh/h)	135	127	391	119	130	349	502			403		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	7	20	3	972	490	11	873	442
Volume Left	7	6	3	0	0	11	0	0
Volume Right	0	14	0	0	4	0	0	5
cSH	135	221	502	1700	1700	403	1700	1700
Volume to Capacity	0.05	0.09	0.01	0.57	0.29	0.03	0.51	0.26
Queue Length 95th (m)	1.1	2.1	0.1	0.0	0.0	0.6	0.0	0.0
Control Delay (s)	33.1	22.9	12.2	0.0	0.0	14.2	0.0	0.0
Lane LOS	D	C	B			B		
Approach Delay (s)	33.1	22.9	0.0			0.1		
Approach LOS	D	C						

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	50.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	12	91	1539	12	51	1419
Future Volume (Veh/h)	12	91	1539	12	51	1419
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	12	91	1539	12	51	1419
Pedestrians	7		5			5
Lane Width (m)	3.5		3.7			3.6
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	1		0			0
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (m)						348
pX, platoon unblocked	0.74					
vC, conflicting volume	2368	788			1558	
vC1, stage 1 conf vol	1552					
vC2, stage 2 conf vol	816					
vCu, unblocked vol	2148	788			1558	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	72			87	
cM capacity (veh/h)	146	325			404	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	103	1026	525	51	710	710
Volume Left	12	0	0	51	0	0
Volume Right	91	0	12	0	0	0
cSH	284	1700	1700	404	1700	1700
Volume to Capacity	0.36	0.60	0.31	0.13	0.42	0.42
Queue Length 95th (m)	11.1	0.0	0.0	3.0	0.0	0.0
Control Delay (s)	24.7	0.0	0.0	15.2	0.0	0.0
Lane LOS	C			C		
Approach Delay (s)	24.7	0.0		0.5		
Approach LOS	C					

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	18	35	10	1575	1491	22
Future Volume (Veh/h)	18	35	10	1575	1491	22
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	18	35	10	1575	1491	22
Pedestrians	6			5	5	
Lane Width (m)	3.5			3.6	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	0	
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (m)					232	
pX, platoon unblocked	0.73	0.73	0.73			
vC, conflicting volume	2320	768	1519			
vC1, stage 1 conf vol	1508					
vC2, stage 2 conf vol	812					
vCu, unblocked vol	2066	0	963			
tC, single (s)	6.9	7.0	4.2			
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	95	98			
cM capacity (veh/h)	196	774	501			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	53	10	788	788	994	519
Volume Left	18	10	0	0	0	0
Volume Right	35	0	0	0	0	22
cSH	387	501	1700	1700	1700	1700
Volume to Capacity	0.14	0.02	0.46	0.46	0.58	0.31
Queue Length 95th (m)	3.3	0.4	0.0	0.0	0.0	0.0
Control Delay (s)	15.8	12.3	0.0	0.0	0.0	0.0
Lane LOS	C	B				
Approach Delay (s)	15.8	0.1			0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	53.5%	ICU Level of Service	A
Analysis Period (min)	15		

2016 PM PEAK HOUR

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	9	36	1485	24	77	2057
Future Volume (Veh/h)	9	36	1485	24	77	2057
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	9	36	1485	24	77	2057
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			168			166
pX, platoon unblocked	0.81	0.85			0.85	
vC, conflicting volume	2337	754			1509	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	831	344			1236	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	93			83	
cM capacity (veh/h)	204	544			459	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3	SB 4
Volume Total	45	990	519	77	686	686	686
Volume Left	9	0	0	77	0	0	0
Volume Right	36	0	24	0	0	0	0
cSH	408	1700	1700	459	1700	1700	1700
Volume to Capacity	0.11	0.58	0.31	0.17	0.40	0.40	0.40
Queue Length 95th (m)	2.6	0.0	0.0	4.2	0.0	0.0	0.0
Control Delay (s)	14.9	0.0	0.0	14.4	0.0	0.0	0.0
Lane LOS	B			B			
Approach Delay (s)	14.9	0.0		0.5			
Approach LOS	B						

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	59.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	13	57	16	1325	1658	22
Future Volume (Veh/h)	13	57	16	1325	1658	22
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	13	57	16	1325	1658	22
Pedestrians	6				1	
Lane Width (m)	3.6				3.7	
Walking Speed (m/s)	1.2				1.2	
Percent Blockage	1				0	
Right turn flare (veh)						
Median type				Raised	None	
Median storage veh)				1		
Upstream signal (m)				276		
pX, platoon unblocked	0.73					
vC, conflicting volume	2370	846	1686			
vC1, stage 1 conf vol	1675					
vC2, stage 2 conf vol	696					
vCu, unblocked vol	2133	846	1686			
tC, single (s)	6.9	7.0	4.2			
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.3	2.2			
p0 queue free %	88	81	96			
cM capacity (veh/h)	108	298	360			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	13	57	16	662	662	1105	575
Volume Left	13	0	16	0	0	0	0
Volume Right	0	57	0	0	0	0	22
cSH	108	298	360	1700	1700	1700	1700
Volume to Capacity	0.12	0.19	0.04	0.39	0.39	0.65	0.34
Queue Length 95th (m)	2.8	4.9	1.0	0.0	0.0	0.0	0.0
Control Delay (s)	42.8	19.9	15.5	0.0	0.0	0.0	0.0
Lane LOS	E	C	C				
Approach Delay (s)	24.2		0.2			0.0	
Approach LOS	C						

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	56.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	0	46	5	0	11	21	1344	3	6	1543	27
Future Volume (Veh/h)	32	0	46	5	0	11	21	1344	3	6	1543	27
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	32	0	46	5	0	11	21	1344	3	6	1543	27
Pedestrians		5			3			10			4	
Lane Width (m)		3.6			3.6			3.6			3.6	
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	2302	2966	800	2230	2978	680	1575			1350		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2302	2966	800	2230	2978	680	1575			1350		
tC, single (s)	7.6	6.6	7.0	7.6	6.6	7.0	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	86	72	100	97	95			99		
cM capacity (veh/h)	18	12	318	18	12	384	399			489		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	32	46	5	11	21	896	451	6	1029	541
Volume Left	32	0	5	0	21	0	0	6	0	0
Volume Right	0	46	0	11	0	0	3	0	0	27
cSH	18	318	18	384	399	1700	1700	489	1700	1700
Volume to Capacity	1.76	0.14	0.28	0.03	0.05	0.53	0.27	0.01	0.61	0.32
Queue Length 95th (m)	31.1	3.5	5.4	0.6	1.2	0.0	0.0	0.3	0.0	0.0
Control Delay (s)	808.2	18.2	267.2	14.7	14.5	0.0	0.0	12.5	0.0	0.0
Lane LOS	F	C	F	B	B			B		
Approach Delay (s)	342.3		93.6		0.2			0.0		
Approach LOS	F		F							

Intersection Summary			
Average Delay	9.4		
Intersection Capacity Utilization	64.7%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	0	14	0	0	0	43	1410	0	0	1723	18
Future Volume (Veh/h)	3	0	14	0	0	0	43	1410	0	0	1723	18
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	3	0	14	0	0	0	43	1410	0	0	1723	18
Pedestrians		5						4				
Lane Width (m)		3.7						3.6				
Walking Speed (m/s)		1.2						1.2				
Percent Blockage		0						0				
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)								368			327	
pX, platoon unblocked	0.80	0.80	0.73	0.80	0.80	0.87	0.73			0.87		
vC, conflicting volume	2528	3233	880	2376	3242	705	1746			1410		
vC1, stage 1 conf vol	1737	1737		1496	1496							
vC2, stage 2 conf vol	791	1496		880	1746							
vCu, unblocked vol	1652	2538	91	1460	2549	351	1280			1165		
tC, single (s)	7.6	6.6	7.0	7.6	6.6	7.0	4.2			4.2		
tC, 2 stage (s)	6.6	5.6		6.6	5.6							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	98	100	100	100	89			100		
cM capacity (veh/h)	120	119	679	130	99	551	379			501		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	17	0	43	705	705	0	1149	592
Volume Left	3	0	43	0	0	0	0	0
Volume Right	14	0	0	0	0	0	0	18
cSH	373	1700	379	1700	1700	1700	1700	1700
Volume to Capacity	0.05	0.00	0.11	0.41	0.41	0.00	0.68	0.35
Queue Length 95th (m)	1.0	0.0	2.7	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	15.1	0.0	15.7	0.0	0.0	0.0	0.0	0.0
Lane LOS	C	A	C					
Approach Delay (s)	15.1	0.0	0.5			0.0		
Approach LOS	C	A						

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	0	6	13	0	13	16	1400	8	3	1347	0
Future Volume (Veh/h)	3	0	6	13	0	13	16	1400	8	3	1347	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	3	0	6	13	0	13	16	1400	8	3	1347	0
Pedestrians					5							
Lane Width (m)					3.7							
Walking Speed (m/s)					1.2							
Percent Blockage					0							
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)								251				
pX, platoon unblocked	0.63	0.63		0.63	0.63	0.63				0.63		
vC, conflicting volume	2098	2798	674	2126	2794	709	1347			1413		
vC1, stage 1 conf vol	1353	1353		1441	1441							
vC2, stage 2 conf vol	745	1445		686	1353							
vCu, unblocked vol	1567	2679	674	1612	2673	0	1347			478		
tC, single (s)	7.6	6.6	7.0	7.6	6.6	7.0	4.2			4.2		
tC, 2 stage (s)	6.6	5.6		6.6	5.6							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	98	94	100	98	97			100		
cM capacity (veh/h)	146	165	390	229	157	673	492			664		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	9	26	16	933	475	3	898	449
Volume Left	3	13	16	0	0	3	0	0
Volume Right	6	13	0	0	8	0	0	0
cSH	251	342	492	1700	1700	664	1700	1700
Volume to Capacity	0.04	0.08	0.03	0.55	0.28	0.00	0.53	0.26
Queue Length 95th (m)	0.8	1.7	0.7	0.0	0.0	0.1	0.0	0.0
Control Delay (s)	19.9	16.4	12.6	0.0	0.0	10.4	0.0	0.0
Lane LOS	C	C	B			B		
Approach Delay (s)	19.9	16.4	0.1			0.0		
Approach LOS	C	C						

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	49.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	12	24	22	1218	1327	32
Future Volume (Veh/h)	12	24	22	1218	1327	32
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	12	24	22	1218	1327	32
Pedestrians	6					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (m)				366		
pX, platoon unblocked	0.68					
vC, conflicting volume	2002	686	1365			
vC1, stage 1 conf vol	1349					
vC2, stage 2 conf vol	653					
vCu, unblocked vol	1524	686	1365			
tC, single (s)	6.9	7.0	4.2			
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.3	2.2			
p0 queue free %	94	94	95			
cM capacity (veh/h)	190	381	481			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	36	22	609	609	885	474
Volume Left	12	22	0	0	0	0
Volume Right	24	0	0	0	0	32
cSH	286	481	1700	1700	1700	1700
Volume to Capacity	0.13	0.05	0.36	0.36	0.52	0.28
Queue Length 95th (m)	3.0	1.0	0.0	0.0	0.0	0.0
Control Delay (s)	19.4	12.8	0.0	0.0	0.0	0.0
Lane LOS	C	B				
Approach Delay (s)	19.4	0.2			0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	47.7%	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)	2	1	2	3	2	11	4	1280	4	10	1339	1
Future Volume (Veh/h)	2	1	2	3	2	11	4	1280	4	10	1339	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	2	1	2	3	2	11	4	1280	4	10	1339	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	2020	2652	670	1982	2650	642	1340			1284		
vC1, stage 1 conf vol	1360	1360		1290	1290							
vC2, stage 2 conf vol	660	1292		692	1360							
vCu, unblocked vol	2020	2652	670	1982	2650	642	1340			1284		
tC, single (s)	7.6	6.6	7.0	7.6	6.6	7.0	4.2			4.2		
tC, 2 stage (s)	6.6	5.6		6.6	5.6							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	99	99	99	98	99	97	99			98		
cM capacity (veh/h)	137	143	393	150	145	410	495			520		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	5	16	4	853	431	10	893	447
Volume Left	2	3	4	0	0	10	0	0
Volume Right	2	11	0	0	4	0	0	1
cSH	187	264	495	1700	1700	520	1700	1700
Volume to Capacity	0.03	0.06	0.01	0.50	0.25	0.02	0.53	0.26
Queue Length 95th (m)	0.6	1.3	0.2	0.0	0.0	0.4	0.0	0.0
Control Delay (s)	24.7	19.5	12.3	0.0	0.0	12.1	0.0	0.0
Lane LOS	C	C	B			B		
Approach Delay (s)	24.7	19.5	0.0			0.1		
Approach LOS	C	C						

Intersection Summary				
Average Delay	0.2			
Intersection Capacity Utilization	47.0%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	15	63	1271	27	55	1477
Future Volume (Veh/h)	15	63	1271	27	55	1477
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	15	63	1271	27	55	1477
Pedestrians	5					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (m)						348
pX, platoon unblocked	0.67					
vC, conflicting volume	2138	654			1303	
vC1, stage 1 conf vol	1290					
vC2, stage 2 conf vol	848					
vCu, unblocked vol	1712	654			1303	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	84			89	
cM capacity (veh/h)	200	400			509	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	78	847	451	55	738	738
Volume Left	15	0	0	55	0	0
Volume Right	63	0	27	0	0	0
cSH	336	1700	1700	509	1700	1700
Volume to Capacity	0.23	0.50	0.27	0.11	0.43	0.43
Queue Length 95th (m)	6.2	0.0	0.0	2.5	0.0	0.0
Control Delay (s)	18.9	0.0	0.0	12.9	0.0	0.0
Lane LOS	C			B		
Approach Delay (s)	18.9	0.0		0.5		
Approach LOS	C					

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	24	31	1375	1592	32
Future Volume (Veh/h)	6	24	31	1375	1592	32
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	6	24	31	1375	1592	32
Pedestrians	3					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (m)					232	
pX, platoon unblocked	0.65	0.65	0.65			
vC, conflicting volume	2360	815	1627			
vC1, stage 1 conf vol	1611					
vC2, stage 2 conf vol	750					
vCu, unblocked vol	2022	0	900			
tC, single (s)	6.9	7.0	4.2			
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	97	94			
cM capacity (veh/h)	195	701	477			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	30	31	688	688	1061	563
Volume Left	6	31	0	0	0	0
Volume Right	24	0	0	0	0	32
cSH	462	477	1700	1700	1700	1700
Volume to Capacity	0.06	0.06	0.40	0.40	0.62	0.33
Queue Length 95th (m)	1.5	1.5	0.0	0.0	0.0	0.0
Control Delay (s)	13.3	13.1	0.0	0.0	0.0	0.0
Lane LOS	B	B				
Approach Delay (s)	13.3	0.3			0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	55.0%	ICU Level of Service	B
Analysis Period (min)	15		

APPENDIX C

BASE CONDITION
FUTURE (2031) AM & PM PEAK HOUR
LEVEL OF SERVICE ANALYSIS
(SYNCHRO 9 OUTPUT)

APPENDIX C1

SIGNALIZED INTERSECTIONS

2031 AM PEAK HOUR

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	290	325	40	24	40	273	24	1487	79	277	883	112
Future Volume (vph)	290	325	40	24	40	273	24	1487	79	277	883	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	7.3	7.3		7.3	7.3		6.7	6.7		3.0	6.7	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.87		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1700	1788		1700	1564		1700	3450		1594	3418	
Flt Permitted	0.43	1.00		0.36	1.00		0.29	1.00		0.08	1.00	
Satd. Flow (perm)	774	1788		651	1564		515	3450		126	3418	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	290	325	40	24	40	273	24	1487	79	277	883	112
RTOR Reduction (vph)	0	4	0	0	155	0	0	3	0	0	8	0
Lane Group Flow (vph)	290	361	0	24	158	0	24	1563	0	277	987	0
Heavy Vehicles (%)	5%	5%	11%	5%	5%	7%	5%	5%	5%	12%	5%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		8			4			6		5	2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)	39.7	39.7		39.7	39.7		50.3	50.3		66.3	66.3	
Effective Green, g (s)	39.7	39.7		39.7	39.7		50.3	50.3		66.3	66.3	
Actuated g/C Ratio	0.33	0.33		0.33	0.33		0.42	0.42		0.55	0.55	
Clearance Time (s)	7.3	7.3		7.3	7.3		6.7	6.7		3.0	6.7	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	256	591		215	517		215	1446		228	1888	
v/s Ratio Prot		0.20			0.10			0.45		c0.13	0.29	
v/s Ratio Perm	c0.37			0.04			0.05			c0.54		
v/c Ratio	1.13	0.61		0.11	0.31		0.11	1.08		1.21	0.52	
Uniform Delay, d1	40.1	33.7		27.9	29.9		21.2	34.9		38.2	16.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	96.8	2.7		0.5	0.7		1.0	48.8		129.9	1.0	
Delay (s)	136.9	36.4		28.4	30.6		22.3	83.7		168.2	17.9	
Level of Service	F	D		C	C		C	F		F	B	
Approach Delay (s)		80.9			30.4			82.8			50.6	
Approach LOS		F			C			F			D	

Intersection Summary			
HCM 2000 Control Delay	67.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	115.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	425	160	0	1306	1156	0
Future Volume (vph)	425	160	0	1306	1156	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.7	3.7	3.7	3.7
Total Lost time (s)	6.3	6.3		6.0	6.0	
Lane Util. Factor	0.97	0.91		0.91	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	0.99	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3164	1251		4995	3476	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3164	1251		4995	3476	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	425	160	0	1306	1156	0
RTOR Reduction (vph)	2	67	0	0	0	0
Lane Group Flow (vph)	439	77	0	1306	1156	0
Confl. Peds. (#/hr)	5	5	5			5
Heavy Vehicles (%)	9%	14%	5%	5%	5%	5%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	2	
Permitted Phases		4				
Actuated Green, G (s)	23.0	23.0		73.1	73.1	
Effective Green, g (s)	23.0	23.0		73.1	73.1	
Actuated g/C Ratio	0.21	0.21		0.67	0.67	
Clearance Time (s)	6.3	6.3		6.0	6.0	
Vehicle Extension (s)	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	671	265		3368	2344	
v/s Ratio Prot	c0.14			0.26	c0.33	
v/s Ratio Perm		0.06				
v/c Ratio	0.65	0.29		0.39	0.49	
Uniform Delay, d1	39.1	35.9		7.8	8.6	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.1	1.3		0.3	0.7	
Delay (s)	42.1	37.1		8.1	9.4	
Level of Service	D	D		A	A	
Approach Delay (s)	40.9			8.1	9.4	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	14.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	108.4	Sum of lost time (s)	12.3
Intersection Capacity Utilization	56.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	211	326	1559	0	0	1620
Future Volume (vph)	211	326	1559	0	0	1620
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.7	3.7	3.7	3.7
Total Lost time (s)	6.3	6.3	6.0			6.0
Lane Util. Factor	0.97	0.91	0.95			0.91
Frpb, ped/bikes	0.98	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	0.94	0.85	1.00			1.00
Flt Protected	0.97	1.00	1.00			1.00
Satd. Flow (prot)	3113	1354	3476			4995
Flt Permitted	0.97	1.00	1.00			1.00
Satd. Flow (perm)	3113	1354	3476			4995
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	211	326	1559	0	0	1620
RTOR Reduction (vph)	38	38	0	0	0	0
Lane Group Flow (vph)	326	135	1559	0	0	1620
Confl. Peds. (#/hr)	5	5		5	5	
Confl. Bikes (#/hr)		1		5		
Turn Type	Prot	Perm	NA			NA
Protected Phases	4		2			2
Permitted Phases		4				
Actuated Green, G (s)	19.8	19.8	80.2			80.2
Effective Green, g (s)	19.8	19.8	80.2			80.2
Actuated g/C Ratio	0.18	0.18	0.71			0.71
Clearance Time (s)	6.3	6.3	6.0			6.0
Vehicle Extension (s)	5.0	5.0	5.0			5.0
Lane Grp Cap (vph)	548	238	2482			3567
v/s Ratio Prot	c0.10		c0.45			0.32
v/s Ratio Perm		0.10				
v/c Ratio	0.60	0.57	0.63			0.45
Uniform Delay, d1	42.6	42.3	8.3			6.8
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	2.6	5.0	1.2			0.4
Delay (s)	45.2	47.4	9.5			7.2
Level of Service	D	D	A			A
Approach Delay (s)	45.9		9.5			7.2
Approach LOS	D		A			A

Intersection Summary			
HCM 2000 Control Delay	13.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	112.3	Sum of lost time (s)	12.3
Intersection Capacity Utilization	67.3%	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												
Traffic Volume (vph)	62	146	246	249	172	92	145	1447	200	42	1802	42
Future Volume (vph)	62	146	246	249	172	92	145	1447	200	42	1802	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	6.6	6.6		3.0	6.6		3.0	6.3		6.3	6.3	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.91	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.95		1.00	0.98		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1694	1640		1699	1724		1700	3401		1700	4972	
Flt Permitted	0.60	1.00		0.20	1.00		0.08	1.00		0.08	1.00	
Satd. Flow (perm)	1063	1640		352	1724		137	3401		145	4972	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	62	146	246	249	172	92	145	1447	200	42	1802	42
RTOR Reduction (vph)	0	53	0	0	12	0	0	9	0	0	2	0
Lane Group Flow (vph)	62	339	0	249	252	0	145	1638	0	42	1842	0
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	7%
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA		Perm	NA	
Protected Phases		8		7	4		1	6			2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)	29.0	29.0		42.0	42.0		59.3	59.3		49.3	49.3	
Effective Green, g (s)	29.0	29.0		42.0	42.0		59.3	59.3		49.3	49.3	
Actuated g/C Ratio	0.25	0.25		0.37	0.37		0.52	0.52		0.43	0.43	
Clearance Time (s)	6.6	6.6		3.0	6.6		3.0	6.3		6.3	6.3	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	269	416		247	634		166	1766		62	2146	
v/s Ratio Prot		0.21		c0.09	0.15		0.05	c0.48			0.37	
v/s Ratio Perm	0.06			c0.28			0.40			0.29		
v/c Ratio	0.23	0.81		1.01	0.40		0.87	0.93		0.68	0.86	
Uniform Delay, d1	33.8	40.1		32.4	26.7		24.4	25.5		26.1	29.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	13.0		59.3	0.9		38.6	10.0		46.2	4.7	
Delay (s)	34.7	53.1		91.8	27.6		62.9	35.5		72.3	34.0	
Level of Service	C	D		F	C		E	D		E	C	
Approach Delay (s)		50.6			58.7			37.7			34.9	
Approach LOS		D			E			D			C	

Intersection Summary			
HCM 2000 Control Delay	40.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	114.2	Sum of lost time (s)	18.9
Intersection Capacity Utilization	110.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	80	99	72	1653	1836	23
Future Volume (vph)	80	99	72	1653	1836	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.5	3.7	3.7	3.5
Total Lost time (s)	7.1	7.1	6.3	6.3	6.3	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.91	
Frpb, ped/bikes	1.00	0.98	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	1.00	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1700	1494	1698	3476	4983	
Flt Permitted	0.95	1.00	0.10	1.00	1.00	
Satd. Flow (perm)	1700	1494	176	3476	4983	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	80	99	72	1653	1836	23
RTOR Reduction (vph)	0	20	0	0	1	0
Lane Group Flow (vph)	80	79	72	1653	1858	0
Confl. Peds. (#/hr)	5	5	5			5
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	8			6	2	
Permitted Phases		8	6			
Actuated Green, G (s)	13.6	13.6	93.0	93.0	93.0	
Effective Green, g (s)	13.6	13.6	93.0	93.0	93.0	
Actuated g/C Ratio	0.11	0.11	0.78	0.78	0.78	
Clearance Time (s)	7.1	7.1	6.3	6.3	6.3	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	192	169	136	2693	3861	
v/s Ratio Prot	0.05			c0.48	0.37	
v/s Ratio Perm		c0.05	0.41			
v/c Ratio	0.42	0.47	0.53	0.61	0.48	
Uniform Delay, d1	49.5	49.8	5.2	5.8	4.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.0	4.3	14.0	1.1	0.4	
Delay (s)	52.6	54.1	19.1	6.8	5.3	
Level of Service	D	D	B	A	A	
Approach Delay (s)	53.4			7.4	5.3	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.4
Intersection Capacity Utilization	68.4%	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)	272	971	321	194	512	221	105	1236	526	282	1277	47
Future Volume (vph)	272	971	321	194	512	221	105	1236	526	282	1277	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	5.0	6.9		5.0	6.9		5.0	7.5		5.0	7.5	
Lane Util. Factor	1.00	0.91		0.97	0.91		1.00	0.91		0.97	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.95		1.00	0.96		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1700	4786		3298	4661		1700	4743		3298	4965	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1700	4786		3298	4661		1700	4743		3298	4965	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	272	971	321	194	512	221	105	1236	526	282	1277	47
RTOR Reduction (vph)	0	43	0	0	56	0	0	55	0	0	3	0
Lane Group Flow (vph)	272	1249	0	194	677	0	105	1707	0	282	1321	0
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
Heavy Vehicles (%)	5%	5%	5%	5%	5%	11%	5%	5%	5%	5%	5%	5%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases												
Actuated Green, G (s)	23.0	42.1		9.0	28.1		14.4	51.5		13.0	50.1	
Effective Green, g (s)	23.0	42.1		9.0	28.1		14.4	51.5		13.0	50.1	
Actuated g/C Ratio	0.16	0.30		0.06	0.20		0.10	0.37		0.09	0.36	
Clearance Time (s)	5.0	6.9		5.0	6.9		5.0	7.5		5.0	7.5	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	279	1439		212	935		174	1744		306	1776	
v/s Ratio Prot	c0.16	c0.26		0.06	0.15		0.06	c0.36		c0.09	0.27	
v/s Ratio Perm												
v/c Ratio	0.97	0.87		0.92	0.72		0.60	0.98		0.92	0.74	
Uniform Delay, d1	58.2	46.3		65.1	52.3		60.1	43.7		63.0	39.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.77	1.06	
Incremental Delay, d2	47.1	6.3		40.4	3.4		8.4	17.1		25.5	2.0	
Delay (s)	105.3	52.7		105.6	55.8		68.5	60.8		74.3	43.6	
Level of Service	F	D		F	E		E	E		E	D	
Approach Delay (s)		61.8			66.2			61.2			48.9	
Approach LOS		E			E			E			D	

Intersection Summary			
HCM 2000 Control Delay	58.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	24.4
Intersection Capacity Utilization	96.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	358	1	134	0	1	0	50	1216	0	0	1598	669
Future Volume (vph)	358	1	134	0	1	0	50	1216	0	0	1598	669
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.7	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.5
Total Lost time (s)	6.4	6.4	6.4		6.4		3.0	6.4			6.4	6.4
Lane Util. Factor	0.95	0.95	1.00		1.00		1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.93		1.00		1.00	1.00			1.00	0.95
Flpb, ped/bikes	1.00	1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85		1.00		1.00	1.00			1.00	0.85
Flt Protected	0.95	0.95	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1615	1656	1407		1830		1638	3476			3476	1446
Flt Permitted	0.95	0.95	1.00		1.00		0.07	1.00			1.00	1.00
Satd. Flow (perm)	1615	1656	1407		1830		112	3476			3476	1446
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	358	1	134	0	1	0	50	1216	0	0	1598	669
RTOR Reduction (vph)	0	0	111	0	0	0	0	0	0	0	0	162
Lane Group Flow (vph)	179	180	23	0	1	0	50	1216	0	0	1598	507
Confl. Peds. (#/hr)			35	16					7			19
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	9%	5%	5%	5%	5%	5%
Turn Type	Split	NA	Perm		NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	4	4			3		1	6			2	
Permitted Phases			4	3			6			2		2
Actuated Green, G (s)	24.4	24.4	24.4		8.0		88.4	88.4			80.5	80.5
Effective Green, g (s)	24.4	24.4	24.4		8.0		88.4	88.4			80.5	80.5
Actuated g/C Ratio	0.17	0.17	0.17		0.06		0.63	0.63			0.58	0.58
Clearance Time (s)	6.4	6.4	6.4		6.4		3.0	6.4			6.4	6.4
Vehicle Extension (s)	5.0	5.0	5.0		5.0		5.0	5.0			5.0	5.0
Lane Grp Cap (vph)	281	288	245		104		124	2194			1998	831
v/s Ratio Prot	c0.11	0.11			c0.00		0.01	c0.35			c0.46	
v/s Ratio Perm			0.02				0.24					0.35
v/c Ratio	0.64	0.62	0.10		0.01		0.40	0.55			0.80	0.61
Uniform Delay, d1	53.7	53.6	48.5		62.3		20.2	14.6			23.4	19.5
Progression Factor	0.89	0.89	0.57		1.00		2.09	2.25			1.49	2.32
Incremental Delay, d2	6.0	5.5	0.3		0.1		1.6	0.4			2.0	1.9
Delay (s)	53.5	53.0	28.1		62.3		43.9	33.3			36.8	47.0
Level of Service	D	D	C		E		D	C			D	D
Approach Delay (s)		46.4			62.3			33.8			39.8	
Approach LOS		D			E			C			D	

Intersection Summary			
HCM 2000 Control Delay	38.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	22.2
Intersection Capacity Utilization	86.0%	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)	107	0	381	0	0	0	133	1477	0	0	1753	37
Future Volume (vph)	107	0	381	0	0	0	133	1477	0	0	1753	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.7	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.5
Total Lost time (s)		6.0	6.0				3.0	6.0			6.0	
Lane Util. Factor		1.00	1.00				1.00	0.95			0.95	
Frpb, ped/bikes		1.00	0.98				1.00	1.00			1.00	
Flpb, ped/bikes		0.99	1.00				1.00	1.00			1.00	
Frt		1.00	0.85				1.00	1.00			1.00	
Flt Protected		0.95	1.00				0.95	1.00			1.00	
Satd. Flow (prot)		1728	1486				1700	3476			3459	
Flt Permitted		0.76	1.00				0.05	1.00			1.00	
Satd. Flow (perm)		1377	1486				81	3476			3459	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	107	0	381	0	0	0	133	1477	0	0	1753	37
RTOR Reduction (vph)	0	0	115	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	107	266	0	0	0	133	1477	0	0	1789	0
Confl. Peds. (#/hr)	3		6	6		3	7					7
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	10%
Turn Type	Perm	NA	Perm				pm+pt	NA		Perm	NA	
Protected Phases		4			4		1	6			2	
Permitted Phases	4		4	4			6			2		
Actuated Green, G (s)		29.4	29.4				98.6	98.6			85.0	
Effective Green, g (s)		29.4	29.4				98.6	98.6			85.0	
Actuated g/C Ratio		0.21	0.21				0.70	0.70			0.61	
Clearance Time (s)		6.0	6.0				3.0	6.0			6.0	
Vehicle Extension (s)		5.0	5.0				5.0	5.0			5.0	
Lane Grp Cap (vph)		289	312				179	2448			2100	
v/s Ratio Prot							c0.06	0.42			c0.52	
v/s Ratio Perm		0.08	c0.18				0.46					
v/c Ratio		0.37	0.85				0.74	0.60			0.85	
Uniform Delay, d1		47.4	53.2				39.7	10.6			22.4	
Progression Factor		1.00	1.00				0.64	1.94			0.60	
Incremental Delay, d2		1.7	21.4				15.6	0.9			2.5	
Delay (s)		49.0	74.6				40.9	21.6			16.0	
Level of Service		D	E				D	C			B	
Approach Delay (s)		69.0			0.0			23.2			16.0	
Approach LOS		E			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	25.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	83.9%	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)	146	592	306	259	327	67	139	1391	212	103	1392	52
Future Volume (vph)	146	592	306	259	327	67	139	1391	212	103	1392	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.9	6.9	3.0	6.9	6.9	3.0	7.0		3.0	7.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00		1.00	1.00	0.99
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1682	3476	1488	1700	3476	1455	1700	3407		1700	3476	1501
Flt Permitted	0.55	1.00	1.00	0.16	1.00	1.00	0.06	1.00		0.06	1.00	1.00
Satd. Flow (perm)	981	3476	1488	283	3476	1455	113	3407		114	3476	1501
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	146	592	306	259	327	67	139	1391	212	103	1392	52
RTOR Reduction (vph)	0	0	128	0	0	50	0	9	0	0	0	0
Lane Group Flow (vph)	146	592	178	259	327	17	139	1594	0	103	1392	52
Confl. Peds. (#/hr)	16		5			16	5					5
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Free
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6			2		Free
Actuated Green, G (s)	38.0	28.0	28.0	50.0	36.0	36.0	73.4	63.3		72.8	63.0	140.0
Effective Green, g (s)	38.0	28.0	28.0	50.0	36.0	36.0	73.4	63.3		72.8	63.0	140.0
Actuated g/C Ratio	0.27	0.20	0.20	0.36	0.26	0.26	0.52	0.45		0.52	0.45	1.00
Clearance Time (s)	4.0	6.9	6.9	3.0	6.9	6.9	3.0	7.0		3.0	7.0	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	316	695	297	293	893	374	173	1540		170	1564	1501
v/s Ratio Prot	0.03	0.17		c0.12	0.09		c0.06	c0.47		0.04	0.40	
v/s Ratio Perm	0.09		0.12	c0.20		0.01	0.36			0.27		c0.03
v/c Ratio	0.46	0.85	0.60	0.88	0.37	0.05	0.80	1.04		0.61	0.89	0.03
Uniform Delay, d1	40.7	54.0	50.9	36.2	42.6	39.1	34.6	38.4		30.4	35.3	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.78	1.20		1.07	1.51	1.00
Incremental Delay, d2	2.2	10.8	4.9	27.0	0.5	0.1	22.8	31.0		5.8	5.5	0.0
Delay (s)	42.9	64.8	55.8	63.2	43.2	39.2	49.8	77.1		38.3	58.8	0.0
Level of Service	D	E	E	E	D	D	D	E		D	E	A
Approach Delay (s)		59.1			50.7			74.9			55.4	
Approach LOS		E			D			E			E	

