TRANSPORTATION PLANNERS AND ENGINEERS

UEL Block F
Transportation Assessment

Final Report

Prepared for

Musqueam Capital Corp.

Date

September 30, 2015

Prepared by

Bunt & Associates

Project No.

4912.01

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EXHIBITS

TABLES

1. INTRODUCTION

In 2008, through settlement agreements with the Province of British Columbia, the Musqueam First Nation acquired free title to a 22 acre parcel referred to as 'Block F' in the University Endowment Lands (UEL) located on the south side of University Boulevard between the existing developments along Acadia Road and the University Golf Course. **Exhibit 1.1** shows the location of the development site.

Extensive master planning and community consultation efforts were undertaken since 2008, and Musqueam submitted a formal rezoning application to develop a mixed-use project on this parcel in December 2013. Since the submission of the rezoning application, UEL has conducted an extensive review of the proposed Master Plan and provided comments to the applicant team. The applicant team have worked closely with UEL and other stakeholders to address the comments that were raised and submitted a revised rezoning application in May 2015.

Bunt & Associates Engineering (B.C) Ltd was commissioned by Musqueam Capital Corp. (Musqueam) to undertake a Transportation Assessment to support the proposed master plan development at Block F. This Final version of the Transportation Assessment report incorporates the latest comments received from UEL and other stakeholders regarding the revised rezoning application.

This report has been set out in the following manner:

- **Section 2** provides a review of the study area travel characteristics, planning policy, as well as neighbouring development plans that influence future travel characteristics in the area;
- **Section 3** examines the existing transportation system, modal splits, and traffic operations in the local network;
- **Section 4** outlines the development contents and specifically the transportation aspects including parking provisions;
- **Section 5** establishes the future vehicle projections in the study street network, taking into consideration of background traffic growth in the area and the development vehicle movements. It also examines the likely trip distribution for the proposed development and assesses the effect of the development traffic on the study street network.

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Exhibit 1.1
Site Location

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2. LOCAL CONTEXT AND POLICY REVIEW

This section provides an overview of the existing infrastructure in the study area as well as an outline of transportation policies and plans relevant to the proposed development site.

2.1 Study Area Travel Characteristics and Infrastructure

2.1.1 Walking

Walking is an everyday activity, whether part of a single-purpose trip or linked with transit and driving. Typically, people are willing to walk up to 15 minutes for certain activities (i.e. work, school, recreation activities) with 400 to 800 metres being typical average distances for such trips (transit, shopping, etc.).

Exhibit 2.1 highlights the various destinations within a comfortable walking distance of the development site and clearly demonstrates that residents, employees and visitors can access a wide range of amenities including commercial/retail services, restaurants, open space, and a hospital.

Bus stops along University Boulevard, Wesbrook Mall and Acadia Road are located within a 500-metre walking distance from the development site, providing convenient transit connections to areas throughout UBC and Vancouver.

Key destinations within close proximity to the site include: UBC Hospital, University Village, University Golf Course, as well as several churches, schools, and daycare centres.

Located in the southeast quadrant of the University Boulevard & Western Parkway intersection are the University Village and University Marketplace developments, which offer a variety of commercial/retail stores and restaurants.

Block permeability is adequate within the vicinity of the site which should further encourage walking as an activity and mode of transportation for the development site. While the street network along Acadia Road is fairly circuitous, it is supplemented with a system of lanes and pathways which help enhance the pedestrian network. As part of the future master plan, a well connected street network will be provided, enhancing pedestrian connections between University Boulevard and Acadia Road.

Decommissioning and redevelopment of the Acadia Park Courts on UBC may have some implications on the pedestrian routes available to/from the development site in the future. However, it is expected that any future redevelopment of Acadia will continue to follow best practices in terms of providing pedestrian accessibility to future residents in the area and adjacent developments.

Sidewalks are provided on various streets nearby the site, with boulevards (buffer strips) also available on many of the streets within the study area. Sidewalks in the area are generally in adequate condition and vary in width from 1.2 m to 1.8 m. Boulevards (buffer strips) in the study area, which provide adequate space for vehicle door swings and create comfortable walking spaces, vary in width from 2.5m to 3.9m.

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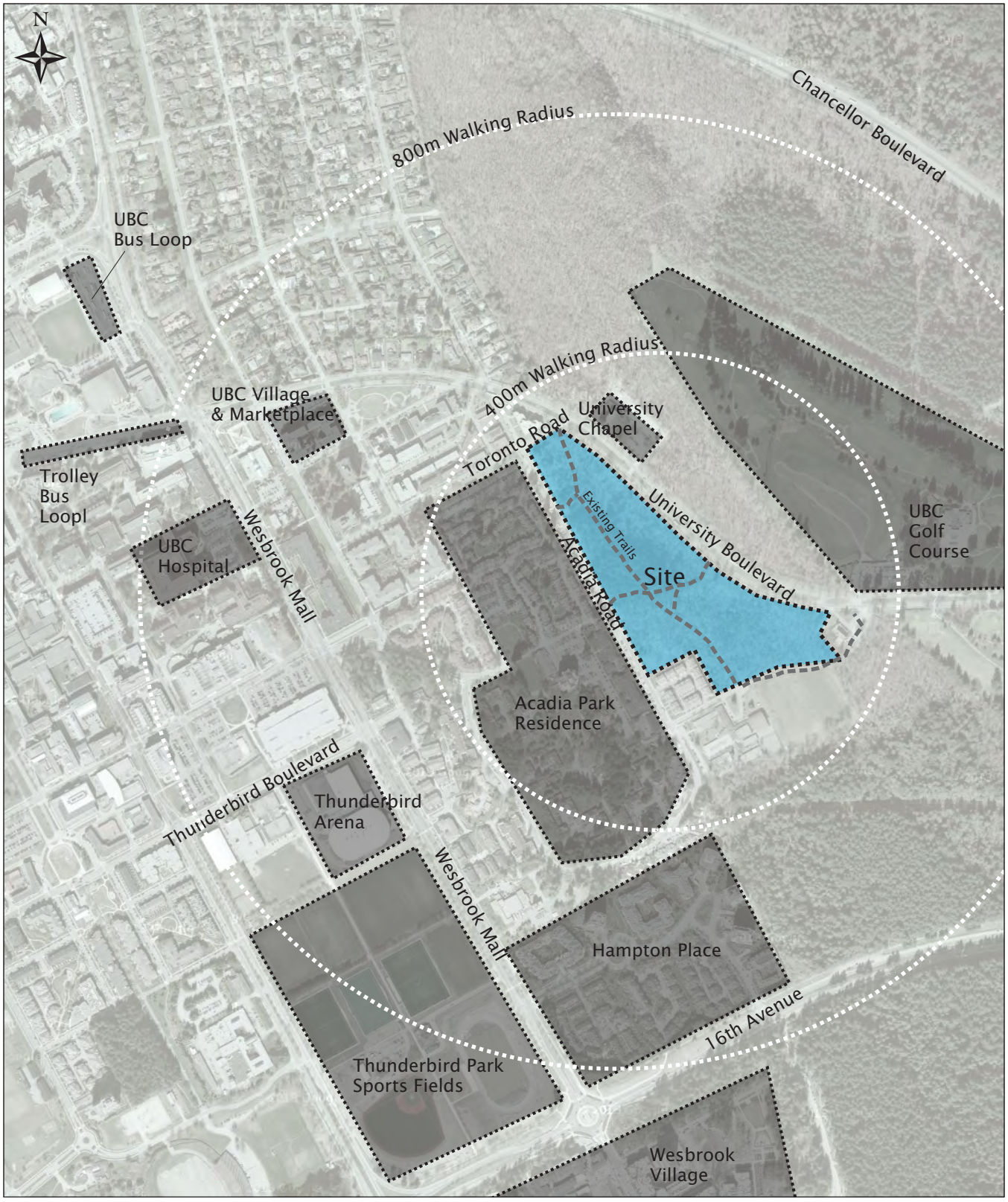

Exhibit 2.1

Existing Walking Destinations

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The exceptions in the neighbourhood are the site fronting sidewalks on Acadia Road and Toronto Road, neither of which have buffers. The lack of buffer space results in door swing from parked vehicles intruding into the pedestrian sidewalk space. As part of the master plan development, sidewalks along the site frontages will be upgraded to provide sufficient buffer space for on-street parking, enhancing the pedestrian walking experience around the perimeter of the Block F site.

Pedestrian crosswalk facilities are located on all legs at the intersections along Acadia Road and Toronto Road, and at other major intersections nearby. In addition, signed and marked crosswalks are located at the intersections along Acadia Road at Toronto Road and Ortona Avenue.

Two trails: Sword Fern Trail (part of Iva Mann Trail) and Fairview Trail, currently bisect the development site. Given the site is located between the northern and southern sections of Pacific Spirit Regional Park, Sword Fern Trail and Fairview Trail serve as important connections to the numerous trails within the park. Connection to these trails will be maintained and enhanced as part of the master plan of Block F.

2.1.2 Cycling

Cyclists can generally travel 3 to 4 times the distance of pedestrians over a similar period of time, suggesting that a 4 to 5 kilometre trip is a reasonable travel distance for cyclists to travel to an activity. Cycling is becoming an increasingly more popular travel mode in Vancouver for work and leisure.

Improvements to cycling infrastructure in the City of Vancouver and UBC are helping make cycling more convenient and safer. While the number of cycling trips at UBC has fluctuated within the last 15 years, recent years have shown a steady increase.

The average cycling speed for commuters is about 15km/h and the average distance per journey is approximately 5km. This equates to about a 20-minute journey on average.

Exhibit 2.2 shows the cycle routes and infrastructure in the context of the development site. The site is well connected with routes on University Boulevard, Acadia Road, Toronto Road, and Fairview Lane/Avenue. University Boulevard provides an east-west link through the university and to Blanca Street, from which various routes connect throughout Vancouver.

Dedicated bike lanes are provided along University Boulevard and along Wesbrook Mall (south of Thunderbird Boulevard). Bikeways along Acadia Road and Toronto Road are shared with traffic. Multi-use trails within Pacific Spirit Regional Park also provide cyclists with connections throughout the park and to Chancellor Boulevard/West 10th Avenue and West 16th Avenue, which serve as major routes to/from Vancouver.

Overall, cycling infrastructure within the vicinity of the site is very good with several key cycling routes in the campus located near the development site. Bicycle facilities can be found throughout the UBC campus, including a bicycle repair shop, 9 bicycle locker locations, 10 bicycle parking facilities, and various shower locations. In addition, bike-share programs are also available for UBC staff and students.

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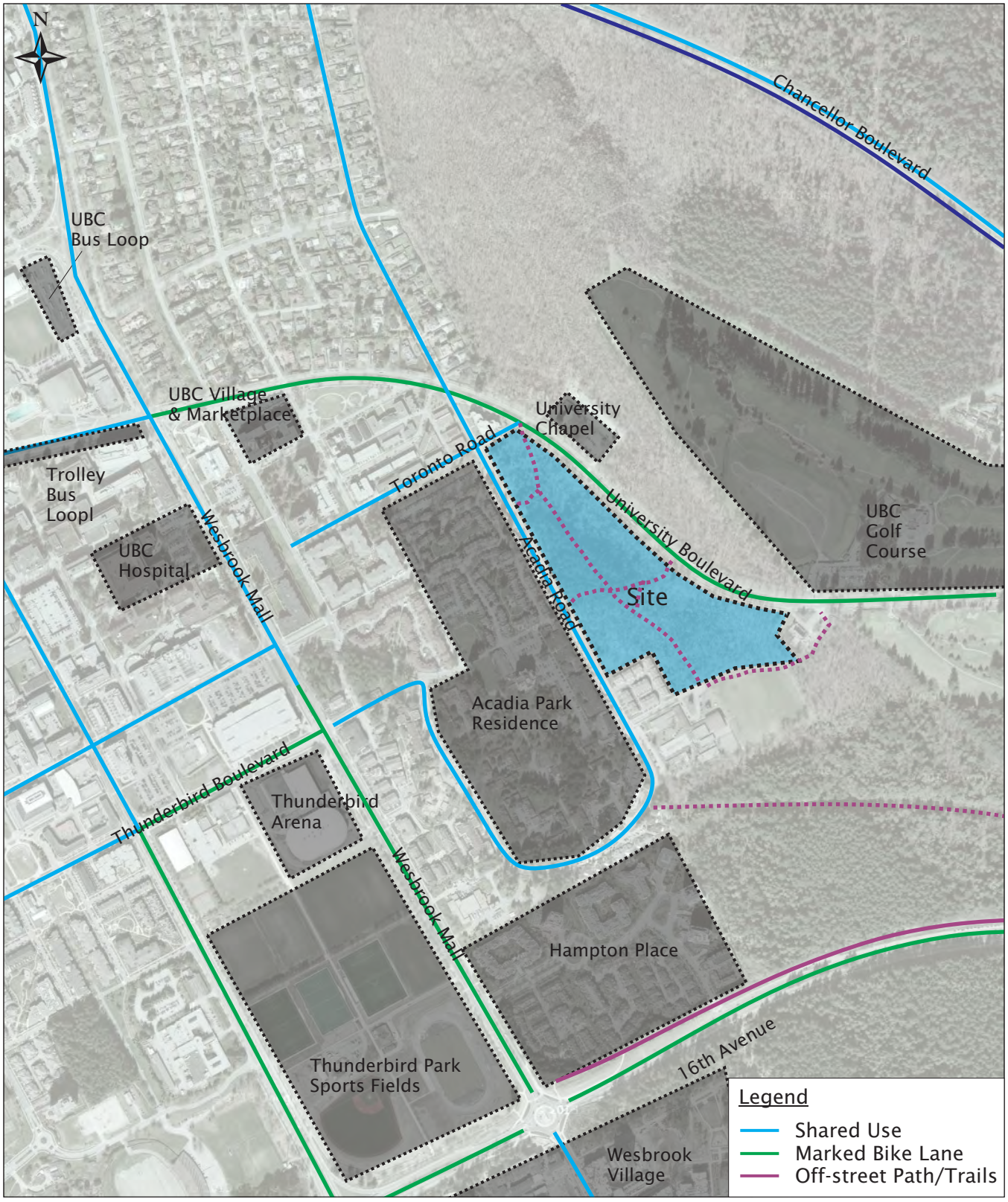

Exhibit 2.2

Existing Cycling Routes and Infrastructure

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2.1.3 Transit

The development site is well served by transit with bus stops located nearby on University Boulevard and Wesbrook Mall. A potential future rapid transit line is also planned for the Broadway corridor via University Boulevard between UBC and the Commercial Drive SkyTrain Station, which would further increase accessibility to the site. This will be discussed in further detail in the policy review section.

There are several bus routes providing a high frequency of transit service near the site, all of which provide connections to UBC and the wider transit network to various key destinations in the Lower Mainland. Bus routes with stops along University Boulevard include: 4, 9, 14, and N17.

Bus stops at the southeast and northwest corners of University Boulevard & Allison Road, 400m from the development site, provide access to the 99 B-Line. The 99 B-Line is an express bus service between UBC and Commercial Drive SkyTrain Station, providing high frequency transit service on one of the busiest transit routes outside of downtown. Bus stops along Wesbrook Mall near the UBC Hospital and Thunderbird Boulevard are within a 550 m walk, about a 7 to 8 minute walk, providing access to the following bus routes: 25, 33, 41, 43, 49, and 480. **Exhibit 2.3** summarizes the transit routes available near the site.

There was a Community Shuttle (Route #C22) that used to run between the UBC Bus Exchange and the residential streets fronting Hampton Place and Acadia Park via Acadia Road. However, the #C22 community shuttle service was replaced by a new route as part of TransLink's bus service optimization effort that was undertaken in late 2012/early 2013. The new route (#C18) now circulates a larger area of the UBC campus and no longer runs along Acadia Road.

It is anticipated that transit services along Acadia Road (near Block F) will be reviewed as the population continues to grow around this area in the future with the build-out of the Master Plan although TransLink advised that there is no future service identified for Acadia Road at this time.

Transit stop amenities (i.e. bus shelters, garbage/recycling bins) are currently not provided at most stops along the University Boulevard corridor. The only bus shelter that is available along University Boulevard is at the eastbound 99-B Line bus stop at Allison Road.

As part of the site Master Plan, a new bus bay is proposed along eastbound University Blvd, which will likely replace an existing bus top stop (ID 50270). The propose bus bay will include the following features:

- Concrete passenger landing area to accommodate accessible passengers;
- ID pole with bus stop ID sign;
- Shelter;
- Concrete bus pad (on roadway); and,
- Waste receptacles.

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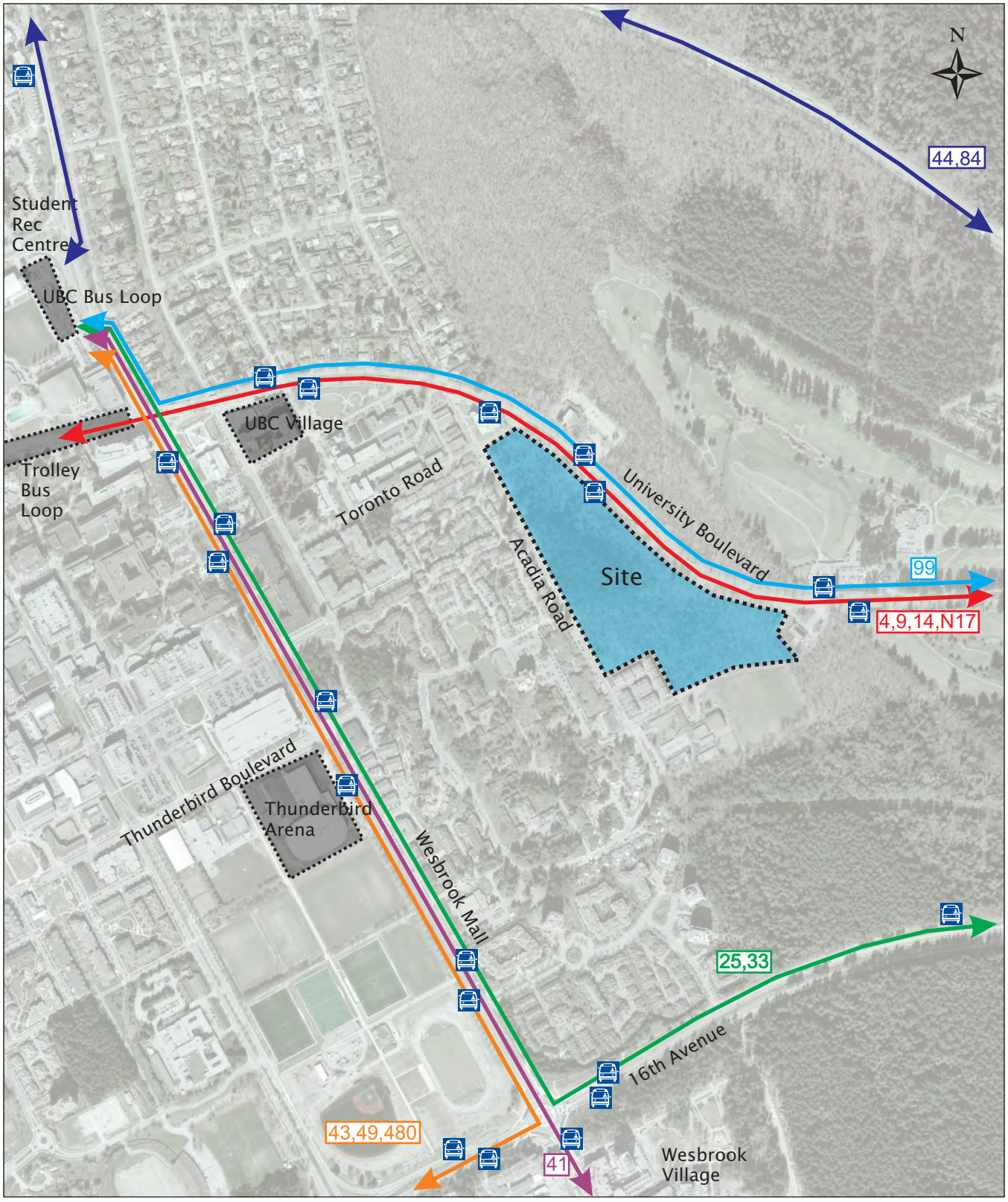

Exhibit 2.3

Transit Routes and Facilities

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2.1.4 Automobile

The existing roadway laning and on-street parking regulations in the study street network adjacent to the development site are shown on **Exhibit 2.4**. A brief description of these streets is provided below, which focuses on their function, design characteristics and intersection controls.