Intersection Summary			
HCM 2000 Control Delay	62.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	20.9
Intersection Capacity Utilization	100.1%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	148	1304	229	185	652	61	209	1312	226	115	1157	63
Future Volume (vph)	148	1304	229	185	652	61	209	1312	226	115	1157	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	3.0	7.5	7.5	3.0	7.5	7.5	3.0	8.0	8.0	4.0	8.0	8.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1698	3476	1501	1700	3476	1483	1700	3476	1501	1700	3476	1495
Flt Permitted	0.29	1.00	1.00	0.08	1.00	1.00	0.08	1.00	1.00	0.08	1.00	1.00
Satd. Flow (perm)	524	3476	1501	143	3476	1483	141	3476	1501	150	3476	1495
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	148	1304	229	185	652	61	209	1312	226	115	1157	63
RTOR Reduction (vph)	0	0	89	0	0	39	0	0	93	0	0	42
Lane Group Flow (vph)	148	1304	140	185	652	22	209	1312	133	115	1157	21
Confl. Peds. (#/hr)	14		1	1		14	11		1	1		5
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6		6	2		2
Actuated Green, G (s)	59.9	49.9	49.9	59.9	49.9	49.9	61.6	51.6	51.6	53.6	47.6	47.6
Effective Green, g (s)	59.9	49.9	49.9	59.9	49.9	49.9	61.6	51.6	51.6	53.6	47.6	47.6
Actuated g/C Ratio	0.43	0.36	0.36	0.43	0.36	0.36	0.44	0.37	0.37	0.38	0.34	0.34
Clearance Time (s)	3.0	7.5	7.5	3.0	7.5	7.5	3.0	8.0	8.0	4.0	8.0	8.0
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	308	1238	534	172	1238	528	184	1281	553	123	1181	508
v/s Ratio Prot	0.03	0.38		c0.08	0.19		c0.09	0.38		0.04	0.33	
v/s Ratio Perm	0.17		0.09	c0.38		0.01	c0.41		0.09	0.31		0.01
v/c Ratio	0.48	1.05	0.26	1.08	0.53	0.04	1.14	1.02	0.24	0.93	0.98	0.04
Uniform Delay, d1	25.9	45.0	32.0	39.1	35.7	29.4	40.0	44.2	30.6	37.0	45.7	30.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.87	1.14	1.65	2.00	1.03	30.34
Incremental Delay, d2	2.5	40.9	0.6	90.2	0.8	0.1	94.6	26.4	0.7	48.5	17.0	0.1
Delay (s)	28.4	85.9	32.5	129.3	36.5	29.5	129.3	76.7	51.2	122.4	64.0	938.6
Level of Service	C	F	C	F	D	C	F	E	D	F	E	F
Approach Delay (s)		73.6			55.1			79.7			110.3	
Approach LOS		E			E			E			F	

Intersection Summary			
HCM 2000 Control Delay	81.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	22.5
Intersection Capacity Utilization	110.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	700	148	89	473	127	134	1187	197	103	1107	27
Future Volume (vph)	71	700	148	89	473	127	134	1187	197	103	1107	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	3.0	6.4		3.0	6.4		3.0	6.5		3.0	6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.97		1.00	0.98		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1695	3371		1700	3332		1700	3393		1700	3456	
Flt Permitted	0.29	1.00		0.11	1.00		0.12	1.00		0.06	1.00	
Satd. Flow (perm)	518	3371		188	3332		217	3393		115	3456	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	71	700	148	89	473	127	134	1187	197	103	1107	27
RTOR Reduction (vph)	0	13	0	0	17	0	0	9	0	0	1	0
Lane Group Flow (vph)	71	835	0	89	583	0	134	1375	0	103	1133	0
Confl. Peds. (#/hr)	36		12	12		36	12		6	6		12
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	12%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)	45.4	39.8		49.2	41.7		74.3	62.9		73.3	62.4	
Effective Green, g (s)	45.4	39.8		49.2	41.7		74.3	62.9		73.3	62.4	
Actuated g/C Ratio	0.32	0.28		0.35	0.30		0.53	0.45		0.52	0.45	
Clearance Time (s)	3.0	6.4		3.0	6.4		3.0	6.5		3.0	6.5	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	215	958		147	992		235	1524		183	1540	
v/s Ratio Prot	0.01	c0.25		c0.03	0.18		c0.05	c0.41		0.04	0.33	
v/s Ratio Perm	0.09			0.18			0.26			0.25		
v/c Ratio	0.33	0.87		0.61	0.59		0.57	0.90		0.56	0.74	
Uniform Delay, d1	34.0	47.7		34.5	41.8		22.1	35.7		26.7	32.0	
Progression Factor	1.00	1.00		1.00	1.00		2.46	0.63		1.72	1.64	
Incremental Delay, d2	1.9	9.5		10.0	1.4		1.9	3.3		6.0	3.0	
Delay (s)	35.9	57.1		44.5	43.2		56.2	25.9		51.7	55.6	
Level of Service	D	E		D	D		E	C		D	E	
Approach Delay (s)		55.5			43.4			28.6			55.2	
Approach LOS		E			D			C			E	

Intersection Summary			
HCM 2000 Control Delay	44.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	91.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	123	25	3	1317	1159	0
Future Volume (vph)	123	25	3	1317	1159	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.5	3.7	3.7	3.5
Total Lost time (s)	6.2	6.2	3.0	6.0	6.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	1.00	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1700	1521	1700	3476	3476	
Flt Permitted	0.95	1.00	0.21	1.00	1.00	
Satd. Flow (perm)	1700	1521	380	3476	3476	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	123	25	3	1317	1159	0
RTOR Reduction (vph)	0	14	0	0	0	0
Lane Group Flow (vph)	123	11	3	1317	1159	0
Confl. Peds. (#/hr)			2			2
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6			
Actuated Green, G (s)	17.3	17.3	110.5	110.5	106.0	
Effective Green, g (s)	17.3	17.3	110.5	110.5	106.0	
Actuated g/C Ratio	0.12	0.12	0.79	0.79	0.76	
Clearance Time (s)	6.2	6.2	3.0	6.0	6.0	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	210	187	314	2743	2631	
v/s Ratio Prot	c0.07		0.00	c0.38	0.33	
v/s Ratio Perm		0.01	0.01			
v/c Ratio	0.59	0.06	0.01	0.48	0.44	
Uniform Delay, d1	58.0	54.2	3.9	5.0	6.2	
Progression Factor	1.00	1.00	0.60	0.67	0.58	
Incremental Delay, d2	6.3	0.3	0.0	0.1	0.4	
Delay (s)	64.3	54.4	2.3	3.5	4.0	
Level of Service	E	D	A	A	A	
Approach Delay (s)	62.6			3.5	4.0	
Approach LOS	E			A	A	

Intersection Summary			
HCM 2000 Control Delay	7.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	53.4%	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)	427	1652	386	63	591	272	224	1151	139	209	746	145
Future Volume (vph)	427	1652	386	63	591	272	224	1151	139	209	746	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	3.0	7.9	7.9	4.0	7.9	7.9	3.0	8.4		3.0	8.4	8.4
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1700	3476	1521	1580	3476	1521	1700	3420		1700	3476	1268
Flt Permitted	0.25	1.00	1.00	0.11	1.00	1.00	0.19	1.00		0.10	1.00	1.00
Satd. Flow (perm)	451	3476	1521	179	3476	1521	335	3420		180	3476	1268
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	427	1652	386	63	591	272	224	1151	139	209	746	145
RTOR Reduction (vph)	0	0	150	0	0	162	0	6	0	0	0	104
Lane Group Flow (vph)	427	1652	236	63	591	110	224	1284	0	209	746	41
Confl. Peds. (#/hr)												
Heavy Vehicles (%)	5%	5%	5%	13%	5%	5%	5%	5%	5%	5%	5%	26%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6			2		2
Actuated Green, G (s)	68.9	61.7	61.7	40.4	37.2	37.2	51.8	39.8		51.8	39.8	39.8
Effective Green, g (s)	68.9	61.7	61.7	40.4	37.2	37.2	51.8	39.8		51.8	39.8	39.8
Actuated g/C Ratio	0.49	0.44	0.44	0.29	0.27	0.27	0.37	0.28		0.37	0.28	0.28
Clearance Time (s)	3.0	7.9	7.9	4.0	7.9	7.9	3.0	8.4		3.0	8.4	8.4
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Lane Grp Cap (vph)	478	1531	670	83	923	404	240	972		196	988	360
v/s Ratio Prot	c0.18	c0.48		0.02	0.17		0.08	c0.38		c0.09	0.21	
v/s Ratio Perm	0.26		0.16	0.20		0.07	0.26			0.30		0.03
v/c Ratio	0.89	1.08	0.35	0.76	0.64	0.27	0.93	1.32		1.07	0.76	0.11
Uniform Delay, d1	26.3	39.1	25.9	46.6	45.5	40.7	36.1	50.1		38.9	45.7	37.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.36	1.14		1.00	1.00	1.00
Incremental Delay, d2	19.8	47.6	0.7	37.1	2.1	0.8	38.8	150.9		83.0	5.4	0.6
Delay (s)	46.1	86.7	26.6	83.7	47.6	41.5	87.9	208.2		121.8	51.0	37.7
Level of Service	D	F	C	F	D	D	F	F		F	D	D
Approach Delay (s)		70.3			48.2			190.4			62.7	
Approach LOS		E			D			F			E	

Intersection Summary			
HCM 2000 Control Delay	95.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	23.3
Intersection Capacity Utilization	117.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

2031 PM PEAK HOUR

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	142	58	50	127	323	51	1246	44	266	1783	383
Future Volume (vph)	121	142	58	50	127	323	51	1246	44	266	1783	383
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	7.3	7.3		7.3	7.3		6.7	6.7		3.0	6.7	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.96		1.00	0.89		1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1700	1750		1700	1633		1700	3459		1700	3384	
Flt Permitted	0.22	1.00		0.58	1.00		0.08	1.00		0.07	1.00	
Satd. Flow (perm)	398	1750		1038	1633		140	3459		132	3384	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	121	142	58	50	127	323	51	1246	44	266	1783	383
RTOR Reduction (vph)	0	10	0	0	77	0	0	2	0	0	15	0
Lane Group Flow (vph)	121	190	0	50	373	0	51	1288	0	266	2151	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		8			4			6		5	2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)	36.1	36.1		36.1	36.1		51.3	51.3		68.3	68.3	
Effective Green, g (s)	36.1	36.1		36.1	36.1		51.3	51.3		68.3	68.3	
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.43	0.43		0.58	0.58	
Clearance Time (s)	7.3	7.3		7.3	7.3		6.7	6.7		3.0	6.7	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	121	533		316	497		60	1498		261	1952	
v/s Ratio Prot		0.11			0.23			0.37		0.12	c0.64	
v/s Ratio Perm	c0.30			0.05			0.37			0.47		
v/c Ratio	1.00	0.36		0.16	0.75		0.85	0.86		1.02	1.10	
Uniform Delay, d1	41.2	32.1		30.1	37.1		30.1	30.3		37.0	25.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	81.8	0.9		0.5	7.4		78.6	6.7		60.7	54.3	
Delay (s)	123.0	32.9		30.5	44.5		108.7	37.0		97.7	79.4	
Level of Service	F	C		C	D		F	D		F	E	
Approach Delay (s)		66.9			43.1			39.7			81.4	
Approach LOS		E			D			D			F	

Intersection Summary			
HCM 2000 Control Delay	64.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	118.4	Sum of lost time (s)	17.0
Intersection Capacity Utilization	130.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	544	350	0	1450	2143	0
Future Volume (vph)	544	350	0	1450	2143	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.7	3.7	3.7	3.7
Total Lost time (s)	6.3	6.3		6.0	6.0	
Lane Util. Factor	0.97	0.91		0.91	0.95	
Frt	0.98	0.85		1.00	1.00	
Flt Protected	0.96	1.00		1.00	1.00	
Satd. Flow (prot)	3267	1384		4995	3476	
Flt Permitted	0.96	1.00		1.00	1.00	
Satd. Flow (perm)	3267	1384		4995	3476	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	544	350	0	1450	2143	0
RTOR Reduction (vph)	9	10	0	0	0	0
Lane Group Flow (vph)	605	270	0	1450	2143	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	26.8	26.8		80.0	80.0	
Effective Green, g (s)	26.8	26.8		80.0	80.0	
Actuated g/C Ratio	0.23	0.23		0.67	0.67	
Clearance Time (s)	6.3	6.3		6.0	6.0	
Vehicle Extension (s)	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	735	311		3355	2334	
v/s Ratio Prot	0.19	c0.20		0.29	c0.62	
v/s Ratio Perm						
v/c Ratio	0.82	0.87		0.43	0.92	
Uniform Delay, d1	43.9	44.4		9.0	16.7	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	8.3	23.3		0.4	7.2	
Delay (s)	52.2	67.7		9.5	24.0	
Level of Service	D	E		A	C	
Approach Delay (s)	57.1			9.5	24.0	
Approach LOS	E			A	C	

Intersection Summary			
HCM 2000 Control Delay	25.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	119.1	Sum of lost time (s)	12.3
Intersection Capacity Utilization	88.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	297	283	1481	0	0	2288
Future Volume (vph)	297	283	1481	0	0	2288
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.7	3.7	3.7	3.7
Total Lost time (s)	6.3	6.3	6.0			6.0
Lane Util. Factor	0.97	0.91	0.95			0.91
Frt	0.96	0.85	1.00			1.00
Flt Protected	0.96	1.00	1.00			1.00
Satd. Flow (prot)	3221	1384	3476			4995
Flt Permitted	0.96	1.00	1.00			1.00
Satd. Flow (perm)	3221	1384	3476			4995
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	297	283	1481	0	0	2288
RTOR Reduction (vph)	29	47	0	0	0	0
Lane Group Flow (vph)	367	137	1481	0	0	2288
Turn Type	Prot	Prot	NA			NA
Protected Phases	4	4	2			2
Permitted Phases						
Actuated Green, G (s)	20.8	20.8	81.1			81.1
Effective Green, g (s)	20.8	20.8	81.1			81.1
Actuated g/C Ratio	0.18	0.18	0.71			0.71
Clearance Time (s)	6.3	6.3	6.0			6.0
Vehicle Extension (s)	5.0	5.0	5.0			5.0
Lane Grp Cap (vph)	586	252	2468			3547
v/s Ratio Prot	c0.11	0.10	0.43			c0.46
v/s Ratio Perm						
v/c Ratio	0.63	0.54	0.60			0.65
Uniform Delay, d1	43.1	42.4	8.4			8.9
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	2.9	4.1	1.1			0.9
Delay (s)	46.1	46.5	9.4			9.8
Level of Service	D	D	A			A
Approach Delay (s)	46.2		9.4			9.8
Approach LOS	D		A			A

Intersection Summary			
HCM 2000 Control Delay	14.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	114.2	Sum of lost time (s)	12.3
Intersection Capacity Utilization	65.9%	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	92	174	659	603	223	165	1397	179	60	2386	91
Future Volume (vph)	48	92	174	659	603	223	165	1397	179	60	2386	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	6.6	6.6		3.0	6.6		3.0	6.3		6.3	6.3	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.91	
Frt	1.00	0.90		1.00	0.96		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1700	1650		1700	1756		1700	3417		1700	4967	
Flt Permitted	0.10	1.00		0.45	1.00		0.08	1.00		0.09	1.00	
Satd. Flow (perm)	184	1650		800	1756		149	3417		159	4967	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	48	92	174	659	603	223	165	1397	179	60	2386	91
RTOR Reduction (vph)	0	57	0	0	8	0	0	8	0	0	3	0
Lane Group Flow (vph)	48	209	0	659	818	0	165	1568	0	60	2474	0
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA		Perm	NA	
Protected Phases		8		7	4		1	6			2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)	39.0	39.0		54.0	54.0		53.1	53.1		45.1	45.1	
Effective Green, g (s)	39.0	39.0		54.0	54.0		53.1	53.1		45.1	45.1	
Actuated g/C Ratio	0.32	0.32		0.45	0.45		0.44	0.44		0.38	0.38	
Clearance Time (s)	6.6	6.6		3.0	6.6		3.0	6.3		6.3	6.3	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	59	536		450	790		130	1512		59	1866	
v/s Ratio Prot		0.13		c0.15	0.47		c0.05	0.46			0.50	
v/s Ratio Perm	0.26			c0.51			c0.51			0.38		
v/c Ratio	0.81	0.39		1.46	1.04		1.27	1.04		1.02	1.33	
Uniform Delay, d1	37.2	31.3		32.0	33.0		31.5	33.5		37.5	37.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	61.0	1.0		220.9	41.4		168.2	33.3		122.0	150.4	
Delay (s)	98.2	32.3		253.0	74.4		199.7	66.7		159.5	187.9	
Level of Service	F	C		F	E		F	E		F	F	
Approach Delay (s)		42.4			153.7			79.3			187.2	
Approach LOS		D			F			E			F	

Intersection Summary			
HCM 2000 Control Delay	140.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.44		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	128.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	52	60	66	1689	2410	54
Future Volume (vph)	52	60	66	1689	2410	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.5	3.7	3.7	3.5
Total Lost time (s)	7.1	7.1	3.0	6.3	6.3	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.91	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	1.00	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1689	1521	1700	3476	4975	
Flt Permitted	0.95	1.00	0.04	1.00	1.00	
Satd. Flow (perm)	1689	1521	80	3476	4975	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	52	60	66	1689	2410	54
RTOR Reduction (vph)	0	55	0	0	1	0
Lane Group Flow (vph)	52	5	66	1689	2463	0
Confl. Peds. (#/hr)	5	5	5			5
Turn Type	Perm	Prot	pm+pt	NA	NA	
Protected Phases		8	1	6	2	
Permitted Phases	8		6			
Actuated Green, G (s)	9.5	9.5	97.1	97.1	86.9	
Effective Green, g (s)	9.5	9.5	97.1	97.1	86.9	
Actuated g/C Ratio	0.08	0.08	0.81	0.81	0.72	
Clearance Time (s)	7.1	7.1	3.0	6.3	6.3	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	133	120	161	2812	3602	
v/s Ratio Prot		0.00	0.02	c0.49	c0.50	
v/s Ratio Perm	c0.03		0.31			
v/c Ratio	0.39	0.04	0.41	0.60	0.68	
Uniform Delay, d1	52.5	51.0	10.6	4.3	9.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.9	0.3	3.5	1.0	1.1	
Delay (s)	56.4	51.3	14.2	5.2	10.1	
Level of Service	E	D	B	A	B	
Approach Delay (s)	53.7			5.5	10.1	
Approach LOS	D			A	B	

Intersection Summary			
HCM 2000 Control Delay	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	75.4%	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)	165	588	222	646	1768	228	299	1181	168	220	1543	104
Future Volume (vph)	165	588	222	646	1768	228	299	1181	168	220	1543	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	5.0	6.9		5.0	6.9		5.0	7.5		5.0	7.5	
Lane Util. Factor	1.00	0.91		0.97	0.91		1.00	0.91		0.97	0.91	
Frt	1.00	0.96		1.00	0.98		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1700	4790		3298	4909		1700	4902		3298	4948	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1700	4790		3298	4909		1700	4902		3298	4948	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	165	588	222	646	1768	228	299	1181	168	220	1543	104
RTOR Reduction (vph)	0	49	0	0	12	0	0	13	0	0	5	0
Lane Group Flow (vph)	165	761	0	646	1984	0	299	1336	0	220	1642	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases												
Actuated Green, G (s)	11.0	30.2		29.9	49.1		10.0	47.5		8.0	45.5	
Effective Green, g (s)	11.0	30.2		29.9	49.1		10.0	47.5		8.0	45.5	
Actuated g/C Ratio	0.08	0.22		0.21	0.35		0.07	0.34		0.06	0.32	
Clearance Time (s)	5.0	6.9		5.0	6.9		5.0	7.5		5.0	7.5	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	133	1033		704	1721		121	1663		188	1608	
v/s Ratio Prot	c0.10	0.16		0.20	c0.40		c0.18	0.27		0.07	c0.33	
v/s Ratio Perm												
v/c Ratio	1.24	0.74		0.92	1.15		2.47	0.80		1.17	1.02	
Uniform Delay, d1	64.5	51.2		53.8	45.5		65.0	42.0		66.0	47.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.78	1.41	
Incremental Delay, d2	156.5	3.4		17.6	76.0		686.1	4.2		113.5	25.9	
Delay (s)	221.0	54.6		71.4	121.4		751.1	46.2		164.7	92.6	
Level of Service	F	D		E	F		F	D		F	F	
Approach Delay (s)		82.7			109.2			174.1			101.1	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	118.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.22		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	24.4
Intersection Capacity Utilization	117.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	659	1	179	0	1	0	127	1388	0	0	1390	606
Future Volume (vph)	659	1	179	0	1	0	127	1388	0	0	1390	606
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.7	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.5
Total Lost time (s)	6.4	6.4	6.4		6.4		3.0	6.4			6.4	6.4
Lane Util. Factor	0.95	0.95	1.00		1.00		1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.96		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			1.00	1.00
Frt	1.00	1.00	0.85		1.00		1.00	1.00			1.00	0.85
Flt Protected	0.95	0.95	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1615	1656	1467		1830		1700	3476			3476	1521
Flt Permitted	0.95	0.95	1.00		1.00		0.07	1.00			1.00	1.00
Satd. Flow (perm)	1615	1656	1467		1830		121	3476			3476	1521
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	659	1	179	0	1	0	127	1388	0	0	1390	606
RTOR Reduction (vph)	0	0	103	0	0	0	0	0	0	0	0	167
Lane Group Flow (vph)	329	331	76	0	1	0	127	1388	0	0	1390	439
Confl. Peds. (#/hr)			13	13		2						
Turn Type	Split	NA	Perm		NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	4	4			3		1	6			2	
Permitted Phases			4	3			6			2		2
Actuated Green, G (s)	36.9	36.9	36.9		1.6		82.3	82.3			67.8	67.8
Effective Green, g (s)	36.9	36.9	36.9		1.6		82.3	82.3			67.8	67.8
Actuated g/C Ratio	0.26	0.26	0.26		0.01		0.59	0.59			0.48	0.48
Clearance Time (s)	6.4	6.4	6.4		6.4		3.0	6.4			6.4	6.4
Vehicle Extension (s)	5.0	5.0	5.0		5.0		5.0	5.0			5.0	5.0
Lane Grp Cap (vph)	425	436	386		20		200	2043			1683	736
v/s Ratio Prot	c0.20	0.20			c0.00		0.05	c0.40			c0.40	
v/s Ratio Perm			0.05				0.32					0.29
v/c Ratio	0.77	0.76	0.20		0.05		0.64	0.68			0.83	0.60
Uniform Delay, d1	47.7	47.5	40.0		68.4		26.2	19.8			31.0	26.2
Progression Factor	1.17	1.17	1.88		1.00		0.62	1.26			0.78	1.08
Incremental Delay, d2	5.5	4.8	0.3		2.2		4.5	0.9			2.8	2.1
Delay (s)	61.2	60.4	75.7		70.6		20.8	25.8			26.9	30.3
Level of Service	E	E	E		E		C	C			C	C
Approach Delay (s)		64.0			70.6			25.4			27.9	
Approach LOS		E			E			C			C	

Intersection Summary			
HCM 2000 Control Delay	34.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	22.2
Intersection Capacity Utilization	86.0%	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)	69	0	245	0	0	0	358	1624	0	0	1708	91
Future Volume (vph)	69	0	245	0	0	0	358	1624	0	0	1708	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.7	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)		6.0	6.0				3.0	6.0			6.0	6.0
Lane Util. Factor		1.00	1.00				1.00	0.95			0.95	1.00
Frpb, ped/bikes		1.00	0.97				1.00	1.00			1.00	0.97
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		0.95	1.00				0.95	1.00			1.00	1.00
Satd. Flow (prot)		1735	1483				1700	3476			3476	1477
Flt Permitted		0.76	1.00				0.05	1.00			1.00	1.00
Satd. Flow (perm)		1383	1483				86	3476			3476	1477
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	69	0	245	0	0	0	358	1624	0	0	1708	91
RTOR Reduction (vph)	0	0	219	0	0	0	0	0	0	0	0	20
Lane Group Flow (vph)	0	69	26	0	0	0	358	1624	0	0	1708	71
Confl. Peds. (#/hr)	1		7	7		1	3					3
Turn Type	Perm	NA	Perm				pm+pt	NA		Perm	NA	Perm
Protected Phases		4			4		1	6			2	
Permitted Phases	4		4	4			6			2		2
Actuated Green, G (s)		14.8	14.8				113.2	113.2			80.5	80.5
Effective Green, g (s)		14.8	14.8				113.2	113.2			80.5	80.5
Actuated g/C Ratio		0.11	0.11				0.81	0.81			0.58	0.58
Clearance Time (s)		6.0	6.0				3.0	6.0			6.0	6.0
Vehicle Extension (s)		5.0	5.0				5.0	5.0			5.0	5.0
Lane Grp Cap (vph)		146	156				411	2810			1998	849
v/s Ratio Prot							c0.18	0.47			0.49	
v/s Ratio Perm		c0.05	0.02				c0.52					0.05
v/c Ratio		0.47	0.17				0.87	0.58			0.85	0.08
Uniform Delay, d1		58.9	57.0				45.5	4.8			24.9	13.3
Progression Factor		1.00	1.00				1.26	0.98			1.19	1.70
Incremental Delay, d2		5.0	1.1				15.0	0.6			2.2	0.1
Delay (s)		63.9	58.0				72.3	5.3			31.8	22.7
Level of Service		E	E				E	A			C	C
Approach Delay (s)		59.3			0.0			17.4			31.3	
Approach LOS		E			A			B			C	

Intersection Summary			
HCM 2000 Control Delay	26.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	89.5%	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)	74	425	257	432	1038	143	217	1431	172	104	1289	110
Future Volume (vph)	74	425	257	432	1038	143	217	1431	172	104	1289	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.9	6.9	3.0	6.9	6.9	3.0	7.0		3.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1699	3476	1500	1700	3476	1473	1700	3420		1700	3476	1497
Flt Permitted	0.17	1.00	1.00	0.26	1.00	1.00	0.07	1.00		0.07	1.00	1.00
Satd. Flow (perm)	310	3476	1500	463	3476	1473	122	3420		126	3476	1497
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	74	425	257	432	1038	143	217	1431	172	104	1289	110
RTOR Reduction (vph)	0	0	158	0	0	74	0	6	0	0	0	65
Lane Group Flow (vph)	74	425	99	432	1038	69	217	1597	0	104	1289	45
Confl. Peds. (#/hr)	10		1	1		10	2					2
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6			2		2
Actuated Green, G (s)	28.1	23.1	23.1	53.1	44.1	44.1	71.6	58.6		68.4	57.0	57.0
Effective Green, g (s)	28.1	23.1	23.1	53.1	44.1	44.1	71.6	58.6		68.4	57.0	57.0
Actuated g/C Ratio	0.20	0.17	0.17	0.38	0.32	0.32	0.51	0.42		0.49	0.41	0.41
Clearance Time (s)	4.0	6.9	6.9	3.0	6.9	6.9	3.0	7.0		3.0	7.0	7.0
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Lane Grp Cap (vph)	111	573	247	414	1094	463	208	1431		189	1415	609
v/s Ratio Prot	0.02	0.12		c0.20	0.30		c0.10	c0.47		0.04	0.37	
v/s Ratio Perm	0.11		0.07	c0.19		0.05	0.43			0.22		0.03
v/c Ratio	0.67	0.74	0.40	1.04	0.95	0.15	1.04	1.12		0.55	0.91	0.07
Uniform Delay, d1	47.7	55.6	52.3	37.2	46.8	34.5	43.4	40.7		30.2	39.1	25.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.09	0.99		1.06	1.41	4.09
Incremental Delay, d2	18.3	6.2	2.2	56.0	16.6	0.3	70.3	61.2		1.5	3.1	0.1
Delay (s)	66.0	61.8	54.5	93.3	63.5	34.8	117.6	101.6		33.5	58.2	103.7
Level of Service	E	E	D	F	E	C	F	F		C	E	F
Approach Delay (s)		59.7			68.9			103.5			59.8	
Approach LOS		E			E			F			E	

Intersection Summary			
HCM 2000 Control Delay	76.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	20.9
Intersection Capacity Utilization	104.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	790	131	243	1416	82	318	1011	100	112	1438	63
Future Volume (vph)	70	790	131	243	1416	82	318	1011	100	112	1438	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	3.0	7.5	7.5	3.0	7.5	7.5	3.0	7.5	7.5	3.0	7.5	7.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1700	3476	1521	1700	3476	1471	1700	3476	1485	1700	3476	1485
Flt Permitted	0.09	1.00	1.00	0.19	1.00	1.00	0.08	1.00	1.00	0.12	1.00	1.00
Satd. Flow (perm)	155	3476	1521	333	3476	1471	140	3476	1485	218	3476	1485
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	70	790	131	243	1416	82	318	1011	100	112	1438	63
RTOR Reduction (vph)	0	0	88	0	0	54	0	0	53	0	0	41
Lane Group Flow (vph)	70	790	43	243	1416	28	318	1011	47	112	1438	22
Confl. Peds. (#/hr)	22					22	11		11	11		11
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6		6	2		2
Actuated Green, G (s)	54.0	46.1	46.1	58.2	48.2	48.2	64.2	51.2	51.2	61.6	49.9	49.9
Effective Green, g (s)	54.0	46.1	46.1	58.2	48.2	48.2	64.2	51.2	51.2	61.6	49.9	49.9
Actuated g/C Ratio	0.39	0.33	0.33	0.42	0.34	0.34	0.46	0.37	0.37	0.44	0.36	0.36
Clearance Time (s)	3.0	7.5	7.5	3.0	7.5	7.5	3.0	7.5	7.5	3.0	7.5	7.5
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	146	1144	500	236	1196	506	209	1271	543	219	1238	529
v/s Ratio Prot	0.03	0.23		c0.07	c0.41		c0.14	0.29		0.04	0.41	
v/s Ratio Perm	0.16		0.03	0.35		0.02	c0.56		0.03	0.18		0.02
v/c Ratio	0.48	0.69	0.09	1.03	1.18	0.06	1.52	0.80	0.09	0.51	1.16	0.04
Uniform Delay, d1	34.1	40.8	32.4	36.5	45.9	30.7	42.9	39.7	29.1	27.2	45.0	29.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.81	1.26	2.21	1.90	1.21	3.94
Incremental Delay, d2	5.1	2.3	0.2	66.5	91.5	0.1	246.5	2.7	0.2	0.4	73.6	0.0
Delay (s)	39.2	43.1	32.6	103.0	137.4	30.8	281.1	52.8	64.4	52.1	128.0	116.1
Level of Service	D	D	C	F	F	C	F	D	E	D	F	F
Approach Delay (s)		41.4			127.6			104.5			122.3	
Approach LOS		D			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	105.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.39		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	119.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	395	88	131	1004	76	252	954	102	108	1518	151
Future Volume (vph)	35	395	88	131	1004	76	252	954	102	108	1518	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	3.0	6.4		3.0	6.4		3.0	6.5		3.0	6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	0.99		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1700	3381		1700	3440		1700	3426		1700	3429	
Flt Permitted	0.10	1.00		0.35	1.00		0.06	1.00		0.16	1.00	
Satd. Flow (perm)	174	3381		633	3440		113	3426		285	3429	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	35	395	88	131	1004	76	252	954	102	108	1518	151
RTOR Reduction (vph)	0	13	0	0	4	0	0	5	0	0	6	0
Lane Group Flow (vph)	35	470	0	131	1076	0	252	1051	0	108	1663	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)	45.2	41.2		47.2	42.2		77.5	63.5		72.3	60.9	
Effective Green, g (s)	45.2	41.2		47.2	42.2		77.5	63.5		72.3	60.9	
Actuated g/C Ratio	0.32	0.29		0.34	0.30		0.55	0.45		0.52	0.43	
Clearance Time (s)	3.0	6.4		3.0	6.4		3.0	6.5		3.0	6.5	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	99	994		251	1036		221	1553		262	1491	
v/s Ratio Prot	0.01	0.14		c0.02	c0.31		c0.11	0.31		0.03	0.49	
v/s Ratio Perm	0.10			0.16			c0.52			0.18		
v/c Ratio	0.35	0.47		0.52	1.04		1.14	0.68		0.41	1.12	
Uniform Delay, d1	37.8	40.5		37.2	48.9		46.5	30.2		20.4	39.5	
Progression Factor	1.00	1.00		1.00	1.00		1.64	0.55		1.00	1.00	
Incremental Delay, d2	4.5	0.7		3.7	38.4		96.4	1.8		2.2	61.8	
Delay (s)	42.3	41.2		40.9	87.3		172.7	18.3		22.6	101.4	
Level of Service	D	D		D	F		F	B		C	F	
Approach Delay (s)		41.3			82.3			48.1			96.6	
Approach LOS		D			F			D			F	