University Boulevard

University Boulevard is a two-lane arterial road with a posted speed limit of 50 km/hr that borders the northeast side of the development site, serving as a major connection between UBC and Vancouver. The two travel lanes are separated by a 10-metre wide grass median that extends from Wesbrook Mall to Blanca Street. Designated as a bicycle route, both sides of University Boulevard have marked bike lanes along the curbs. In addition, parking is restricted on both sides of the road.

Intersections along University Boulevard at Wesbrook Mall and Blanca Street are controlled by traffic signals, while intersections at Allison Road and Arcadia Road are controlled by pedestrian signals. A signed and marked crosswalk is provided to allow pedestrian crossing between the University Golf Course and St. Anselm's Anglican Church.

Acadia Road

Acadia Road is a two-lane local road with a posted speed limit of 50 km/hr that borders the west side of the site, serving as a main access route to the Acadia Park residences. A 30 km/hr speed zone is located near the Norma Rose Point Elementary School. There are numerous residential driveways and lanes that intersect with this road. Several 90-degree parking pockets are also located along the west side of the road, while street parking is currently restricted on the east side.

Signed and marked crosswalks are provided at the intersection with Ortona Road and the four-way stop controlled intersection at Toronto Road.

Toronto Road

Toronto Road is a two-lane local road with a posted speed limit of 50 km/hr that provides an east-west connection between Acadia Road and Western Parkway. Bordering the north side of the development site, this road provides access to several residential lanes and driveways. Toronto Road is a traffic calmed road and parking is only allowed on the south side. Signed and marked crosswalks are provided at the intersection with Western Parkway and the four-way stop controlled intersection at Acadia Road.

Thunderbird Boulevard

Thunderbird Boulevard is a two-lane local road within the UBC Campus. It provides connection between the Acadia Neighbourhood to the east and various campus parkades and buildings to the west. Acadia Road connects to Thunderbird Boulevard via Osoyoo Crescent, which in turn connects to Wesbrook Mall, a main collector within UBC that provides external connections outside of the campus.

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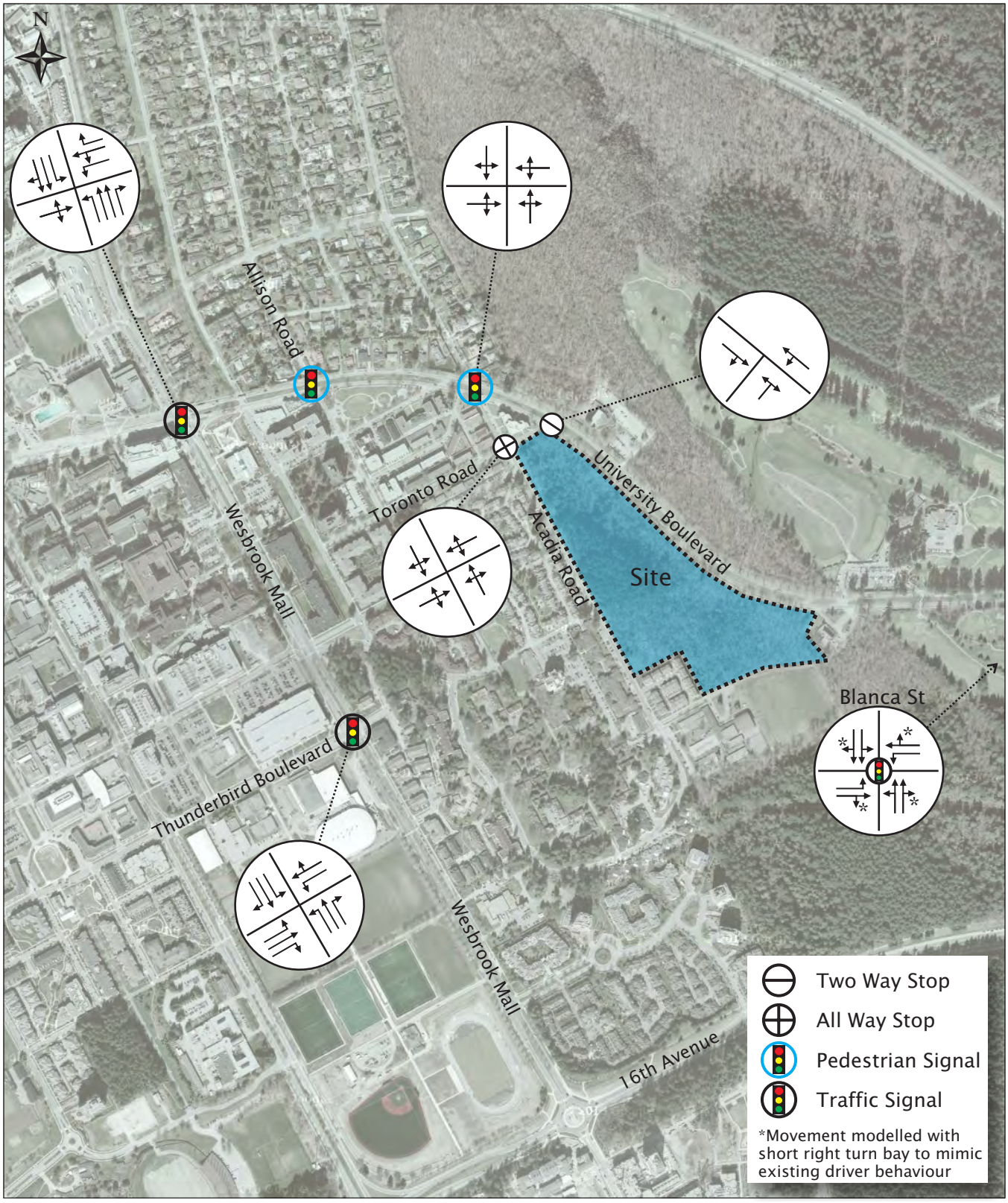

Exhibit 2.4

Existing Lane Configuration and Traffic Control

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2.2 Policy Review

2.2.1 Official Community Plan

The University Endowment Lands Official Community Plan (OCP), adopted in 2005, identifies the key policies and objectives to guide planning and land uses to achieve the community's visions and goals. The OCP was developed through two and a half years of information mail outs, questionnaires, public meetings and open houses, and the OCP continues to evolve as the goals and visions of the community take shape.

In 2008, Block F was included in Area D of the OCP, which is bordered by University Boulevard, Agronomy Road, Toronto Road, and Wesbrook Mall. Topics supporting the development in Block F include:

- Area D shall maintain a village-like atmosphere with a mix of high and low-rise apartments, townhouses, and retail spaces.
- As Area D currently houses higher density mixed-use projects, new developments should help optimize density levels to ensure a human-scaled streetscape environment
- There is continued community support for a grocery store in Area D.
- Area D has the potential for new mixed commercial and multi-family development.

Transportation related topics discussed in the OCP include:

- Implement traffic calming measures as needed to slow speeds, impede inter-arterial shortcutting, and direct non-local traffic to main arterial roads;
- Encourage bicycle use through requiring new multi-family developments to provide a safe, secure and convenient storage area in conjunction with exterior visitor bicycle racks. New commercial developments of significant scale should, in addition to the above requirements, provide change/shower rooms for tenant use.
- Encourage the provincial Ministry of Transportation to install new on-road bicycle lanes on all roads within the UEL under their jurisdiction;
- Through the Ministry of Transportation, University Boulevard shall be maintained as an arterial road designed to support transit and bicycle use; and,
- Maintain a proactive stance and advocate community needs directly to TransLink and UBC.

2.2.2 UBC Vancouver Campus Plan to 2030

The UBC Vancouver Campus Plan to 2030, adopted in 2010, provides the guidelines for growth at the university that "will support UBC's world-class community of scholars with a campus that physically reflects the stature of the university, provides the optimal environment for teaching, learning and research, and encourages a unique community life; and with a campus that is beautiful, functional, sustainable, cost-effective, connected to its neighbours and responsible to future generations."

While the development site does not fall within the campus plan's subject area, there are several topics in the plan that are of relevance to the proposed Master Plan:

- The student population is expected to increase from 37,600 full time equivalent (FTE) students and 6,800 graduate students to 39,700 FTE students and 11,300 graduate students; until 2017, after which it will be capped until 2030.

- Academic and research floor space is expected to increase by 1 million square feet, while student housing floor space is expected to increase by 3.6 million square feet in order to provide accommodation for 50 percent of full-time students.

- Connections to hubs and neighbourhoods throughout the campus via TransLink community shuttles.

2.2.3 UBC Strategic Transportation Plan (2005)

The UBC Strategic Transportation Plan (STP) was approved in 1999 and outlines various policies to address a broad range of transportation subjects. Among the goals of the plan was to reduce automobile traffic, increase transit use and manage travel demands. An update of the document was completed in 2005 to quantify the consequences of the plan. Some of the key policies and topics outlined in the report include:

- Numerous transportation initiatives (i.e. U-Pass program, carpool programs, various bicycle facilities, and reduced parking supply) were implemented, resulting in all but one of the goals being achieved: reduce single occupancy vehicle (SOV) trips by 20% from 1997 levels.

- Automobile usage goals were revised to be based on trips per person. SOV trips per person has seen a 22% decrease since 1997, the university aims to reach a 30% reduction.

- UBC and TransLink have plans to provide Community Shuttle service covering the entire campus.

- Increase the provision of bicycle lanes and end-of-trip facilities (i.e. bike storage, lockers and showers).

- Improve safety at crossings through implementation of raised crosswalks, lighting, and audible and tactile indicators.

- Manage the commuter and residential parking supply and parking prices.

- Minimize and disperse heavy truck traffic travelling to/from UBC.

2.2.4 Transportation Status Report (2013)

The Transportation Status Report is an annual report that compiles all of the findings from annual data collection programs conducted at UBC. These data collection programs vary from speed counts to screen-line and intersection traffic counts. The report provides an understanding of the year-to-year travel trends and progress of achieving the university's transportation goals and strategies. Key findings that provide context to the Block F development site include:

- Daytime population (including students, staff, and faculty members) at UBC has steadily increased from 42,300 in 1997 to 64,000 in 2013, representing a 51% increase over 15 years.

- A variety of changes at UBC have significantly increased transit ridership such as introduction of the U-pass program, increased transit service, decreased parking supply and increased parking costs. Transit trips have quadrupled in the last 16 years and now represent approximately 60% of all trips to and from UBC.

- Despite the considerable population growth and steady increase in person trips at UBC, automobile trips (single occupancy vehicle and carpool trips) have decreased by 21%, achieving the goal to not exceed daily automobile traffic in 1997as set out in the STP.

- SOV trips per person have decreased 46% since 1997, exceeding the STP goal of 30%.

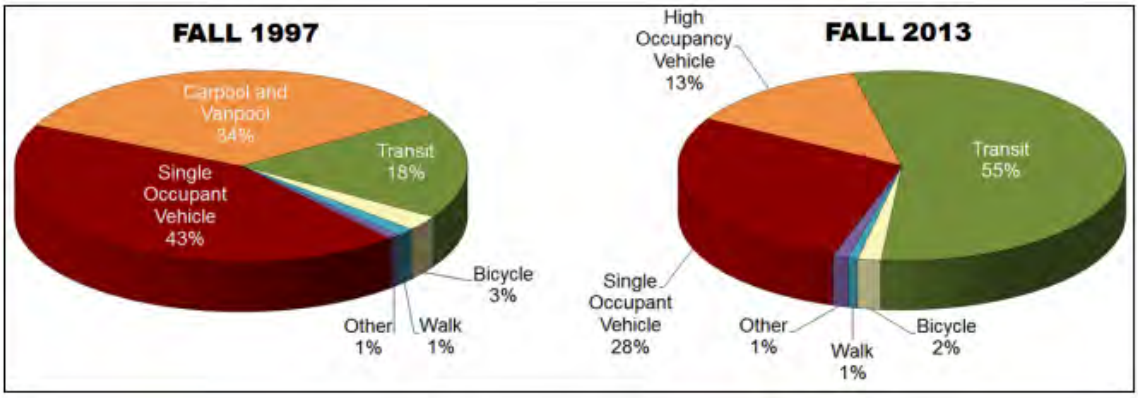
- Pedestrian and bicycle trips have decreased 38% and 34% since 1997, respectively, but have marginally fluctuated in the last 5 years.

- A total of 234 bicycles were observed on buses in one day out of an available 4,214 racks on buses. This is an increase from 2012 when there were 201 bicycles counted and a capacity of 4,162. The most popular route for cyclists to travel with their bicycles was the 99 B-Line, followed by the 84 and 44 routes.

With the provision of various Transportation Demand Management programs (U-Pass, employer pass programs, bike-share and car-share programs) and end-of-trip cyclist facilities, UBC has seen a major shift from auto trips to transit trips.

Exhibit 2.5 shows a significant shift in auto trips to transit trips since the introduction of the U-Pass in 1997.

Exhibit 2.5: Mode Split



Source: UBC Transportation Planning

2.2.5 UBC Line

The UBC Line is a potential rapid transit line along the Broadway corridor connecting UBC with Central Broadway, and other rapid transit lines in Vancouver. The UBC line is being considered because of the continued growth occurring along the Broadway regional corridor and the increasing number of students enrolling at UBC. Due to this growth, the existing bus transit service is reaching its capacity. Major stakeholder groups (TransLink, the Province, the City of Vancouver, UBC, University Endowment Lands, and Metro Vancouver) are working on a technical study to determine the transportation technology and alignment of this potential new rapid transit line. The transportation technology for the UBC Line has not yet been decided at this stage. Alternatives that are under considerations include, Bus Rapid Transit (BRT), Light Rail Transit (LRT), and Rail Rapid Transit (RRT).

The potential location of a rapid transit line within close proximity to the development site in the future makes this site highly accessible by transit to all areas throughout the Lower Mainland. While the design for the UBC Line has not yet been determined, all seven alternatives currently being considered indicate that UBC Line would run along Broadway / University Boulevard. Five of the alternatives consider a potential station directly across from the development site.

The UBC Line is still in the planning stages and a timeline for construction and completion has not yet been determined. The recent Mayor's Council *Regional Transportation Investment Plan* proposes that, if approved, the SkyTrain Millennium Line would extend from VCC-Clark to Arbutus Street along the Broadway corridor to serve current and future demand in the next decade. Therefore, it is likely that any rapid transit extension to UBC would be post-2025.

3. EXISTING CONDITIONS

Currently, the site consists of forested vacant land bounded by Acadia Road to the west, University Boulevard to the east and Toronto Road to the north. A number of multi-use trails traverse the site providing connections for pedestrians and cyclists.

The surrounding neighbourhood is comprised primarily of residential and institutional developments along Acadia Road and some retail, restaurant and institutional uses along University Boulevard to the west.

3.1 Study Area

Table 3.1 indicates the intersections that are included in the study area along with their control types.

Table 3.1: Study Area Intersections

Intersection	Control
University Boulevard & Arcadia Road	Pedestrian/Bike-Actuated Signal
University Boulevard & Toronto Road	Stop control on Toronto Road
Acadia Road & Toronto Road	Four-way stop control
University Boulevard & Wesbrook Boulevard	Signal
University Boulevard & Blanca Street	Signal
Wesbrook Boulevard & Thunderbird Boulevard	Signal

The intersection of Wesbrook Boulevard & Thunderbird Boulevard is included given the connection to the site via Acadia Road.

Traffic surveys were conducted in March of 2011 and 2013 and were used to determine existing traffic movements in the area during the morning (7am to 9am) and afternoon (3pm to 6pm) peak periods. The observed morning and afternoon peak hour traffic volumes are summarized in **Exhibit 3.1**.

3.2 Mode Split

The University of British Columbia published mode split data in their *Fall 2011 Transportation Status Report*. Screenline data from 1997 to 2013 was presented. This data measures mode split for all trips to and from the university and is helpful in relation to the expected mode split of our site. Mode splits presented in *Figure 2.3* of the *UBC Fall 2013 Transportation Status Report* are summarized in **Table 3.2**.

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AM (PM) - Volumes (Rounded to nearest 5)

Exhibit 3.1

Existing Peak Hour Vehicle Volumes

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Table 3.2: Weekday Mode Split

Trip Mode	1997 UBC	2013 UBC
Transit	18%	55%
Single Occupant Vehicle	43%	28%
Carpool and Vanpool	34%	14%
Bicycle	3%	1%
Walk	1%	1%
Other	1%	1%
Total	100%	100%

The large change in transit users is largely in part to the introduction of the U-pass. However, in both 1997 and 2013, single occupancy vehicles represent less than 50% of the trips. Statistics Canada identifies Metro Vancouver's journey to work mode split as approximately 60% single occupancy vehicle based on 2006 census data, down slightly from 1996. The university area experiences a higher number of alternative mode trips than the Metro Vancouver average. The proposed land uses for Block F are not identical to that of the university, but will be similar and complementary in some cases. It is expected that the site will experience a lower number of vehicle trips than similar developments elsewhere in the lower mainland.

3.3 Norma Rose Point Elementary School

The new Norma Rose Point elementary school at 5488 Ortona Road opened its doors in September 2014 with instruction for grades K-8 and a planned eventual student population of 920 students. The student enrollment at present is approximately 500 students. The two access routes for vehicle traffic heading toward and away from the school are Acadia Road (with connection to University Boulevard via Toronto Road) and Osoyoos Crescent which connects to Thunderbird Boulevard.