Intersection Summary			
HCM 2000 Control Delay	73.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	112.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	46	17	61	808	1783	247
Future Volume (vph)	46	17	61	808	1783	247
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.5	3.7	3.7	3.7
Total Lost time (s)	6.2	6.2	3.0	6.0	6.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	
Frt	1.00	0.85	1.00	1.00	0.98	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1700	1521	1700	3476	3413	
Flt Permitted	0.95	1.00	0.06	1.00	1.00	
Satd. Flow (perm)	1700	1521	116	3476	3413	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	46	17	61	808	1783	247
RTOR Reduction (vph)	0	16	0	0	5	0
Lane Group Flow (vph)	46	1	61	808	2025	0
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6			
Actuated Green, G (s)	9.9	9.9	132.9	132.9	122.5	
Effective Green, g (s)	9.9	9.9	132.9	132.9	122.5	
Actuated g/C Ratio	0.06	0.06	0.86	0.86	0.79	
Clearance Time (s)	6.2	6.2	3.0	6.0	6.0	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	108	97	175	2980	2697	
v/s Ratio Prot	c0.03		c0.02	0.23	c0.59	
v/s Ratio Perm		0.00	0.28			
v/c Ratio	0.43	0.01	0.35	0.27	0.75	
Uniform Delay, d1	69.8	68.0	11.3	2.1	8.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	5.6	0.1	2.5	0.2	2.0	
Delay (s)	75.4	68.1	13.8	2.3	10.4	
Level of Service	E	E	B	A	B	
Approach Delay (s)	73.4			3.1	10.4	
Approach LOS	E			A	B	

Intersection Summary			
HCM 2000 Control Delay	9.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	155.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	74.0%	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)	131	588	327	170	1178	97	172	591	65	295	1595	430
Future Volume (vph)	131	588	327	170	1178	97	172	591	65	295	1595	430
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	7.9	7.9	3.0	7.9	7.9	4.0	8.4		3.0	8.4	8.4
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1700	3476	1521	1700	3476	1521	1700	3425		1700	3476	1485
Flt Permitted	0.10	1.00	1.00	0.26	1.00	1.00	0.07	1.00		0.28	1.00	1.00
Satd. Flow (perm)	170	3476	1521	467	3476	1521	132	3425		500	3476	1485
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	131	588	327	170	1178	97	172	591	65	295	1595	430
RTOR Reduction (vph)	0	0	105	0	0	67	0	5	0	0	0	71
Lane Group Flow (vph)	131	588	222	170	1178	30	172	651	0	295	1595	359
Confl. Peds. (#/hr)							8					8
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6			2		2
Actuated Green, G (s)	48.1	42.1	42.1	57.1	47.1	47.1	62.4	54.4		77.6	65.6	65.6
Effective Green, g (s)	48.1	42.1	42.1	57.1	47.1	47.1	62.4	54.4		77.6	65.6	65.6
Actuated g/C Ratio	0.32	0.28	0.28	0.38	0.31	0.31	0.41	0.36		0.51	0.43	0.43
Clearance Time (s)	4.0	7.9	7.9	3.0	7.9	7.9	4.0	8.4		3.0	8.4	8.4
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Lane Grp Cap (vph)	114	969	424	274	1084	474	137	1233		417	1510	645
v/s Ratio Prot	c0.05	0.17		c0.05	c0.34		c0.07	0.19		0.09	c0.46	
v/s Ratio Perm	0.32		0.15	0.18		0.02	c0.45			0.27		0.24
v/c Ratio	1.15	0.61	0.52	0.62	1.09	0.06	1.26	0.53		0.71	1.06	0.56
Uniform Delay, d1	47.9	47.3	46.0	33.8	52.0	36.5	38.8	38.2		23.3	42.7	31.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	129.9	1.6	2.2	6.1	54.0	0.1	161.1	1.6		6.8	39.6	3.4
Delay (s)	177.9	48.9	48.2	39.8	106.0	36.6	199.8	39.8		30.1	82.3	35.3
Level of Service	F	D	D	D	F	D	F	D		C	F	D
Approach Delay (s)		64.8			93.6			73.0			67.0	
Approach LOS		E			F			E			E	

Intersection Summary			
HCM 2000 Control Delay	74.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	151.0	Sum of lost time (s)	24.3
Intersection Capacity Utilization	113.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX C2

UNSIGNALIZED INTERSECTIONS

2031 AM PEAK HOUR

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	18	44	1751	19	22	1837
Future Volume (Veh/h)	18	44	1751	19	22	1837
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	18	44	1751	19	22	1837
Pedestrians	5		5			5
Lane Width (m)	3.5		3.7			3.6
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)			168			166
pX, platoon unblocked	0.88	0.77			0.77	
vC, conflicting volume	2427	895			1775	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	823	273			1413	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	92			94	
cM capacity (veh/h)	252	548			356	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3	SB 4
Volume Total	62	1167	603	22	612	612	612
Volume Left	18	0	0	22	0	0	0
Volume Right	44	0	19	0	0	0	0
cSH	408	1700	1700	356	1700	1700	1700
Volume to Capacity	0.15	0.69	0.35	0.06	0.36	0.36	0.36
Queue Length 95th (m)	3.7	0.0	0.0	1.4	0.0	0.0	0.0
Control Delay (s)	15.4	0.0	0.0	15.8	0.0	0.0	0.0
Lane LOS	C			C			
Approach Delay (s)	15.4	0.0		0.2			
Approach LOS	C						

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	61.2%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	18	34	22	1509	1715	57
Future Volume (Veh/h)	18	34	22	1509	1715	57
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	18	34	22	1509	1715	57
Pedestrians	10			5	5	
Lane Width (m)	3.5			3.6	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	1			0	0	
Right turn flare (veh)						
Median type				Raised	None	
Median storage veh)				1		
Upstream signal (m)				276		
pX, platoon unblocked	0.66					
vC, conflicting volume	2557	901	1782			
vC1, stage 1 conf vol	1754					
vC2, stage 2 conf vol	804					
vCu, unblocked vol	2332	901	1782			
tC, single (s)	7.0	7.0	4.3			
tC, 2 stage (s)	6.0					
tF (s)	3.6	3.4	2.3			
p0 queue free %	80	87	93			
cM capacity (veh/h)	90	270	310			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	18	34	22	754	754	1143	629
Volume Left	18	0	22	0	0	0	0
Volume Right	0	34	0	0	0	0	57
cSH	90	270	310	1700	1700	1700	1700
Volume to Capacity	0.20	0.13	0.07	0.44	0.44	0.67	0.37
Queue Length 95th (m)	4.9	3.0	1.6	0.0	0.0	0.0	0.0
Control Delay (s)	54.6	20.2	17.5	0.0	0.0	0.0	0.0
Lane LOS	F	C	C				
Approach Delay (s)	32.1		0.3			0.0	
Approach LOS	D						

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	0	8	9	0	2	17	1478	9	8	1688	29
Future Volume (Veh/h)	9	0	8	9	0	2	17	1478	9	8	1688	29
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	9	0	8	9	0	2	17	1478	9	8	1688	29
Pedestrians		6			5			5			5	
Lane Width (m)		3.6			3.5			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	2504	3250	870	2394	3260	754	1723			1492		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2504	3250	870	2394	3260	754	1723			1492		
tC, single (s)	7.9	6.6	7.7	9.1	6.6	7.9	4.2			4.9		
tC, 2 stage (s)												
tF (s)	3.7	4.0	3.7	4.3	4.0	3.8	2.2			2.6		
p0 queue free %	10	100	97	0	100	99	95			97		
cM capacity (veh/h)	10	8	230	6	8	261	348			302		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	9	8	9	2	17	985	502	8	1125	592
Volume Left	9	0	9	0	17	0	0	8	0	0
Volume Right	0	8	0	2	0	0	9	0	0	29
cSH	10	230	6	261	348	1700	1700	302	1700	1700
Volume to Capacity	0.90	0.03	1.63	0.01	0.05	0.58	0.30	0.03	0.66	0.35
Queue Length 95th (m)	12.4	0.8	14.5	0.2	1.1	0.0	0.0	0.6	0.0	0.0
Control Delay (s)	729.1	21.2	1509.7	18.9	15.9	0.0	0.0	17.2	0.0	0.0
Lane LOS	F	C	F	C	C			C		
Approach Delay (s)	396.0		1238.7		0.2			0.1		
Approach LOS	F		F							

Intersection Summary				
Average Delay	6.4			
Intersection Capacity Utilization	66.2%	ICU Level of Service		C
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	0	22	0	0	0	22	1618	0	0	1981	5
Future Volume (Veh/h)	5	0	22	0	0	0	22	1618	0	0	1981	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	0	22	0	0	0	22	1618	0	0	1981	5
Pedestrians		6			5			5			5	
Lane Width (m)		3.7			3.7			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			0			0	
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)								368			327	
pX, platoon unblocked	0.73	0.73	0.61	0.73	0.73	0.76	0.61			0.76		
vC, conflicting volume	2848	3656	1004	2684	3659	819	1992			1623		
vC1, stage 1 conf vol	1990	1990		1667	1667							
vC2, stage 2 conf vol	858	1667		1018	1992							
vCu, unblocked vol	1329	2430	0	1107	2434	134	1361			1191		
tC, single (s)	7.6	6.6	7.0	7.6	6.6	7.0	4.2			4.2		
tC, 2 stage (s)	6.6	5.6		6.6	5.6							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	100	97	100	100	100	93			100		
cM capacity (veh/h)	91	100	655	122	89	664	297			429		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	27	0	22	809	809	0	1321	665
Volume Left	5	0	22	0	0	0	0	0
Volume Right	22	0	0	0	0	0	0	5
cSH	306	1700	297	1700	1700	1700	1700	1700
Volume to Capacity	0.09	0.00	0.07	0.48	0.48	0.00	0.78	0.39
Queue Length 95th (m)	2.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	17.9	0.0	18.1	0.0	0.0	0.0	0.0	0.0
Lane LOS	C	A	C					
Approach Delay (s)	17.9	0.0	0.2			0.0		
Approach LOS	C	A						

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	65.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	2	7	0	8	3	1551	10	7	1575	3
Future Volume (Veh/h)	0	0	2	7	0	8	3	1551	10	7	1575	3
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	2	7	0	8	3	1551	10	7	1575	3
Pedestrians		5			6			5			5	
Lane Width (m)		3.7			3.7			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			1			0			0	
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)								251				
pX, platoon unblocked	0.57	0.57		0.57	0.57	0.57				0.57		
vC, conflicting volume	2390	3168	799	2376	3165	792	1583			1567		
vC1, stage 1 conf vol	1596	1596		1568	1568							
vC2, stage 2 conf vol	794	1573		808	1597							
vCu, unblocked vol	1937	3294	799	1913	3288	0	1583			502		
tC, single (s)	7.6	6.6	7.0	7.6	6.6	7.0	4.2			4.2		
tC, 2 stage (s)	6.6	5.6		6.6	5.6							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	99	97	100	99	99			99		
cM capacity (veh/h)	102	130	319	206	129	611	396			592		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	2	15	3	1034	527	7	1050	528
Volume Left	0	7	3	0	0	7	0	0
Volume Right	2	8	0	0	10	0	0	3
cSH	319	318	396	1700	1700	592	1700	1700
Volume to Capacity	0.01	0.05	0.01	0.61	0.31	0.01	0.62	0.31
Queue Length 95th (m)	0.1	1.0	0.2	0.0	0.0	0.3	0.0	0.0
Control Delay (s)	16.3	16.9	14.2	0.0	0.0	11.2	0.0	0.0
Lane LOS	C	C	B			B		
Approach Delay (s)	16.3	16.9	0.0			0.0		
Approach LOS	C	C						

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	35	36	30	1509	1524	14
Future Volume (Veh/h)	35	36	30	1509	1524	14
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	35	36	30	1509	1524	14
Pedestrians	4			5	5	
Lane Width (m)	3.5			3.6	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	0	
Right turn flare (veh)		1				
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (m)				366		
pX, platoon unblocked	0.59					
vC, conflicting volume	2354	778	1542			
vC1, stage 1 conf vol	1535					
vC2, stage 2 conf vol	820					
vCu, unblocked vol	1908	778	1542			
tC, single (s)	6.9	7.0	4.2			
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.3	2.2			
p0 queue free %	77	89	93			
cM capacity (veh/h)	149	330	411			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	71	30	754	754	1016	522
Volume Left	35	30	0	0	0	0
Volume Right	36	0	0	0	0	14
cSH	303	411	1700	1700	1700	1700
Volume to Capacity	0.23	0.07	0.44	0.44	0.60	0.31
Queue Length 95th (m)	6.2	1.6	0.0	0.0	0.0	0.0
Control Delay (s)	26.7	14.4	0.0	0.0	0.0	0.0
Lane LOS	D	B				
Approach Delay (s)	26.7	0.3			0.0	
Approach LOS	D					

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	0	0	6	0	14	3	1650	4	11	1483	5
Future Volume (Veh/h)	7	0	0	6	0	14	3	1650	4	11	1483	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	7	0	0	6	0	14	3	1650	4	11	1483	5
Pedestrians		5			5			5			5	
Lane Width (m)		3.7			3.7			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	2362	3178	754	2432	3178	837	1493			1659		
vC1, stage 1 conf vol	1512	1512		1663	1663							
vC2, stage 2 conf vol	850	1665		768	1515							
vCu, unblocked vol	2362	3178	754	2432	3178	837	1493			1659		
tC, single (s)	7.6	6.6	7.0	7.6	6.6	7.0	4.2			4.4		
tC, 2 stage (s)	6.6	5.6		6.6	5.6							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	93	100	100	93	100	95	99			97		
cM capacity (veh/h)	106	100	342	91	104	301	429			336		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	7	20	3	1100	554	11	989	499
Volume Left	7	6	3	0	0	11	0	0
Volume Right	0	14	0	0	4	0	0	5
cSH	106	177	429	1700	1700	336	1700	1700
Volume to Capacity	0.07	0.11	0.01	0.65	0.33	0.03	0.58	0.29
Queue Length 95th (m)	1.5	2.6	0.1	0.0	0.0	0.7	0.0	0.0
Control Delay (s)	41.5	27.9	13.4	0.0	0.0	16.1	0.0	0.0
Lane LOS	E	D	B			C		
Approach Delay (s)	41.5	27.9	0.0			0.1		
Approach LOS	E	D						

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	56.1%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	12	91	1742	12	51	1606
Future Volume (Veh/h)	12	91	1742	12	51	1606
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	12	91	1742	12	51	1606
Pedestrians	7		5			5
Lane Width (m)	3.5		3.6			3.6
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	1		0			0
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (m)						348
pX, platoon unblocked	0.69					
vC, conflicting volume	2659	883			1761	
vC1, stage 1 conf vol	1749					
vC2, stage 2 conf vol	910					
vCu, unblocked vol	2508	883			1761	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.3			2.2	
p0 queue free %	90	68			85	
cM capacity (veh/h)	115	280			336	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	103	871	871	12	51	803	803
Volume Left	12	0	0	0	51	0	0
Volume Right	91	0	0	12	0	0	0
cSH	240	1700	1700	1700	336	1700	1700
Volume to Capacity	0.43	0.51	0.51	0.01	0.15	0.47	0.47
Queue Length 95th (m)	14.1	0.0	0.0	0.0	3.7	0.0	0.0
Control Delay (s)	30.8	0.0	0.0	0.0	17.6	0.0	0.0
Lane LOS	D				C		
Approach Delay (s)	30.8	0.0			0.5		
Approach LOS	D						

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	62.6%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	18	35	10	1783	1688	22
Future Volume (Veh/h)	18	35	10	1783	1688	22
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	18	35	10	1783	1688	22
Pedestrians	6			5	5	
Lane Width (m)	3.5			3.6	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	0	
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (m)					232	
pX, platoon unblocked	0.68	0.68	0.68			
vC, conflicting volume	2622	866	1716			
vC1, stage 1 conf vol	1705					
vC2, stage 2 conf vol	916					
vCu, unblocked vol	2441	0	1104			
tC, single (s)	6.9	7.0	4.2			
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.3	2.2			
p0 queue free %	88	95	98			
cM capacity (veh/h)	156	721	412			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	53	10	892	892	1125	585
Volume Left	18	10	0	0	0	0
Volume Right	35	0	0	0	0	22
cSH	324	412	1700	1700	1700	1700
Volume to Capacity	0.16	0.02	0.52	0.52	0.66	0.34
Queue Length 95th (m)	4.0	0.5	0.0	0.0	0.0	0.0
Control Delay (s)	18.3	14.0	0.0	0.0	0.0	0.0
Lane LOS	C	B				
Approach Delay (s)	18.3	0.1			0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		

2031 PM PEAK HOUR

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	9	36	1681	24	77	2329
Future Volume (Veh/h)	9	36	1681	24	77	2329
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	9	36	1681	24	77	2329
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			168			166
pX, platoon unblocked	0.79	0.80			0.80	
vC, conflicting volume	2623	852			1705	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	791	308			1376	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	93			80	
cM capacity (veh/h)	203	542			382	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3	SB 4
Volume Total	45	1121	584	77	776	776	776
Volume Left	9	0	0	77	0	0	0
Volume Right	36	0	24	0	0	0	0
cSH	406	1700	1700	382	1700	1700	1700
Volume to Capacity	0.11	0.66	0.34	0.20	0.46	0.46	0.46
Queue Length 95th (m)	2.6	0.0	0.0	5.2	0.0	0.0	0.0
Control Delay (s)	15.0	0.0	0.0	16.8	0.0	0.0	0.0
Lane LOS	B			C			
Approach Delay (s)	15.0	0.0		0.5			
Approach LOS	B						

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	64.8%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	13	57	16	1500	1877	22
Future Volume (Veh/h)	13	57	16	1500	1877	22
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	13	57	16	1500	1877	22
Pedestrians	6				1	
Lane Width (m)	3.5				3.7	
Walking Speed (m/s)	1.2				1.2	
Percent Blockage	0				0	
Right turn flare (veh)						
Median type				Raised	None	
Median storage veh)				1		
Upstream signal (m)				276		
pX, platoon unblocked	0.73					
vC, conflicting volume	2677	956	1905			
vC1, stage 1 conf vol	1894					
vC2, stage 2 conf vol	783					
vCu, unblocked vol	2556	956	1905			
tC, single (s)	6.9	7.0	4.2			
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.3	2.2			
p0 queue free %	84	77	95			
cM capacity (veh/h)	83	252	295			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	13	57	16	750	750	1251	648
Volume Left	13	0	16	0	0	0	0
Volume Right	0	57	0	0	0	0	22
cSH	83	252	295	1700	1700	1700	1700
Volume to Capacity	0.16	0.23	0.05	0.44	0.44	0.74	0.38
Queue Length 95th (m)	3.7	5.9	1.2	0.0	0.0	0.0	0.0
Control Delay (s)	56.6	23.4	17.9	0.0	0.0	0.0	0.0
Lane LOS	F	C	C				
Approach Delay (s)	29.6		0.2			0.0	
Approach LOS	D						

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	62.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	0	46	5	0	11	21	1521	3	6	1747	27
Future Volume (Veh/h)	32	0	46	5	0	11	21	1521	3	6	1747	27
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	32	0	46	5	0	11	21	1521	3	6	1747	27
Pedestrians		5			3			10			4	
Lane Width (m)		3.6			3.5			3.6			3.6	
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	2595	3346	902	2509	3358	769	1779			1527		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2595	3346	902	2509	3358	769	1779			1527		
tC, single (s)	7.6	6.6	7.0	7.6	6.6	7.0	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	83	53	100	97	94			99		
cM capacity (veh/h)	11	7	271	11	7	335	331			417		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	32	46	5	11	21	1014	510	6	1165	609
Volume Left	32	0	5	0	21	0	0	6	0	0
Volume Right	0	46	0	11	0	0	3	0	0	27
cSH	11	271	11	335	331	1700	1700	417	1700	1700
Volume to Capacity	3.03	0.17	0.47	0.03	0.06	0.60	0.30	0.01	0.69	0.36
Queue Length 95th (m)	Err	4.2	7.5	0.7	1.4	0.0	0.0	0.3	0.0	0.0
Control Delay (s)	Err	20.9	522.1	16.1	16.6	0.0	0.0	13.8	0.0	0.0
Lane LOS	F	C	F	C	C			B		
Approach Delay (s)	4114.5		174.2		0.2			0.0		
Approach LOS	F		F							

Intersection Summary				
Average Delay	94.8			
Intersection Capacity Utilization	70.3%	ICU Level of Service		C
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	0	14	0	0	0	43	1596	0	0	1950	18
Future Volume (Veh/h)	3	0	14	0	0	0	43	1596	0	0	1950	18
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	3	0	14	0	0	0	43	1596	0	0	1950	18
Pedestrians		5						4				
Lane Width (m)		3.7						3.6				
Walking Speed (m/s)		1.2						1.2				
Percent Blockage		0						0				
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)								368			327	
pX, platoon unblocked	0.73	0.73	0.64	0.73	0.73	0.82	0.64			0.82		
vC, conflicting volume	2848	3646	993	2675	3655	798	1973			1596		
vC1, stage 1 conf vol	1964	1964		1682	1682							
vC2, stage 2 conf vol	884	1682		993	1973							
vCu, unblocked vol	1664	2756	0	1427	2768	304	1393			1281		
tC, single (s)	7.6	6.6	7.0	7.6	6.6	7.0	4.2			4.2		
tC, 2 stage (s)	6.6	5.6		6.6	5.6							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	100	98	100	100	100	86			100		
cM capacity (veh/h)	91	92	681	100	71	558	300			426		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	17	0	43	798	798	0	1300	668
Volume Left	3	0	43	0	0	0	0	0
Volume Right	14	0	0	0	0	0	0	18
cSH	318	1700	300	1700	1700	1700	1700	1700
Volume to Capacity	0.05	0.00	0.14	0.47	0.47	0.00	0.76	0.39
Queue Length 95th (m)	1.2	0.0	3.5	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	17.0	0.0	19.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	C	A	C					
Approach Delay (s)	17.0	0.0	0.5			0.0		
Approach LOS	C	A						

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	0	6	13	0	13	16	1585	8	3	1525	0
Future Volume (Veh/h)	3	0	6	13	0	13	16	1585	8	3	1525	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	3	0	6	13	0	13	16	1585	8	3	1525	0
Pedestrians					5							
Lane Width (m)					3.7							
Walking Speed (m/s)					1.2							
Percent Blockage					0							
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)								251				
pX, platoon unblocked	0.60	0.60		0.60	0.60	0.60				0.60		
vC, conflicting volume	2368	3161	762	2400	3157	802	1525			1598		
vC1, stage 1 conf vol	1531	1531		1626	1626							
vC2, stage 2 conf vol	838	1630		774	1531							
vCu, unblocked vol	1943	3270	762	1996	3263	0	1525			652		
tC, single (s)	7.6	6.6	7.0	7.6	6.6	7.0	4.2			4.2		
tC, 2 stage (s)	6.6	5.6		6.6	5.6							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	100	98	93	100	98	96			99		
cM capacity (veh/h)	113	131	341	176	123	639	419			541		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	9	26	16	1057	536	3	1017	508
Volume Left	3	13	16	0	0	3	0	0
Volume Right	6	13	0	0	8	0	0	0
cSH	204	276	419	1700	1700	541	1700	1700
Volume to Capacity	0.04	0.09	0.04	0.62	0.32	0.01	0.60	0.30
Queue Length 95th (m)	1.0	2.2	0.8	0.0	0.0	0.1	0.0	0.0
Control Delay (s)	23.5	19.4	13.9	0.0	0.0	11.7	0.0	0.0
Lane LOS	C	C	B			B		
Approach Delay (s)	23.5	19.4	0.1			0.0		
Approach LOS	C	C						

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	12	24	22	1379	1502	32
Future Volume (Veh/h)	12	24	22	1379	1502	32
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	12	24	22	1379	1502	32
Pedestrians	6					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)		1				
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (m)				366		
pX, platoon unblocked	0.63					
vC, conflicting volume	2258	773	1540			
vC1, stage 1 conf vol	1524					
vC2, stage 2 conf vol	734					
vCu, unblocked vol	1817	773	1540			
tC, single (s)	6.9	7.0	4.2			
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.3	2.2			
p0 queue free %	92	93	95			
cM capacity (veh/h)	152	334	411			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	36	22	690	690	1001	533
Volume Left	12	22	0	0	0	0
Volume Right	24	0	0	0	0	32
cSH	457	411	1700	1700	1700	1700
Volume to Capacity	0.08	0.05	0.41	0.41	0.59	0.31
Queue Length 95th (m)	1.8	1.2	0.0	0.0	0.0	0.0
Control Delay (s)	21.3	14.2	0.0	0.0	0.0	0.0
Lane LOS	C	B				
Approach Delay (s)	21.3	0.2			0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	1	2	3	2	11	4	1449	4	10	1516	1
Future Volume (Veh/h)	2	1	2	3	2	11	4	1449	4	10	1516	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	2	1	2	3	2	11	4	1449	4	10	1516	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	2281	2998	758	2240	2996	726	1517			1453		
vC1, stage 1 conf vol	1536	1536		1459	1459							
vC2, stage 2 conf vol	744	1461		780	1537							
vCu, unblocked vol	2281	2998	758	2240	2996	726	1517			1453		
tC, single (s)	7.6	6.6	7.0	7.6	6.6	7.0	4.2			4.2		
tC, 2 stage (s)	6.6	5.6		6.6	5.6							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	99	99	97	98	97	99			98		
cM capacity (veh/h)	106	115	343	119	117	360	422			447		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	5	16	4	966	487	10	1011	506
Volume Left	2	3	4	0	0	10	0	0
Volume Right	2	11	0	0	4	0	0	1
cSH	150	219	422	1700	1700	447	1700	1700
Volume to Capacity	0.03	0.07	0.01	0.57	0.29	0.02	0.59	0.30
Queue Length 95th (m)	0.7	1.6	0.2	0.0	0.0	0.5	0.0	0.0
Control Delay (s)	29.8	22.7	13.6	0.0	0.0	13.2	0.0	0.0
Lane LOS	D	C	B			B		
Approach Delay (s)	29.8	22.7	0.0			0.1		
Approach LOS	D	C						

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	15	63	1439	27	55	1672
Future Volume (Veh/h)	15	63	1439	27	55	1672
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	15	63	1439	27	55	1672
Pedestrians	5					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (m)						348
pX, platoon unblocked	0.66					
vC, conflicting volume	2390	724			1471	
vC1, stage 1 conf vol	1444					
vC2, stage 2 conf vol	946					
vCu, unblocked vol	2074	724			1471	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	82			87	
cM capacity (veh/h)	165	360			438	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	78	720	720	27	55	836	836
Volume Left	15	0	0	0	55	0	0
Volume Right	63	0	0	27	0	0	0
cSH	293	1700	1700	1700	438	1700	1700
Volume to Capacity	0.27	0.42	0.42	0.02	0.13	0.49	0.49
Queue Length 95th (m)	7.3	0.0	0.0	0.0	3.0	0.0	0.0
Control Delay (s)	21.7	0.0	0.0	0.0	14.4	0.0	0.0
Lane LOS	C				B		
Approach Delay (s)	21.7	0.0			0.5		
Approach LOS	C						

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	57.6%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	24	31	1557	1802	32
Future Volume (Veh/h)	6	24	31	1557	1802	32
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	6	24	31	1557	1802	32
Pedestrians	3					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (m)					232	
pX, platoon unblocked	0.65	0.65	0.65			
vC, conflicting volume	2662	920	1837			
vC1, stage 1 conf vol	1821					
vC2, stage 2 conf vol	840					
vCu, unblocked vol	2482	0	1222			
tC, single (s)	6.9	7.0	4.2			
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	97	91			
cM capacity (veh/h)	138	701	359			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	30	31	778	778	1201	633
Volume Left	6	31	0	0	0	0
Volume Right	24	0	0	0	0	32
cSH	386	359	1700	1700	1700	1700
Volume to Capacity	0.08	0.09	0.46	0.46	0.71	0.37
Queue Length 95th (m)	1.8	2.0	0.0	0.0	0.0	0.0
Control Delay (s)	15.1	16.0	0.0	0.0	0.0	0.0
Lane LOS	C	C				
Approach Delay (s)	15.1	0.3			0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		

APPENDIX D

POTENTIAL IMPROVEMENTS/ MITIGATION
FUTURE (2031) AM & PM PEAK HOUR
LEVEL OF SERVICE ANALYSIS

(SYNCHRO 9 OUTPUT)

APPENDIX D1

AUXILARY RIGHT-TURN LANE
WARRANT ASSESSMENT

Intersection Approach	Current Lane Configuration	Configuration with Added Auxiliary Right-Turn Lane	2031 Right-Turn Volume during Critical Approach Conditions	Volume/ Capacity during Critical Peak Hour			Notes on Constructability	Recommended Measure
				V/C for Shared Through-Right (current lane configuration)	V/C for Exclusive Through (with added right-turn lane)	V/C for Exclusive Right-Turn (with added right-turn lane)		
EASTGATE PARKWAY								
Northbound	1L 1T 1TR	1L 2T 1R	139 vph (a.m.) *(65 vph p.m.)*	<u>1.06</u> (a.m.)	1.02	0.23	- Appears to be sufficient property available on the SE corner. - No conflicts with cycling lanes at this intersection. - Minor impacts include relocation of electrical MH, light standards.	**Recommended**
MEADOWS BOULEVARD								
Southbound	1T 1TR	2T 1R	247 vph (p.m.) *(-- vph a.m.)*	0.69 (p.m.)	0.60	0.18	- Without the exclusive right-turn lane, the SBTR movement is still projected to operate well below capacity despite the right-turning traffic. - May be being used as a cut-through route in the p.m. to avoid congestion on Hwy-403 (SBR volume is 247 vph in p.m., EBL volume is 123 vph in a.m.). - Requires relocation of a hydro pole. - The 3.5m wide multi-use path adjacent to the curb at the northwest quadrant will need to be relocated. - Requires re-grading and extension of existing 0.3m diameter CSP culvert. - Minor impacts include relocation of electrical MH, light standards.	Not recommended
RATHBURN ROAD								
Northbound	1L 1T 1TR	1L 2T 1R	197 vph (a.m.) *(102 vph p.m.)*	0.75 (a.m.)	0.63	0.24	- Without the exclusive right-turn lane, the NBTR movement is still projected to operate below capacity despite the right-turning traffic. - Impacts to overhead hydro impacts. - A retaining wall would be required due to grade difference between the curb and noise wall. - Minor impacts include relocation of Bell MH.	Not recommended
Southbound	1L 1T 1TR	1L 2T 1R	151 vph (p.m.) *(27 vph a.m.)*	<u>1.04</u> (p.m.)	1.03	0.22	- Impacts to residences fronting Cawthra Rd, including reduction of driveway space. However property takings would be minimal (or not required) given the wide boulevards. - Minor impacts include relocation of light standards.	**Recommended**
Eastbound	1L 1T 1TR	1L 2T 1R	148 vph (a.m.) *(88 vph p.m.)*	0.94 (a.m.)	0.76	0.32	- Requires property takings from gas station. - Impacts to a major overhead hydro line, forestry impacts. - Minor impacts include relocation of Bell MH, light standards.	Not recommended
Westbound	1L 1T 1TR	1L 2T 1R	76 vph (p.m.) *(127 vph a.m., but WBT not critical)*	<u>1.14</u> (p.m.)	1.08	0.16	- Intersection was recently reconstructed. A right turn lane was temporally provided during construction and has since been removed. - Insufficient right-of-way available for standard right turn lane treatment (i.e. lane width) and boulevard	Not recommended

Intersection Approach	Current Lane Configuration	Configuration with Added Auxiliary Right-Turn Lane	2031 Right-Turn Volume during Critical Approach Conditions	Volume/ Capacity during Critical Peak Hour			Notes on Constructability	Recommended Measure
				V/C for Shared Through-Right (current lane configuration)	V/C for Exclusive Through (with added right-turn lane)	V/C for Exclusive Right-Turn (with added right-turn lane)		
BLOOR STREET								
Northbound	1L 1T 1TR	1L 2T 1R	172 (p.m.) *(212 vph a.m., but NBT not critical)*	0.99 (p.m.)	0.90	0.23	- Impacts to overhead hydro. - Requires relocation of a hydro pole at the southeast corner. - Property takings (± 50 sq-m) and impacts to residences on the southeast quadrant (may impact two properties that front onto Cawthra Rd, and one property that fronts onto Bloor St). - Minor impacts include relocation of Bell facilities, light standards.	**Recommended**
SILVER CREEK BOULEVARD								
Southbound	1T 1TR	2T 1R	91 vph (p.m.) *(37 vph a.m.)*	0.92 (p.m.)	0.86	0.11	- Requires relocation of the portion of sidewalk located between the intersection and bus shelter, and light standards. - Current bus bay location.	Not recommended
TEDWYN DRIVE								
Southbound	2T 1TR	3T 1R	54 vph (p.m.) *(23 vph a.m.)*	0.66 (p.m.)	0.64	0.05	- SBR volumes are low. - Without the exclusive right-turn lane, the SBTR movement is still projected to operate well below capacity despite the right-turning traffic. - Impacts to major overhead hydro facility, forestry impacts. - Property takings required to accommodate the relocation of hydro poles and to provide daylight triangles. - Relocation of noise wall is required.	Not recommended
NORTH SERVICE ROAD								
Northbound	1L 1T 1TR	1L 2T 1R	179 vph (p.m.) *(200 vph a.m., but NBT less critical)*	<u>1.04</u> (p.m.)	0.91	0.24	- Minor impacts include relocation of light standards.	**Recommended**
Southbound	1L 2T 1TR	1L 3T 1R	91 vph (p.m.)	<u>1.33</u> (p.m.)	1.27	0.15	- Possible impacts to a major overhead hydro facility (exclusive right-turn lane may avoid impacts to overhead hydro if the sidewalk is placed between poles; however, this may not be feasible if a bike lane is added). - Relatively low right turn volumes and limited benefit unless extended to allow by-pass of lengthy southbound queue.	Not recommended
Eastbound	1L 1TR	1L 1T 1R	246 vph (a.m.)	0.84 (a.m.)	0.49	0.63	- Without the exclusive right-turn lane, the EBTR movement is still projected to operate below capacity despite the right-turning traffic. - Geometry constraints given the tight curvature along the EB approach, and with the right-turn lane needing to be located on the inside curve. - Minor impacts include relocation of light standards.	Not recommended
Westbound	1L 1TR	1L 1T 1R	223 vph (p.m.) (603 Thru)	<u>1.04</u> (p.m.)	0.82	0.35	- Impacts to existing retaining wall, and requires property in the northeast quadrant.	Not recommended (largely due to property impacts)

Intersection Approach	Current Lane Configuration	Configuration with Added Auxiliary Right-Turn Lane	2031 Right-Turn Volume during Critical Approach Conditions	Volume/ Capacity during Critical Peak Hour			Notes on Constructability	Recommended Measure
				V/C for Shared Through-Right (current lane configuration)	V/C for Exclusive Through (with added right-turn lane)	V/C for Exclusive Right-Turn (with added right-turn lane)		
							- Widening potentially encroaches into hydro and utility corridor (containing high pressure pipeline) - Requires relocation/removal of bus shelter.	
SOUTH SERVICE ROAD								
Northbound	1L 1T TR	1L 2T 1R	79 vph (a.m.) *(44 vph p.m.)*	1.08	1.02	0.12	- NBR volumes are fairly low / limited benefit. - Property required to provide sufficient daylighting at southeast quadrant. - Will impact Environmentally Significant Area (ESA) - Requires relocation of bus shelter, light standards	Not recommended
Southbound	1L 1T 1TR	1L 2T 1R	383 vph (p.m.) *(112 vph a.m.)*	1.09	0.89	0.41	- High volume right turn - Minor impacts include relocation of light standards.	**Recommended**
Eastbound	1L 1TR	1L 1T 1R	58 vph (p.m.) *40 vph (a.m.)*	0.61	0.54	0.08	- EBR volumes are low in both a.m. and p.m. - Without the exclusive right-turn lane, the EBTR movement is still projected to operate well below capacity despite the right-turning traffic. - Requires relocation of hydro pole if total length (combined parallel & taper) of the right-turn lane exceeds 55m. - Minor impacts include relocation of light standards, controller box.	Not recommended
Westbound	1L 1TR	1L 1T 1R	323 vph (p.m.) 127 Thru *(273 vph a.m.;* *40 vph WBT)*	0.78	0.39	0.69	- Geometry constraints given the tight curvature along the WB approach, and with the right-turn lane needing to be located on the inside curve. - Requires relocation of hydro pole if the total length (combined parallel & taper) of the right-turn lane exceeds 50m. - Minor impacts include relocation of light standards.	Not recommended

APPENDIX D2

REVIEW OF ALTERNATIVE INTERSECTION LANE CONFIGUATIONS

CASE I - CAWTHRA ROAD/ BLOOR STREET INTERSECTION
Provide WB dual left-turn lanes

Existing WB approach configuration: 1L, 2T, 1R
Tested WB approach configuration: 2L, 1T, 1TR

BLOOR STREET & CAWTHRA ROAD INTERSECTION										
SCENARIO	AM PEAK					PM PEAK				
	Overall LOS	Affected Movements				Overall LOS	Affected Movements			
		Mvmt	LOS	V/C	95%ile Queue		Mvmt	LOS	V/C	95%ile Queue
Existing: Bloor Street WB approach with 1L, 2T, 1R	D	WBL	F	1.08	109m	D	WBL	F	1.01	152m
		WBT	D	0.49	54m		WBT	E	0.94	173m
		WBR	A	0.04	0m		WBR	A	0.10	0m
		EBT	F	1.02	118m		EBT	E	0.79	73m
		NBT	B	0.73	185m		NBT	E	0.90	224m
		SBT	D	0.66	190m		SBT	C	0.90	60m
Tested: Bloor Street WB approach with 2L, 1T, 1TR	D	WBL	D	0.81	56m	D	WBL	D	0.78	71m
		WBTR	D	0.52	65m		WBTR	E	0.99	202m
		EBT	E	0.84	105m		EBT	D	0.57	69m
		NBT	C	0.77	191m		NBT	E	0.95	234m
		SBT	D	0.83	207m		SBT	D	0.97	71m

Notes:

- Fully protected dual lefts were implemented on the WB approach in an effort to reduce WBL queuing and improve overall intersection operations.
- The v/c ratio for the WBL movement improves greatly during both peak hour periods.
- Queues for the WBL movement are significantly shorter, with 95th percentile queues reduced from 152m to 71m in the p.m. peak hour.
- EBT operations improve, while NBT and SBT operations slightly worsen.
- Average Intersection Delay was largely unchanged in the a.m. peak, and increased from 49.0 to 54.0 seconds in the p.m. peak.