The new school features pick-up/drop-off parking in parking lots located directly adjacent the Osoyoos Crescent frontage and also off Ortona Road. Pick-up/drop-off activity also occurs on street along Osoyoos Crescent and Acadia Road.

Classes begin at 8:40am for the Grade 6 to 8 students, and at 8:55am for Kindergarten to Grade 5 students. Dismissal time for all grades is at 3:00pm.

Expected vehicle movements from the Norma Rose Point Elementary at full occupancy are taken into consideration in forming the background vehicle flows for the future conditions, which are discussed in further details in Section 5.2 of the report.

3.4 Peak Hour Selection

The time of the AM and PM Peak hours were considered for this site. University Boulevard, Norma Rose Point Elementary, and the site are expected to have overlapping AM Peak Hours.

However, the Norma Rose Point Elementary school does have a different peak traffic activity period in the PM, and therefore may impact the selection of the street network peak-hour period for the PM. The PM peak hour for University Boulevard is approximately 1,050 trips (650 Eastbound, 400 Westbound) between 4:30pm and 5:30pm. The school is anticipated to have a PM peak hour between 2:45pm and 3:45pm, with approximately 175 trips (165 Eastbound and 10 Westbound) adding onto University Boulevard. Vehicle volumes along University Boulevard at the school peak-hour period are just under 1,000 trips (600 Eastbound, 400 Westbound).

The peak-hour volumes on University Boulevard at 2:45pm and 4:30pm peak hour are very close to each other, with the volumes at 2:45pm being 50 vehicles higher. However, the PM peak-hour for the site land uses is expected to be consistent with the University Boulevard PM peak-hour at 4:30pm to 5:30pm. The site volume is expected to have a larger impact on the road network and therefore the PM Peak-hour of 4:30pm to 5:30pm was selected.

3.5 Peak Hour Factor

The peak hour factor for the collected data was analysed to better approximate the existing peak hour traffic conditions. The peak hour factors for the study area during the AM peak-hour were approximately 0.80 to 0.85. This indicates a slightly higher concentration of peak 15-minute vehicle traffic than the typically range. During the afternoon peak hour, the peak hour factors were in a typical range of approximately 0.90 to 0.95.

The peak hour factors used for all movements for all analysis periods was 0.80 during the AM Peak hour and 0.92 during the PM Peak hour.

3.6 Existing Traffic Operations

Traffic operations of the study intersections were evaluated using Trafficware's Synchro 8.0 traffic analysis model with HCM 2000 reports. This model uses standard procedures to test the Volume to Capacity ratio (V/C) and the corresponding delay-based traffic Level of Service (LOS) at each of the intersections in the study area. For the Level of Service indicator, the following summarize the range of delays (in seconds per vehicle) for signalized and unsignalized intersections:

- For signalized intersection, the Level of Service ranging from LOS 'A' conditions with minimal delay (< 10 sec per vehicle) through to LOS 'E' 'near capacity' conditions (> 55 sec to ≤ 80 sec per vehicle) and LOS 'F' 'over-saturated' conditions (> 80 sec per vehicle).

- For unsignalized intersection, the Level of Service ranging from LOS 'A' conditions with minimal delay (< 10 sec per vehicle) through to LOS 'E' 'near capacity' conditions (> 35 sec to ≤ 50 sec per vehicle) and LOS 'F' 'over-saturated' conditions (> 50 sec per vehicle).

The pedestrian-actuated signal at University Boulevard and Acadia Road is not able to be properly assessed using the Synchro 8 software. In order to better understand the operations at this intersection, two control types were considered:

- Actuated Signal (assumes pedestrian actuation every cycle and is the best case for the side street); and,
- Stop controlled (assumes no pedestrian actuation and is the worst case for the side street).

This approach results in two reported values of capacity and LOS for the pedestrian-actuated signals reflecting the very different traffic operations experienced when pedestrian actuation is present, or not. It is expected that the actual operation will be between these two results based on the number of pedestrians and pedestrian calls.

It should also be noted that the HCM 2000 report outputs levels of service (not v/c ratios or 95th percentile queue lengths) for 4-way stop controlled intersections.

Finally, given the wide through/right curb lanes at all the approaches of the Blanca Street & University Boulevard intersection, the curb lanes have been modelled as separate through and right lanes. The modelling assumption is consistent with the actual operations that were being observed on-site.

This modelling approach is also supported by the Highway Capacity Manual (HCM). In particular, Chapter 18 of HCM 2010 states that when lane widths are greater than 16 ft (4.8m), "the analyst should consider whether the wide lane actually operates as two narrow lanes. The analysis should reflect the way in which the lane width is actually used or expected to be used."

Table 3.3 summarizes the performances of each of the study intersections analysed for the morning and afternoon peak periods. The v/c ratio, LOS, and 95th percentile queue have been presented for only the critical movement for each approach. Full Synchro outputs are included in **Appendix A**. The same information is also presented graphically in **Exhibit 3.2.**

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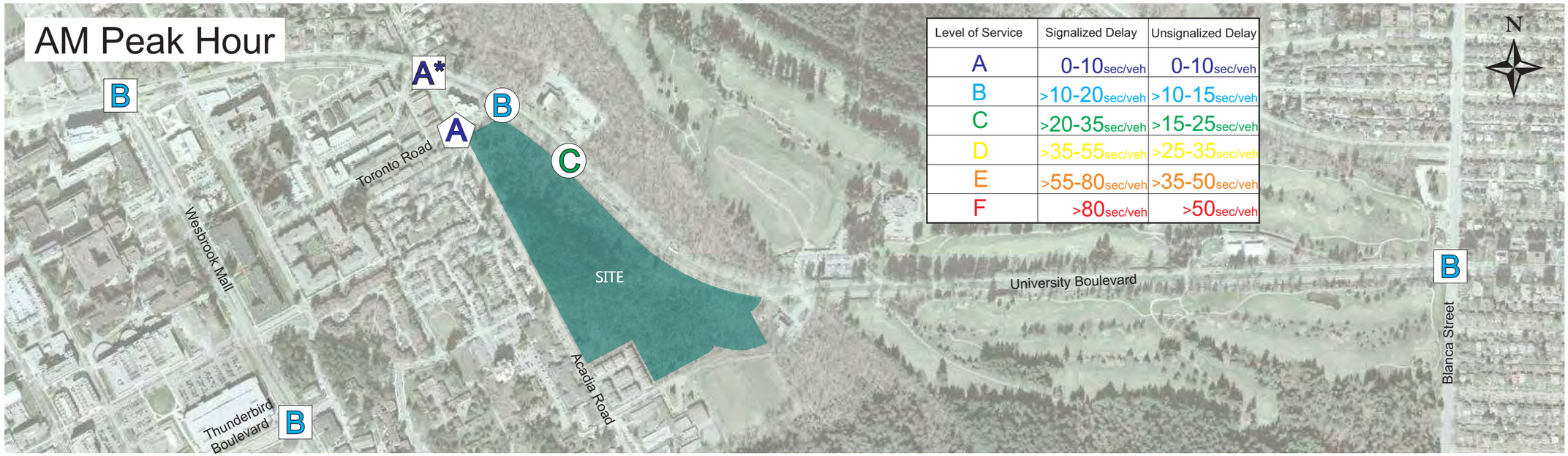

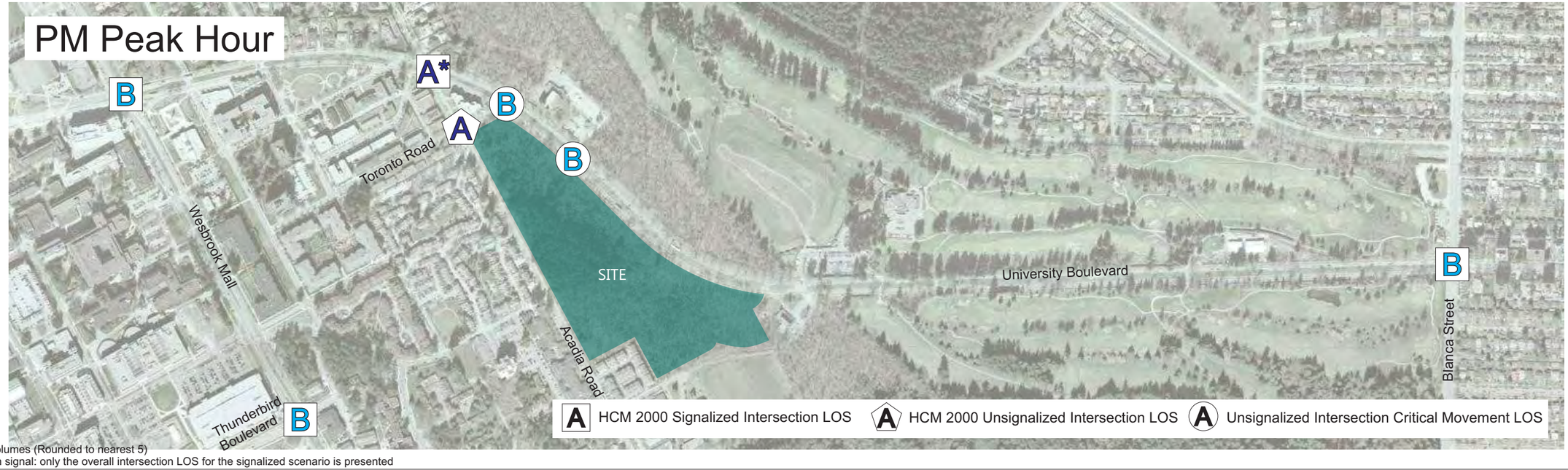

AM (PM) - Volumes (Rounded to nearest 5)
* - Pedestrian signal: only the overall intersection LOS for the signalized scenario is presented

Exhibit 3.2
Existing Intersection LOS Summary

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Table 3.3: Existing Traffic Operations

Intersection	Critical Movement	AM			PM		
		V/C	LOS	95th Percentile Queue (m)	V/C	LOS	95th Percentile Queue (m)
Signalized Intersection							
Wesbrook Mall (NB/SB) & Thunderbird Blvd (EB/WB)	Overall	0.52	B	-	0.79	B	-
	EB L	0.32	B	20	0.74	C	52
	WB L	0.30	C	13	0.49	C	20
	NB T/R	0.47	A	64	0.40	B	49
	SB T	0.49	C	49	0.74	C	107
Wesbrook Mall (NB/SB) & University Blvd (EB/WB)	Overall	0.32	B	-	0.40	B	-
	EB L/T/R	0.10	C	11	0.43	C	28
	WB L	0.31	B	26	0.17	B	13
	NB T	0.34	B	31	0.29	B	33
	SB L	-	-	-	0.43	B	34
	SB T/R	0.23	B	29	-	-	-
University Blvd (EB/WB) & Blanca St (NB/SB)	Overall	0.49	B	-	0.40	B	-
	EB L/T	0.30	B	21	0.52	B	39
	WB T	0.65	B	75	0.36	B	36
	NB T	0.29	B	28	0.28	B	28
	SB L/T	0.20	B	16	0.15	B	12
University Blvd (EB/WB) & Acadia Rd (NB/SB) (Signalized)	Overall	0.50	A	-	0.44	A	-
	EB L/T/R	0.27	A	19	0.46	A	36
	WB L/T/R	0.51	A	45	0.26	A	18
	NB L/T/R	0.39	B	13	0.21	B	7
	SB L/T/R	0.25	B	9	0.32	B	10

Table 3.3: Existing Traffic Operations (Cont'd)

Intersection	Critical Movement	AM			PM		
		V/C	LOS	95th Percentile Queue (m)	V/C	LOS	95th Percentile Queue (m)
Unsignalized Intersection							
University Blvd (EB/WB) & Acadia Rd (NB/SB) (Unsignalized)	EB L/T/R	0.01	A	0.1	0.00	A	0.1
	WB L/T/R	0.00	A	0	0.00	A	0.1
	NB L/T/R	0.22	C	6	0.11	C	3
	SB L/T/R	0.14	C	4	0.17	C	5
Acadia Rd (NB/SB) & Toronto Rd (EB/WB) (4-way Stop)	EB L/T/R	0.09	A	-	0.10	A	-
	WB L/T/R	0.16	A	-	0.13	A	-
	NB L/T/R	0.21	A	-	0.18	A	-
	SB L/T/R	0.04	A	-	0.06	A	-
University Blvd (NB/SB) & Toronto Rd (EB/WB)	NB L/T	0.10	A	3	0.10	A	3
	EB L/R	0.22	B	6	0.31	B	10
University Blvd (NB/SB) & University Chapel (EB/WB)	SB L/T	0.02	A	1	0.00	A	1
	WB L/R	0.04	C	1	0.06	B	2

nNotes: a) "-" represents a value that is not calculated by Synchro;
b) **Bolded** results indicate an LOS F, a v/c ratio > 1.0 or a 95th percentile queue that exceeds its physical storage space.
c) EB, WB, NB, and SB represent eastbound, westbound, northbound, and southbound, respectively.
d) L, T, R represent left, through, and right, respectively.
e) Degree Utilization is reported as V/C for All-Way Stop Controlled intersections

Overall, levels of service during the weekday AM and PM peak hours are satisfactory, ranging from LOS 'A' to 'C'. In addition, all movements are shown to operate with low v/c ratios and short 95th percentile queue lengths. Based on the analysis, the intersection of University Boulevard and Acadia Road operates at an acceptable level both during the time when the signal is being called by pedestrians or when no called is made.

4. PROPOSED DEVELOPMENT

Exhibit 4.1 shows the site plan for the development. The existing Sword Fern and Fairview Trails will be retained, and are integrated into the design to provide access to existing trails. Retail use is located on the north end of the site with a community building south of this location while residential uses are planned throughout the site. **Table 4.1** summarizes the land use breakdown. It is anticipated that the proposed development breakdown would represent the upper limit of the developable programme on the site.

Table 4.1: Proposed Development Breakdown

Land Use	Quantity
Residential	1,300 units
Retail	30,000 ft^2
Community Building (including 4,800 ft^2 for Daycare use)	19,800 ft^2

Currently, a grocery store is planned to be part of the retail use. It is planned to be 15,000 ft^2 of the 30,000 ft^2 of retail use. The remaining uses are expected to be a combination of restaurant/café and general retail. The Community Building is envisioned to be publicly accessible by residents in the UEL with gym facilities, meeting rooms, and a daycare.

4.1 Street Network and Site Access

As part of the development plan, two access roads will be provided, with connections between Acadia Road and University Boulevard.

4.1.1 Road A

Located at the northern part of the site, Road A is proposed to provide full movement access from University Boulevard to residential uses, the Community Building, and access to the a number of underground parkades via Acadia Road. A traffic signal at this location would improve the left-turn exit from the site to University Boulevard as well as the westbound left-turn access from University Boulevard.

Left-turn bays are planned at the intersection of Road A & University Boulevard, with storage lengths proposed at 50m and 30m for the westbound and eastbound directions, respectively. Parallel street parking stalls are generally available on Road A with back-in angle parking stalls available adjacent to the Community Building.

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Source: Rositch Hempill Architects

Exhibit 4.1
Proposed Site Plan

Block F
4912.01 September 2015 Scale NTS

Installing a traffic signal at Road A & University Boulevard will provide controlled crossing opportunities for future residents accessing to the bus stops along University Boulevard. In addition, in light of the proposed UBC rapid transit line along University Boulevard, consideration should be given to potentially providing a rapid transit stop at this location to take advantage of the controlled pedestrian crossing point.

The planning of the UBC rapid transit station is outside of the scope of this project. However, the traffic signal proposed will not preclude the implementation of the future rapid transit stops along University Boulevard.

The intersection of Road A at Acadia Road will be a stop-controlled intersection with priority movement along Acadia Road.

4.1.2 Road B

Located at the southern part of the site, Road B provides access primarily to various residential buildings that are proposed in the Master Plan. As it will be evident in Section 5, it is expected that majority of the residential vehicle trips are oriented to/from the east. Given this, intersection control at the intersection of Road B & University Boulevard is proposed to be unsignalized, with Right-in/Right-out and Left-in access only. A westbound left-turn bay is proposed along University Boulevard, with storage length of approximately 45m. On-street parking is generally available on Road B.

The intersection of Road B at Acadia Road is proposed to be controlled by a roundabout. The proposed roundabout at Road B & Acadia Road has an offset with Fairview Place on the west side of Acadia Road. However, the expected left-turn volumes at these locations are quite low with less than 1 vehicle every 10 minutes and therefore are not expected to result in any operational issue. With the redevelopment of the UBC student housing in the future, it is desirable to have the future connection opposing Block F to align with the proposed Road B in the site Master Plan.

Road B primarily serves the residential uses adjacent to it with only a small amount of shortcutting traffic expected. Road B will only be required to support the residential development adjacent to it and may be staged with this construction.

4.1.3 Traffic Calming and Accommodation of Cyclists

The presence of on-street parking and raised midblock crossing will serve as appropriate traffic calming measures to reduce vehicle travel speed along Road A and Road B. Along Acadia Road, the proposed roundabout at Road B & Acadia Road will also serve as a traffic calming feature.

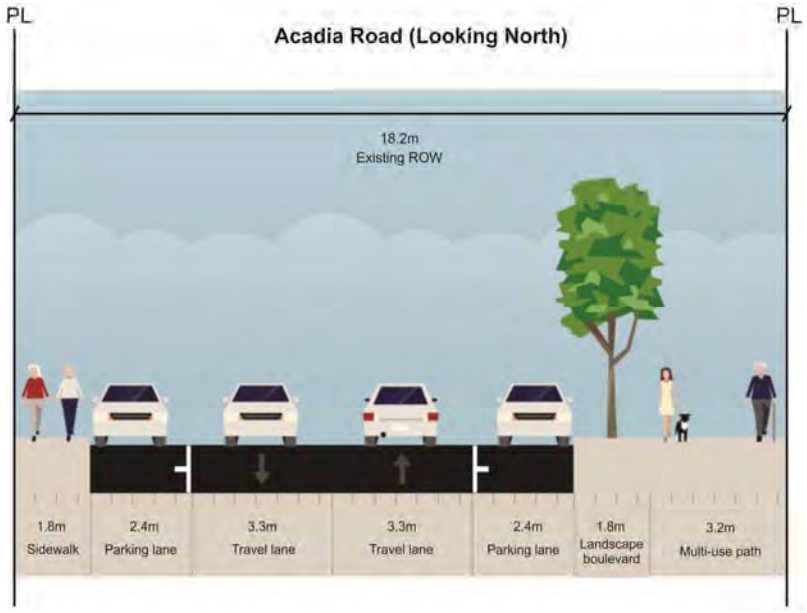
In terms of accommodation of cyclists, the UEL Official Community Plan does has a policy to encourage the Ministry of Transportation & Infrastructure (MoTI) to install new on-road bicycle lanes on all roads within the UEL jurisdiction. However, based on the review of traffic volumes that are expected on Road A and Road B, it is Bunt's opinion that marked bike lanes would not be warranted on those streets as per the

NACTO and CROW guidelines, where both of the guidelines advised that bike lanes are only useful if daily vehicle volumes are >3,000 vehicles per day).