Not recommended. Re-configuration of the Bloor St westbound approach to provide dual WBL is not recommended on a traffic operations basis. Average intersection delay remains largely unchanged in the a.m. peak and increases in the p.m. peak hour.

** All analyses were carried out in Synchro 9.0 using projected 2031 traffic volumes*

CASE II - CAWTHRA ROAD / RAMP TO DUNDAS INTERSECTION
Eliminate split phase operation by removing EB dual lefts

Existing EB approach configuration (with split phasing): 1L, 1LT, 1R
Tested EB approach configuration (with no split phasing): 1L, 1T, 1R

CAWTHRA ROAD AT RAMP TO DUNDAS										
SCENARIO	AM PEAK					PM PEAK				
	Overall LOS	Affected Movements				Overall LOS	Affected Movements			
		Mvmt	LOS	V/C	95%ile Queue		Mvmt	LOS	V/C	95%ile Queue
Existing: Split phase signal operation, dual EBL lanes	B	EBL	C	0.53	45m	D	EBL	E	0.77	89m
		EBTL	C	0.52	44m		EBTL	E	0.76	89m
Tested: Removal of split phasing, single EBL lane	C	EBL	D	0.82	109m	E	EBL	F	1.36	313m
		EBT	C	0.00	1m		EBT	D	0.00	2m

Notes:

- Traffic volumes on the WB approach (south access to the church) and for the EBT movement are typically very low (apart from occasional event traffic for the church). In comparison, projected 2031 EBL volumes are 358 vph in the a.m. peak and 659 vph in the p.m. peak.
- Apart from eliminating the WB approach (and church accesses to the north), eliminating split phasing necessitates a removal of the fully protected dual EBL so that this movement can operate as a single left-turn lane under protected + permissive phasing.
- With only a single EBL lane, conditions deteriorate in both peak periods. In the p.m. peak, the v/c ratio was output as 1.36 and 95th percentile queues reach 313m.

Not recommended. A single EBL lane is not able to accommodate the projected p.m. left-turning volumes (659 vph). The single EBL was modelled as having a v/c ratio of 1.36 in the p.m. peak.

** All analyses were carried out in Synchro 9.0 using projected 2031 traffic volumes*

CASE III - CAWTHRA ROAD / QUEENSWAY INTERSECTION
Model with exclusive right-turn lanes on EB and WB approaches

Existing lane configuration:
Right-most lanes on EB and WB approaches are treated as shared through-right lanes

Tested lane configuration:
Right-most lanes on EB and WB approaches are treated as exclusive right-turn lanes

(Note: In both the existing and tested models, the right-most lane on the NB approach is treated as an exclusive right-turn, and the right-most lane on the SB approach is treated as a shared through-right)

QUEENSWAY & CAWTHRA ROAD INTERSECTION										
SCENARIO	AM PEAK					PM PEAK				
	Overall LOS	Affected Movements				Overall LOS	Affected Movements			
		Mvmt	LOS	V/C	95%ile Queue		Mvmt	LOS	V/C	95%ile Queue
Existing: Right-most lanes on SB, EB, WB approaches treated as shared through-right	D	EBTR	E	0.95	142m	F	EBTR	D	0.74	81m
		WBTR	D	0.73	73m		WBTR	F	1.09	235m
		NBT	D	0.87	178m		NBT	F	1.03	208m
		SBTR	C	0.61	108m		SBTR	F	1.04	193m
Tested: Right-most lanes on EB and WB approaches treated as exclusive right-turn	D	EBT	E	0.95	166m	F	EBT	D	0.67	90m
		EBR	C	0.60	71m		EBR	B	0.44	36m
		WBT	D	0.66	81m		WBT	F	1.23	330m
		WBR	B	0.49	31m		WBR	B	0.33	36m
		NBT	D	0.91	195m		NBT	F	1.15	224m
		SBTR	C	0.63	110m		SBT	F	1.12	204m

Notes:

- In the a.m. peak, the intersection operates with a similar overall average intersection delay, however queues for the SBT and EBT movements increase with only two through lanes available. Conditions also worsen on the northbound approach as a result of signal optimization changes.
- In the p.m. peak, operations significantly worsen given the higher traffic volumes, and conditions for the SBT and WBT movements break down entirely. The output v/c ratios for the SBT and WBT movements are 1.34 and 1.37, respectively. The output 95th percentile queue lengths for the SBT and WBT movements 308m and 351m, respectively.
- Average intersection delay was reduced from 51.4 to 50.1 seconds in the a.m. peak, and increased from 82.3 to 109.5 seconds in the p.m. peak.

Not recommended. Constraining the EBT and WBT to two through-lanes (which is not how they were observed to operate at present) would result in a significant deterioration of operations in the p.m. peak hour.

** All analyses were carried out in Synchro 9.0 using projected 2031 traffic volumes*

POTENTIAL ROUNDABOUT
AT CAWTHRA ROAD – BURNHAMTHORPE

Project No.:
Intersecrtion: Burnhamthorpe Road at Cawthra Road

Horizon Year: 2031
Time Period: AM

Entering+Circulating 2381

Cawthra Road N

Entering PCEs 1335

63	1157	115	

Exiting PCEs 1521

Single-Lane (1E,1C) V/C	3.36
Single-Lane (1E,2C) V/C	2.46
Double-Lane (2E,1C) V/C	1.68
Double-Lane (2E,2C) Left V/C	1.29
Double-Lane (2E,2C) Right V/C	1.23
% Trucks	0%

Single-Lane (1E,1C) V/C	4.22
Single-Lane (1E,2C) V/C	2.56
Double-Lane (2E,1C) V/C	2.11
Double-Lane (2E,2C) Left V/C	1.39
Double-Lane (2E,2C) Right V/C	1.28
% Trucks	0%

Exiting PCEs 924

Entering+Circulating 3138

Burnhamthorpe Road W

Entering PCEs 1681

148
1304
229

1046

1457

1669

1567

61
652
185

Entering PCEs 898

Burnhamthorpe Road E

2567 **Entering+Circulating**

1645
Exiting PCEs

% Trucks	0%
Single-Lane (1E,1C) V/C	6.39
Single-Lane (1E,2C) V/C	4.13
Double-Lane (2E,1C) V/C	3.19
Double-Lane (2E,2C) Left V/C	2.22
Double-Lane (2E,2C) Right V/C	2.06

1571
Exiting PCEs

	209	1312	226

1747
Entering PCEs

Cawthra Road S

Entering+Circulating 3314

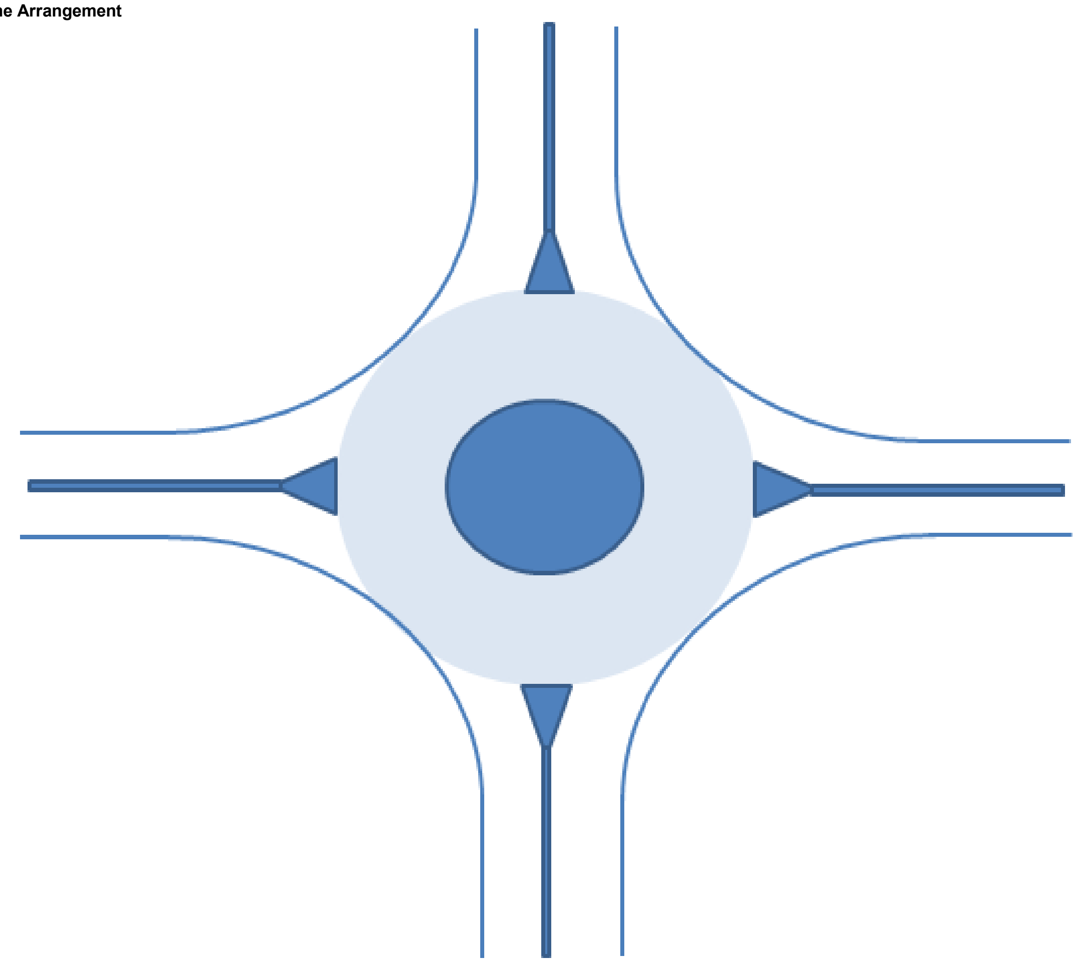
% Trucks	0%
Single-Lane (1E,1C) V/C	7.41
Single-Lane (1E,2C) V/C	4.63
Double-Lane (2E,1C) V/C	3.70
Double-Lane (2E,2C) Left V/C	2.50
Double-Lane (2E,2C) Right V/C	2.32

- Input Field (veh/hr, %)

- Formula Field (PCE)

Note: Double-lane rounabout analysis assumes even entry lane utilization.

Proposed Lane Arrangement



Project No.:
Intersecrtion: Burnhamthorpe Road at Cawthra Road

Horizon Year: 2301
Time Period: PM

Cawthra Road N

Entering+Circulating: 3590
Entering PCEs: 1613
Exiting PCEs: 1163
Movements: 63 | 1438 | 112 |

Northwest	
Single-Lane (1E,1C) V/C	10.31
Single-Lane (1E,2C) V/C	5.70
Double-Lane (2E,1C) V/C	5.15
Double-Lane (2E,2C) Left V/C	3.14
Double-Lane (2E,2C) Right V/C	2.85
% Trucks	0%

Northeast	
Single-Lane (1E,1C) V/C	6.24
Single-Lane (1E,2C) V/C	4.10
Double-Lane (2E,1C) V/C	3.12
Double-Lane (2E,2C) Left V/C	2.20
Double-Lane (2E,2C) Right V/C	2.05
% Trucks	0%

Burnhamthorpe Road W

Exiting PCEs: 1797
Entering+Circulating: 2784
Entering PCEs: 991
Movements: | 70 | 790 | 131

Burnhamthorpe Road E

Entering PCEs: 1741
Movements: 82 | 1416 | 243 |
Entering+Circulating: 3140
Exiting PCEs: 1002

Circulating: 1977, 1399, 1793, 972

Cawthra Road S

Exiting PCEs: 1812
Movements: | 318 | 1011 | 100
Entering PCEs: 1429
Entering+Circulating: 2401

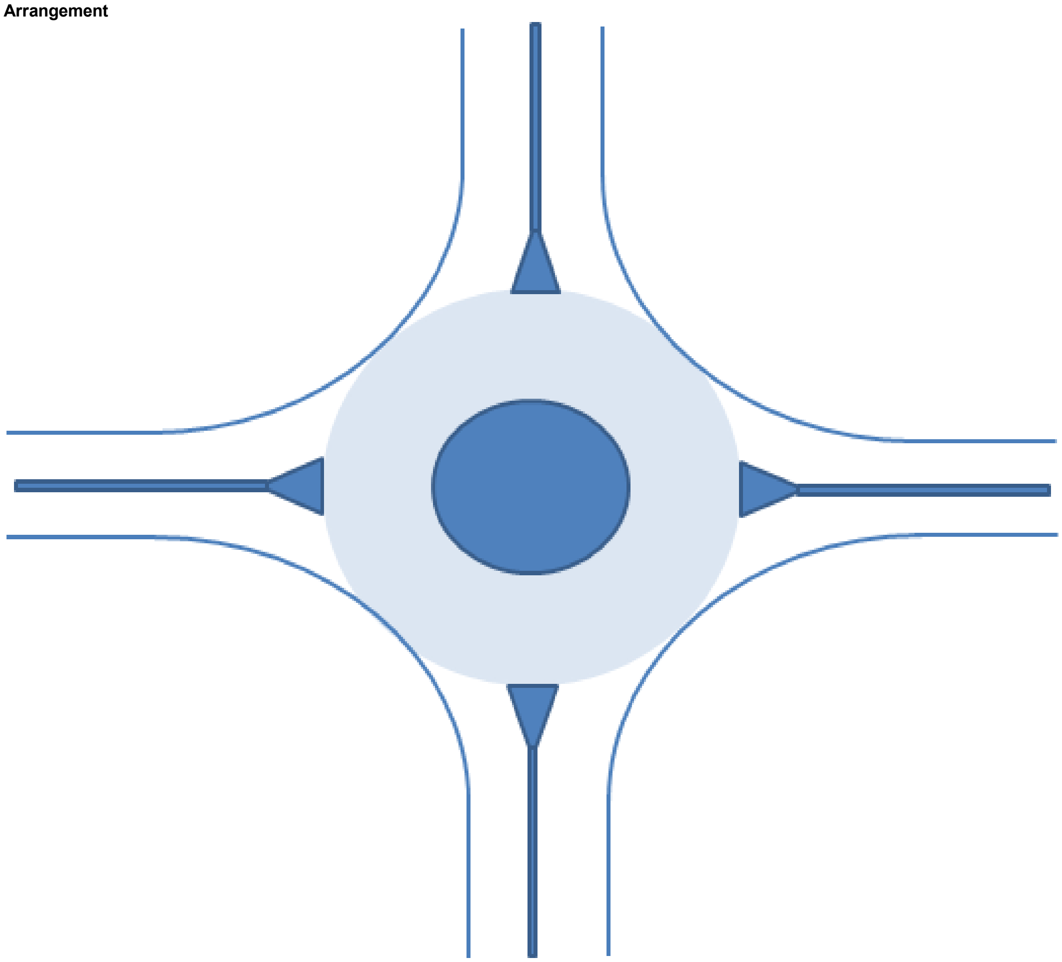
Southwest	
% Trucks	0%
Single-Lane (1E,1C) V/C	5.27
Single-Lane (1E,2C) V/C	3.08
Double-Lane (2E,1C) V/C	2.63
Double-Lane (2E,2C) Left V/C	1.68
Double-Lane (2E,2C) Right V/C	1.54

Southeast	
% Trucks	0%
Single-Lane (1E,1C) V/C	3.34
Single-Lane (1E,2C) V/C	2.50
Double-Lane (2E,1C) V/C	1.67
Double-Lane (2E,2C) Left V/C	1.31
Double-Lane (2E,2C) Right V/C	1.25

- Input Field (veh/hr, %)
- Formula Field (PCE)

Note: Double-lane rounabout analysis assumes even entry lane utilization.

Proposed Lane Arrangement



APPENDIX D3

SIGNALIZED INTERSECTION OPERATIONS (MITIGATED CONDITION)

2031 AM PEAK HOUR

APPENDIX D3 - Future (2031 AM Peak) Mitigated Condition – Recommended Improvements

Cawthra Rd Intersection	Intersection			Critical Movements				
	LOS	Delay (s)	V/C	Mvmt	LOS	Delay (s)	V/C Ratio	95th Queue
Eastgate Pkwy	F	81.3	1.20	NBL	F	138	1.09	#113
				SBL	F	264	1.41	#101
				EBT	F	94	1.10	#295
				NBT	F	94	1.06	#211
Meadows Blvd	A	6.7	0.51	--	--	--	--	--
Rathburn Rd	D	41.6	0.84	--	--	--	--	--
Burnhamthorpe Rd	E	80.5	1.16	NBL	F	120	1.08	m#84
				EBT	F	97	1.08	#235
				WBL	F	191	1.25	#87
				NBT	F	77	1.02	#229
				SBL	F	155	1.06	m#57
				SBT	F	83	1.08	#200
Bloor St	E	57.2	0.95	--	--	--	--	--
Silver Creek Blvd	C	25.5	0.84	--	--	--	--	--
Ramp to Dundas	D	35.9	0.82	--	--	--	--	--
Queensway	D	53.9	0.92	--	--	--	--	--
Tedwyn Dr	A	8.5	0.60	--	--	--	--	--
North Service Rd	D	36.3	0.98	WBL	F	92	1.01	#78
South Service Rd	E	66.9	1.21	SBL	F	168	1.21	#108
				EBL	F	137	1.13	#122
				NBT	F	84	1.08	#240

reflects queue length after two cycles

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	290	325	40	24	40	273	24	1487	79	277	883	112
Future Volume (vph)	290	325	40	24	40	273	24	1487	79	277	883	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	7.3	7.3		7.3	7.3		6.7	6.7		3.0	6.7	6.7
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.98		1.00	0.87		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1700	1788		1700	1564		1700	3450		1594	3476	1521
Flt Permitted	0.43	1.00		0.36	1.00		0.32	1.00		0.08	1.00	1.00
Satd. Flow (perm)	774	1788		651	1564		576	3450		126	3476	1521
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	290	325	40	24	40	273	24	1487	79	277	883	112
RTOR Reduction (vph)	0	4	0	0	155	0	0	3	0	0	0	38
Lane Group Flow (vph)	290	361	0	24	158	0	24	1563	0	277	883	74
Heavy Vehicles (%)	5%	5%	11%	5%	5%	7%	5%	5%	5%	12%	5%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	Perm
Protected Phases		8			4			6		5	2	
Permitted Phases	8			4			6			2		2
Actuated Green, G (s)	39.7	39.7		39.7	39.7		50.3	50.3		66.3	66.3	66.3
Effective Green, g (s)	39.7	39.7		39.7	39.7		50.3	50.3		66.3	66.3	66.3
Actuated g/C Ratio	0.33	0.33		0.33	0.33		0.42	0.42		0.55	0.55	0.55
Clearance Time (s)	7.3	7.3		7.3	7.3		6.7	6.7		3.0	6.7	6.7
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Lane Grp Cap (vph)	256	591		215	517		241	1446		228	1920	840
v/s Ratio Prot		0.20			0.10			0.45		c0.13	0.25	
v/s Ratio Perm	c0.37			0.04			0.04			c0.54		0.05
v/c Ratio	1.13	0.61		0.11	0.31		0.10	1.08		1.21	0.46	0.09
Uniform Delay, d1	40.1	33.7		27.9	29.9		21.1	34.9		38.2	16.1	12.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	96.8	2.7		0.5	0.7		0.8	48.8		129.9	0.8	0.2
Delay (s)	136.9	36.4		28.4	30.6		21.9	83.7		168.2	16.9	12.8
Level of Service	F	D		C	C		C	F		F	B	B
Approach Delay (s)		80.9			30.4			82.8			49.5	
Approach LOS		F			C			F			D	

Intersection Summary			
HCM 2000 Control Delay	66.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	115.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	290	325	24	40	24	1487	277	883	112
Future Volume (vph)	290	325	24	40	24	1487	277	883	112
Lane Group Flow (vph)	290	365	24	313	24	1566	277	883	112
Turn Type	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA	Perm
Protected Phases		8		4		6	5	2	
Permitted Phases	8		4		6		2		2
Detector Phase	8	8	4	4	6	6	5	2	2
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	8.0	15.0	15.0	5.0	15.0	15.0
Minimum Split (s)	40.3	40.3	40.3	40.3	33.7	33.7	8.0	33.7	33.7
Total Split (s)	47.0	47.0	47.0	47.0	57.0	57.0	16.0	73.0	73.0
Total Split (%)	39.2%	39.2%	39.2%	39.2%	47.5%	47.5%	13.3%	60.8%	60.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	3.3	3.3	3.3	3.3	2.7	2.7	0.0	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.3	7.3	7.3	7.3	6.7	6.7	3.0	6.7	6.7
Lead/Lag					Lag	Lag	Lead		
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	Max	Max	None	Max	Max
v/c Ratio	1.14	0.61	0.11	0.47	0.10	1.08	1.19	0.46	0.13
Control Delay	136.3	38.4	29.8	11.1	22.7	83.0	152.0	17.1	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	136.3	38.4	29.8	11.1	22.7	83.0	152.0	17.1	4.5
Queue Length 50th (m)	~73.2	65.1	3.6	12.5	3.1	~200.1	~58.9	57.7	2.5
Queue Length 95th (m)	#122.4	94.4	9.7	34.8	8.5	#239.9	#108.0	72.1	10.0
Internal Link Dist (m)		154.1		138.3		251.6		70.1	
Turn Bay Length (m)	70.0		70.0		65.0		65.0		30.0
Base Capacity (vph)	255	595	215	672	241	1448	232	1920	878
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.14	0.61	0.11	0.47	0.10	1.08	1.19	0.46	0.13

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Natural Cycle: 115
Control Type: Actuated-Uncoordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 49: Cawthra Rd & South Service Rd

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	425	160	0	1306	1156	0
Future Volume (vph)	425	160	0	1306	1156	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.7	3.7	3.7	3.7
Total Lost time (s)	6.3	6.3		6.0	6.0	
Lane Util. Factor	0.97	0.91		0.91	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	0.99	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3164	1251		4995	3476	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3164	1251		4995	3476	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	425	160	0	1306	1156	0
RTOR Reduction (vph)	2	67	0	0	0	0
Lane Group Flow (vph)	439	77	0	1306	1156	0
Confl. Peds. (#/hr)	5	5	5			5
Heavy Vehicles (%)	9%	14%	5%	5%	5%	5%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	2	
Permitted Phases		4				
Actuated Green, G (s)	23.0	23.0		73.1	73.1	
Effective Green, g (s)	23.0	23.0		73.1	73.1	
Actuated g/C Ratio	0.21	0.21		0.67	0.67	
Clearance Time (s)	6.3	6.3		6.0	6.0	
Vehicle Extension (s)	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	671	265		3368	2344	
v/s Ratio Prot	c0.14			0.26	c0.33	
v/s Ratio Perm		0.06				
v/c Ratio	0.65	0.29		0.39	0.49	
Uniform Delay, d1	39.1	35.9		7.8	8.6	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.1	1.3		0.3	0.7	
Delay (s)	42.1	37.1		8.1	9.4	
Level of Service	D	D		A	A	
Approach Delay (s)	40.9			8.1	9.4	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	14.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	108.4	Sum of lost time (s)	12.3
Intersection Capacity Utilization	56.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBT	SBT
Lane Configurations				
Traffic Volume (vph)	425	160	1306	1156
Future Volume (vph)	425	160	1306	1156
Lane Group Flow (vph)	441	144	1306	1156
Turn Type	Prot	Perm	NA	NA
Protected Phases	4		2	2
Permitted Phases		4		
Detector Phase	4	4	2	2
Switch Phase				
Minimum Initial (s)	8.0	8.0	8.0	8.0
Minimum Split (s)	14.3	14.3	28.0	28.0
Total Split (s)	41.0	41.0	79.0	79.0
Total Split (%)	34.2%	34.2%	65.8%	65.8%
Yellow Time (s)	4.0	4.0	4.0	4.0
All-Red Time (s)	2.3	2.3	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.0	6.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	Max	Max
v/c Ratio	0.66	0.43	0.39	0.49
Control Delay	43.6	20.1	8.6	10.0
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	43.6	20.1	8.6	10.0
Queue Length 50th (m)	40.4	10.5	36.4	51.2
Queue Length 95th (m)	55.0	28.5	54.6	80.1
Internal Link Dist (m)	232.9		53.5	128.5
Turn Bay Length (m)		140.0		
Base Capacity (vph)	1017	459	3369	2344
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.43	0.31	0.39	0.49

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 108.4
Natural Cycle: 45
Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Cawthra Rd & QEW EB Off-ramp

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	211	326	1559	0	0	1620
Future Volume (vph)	211	326	1559	0	0	1620
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.7	3.7	3.7	3.7
Total Lost time (s)	6.3	6.3	6.0			6.0
Lane Util. Factor	0.97	0.91	0.95			0.91
Frpb, ped/bikes	0.98	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	0.94	0.85	1.00			1.00
Flt Protected	0.97	1.00	1.00			1.00
Satd. Flow (prot)	3113	1354	3476			4995
Flt Permitted	0.97	1.00	1.00			1.00
Satd. Flow (perm)	3113	1354	3476			4995
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	211	326	1559	0	0	1620
RTOR Reduction (vph)	38	38	0	0	0	0
Lane Group Flow (vph)	326	135	1559	0	0	1620
Confl. Peds. (#/hr)	5	5		5	5	
Confl. Bikes (#/hr)		1		5		
Turn Type	Prot	Perm	NA			NA
Protected Phases	4		2			2
Permitted Phases		4				
Actuated Green, G (s)	19.8	19.8	80.2			80.2
Effective Green, g (s)	19.8	19.8	80.2			80.2
Actuated g/C Ratio	0.18	0.18	0.71			0.71
Clearance Time (s)	6.3	6.3	6.0			6.0
Vehicle Extension (s)	5.0	5.0	5.0			5.0
Lane Grp Cap (vph)	548	238	2482			3567
v/s Ratio Prot	c0.10		c0.45			0.32
v/s Ratio Perm		0.10				
v/c Ratio	0.60	0.57	0.63			0.45
Uniform Delay, d1	42.6	42.3	8.3			6.8
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	2.6	5.0	1.2			0.4
Delay (s)	45.2	47.4	9.5			7.2
Level of Service	D	D	A			A
Approach Delay (s)	45.9		9.5			7.2
Approach LOS	D		A			A

Intersection Summary			
HCM 2000 Control Delay	13.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	112.3	Sum of lost time (s)	12.3
Intersection Capacity Utilization	67.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBR	NBT	SBT
Lane Configurations				
Traffic Volume (vph)	211	326	1559	1620
Future Volume (vph)	211	326	1559	1620
Lane Group Flow (vph)	364	173	1559	1620
Turn Type	Prot	Perm	NA	NA
Protected Phases	4		2	2
Permitted Phases		4		
Detector Phase	4	4	2	2
Switch Phase				
Minimum Initial (s)	8.0	8.0	8.0	8.0
Minimum Split (s)	14.3	14.3	28.0	28.0
Total Split (s)	34.0	34.0	86.0	86.0
Total Split (%)	28.3%	28.3%	71.7%	71.7%
Yellow Time (s)	4.0	4.0	4.0	4.0
All-Red Time (s)	2.3	2.3	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.0	6.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	Max	Max
v/c Ratio	0.62	0.62	0.63	0.45
Control Delay	41.7	41.2	10.4	7.8
Queue Delay	0.0	0.0	0.0	0.4
Total Delay	41.7	41.2	10.4	8.1
Queue Length 50th (m)	30.8	26.1	74.4	44.0
Queue Length 95th (m)	44.2	48.9	119.0	67.3
Internal Link Dist (m)	265.2		83.8	45.5
Turn Bay Length (m)	90.0			
Base Capacity (vph)	805	370	2481	3565
Starvation Cap Reductn	0	0	0	1180
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.45	0.47	0.63	0.68

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 112.3
Natural Cycle: 50
Control Type: Actuated-Uncoordinated

Splits and Phases: 2: Cawthra Rd & QEW WB Off-ramp

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	62	146	246	249	172	92	145	1447	200	42	1802	42
Future Volume (vph)	62	146	246	249	172	92	145	1447	200	42	1802	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	6.6	6.6		3.0	6.6		3.0	6.3	6.3	6.3	6.3	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00	0.97	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.91		1.00	0.95		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1694	1640		1699	1724		1700	3476	1475	1699	4972	
Flt Permitted	0.60	1.00		0.20	1.00		0.08	1.00	1.00	0.09	1.00	
Satd. Flow (perm)	1063	1640		352	1724		137	3476	1475	168	4972	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	62	146	246	249	172	92	145	1447	200	42	1802	42
RTOR Reduction (vph)	0	53	0	0	12	0	0	0	72	0	2	0
Lane Group Flow (vph)	62	339	0	249	252	0	145	1447	128	42	1842	0
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	7%
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases		8		7	4		1	6			2	
Permitted Phases	8			4			6		6	2		
Actuated Green, G (s)	29.0	29.0		42.0	42.0		59.3	59.3	59.3	49.3	49.3	
Effective Green, g (s)	29.0	29.0		42.0	42.0		59.3	59.3	59.3	49.3	49.3	
Actuated g/C Ratio	0.25	0.25		0.37	0.37		0.52	0.52	0.52	0.43	0.43	
Clearance Time (s)	6.6	6.6		3.0	6.6		3.0	6.3	6.3	6.3	6.3	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	269	416		247	634		166	1804	765	72	2146	
v/s Ratio Prot		0.21		c0.09	0.15		c0.05	0.42			0.37	
v/s Ratio Perm	0.06			c0.28			c0.40		0.09	0.25		
v/c Ratio	0.23	0.81		1.01	0.40		0.87	0.80	0.17	0.58	0.86	
Uniform Delay, d1	33.8	40.1		32.4	26.7		24.4	22.6	14.5	24.6	29.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.9	13.0		59.3	0.9		38.6	3.9	0.5	30.2	4.7	
Delay (s)	34.7	53.1		91.8	27.6		62.9	26.5	14.9	54.8	34.0	
Level of Service	C	D		F	C		E	C	B	D	C	
Approach Delay (s)		50.6			58.7			28.1			34.5	
Approach LOS		D			E			C			C	