Instead of installing marked bike lanes on Road A and Road B, it is suggested that bike stencils (sharrows) can be installed on both Road A and Road B to alert drivers of the presence of bicycles. In addition, for the intersection of Road A & University Blvd, a short-section of marked bike lane will be provided between the right-turn and the left-turn lanes, along a bike box at the front of the right-turn lane.

Finally, while Acadia Road is not a designated bikeway under the current UEL Official Community Plan (OCP), given the higher volume projected on Acadia Road (~6,000 per day), and Acadia's Road's proximity to the Norma Rose Point Elementary School, an off-street multi-use path is proposed better serve the expected bicycle users on Acadia Road than having them on-street shared the road space with vehicles.

Assuming the existing Right-of-Way width being 18.2m, the following shows the proposed cross-section that has been discussed and agreed with UEL:



Although TransLink advised that there is no current plan to reintroduce transit services on Acadia Road, the travel lanes are planned at 3.3m wide to allow for flexibility to accommodate bus travel in the future. The proposed cross-section also assumes any sidewalk widening or introduction of Landscape Boulevard on the west side of Acadia would be undertaken by UBC as and when the Acadia Residence redevelops in the future.

Bicycle lanes that are currently provided along University Boulevard will be retained as part of the site plan.

4.2 Parking

On-street parking is generally available on both Road A and Road B. As part of the development plan, on-street parking is also planned along the site frontages on Acadia Road and the north side of Toronto Road.

Off-street parking requirements for the development have been carefully planned, taking into consideration relevant planning policies, as well as anticipated built-form and expected parking demand for the proposed Master Plan. Excessive provision of parking would undermine the urban design and generate unnecessary vehicle trips. It is imperative that parking be provided at a level that meets the broad sustainability objectives, while ensuring the development is commercially viable.

The following highlights the parking requirements that are currently mandated for the University Endowment Lands. It will then compare with the parking rates that are currently used for the South Campus community in the UBC neighbourhood, as well as the Proposed parking supply ratios that are developed based on the Project Team's experiences for other mixed-use community similar to the proposed development.

4.2.1 Residential Parking

Table 4.2 shows the comparison of the residential parking rates.

Table 4.2: Comparison of Market-Residential Parking Rates

Use	UEL Land Use, Building and Community Administrative By-Law (1999)	UBC South Campus Northeast Sub-Area Neighbourhood Plan (2005)	Proposed Parking Supply Ratios (Minimum)
Apartments & Condominiums	1.6 for every unit inclusive of a minimum of 0.25 per unit for visitors	Minimum: None; Maximum: 1 for each 70 sq m of GFA, or 1.8 per unit, whichever is less, Inclusive of 0.1 for visitor and 0.1 for handicap.	Low-rise (up to 6 storeys): 1.1 per unit for residents plus 0.1 per unit for visitors; Condominium (7-16 storeys): 1.0 per unit for residents plus 0.1 per unit for visitors.
Townhouses	1.75 for every unit inclusive of a minimum of 0.25 per unit for visitors	Minimum: None; Maximum: 2.0 spaces per unit inclusive of 0.1 for visitor and 0.1 for handicap.	1.4 per unit for residents plus 0.1 per unit for visitors.
Market Rental	n/a	n/a	0.75 per unit for residents, plus 0.1 per unit for visitors to be located in a communal parking pool with the

Use	UEL Land Use, Building and Community Administrative By-Law (1999)	UBC South Campus Northeast Sub-Area Neighbourhood Plan (2005)	Proposed Parking Supply Ratios (Minimum)
			commercial parking.
Non-Market Rental	n/a	n/a	0.5 per unit for residents, plus 0.05 per unit for visitors to be located in a communal parking pool with the commercial parking.

The UEL Land Use, Building and Community Administrative By-law has included specific parking requirements for Market-Residential (Apartment/ Condominium and Townhouse uses). The UEL By-law, however, was written almost 20 years ago (1996) and therefore the parking ratios that were mandated at the time is not consistent with the current trends in auto ownership and travel mode splits.

In fact, the UEL minimum parking rate for Apartments and Condominiums are approximately 30% to 35% higher than what have been previously applied by Bunt & Associates for similar communities. For townhouses, the UEL parking rate is 10% to 15% higher than the rates that have been applied for other comparable communities. The suggested parking supply ratios for residential uses are also supported by the survey findings in the *Metro Vancouver Apartment Parking Study (September 2012)*.

The UBC South Campus community does not have any minimum parking rate for Market-Residential use, as this determination is left to the individual developer. In fact, the parking policy at the South Neighbourhood stipulates parking maximums for both condominiums (1 for each 70 sq m of GFA, or 1.8 per unit, whichever is less) and townhomes (2.0 spaces per unit). The parking rates are also inclusive of visitor and handicap parking at 0.1 spaces per unit for each category.

To support the proposed parking supply ratios, Bunt have contacted ICBC to obtain information on the number of actively insured vehicles for buildings in the following neighbourhoods:

- UBC Hampton Place;
- UBC Hawthorn Place;
- Point Grey near Blanca Street & West 10th Avenue; and,
- Kerrisdale.

In addition, for comparison purposes, Bunt have also included information from the Liberta townhouse development just south of to the Block F site Master Plan boundary on Acadia Road. **Tables 4.3** to 4.6 provide the information summarized by Neighbourhoods.

Table 4.3: Average Auto Ownership for Multi-Family Buildings in UBC Hampton Place

Building Name	Address	# of Storeys	No of Units	No. of Actively Insured Vehicles	Average No. of Vehicles Per Unit
West Hampstead	5760 Hampton Place	3	73	102	1.40
The Pemberley	5605 Hampton Place	4	72	60	0.83
St. James House	5835 Hampton Place	4	142	129	0.91
Wyndham Hall	5683 Hampton Place	4	54	51	0.94
Stratford	5657 Hampton Place	11	59	59	1.00
The Regency	5639 Hampton Place	18	123	114	0.93
The Chatham	5775 Hampton Place	19	97	112	1.15
	Overall (7 Buildings)		**620**	**627**	**1.01**

Note: The West Hampstead has over 50% of the units that are larger than 2,000 sq ft, while all the smaller units are also larger than 1,200 sq ft. Therefore the average vehicle ownership is generally higher than the other buildings.

It is to note that approximately 35% of the units being studied at UBC Hampton Place have an average unit size larger than 1,200 sq ft, while the rest of them are within 800 sq ft to 1,000 sq ft on average. The Block F Master Plan currently contemplates an average unit size of 750 to 800 sq ft.

Table 4.4: Average Auto Ownership for Multi-Family Buildings in UBC Hawthorne Place

Building Name	Address	# of Storey	No of Units	No. of Actively Insured Vehicles	Average No. of Vehicles Per Unit
The Legacy	6333 Larkin Drive	5	55	56	1.02
Promontory	2688 West Mall	18	95	95	1.00
	Overall (2 Buildings)		**150**	**151**	**1.01**

Both of these buildings at UBC Hawthorne Place feature units that are larger than 1,200 sq ft on average.

Table 4.5: Average Auto Ownership for Multi-Family Buildings near Blanca Street & West 10th Ave

Building Name	Address	# of Storey	No of Units	No. of Actively Insured Vehicles	Average No. of Vehicles Per Unit
The Avenue	4479 W 10th Ave	4	18	8	0.44
Point Grey Tower	2575 Tolmie Street	12	10	6	0.60
Point Grey Place	2580 Tolmie Street	24	37	19	0.51
	Overall (3 Buildings)		**65**	**33**	**0.51**

Approximately 70% of the units being studied near Blanac Street & West 10th Avenue have an average unit size larger than 1,200 sq ft, with the rest of them being 800 sq ft on average.

Table 4.6: Average Auto Ownership for Multi-Family Buildings in Kerrisdale

Building Name	Address	# of Storey	No of Units	No. of Actively Insured Vehicles	Average No. of Vehicles Per Unit
Kerrisdale Landing	2096 W 46th Ave	4	27	24	0.89
Platinum	2102 W 38th Ave	4	48	29	0.60
Balsam House	5350 Balsam Street	6	24	18	0.75
Elm Park Place	5700 Larch Street	7	30	29	0.97
Tiffany Place	5939 Yew Street	7	7	12	1.71
Chelsea Court	5389 Vine Street	10	10	12	1.20
Carlton Towers	5555 Yew Street	11	12	10	0.83
Ashleigh Court	2121 W 38 Ave	12	24	26	1.08
5955 Balsam	5955 Balsam Street	12	41	60	1.46
The Claridge	5850 Balsam Street	12	21	26	1.24
The Kerry	2260 West 39th Avenue	12	12	15	1.25
The Belmont	5425 Yew Street	13	37	29	0.78
Regency Place	2115 W 40th Ave	13	25	20	0.80
Wiltshire	2108 W 38th Ave	13	41	30	0.73
	Overall (14 Buildings)		**359**	**340**	**0.95**

In the Kerrisdale Neighbourhood, there are approximately 65% of the units being studied have an average unit size larger than 1,200 sq ft, while the rest of them are within 800 sq ft to 1,000 sq ft on average. Even so, the average vehicle ownership are no more than 1 vehicle per unit.

Finally, the Liberta townhouse development adjacent to Block F has an average vehicle ownership of 0.81 vehicles per unit. The average unit size for the development was in the range of 1,000 sq ft, which is slightly larger than the residential units that are currently planned for the Block F Master Plan.

Based on the ICBC data, the Project Team is confident that the proposed parking supply for the residential uses are in line with auto ownership levels that are expected from other established multi-family residential buildings in other comparable communities.

4.2.2 Non-Residential Parking

Table 4.7 shows the comparison of the non-residential parking rates.

Table 4.7: Comparison of Non-Residential Parking Rates

Use	UEL Land Use, Building and Community Administrative By-Law (1999)	UBC South Campus Northeast Sub-Area Neighbourhood Plan (2005)	Proposed Parking Supply (Minimum)
Retail	None	N/A	2.5 per 1,000 sq ft GFA
Restaurants	None	N/A	6 per 1,000 sq ft. GFA
Community Building	1 space for every 200 sq. ft. of floor area used for assembly purposes.	N/A (rely on-street parking only)	20 parking stalls to be provided within commercial parking area in Parcel A (in addition to the retail parking) to serve the community building patrons
Daycare (Staff Parking)	Not Specified	N/A	1 per 15 children (3 underground parking stalls in Parcel A reserved for Daycare staff during the operating hours of the Daycare)
Daycare (Pick-up/Drop-off)	Not Specified	N/A	1 every 8 children (located on-street)

From Table 4.7, it is clear that the current UEL By-Law and the UBC South Campus Neighbourhood Plan do not provide much guidance with regards to the appropriate parking supply levels for non-residential uses. This could partly be explained by the fact that both the UBC South Campus community and the existing community at UEL do have a significant number of residents where they can access the commercial facilities easily by walking or cycling hence reducing the need of parking for the non-residential uses.

For the proposed Block F Master Plan, some provision of parking would be appropriate to ensure the viability of the retail and restaurant uses in the community. The proposed parking ratios for the retail and restaurant uses are based on research and industry best practices as outlined in Industry Guidelines such as the *ITE Parking Generation*, along with input from commercial real estate leasing agents.

For the proposed Community Building, based on Bunt & Associates' previous observations at other community centres in an urban setting, peak parking demand for this type of use is generally at 2 per 100 sq m (1.86 stalls per 1,000 sq ft). Furthermore, based on interview surveys conducted by Bunt for two urban community centres (Creekside at Southeast False Creek and John Braithwaite at Lonsdale), it is determined that on-street parking is the preferred parking location for patrons at urban community

centres. Notwithstanding this, it is proposed that 20 parking stalls will be provided within the commercial parking area in Parcel A to serve the community building patrons.

For the Daycare centre, Bunt's previous observations also found that staff parking is approximately 1 for every 15 children and pick-up/drop-off demand is approximately 1 for every 8 children. Three underground parking stalls will be reserved for the Daycare centre staff in Parcel A or Parcel B, while the pick-up/drop-off spaces will be accommodated on-street along the frontage of the Daycare centre during the peak vehicle activity periods (i.e. 7am to 9am for drop-off and 4pm to 6pm for pick-up).

4.3 Loading

Loading for the development will be provided to meet or exceed the minimum requirements set out in the UEL Zoning By-law. For the multi-family residential buildings, delivery vehicles will be accommodated at the parking lay-by located along Road B. Consideration could be given to share a number of underground visitor parking stalls within each parkade of the residential buildings to accommodate maintenance and smaller delivery vehicles, etc.

4.4 Sustainable Transportation Features

The proposed Block F development aims to promote non-auto travel through the introduction of a number of sustainable transportation features within the site Master Plan:

- Bicycle Parking and End-of-Trip Facilities
- Car-Share Vehicles
- Ride-Share Programs
- Multi-Modal Access Guide

These features are discussed in detail below.

4.4.1 Bicycle Parking and End-of-Trip Facilities

Bicycle parking is planned for residents and employees in secure locations, while short-term visitor bicycle parking will be provided at building entrances or in the public realm.

The current UEL Land Use, Building and Community Administration Bylaw do not have any specific guidelines on the bicycle parking requirements for the different uses proposed on-site. Provision levels will therefore be modelled based on best practice, as indicated in **Table 4.8**. The provision level can be refined as the development continues to build-out over time.

Table 4.8: Proposed Bicycle Parking Supply Ratios (Minimum)

Land use	Class I (Long-term)	Class II (Short-term)
Residential	1 per unit	6 spaces per Building
Commercial/Retail	1 per 5000 sq ft	1 per 1000 sq ft
Community Building/Daycare	1 per 10 staff	1 per 2000 sq ft

In addition to bicycle parking, end-of-trip facilities such as showers and lockers will be incorporated into the community building for use by Block F commercial tenants and employees.

4.4.2 Car-Share Vehicles

Car-sharing clubs have developed significantly in the last 15-20 years in the Lower Mainland and allow people to have access to a car in their area without having to buy or maintain their own vehicle. Members are usually charged on a "pay-as-you-go" basis.

The *Metro Vancouver Apartment Parking Study* indicates that households with access to car-share program generally have fewer vehicles than those who do not participate in car-share program. Based on a build-out of 1,250 units, it is recommended that a total of 6 street parking stalls be set aside for car-share vehicles to encourage future residents in Block F to participate in car-share program. Typically one car-share vehicle can support between 150 to 250 residential units based on information provided previously by the car-share operators. **Exhibit 4.2** indicates the proposed location for the car-share vehicles.

4.4.3 Ride-Share Programs

Ride-sharing involves two or more people sharing a car for a trip. The cost of the journey (fuel, tolls, parking, etc) can be split between the driver and passengers, resulting in savings for all members. Ride-sharing also helps reduce the number of vehicles on the road network and lowers parking demand.

The Block F development could help promote ride-sharing through simple measures such as bulletin board notices or information packages provided to residents.

Also, residents could be linked up with a number of existing public ride sharing schemes such as the Jack Bell Ride-Share Program (https://online.ride-share.com/en/my/).

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Exhibit 4.2
Proposed Car-Share Vehicle Locations

UEL Block F Master Plan Transportation Assessment
4912.01 September 2015 Scale NTS

bunt & associates

4.4.4 Multi-Modal Access Guide

A Multi-Modal Access Guide (also called a Transportation Access Guide) is a document or set of documents that provide concise, customized information on how to access a particular destination by various travel modes, with special consideration of sustainable modes such as walking, cycling and public transport. The contents of this guide could include:

- A map of the area, showing the internal walking trails, major roads, nearby landmarks, the closest bus routes/stops, and recommended cycling and walking routes to key destinations;
- Information about transit service frequency, fares, first and last runs, plus phone numbers and web addresses for transit service providers
- Phone numbers and web addresses for taxi companies;
- Information on how long it takes to walk from transit stops and other locations near the site;
- Access arrangements for people with disabilities;
- Carpool program hotline number; and,
- Car Share program policies and vehicle locations.

Different versions of the Multi-modal access guide may be needed to accommodate different types of users, including special versions for people who have disabilities, speak a different language, travel by a particular mode, or travel from a particular area. Given the information in the Multi-modal access guide would change over time, it is recommended that the community building operator to take on the responsibilities in keeping the information current and updating the Multi-modal access guide as appropriate.

4.4.1 Sustainable Transportation Features Commitment and Responsibilities

Table 4.9 summarizes the capital cost commitment and the maintenance responsibilities for each of the sustainable features described above.

Table 4.9: Sustainable Transportation Features Commitment and Maintenance Responsibilities

Sustainable Transportation Features	Capital Cost Commitment	Maintenance Responsibilities
1. Bicycle Parking	Developer to construct bicycle parking as per recommended supply ratios.	Strata or Building Management to maintain their own facilities for each individual buildings.
2. End-of-trip Facility	Musqueam to provide funding contribution to the construction of the community building. End-of-trip facility to be included as part of the community building's building program.	Community building operator to maintain the end-of-trip facility within the building.

Sustainable Transportation Features	Capital Cost Commitment	Maintenance Responsibilities
3. Car-share Vehicles	UEL to designate six (6) on-street parking stalls reserved for car-share vehicles. Musqueam to contact car-share vehicle operators to solicit interest to place car-share vehicles in the neighbourhood. Individual car-share operators will be responsible to fund and provide vehicles to the neighbourhood.	Car-share operators will be responsible to maintain their own vehicles.
4. Ride-share Program & Multi-modal Access Guide	Musqueam will generate initial content about Ride-share Program and the Multi-modal Access Guide, to be displayed at the bulletin board at the community building. The same information will be shared with the developers of the individual parcels and they may choose to include the information as part of their marketing materials and/or information package for new home owners.	Community building operator and the developers will be responsible to ensure the information in the Multi-modal Access Guide is kept up-to-date.

5. FUTURE TRAFFIC OPERATIONS

5.1 Capacity Analysis Scenarios

Four future analysis horizons will be analyzed:

- Background 2030 – AM Peak
- Background 2030 – PM Peak
- Total (Background + New Site Trips) 2030 – AM Peak
- Total (Background + New Site Trips) 2030 – PM Peak

Results of this analysis are presented in Section 5.4.

The project is phased over 10-12 years, with the Master Plan build-out expected to be 2025. The analysis year of 2030 was selected to coincide with the final year of the *UBC Vancouver Campus Plan to 2030* discussed in Section 2. Often, in a report of this nature, an opening day horizon and a horizon 10 years after opening day are both analyzed. The decision was made to consider only 2030 given:

- The short time between the two years;
- The small amount of background growth;
- The lack of any significant network change between the two horizon years; and,
- The small number of network improvements required.

The Background 2030 Horizon will identify any network improvements required as a result of the existing traffic and any background traffic growth not generated by the Master Plan.

The Total 2030 Horizon will add the new site trips to the network and apply any expected adjustments to the background traffic including pass-by and shortcutting trips. Trip generation and distribution assumptions are identified and discussed in Section 5.2.

5.2 Background Traffic Growth

The UBC Fall 2011 Transportation Status Report[1] (April 13, 2012) summarizes the mode choice and number of person trips to and from the university. UBC has been working to reduce automobile trips to

[1] Analysis for the Transportation Assessment was undertaken before the UBC Fall 2013 Transportation Status Report became available. The 2011 Transportation Status Report was used for the purpose of analysis.

and from UBC and encouraging alternative modes of travel. Between 1997 and 2011, automobile volumes have reduced from over 60,000 daily vehicles to fewer than 50,000 based on UBC screenline counts. During that time, UBC daytime population (students, staff and faculty) has increased 43%. One major factor was the introduction of the U-Pass for students, giving all students a reduced cost transit pass included in their student fees. This was implemented for the fall of 2003 and that year showed an automobile volume drop of over 5,000 daily trips.

The *UBC Vancouver Campus Plan (June 2010)* identifies daytime population (student, staff and faculty) growth up to 2017, at which point enrollment is planned to be capped. The expected increase from 2007 to 2017 is approximately 5% (~2,500 persons); this is significantly lower than the 43% (~18,000 persons) increase in daytime population between 1997 and 2011.

A combination of the historic reduction in automobile volumes and the slowing of daytime population growth provide a reasonable expectation that background volumes are unlikely to increase during the analysis period.

One additional consideration affecting background growth is the redevelopment and densification of the Acadia Neighbouring adjacent to the site. Data specific to the Acadia Neighbourhood was not available, however, some data was available for campus wide student housing was available. The *UBC Vancouver Campus Plan (June 2010)* identifies a goal to house 50% of full time students on campus by 2030.

Achieving this goal will result in an additional 8,000 beds, nearly doubling the existing supply. The new student housing will not be located solely in the Acadia Neighbourhood. However, it is prudent to consider the transportation impacts of additional people living on campus. The process to determine traffic growth based on additional student housing is outlined below.

5.2.1 Student Housing Vehicle Trip Generation

Trip rates for student housing collected previously by Bunt & Associates were used to determine expected vehicle trips for the new student housing. **Table 5.1** summarizes the volumes.

Table 5.1: Student Housing Trip Generation

Period	Bunt Trip Rate for Student Housing (trips per bed)		Total Trips (8,000 beds)
	Inbound	Outbound	
AM Peak	0.03	0.02	407
PM Peak	0.08	0.08	1,303

5.2.2 New Vehicle Trips per year

Construction of the new student housing is assumed to be completed within a 15 to 20 years timeframe. Assuming construction of the new student housing would occur evenly throughout the anticipated timeframe, an increase of approximately *100 vehicle trips per year* during the peak-hour periods (AM and PM combined) would be expected.

5.2.3 Screenline Volume Distribution

Based on Figure 2.7 in the *UBC Fall Transportation Status Repor*t, approximately 23% of traffic accessing UBC uses University Boulevard. Applying this yields *approximately 25 new vehicle trips* during the peak-hour periods along University Boulevard every year.

5.2.4 Percentage Growth

To approximate the spread of the new student housing throughout the campus, a percentage increase was applied to all movements within the study area rather than strictly increasing traffic along University Boulevard.

Considering the existing 2013 two way volumes along University Boulevard of 1,175 vph during the AM Peak and 1,075 vph during the PM Peak, the 25 daily new trips per year correspond to an approximate growth of 1% per year for a total of 425 new peak hour trips by 2030. A linear growth rate of 1% per year was applied to the existing 2013 volumes through to 2030. This process represents a conservative analysis as the existing volumes are not adjusted based on the reduction of students living off-campus.

5.2.5 Vehicle Trips from Norma Rose Point Elementary School

The new elementary school in the Acadia neighbourhood is expected to increase vehicle movements within the study area during the morning and early afternoon. A *Traffic and Parking Study* was prepared by Creative Transportation Solutions (CTS) in 2010 for the VSB to support the proposed new school. Based on information presented in the CTS report, the expected peak hours of the school are 8:15am to 9:15am and 2:45pm to 3:45pm. The afternoon peak-hour for the elementary school occurs before the peak-hour in the study area and therefore will not be included in the analysis. The distribution for the morning peak-hour from the CTS report is presented in **Table 5.2.** More detailed volume data is available in *Figure 12* of the CTS report.

Table 5.2: Elementary School Morning Peak Hour Distribution

From/To	Inbound	Outbound
North	16.4%	17.4%
East	29.3%	55.3%
West	55.3%	43.5%
Total	100.0%	100.0%

In Fall 2014, Bunt conducted vehicle counts at the Norma Rose Point Elementary school after the first stage of the school opening (500 students) to provide additional insight on the expected school volumes along Acadia Road. Based on the counted volumes, the school traffic is factored up to account for a full occupancy of the school (920 students).

Accordingly, in the AM Peak Hour, 75 northbound school trips (away from the school) and 149 southbound school trips (towards the school) are projected along the section of Acadia Road north of Ortona Road. For comparison, the CTS projected school volumes were 115 northbound and 112 southbound. For the background traffic forecast, the Bunt factored data was used for the section of study network north of Ortona Road. It is important to note that directly factoring up the school traffic from the 500-student to 920-student enrollment is likely overstated, as a portion of the of the future students could potentially be coming from Block F, where they are likely to walk or cycle to the school than in the case with the existing catchment area. Nevertheless, it provides a more robust analysis for the future scenarios.

For the school traffic via Wesbrook Mall and Thunderbird Boulevard, the projections from the CTS report were used. Based on the information from the CTS report, approximately 90 vehicles are expected to depart via the intersection of Wesbrook Mall & Thunderbird Boulevard and 140 vehicles arrive by the same intersection in the AM Peak-hour period.

5.2.6 Summary

A 1% per year linear growth rate was applied to account for the Acadia Neighbourhood densification. The morning peak-hour volumes for the Norma Rose Point Elementary (factored up for 920-student occupancy) were also added to the background growth. The afternoon peak-hour of the school occurs outside of the study area peak and therefore is not included in the analysis.

No background volume reduction was considered even though the proposed UBC rapid transit line may happen beyond 2025. Summarizing the information above, the morning and afternoon peak hour 2030 Background volumes are presented in **Exhibit 5.1**.

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AM (PM) - Volumes (Rounded to nearest 5)

Volumes on this exhibit include background volumes

Exhibit 5.1

Background 2030 Peak Hour Vehicle Volumes

UEL Block F Master Plan Transportation Assessment
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5.3 Site Vehicle Trip Generation and Distribution

Vehicle trip generation for the proposed development was estimated using trip rates observed from residential development located at the UBC South Campus area (see **Appendix B**), as well as trip rates published in the Institute of Transportation Engineer's (ITE) Trip Generation Report (9th Edition).

The ITE Trip Generation Report is the industry-wide standard in North America for assessing vehicle trip generation at new developments. However, the vehicle trip rates from ITE are primarily focused on suburban sites where automobile is the predominant transportation mode, which are not appropriate for use in urban environments where walking, cycling and transit form a significant portion of journeys, as is expected to be the case for the proposed Block F Master Plan.

According to the *2011 Metro Vancouver Regional Trip Diary Survey Analysis Report*, the Auto Mode share for the Vancouver/UEL area was found to be 56% (TransLink, 2013). Assuming the ITE trip rates represent an Auto Mode share of 90%, the Auto Mode share in the Vancouver/UEL area represents a reduction of 37%. Given this, the ITE trip rates for the non-residential uses were conservatively reduced by 30% to account for internal capture and the Master Plan's proximity to the UBC Campus and transit services, resulting in higher percentage of non-vehicular trips.

The UBC South Campus trip rates were left unchanged as they have already accounted for internal capture and the low automobile mode split. **Table 5.3** presents the vehicle trip rates used for the Weekday AM and PM Peak periods.

Table 5.3: Site Vehicle Trip Rates

Use	Source	Trip Rate Variables	Weekday AM Peak			Weekday PM Peak		
			In	Out	Total	In	Out	Total
Residential	Bunt collected vehicle trip rates from UBC South Campus Area at Wesbrook Village	Trips per unit	0.13	0.18	0.31	0.20	0.09	0.29
Community Building (excluding Daycare)	ITE Recreational Community Centre (495) less 30%	Trips per 1,000 sq ft GFA	0.95	0.49	1.44	0.94	0.98	1.92
Daycare (40 Children)	ITE Day Care Centre less 30%	Trips per 1,000 sq ft GFA	0.30	0.26	0.56	0.26	0.30	0.57
Grocery Store	ITE Supermarket (850) less 30%	Trips per 1,000 sq ft GFA	1.48	0.9	2.38	3.39	3.25	6.64
Restaurant/Café	ITE High-Turnover (Sit Down) Restaurant (932) less 30%	Trips per 1,000 sq ft GFA	4.16	3.41	7.57	4.14	2.76	6.90

Table 5.4 presents the vehicle trip estimates for the current site plan. These vehicle volumes are used for the analysis in Section 5.3.

Table 5.4: Site Vehicle Trip Estimates

Land Use	Size	Weekday AM Peak			Weekday PM Peak		
		In	Out	Total	In	Out	Total
Residential	1,300 units	171	233	404	260	116	376
Community Building (excl. Daycare)	15,000 ft²	14	7	21	14	15	29
Daycare (40 Children)	4,800 ft²	12	10	22	10	12	22
Retail	15,000 ft²	34	28	62	40	32	72
Grocery	15,000 ft²	22	14	36	51	49	100
	Total	253	292	545	375	224	599
	Pass-by Trips	*28*	*28*	*56*	*45*	*45*	*90*
	Total New Trips	**225**	**264**	**489**	**330**	**179**	**509**

The development is expected to generate approximately 550 and 600 vehicle trips per hour during the morning and afternoon peak-hour periods, respectively. Approximately 55 to 90 of these trips are assumed to be pass-by trips from the existing neighbourhood. The ITE Trip Generation Handbook (2nd Edition) identifies weekday PM peak hour pass-by for a supermarket between 25% and 45%. Considering this and the isolation of the site from Vancouver, pass-by was assumed to be 50% of the inbound retail trips.

Vehicle trip distribution pattern for the development is established based on existing traffic patterns and anticipated origin and destinations of site traffic. University Boulevard was the primary road for the residential, office and amenity uses at approximately 70% of the trips. The retail use has a relatively even distribution split between the west (University Boulevard), north (Acadia Road and Wesbrook Mall), south (Wesbrook Mall) and the neighbouring Acadia Neighbourhood.

The approximate total distribution of site trips is summarized in **Table 5.5**, while the same information is also presented graphically in **Exhibit 5.2**. The total site trips are presented in **Exhibit 5.3.** Negative numbers in this exhibit represent changes in the existing volumes due to the re-routing of the pass-by trips.

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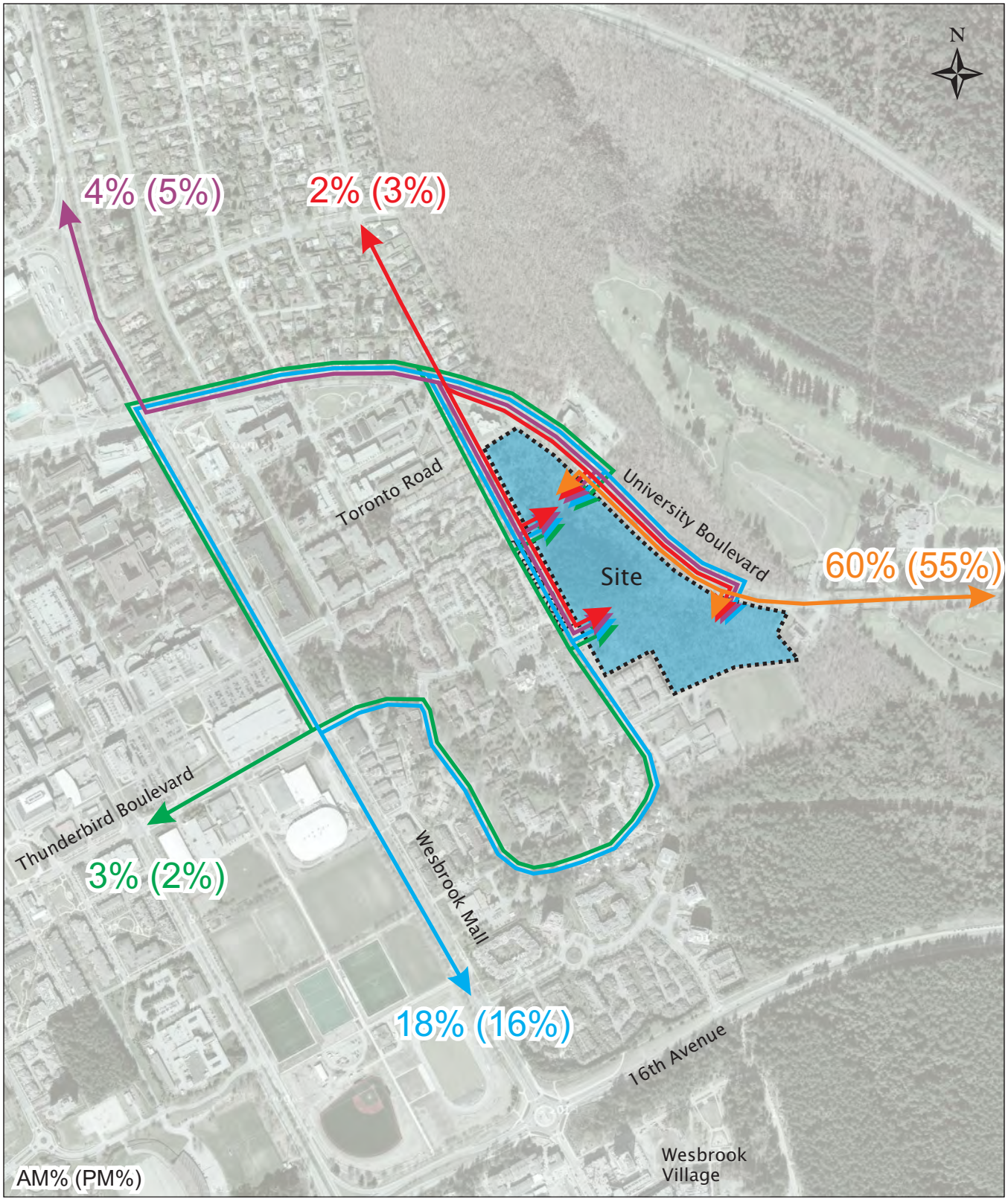

Exhibit 5.2
Trip Distribution Pattern

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AM (PM) - Volumes (Rounded to nearest 5)

Volumes on this exhibit include pass-by trips and new site trips

Exhibit 5.3

Site Peak Hour Vehicle Volumes

UEL Block F Master Plan Transportation Assessment
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Table 5.5: Trip Distribution Pattern

Direction	Potential Route (s)	Destination	AM	PM
East	University Boulevard	University Boulevard	60%	55%
North	Acadia Road	Acadia Road	2%	3%
North	University Boulevard	Wesbrook Mall	4%	5%
South	University Boulevard, Osoyoos Crescent	Wesbrook Mall	18%	16%
West	University Boulevard, Osoyoos Crescent	Thunderbird Boulevard	3%	2%
		Total	87%	81%

There is an additional 13% -19% of the site trips do not leave the study area and would be primarily to/from the Acadia neighbourhood. From Table 5.4, over half of the site development traffic is expected to orient to/from the East. With a total of 600 vehicle trips predicted for the Weekday AM and PM peak periods, this means that approximately 330 vehicle trips (240 to 270 new trips) are expected to travel to/from the east.

Anticipated westbound volumes along University Boulevard east of the site are presented in **Exhibit 5.4** and eastbound volumes are presented in **Exhibit 5.5**.

Exhibit 5.6 summarizes Total 2030 volumes for the AM and PM Peak Periods including background volumes pass-by trips, new site trips and diverted trips from the Acadia neighbourhood. For the purpose of the traffic analysis, it was assumed that 70% of existing vehicles using Toronto Road to travel between Acadia Road south and University Boulevard east would be diverted through the site, primarily via Road A, given the shorter travel distance that is provided by the site. This corresponds to approximately 120 vehicles during the morning peak and 140 vehicles during the afternoon peak.

Exhibit 5.4: Future Westbound Volumes along University Boulevard

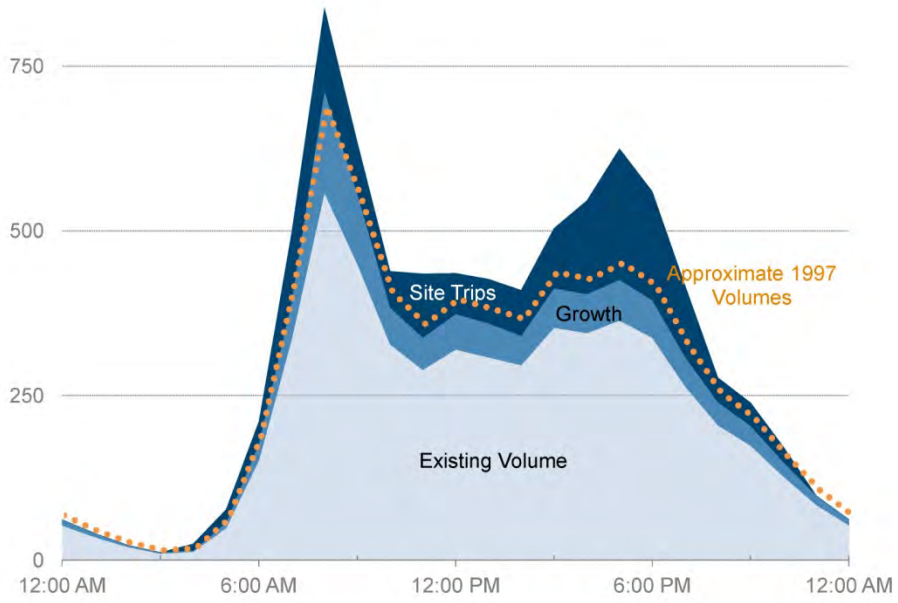
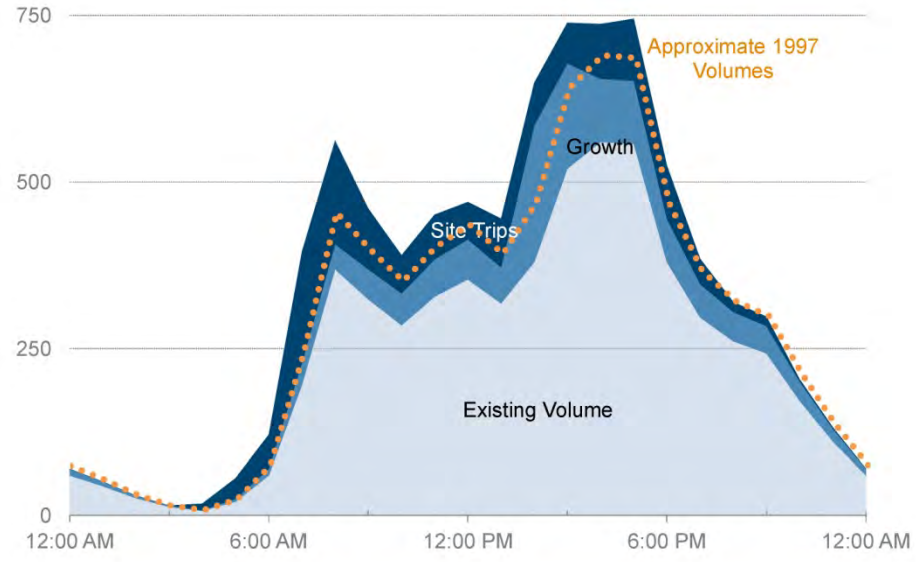


Exhibit 5.5: Future Eastbound Volumes along University Boulevard



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AM (PM) - Volumes (Rounded to nearest 5)

Volumes on this exhibit include background volumes, pass-by trips, new site trips and diverted trips from the Acadia neighbourhood

Exhibit 5.6

Total 2030 Peak Hour Vehicle Volumes

UEL Block F Mater Plan Transportation Assessment
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5.4 Future Traffic Analysis (2030)

The following presents the Capacity Analysis for the future scenarios. Model outputs are included in **Appendix C**.