Intersection Summary			
HCM 2000 Control Delay	36.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	114.2	Sum of lost time (s)	18.9
Intersection Capacity Utilization	103.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	62	146	249	172	145	1447	200	42	1802
Future Volume (vph)	62	146	249	172	145	1447	200	42	1802
Lane Group Flow (vph)	62	392	249	264	145	1447	200	42	1844
Turn Type	Perm	NA	pm+pt	NA	pm+pt	NA	Perm	Perm	NA
Protected Phases		8	7	4	1	6			2
Permitted Phases	8		4		6		6	2	
Detector Phase	8	8	7	4	1	6	6	2	2
Switch Phase									
Minimum Initial (s)	8.0	8.0	5.0	8.0	5.0	8.0	8.0	8.0	8.0
Minimum Split (s)	41.6	41.6	8.0	41.6	8.0	34.3	34.3	34.3	34.3
Total Split (s)	41.6	41.6	13.0	54.6	10.0	65.4	65.4	55.4	55.4
Total Split (%)	34.7%	34.7%	10.8%	45.5%	8.3%	54.5%	54.5%	46.2%	46.2%
Yellow Time (s)	4.0	4.0	3.0	4.0	3.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.6	2.6	0.0	2.6	0.0	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	3.0	6.6	3.0	6.3	6.3	6.3	6.3
Lead/Lag	Lag	Lag	Lead		Lead			Lag	Lag
Lead-Lag Optimize?									
Recall Mode	Min	Min	Min	Min	None	Max	Max	Max	Max
v/c Ratio	0.23	0.84	0.97	0.41	0.85	0.80	0.24	0.58	0.86
Control Delay	35.3	49.0	75.8	26.5	61.7	28.0	5.7	63.5	35.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	12.6	0.0	0.0	0.0
Total Delay	35.3	49.0	75.8	26.5	61.7	40.6	5.7	63.5	35.2
Queue Length 50th (m)	10.1	63.7	35.4	36.8	15.7	129.0	5.2	6.6	126.9
Queue Length 95th (m)	20.8	97.7	#77.7	56.9	#52.2	168.8	17.2	#25.1	155.5
Internal Link Dist (m)		129.5		149.8		57.6			269.7
Turn Bay Length (m)	80.0		90.0		60.0		60.0	180.0	
Base Capacity (vph)	326	553	258	737	170	1803	837	72	2145
Starvation Cap Reductn	0	0	0	0	0	361	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.71	0.97	0.36	0.85	1.00	0.24	0.58	0.86

Intersection Summary

Cycle Length: 120

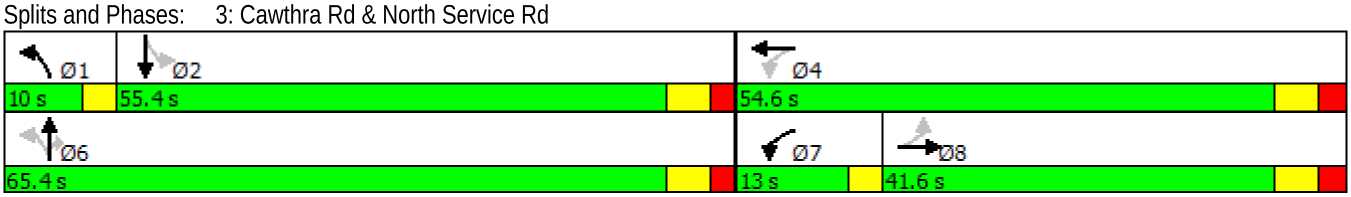
Actuated Cycle Length: 114.2

Natural Cycle: 95

Control Type: Actuated-Uncoordinated

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Cawthra Rd & North Service Rd



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	80	99	72	1653	1836	23
Future Volume (vph)	80	99	72	1653	1836	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.5	3.7	3.7	3.5
Total Lost time (s)	7.1	7.1	6.3	6.3	6.3	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.91	
Frpb, ped/bikes	1.00	0.98	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	1.00	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1700	1494	1698	3476	4983	
Flt Permitted	0.95	1.00	0.10	1.00	1.00	
Satd. Flow (perm)	1700	1494	176	3476	4983	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	80	99	72	1653	1836	23
RTOR Reduction (vph)	0	20	0	0	1	0
Lane Group Flow (vph)	80	79	72	1653	1858	0
Confl. Peds. (#/hr)	5	5	5			5
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	8			6	2	
Permitted Phases		8	6			
Actuated Green, G (s)	13.6	13.6	93.0	93.0	93.0	
Effective Green, g (s)	13.6	13.6	93.0	93.0	93.0	
Actuated g/C Ratio	0.11	0.11	0.78	0.78	0.78	
Clearance Time (s)	7.1	7.1	6.3	6.3	6.3	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	192	169	136	2693	3861	
v/s Ratio Prot	0.05			c0.48	0.37	
v/s Ratio Perm		c0.05	0.41			
v/c Ratio	0.42	0.47	0.53	0.61	0.48	
Uniform Delay, d1	49.5	49.8	5.2	5.8	4.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.0	4.3	14.0	1.1	0.4	
Delay (s)	52.6	54.1	19.1	6.8	5.3	
Level of Service	D	D	B	A	A	
Approach Delay (s)	53.4			7.4	5.3	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.4
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	Ø4
Lane Configurations						
Traffic Volume (vph)	80	99	72	1653	1836	
Future Volume (vph)	80	99	72	1653	1836	
Lane Group Flow (vph)	80	99	72	1653	1859	
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	8			6	2	4
Permitted Phases		8	6			
Detector Phase	8	8	6	6	2	
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	36.1	36.1	25.3	25.3	25.3	36.1
Total Split (s)	36.2	36.2	83.8	83.8	83.8	36.2
Total Split (%)	30.2%	30.2%	69.8%	69.8%	69.8%	30%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.1	3.1	2.3	2.3	2.3	3.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.1	7.1	6.3	6.3	6.3	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	None
v/c Ratio	0.41	0.52	0.53	0.61	0.48	
Control Delay	54.8	47.9	24.4	7.5	5.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	54.8	47.9	24.4	7.5	5.7	
Queue Length 50th (m)	16.4	15.9	5.0	67.5	44.1	
Queue Length 95th (m)	29.3	30.5	#31.2	103.1	64.2	
Internal Link Dist (m)	126.5			269.7	143.6	
Turn Bay Length (m)		20.0	40.0			
Base Capacity (vph)	412	378	135	2692	3861	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.19	0.26	0.53	0.61	0.48	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 96.1 (80%), Referenced to phase 2:SBT and 6:NBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Cawthra Rd & Tedwyn Dr

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	272	971	321	194	512	221	105	1236	526	282	1277	47
Future Volume (vph)	272	971	321	194	512	221	105	1236	526	282	1277	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	5.0	6.9		5.0	6.9		5.0	7.5	7.5	5.0	7.5	
Lane Util. Factor	0.97	0.91		0.97	0.91		0.97	0.95	1.00	0.97	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.95		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3298	4786		3298	4661		3298	3476	1491	3298	4965	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3298	4786		3298	4661		3298	3476	1491	3298	4965	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	272	971	321	194	512	221	105	1236	526	282	1277	47
RTOR Reduction (vph)	0	42	0	0	54	0	0	0	133	0	3	0
Lane Group Flow (vph)	272	1250	0	194	679	0	105	1236	393	282	1321	0
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
Heavy Vehicles (%)	5%	5%	5%	5%	5%	11%	5%	5%	5%	5%	5%	5%
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases									6			
Actuated Green, G (s)	18.6	41.0		10.0	32.4		8.0	51.6	51.6	13.0	56.6	
Effective Green, g (s)	18.6	41.0		10.0	32.4		8.0	51.6	51.6	13.0	56.6	
Actuated g/C Ratio	0.13	0.29		0.07	0.23		0.06	0.37	0.37	0.09	0.40	
Clearance Time (s)	5.0	6.9		5.0	6.9		5.0	7.5	7.5	5.0	7.5	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	438	1401		235	1078		188	1281	549	306	2007	
v/s Ratio Prot	0.08	c0.26		c0.06	0.15		0.03	c0.36		c0.09	c0.27	
v/s Ratio Perm									0.26			
v/c Ratio	0.62	0.89		0.83	0.63		0.56	0.96	0.72	0.92	0.66	
Uniform Delay, d1	57.4	47.4		64.1	48.4		64.3	43.3	37.9	63.0	33.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	0.77	1.12	
Incremental Delay, d2	3.8	8.1		22.6	1.7		6.0	18.0	7.8	25.5	1.2	
Delay (s)	61.2	55.5		86.8	50.1		70.3	61.3	45.7	73.8	39.1	
Level of Service	E	E		F	D		E	E	D	E	D	
Approach Delay (s)		56.5			57.8			57.4			45.2	
Approach LOS		E			E			E			D	

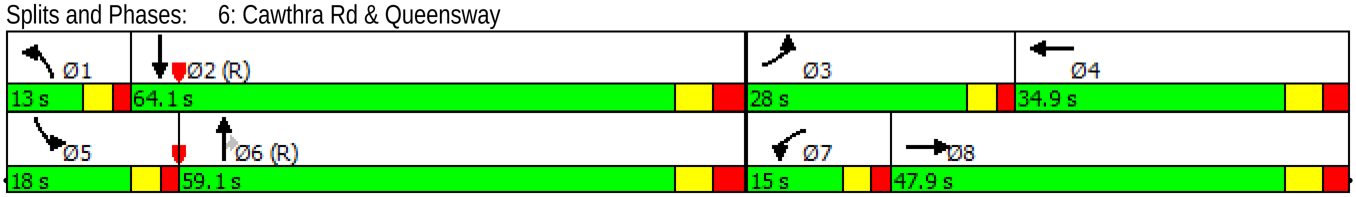
Intersection Summary			
HCM 2000 Control Delay	53.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	24.4
Intersection Capacity Utilization	95.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	272	971	194	512	105	1236	526	282	1277
Future Volume (vph)	272	971	194	512	105	1236	526	282	1277
Lane Group Flow (vph)	272	1292	194	733	105	1236	526	282	1324
Turn Type	Prot	NA	Prot	NA	Prot	NA	Perm	Prot	NA
Protected Phases	3	8	7	4	1	6		5	2
Permitted Phases							6		
Detector Phase	3	8	7	4	1	6	6	5	2
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	13.0	34.9	13.0	34.9	13.0	34.5	34.5	13.0	34.5
Total Split (s)	28.0	47.9	15.0	34.9	13.0	59.1	59.1	18.0	64.1
Total Split (%)	20.0%	34.2%	10.7%	24.9%	9.3%	42.2%	42.2%	12.9%	45.8%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	2.0	2.9	2.0	2.9	2.0	3.5	3.5	2.0	3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.9	5.0	6.9	5.0	7.5	7.5	5.0	7.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Max	C-Max	None	C-Max
v/c Ratio	0.62	0.89	0.83	0.65	0.56	0.96	0.77	0.92	0.66
Control Delay	63.5	54.3	90.9	47.4	76.1	61.3	31.4	76.0	39.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.5	54.3	90.9	47.4	76.1	61.3	31.4	76.0	39.3
Queue Length 50th (m)	34.3	111.3	25.6	56.5	13.7	161.7	74.2	36.8	126.7
Queue Length 95th (m)	46.2	129.5	#43.9	73.1	22.7	#204.7	118.2	m#55.3	139.9
Internal Link Dist (m)		166.8		126.1		142.3			132.1
Turn Bay Length (m)	160.0		100.0		80.0		70.0	80.0	
Base Capacity (vph)	541	1444	235	1132	188	1281	682	306	2010
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.89	0.83	0.65	0.56	0.96	0.77	0.92	0.66

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Cawthra Rd & Queensway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	358	1	134	0	1	0	50	1216	0	0	1598	669
Future Volume (vph)	358	1	134	0	1	0	50	1216	0	0	1598	669
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.7	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.5
Total Lost time (s)	6.4	6.4	6.4		6.4		4.0	6.4			6.4	6.4
Lane Util. Factor	0.95	0.95	1.00		1.00		1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.93		1.00		1.00	1.00			1.00	0.95
Flpb, ped/bikes	1.00	1.00	1.00		1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85		1.00		1.00	1.00			1.00	0.85
Flt Protected	0.95	0.95	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1615	1656	1407		1830		1638	3476			3476	1446
Flt Permitted	0.95	0.95	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (perm)	1615	1656	1407		1830		1638	3476			3476	1446
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	358	1	134	0	1	0	50	1216	0	0	1598	669
RTOR Reduction (vph)	0	0	111	0	0	0	0	0	0	0	0	162
Lane Group Flow (vph)	179	180	23	0	1	0	50	1216	0	0	1598	507
Confl. Peds. (#/hr)			35	16					7			19
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	9%	5%	5%	5%	5%	5%
Turn Type	Split	NA	Perm		NA		Prot	NA		Perm	NA	Perm
Protected Phases	4	4			3		1	6			2	
Permitted Phases			4	3						2		2
Actuated Green, G (s)	23.9	23.9	23.9		8.0		6.8	88.9			78.1	78.1
Effective Green, g (s)	23.9	23.9	23.9		8.0		6.8	88.9			78.1	78.1
Actuated g/C Ratio	0.17	0.17	0.17		0.06		0.05	0.64			0.56	0.56
Clearance Time (s)	6.4	6.4	6.4		6.4		4.0	6.4			6.4	6.4
Vehicle Extension (s)	5.0	5.0	5.0		5.0		5.0	5.0			5.0	5.0
Lane Grp Cap (vph)	275	282	240		104		79	2207			1939	806
v/s Ratio Prot	c0.11	0.11			c0.00		0.03	c0.35			c0.46	
v/s Ratio Perm			0.02									0.35
v/c Ratio	0.65	0.64	0.10		0.01		0.63	0.55			0.82	0.63
Uniform Delay, d1	54.2	54.0	48.9		62.3		65.4	14.3			25.3	21.1
Progression Factor	0.89	0.89	0.55		1.00		0.78	2.25			1.50	2.26
Incremental Delay, d2	6.7	6.0	0.3		0.1		11.4	0.5			2.4	2.2
Delay (s)	54.7	53.9	27.2		62.3		62.1	32.7			40.4	49.9
Level of Service	D	D	C		E		E	C			D	D
Approach Delay (s)		46.9			62.3			33.9			43.2	
Approach LOS		D			E			C			D	

Intersection Summary			
HCM 2000 Control Delay	40.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	23.2
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	SBT	SBR
Lane Configurations								
Traffic Volume (vph)	358	1	134	1	50	1216	1598	669
Future Volume (vph)	358	1	134	1	50	1216	1598	669
Lane Group Flow (vph)	179	180	134	1	50	1216	1598	669
Turn Type	Split	NA	Perm	NA	Prot	NA	NA	Perm
Protected Phases	4	4		3	1	6	2	
Permitted Phases			4					2
Detector Phase	4	4	4	3	1	6	2	2
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	5.0	8.0	8.0	8.0
Minimum Split (s)	29.4	29.4	29.4	14.4	9.0	29.4	29.4	29.4
Total Split (s)	31.0	31.0	31.0	14.4	12.0	94.6	82.6	82.6
Total Split (%)	22.1%	22.1%	22.1%	10.3%	8.6%	67.6%	59.0%	59.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.4	2.4	2.4	2.4	1.0	2.4	2.4	2.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	4.0	6.4	6.4	6.4
Lead/Lag	Lag	Lag	Lag	Lead	Lead		Lag	Lag
Lead-Lag Optimize?								
Recall Mode	Ped	Ped	Ped	Min	None	C-Max	C-Max	C-Max
v/c Ratio	0.65	0.64	0.38	0.01	0.52	0.55	0.82	0.69
Control Delay	59.1	58.2	7.3	63.0	60.0	33.3	41.2	24.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	1.9	47.7	1.3
Total Delay	59.1	58.2	7.3	63.0	60.0	35.2	88.8	25.4
Queue Length 50th (m)	45.4	45.6	2.3	0.3	12.9	154.9	191.0	96.1
Queue Length 95th (m)	69.4	69.2	5.3	2.0	m16.1	m161.6	213.2	m135.9
Internal Link Dist (m)		235.5		55.0		503.1	151.6	
Turn Bay Length (m)			45.0		100.0			50.0
Base Capacity (vph)	283	290	357	104	98	2207	1959	974
Starvation Cap Reductn	0	0	0	0	0	0	539	135
Spillback Cap Reductn	0	0	0	0	0	789	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.62	0.38	0.01	0.51	0.86	1.13	0.80

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBT, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Cawthra Rd & Dundas St Ramp

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	107	0	381	0	0	0	133	1477	0	0	1753	37
Future Volume (vph)	107	0	381	0	0	0	133	1477	0	0	1753	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.7	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.5
Total Lost time (s)		6.0	6.0				3.0	6.0			6.0	
Lane Util. Factor		1.00	1.00				1.00	0.95			0.95	
Frpb, ped/bikes		1.00	0.98				1.00	1.00			1.00	
Flpb, ped/bikes		0.99	1.00				1.00	1.00			1.00	
Frt		1.00	0.85				1.00	1.00			1.00	
Flt Protected		0.95	1.00				0.95	1.00			1.00	
Satd. Flow (prot)		1728	1486				1700	3476			3459	
Flt Permitted		0.76	1.00				0.05	1.00			1.00	
Satd. Flow (perm)		1377	1486				81	3476			3459	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	107	0	381	0	0	0	133	1477	0	0	1753	37
RTOR Reduction (vph)	0	0	115	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	107	266	0	0	0	133	1477	0	0	1789	0
Confl. Peds. (#/hr)	3		6	6		3	7					7
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	10%
Turn Type	Perm	NA	Perm				pm+pt	NA		Perm	NA	
Protected Phases		4			4		1	6			2	
Permitted Phases	4		4	4			6			2		
Actuated Green, G (s)		29.4	29.4				98.6	98.6			85.0	
Effective Green, g (s)		29.4	29.4				98.6	98.6			85.0	
Actuated g/C Ratio		0.21	0.21				0.70	0.70			0.61	
Clearance Time (s)		6.0	6.0				3.0	6.0			6.0	
Vehicle Extension (s)		5.0	5.0				5.0	5.0			5.0	
Lane Grp Cap (vph)		289	312				179	2448			2100	
v/s Ratio Prot							c0.06	0.42			c0.52	
v/s Ratio Perm		0.08	c0.18				0.46					
v/c Ratio		0.37	0.85				0.74	0.60			0.85	
Uniform Delay, d1		47.4	53.2				39.7	10.6			22.4	
Progression Factor		1.00	1.00				0.65	2.01			0.57	
Incremental Delay, d2		1.7	21.4				15.6	0.9			2.3	
Delay (s)		49.0	74.6				41.5	22.3			15.1	
Level of Service		D	E				D	C			B	
Approach Delay (s)		69.0			0.0			23.9			15.1	
Approach LOS		E			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	25.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	83.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	NBL	NBT	SBT
Lane Configurations						
Traffic Volume (vph)	107	0	381	133	1477	1753
Future Volume (vph)	107	0	381	133	1477	1753
Lane Group Flow (vph)	0	107	381	133	1477	1790
Turn Type	Perm	NA	Perm	pm+pt	NA	NA
Protected Phases		4		1	6	2
Permitted Phases	4		4	6		
Detector Phase	4	4	4	1	6	2
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	5.0	15.0	15.0
Minimum Split (s)	28.0	28.0	28.0	8.0	29.0	29.0
Total Split (s)	39.0	39.0	39.0	14.0	101.0	87.0
Total Split (%)	27.9%	27.9%	27.9%	10.0%	72.1%	62.1%
Yellow Time (s)	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0	6.0	3.0	6.0	6.0
Lead/Lag				Lead		Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	C-Max	C-Max
v/c Ratio		0.37	0.89	0.73	0.60	0.85
Control Delay		50.1	56.3	40.7	23.9	16.2
Queue Delay		0.0	69.4	0.0	0.9	0.5
Total Delay		50.1	125.7	40.7	24.8	16.6
Queue Length 50th (m)		22.8	60.1	24.4	163.8	232.1
Queue Length 95th (m)		39.1	#107.3	#46.3	186.7	m253.9
Internal Link Dist (m)		145.4			151.6	343.9
Turn Bay Length (m)				70.0		
Base Capacity (vph)		324	461	186	2447	2100
Starvation Cap Reductn		0	0	0	623	0
Spillback Cap Reductn		0	340	0	0	72
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.33	3.15	0.72	0.81	0.88

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 50.4 (36%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: Cawthra Rd & Silver Creek Blvd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	146	592	306	259	327	67	139	1391	212	103	1392	52
Future Volume (vph)	146	592	306	259	327	67	139	1391	212	103	1392	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.9	6.9	3.0	6.9	6.9	4.0	7.0	7.0	4.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1682	3476	1488	1700	3476	1455	1700	3476	1521	1700	3476	1489
Flt Permitted	0.55	1.00	1.00	0.14	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	981	3476	1488	246	3476	1455	1700	3476	1521	1700	3476	1489
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	146	592	306	259	327	67	139	1391	212	103	1392	52
RTOR Reduction (vph)	0	0	136	0	0	51	0	0	63	0	0	29
Lane Group Flow (vph)	146	592	170	259	327	16	139	1391	149	103	1392	23
Confl. Peds. (#/hr)	16		5			16	5					5
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4			6			2
Actuated Green, G (s)	36.1	26.1	26.1	47.1	33.1	33.1	13.0	64.0	64.0	11.0	62.0	62.0
Effective Green, g (s)	36.1	26.1	26.1	47.1	33.1	33.1	13.0	64.0	64.0	11.0	62.0	62.0
Actuated g/C Ratio	0.26	0.19	0.19	0.34	0.24	0.24	0.09	0.46	0.46	0.08	0.44	0.44
Clearance Time (s)	4.0	6.9	6.9	3.0	6.9	6.9	4.0	7.0	7.0	4.0	7.0	7.0
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	303	648	277	269	821	344	157	1589	695	133	1539	659
v/s Ratio Prot	0.03	0.17		c0.12	0.09		c0.08	0.40		0.06	c0.40	
v/s Ratio Perm	0.09		0.11	c0.20		0.01			0.10			0.02
v/c Ratio	0.48	0.91	0.61	0.96	0.40	0.05	0.89	0.88	0.21	0.77	0.90	0.03
Uniform Delay, d1	42.2	55.8	52.3	39.6	45.1	41.3	62.8	34.4	22.9	63.3	36.2	22.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.72	1.18	1.67	0.69	1.53	1.00
Incremental Delay, d2	2.5	18.2	5.7	45.1	0.7	0.1	38.4	6.2	0.6	17.5	5.8	0.1
Delay (s)	44.7	74.0	58.1	84.7	45.7	41.4	83.3	46.9	38.7	61.4	61.1	22.1
Level of Service	D	E	E	F	D	D	F	D	D	E	E	C
Approach Delay (s)		65.3			60.7			48.8			59.8	
Approach LOS		E			E			D			E	

Intersection Summary			
HCM 2000 Control Delay	57.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	21.9
Intersection Capacity Utilization	95.3%	ICU Level of Service	F
Analysis Period (min)	15		

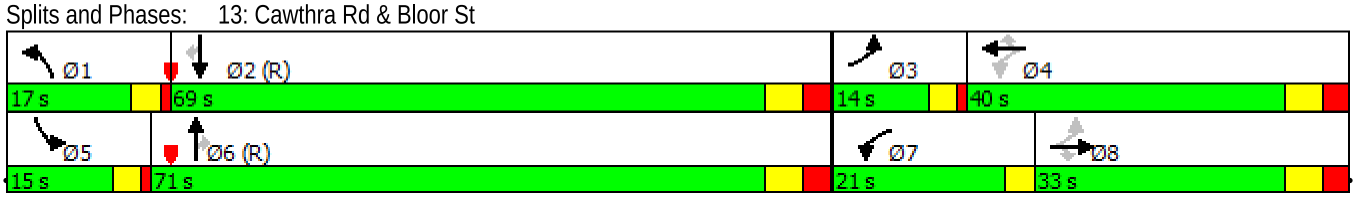
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	146	592	306	259	327	67	139	1391	212	103	1392	52
Future Volume (vph)	146	592	306	259	327	67	139	1391	212	103	1392	52
Lane Group Flow (vph)	146	592	306	259	327	67	139	1391	212	103	1392	52
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4			6			2
Detector Phase	3	8	8	7	4	4	1	6	6	5	2	2
Switch Phase												
Minimum Initial (s)	5.0	8.0	8.0	5.0	8.0	8.0	2.0	8.0	8.0	5.0	8.0	8.0
Minimum Split (s)	9.0	27.9	27.9	8.0	27.9	27.9	8.0	29.0	29.0	9.0	29.0	29.0
Total Split (s)	14.0	33.0	33.0	21.0	40.0	40.0	17.0	71.0	71.0	15.0	69.0	69.0
Total Split (%)	10.0%	23.6%	23.6%	15.0%	28.6%	28.6%	12.1%	50.7%	50.7%	10.7%	49.3%	49.3%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	1.0	2.9	2.9	0.0	2.9	2.9	1.0	3.0	3.0	1.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.9	6.9	3.0	6.9	6.9	4.0	7.0	7.0	4.0	7.0	7.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
v/c Ratio	0.45	0.91	0.74	0.94	0.40	0.16	0.89	0.88	0.28	0.77	0.90	0.07
Control Delay	38.1	75.4	35.8	77.6	46.8	4.1	88.4	47.4	18.1	67.6	61.2	6.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.1	75.4	35.8	77.6	46.8	4.1	88.4	47.4	18.1	67.6	61.2	6.4
Queue Length 50th (m)	26.1	78.7	34.3	50.4	37.3	0.0	34.9	186.3	29.3	26.3	193.8	0.0
Queue Length 95th (m)	41.7	#109.1	66.7	#99.1	50.6	5.6	#70.2	209.6	47.3	m30.4	m192.8	m1.6
Internal Link Dist (m)		336.4			825.0			303.1			227.0	
Turn Bay Length (m)	120.0		70.0	50.0		70.0	50.0		20.0	90.0		110.0
Base Capacity (vph)	322	648	413	276	821	415	157	1589	758	133	1539	724
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.45	0.91	0.74	0.94	0.40	0.16	0.89	0.88	0.28	0.77	0.90	0.07

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 13: Cawthra Rd & Bloor St



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	148	1304	229	185	652	61	209	1312	226	115	1157	63
Future Volume (vph)	148	1304	229	185	652	61	209	1312	226	115	1157	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	3.0	7.5	7.5	3.0	7.5	7.5	4.0	8.0	8.0	4.0	8.0	8.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1698	3476	1501	1700	3476	1483	1700	3476	1501	1700	3476	1495
Flt Permitted	0.29	1.00	1.00	0.08	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	513	3476	1501	148	3476	1483	1700	3476	1501	1700	3476	1495
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	148	1304	229	185	652	61	209	1312	226	115	1157	63
RTOR Reduction (vph)	0	0	131	0	0	40	0	0	92	0	0	43
Lane Group Flow (vph)	148	1304	98	185	652	21	209	1312	134	115	1157	20
Confl. Peds. (#/hr)	14		1	1		14	11		1	1		5
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4			6			2
Actuated Green, G (s)	56.5	48.5	48.5	56.5	48.5	48.5	16.0	52.0	52.0	9.0	45.0	45.0
Effective Green, g (s)	56.5	48.5	48.5	56.5	48.5	48.5	16.0	52.0	52.0	9.0	45.0	45.0
Actuated g/C Ratio	0.40	0.35	0.35	0.40	0.35	0.35	0.11	0.37	0.37	0.06	0.32	0.32
Clearance Time (s)	3.0	7.5	7.5	3.0	7.5	7.5	4.0	8.0	8.0	4.0	8.0	8.0
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	274	1204	519	148	1204	513	194	1291	557	109	1117	480
v/s Ratio Prot	0.03	0.38		c0.07	0.19		c0.12	c0.38		0.07	0.33	
v/s Ratio Perm	0.19		0.07	c0.43		0.01			0.09			0.01
v/c Ratio	0.54	1.08	0.19	1.25	0.54	0.04	1.08	1.02	0.24	1.06	1.04	0.04
Uniform Delay, d1	28.2	45.8	32.0	35.1	36.8	30.3	62.0	44.0	30.4	65.5	47.5	32.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.67	1.16	1.76	1.04	1.08	1.00
Incremental Delay, d2	3.8	51.5	0.4	156.3	0.9	0.1	78.3	25.9	0.8	86.4	32.0	0.1
Delay (s)	32.0	97.3	32.4	191.4	37.7	30.4	119.6	77.0	54.2	154.9	83.4	32.8
Level of Service	C	F	C	F	D	C	F	E	D	F	F	C
Approach Delay (s)		82.7			68.8			79.2			87.2	
Approach LOS		F			E			E			F	

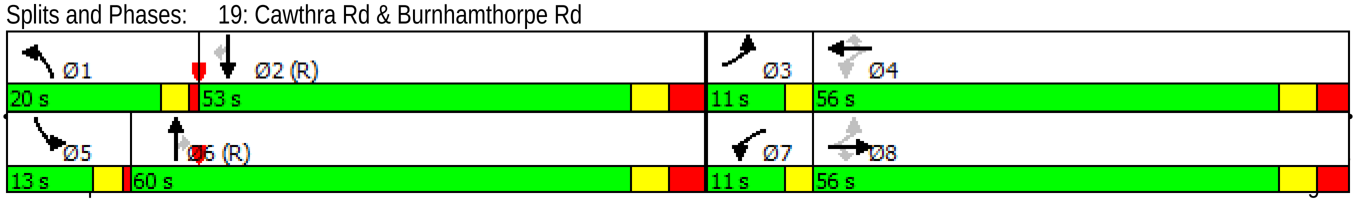
Intersection Summary			
HCM 2000 Control Delay	80.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	22.5
Intersection Capacity Utilization	110.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	148	1304	229	185	652	61	209	1312	226	115	1157	63
Future Volume (vph)	148	1304	229	185	652	61	209	1312	226	115	1157	63
Lane Group Flow (vph)	148	1304	229	185	652	61	209	1312	226	115	1157	63
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4			6			2
Detector Phase	3	8	8	7	4	4	1	6	6	5	2	2
Switch Phase												
Minimum Initial (s)	5.0	8.0	8.0	5.0	8.0	8.0	5.0	8.0	8.0	5.0	8.0	8.0
Minimum Split (s)	8.0	51.5	51.5	9.0	51.5	51.5	10.0	47.0	47.0	10.0	47.0	47.0
Total Split (s)	11.0	56.0	56.0	11.0	56.0	56.0	20.0	60.0	60.0	13.0	53.0	53.0
Total Split (%)	7.9%	40.0%	40.0%	7.9%	40.0%	40.0%	14.3%	42.9%	42.9%	9.3%	37.9%	37.9%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	0.0	3.5	3.5	0.0	3.5	3.5	1.0	4.0	4.0	1.0	4.0	4.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.5	7.5	3.0	7.5	7.5	4.0	8.0	8.0	4.0	8.0	8.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
v/c Ratio	0.51	1.08	0.35	1.22	0.54	0.10	1.08	1.02	0.35	1.06	1.04	0.11
Control Delay	30.0	94.6	7.8	171.2	38.9	0.3	119.2	75.7	20.8	149.3	81.5	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.0	94.6	7.8	171.2	38.9	0.3	119.2	75.7	20.8	149.3	81.5	5.9
Queue Length 50th (m)	22.1	~195.4	4.8	~42.6	70.2	0.0	~60.1	~189.4	32.7	~32.3	~117.5	1.3
Queue Length 95th (m)	35.1	#234.7	22.2	#87.1	87.8	0.0	m#83.8	#229.5	m43.6	m#56.8	#200.5	m3.5
Internal Link Dist (m)		927.6			832.4			76.3			156.2	
Turn Bay Length (m)	70.0		100.0	80.0		60.0	100.3			130.0		160.0
Base Capacity (vph)	290	1204	651	152	1204	595	194	1291	649	109	1117	562
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.51	1.08	0.35	1.22	0.54	0.10	1.08	1.02	0.35	1.06	1.04	0.11

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 19: Cawthra Rd & Burnhamthorpe Rd



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	700	148	89	473	127	134	1187	197	103	1107	27
Future Volume (vph)	71	700	148	89	473	127	134	1187	197	103	1107	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	3.0	6.4		3.0	6.4		3.0	6.5		3.0	6.5	6.5
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.97		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1695	3371		1700	3332		1700	3393		1700	3476	1387
Flt Permitted	0.29	1.00		0.11	1.00		0.13	1.00		0.06	1.00	1.00
Satd. Flow (perm)	518	3371		188	3332		233	3393		115	3476	1387
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	71	700	148	89	473	127	134	1187	197	103	1107	27
RTOR Reduction (vph)	0	13	0	0	17	0	0	9	0	0	0	15
Lane Group Flow (vph)	71	835	0	89	583	0	134	1375	0	103	1107	12
Confl. Peds. (#/hr)	36		12	12		36	12		6	6		12
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	12%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8			4			6			2		2
Actuated Green, G (s)	45.4	39.8		49.2	41.7		74.3	62.9		73.3	62.4	62.4
Effective Green, g (s)	45.4	39.8		49.2	41.7		74.3	62.9		73.3	62.4	62.4
Actuated g/C Ratio	0.32	0.28		0.35	0.30		0.53	0.45		0.52	0.45	0.45
Clearance Time (s)	3.0	6.4		3.0	6.4		3.0	6.5		3.0	6.5	6.5
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Lane Grp Cap (vph)	215	958		147	992		243	1524		183	1549	618
v/s Ratio Prot	0.01	c0.25		c0.03	0.18		c0.04	c0.41		0.04	0.32	
v/s Ratio Perm	0.09			0.18			0.25			0.25		0.01
v/c Ratio	0.33	0.87		0.61	0.59		0.55	0.90		0.56	0.71	0.02
Uniform Delay, d1	34.0	47.7		34.5	41.8		21.6	35.7		26.7	31.6	21.7
Progression Factor	1.00	1.00		1.00	1.00		2.14	0.41		1.70	1.70	1.00
Incremental Delay, d2	1.9	9.5		10.0	1.4		2.0	4.0		6.0	2.7	0.1
Delay (s)	35.9	57.1		44.5	43.2		48.4	18.5		51.2	56.4	21.7
Level of Service	D	E		D	D		D	B		D	E	C
Approach Delay (s)		55.5			43.4			21.1			55.2	
Approach LOS		E			D			C			E	