5.4.1 Background 2030 Conditions

Table 5.6 summarizes the intersection performances for the background traffic conditions. The v/c ratio, LOS, and 95th percentile queues for only the critical movements of each approach are presented. Intersection LOS Summary is also presented graphically in **Exhibit 5.7**.

Table 5.6: Background 2030 Conditions

Intersection	Critical Movement	AM			PM		
		V/C	LOS	95th Percentile Queue (m)	V/C	LOS	95th Percentile Queue (m)
Signalized Intersection							
Wesbrook Mall (NB/SB) & Thunderbird Blvd (EB/WB)	Overall	0.66	C	-	0.81	C	-
	EB L	0.34	B	22	0.86	D	68
	WB L	0.46	C	23	0.54	C	23
	NB T/R	0.75	B	113	0.47	B	62
	SB T	0.66	C	63	0.88	D	137
Wesbrook Mall (NB/SB) & University Blvd (EB/WB)	Overall	0.41	B	-	0.43	B	-
	EB L/T/R	0.20	C	12	0.51	C	33
	WB L	0.39	B	32	0.22	B	15
	NB T	0.47	B	40	0.39	B	39
	SB L	-	-	-	0.48	B	40
	SB T/R	0.34	B	35	-	-	-
University Blvd (EB/WB) & Blanca St (NB/SB)	Overall	0.70	B	-	0.55	B	-
	EB L	0.56	B	21	0.71	B	21
	WB L	-	-	-	0.52	C	27
	WB T	0.74	B	86	-	-	-
	NB L	0.61	C	34	0.21	B	15
	SB L/T	0.38	B	23	0.08	B	15

Table 5.6: Background 2030 Conditions (Cont'd)

Intersection	Critical Movement	AM			PM		
		V/C	LOS	95th Percentile Queue (m)	V/C	LOS	95th Percentile Queue (m)
Signalized Intersection							
University Blvd (EB/WB) & Acadia Rd (NB/SB) (Signalized)	Overall	0.67	A	-	0.51	A	-
	EB L/T/R	0.40	A	30	0.53	A	48
	WB L/T/R	0.70	A	71	0.30	A	22
	NB L/T/R	0.56	C	27	0.26	B	9
	SB L/T/R	0.31	B	17	0.39	B	14
University Blvd (EB/W B) & Acadia Rd (NB/SB) (Unsignalized)	EB L/T/R	0.01	A	1	0.01	A	0.1
	WB L/T/R	0.00	A	0	0.01	A	0.1
	NB L/T/R	0.67	E	32	0.14	C	4
	SB L/T/R	0.37	D	13	0.23	C	7
Unsignalized Intersection							
Acadia Rd (EB/WB) & Toronto Rd (NB/SB) (4-way Stop)	EB L/T/R	0.15	A	-	0.12	A	-
	WB L/T/R	0.40	B	-	0.16	A	-
	NB L/T/R	0.42	B	-	0.21	A	-
	SB L/T/R	0.17	A	-	0.07	A	-
University Blvd (NB/SB) & Toronto Rd (EB/WB)	NB L/T	0.25	A	8	0.13	A	3
	EB L/R	0.39	C	14	0.41	C	15
University Blvd (NB/SB) & University Chapel (EB/WB)	SB L/T	0.03	A	1	0.00	A	0.1
	WB L/R	0.08	C	2	0.08	C	2

Notes: a) "-" represents a value that is not calculated by Synchro;
b) **Bolded** results indicate an LOS F, a v/c ratio > 1.0 or a 95th percentile queue that exceeds its physical storage space.
c) EB, WB, NB, and SB represent eastbound, westbound, northbound, and southbound, respectively.
d) L, T, R represent left, through, and right, respectively.
e) Degree Utilization is reported as V/C for All-Way Stop Controlled intersections

Overall, levels of service of the unsignalized intersections during the weekday AM and PM peak hours are satisfactory, generally ranging from LOS 'A' to 'C'. In addition, all movements are shown to operate with low v/c ratios and short 95th percentile queue lengths.

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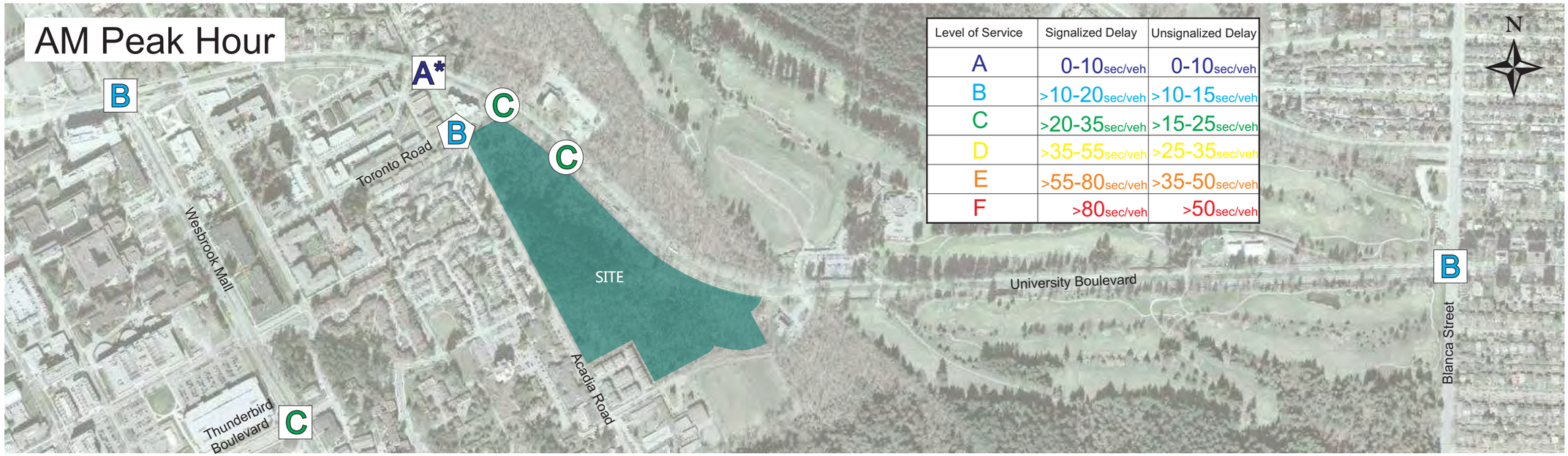

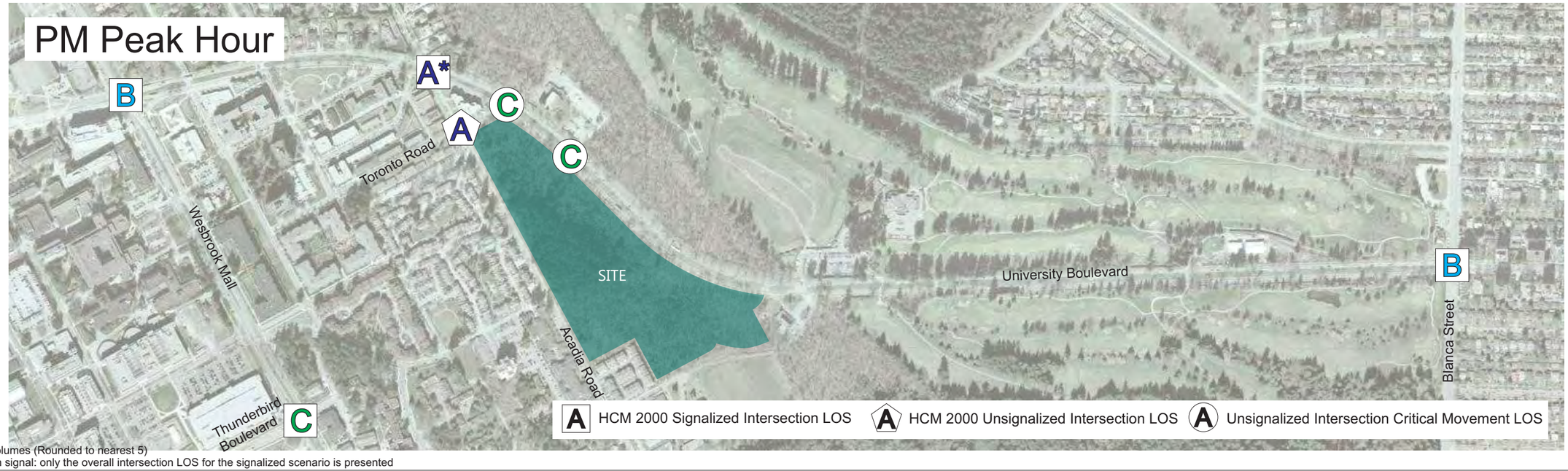

AM (PM) - Volumes (Rounded to nearest 5)
* - Pedestrian signal: only the overall intersection LOS for the signalized scenario is presented

Exhibit 5.7

Background 2030 Intersection LOS Summary

UEL Block F Master Plan Transportation Assessment
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The pedestrian-actuated signal at University Boulevard and Acadia Road operates at acceptable levels with low v/c ratios and queues both during the time when the signal is being called by pedestrians or when no called is made. The only exception is the northbound movement at morning peak hour, where longer delays are predicted when no pedestrian call is made at the intersection. However, it is expected that the actual intersection operations would be between the signalized and unsignalized scenarios.

Long vehicle queues are also predicted at certain locations along Wesbrook Mall. UBC is currently undertaking a design study for Wesbrook Mall corridor between West 16th Avenue and Chancellor Boulevard, with the goal of prioritizing pedestrian, bicycle and transit movements ahead of vehicle travel. As we understand, UBC has conducted an operational review as part of their study and are satisfied that the corridor will continue to operate satisfactorily in the future.

5.4.2 Total 2030 Conditions

Table 5.7 summarizes the intersection performances for the Total traffic conditions. The v/c ratio, LOS, and 95th percentile queues for only the critical movements of each approach are presented. Intersection LOS Summary is also presented graphically in **Exhibit 5.8**. The intersection of University Boulevard & Road A are analysed as both a signal and as a stop controlled intersection, while the Road B & Acadia Road intersection is analysed as a roundabout.

Table 5.7: Total 2030 Conditions

Intersection	Critical Movement	AM			PM		
		V/C	LOS	95th Percentile Queue (m)	V/C	LOS	95th Percentile Queue (m)
Signalized Intersection							
Wesbrook Mall (NB/SB) & Thunderbird Blvd (EB/WB)	Overall	0.72	C	-	0.82	C	-
	EB L	0.33	B	22	0.81	C	62
	WB L	0.60	C	33	0.62	C	28
	NB T/R	0.81	C	149	0.57	B	79
	SB T	0.66	C	73	0.91	D	147
Wesbrook Mall (NB/SB) & University Blvd (EB/WB)	Overall	0.43	B	-	0.45	B	-
	EB L/T/R	0.21	C	13	0.51	C	33
	WB L	0.44	B	35	0.23	B	16
	NB T	0.49	B	41	0.39	B	39
	SB L	0.34	B	23	0.51	B	43

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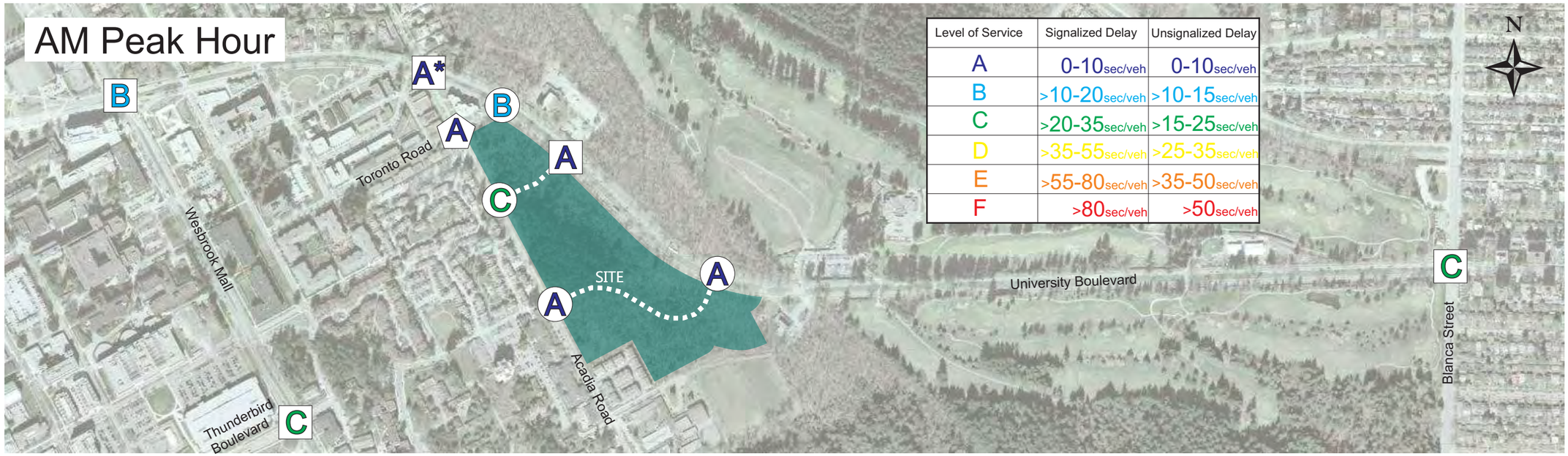

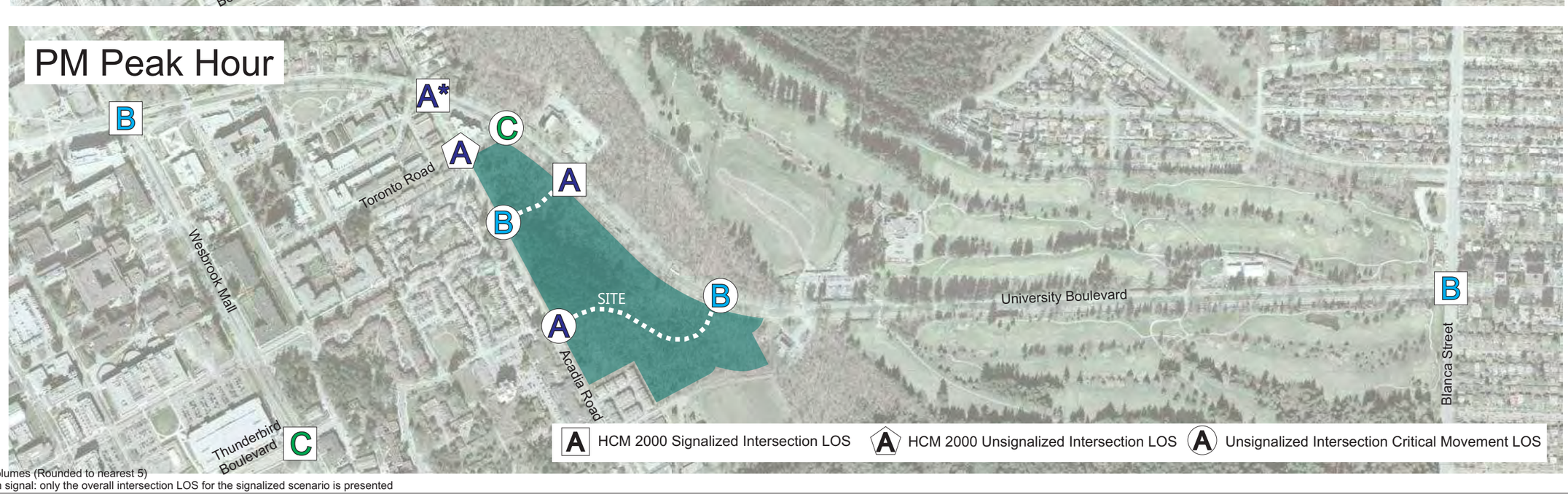

AM (PM) - Volumes (Rounded to nearest 5)
* - Pedestrian signal: only the overall intersection LOS for the signalized scenario is presented

Exhibit 5.8

Total 2030 Intersection LOS Summary

UEL Block F Master Plan Transportation Assessment
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Table 5.7: Total 2030 Conditions (Cont'd)

Intersection	Critical Movement	AM			PM		
		V/C	LOS	95th Percentile Queue (m)	V/C	LOS	95th Percentile Queue (m)
Signalized Intersection							
University Blvd (EB/WB) & Blanca St (NB/SB) (As pre-timed)	Overall	0.82	C	-	0.60	B	-
	EB L	0.82	D	44	0.55	B	30
	EB T	0.56	B	63	0.81	C	118
	WB L	0.38	B	17	0.75	D	34
	WB T	0.78	B	108	0.58	B	64
	NB L	0.83	D	55	0.29	B	20
	NB T	0.57	C	50	0.35	B	34
	SB L/T	0.47	C	28	0.20	B	15
University Blvd (EB/WB) & Acadia Rd (NB/SB) (Signalized)	Overall	0.70	A	-	0.55	A	-
	EB L/T/R	0.44	A	34	0.57	A	56
	WB L/T/R	0.72	A	77	0.30	A	23
	NB L/T/R	0.63	C	30	0.40	B	15
	SB L/T/R	0.31	B	17	0.43	B	16
University Blvd (NB/SB) & Road A (EB/WB) (Improved - Signalized)	Overall	0.64	A	-	0.52	A	-
	SB T/R	0.09	C	5	0.16	B	7
	NB L	0.12	C	6	0.06	B	4
	NB T/R	0.10	C	0	0.08	B	6
	EB L/T/R	0.41	A	24	0.58	A	49
	WB L/T/R	0.71	A	60	0.31	A	20

Table 5.7: Total 2030 Conditions (Cont'd)

Intersection	Critical Movement	AM			PM		
		V/C	LOS	95th Percentile Queue (m)	V/C	LOS	95th Percentile Queue (m)
Unsignalized Intersection							
University Blvd (EB/WB) & Acadia Rd (NB/SB) (Unsignalized)	EB L/T/R	0.01	A	1	0.01	A	1
	WB L/T/R	0.00	A	0	0.01	A	1
	NB L/T/R	0.83	**F**	48	0.33	C	10
	SB L/T/R	0.42	D	15	0.35	C	24
Acadia Rd (NB/SB) & Toronto Rd (EB/WB) (4-way Stop)	EB L/T/R	0.14	A	17	0.12	A	16
	WB L/T/R	0.18	A	16	0.07	A	15
	NB L/T/R	0.33	A	22	0.16	A	18
	SB L/T/R	0.22	A	17	0.15	A	15
University Blvd (NB/SB) & Toronto Rd (EB/WB)	NB L/T	0.11	A	3	0.05	A	1
	EB L/R	0.24	B	13	0.28	C	15
Acadia Rd (NB/SB) & Road A (EB/WB)	WB L/R	0.22	C	6	0.13	A	4
	SB L/T	0.01	A	1	0.12	B	1
Acadia Rd (NB/SB) & Road B (EB/WB)	WB L/R	0.22	C	15	0.10	B	3
	SB L/T	0.01	A	1	0.01	A	1
University Blvd (NB/SB) & Road A (EB/WB) (Unsignalized)	NB L	0.19	F	5	0.07	D	2
	NB T/R	0.30	B	10	0.41	C	15
	SB L	0.23	**F**	6	0.89	**F**	24
	WB L	0.21	A	6	0.23	B	7

Notes:
a) "-" represents a value that is not calculated by Synchro.
b) **Bolded** results indicate an LOS F, a v/c ratio > 1.0 or a 95th percentile queue that exceeds its physical storage space.
c) "Err" represents a value that is too high for Synchro to calculate.
d) EB, WB, NB, and SB represent eastbound, westbound, northbound, and southbound, respectively.
e) L, T, R represent left, through, and right, respectively.
f) Degree Utilization is reported as V/C for All-Way Stop Controlled intersections
g) Queue for Acadia Rd & Toronto Rd is from SimTraffic

Overall, levels of service of the unsignalized intersections during the weekday AM and PM peak hours are satisfactory, generally ranging from LOS 'A' to 'C'. In addition, all movements are shown to operate with low v/c ratios and short 95th percentile queue lengths.

The pedestrian-actuated signal at University Boulevard and Acadia Road operates at acceptable levels with low v/c ratios and queues both during the time when the signal is being called by pedestrians or when no call is made. Similar to the 2030 Background scenario, longer delays are predicted for the northbound movement at morning peak hour when no pedestrian call is made at the intersection. However, it is expected that the actual intersection operations would be between the signalized and unsignalized scenarios. The site is predicted to add approximately 25 to 30 vehicles to the northbound approach of Acadia Road at University Boulevard in the Weekday peak-hour periods. Of these, approximately 15 (out of the 25-30 vehicles) are left-turns, with the rest being through movements.

The intersection of Road A & University Boulevard is predicted to operate with LOS 'A' for the peak-hour periods as a signalized intersection. Without a traffic signal, the northbound and southbound left-turn movements are predicted to operate with LOS 'F' for the build-out condition. However, as a sensitivity test, the intersection is also modelled with only Parcels A, B, C and D completed. Under this scenario, a stop-sign controlled intersection at Road A & University Boulevard is expected to operate well without any excessive delay. Signal warrant analysis for the intersections at Road A & University Boulevard and Acadia Road & University Boulevard are included in the next section.

Similar to the 2030 Background Condition, long vehicle queues are predicted to occur at certain locations along Wesbrook Mall. However, it is to note that the Block F development traffic only represents a small percentage of vehicle movements that travel along the Wesbrook Mall corridor during the peak-hour periods.

For the Toronto Road & Acadia Road intersection, the SimTraffic model predicted the 95th percentile vehicle queue for the northbound approach to be 22m in the Weekday AM Peak-hour period. The driveway to the surface parking lot has therefore been designed accordingly to be located a minimum 22m away from the intersection.

The eastbound and westbound queues on University Boulevard at Blanca Street were reported to be 118m and 108m, respectively. This nearest intersection along University Boulevard is approximately 200m to the east and, therefore, this queue should not impact that intersection. The low delay at this intersection implies that vehicles, including transit vehicles, along University Boulevard will not experience excessive delay.

Roundabout at Acadia Road & Road B

The proposed roundabout at Acadia Road & Road B was analyzed using Sidra. Performance under this control type is acceptable with results shown in **Table 5.8** while printouts from Sidra are provided in **Appendix C**.

Table 5.8: Total 2030 Conditions – Acadia Rd & Road B Roundabout

	Acadia Road Southbound		Acadia Road Northbound		Road B Westbound	
	v/c	LOS	v/c	LOS	v/c	LOS
AM Peak Hour	0.225	A	0.199	A	0.087	A
PM Peak Hour	0.117	A	0.161	A	0.061	A

5.5 Signal Warrant Analysis

Signal Warrant Analyses were completed for two intersections within the study area, University Boulevard & Acadia Road and University Boulevard & Road A using the MOTI Signal Warrant procedure with the Total 2030 volumes. The primary consideration of the signal warrants was the increased side street volumes due to the proposed development. Warrants 3 (Progressive Movement) and 4 (Accident Experience) are not directly related to the change in volume and were therefore not considered. Additionally, the findings for these two warrants are not expected to be different based on existing or future conditions. Traffic volumes for the mid-day hours were estimated based on the AM and PM count data as well as week-long link counts on University Boulevard. A summary of the warrants is provided below and the Signal Warrant Analyses are included in **Appendix D**.

University Boulevard & Acadia Road

The existing control at this intersection is a pedestrian actuated signal with stop-sign controls on Acadia Road. Based on the MOTI Signal Warrant Procedure, a full traffic signal is not warranted at this location. Warrant 2 (Interruption of Continue Traffic) and Warrant 9 (Peak Hour Volumes) are the warrants that are closest to being satisfied, with the volume for four of seven hours in Warrant 2 being above the minimum thresholds.

University Boulevard & Road A

Based on the MOTI Signal Warrant Procedure, a full traffic signal is not warranted at this location based on the 2030 build-out traffic volumes. Warrant 2 (Interruption of Continue Traffic) is the only warrant that is closest to being satisfied, with volumes for five of seven hours higher being above the minimum thresholds. Although the signal warrant does not indicate a traffic signal is needed, it is the Project Team's view that the installation of a traffic signal at this intersection can result in a number of benefits including the following:

- **Providing improved and safe crossing opportunities for current and future transit users** – there is a bus stop located in the Westbound direction of University Boulevard in front of University Chapel (Stop ID: 50603). In addition, as part of the development, a new eastbound bus stop will be provided in front of Parcel A. Finally, while the timeline for the rapid transit service to UBC is currently unknown at this stage, the preliminary information identified in TransLink's website has indicated that a future rapid transit station maybe located close to this intersection,

further supporting the need to a traffic signal at this location to facilitate safe crossings for transit users;

- **Improve the crossing conditions for the existing and future trail users** – there is an extensive trail system that is well-utilized near the Block F site. The trail system requires pedestrians to cross University Boulevard. The signalization of Road A & University Blvd would improve the crossing conditions for the existing and future trail users.

- **Improved crossing for children going to University Hill Elementary** – it was anecdotally observed that there were children riding their bicycles to cross University Boulevard, through the University Chapel parking lot to get to the trail to go to University Hill Elementary. It is to note that the Block F Master Plan area is currently located outside of the Norma Rose Point Elementary School catchment area. As a result, children residing at Block F in the future will have to travel to University Hill Elementary School instead, therefore increasing the pedestrian crossing demand on University Boulevard.

- **Gateway entry to the Block F community** – the traffic signal would improve access and egress from the Block F site, providing ease of access for retail customers.

5.6 Off-site Intersection Changes

As part of the review of an earlier draft version of this report, the Ministry of Transportation and Infrastructure (MoTI) indicated that the close proximity of the Road B access on University Blvd to the St. Anselm's Anglican Church's west access (break in the median) may increase vehicle conflict within the area. Bunt conducted a vehicle movement count at the location of interest on a Sunday morning on August 2, 2015 during the peak activity period for the St. Anselm's Anglican Church (9am to 1pm).

During the survey period, there were only two vehicles observed utilizing this particular median break, one of which is to make a U-turn movement from westbound University Boulevard back to the eastbound direction, while the other vehicle was exiting from the St. Anselm's Anglican Church parking lot to University Boulevard westbound. At the same time, Bunt observed that there were a high number of pedestrians and bicycles crossing University Boulevard at the Golf Course driveway intersection as it is located next to the Salish Trail.

Given the low utilization of the driveway west of the Golf Course exit, the closing of this median break may be possible. The Golf Course driveway intersection should also be reconfigured to formalize pedestrian crossing at that intersection, as well as allowing for inbound access to both the University Golf Course and St. Anselm Church. The applicant will work with MOTI, the golf course and St. Anselm Church to close the median break at the church's west access and reconfigure the Golf Course driveway intersection to accommodate pedestrian and bicycle crossings if possible.

5.7 Construction Truck Movements

The effects of construction truck movements will be considered separately in the traffic management plan as part of the servicing, infrastructure, and detailed design requirements for each phase.

6. SUMMARY

Musqueam is proposing a mixed-use project on a 22 acre freehold parcel in 'Block F' of the University Endowment Lands, located on the south side of University Boulevard between the existing developments along Acadia Road, Pacific Spirit Park and the University Golf Course.

The build-out of the master plan is expected to occur over 10 to 12 years, with up to 1,300 multi-family residential units, 30,000 ft^2 of retail, and a 19,800 ft^2 community building including a daycare centre, along with amenity spaces.

Parking for the development is provided based on best practice guidelines, recognizing the mixed-use nature of the development, while ensuring the viability of the commercial uses that are proposed in the Master Plan.

The development is expected to generate approximately 550 to 600 vehicle trips per hour during the morning and afternoon peak-hour periods at full build-out. These vehicle trips will be served by two access roads, providing connections between Acadia Road and University Boulevard.

Capacity analyses indicate that intersections in the study street network are expected to continue to operate satisfactorily with the master plan build-out vehicle volumes factored in, along with the background traffic growth that are expected from the redevelopment of the Acadia Neighbourhood and UBC.

While the Master Plan currently contemplates the provision of a traffic signal at Road A & University Boulevard, the Signal Warrant analysis suggested that a full traffic signal may not be warranted at this location based on the 2030 build-out traffic volumes. However, a traffic signal at this location would better serve the existing transit and trailer users in the area, allowing for safe crossing opportunities, and serves as a gateway entry to the community and therefore is recommended.

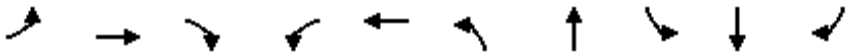
The roundabout proposed at Road B & Acadia Road can serve as a traffic calming measure on Acadia Road, and the intersection is also predicted to operate well without any operational issue.

Based on the analysis outlined in this study, it is concluded that the proposed form and density of the proposed development can be supported from a transportation perspective.

APPENDIX A

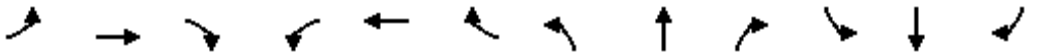
Synchro Model Output – Existing

(to be provided electronically only)



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	90	42	23	36	63	243	477	15	238	137
v/c Ratio	0.26	0.07	0.04	0.19	0.24	0.38	0.43	0.06	0.49	0.25
Control Delay	20.0	18.1	0.1	32.5	25.6	11.6	12.0	22.1	27.1	3.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.0	18.1	0.1	32.5	25.6	11.6	12.0	22.1	27.1	3.9
Queue Length 50th (m)	8.0	3.6	0.0	4.3	5.4	16.8	37.4	1.5	27.5	0.0
Queue Length 95th (m)	19.9	11.1	0.0	13.3	16.8	30.9	64.1	5.9	49.3	8.1
Internal Link Dist (m)		131.0			44.8		163.9		585.5	
Turn Bay Length (m)	70.0		50.0	25.0		110.0		55.0		75.0
Base Capacity (vph)	391	1319	1151	721	953	699	1258	370	755	743
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.03	0.02	0.05	0.07	0.35	0.38	0.04	0.32	0.18

Intersection Summary

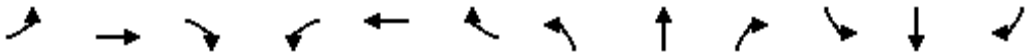


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	83	39	21	33	41	17	224	380	59	14	219	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Lane Util. Factor	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	0.96		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1803		1789	1846		1789	1883	1601
Flt Permitted	0.35	1.00	1.00	0.73	1.00		0.41	1.00		0.49	1.00	1.00
Satd. Flow (perm)	651	1883	1601	1374	1803		781	1846		924	1883	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	90	42	23	36	45	18	243	413	64	15	238	137
RTOR Reduction (vph)	0	0	17	0	16	0	0	5	0	0	0	101
Lane Group Flow (vph)	90	42	6	36	47	0	243	472	0	15	238	36
Turn Type	pm+pt	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	7	4			8		5	2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	17.9	17.9	17.9	5.7	5.7		35.3	35.3		17.0	17.0	17.0
Effective Green, g (s)	17.9	17.9	17.9	5.7	5.7		35.3	35.3		17.0	17.0	17.0
Actuated g/C Ratio	0.27	0.27	0.27	0.09	0.09		0.54	0.54		0.26	0.26	0.26
Clearance Time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	285	516	439	120	157		614	999		240	490	417
v/s Ratio Prot	c0.03	0.02			0.03		0.08	c0.26			0.13	
v/s Ratio Perm	c0.06		0.00	0.03			0.14			0.02		0.02
v/c Ratio	0.32	0.08	0.01	0.30	0.30		0.40	0.47		0.06	0.49	0.09
Uniform Delay, d1	18.4	17.5	17.2	27.9	27.9		8.5	9.2		18.1	20.4	18.2
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.6	0.1	0.0	1.4	1.1		0.4	0.5		0.1	1.0	0.1
Delay (s)	19.0	17.6	17.2	29.3	28.9		8.9	9.7		18.3	21.4	18.3
Level of Service	B	B	B	C	C		A	A		B	C	B
Approach Delay (s)		18.4			29.1			9.4			20.2	
Approach LOS		B			C			A			C	

Intersection Summary			
HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	65.2	Sum of lost time (s)	24.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	46	187	197	222	22	333	96	91	305
v/c Ratio	0.09	0.29	0.28	0.27	0.04	0.35	0.19	0.17	0.22
Control Delay	17.3	12.3	12.2	2.7	12.4	22.6	7.0	12.9	15.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.3	12.3	12.2	2.7	12.4	22.6	7.0	12.9	15.9
Queue Length 50th (m)	3.3	14.0	14.8	0.0	1.7	20.0	0.0	7.1	13.2
Queue Length 95th (m)	10.7	25.6	26.7	9.4	5.3	31.1	10.5	15.2	28.6
Internal Link Dist (m)	106.7		487.7			585.5			116.0
Turn Bay Length (m)		40.0			25.0		50.0	75.0	
Base Capacity (vph)	676	768	1264	1290	791	1334	657	772	1570
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	0.07	0.24	0.16	0.17	0.03	0.25	0.15	0.12	0.19

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	28	14	249	104	204	20	306	88	84	273	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt		0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1799		1700	1752	1601	1789	3579	1601	1789	3564	
Flt Permitted		0.99		0.67	0.89	1.00	0.57	1.00	1.00	0.44	1.00	
Satd. Flow (perm)		1790		1204	1594	1601	1066	3579	1601	838	3564	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	30	15	271	113	222	22	333	96	91	297	8
RTOR Reduction (vph)	0	12	0	0	0	126	0	0	69	0	1	0
Lane Group Flow (vph)	0	34	0	187	197	96	22	333	27	91	304	0
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		12.4		27.6	27.6	27.6	19.3	17.6	17.6	28.1	23.4	
Effective Green, g (s)		12.4		27.6	27.6	27.6	19.3	17.6	17.6	28.1	23.4	
Actuated g/C Ratio		0.19		0.43	0.43	0.43	0.30	0.28	0.28	0.44	0.37	
Clearance Time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Vehicle Extension (s)		2.5		2.5	2.5	2.5	2.5	0.2	0.2	3.0	2.5	
Lane Grp Cap (vph)		348		608	718	693	342	988	442	481	1309	
v/s Ratio Prot				c0.05	0.05		0.00	c0.09		c0.02	0.09	
v/s Ratio Perm		0.02		c0.08	0.07	0.06	0.02		0.02	0.06		
v/c Ratio		0.10		0.31	0.27	0.14	0.06	0.34	0.06	0.19	0.23	
Uniform Delay, d1		21.1		11.6	11.6	10.9	15.7	18.4	17.0	10.6	13.9	
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.1		0.2	0.2	0.1	0.1	0.1	0.0	0.2	0.1	
Delay (s)		21.1		11.8	11.8	11.0	15.7	18.5	17.0	10.8	14.0	
Level of Service		C		B	B	B	B	B	B	B	B	
Approach Delay (s)		21.1			11.5			18.0			13.3	
Approach LOS		C			B			B			B	

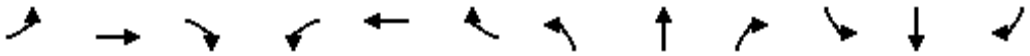
Intersection Summary			
HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	63.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	47.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	351	662	72	48
v/c Ratio	0.24	0.46	0.21	0.15
Control Delay	3.6	5.1	16.3	14.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	3.6	5.1	16.3	14.4
Queue Length 50th (m)	8.3	19.8	4.7	2.7
Queue Length 95th (m)	19.4	45.0	12.9	9.0
Internal Link Dist (m)	487.7	114.8	84.4	98.2
Turn Bay Length (m)				
Base Capacity (vph)	1736	1748	675	627
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	0.20	0.38	0.11	0.08