Intersection Summary			
HCM 2000 Control Delay	41.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	91.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	71	700	89	473	134	1187	103	1107	27
Future Volume (vph)	71	700	89	473	134	1187	103	1107	27
Lane Group Flow (vph)	71	848	89	600	134	1384	103	1107	27
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	Perm
Protected Phases	3	8	7	4	1	6	5	2	
Permitted Phases	8		4		6		2		2
Detector Phase	3	8	7	4	1	6	5	2	2
Switch Phase									
Minimum Initial (s)	5.0	8.0	5.0	8.0	5.0	8.0	5.0	8.0	8.0
Minimum Split (s)	8.0	43.4	8.0	43.4	8.0	40.5	8.0	40.5	40.5
Total Split (s)	10.0	46.0	10.0	46.0	15.0	69.0	15.0	69.0	69.0
Total Split (%)	7.1%	32.9%	7.1%	32.9%	10.7%	49.3%	10.7%	49.3%	49.3%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0	4.0
All-Red Time (s)	0.0	2.4	0.0	2.4	0.0	2.5	0.0	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.4	3.0	6.4	3.0	6.5	3.0	6.5	6.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	Min	None	C-Min	C-Min
v/c Ratio	0.29	0.89	0.60	0.60	0.54	0.89	0.55	0.71	0.04
Control Delay	31.6	59.4	46.8	43.7	33.3	18.8	47.1	56.2	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.6	59.4	46.8	43.7	33.3	18.8	47.1	56.2	6.9
Queue Length 50th (m)	11.7	107.0	14.8	67.6	13.6	47.3	20.2	135.6	0.2
Queue Length 95th (m)	21.6	#137.1	#26.6	86.2	m17.4	m56.1	35.6	159.3	m4.4
Internal Link Dist (m)		745.4		810.9		174.4		393.3	
Turn Bay Length (m)	40.0		60.0		80.0		40.0		30.0
Base Capacity (vph)	244	966	148	1008	257	1550	200	1565	664
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.88	0.60	0.60	0.52	0.89	0.52	0.71	0.04

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:SBTL, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 20: Cawthra Rd & Rathburn Rd

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	123	25	3	1317	1159	0
Future Volume (vph)	123	25	3	1317	1159	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.5	3.7	3.7	3.5
Total Lost time (s)	6.2	6.2	3.0	6.0	6.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	1.00	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1700	1521	1700	3476	3476	
Flt Permitted	0.95	1.00	0.21	1.00	1.00	
Satd. Flow (perm)	1700	1521	380	3476	3476	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	123	25	3	1317	1159	0
RTOR Reduction (vph)	0	14	0	0	0	0
Lane Group Flow (vph)	123	11	3	1317	1159	0
Confl. Peds. (#/hr)			2			2
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6			
Actuated Green, G (s)	17.3	17.3	110.5	110.5	106.0	
Effective Green, g (s)	17.3	17.3	110.5	110.5	106.0	
Actuated g/C Ratio	0.12	0.12	0.79	0.79	0.76	
Clearance Time (s)	6.2	6.2	3.0	6.0	6.0	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	210	187	314	2743	2631	
v/s Ratio Prot	c0.07		0.00	c0.38	0.33	
v/s Ratio Perm		0.01	0.01			
v/c Ratio	0.59	0.06	0.01	0.48	0.44	
Uniform Delay, d1	58.0	54.2	3.9	5.0	6.2	
Progression Factor	1.00	1.00	0.62	0.66	0.47	
Incremental Delay, d2	6.3	0.3	0.0	0.1	0.4	
Delay (s)	64.3	54.4	2.4	3.5	3.3	
Level of Service	E	D	A	A	A	
Approach Delay (s)	62.6			3.4	3.3	
Approach LOS	E			A	A	

Intersection Summary			
HCM 2000 Control Delay	6.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	53.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	123	25	3	1317	1159
Future Volume (vph)	123	25	3	1317	1159
Lane Group Flow (vph)	123	25	3	1317	1159
Turn Type	Prot	Perm	pm+pt	NA	NA
Protected Phases	4		1	6	2
Permitted Phases		4	6		
Detector Phase	4	4	1	6	2
Switch Phase					
Minimum Initial (s)	5.0	5.0	5.0	8.0	8.0
Minimum Split (s)	28.2	28.2	8.0	27.0	23.0
Total Split (s)	38.0	38.0	9.0	102.0	93.0
Total Split (%)	27.1%	27.1%	6.4%	72.9%	66.4%
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.2	2.2	0.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	3.0	6.0	6.0
Lead/Lag			Lead		Lag
Lead-Lag Optimize?					
Recall Mode	None	None	None	None	C-Max
v/c Ratio	0.59	0.12	0.01	0.48	0.43
Control Delay	68.6	29.4	2.0	3.9	3.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	68.6	29.4	2.0	3.9	3.3
Queue Length 50th (m)	30.1	2.1	0.1	29.5	11.6
Queue Length 95th (m)	47.2	9.8	m0.1	35.3	34.4
Internal Link Dist (m)	191.7			393.3	365.1
Turn Bay Length (m)		10.0	30.0		
Base Capacity (vph)	386	357	378	2743	2690
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.32	0.07	0.01	0.48	0.43

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:SBT, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 21: Cawthra Rd & Meadows Blvd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	427	1652	386	63	591	272	224	1151	139	209	746	145
Future Volume (vph)	427	1652	386	63	591	272	224	1151	139	209	746	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	3.0	7.9	7.9	4.0	7.9	7.9	4.0	8.4	8.4	4.0	8.4	8.4
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	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	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1700	3476	1521	1580	3476	1521	1700	3476	1521	1700	3476	1268
Flt Permitted	0.24	1.00	1.00	0.11	1.00	1.00	0.95	1.00	1.00	0.11	1.00	1.00
Satd. Flow (perm)	431	3476	1521	187	3476	1521	1700	3476	1521	206	3476	1268
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	427	1652	386	63	591	272	224	1151	139	209	746	145
RTOR Reduction (vph)	0	0	168	0	0	131	0	0	85	0	0	109
Lane Group Flow (vph)	427	1652	218	63	591	142	224	1151	54	209	746	36
Confl. Peds. (#/hr)												
Heavy Vehicles (%)	5%	5%	5%	13%	5%	5%	5%	5%	5%	5%	5%	26%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4			6	2		2
Actuated Green, G (s)	67.9	60.7	60.7	38.8	35.6	35.6	17.0	43.8	43.8	42.8	34.8	34.8
Effective Green, g (s)	67.9	60.7	60.7	38.8	35.6	35.6	17.0	43.8	43.8	42.8	34.8	34.8
Actuated g/C Ratio	0.49	0.43	0.43	0.28	0.25	0.25	0.12	0.31	0.31	0.31	0.25	0.25
Clearance Time (s)	3.0	7.9	7.9	4.0	7.9	7.9	4.0	8.4	8.4	4.0	8.4	8.4
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	474	1507	659	83	883	386	206	1087	475	148	864	315
v/s Ratio Prot	c0.19	c0.48		0.02	0.17		c0.13	0.33		c0.08	0.21	
v/s Ratio Perm	0.25		0.14	0.19		0.09			0.04	c0.35		0.03
v/c Ratio	0.90	1.10	0.33	0.76	0.67	0.37	1.09	1.06	0.11	1.41	0.86	0.11
Uniform Delay, d1	27.1	39.6	26.2	47.5	46.9	42.9	61.5	48.1	34.3	43.8	50.3	40.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.86	1.05	2.11	1.00	1.00	1.00
Incremental Delay, d2	21.1	54.2	0.6	37.1	2.6	1.2	85.1	43.2	0.4	220.5	11.1	0.7
Delay (s)	48.2	93.8	26.8	84.6	49.5	44.2	137.8	93.5	72.7	264.4	61.5	41.4
Level of Service	D	F	C	F	D	D	F	F	E	F	E	D
Approach Delay (s)		75.4			50.3			98.2			97.4	
Approach LOS		E			D			F			F	

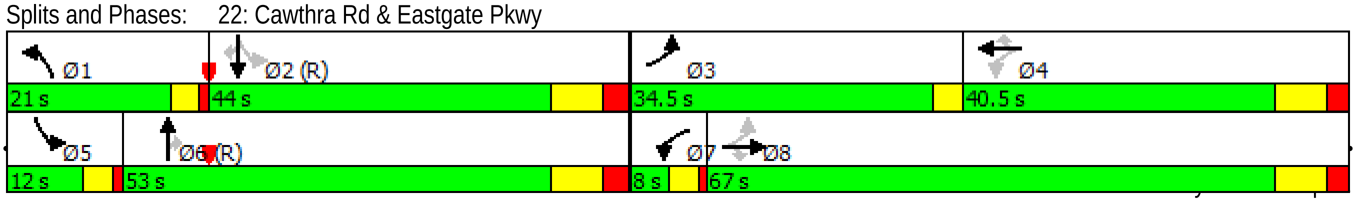
Intersection Summary			
HCM 2000 Control Delay	81.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	24.3
Intersection Capacity Utilization	112.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	427	1652	386	63	591	272	224	1151	139	209	746	145
Future Volume (vph)	427	1652	386	63	591	272	224	1151	139	209	746	145
Lane Group Flow (vph)	427	1652	386	63	591	272	224	1151	139	209	746	145
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4			6	2		2
Detector Phase	3	8	8	7	4	4	1	6	6	5	2	2
Switch Phase												
Minimum Initial (s)	12.0	5.0	5.0	4.0	12.0	12.0	5.0	12.0	12.0	5.0	12.0	12.0
Minimum Split (s)	19.9	38.9	38.9	8.0	38.9	38.9	9.0	39.4	39.4	9.0	39.4	39.4
Total Split (s)	34.5	67.0	67.0	8.0	40.5	40.5	21.0	53.0	53.0	12.0	44.0	44.0
Total Split (%)	24.6%	47.9%	47.9%	5.7%	28.9%	28.9%	15.0%	37.9%	37.9%	8.6%	31.4%	31.4%
Yellow Time (s)	3.0	5.5	5.5	3.0	5.5	5.5	3.0	5.5	5.5	3.0	5.5	5.5
All-Red Time (s)	0.0	2.4	2.4	1.0	2.4	2.4	1.0	2.9	2.9	1.0	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.9	7.9	4.0	7.9	7.9	4.0	8.4	8.4	4.0	8.4	8.4
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
v/c Ratio	0.88	1.10	0.47	0.66	0.68	0.53	1.09	1.04	0.24	1.34	0.84	0.33
Control Delay	44.7	92.0	8.7	56.5	52.9	20.8	134.3	84.8	16.8	216.9	59.6	7.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.7	92.0	8.7	56.5	52.9	20.8	134.3	84.8	16.8	216.9	59.6	7.1
Queue Length 50th (m)	68.8	~255.7	13.9	8.1	73.9	20.8	~65.6	~170.4	11.7	~53.7	95.6	0.0
Queue Length 95th (m)	#117.3	#294.6	37.9	#21.3	93.4	47.8	#112.5	#210.5	26.8	#100.9	118.1	13.3
Internal Link Dist (m)		447.2			798.3			365.1			157.1	
Turn Bay Length (m)	170.0		300.0	100.0		100.0	120.0		120.0	130.0		80.0
Base Capacity (vph)	507	1507	827	96	865	510	206	1107	569	156	883	438
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.84	1.10	0.47	0.66	0.68	0.53	1.09	1.04	0.24	1.34	0.84	0.33

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 22: Cawthra Rd & Eastgate Pkwy



2031 PM PEAK HOUR

APPENDIX D3 - Future (2031 PM Peak) Mitigated Condition – Recommended Improvements

Cawthra Rd Intersection	Intersection			Critical Movements				
	LOS	Delay (s)	V/C	Mvmt	LOS	Delay (s)	V/C Ratio	95th Queue
Eastgate Pkwy	E	82.6	1.17	NBL	F	241	1.29	#99
				EBL	F	250	1.32	#64
				WBT	F	119	1.13	#221
				SBT	F	96	1.10	#281
Meadows Blvd	A	9.6	0.71	--	--	--	--	--
Rathburn Rd	E	58.6	1.11	NBL	F	177	1.14	m#107
				SBT	E	64	1.00	#249
				WBT	F	87	1.04	#200
Burnhamthorpe Rd	F	122.8	1.29	NBL	F	341	1.64	m#137
				WBL	F	113	1.06	#86
				WBT	F	149	1.21	#280
				SBT	F	167	1.24	#239
Bloor St	E	63.4	1.09	NBL	F	118	1.04	#94
				WBL	F	93	1.04	#149
				WBT	E	64	0.95	#175
				NBT	E	59	0.98	#243
				SBT	E	58	0.91	m157
Silver Creek Blvd	C	28.3	0.85	--	--	--	--	--
Ramp to Dundas	C	32.9	0.79	--	--	--	--	--
Queensway	F	89	1.09	NBL	F	216	1.27	#70
				SBL	F	116	1.04	m#52
				WBT	F	98	1.10	#237
				NBT	E	75	1.01	#205
				SBT	F	104	1.05	#198
Tedwyn Dr	A	9.4	0.65	--	--	--	--	--
North Service Rd	F	133.3	1.44	NBL	F	200	1.27	#70
				SBL	F	160	1.02	#39
				WBL	F	253	1.46	#255
				WBT	E	74	1.04	#260
				NBT	D	41	0.91	#182
				SBT	F	188	1.33	#283
South Service Road	D	38.7	1.04	SBL	F	98	1.02	#95
				EBL	F	123	1.00	#61

reflects queue length after two cycles

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	142	58	50	127	323	51	1246	44	266	1783	383
Future Volume (vph)	121	142	58	50	127	323	51	1246	44	266	1783	383
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	7.3	7.3		7.3	7.3		6.7	6.7		3.0	6.7	6.7
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.96		1.00	0.89		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1700	1750		1700	1633		1700	3459		1700	3476	1521
Flt Permitted	0.22	1.00		0.58	1.00		0.08	1.00		0.07	1.00	1.00
Satd. Flow (perm)	398	1750		1038	1633		140	3459		132	3476	1521
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	121	142	58	50	127	323	51	1246	44	266	1783	383
RTOR Reduction (vph)	0	10	0	0	77	0	0	2	0	0	0	63
Lane Group Flow (vph)	121	190	0	50	373	0	51	1288	0	266	1783	320
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	Perm
Protected Phases		8			4			6		5	2	
Permitted Phases	8			4			6			2		2
Actuated Green, G (s)	36.1	36.1		36.1	36.1		51.3	51.3		68.3	68.3	68.3
Effective Green, g (s)	36.1	36.1		36.1	36.1		51.3	51.3		68.3	68.3	68.3
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.43	0.43		0.58	0.58	0.58
Clearance Time (s)	7.3	7.3		7.3	7.3		6.7	6.7		3.0	6.7	6.7
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Lane Grp Cap (vph)	121	533		316	497		60	1498		261	2005	877
v/s Ratio Prot		0.11			0.23			0.37		c0.12	0.51	
v/s Ratio Perm	c0.30			0.05			0.37			c0.47		0.21
v/c Ratio	1.00	0.36		0.16	0.75		0.85	0.86		1.02	0.89	0.36
Uniform Delay, d1	41.2	32.1		30.1	37.1		30.1	30.3		37.0	21.8	13.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	81.8	0.9		0.5	7.4		78.6	6.7		60.7	6.4	1.2
Delay (s)	123.0	32.9		30.5	44.5		108.7	37.0		97.7	28.2	14.6
Level of Service	F	C		C	D		F	D		F	C	B
Approach Delay (s)		66.9			43.1			39.7			33.6	
Approach LOS		E			D			D			C	

Intersection Summary			
HCM 2000 Control Delay	38.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	118.4	Sum of lost time (s)	17.0
Intersection Capacity Utilization	118.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	121	142	50	127	51	1246	266	1783	383
Future Volume (vph)	121	142	50	127	51	1246	266	1783	383
Lane Group Flow (vph)	121	200	50	450	51	1290	266	1783	383
Turn Type	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA	Perm
Protected Phases		8		4		6	5	2	
Permitted Phases	8		4		6		2		2
Detector Phase	8	8	4	4	6	6	5	2	2
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	8.0	15.0	15.0	5.0	15.0	15.0
Minimum Split (s)	40.3	40.3	40.3	40.3	33.7	33.7	8.0	33.7	33.7
Total Split (s)	45.0	45.0	45.0	45.0	58.0	58.0	17.0	75.0	75.0
Total Split (%)	37.5%	37.5%	37.5%	37.5%	48.3%	48.3%	14.2%	62.5%	62.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	3.3	3.3	3.3	3.3	2.7	2.7	0.0	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.3	7.3	7.3	7.3	6.7	6.7	3.0	6.7	6.7
Lead/Lag					Lag	Lag	Lead		
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	Max	Max	None	Max	Max
v/c Ratio	1.01	0.37	0.16	0.78	0.85	0.86	1.00	0.89	0.41
Control Delay	126.1	31.8	31.4	38.7	117.3	37.6	88.6	29.1	9.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.4	0.0
Total Delay	126.1	31.8	31.4	38.7	117.3	37.6	88.6	53.5	9.7
Queue Length 50th (m)	25.8	30.8	7.8	67.7	9.8	131.6	~44.8	171.2	25.3
Queue Length 95th (m)	#61.2	49.5	17.0	105.1	#33.4	160.3	#94.7	207.3	44.2
Internal Link Dist (m)		235.7		233.3		84.9		74.1	
Turn Bay Length (m)	83.8		81.8		77.6		75.6		30.0
Base Capacity (vph)	126	567	330	595	60	1501	266	2005	941
Starvation Cap Reductn	0	0	0	0	0	0	0	301	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.96	0.35	0.15	0.76	0.85	0.86	1.00	1.05	0.41

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 118.5

Natural Cycle: 95

Control Type: Actuated-Uncoordinated

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 48: Cawthra Rd & South Service Rd

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	544	350	0	1450	2143	0
Future Volume (vph)	544	350	0	1450	2143	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.7	3.7	3.7	3.7
Total Lost time (s)	6.3	6.3		6.0	6.0	
Lane Util. Factor	0.97	0.91		0.91	0.95	
Frt	0.98	0.85		1.00	1.00	
Flt Protected	0.96	1.00		1.00	1.00	
Satd. Flow (prot)	3267	1384		4995	3476	
Flt Permitted	0.96	1.00		1.00	1.00	
Satd. Flow (perm)	3267	1384		4995	3476	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	544	350	0	1450	2143	0
RTOR Reduction (vph)	9	10	0	0	0	0
Lane Group Flow (vph)	605	270	0	1450	2143	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	26.8	26.8		80.0	80.0	
Effective Green, g (s)	26.8	26.8		80.0	80.0	
Actuated g/C Ratio	0.23	0.23		0.67	0.67	
Clearance Time (s)	6.3	6.3		6.0	6.0	
Vehicle Extension (s)	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	735	311		3355	2334	
v/s Ratio Prot	0.19	c0.20		0.29	c0.62	
v/s Ratio Perm						
v/c Ratio	0.82	0.87		0.43	0.92	
Uniform Delay, d1	43.9	44.4		9.0	16.7	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	8.3	23.3		0.4	7.2	
Delay (s)	52.2	67.7		9.5	24.0	
Level of Service	D	E		A	C	
Approach Delay (s)	57.1			9.5	24.0	
Approach LOS	E			A	C	

Intersection Summary			
HCM 2000 Control Delay	25.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	119.1	Sum of lost time (s)	12.3
Intersection Capacity Utilization	88.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBT	SBT
Lane Configurations				
Traffic Volume (vph)	544	350	1450	2143
Future Volume (vph)	544	350	1450	2143
Lane Group Flow (vph)	614	280	1450	2143
Turn Type	Prot	Prot	NA	NA
Protected Phases	4	4	2	2
Permitted Phases				
Detector Phase	4	4	2	2
Switch Phase				
Minimum Initial (s)	8.0	8.0	8.0	8.0
Minimum Split (s)	14.3	14.3	28.0	28.0
Total Split (s)	34.0	34.0	86.0	86.0
Total Split (%)	28.3%	28.3%	71.7%	71.7%
Yellow Time (s)	4.0	4.0	4.0	4.0
All-Red Time (s)	2.3	2.3	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.0	6.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	Max	Max
v/c Ratio	0.83	0.87	0.43	0.92
Control Delay	53.6	69.6	9.6	24.8
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	53.6	69.6	9.6	24.8
Queue Length 50th (m)	64.1	61.5	49.5	194.6
Queue Length 95th (m)	83.3	#108.6	57.7	238.0
Internal Link Dist (m)	232.9		57.9	128.5
Turn Bay Length (m)		140.0		
Base Capacity (vph)	769	332	3356	2335
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.80	0.84	0.43	0.92

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 119.1
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Cawthra Rd & QEW EB Off-ramp

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	297	283	1481	0	0	2288
Future Volume (vph)	297	283	1481	0	0	2288
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.7	3.7	3.7	3.7
Total Lost time (s)	6.3	6.3	6.0			6.0
Lane Util. Factor	0.97	0.91	0.95			0.91
Frt	0.96	0.85	1.00			1.00
Flt Protected	0.96	1.00	1.00			1.00
Satd. Flow (prot)	3221	1384	3476			4995
Flt Permitted	0.96	1.00	1.00			1.00
Satd. Flow (perm)	3221	1384	3476			4995
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	297	283	1481	0	0	2288
RTOR Reduction (vph)	29	47	0	0	0	0
Lane Group Flow (vph)	367	137	1481	0	0	2288
Turn Type	Prot	Prot	NA			NA
Protected Phases	4	4	2			2
Permitted Phases						
Actuated Green, G (s)	20.8	20.8	81.1			81.1
Effective Green, g (s)	20.8	20.8	81.1			81.1
Actuated g/C Ratio	0.18	0.18	0.71			0.71
Clearance Time (s)	6.3	6.3	6.0			6.0
Vehicle Extension (s)	5.0	5.0	5.0			5.0
Lane Grp Cap (vph)	586	252	2468			3547
v/s Ratio Prot	c0.11	0.10	0.43			c0.46
v/s Ratio Perm						
v/c Ratio	0.63	0.54	0.60			0.65
Uniform Delay, d1	43.1	42.4	8.4			8.9
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	2.9	4.1	1.1			0.9
Delay (s)	46.1	46.5	9.4			9.8
Level of Service	D	D	A			A
Approach Delay (s)	46.2		9.4			9.8
Approach LOS	D		A			A

Intersection Summary			
HCM 2000 Control Delay	14.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	114.2	Sum of lost time (s)	12.3
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBR	NBT	SBT
Lane Configurations				
Traffic Volume (vph)	297	283	1481	2288
Future Volume (vph)	297	283	1481	2288
Lane Group Flow (vph)	396	184	1481	2288
Turn Type	Prot	Prot	NA	NA
Protected Phases	4	4	2	2
Permitted Phases				
Detector Phase	4	4	2	2
Switch Phase				
Minimum Initial (s)	8.0	8.0	8.0	8.0
Minimum Split (s)	27.0	27.0	28.0	28.0
Total Split (s)	33.0	33.0	87.0	87.0
Total Split (%)	27.5%	27.5%	72.5%	72.5%
Yellow Time (s)	4.0	4.0	4.0	4.0
All-Red Time (s)	2.3	2.3	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.0	6.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	Max	Max
v/c Ratio	0.64	0.62	0.60	0.64
Control Delay	44.2	38.3	10.1	10.4
Queue Delay	0.0	0.0	0.0	1.2
Total Delay	44.2	38.3	10.1	11.6
Queue Length 50th (m)	35.6	26.2	71.3	81.2
Queue Length 95th (m)	50.0	49.5	105.6	112.8
Internal Link Dist (m)	265.2		83.8	49.8
Turn Bay Length (m)	90.0			
Base Capacity (vph)	781	368	2469	3548
Starvation Cap Reductn	0	0	0	944
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.51	0.50	0.60	0.88

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 114.2
Natural Cycle: 60
Control Type: Actuated-Uncoordinated

Splits and Phases: 2: Cawthra Rd & QEW WB Off-ramp

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	92	174	659	603	223	165	1397	179	60	2386	91
Future Volume (vph)	48	92	174	659	603	223	165	1397	179	60	2386	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	6.6	6.6		3.0	6.6		3.0	6.3	6.3	6.3	6.3	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.91	
Frt	1.00	0.90		1.00	0.96		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1700	1650		1700	1756		1700	3476	1521	1700	4967	
Flt Permitted	0.10	1.00		0.45	1.00		0.08	1.00	1.00	0.09	1.00	
Satd. Flow (perm)	184	1650		800	1756		149	3476	1521	159	4967	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	48	92	174	659	603	223	165	1397	179	60	2386	91
RTOR Reduction (vph)	0	57	0	0	8	0	0	0	70	0	3	0
Lane Group Flow (vph)	48	209	0	659	818	0	165	1397	109	60	2474	0
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases		8		7	4		1	6			2	
Permitted Phases	8			4			6		6	2		
Actuated Green, G (s)	39.0	39.0		54.0	54.0		53.1	53.1	53.1	45.1	45.1	
Effective Green, g (s)	39.0	39.0		54.0	54.0		53.1	53.1	53.1	45.1	45.1	
Actuated g/C Ratio	0.32	0.32		0.45	0.45		0.44	0.44	0.44	0.38	0.38	
Clearance Time (s)	6.6	6.6		3.0	6.6		3.0	6.3	6.3	6.3	6.3	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	59	536		450	790		130	1538	673	59	1866	
v/s Ratio Prot		0.13		c0.15	0.47		c0.05	0.40			0.50	
v/s Ratio Perm	0.26			c0.51			c0.51		0.07	0.38		
v/c Ratio	0.81	0.39		1.46	1.04		1.27	0.91	0.16	1.02	1.33	
Uniform Delay, d1	37.2	31.3		32.0	33.0		31.5	31.2	20.1	37.5	37.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	61.0	1.0		220.9	41.4		168.2	9.4	0.5	122.0	150.4	
Delay (s)	98.2	32.3		253.0	74.4		199.7	40.6	20.6	159.5	187.9	
Level of Service	F	C		F	E		F	D	C	F	F	
Approach Delay (s)		42.4			153.7			53.6			187.2	
Approach LOS		D			F			D			F	

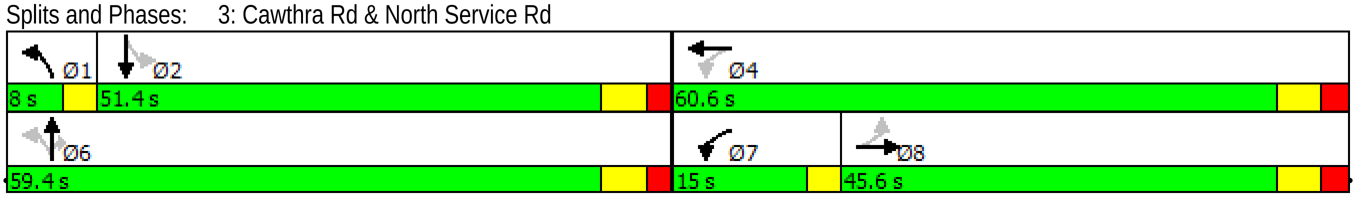
Intersection Summary			
HCM 2000 Control Delay	133.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.44		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	128.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	48	92	659	603	165	1397	179	60	2386
Future Volume (vph)	48	92	659	603	165	1397	179	60	2386
Lane Group Flow (vph)	48	266	659	826	165	1397	179	60	2477
Turn Type	Perm	NA	pm+pt	NA	pm+pt	NA	Perm	Perm	NA
Protected Phases		8	7	4	1	6			2
Permitted Phases	8		4		6		6	2	
Detector Phase	8	8	7	4	1	6	6	2	2
Switch Phase									
Minimum Initial (s)	8.0	8.0	5.0	8.0	5.0	8.0	8.0	8.0	8.0
Minimum Split (s)	45.6	45.6	8.0	41.6	8.0	34.3	34.3	34.3	34.3
Total Split (s)	45.6	45.6	15.0	60.6	8.0	59.4	59.4	51.4	51.4
Total Split (%)	38.0%	38.0%	12.5%	50.5%	6.7%	49.5%	49.5%	42.8%	42.8%
Yellow Time (s)	4.0	4.0	3.0	4.0	3.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.6	2.6	0.0	2.6	0.0	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	3.0	6.6	3.0	6.3	6.3	6.3	6.3
Lead/Lag	Lag	Lag	Lead		Lead			Lag	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.81	0.45	1.39	1.04	1.23	0.91	0.24	1.02	1.33
Control Delay	114.3	24.2	214.3	73.8	177.0	41.1	7.8	163.4	182.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	43.9	0.0	0.0	0.0
Total Delay	114.3	24.2	214.3	73.8	177.0	85.0	7.8	163.4	182.6
Queue Length 50th (m)	9.5	30.5	~184.1	~190.9	~29.4	145.6	6.6	~13.0	~256.4
Queue Length 95th (m)	#31.2	53.0	#254.5	#260.2	#69.8	#181.6	19.1	#39.3	#282.6
Internal Link Dist (m)		129.5		149.8		53.3			269.7
Turn Bay Length (m)	80.0		90.0		60.0		60.0	180.0	
Base Capacity (vph)	59	592	474	798	134	1538	742	59	1869
Starvation Cap Reductn	0	0	0	0	0	262	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.81	0.45	1.39	1.04	1.23	1.09	0.24	1.02	1.33

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Cawthra Rd & North Service Rd



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	52	60	66	1689	2410	54
Future Volume (vph)	52	60	66	1689	2410	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.5	3.7	3.7	3.5
Total Lost time (s)	7.1	7.1	3.0	6.3	6.3	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.91	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	1.00	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1689	1521	1700	3476	4975	
Flt Permitted	0.95	1.00	0.04	1.00	1.00	
Satd. Flow (perm)	1689	1521	80	3476	4975	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	52	60	66	1689	2410	54
RTOR Reduction (vph)	0	55	0	0	1	0
Lane Group Flow (vph)	52	5	66	1689	2463	0
Confl. Peds. (#/hr)	5	5	5			5
Turn Type	Perm	Prot	pm+pt	NA	NA	
Protected Phases		8	1	6	2	
Permitted Phases	8		6			
Actuated Green, G (s)	9.5	9.5	97.1	97.1	86.9	
Effective Green, g (s)	9.5	9.5	97.1	97.1	86.9	
Actuated g/C Ratio	0.08	0.08	0.81	0.81	0.72	
Clearance Time (s)	7.1	7.1	3.0	6.3	6.3	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	133	120	161	2812	3602	
v/s Ratio Prot		0.00	0.02	c0.49	c0.50	
v/s Ratio Perm	c0.03		0.31			
v/c Ratio	0.39	0.04	0.41	0.60	0.68	
Uniform Delay, d1	52.5	51.0	10.6	4.3	9.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.9	0.3	3.5	1.0	1.1	
Delay (s)	56.4	51.3	14.2	5.2	10.1	
Level of Service	E	D	B	A	B	
Approach Delay (s)	53.7			5.5	10.1	
Approach LOS	D			A	B	

Intersection Summary			
HCM 2000 Control Delay	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	75.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	Ø4
Lane Configurations						
Traffic Volume (vph)	52	60	66	1689	2410	
Future Volume (vph)	52	60	66	1689	2410	
Lane Group Flow (vph)	52	60	66	1689	2464	
Turn Type	Perm	Prot	pm+pt	NA	NA	
Protected Phases		8	1	6	2	4
Permitted Phases	8		6			
Detector Phase	8	8	1	6	2	
Switch Phase						
Minimum Initial (s)	8.0	8.0	5.0	8.0	8.0	8.0
Minimum Split (s)	36.1	36.1	8.0	25.3	25.3	36.1
Total Split (s)	36.1	36.1	8.0	83.9	75.9	36.1
Total Split (%)	30.1%	30.1%	6.7%	69.9%	63.3%	30%
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	3.1	3.1	0.0	2.3	2.3	3.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.1	7.1	3.0	6.3	6.3	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?					Yes	
Recall Mode	None	None	None	C-Max	C-Max	None
v/c Ratio	0.33	0.31	0.36	0.58	0.66	
Control Delay	55.9	16.3	15.6	5.6	11.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	55.9	16.3	15.6	5.6	11.2	
Queue Length 50th (m)	10.8	0.0	2.0	62.0	103.1	
Queue Length 95th (m)	21.7	11.5	13.0	89.0	141.7	
Internal Link Dist (m)	126.5			269.7	143.6	
Turn Bay Length (m)		20.0	40.0			
Base Capacity (vph)	408	413	185	2889	3738	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.13	0.15	0.36	0.58	0.66	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 7.2 (6%), Referenced to phase 2:SBT and 6:NBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated

Splits and Phases: 4: Cawthra Rd & Tedwyn Dr

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	165	588	222	646	1768	228	299	1181	168	220	1543	104
Future Volume (vph)	165	588	222	646	1768	228	299	1181	168	220	1543	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	5.0	6.9		5.0	6.9		5.0	7.5	7.5	5.0	7.5	
Lane Util. Factor	0.97	0.91		0.97	0.91		0.97	0.95	1.00	0.97	0.91	
Frt	1.00	0.96		1.00	0.98		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3298	4790		3298	4909		3298	3476	1521	3298	4948	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3298	4790		3298	4909		3298	3476	1521	3298	4948	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	165	588	222	646	1768	228	299	1181	168	220	1543	104
RTOR Reduction (vph)	0	49	0	0	11	0	0	0	98	0	5	0
Lane Group Flow (vph)	165	761	0	646	1985	0	299	1181	70	220	1642	0
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases									6			
Actuated Green, G (s)	8.0	29.6		29.9	51.5		12.0	47.1	47.1	9.0	44.1	
Effective Green, g (s)	8.0	29.6		29.9	51.5		12.0	47.1	47.1	9.0	44.1	
Actuated g/C Ratio	0.06	0.21		0.21	0.37		0.09	0.34	0.34	0.06	0.32	
Clearance Time (s)	5.0	6.9		5.0	6.9		5.0	7.5	7.5	5.0	7.5	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	188	1012		704	1805		282	1169	511	212	1558	
v/s Ratio Prot	0.05	0.16		c0.20	c0.40		c0.09	c0.34		0.07	0.33	
v/s Ratio Perm									0.05			
v/c Ratio	0.88	0.75		0.92	1.10		1.06	1.01	0.14	1.04	1.05	
Uniform Delay, d1	65.5	51.8		53.8	44.2		64.0	46.5	32.3	65.5	48.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	0.76	1.40	
Incremental Delay, d2	35.9	3.8		17.6	53.9		70.4	28.9	0.6	66.5	36.6	
Delay (s)	101.4	55.6		71.4	98.2		134.4	75.3	32.9	116.2	103.5	
Level of Service	F	E		E	F		F	E	C	F	F	
Approach Delay (s)		63.3			91.6			81.7			105.0	
Approach LOS		E			F			F			F	

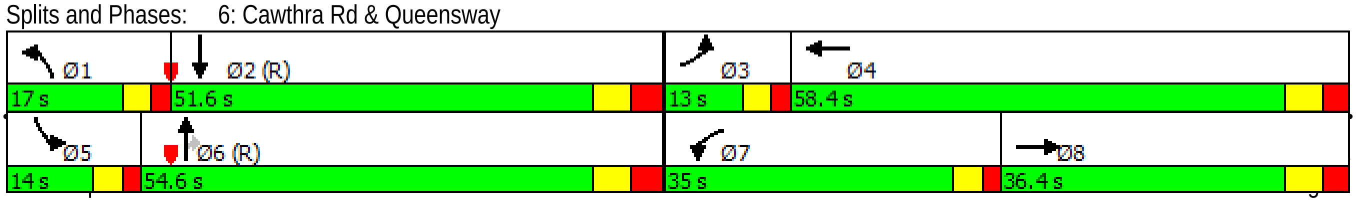
Intersection Summary			
HCM 2000 Control Delay	89.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	24.4
Intersection Capacity Utilization	106.9%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	165	588	646	1768	299	1181	168	220	1543
Future Volume (vph)	165	588	646	1768	299	1181	168	220	1543
Lane Group Flow (vph)	165	810	646	1996	299	1181	168	220	1647
Turn Type	Prot	NA	Prot	NA	Prot	NA	Perm	Prot	NA
Protected Phases	3	8	7	4	1	6		5	2
Permitted Phases							6		
Detector Phase	3	8	7	4	1	6	6	5	2
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	13.0	34.9	13.0	34.9	13.0	34.5	34.5	13.0	34.5
Total Split (s)	13.0	36.4	35.0	58.4	17.0	54.6	54.6	14.0	51.6
Total Split (%)	9.3%	26.0%	25.0%	41.7%	12.1%	39.0%	39.0%	10.0%	36.9%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	2.0	2.9	2.0	2.9	2.0	3.5	3.5	2.0	3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.9	5.0	6.9	5.0	7.5	7.5	5.0	7.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Max	C-Max	None	C-Max
v/c Ratio	0.88	0.76	0.92	1.10	1.06	1.01	0.28	1.04	1.05
Control Delay	104.8	53.3	72.7	94.6	129.9	74.7	8.2	115.5	98.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	104.8	53.3	72.7	94.6	129.9	74.7	8.2	115.5	98.5
Queue Length 50th (m)	21.9	66.7	83.7	~210.0	~42.9	~161.5	3.6	~31.7	~170.6
Queue Length 95th (m)	#41.1	81.1	#114.1	#236.8	#70.2	#205.0	18.4	m#52.4	#197.9
Internal Link Dist (m)		1035.8		119.2		142.3			124.6
Turn Bay Length (m)	160.0		100.0		80.0		70.0	80.0	
Base Capacity (vph)	188	1061	706	1817	282	1169	609	212	1564
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.88	0.76	0.92	1.10	1.06	1.01	0.28	1.04	1.05

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 63 (45%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Cawthra Rd & Queensway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	659	1	179	0	1	0	127	1388	0	0	1390	606
Future Volume (vph)	659	1	179	0	1	0	127	1388	0	0	1390	606
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.7	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.5
Total Lost time (s)	6.4	6.4	6.4		6.4		4.0	6.4			6.4	6.4
Lane Util. Factor	0.95	0.95	1.00		1.00		1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.96		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			1.00	1.00
Frt	1.00	1.00	0.85		1.00		1.00	1.00			1.00	0.85
Flt Protected	0.95	0.95	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1615	1656	1467		1830		1700	3476			3476	1521
Flt Permitted	0.95	0.95	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (perm)	1615	1656	1467		1830		1700	3476			3476	1521
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	659	1	179	0	1	0	127	1388	0	0	1390	606
RTOR Reduction (vph)	0	0	100	0	0	0	0	0	0	0	0	174
Lane Group Flow (vph)	329	331	79	0	1	0	127	1388	0	0	1390	432
Confl. Peds. (#/hr)			13	13		2						
Turn Type	Split	NA	Perm		NA		Prot	NA		Perm	NA	Perm
Protected Phases	4	4			3		1	6			2	
Permitted Phases			4	3						2		2
Actuated Green, G (s)	37.0	37.0	37.0		1.6		15.1	82.2			63.1	63.1
Effective Green, g (s)	37.0	37.0	37.0		1.6		15.1	82.2			63.1	63.1
Actuated g/C Ratio	0.26	0.26	0.26		0.01		0.11	0.59			0.45	0.45
Clearance Time (s)	6.4	6.4	6.4		6.4		4.0	6.4			6.4	6.4
Vehicle Extension (s)	5.0	5.0	5.0		5.0		5.0	5.0			5.0	5.0
Lane Grp Cap (vph)	426	437	387		20		183	2040			1566	685
v/s Ratio Prot	c0.20	0.20			c0.00		0.07	c0.40			c0.40	
v/s Ratio Perm			0.05									0.28
v/c Ratio	0.77	0.76	0.20		0.05		0.69	0.68			0.89	0.63
Uniform Delay, d1	47.6	47.4	40.0		68.4		60.2	19.9			35.2	29.5
Progression Factor	1.23	1.23	1.96		1.00		0.74	1.12			0.75	1.01
Incremental Delay, d2	5.4	4.8	0.3		2.2		4.6	0.6			4.2	2.2
Delay (s)	63.9	63.1	78.6		70.6		49.1	22.9			30.7	31.9
Level of Service	E	E	E		E		D	C			C	C
Approach Delay (s)		66.7			70.6			25.1			31.1	
Approach LOS		E			E			C			C	

Intersection Summary			
HCM 2000 Control Delay	35.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	23.2
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	SBT	SBR
Lane Configurations								
Traffic Volume (vph)	659	1	179	1	127	1388	1390	606
Future Volume (vph)	659	1	179	1	127	1388	1390	606
Lane Group Flow (vph)	329	331	179	1	127	1388	1390	606
Turn Type	Split	NA	Perm	NA	Prot	NA	NA	Perm
Protected Phases	4	4		3	1	6	2	
Permitted Phases			4					2
Detector Phase	4	4	4	3	1	6	2	2
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	5.0	8.0	8.0	8.0
Minimum Split (s)	29.4	29.4	29.4	14.4	9.0	27.4	27.4	27.4
Total Split (s)	40.0	40.0	40.0	14.4	16.0	85.6	69.6	69.6
Total Split (%)	28.6%	28.6%	28.6%	10.3%	11.4%	61.1%	49.7%	49.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.4	2.4	2.4	2.4	1.0	2.4	2.4	2.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	4.0	6.4	6.4	6.4
Lead/Lag	Lag	Lag	Lag	Lead	Lead		Lag	Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	C-Max	C-Max	C-Max
v/c Ratio	0.77	0.76	0.37	0.01	0.69	0.64	0.82	0.67
Control Delay	64.8	64.1	23.5	63.0	52.8	20.6	26.8	15.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	30.1	2.2
Total Delay	64.8	64.1	23.5	63.0	52.8	20.6	56.9	17.6
Queue Length 50th (m)	76.8	77.2	13.0	0.3	25.1	173.6	196.3	111.9
Queue Length 95th (m)	m#101.5	m#99.5	m23.2	2.0	m30.5	m176.7	214.8	m149.0
Internal Link Dist (m)		235.5		55.0		503.1	151.6	
Turn Bay Length (m)			45.0		100.0			50.0
Base Capacity (vph)	439	450	497	104	183	2167	1693	902
Starvation Cap Reductn	0	0	0	0	0	0	377	171
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.74	0.36	0.01	0.69	0.64	1.06	0.83

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 46.2 (33%), Referenced to phase 2:SBTL and 6:NBT, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Cawthra Rd & Dundas St Ramp

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	69	0	245	0	0	0	358	1624	0	0	1708	91
Future Volume (vph)	69	0	245	0	0	0	358	1624	0	0	1708	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.7	3.7	3.7	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)		6.0	6.0				3.0	6.0			6.0	
Lane Util. Factor		1.00	1.00				1.00	0.95			0.95	
Frpb, ped/bikes		1.00	0.97				1.00	1.00			1.00	
Flpb, ped/bikes		1.00	1.00				1.00	1.00			1.00	
Frt		1.00	0.85				1.00	1.00			0.99	
Flt Protected		0.95	1.00				0.95	1.00			1.00	
Satd. Flow (prot)		1735	1483				1700	3476			3445	
Flt Permitted		0.76	1.00				0.05	1.00			1.00	
Satd. Flow (perm)		1383	1483				86	3476			3445	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	69	0	245	0	0	0	358	1624	0	0	1708	91
RTOR Reduction (vph)	0	0	219	0	0	0	0	0	0	0	3	0
Lane Group Flow (vph)	0	69	26	0	0	0	358	1624	0	0	1796	0
Confl. Peds. (#/hr)	1		7	7		1	3					3
Turn Type	Perm	NA	Perm				pm+pt	NA		Perm	NA	
Protected Phases		4			4		1	6			2	
Permitted Phases	4		4	4			6			2		
Actuated Green, G (s)		14.8	14.8				113.2	113.2			80.5	
Effective Green, g (s)		14.8	14.8				113.2	113.2			80.5	
Actuated g/C Ratio		0.11	0.11				0.81	0.81			0.58	
Clearance Time (s)		6.0	6.0				3.0	6.0			6.0	
Vehicle Extension (s)		5.0	5.0				5.0	5.0			5.0	
Lane Grp Cap (vph)		146	156				411	2810			1980	
v/s Ratio Prot							c0.18	0.47			c0.52	
v/s Ratio Perm		c0.05	0.02				0.52					
v/c Ratio		0.47	0.17				0.87	0.58			0.91	
Uniform Delay, d1		58.9	57.0				45.9	4.8			26.4	
Progression Factor		1.00	1.00				1.26	0.98			1.18	
Incremental Delay, d2		5.0	1.1				15.0	0.6			3.5	
Delay (s)		63.9	58.0				72.9	5.4			34.6	
Level of Service		E	E				E	A			C	
Approach Delay (s)		59.3			0.0			17.6			34.6	
Approach LOS		E			A			B			C	

Intersection Summary			
HCM 2000 Control Delay	28.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	92.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	NBL	NBT	SBT
Lane Configurations						
Traffic Volume (vph)	69	0	245	358	1624	1708
Future Volume (vph)	69	0	245	358	1624	1708
Lane Group Flow (vph)	0	69	245	358	1624	1799
Turn Type	Perm	NA	Perm	pm+pt	NA	NA
Protected Phases		4		1	6	2
Permitted Phases	4		4	6		
Detector Phase	4	4	4	1	6	2
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	5.0	15.0	15.0
Minimum Split (s)	28.0	28.0	28.0	8.0	29.0	29.0
Total Split (s)	28.0	28.0	28.0	32.0	112.0	80.0
Total Split (%)	20.0%	20.0%	20.0%	22.9%	80.0%	57.1%
Yellow Time (s)	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0	6.0	3.0	6.0	6.0
Lead/Lag				Lead		Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	C-Max	C-Max
v/c Ratio		0.48	0.65	0.87	0.58	0.91
Control Delay		68.4	15.1	67.5	5.9	35.9
Queue Delay		0.0	0.4	0.0	0.3	46.0
Total Delay		68.4	15.5	67.5	6.2	81.9
Queue Length 50th (m)		16.9	0.0	77.7	40.7	169.5
Queue Length 95th (m)		29.8	22.8	#128.5	99.3	m#271.7
Internal Link Dist (m)		145.4			151.6	343.9
Turn Bay Length (m)				70.0		
Base Capacity (vph)		217	439	427	2811	1983
Starvation Cap Reductn		0	0	0	534	0
Spillback Cap Reductn		0	29	0	0	400
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.32	0.60	0.84	0.71	1.14

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 1.4 (1%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: Cawthra Rd & Silver Creek Blvd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	425	257	432	1038	143	217	1431	172	104	1289	110
Future Volume (vph)	74	425	257	432	1038	143	217	1431	172	104	1289	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	6.9	6.9	3.0	6.9	6.9	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1699	3476	1500	1700	3476	1473	1700	3476	1521	1700	3476	1497
Flt Permitted	0.17	1.00	1.00	0.26	1.00	1.00	0.07	1.00	1.00	0.07	1.00	1.00
Satd. Flow (perm)	310	3476	1500	463	3476	1473	122	3476	1521	126	3476	1497
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	74	425	257	432	1038	143	217	1431	172	104	1289	110
RTOR Reduction (vph)	0	0	158	0	0	74	0	0	63	0	0	65
Lane Group Flow (vph)	74	425	99	432	1038	69	217	1431	109	104	1289	45
Confl. Peds. (#/hr)	10		1	1		10	2					2
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6		6	2		2
Actuated Green, G (s)	28.1	23.1	23.1	53.1	44.1	44.1	71.6	58.6	58.6	68.4	57.0	57.0
Effective Green, g (s)	28.1	23.1	23.1	53.1	44.1	44.1	71.6	58.6	58.6	68.4	57.0	57.0
Actuated g/C Ratio	0.20	0.17	0.17	0.38	0.32	0.32	0.51	0.42	0.42	0.49	0.41	0.41
Clearance Time (s)	4.0	6.9	6.9	3.0	6.9	6.9	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	111	573	247	414	1094	463	208	1454	636	189	1415	609
v/s Ratio Prot	0.02	0.12		c0.20	0.30		c0.10	0.41		0.04	0.37	
v/s Ratio Perm	0.11		0.07	c0.19		0.05	c0.43		0.07	0.22		0.03
v/c Ratio	0.67	0.74	0.40	1.04	0.95	0.15	1.04	0.98	0.17	0.55	0.91	0.07
Uniform Delay, d1	47.7	55.6	52.3	37.2	46.8	34.5	43.4	40.2	25.5	29.4	39.1	25.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.09	1.00	1.12	1.11	1.44	4.37
Incremental Delay, d2	18.3	6.2	2.2	56.0	16.6	0.3	70.3	18.7	0.5	0.5	1.1	0.0
Delay (s)	66.0	61.8	54.5	93.3	63.5	34.8	117.7	58.9	29.1	33.1	57.6	110.8
Level of Service	E	E	D	F	E	C	F	E	C	C	E	F
Approach Delay (s)		59.7			68.9			63.1			59.8	
Approach LOS		E			E			E			E	

Intersection Summary			
HCM 2000 Control Delay	63.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	20.9
Intersection Capacity Utilization	101.8%	ICU Level of Service	G
Analysis Period (min)	15		

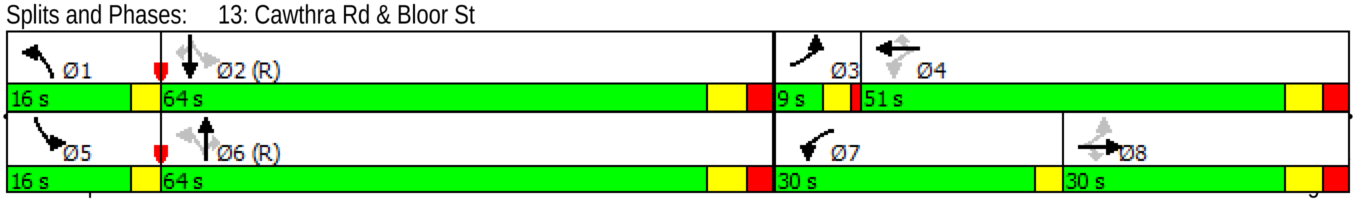
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	425	257	432	1038	143	217	1431	172	104	1289	110
Future Volume (vph)	74	425	257	432	1038	143	217	1431	172	104	1289	110
Lane Group Flow (vph)	74	425	257	432	1038	143	217	1431	172	104	1289	110
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6		6	2		2
Detector Phase	3	8	8	7	4	4	1	6	6	5	2	2
Switch Phase												
Minimum Initial (s)	5.0	8.0	8.0	5.0	8.0	8.0	5.0	8.0	8.0	5.0	8.0	8.0
Minimum Split (s)	9.0	27.9	27.9	8.0	27.9	27.9	8.0	29.0	29.0	8.0	29.0	29.0
Total Split (s)	9.0	30.0	30.0	30.0	51.0	51.0	16.0	64.0	64.0	16.0	64.0	64.0
Total Split (%)	6.4%	21.4%	21.4%	21.4%	36.4%	36.4%	11.4%	45.7%	45.7%	11.4%	45.7%	45.7%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	1.0	2.9	2.9	0.0	2.9	2.9	0.0	3.0	3.0	0.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.9	6.9	3.0	6.9	6.9	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
v/c Ratio	0.63	0.74	0.63	1.01	0.95	0.27	1.02	0.98	0.25	0.54	0.91	0.16
Control Delay	55.2	64.4	23.2	81.1	64.2	11.9	103.4	58.7	12.5	24.6	57.6	19.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.2	64.4	23.2	81.1	64.2	11.9	103.4	58.7	12.5	24.6	57.6	19.6
Queue Length 50th (m)	11.7	54.9	15.4	~88.5	136.2	6.3	~45.8	169.6	11.5	22.7	180.8	12.9
Queue Length 95th (m)	#22.5	72.1	43.1	#149.3	#175.0	21.3	#93.7	#243.4	24.0	m21.2	m157.0	m11.3
Internal Link Dist (m)		336.4			825.0			303.1			227.0	
Turn Bay Length (m)	120.0		70.0	50.0		70.0	50.0		20.0	90.0		110.0
Base Capacity (vph)	118	573	405	427	1094	537	212	1455	699	212	1415	674
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.74	0.63	1.01	0.95	0.27	1.02	0.98	0.25	0.49	0.91	0.16

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 13: Cawthra Rd & Bloor St



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	790	131	243	1416	82	318	1011	100	112	1438	63
Future Volume (vph)	70	790	131	243	1416	82	318	1011	100	112	1438	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	3.0	7.5	7.5	3.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1700	3476	1521	1700	3476	1471	1700	3476	1485	1700	3476	1485
Flt Permitted	0.09	1.00	1.00	0.18	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	159	3476	1521	322	3476	1471	1700	3476	1485	1700	3476	1485
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	70	790	131	243	1416	82	318	1011	100	112	1438	63
RTOR Reduction (vph)	0	0	89	0	0	54	0	0	57	0	0	42
Lane Group Flow (vph)	70	790	42	243	1416	28	318	1011	43	112	1438	21
Confl. Peds. (#/hr)	22					22	11		11	11		11
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4			6			2
Actuated Green, G (s)	53.0	45.1	45.1	57.2	47.2	47.2	16.0	51.0	51.0	11.9	46.9	46.9
Effective Green, g (s)	53.0	45.1	45.1	57.2	47.2	47.2	16.0	51.0	51.0	11.9	46.9	46.9
Actuated g/C Ratio	0.38	0.32	0.32	0.41	0.34	0.34	0.11	0.36	0.36	0.09	0.33	0.33
Clearance Time (s)	3.0	7.5	7.5	3.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	147	1119	489	229	1171	495	194	1266	540	144	1164	497
v/s Ratio Prot	0.03	0.23		c0.08	c0.41		c0.19	0.29		0.07	c0.41	
v/s Ratio Perm	0.15		0.03	0.36		0.02			0.03			0.01
v/c Ratio	0.48	0.71	0.09	1.06	1.21	0.06	1.64	0.80	0.08	0.78	1.24	0.04
Uniform Delay, d1	34.5	41.6	33.1	36.6	46.4	31.3	62.0	39.9	29.1	62.8	46.5	31.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.63	1.23	2.35	1.00	1.25	5.06
Incremental Delay, d2	5.0	2.6	0.2	76.5	102.3	0.1	302.0	3.4	0.2	10.6	108.8	0.1
Delay (s)	39.5	44.2	33.2	113.2	148.7	31.4	341.0	52.5	68.6	73.4	166.8	159.1
Level of Service	D	D	C	F	F	C	F	D	E	E	F	F
Approach Delay (s)		42.4			138.2			117.8			160.1	
Approach LOS		D			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	122.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.29		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	119.8%	ICU Level of Service	H
Analysis Period (min)	15		

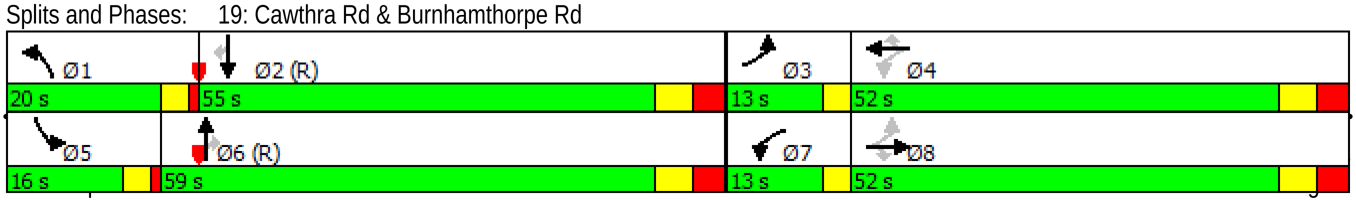
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	790	131	243	1416	82	318	1011	100	112	1438	63
Future Volume (vph)	70	790	131	243	1416	82	318	1011	100	112	1438	63
Lane Group Flow (vph)	70	790	131	243	1416	82	318	1011	100	112	1438	63
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4			6			2
Detector Phase	3	8	8	7	4	4	1	6	6	5	2	2
Switch Phase												
Minimum Initial (s)	5.0	8.0	8.0	5.0	8.0	8.0	5.0	8.0	8.0	5.0	8.0	8.0
Minimum Split (s)	9.0	51.5	51.5	8.0	51.5	51.5	9.0	47.0	47.0	9.0	47.0	47.0
Total Split (s)	13.0	52.0	52.0	13.0	52.0	52.0	20.0	59.0	59.0	16.0	55.0	55.0
Total Split (%)	9.3%	37.1%	37.1%	9.3%	37.1%	37.1%	14.3%	42.1%	42.1%	11.4%	39.3%	39.3%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	0.0	3.5	3.5	0.0	3.5	3.5	1.0	3.5	3.5	1.0	3.5	3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.5	7.5	3.0	7.5	7.5	4.0	7.5	7.5	4.0	7.5	7.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
v/c Ratio	0.41	0.72	0.23	1.03	1.21	0.15	1.64	0.79	0.17	0.78	1.22	0.11
Control Delay	30.0	46.5	6.3	98.1	142.7	6.0	330.7	52.2	17.1	76.3	149.4	12.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.0	46.5	6.3	98.1	142.7	6.0	330.7	52.2	17.1	76.3	149.4	12.6
Queue Length 50th (m)	10.2	93.6	0.0	~42.3	~240.4	0.0	~119.8	138.7	11.9	30.2	~231.6	2.5
Queue Length 95th (m)	19.1	115.0	13.2	#86.0	#279.7	9.4	m#136.5	m146.0	m16.1	m32.4	m#238.7	m3.5
Internal Link Dist (m)		927.6			832.4			81.9			166.4	
Turn Bay Length (m)	70.0		100.0	80.0		60.0	130.0			130.0		160.0
Base Capacity (vph)	177	1104	572	235	1170	554	194	1280	604	145	1179	563
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.72	0.23	1.03	1.21	0.15	1.64	0.79	0.17	0.77	1.22	0.11

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 19: Cawthra Rd & Burnhamthorpe Rd



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	395	88	131	1004	76	252	954	102	108	1518	151
Future Volume (vph)	35	395	88	131	1004	76	252	954	102	108	1518	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	3.0	6.4		3.0	6.4		3.0	6.5		3.0	6.5	6.5
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.97		1.00	0.99		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1700	3381		1700	3440		1700	3426		1700	3476	1521
Flt Permitted	0.10	1.00		0.35	1.00		0.06	1.00		0.16	1.00	1.00
Satd. Flow (perm)	174	3381		633	3440		113	3426		285	3476	1521
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	35	395	88	131	1004	76	252	954	102	108	1518	151
RTOR Reduction (vph)	0	13	0	0	4	0	0	5	0	0	0	41
Lane Group Flow (vph)	35	470	0	131	1076	0	252	1051	0	108	1518	110
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8			4			6			2		2
Actuated Green, G (s)	45.2	41.2		47.2	42.2		77.5	63.5		72.3	60.9	60.9
Effective Green, g (s)	45.2	41.2		47.2	42.2		77.5	63.5		72.3	60.9	60.9
Actuated g/C Ratio	0.32	0.29		0.34	0.30		0.55	0.45		0.52	0.43	0.43
Clearance Time (s)	3.0	6.4		3.0	6.4		3.0	6.5		3.0	6.5	6.5
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Lane Grp Cap (vph)	99	994		251	1036		221	1553		262	1512	661
v/s Ratio Prot	0.01	0.14		c0.02	c0.31		c0.11	0.31		0.03	0.44	
v/s Ratio Perm	0.10			0.16			c0.52			0.18		0.07
v/c Ratio	0.35	0.47		0.52	1.04		1.14	0.68		0.41	1.00	0.17
Uniform Delay, d1	37.8	40.5		37.2	48.9		46.4	30.2		20.4	39.5	24.1
Progression Factor	1.00	1.00		1.00	1.00		1.71	0.37		1.00	1.00	1.00
Incremental Delay, d2	4.5	0.7		3.7	38.4		97.0	1.9		2.2	24.1	0.5
Delay (s)	42.3	41.2		40.9	87.3		176.3	13.0		22.6	63.7	24.6
Level of Service	D	D		D	F		F	B		C	E	C
Approach Delay (s)		41.3			82.3			44.5			57.8	
Approach LOS		D			F			D			E	

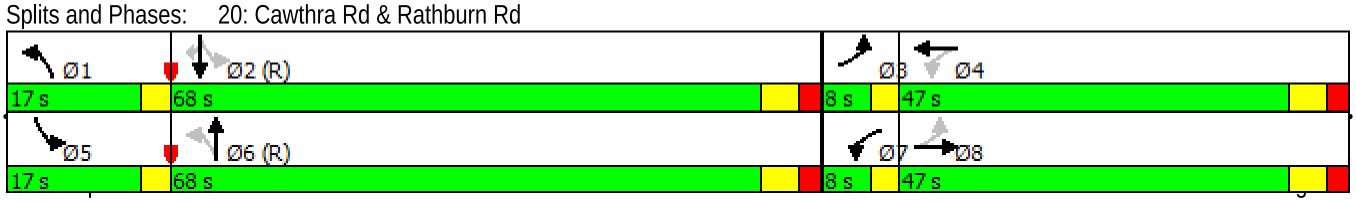
Intersection Summary			
HCM 2000 Control Delay	58.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	107.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	35	395	131	1004	252	954	108	1518	151
Future Volume (vph)	35	395	131	1004	252	954	108	1518	151
Lane Group Flow (vph)	35	483	131	1080	252	1056	108	1518	151
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	Perm
Protected Phases	3	8	7	4	1	6	5	2	
Permitted Phases	8		4		6		2		2
Detector Phase	3	8	7	4	1	6	5	2	2
Switch Phase									
Minimum Initial (s)	5.0	8.0	5.0	8.0	5.0	8.0	5.0	8.0	8.0
Minimum Split (s)	8.0	40.4	8.0	40.4	8.0	38.5	8.0	38.5	38.5
Total Split (s)	8.0	47.0	8.0	47.0	17.0	68.0	17.0	68.0	68.0
Total Split (%)	5.7%	33.6%	5.7%	33.6%	12.1%	48.6%	12.1%	48.6%	48.6%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0	4.0
All-Red Time (s)	0.0	2.4	0.0	2.4	0.0	2.5	0.0	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.4	3.0	6.4	3.0	6.5	3.0	6.5	6.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Max	None	C-Max	C-Max
v/c Ratio	0.30	0.49	0.50	1.04	1.13	0.67	0.40	0.99	0.21
Control Delay	35.3	41.3	39.5	85.3	147.6	12.9	17.5	60.8	13.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.3	41.3	39.5	85.3	147.6	12.9	17.5	60.8	13.1
Queue Length 50th (m)	5.7	51.6	22.6	~161.0	~61.2	24.7	11.7	200.0	11.6
Queue Length 95th (m)	12.7	67.2	36.8	#200.3	m#107.4	51.3	19.8	#249.3	24.9
Internal Link Dist (m)		745.4		810.9		164.2		393.3	
Turn Bay Length (m)	40.0		60.0		80.0		40.0		30.0
Base Capacity (vph)	115	994	262	1040	223	1574	302	1526	709
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.49	0.50	1.04	1.13	0.67	0.36	0.99	0.21

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green
Natural Cycle: 135
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 20: Cawthra Rd & Rathburn Rd



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	46	17	61	808	1783	247
Future Volume (vph)	46	17	61	808	1783	247
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.5	3.7	3.7	3.7
Total Lost time (s)	6.2	6.2	3.0	6.0	6.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	
Frt	1.00	0.85	1.00	1.00	0.98	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1700	1521	1700	3476	3413	
Flt Permitted	0.95	1.00	0.06	1.00	1.00	
Satd. Flow (perm)	1700	1521	116	3476	3413	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	46	17	61	808	1783	247
RTOR Reduction (vph)	0	16	0	0	5	0
Lane Group Flow (vph)	46	1	61	808	2025	0
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6			
Actuated Green, G (s)	9.9	9.9	132.9	132.9	122.5	
Effective Green, g (s)	9.9	9.9	132.9	132.9	122.5	
Actuated g/C Ratio	0.06	0.06	0.86	0.86	0.79	
Clearance Time (s)	6.2	6.2	3.0	6.0	6.0	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	108	97	175	2980	2697	
v/s Ratio Prot	c0.03		c0.02	0.23	c0.59	
v/s Ratio Perm		0.00	0.28			
v/c Ratio	0.43	0.01	0.35	0.27	0.75	
Uniform Delay, d1	69.8	68.0	11.3	2.1	8.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	5.6	0.1	2.5	0.2	2.0	
Delay (s)	75.4	68.1	13.8	2.3	10.4	
Level of Service	E	E	B	A	B	
Approach Delay (s)	73.4			3.1	10.4	
Approach LOS	E			A	B	

Intersection Summary			
HCM 2000 Control Delay	9.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	155.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	46	17	61	808	1783
Future Volume (vph)	46	17	61	808	1783
Lane Group Flow (vph)	46	17	61	808	2030
Turn Type	Prot	Perm	pm+pt	NA	NA
Protected Phases	4		1	6	2
Permitted Phases		4	6		
Detector Phase	4	4	1	6	2
Switch Phase					
Minimum Initial (s)	8.0	8.0	5.0	8.0	8.0
Minimum Split (s)	28.2	28.2	8.0	27.0	23.0
Total Split (s)	28.6	28.6	12.0	126.4	114.4
Total Split (%)	18.5%	18.5%	7.7%	81.5%	73.8%
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.2	2.2	0.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	3.0	6.0	6.0
Lead/Lag			Lead		Lag
Lead-Lag Optimize?					
Recall Mode	None	None	None	C-Max	C-Max
v/c Ratio	0.37	0.13	0.32	0.27	0.73
Control Delay	75.5	26.4	5.9	2.5	11.6
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	75.5	26.4	5.9	2.5	11.6
Queue Length 50th (m)	12.6	0.0	1.8	19.0	146.3
Queue Length 95th (m)	24.7	7.4	4.3	27.8	211.4
Internal Link Dist (m)	191.7			393.3	365.1
Turn Bay Length (m)		10.0	30.0		
Base Capacity (vph)	245	234	200	3034	2768
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.19	0.07	0.30	0.27	0.73

Intersection Summary

Cycle Length: 155

Actuated Cycle Length: 155

Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Splits and Phases: 21: Cawthra Rd & Meadows Blvd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	131	588	327	170	1178	97	172	591	65	295	1595	430
Future Volume (vph)	131	588	327	170	1178	97	172	591	65	295	1595	430
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5	3.5	3.7	3.5
Total Lost time (s)	4.0	7.9	7.9	3.0	7.9	7.9	4.0	8.4	8.4	4.0	8.4	8.4
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1700	3476	1521	1700	3476	1521	1700	3476	1521	1700	3476	1487
Flt Permitted	0.11	1.00	1.00	0.25	1.00	1.00	0.95	1.00	1.00	0.32	1.00	1.00
Satd. Flow (perm)	198	3476	1521	441	3476	1521	1700	3476	1521	566	3476	1487
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	131	588	327	170	1178	97	172	591	65	295	1595	430
RTOR Reduction (vph)	0	0	145	0	0	68	0	0	42	0	0	72
Lane Group Flow (vph)	131	588	182	170	1178	29	172	591	23	295	1595	358
Confl. Peds. (#/hr)							8					8
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4			6	2		2
Actuated Green, G (s)	40.1	36.1	36.1	50.1	42.1	42.1	11.0	50.5	50.5	73.6	58.6	58.6
Effective Green, g (s)	40.1	36.1	36.1	50.1	42.1	42.1	11.0	50.5	50.5	73.6	58.6	58.6
Actuated g/C Ratio	0.29	0.26	0.26	0.36	0.30	0.30	0.08	0.36	0.36	0.53	0.42	0.42
Clearance Time (s)	4.0	7.9	7.9	3.0	7.9	7.9	4.0	8.4	8.4	4.0	8.4	8.4
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	99	896	392	256	1045	457	133	1253	548	452	1454	622
v/s Ratio Prot	c0.04	0.17		0.05	c0.34		c0.10	0.17		0.09	c0.46	
v/s Ratio Perm	c0.34		0.12	0.18		0.02			0.02	0.25		0.24
v/c Ratio	1.32	0.66	0.46	0.66	1.13	0.06	1.29	0.47	0.04	0.65	1.10	0.58
Uniform Delay, d1	50.3	46.4	43.8	33.3	49.0	34.9	64.5	34.5	29.1	20.2	40.7	31.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	199.7	2.3	1.8	8.3	69.8	0.1	176.6	1.3	0.1	4.5	54.8	3.8
Delay (s)	250.0	48.7	45.6	41.7	118.7	35.0	241.1	35.7	29.2	24.7	95.5	35.0
Level of Service	F	D	D	D	F	D	F	D	C	C	F	D
Approach Delay (s)		73.0			104.1			77.9			75.3	
Approach LOS		E			F			E			E	

Intersection Summary			
HCM 2000 Control Delay	82.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	24.3
Intersection Capacity Utilization	113.7%	ICU Level of Service	H
Analysis Period (min)	15		

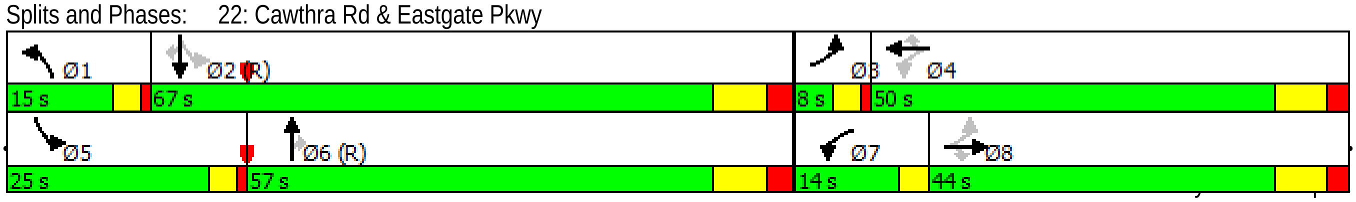
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	131	588	327	170	1178	97	172	591	65	295	1595	430
Future Volume (vph)	131	588	327	170	1178	97	172	591	65	295	1595	430
Lane Group Flow (vph)	131	588	327	170	1178	97	172	591	65	295	1595	430
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4			6	2		2
Detector Phase	3	8	8	7	4	4	1	6	6	5	2	2
Switch Phase												
Minimum Initial (s)	4.0	12.0	12.0	5.0	12.0	12.0	4.0	12.0	12.0	5.0	12.0	12.0
Minimum Split (s)	8.0	40.9	40.9	8.0	40.9	40.9	8.0	41.4	41.4	9.0	41.4	41.4
Total Split (s)	8.0	44.0	44.0	14.0	50.0	50.0	15.0	57.0	57.0	25.0	67.0	67.0
Total Split (%)	5.7%	31.4%	31.4%	10.0%	35.7%	35.7%	10.7%	40.7%	40.7%	17.9%	47.9%	47.9%
Yellow Time (s)	3.0	5.5	5.5	3.0	5.5	5.5	3.0	5.5	5.5	3.0	5.5	5.5
All-Red Time (s)	1.0	2.4	2.4	0.0	2.4	2.4	1.0	2.9	2.9	1.0	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	7.9	7.9	3.0	7.9	7.9	4.0	8.4	8.4	4.0	8.4	8.4
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
v/c Ratio	1.25	0.66	0.61	0.62	1.13	0.18	1.29	0.47	0.10	0.63	1.10	0.62
Control Delay	201.6	50.5	23.0	40.1	114.2	2.5	225.3	36.4	0.3	23.1	93.3	26.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	201.6	50.5	23.0	40.1	114.2	2.5	225.3	36.4	0.3	23.1	93.3	26.6
Queue Length 50th (m)	~29.1	70.8	28.9	29.0	~182.5	0.0	~55.7	61.8	0.0	38.9	~241.5	61.1
Queue Length 95th (m)	#64.0	89.6	59.0	45.3	#221.4	4.6	#98.5	78.6	0.0	55.9	#280.5	94.6
Internal Link Dist (m)		447.2			798.3			365.1			157.1	
Turn Bay Length (m)	170.0		300.0	100.0		100.0	120.0		120.0	130.0		80.0
Base Capacity (vph)	105	896	537	272	1045	552	133	1253	647	485	1454	694
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.25	0.66	0.61	0.63	1.13	0.18	1.29	0.47	0.10	0.61	1.10	0.62

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 22: Cawthra Rd & Eastgate Pkwy



APPENDIX D4

TRAFFIC/ PEDESTRIAN SIGNAL
WARRANT ANALYSIS

Assessment of Pedestrian Crossing at Cawthra Road – Needham Lane Intersection

Traffic Signal Options:

Type 1 - Full Intersection Signals
Type 2 - Intersection Pedestrian Signal (IPS)
Type 3 - Pedestrian Crossovers (PXO) - not appropriate where AADT > 35,000

Input Data

Intersection Turning Movement Counts*:*

- 2015 Turing Movements (2015-04-14)

Corridor Demands:

- 2015 ADT along Cawthra Road at Needham Lane = 35,353 vehicles/day

Collison Experience:

- 8 collisions (5 years 2008 – 2012, including 3- 2008, 1- 2009, 0- 2010, 4- 2011, and 0- 2012)
- For analysis, assume 4 collisions (potentially corrected through signals) over 3 years

8 Hour Pedestrian Crossing Volume:

- Year 2014 TM Counts = 81 pedestrians, Year 2015 TM Counts = 30 pedestrians
- For analysis (erroring on the side of meeting the warrant), assume 81 pedestrians per year, 100% crossing pedestrians are delayed more than 10 seconds; and 20% assisted (i.e. seniors, disabled, and children). Pedestrian volumes remain below 200 per 8 hrs (critical threshold level)
- Disregard centre traffic island which would allow analysis based on peak direction volume only (rather than two-way volume) when assessing Warrants 6A and 6B

Driver Sight Lines:

Driver sight lines (turning onto Cawthra Road from Needham) are partially obstructed by retaining wall, pedestrian railing, and crest curve along Cawthra Road south of intersection. Driver sight distance available (3m back from edge of pavement) = 225m, satisfies minimum requirement based on 70km/h (50km/h posted speed).

- Stopping Sight Distance (SSD) = 105m (70km/h design speed)
- Sight Distance Turning Left from Needham Lane = 150m passenger car, 185m single unit truck, and 225m semi-trailer (per TAC Figure 9.9.4 based on 70km/h design speed

Photo: Looking north along Cawthra Road from Needham Lane (June 2019)

Results of Warrant Assessment (see attached excel sheet output):

Warrant 1 - Minimum Vehicular Volume = 41%
Warrant 2 - Delay to Cross Traffic = 58%
Warrant 3 - Volume/ Delay Combination = Not Justified
Warrant 4 - Minimum Four Hour Vehicle Volume = 46%
Warrant 5 - Collision Experience = 27%
Warrant 6A - Pedestrian Crossing Volume = Not Justified
Warrant 6B - Pedestrian Crossing Delay = Not Justified

References:
OTM Book 12 Traffic Signals (Section 4.9)
OTM Book 15 Pedestrian Crossing Treatments (Section 5)

Conclusions:

- Does not meet warrants for full traffic signals or IPS
- Signal not required for purposes of 'pedestrian system connectivity' (primarily serves as access to/from existing bus stop on Cawthra Road)
- Alternative crossing opportunity:
  - Closest signalized crossing is Queensway Intersection located 590m to the south (exceeds desirable maximum of 400m)
  - Dundas Street signalized crossing is located 525m to the north (however no pedestrian demands generated between Needham Lane and Dundas Street)

Recommendation:

Although the distance to the adjacent signal is greater than maximum desirable, the warrants are not met for a signalized crossing and therefore signals are not recommended at this time. Recommend monitoring this location for an Intersection Pedestrian Signal (IPS) in the future, similar to that recently installed on Cawthra Road at Breckenridge. Undertake pedestrian counts annually going forward, including any pedestrian crossings immediately north and south of intersection. Counts are to accurately capture pedestrians delayed > 10 sec, assisted versus unassisted users, etc.

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision

GO TO Justification:

What are the intersecting roadways? CAWTHRA ROAD - NEEDHAM LANE INTERSECTION

What is the direction of the Main Road street? North-South

When was the data collected? EXISTING (2014-04-14)

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 2 or more

b.- Number of lanes on the Minor Road? 1

c.- How many approaches? 4

d.- What is the operating environment? Urban **Population >= 10,000 AND Speed < 70 km/hr**

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Northbound Approach			Minor Eastbound Approach			Main Southbound Approach			Minor Westbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
8:00	15	1130	8	11	0	12	8	1431	29	10	0	5	9
9:00	20	1251	13	7	0	8	9	1545	31	11	0	5	13
12:00	19	834	15	33	0	24	6	850	36	14	0	10	3
13:00	26	967	15	29	0	30	10	932	28	9	0	15	4
14:00	27	960	13	27	0	37	3	949	29	14	1	6	8
16:00	27	1341	7	31	0	28	4	1253	24	3	0	7	15
17:00	21	1322	3	32	0	46	6	1517	27	5	0	11	21
18:00	16	1310	1	28	0	30	0	1342	25	3	1	8	8
Total	**171**	**9,115**	**75**	**198**	**0**	**215**	**46**	**9,819**	**229**	**69**	**2**	**67**	**81**

Justification 5: Collision Experience

Preceding Months	Number of Collisions*
1-12	0
13-24	4
25-36	0

* Include only collisions that are susceptable to correction through the installation of traffic signal control

Justification 6: Pedestrian Volume

a.- Please fill in table below summarizing total pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	16	65	0	0	0	0	0	0	
Factored 8 hour pedestrian volume	97		0		0		0		
% Assigned to crossing rate	100%		50%		0%		0%		
Net 8 Hour Pedestrian Volume at Crossing									97
Net 8 Hour Vehicular Volume on Street Being Crossed									19,455

b.- Please fill in table below summarizing delay to pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	16	65	0	0	0	0	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds	16	65	0	0	0	0	0	0	
Factored volume of total pedestrians	97		0		0		0		
Factored volume of delayed pedestrians	97		0		0		0		
% Assigned to Crossing Rate	100%		50%		0%		0%		
Net 8 Hour Volume of Total Pedestrians									97
Net 8 Hour Volume of Delayed Pedestrians									97

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: CAWTHRA ROAD - NEEDHAM LANE INTERSECTION   Count Date: EXISTING (2014-04-14)

Justification 1: Minimum Vehicle Volumes

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00		
1A	480	720	600	900	2,659	2,900	1,841	2,061	2,066	2,725	2,990	2,764		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
1B	120	170	120	170	38	31	81	83	85	69	94	70		
	COMPLIANCE %				22	18	48	49	50	41	55	41	324	41

Restricted Flow Signal Justification 1:			
	Both 1A and 1B 100% Fulfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 1A or 1B at least 80% fulfilled each of 8 hours	Yes ☐	No ☑

Justification 2: Delay to Cross Traffic

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00		
2A	480	720	600	900	2,621	2,869	1,760	1,978	1,981	2,656	2,896	2,694		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
2B	50	75	50	75	30	31	50	42	50	49	58	40		
	COMPLIANCE %				40	41	67	56	67	65	77	53	467	58

Restricted Flow Signal Justification 2:			
	Both 2A and 2B 100% fulfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 2A or 2B at least 80% fulfilled each of 8 hours	Yes ☐	No ☑

Justification 3: Combination

Combination Justification 1 and 2

Justification Satisfied 80% or More				Two Justifications Satisfied 80% or More	
Justification 1	Minimum Vehicle Volume	YES ☐	NO ☑	YES ☐	NO ☑
Justification 2	Delay Cross Traffic	YES ☐	NO ☑		NOT JUSTIFIED

Justification 4: Four Hour Volume

Justification	Time Period	Total Volume of Both Approaches (Main) X	Heaviest Minor Approach Y (actual)	Required Value Y (warrant threshold)	Average % Compliance	Overall % Compliance
Justification 4	9:00	2,869	16	115	14 %	46 %
	16:00	2,656	59	115	51 %	
	17:00	2,896	78	115	68 %	
	18:00	2,694	58	115	50 %	

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: CAWTHRA ROAD - NEEDHAM LANE INTERSECTION   Count Date: EXISTING (2014-04-14)

Justification 5: Collision Experience

Justification	Preceding Months	% Fulfillment	Overall % Compliance
Justification 5	1-12	0 %	27 %
	13-24	80 %	
	25-36	0 %	

Justification 6: Pedestrian Volume

Pedestrian Volume Analysis

	8 Hour Vehicular Volume V_8	Net 8 Hour Pedestrian Volume				
		< 200	200 - 275	276 - 475	476 - 1000	>1000
Justification 6A	< 1440					
	1440 - 2600					
	2601 - 7000					
	> 7000	Not Justified				

Pedestrian Delay Analysis

	Net Total 8 Hour Volume of Total Pedestrians	Net Total 8 Hour Volume of Delayed Pedestrians		
		< 75	75 - 130	> 130
Justification 6B	< 200		Not Justified	
	200 - 300			
	> 300			

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: CAWTHRA ROAD - NEEDHAM LANE INTERSECTI Count Date: EXISTING (2014-04-14)

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	100	%	☐	☑
	B	Crossing Volume	41	%		
2. Delay to Cross Traffic	A	Main Road	100	%	☐	☑
	B	Crossing Road	58	%		
3. Combination	A	Justificaton 1	41	%	☐	☑
	B	Justification 2	58	%		
4. 4-Hr Volume			46	%	☐	☑

5. Collision Experience			27	%	☐	☑

6. Pedestrians	A	Volume	Justification not met	☐	☑
	B	Delay	Justification not met		

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision | GO TO Justification:

What are the intersecting roadways? CAWTHRA ROAD - NEEDHAM LANE INTERSECTION

What is the direction of the Main Road street? North-South

When was the data collected? 2031 Horizon (Existing x 1.141)

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 2 or more

b.- Number of lanes on the Minor Road? 1

c.- How many approaches? 4

d.- What is the operating environment? Urban **Population >= 10,000 AND Speed < 70 km/hr**

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Northbound Approach			Minor Eastbound Approach			Main Southbound Approach			Minor Westbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
8:00	15	1289	8	11	0	12	8	1633	29	10	0	5	9
9:00	20	1427	13	7	0	8	9	1763	31	11	0	5	13
12:00	19	951	15	33	0	24	6	970	36	14	0	10	3
13:00	26	1103	15	29	0	30	10	1063	28	9	0	15	4
14:00	27	1095	13	27	0	37	3	1083	29	14	1	6	8
16:00	27	1530	7	31	0	28	4	1430	24	3	0	7	15
17:00	21	1508	3	32	0	46	6	1731	27	5	0	11	21
18:00	16	1495	1	28	0	30	0	1531	25	3	1	8	8
Total	**171**	**10,398**	**75**	**198**	**0**	**215**	**46**	**11,204**	**229**	**69**	**2**	**67**	**81**

Justification 5: Collision Experience

Preceding Months	Number of Collisions*
1-12	0
13-24	0
25-36	0

* Include only collisions that are susceptable to correction through the installation of traffic signal control

Justification 6: Pedestrian Volume

a.- Please fill in table below summarizing total pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	16	65	0	0	0	0	0	0	
Factored 8 hour pedestrian volume	97		0		0		0		
% Assigned to crossing rate	100%		50%		0%		0%		
Net 8 Hour Pedestrian Volume at Crossing									97
Net 8 Hour Vehicular Volume on Street Being Crossed									22,123

b.- Please fill in table below summarizing delay to pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	16	65	0	0	0	0	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds	16	65	0	0	0	0	0	0	
Factored volume of total pedestrians	97		0		0		0		
Factored volume of delayed pedestrians	97		0		0		0		
% Assigned to Crossing Rate	100%		50%		0%		0%		
Net 8 Hour Volume of Total Pedestrians									97
Net 8 Hour Volume of Delayed Pedestrians									97

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: CAWTHRA ROAD - NEEDHAM LANE INTERSECTION   Count Date: 2031 Horizon (Existing x 1.141)

Justification 1: Minimum Vehicle Volumes

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00		
1A	480	720	600	900	3,020	3,294	2,078	2,328	2,335	3,091	3,390	3,138		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
1B	120	170	120	170	38	31	81	83	85	69	94	70		
	COMPLIANCE %				22	18	48	49	50	41	55	41	324	41

Restricted Flow Signal Justification 1:			
	Both 1A and 1B 100% Fulfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 1A or 1B at least 80% fulfilled each of 8 hours	Yes ☐	No ☑

Justification 2: Delay to Cross Traffic

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00		
2A	480	720	600	900	2,982	3,263	1,997	2,245	2,250	3,022	3,296	3,068		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
2B	50	75	50	75	30	31	50	42	50	49	58	40		
	COMPLIANCE %				40	41	67	56	67	65	77	53	467	58

Restricted Flow Signal Justification 2:			
	Both 2A and 2B 100% fulfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 2A or 2B at least 80% fulfilled each of 8 hours	Yes ☐	No ☑

Justification 3: Combination

Combination Justification 1 and 2

Justification Satisfied 80% or More				Two Justifications Satisfied 80% or More	
Justification 1	Minimum Vehicle Volume	YES ☐	NO ☑	YES ☐	NO ☑
Justification 2	Delay Cross Traffic	YES ☐	NO ☑		NOT JUSTIFIED

Justification 4: Four Hour Volume

Justification	Time Period	Total Volume of Both Approaches (Main) X	Heaviest Minor Approach Y (actual)	Required Value Y (warrant threshold)	Average % Compliance	Overall % Compliance
Justification 4	9:00	3,263	16	115	14 %	46 %
	16:00	3,022	59	115	51 %	
	17:00	3,296	78	115	68 %	
	18:00	3,068	58	115	50 %	

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: CAWTHRA ROAD - NEEDHAM LANE INTERSECTION   Count Date: 2031 Horizon (Existing x 1.141)

Justification 5: Collision Experience

Justification	Preceding Months	% Fulfillment	Overall % Compliance
Justification 5	1-12	0 %	0 %
	13-24	0 %	
	25-36	0 %	

Justification 6: Pedestrian Volume

Pedestrian Volume Analysis

8 Hour Vehicular Volume V_8		Net 8 Hour Pedestrian Volume				
		< 200	200 - 275	276 - 475	476 - 1000	>1000
Justification 6A	< 1440					
	1440 - 2600					
	2601 - 7000					
	> 7000	Not Justified				

Pedestrian Delay Analysis

Net Total 8 Hour Volume of Total Pedestrians		Net Total 8 Hour Volume of Delayed Pedestrians		
		< 75	75 - 130	> 130
Justification 6B	< 200		Not Justified	
	200 - 300			
	> 300			

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: CAWTHRA ROAD - NEEDHAM LANE INTERSECTI Count Date: 2031 Horizon (Existing x 1.141)

Summary Results

Justification			Compliance	Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	100 %	☐	☑
	B	Crossing Volume	41 %		
2. Delay to Cross Traffic	A	Main Road	100 %	☐	☑
	B	Crossing Road	58 %		
3. Combination	A	Justificaton 1	41 %	☐	☑
	B	Justification 2	58 %		
4. 4-Hr Volume			46 %	☐	☑

5. Collision Experience	0 %	☐	☑

6. Pedestrians	A	Volume	Justification not met	☐	☑
	B	Delay	Justification not met		

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision

GO TO Justification:

What are the intersecting roadways? CAWTHRA ROAD - ORWELL AVE INTERSECTION

What is the direction of the Main Road street? North-South

When was the data collected? 2031 Horizon 2031 Horizon

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 2 or more

b.- Number of lanes on the Minor Road? 1

c.- How many approaches? 3

d.- What is the operating environment? Urban **Population >= 10,000 AND Speed < 70 km/hr**

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Northbound Approach			Minor Eastbound Approach			Main Southbound Approach			Minor Westbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
7:00	29	1037	0	27	0	45	0	1143	29	0	0	0	
8:00	14	1187	0	6	0	26	0	1464	32	0	0	0	
9:00	18	1510	0	22	0	31	0	1643	52	0	0	0	
10:00	24	1115	0	18	0	48	0	1140	27	0	0	0	
15:00	28	1130	0	19	0	48	0	1094	34	0	0	0	
16:00	36	1524	0	28	0	51	0	1499	25	0	0	0	
17:00	21	1506	0	14	0	54	0	1767	20	0	0	0	
18:00	13	1440	0	10	0	44	0	1924	20	0	0	0	
Total	**183**	**10,449**	**0**	**144**	**0**	**347**	**0**	**11,674**	**239**	**0**	**0**	**0**	**0**

Justification 5: Collision Experience

Preceding Months	Number of Collisions*
1-12	0
13-24	0
25-36	0

* Include only collisions that are susceptable to correction through the installation of traffic signal control

Justification 6: Pedestrian Volume

a.- Please fill in table below summarizing total pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	0	0	0	0	0	0	0	0	
Factored 8 hour pedestrian volume	0		0		0		0		
% Assigned to crossing rate	100%		50%		0%		0%		
Net 8 Hour Pedestrian Volume at Crossing									0
Net 8 Hour Vehicular Volume on Street Being Crossed									0

b.- Please fill in table below summarizing delay to pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	0	0	0	0	0	0	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds	0	0	0	0	0	0	0	0	
Factored volume of total pedestrians	0		0		0		0		
Factored volume of delayed pedestrians	0		0		0		0		
% Assigned to Crossing Rate	100%		50%		0%		0%		
Net 8 Hour Volume of Total Pedestrians									0
Net 8 Hour Volume of Delayed Pedestrians									0

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: CAWTHRA ROAD - ORWELL AVE INTERSECTION   Count Date: 2031 Horizon

Justification 1: Minimum Vehicle Volumes

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	7:00	8:00	9:00	10:00	15:00	16:00	17:00	18:00		
1A	480	720	600	900	2,310	2,729	3,276	2,372	2,353	3,163	3,382	3,451		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
1B	180	255	180	255	72	32	53	66	67	79	68	54		
	COMPLIANCE %				28	13	21	26	26	31	27	21	193	24

Restricted Flow Signal Justification 1:			
	Both 1A and 1B 100% Fulfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 1A or 1B at least 80% fulfilled each of 8 hours	Yes ☐	No ☑

Justification 2: Delay to Cross Traffic

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	7:00	8:00	9:00	10:00	15:00	16:00	17:00	18:00		
2A	480	720	600	900	2,238	2,697	3,223	2,306	2,286	3,084	3,314	3,397		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
2B	50	75	50	75	27	6	22	18	19	28	14	10		
	COMPLIANCE %				36	8	29	24	25	37	19	13	192	24

Restricted Flow Signal Justification 2:			
	Both 2A and 2B 100% fulfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 2A or 2B at least 80% fulfilled each of 8 hours	Yes ☐	No ☑

Justification 3: Combination

Combination Justification 1 and 2

Justification Satisfied 80% or More				Two Justifications Satisfied 80% or More	
Justification 1	Minimum Vehicle Volume	YES ☐	NO ☑	YES ☐	NO ☑
Justification 2	Delay Cross Traffic	YES ☐	NO ☑		NOT JUSTIFIED

Justification 4: Four Hour Volume

Justification	Time Period	Total Volume of Both Approaches (Main) X	Heaviest Minor Approach Y (actual)	Required Value Y (warrant threshold)	Average % Compliance	Overall % Compliance
Justification 4	9:00	3,223	53	115	46 %	55 %
	16:00	3,084	79	115	69 %	
	17:00	3,314	68	115	59 %	
	18:00	3,397	54	115	47 %	

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: CAWTHRA ROAD - ORWELL AVE INTERSECTION   Count Date: 2031 Horizon

Justification 5: Collision Experience

Justification	Preceding Months	% Fulfillment	Overall % Compliance
Justification 5	1-12	0 %	0 %
	13-24	0 %	
	25-36	0 %	

Justification 6: Pedestrian Volume

Pedestrian Volume Analysis

8 Hour Vehicular Volume V_8		Net 8 Hour Pedestrian Volume				
		< 200	200 - 275	276 - 475	476 - 1000	>1000
Justification 6A	< 1440					
	1440 - 2600					
	2601 - 7000	Not Justified				
	> 7000					

Pedestrian Delay Analysis

Net Total 8 Hour Volume of Total Pedestrians		Net Total 8 Hour Volume of Delayed Pedestrians		
		< 75	75 - 130	> 130
Justification 6B	< 200	Not Justified		
	200 - 300			
	> 300			

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision | GO TO Justification:

Intersection: CAWTHRA ROAD - ORWELL AVE INTERSECTION Count Date: 2031 Horizon

Summary Results

Justification			Compliance	Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	100 %	☐	☑
	B	Crossing Volume	24 %		
2. Delay to Cross Traffic	A	Main Road	100 %	☐	☑
	B	Crossing Road	24 %		
3. Combination	A	Justificaton 1	24 %	☐	☑
	B	Justification 2	24 %		
4. 4-Hr Volume			55 %	☐	☑

5. Collision Experience			0 %	☐	☑

6. Pedestrians	A	Volume	Justification not met	☐	☑
	B	Delay	Justification not met		

Assessment of Pedestrian Crossing at Cawthra Road – Santee Gate Intersection

Traffic Signal Options:

Type 1 - Full Intersection Signals
Type 2 - Intersection Pedestrian Signal (IPS)
Type 3 - Pedestrian Crossovers (PXO) - not appropriate where AADT > 35,000

Input Data

Intersection Turning Movement Counts*:*

- 2015 Turing Movements (2015-05-12)

Corridor Demands:

- 2015 ADT along Cawthra Road at Needham Lane = 35,353 vehicles/day

Collison Experience:

- 6 collisions (5 years 2008 – 2012, including 2- 2008, 0- 2009, 2- 2010, 0- 2011, and 2- 2012)
- For analysis, assume 4 collisions (potentially corrected through signals) over 3 years

8 Hour Pedestrian Crossing Volume:

- Year 2015 TM Counts = No pedestrians recorded crossing Cawtha Road

Results of Warrant Assessment (see attached excel sheet output):

Warrant 1 - Minimum Vehicular Volume = 12%
Warrant 2 - Delay to Cross Traffic = 7%
Warrant 3 - Volume/ Delay Combination = Not Justified
Warrant 4 - Minimum Four Hour Vehicle Volume = 20%
Warrant 5 - Collision Experience = 27%
Warrant 6A - Pedestrian Crossing Volume = Not Justified
Warrant 6B - Pedestrian Crossing Delay = Not Justified

References:
OTM Book 12 Traffic Signals (Section 4.9)
OTM Book 15 Pedestrian Crossing Treatments (Section 5)

Conclusions:

- Does not meet warrants for full traffic signals or IPS
- Signal not required for purposes of 'pedestrian system connectivity'
- Alternative crossing opportunity:
  - Closest signalized crossing is Bloor Intersection located 315m to the north
  - Silver Creek signalized crossing is located 375m to the south

Recommendation:

Signals are not recommended. The distance to the adjacent signal is within 400m.

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision

GO TO Justification:

What are the intersecting roadways? CAWTHRA ROAD - SANTEE GATE INTERSECTION

What is the direction of the Main Road street? North-South

When was the data collected? EXISTING (2015-05-12)

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 2 or more

b.- Number of lanes on the Minor Road? 1

c.- How many approaches? 4

d.- What is the operating environment? Urban **Population >= 10,000 AND Speed < 70 km/hr**

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Northbound Approach			Minor Eastbound Approach			Main Southbound Approach			Minor Westbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
8:00	11	1251	0	5	0	19	0	1658	4	0	0	0	0
9:00	17	1397	0	9	0	24	0	1703	6	0	0	0	0
12:00	19	930	0	3	0	14	0	1163	2	0	0	0	0
13:00	24	1132	0	5	0	18	0	1182	7	0	0	0	0
14:00	19	1084	0	7	0	13	0	1003	21	0	0	0	0
16:00	42	1396	0	6	0	10	0	1375	15	0	0	0	0
17:00	37	1401	0	4	0	15	0	1678	19	0	0	0	0
18:00	39	1373	0	4	0	11	0	1683	20	0	0	0	0
Total	**208**	**9,964**	**0**	**43**	**0**	**124**	**0**	**11,445**	**94**	**0**	**0**	**0**	**0**

Justification 5: Collision Experience

Preceding Months	Number of Collisions*
1-12	2
13-24	0
25-36	2

* Include only collisions that are susceptable to correction through the installation of traffic signal control

Justification 6: Pedestrian Volume

a.- Please fill in table below summarizing total pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	0	0	0	0	0	0	0	0	
Factored 8 hour pedestrian volume	0		0		0		0		
% Assigned to crossing rate	100%		50%		0%		0%		
Net 8 Hour Pedestrian Volume at Crossing									0
Net 8 Hour Vehicular Volume on Street Being Crossed									21,711

b.- Please fill in table below summarizing delay to pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	0	0	0	0	0	0	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds	0	0	0	0	0	0	0	0	
Factored volume of total pedestrians	0		0		0		0		
Factored volume of delayed pedestrians	0		0		0		0		
% Assigned to Crossing Rate	100%		50%		0%		0%		
Net 8 Hour Volume of Total Pedestrians									0
Net 8 Hour Volume of Delayed Pedestrians									0

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: CAWTHRA ROAD - SANTEE GATE INTERSECTION Count Date: EXISTING (2015-05-12)

Justification 1: Minimum Vehicle Volumes

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00		
1A	480	720	600	900	2,948	3,156	2,131	2,368	2,147	2,844	3,154	3,130		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
1B	120	170	120	170	24	33	17	23	20	16	19	15		
	COMPLIANCE %				14	19	10	14	12	9	11	9	98	12

Restricted Flow Signal Justification 1:			
	Both 1A and 1B 100% Fulfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 1A or 1B at least 80% fulfilled each of 8 hours	Yes ☐	No ☑

Justification 2: Delay to Cross Traffic

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00		
2A	480	720	600	900	2,924	3,123	2,114	2,345	2,127	2,828	3,135	3,115		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
2B	50	75	50	75	5	9	3	5	7	6	4	4		
	COMPLIANCE %				7	12	4	7	9	8	5	5	57	7

Restricted Flow Signal Justification 2:			
	Both 2A and 2B 100% fulfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 2A or 2B at least 80% fulfilled each of 8 hours	Yes ☐	No ☑

Justification 3: Combination

Combination Justification 1 and 2

Justification Satisfied 80% or More				Two Justifications Satisfied 80% or More	
Justification 1	Minimum Vehicle Volume	YES ☐	NO ☑	YES ☐	NO ☑
Justification 2	Delay Cross Traffic	YES ☐	NO ☑		NOT JUSTIFIED

Justification 4: Four Hour Volume

Justification	Time Period	Total Volume of Both Approaches (Main) X	Heaviest Minor Approach Y (actual)	Required Value Y (warrant threshold)	Average % Compliance	Overall % Compliance
Justification 4	8:00	2,924	24	115	21 %	20 %
	9:00	3,123	33	115	29 %	
	17:00	3,135	19	115	17 %	
	18:00	3,115	15	115	13 %	

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: CAWTHRA ROAD - SANTEE GATE INTERSECTION   Count Date: EXISTING (2015-05-12)

Justification 5: Collision Experience

Justification	Preceding Months	% Fulfillment	Overall % Compliance
Justification 5	1-12	40 %	27 %
	13-24	0 %	
	25-36	40 %	

Justification 6: Pedestrian Volume

Pedestrian Volume Analysis

8 Hour Vehicular Volume V_8		Net 8 Hour Pedestrian Volume				
		< 200	200 - 275	276 - 475	476 - 1000	>1000
Justification 6A	< 1440					
	1440 - 2600					
	2601 - 7000					
	> 7000	Not Justified				

Pedestrian Delay Analysis

Net Total 8 Hour Volume of Total Pedestrians		Net Total 8 Hour Volume of Delayed Pedestrians		
		< 75	75 - 130	> 130
Justification 6B	< 200	Not Justified		
	200 - 300			
	> 300			

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: CAWTHRA ROAD - SANTEE GATE INTERSECTIOI Count Date: EXISTING (2015-05-12)

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	100	%	☐	☑
	B	Crossing Volume	12	%		
2. Delay to Cross Traffic	A	Main Road	100	%	☐	☑
	B	Crossing Road	7	%		
3. Combination	A	Justificaton 1	12	%	☐	☑
	B	Justification 2	7	%		
4. 4-Hr Volume			20	%	☐	☑

5. Collision Experience	27	%	☐	☑

6. Pedestrians	A	Volume	Justification not met	☐	☑
	B	Delay	Justification not met		