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	310	8	1	595	13	17	50	0	17	21	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			1.00			1.00			0.98	
Flt Protected		1.00			1.00			0.99			0.98	
Satd. Flow (prot)		1876			1878			1860			1812	
Flt Permitted		0.99			1.00			0.90			0.85	
Satd. Flow (perm)		1865			1878			1694			1562	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	337	9	1	647	14	18	54	0	18	23	7
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	0	0	6	0
Lane Group Flow (vph)	0	350	0	0	661	0	0	72	0	0	42	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		26.4			26.4			4.2			4.2	
Effective Green, g (s)		26.4			26.4			4.2			4.2	
Actuated g/C Ratio		0.68			0.68			0.11			0.11	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1275			1284			184			169	
v/s Ratio Prot												
v/s Ratio Perm		0.19			0.35			c0.04			0.03	
v/c Ratio		0.27			0.51			0.39			0.25	
Uniform Delay, d1		2.4			3.0			16.0			15.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.1			0.4			1.4			0.8	
Delay (s)		2.5			3.3			17.4			16.5	
Level of Service		A			A			B			B	
Approach Delay (s)		2.5			3.3			17.4			16.5	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	4.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	38.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.4%	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												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	50	19	69	43	0	22	65	78	0	29	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	54	21	75	47	0	24	71	85	0	32	3

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	77	122	179	35
Volume Left (vph)	2	75	24	0
Volume Right (vph)	21	0	85	3
Hadj (s)	-0.12	0.16	-0.22	-0.02
Departure Headway (s)	4.4	4.6	4.2	4.6
Degree Utilization, x	0.09	0.16	0.21	0.04
Capacity (veh/h)	771	733	818	737
Control Delay (s)	7.9	8.5	8.3	7.8
Approach Delay (s)	7.9	8.5	8.3	7.8
Approach LOS	A	A	A	A

Intersection Summary				
Delay	8.2			
Level of Service	A			
Intersection Capacity Utilization	35.5%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBR	EBR2	NWL2	NWL	NEL	NER
Lane Configurations						
Volume (veh/h)	320	0	116	595	3	133
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	348	0	126	647	3	145
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh)	1			1		
Upstream signal (m)	139					
pX, platoon unblocked						
vC, conflicting volume			348		1247	348
vC1, stage 1 conf vol					348	
vC2, stage 2 conf vol					899	
vCu, unblocked vol			348		1247	348
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			90		99	79
cM capacity (veh/h)			1211		282	695

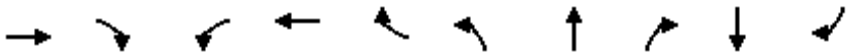
Direction, Lane #	EB 1	EB 2	NW 1	NE 1
Volume Total	348	0	773	148
Volume Left	0	0	126	3
Volume Right	0	0	0	145
cSH	1700	1700	1211	674
Volume to Capacity	0.20	0.00	0.10	0.22
Queue Length 95th (m)	0.0	0.0	2.6	6.3
Control Delay (s)	0.0	0.0	2.5	11.8
Lane LOS			A	B
Approach Delay (s)	0.0		2.5	11.8
Approach LOS				B

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (veh/h)	14	435	705	18	7	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	473	766	20	8	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		Raised	Raised			
Median storage veh)		1	1			
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	786				1279	776
vC1, stage 1 conf vol					776	
vC2, stage 2 conf vol					503	
vCu, unblocked vol	786				1279	776
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	98				98	99
cM capacity (veh/h)	833				315	397

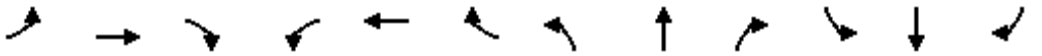
Direction, Lane #	SE 1	NW 1	SW 1
Volume Total	488	786	13
Volume Left	15	0	8
Volume Right	0	20	5
cSH	833	1700	345
Volume to Capacity	0.02	0.46	0.04
Queue Length 95th (m)	0.4	0.0	0.9
Control Delay (s)	0.5	0.0	15.9
Lane LOS	A		C
Approach Delay (s)	0.5	0.0	15.9
Approach LOS			C

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	48.2%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	373	82	104	565	68	125	207	89	241	129
v/c Ratio	0.30	0.11	0.23	0.65	0.09	0.29	0.29	0.15	0.20	0.19
Control Delay	11.1	3.1	11.5	17.1	3.2	15.1	14.2	12.9	13.0	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.1	3.1	11.5	17.1	3.2	15.1	14.2	12.9	13.0	3.6
Queue Length 50th (m)	12.7	0.0	6.5	45.3	0.0	9.2	15.2	6.2	9.0	0.0
Queue Length 95th (m)	20.6	5.7	15.0	74.8	5.2	19.9	28.3	14.0	15.6	8.4
Internal Link Dist (m)	1111.2			86.8			126.9		80.4	
Turn Bay Length (m)		10.0			35.0			10.0		10.0
Base Capacity (vph)	1226	778	457	863	770	434	721	613	1179	693
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.11	0.23	0.65	0.09	0.29	0.29	0.15	0.20	0.19

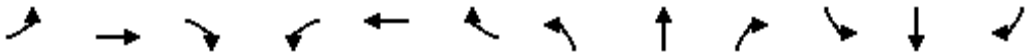
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	63	281	75	96	520	63	115	190	82	48	174	119
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor		0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected		0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	1.00
Satd. Flow (prot)		3546	1601	1789	1883	1601	1789	1883	1601		3540	1601
Flt Permitted		0.75	1.00	0.53	1.00	1.00	0.60	1.00	1.00		0.86	1.00
Satd. Flow (perm)		2678	1601	998	1883	1601	1134	1883	1601		3077	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	68	305	82	104	565	68	125	207	89	52	189	129
RTOR Reduction (vph)	0	0	44	0	0	37	0	0	0	0	0	80
Lane Group Flow (vph)	0	373	38	104	565	31	125	207	89	0	241	49
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		27.5	27.5	27.5	27.5	27.5	23.0	23.0	23.0		23.0	23.0
Effective Green, g (s)		27.5	27.5	27.5	27.5	27.5	23.0	23.0	23.0		23.0	23.0
Actuated g/C Ratio		0.46	0.46	0.46	0.46	0.46	0.38	0.38	0.38		0.38	0.38
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Grp Cap (vph)		1227	733	457	863	733	434	721	613		1179	613
v/s Ratio Prot					c0.30			0.11				
v/s Ratio Perm		0.14	0.02	0.10		0.02	c0.11		0.06		0.08	0.03
v/c Ratio		0.30	0.05	0.23	0.65	0.04	0.29	0.29	0.15		0.20	0.08
Uniform Delay, d1		10.2	9.0	9.8	12.6	9.0	12.8	12.8	12.1		12.4	11.8
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2		0.6	0.1	1.2	3.9	0.1	1.7	1.0	0.5		0.4	0.3
Delay (s)		10.9	9.1	11.0	16.4	9.1	14.5	13.8	12.6		12.8	12.0
Level of Service		B	A	B	B	A	B	B	B		B	B
Approach Delay (s)		10.6			15.0			13.8			12.5	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	13.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.5
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		

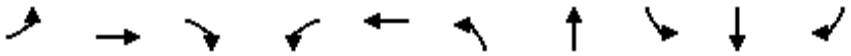
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	310	8	1	595	13	17	50	0	17	21	6
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	337	9	1	647	14	18	54	0	18	23	7
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		Raised			Raised							
Median storage veh)		1			1							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	661			346			1026	1015	341	1035	1012	654
vC1, stage 1 conf vol							352	352		656	656	
vC2, stage 2 conf vol							674	663		379	357	
vCu, unblocked vol	661			346			1026	1015	341	1035	1012	654
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			94	84	100	94	93	99
cM capacity (veh/h)	927			1213			314	343	701	315	346	467

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	351	662	73	48
Volume Left	5	1	18	18
Volume Right	9	14	0	7
cSH	927	1213	335	345
Volume to Capacity	0.01	0.00	0.22	0.14
Queue Length 95th (m)	0.1	0.0	6.2	3.6
Control Delay (s)	0.2	0.0	18.7	17.1
Lane LOS	A	A	C	C
Approach Delay (s)	0.2	0.0	18.7	17.1
Approach LOS			C	C

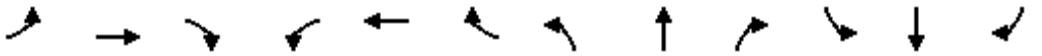
Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	43.4%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	242	57	125	72	72	87	384	58	452	83
v/c Ratio	0.76	0.10	0.23	0.36	0.25	0.22	0.41	0.17	0.71	0.13
Control Delay	36.6	17.1	5.0	32.1	16.1	10.5	11.7	20.7	30.3	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.6	17.1	5.0	32.1	16.1	10.5	11.7	20.7	30.3	0.4
Queue Length 50th (m)	23.7	5.0	0.0	8.4	3.3	5.2	26.5	5.3	51.2	0.0
Queue Length 95th (m)	#51.8	12.5	9.9	19.8	13.5	12.6	49.4	14.9	#107.3	0.0
Internal Link Dist (m)		131.0			44.8		163.9		585.5	
Turn Bay Length (m)	70.0		50.0	25.0		110.0		55.0		75.0
Base Capacity (vph)	320	1169	1041	568	743	678	1370	340	636	656
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.76	0.05	0.12	0.13	0.10	0.13	0.28	0.17	0.71	0.13

Intersection Summary

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	223	52	115	66	27	40	80	308	45	53	416	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Lane Util. Factor	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	0.91		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1715		1789	1847		1789	1883	1601
Flt Permitted	0.38	1.00	1.00	0.72	1.00		0.23	1.00		0.53	1.00	1.00
Satd. Flow (perm)	719	1883	1601	1356	1715		431	1847		1006	1883	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	242	57	125	72	29	43	87	335	49	58	452	83
RTOR Reduction (vph)	0	0	87	0	38	0	0	5	0	0	0	56
Lane Group Flow (vph)	242	57	38	72	34	0	87	379	0	58	452	27
Turn Type	pm+pt	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	7	4			8		5	2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	19.8	19.8	19.8	7.1	7.1		33.4	33.4		21.2	21.2	21.2
Effective Green, g (s)	19.8	19.8	19.8	7.1	7.1		33.4	33.4		21.2	21.2	21.2
Actuated g/C Ratio	0.30	0.30	0.30	0.11	0.11		0.51	0.51		0.33	0.33	0.33
Clearance Time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	326	571	486	147	186		352	946		327	612	520
v/s Ratio Prot	c0.07	0.03			0.02		0.02	c0.20			c0.24	
v/s Ratio Perm	c0.15		0.02	0.05			0.10			0.06		0.02
v/c Ratio	0.74	0.10	0.08	0.49	0.18		0.25	0.40		0.18	0.74	0.05
Uniform Delay, d1	19.0	16.3	16.2	27.3	26.4		10.0	9.8		15.8	19.5	15.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	8.8	0.1	0.1	2.6	0.5		0.4	0.4		0.4	5.0	0.1
Delay (s)	27.8	16.4	16.3	29.9	26.9		10.4	10.1		16.1	24.5	15.2
Level of Service	C	B	B	C	C		B	B		B	C	B
Approach Delay (s)		22.9			28.4			10.2			22.4	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	65.2	Sum of lost time (s)	24.0
Intersection Capacity Utilization	61.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	130	77	82	130	13	342	270	232	357
v/c Ratio	0.19	0.10	0.08	0.13	0.02	0.26	0.36	0.35	0.20
Control Delay	24.2	10.9	10.8	2.8	12.2	23.9	5.3	14.9	16.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.2	10.9	10.8	2.8	12.2	23.9	5.3	14.9	16.3
Queue Length 50th (m)	14.1	5.6	6.0	0.0	1.0	21.2	0.0	19.7	15.7
Queue Length 95th (m)	28.3	12.6	13.2	7.8	3.8	33.0	17.2	34.3	33.0
Internal Link Dist (m)	106.7		487.7			585.5			116.0
Turn Bay Length (m)		40.0			25.0		50.0	75.0	
Base Capacity (vph)	645	752	1004	1017	691	1244	732	679	1650
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	0.20	0.10	0.08	0.13	0.02	0.27	0.37	0.34	0.22

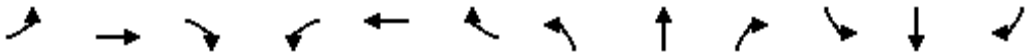
Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	4	104	12	117	29	120	12	315	248	213	326	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt		0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1855		1700	1736	1601	1789	3579	1601	1789	3574	
Flt Permitted		0.99		0.45	0.91	1.00	0.54	1.00	1.00	0.46	1.00	
Satd. Flow (perm)		1842		802	1637	1601	1014	3579	1601	868	3574	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	113	13	127	32	130	13	342	270	232	354	3
RTOR Reduction (vph)	0	6	0	0	0	81	0	0	181	0	1	0
Lane Group Flow (vph)	0	124	0	77	82	49	13	342	89	232	356	0
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		10.2		24.4	24.4	24.4	23.1	21.4	21.4	32.2	27.5	
Effective Green, g (s)		10.2		24.4	24.4	24.4	23.1	21.4	21.4	32.2	27.5	
Actuated g/C Ratio		0.16		0.38	0.38	0.38	0.36	0.33	0.33	0.50	0.43	
Clearance Time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Vehicle Extension (s)		2.5		2.5	2.5	2.5	2.5	0.2	0.2	3.0	2.5	
Lane Grp Cap (vph)		290		444	633	604	382	1185	530	543	1521	
v/s Ratio Prot				c0.03	0.02		0.00	0.10		c0.05	0.10	
v/s Ratio Perm		c0.07		0.04	0.03	0.03	0.01		0.06	c0.16		
v/c Ratio		0.43		0.17	0.13	0.08	0.03	0.29	0.17	0.43	0.23	
Uniform Delay, d1		24.6		13.6	13.2	12.9	13.4	16.0	15.3	9.5	11.8	
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.7		0.1	0.1	0.0	0.0	0.0	0.1	0.5	0.1	
Delay (s)		25.3		13.7	13.2	12.9	13.5	16.0	15.4	10.0	11.9	
Level of Service		C		B	B	B	B	B	B	B	B	
Approach Delay (s)		25.3			13.2			15.7			11.2	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	64.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	49.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

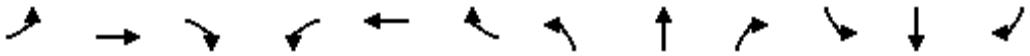
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	579	332	38	69
v/c Ratio	0.40	0.23	0.12	0.20
Control Delay	4.7	3.6	13.6	13.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	4.7	3.6	13.6	13.4
Queue Length 50th (m)	15.7	7.3	2.2	3.7
Queue Length 95th (m)	36.0	17.6	7.0	10.1
Internal Link Dist (m)	487.7	114.8	84.4	98.2
Turn Bay Length (m)				
Base Capacity (vph)	1781	1763	684	743
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	0.33	0.19	0.06	0.09

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	515	13	4	280	22	16	17	3	17	37	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			0.99			0.98	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		1876			1864			1823			1819	
Flt Permitted		1.00			1.00			0.82			0.90	
Satd. Flow (perm)		1873			1856			1534			1656	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	560	14	4	304	24	17	18	3	18	40	11
RTOR Reduction (vph)	0	1	0	0	4	0	0	3	0	0	10	0
Lane Group Flow (vph)	0	578	0	0	328	0	0	35	0	0	59	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		24.8			24.8			4.1			4.1	
Effective Green, g (s)		24.8			24.8			4.1			4.1	
Actuated g/C Ratio		0.67			0.67			0.11			0.11	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1258			1247			170			184	
v/s Ratio Prot												
v/s Ratio Perm		c0.31			0.18			0.02			c0.04	
v/c Ratio		0.46			0.26			0.21			0.32	
Uniform Delay, d1		2.9			2.4			14.9			15.1	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.3			0.1			0.6			1.0	
Delay (s)		3.1			2.5			15.5			16.1	
Level of Service		A			A			B			B	
Approach Delay (s)		3.1			2.5			15.5			16.1	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	4.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	36.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	41.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	1	55	18	70	24	0	18	26	103	1	38	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	60	20	76	26	0	20	28	112	1	41	4

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	80	102	160	47
Volume Left (vph)	1	76	20	1
Volume Right (vph)	20	0	112	4
Hadj (s)	-0.11	0.18	-0.36	-0.02
Departure Headway (s)	4.4	4.6	4.0	4.5
Degree Utilization, x	0.10	0.13	0.18	0.06
Capacity (veh/h)	781	733	852	752
Control Delay (s)	7.8	8.3	7.9	7.8
Approach Delay (s)	7.8	8.3	7.9	7.8
Approach LOS	A	A	A	A

Intersection Summary				
Delay	8.0			
Level of Service	A			
Intersection Capacity Utilization	33.8%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBR	EBR2	NWL2	NWL	NEL	NER
Lane Configurations						
Volume (veh/h)	525	0	91	305	1	154
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	571	0	99	332	1	167
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh)	1			1		
Upstream signal (m)	139					
pX, platoon unblocked			0.87		0.87	0.87
vC, conflicting volume			571		1100	571
vC1, stage 1 conf vol					571	
vC2, stage 2 conf vol					529	
vCu, unblocked vol			435		1042	435
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			90		100	69
cM capacity (veh/h)			981		342	542

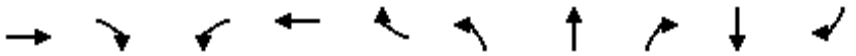
Direction, Lane #	EB 1	EB 2	NW 1	NE 1
Volume Total	571	0	430	168
Volume Left	0	0	99	1
Volume Right	0	0	0	167
cSH	1700	1700	981	540
Volume to Capacity	0.34	0.00	0.10	0.31
Queue Length 95th (m)	0.0	0.0	2.5	10.1
Control Delay (s)	0.0	0.0	3.0	14.7
Lane LOS			A	B
Approach Delay (s)	0.0		3.0	14.7
Approach LOS				B

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	38.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (veh/h)	3	665	395	1	17	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	723	429	1	18	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		Raised	Raised			
Median storage veh)		1	1			
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	430				1159	430
vC1, stage 1 conf vol					430	
vC2, stage 2 conf vol					729	
vCu, unblocked vol	430				1159	430
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	100				95	99
cM capacity (veh/h)	1129				346	625

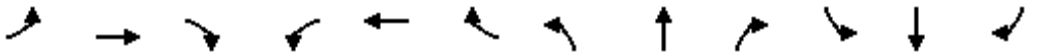
Direction, Lane #	SE 1	NW 1	SW 1
Volume Total	726	430	24
Volume Left	3	0	18
Volume Right	0	1	5
cSH	1129	1700	385
Volume to Capacity	0.00	0.25	0.06
Queue Length 95th (m)	0.1	0.0	1.5
Control Delay (s)	0.1	0.0	15.0
Lane LOS	A		B
Approach Delay (s)	0.1	0.0	15.0
Approach LOS			B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	645	110	91	291	51	79	216	92	188	46
v/c Ratio	0.52	0.15	0.33	0.36	0.07	0.16	0.28	0.14	0.15	0.07
Control Delay	14.6	5.1	15.6	13.4	3.9	12.1	12.8	11.6	11.3	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.6	5.1	15.6	13.4	3.9	12.1	12.8	11.6	11.3	4.2
Queue Length 50th (m)	26.2	2.0	6.4	20.7	0.0	5.2	15.0	6.0	6.4	0.0
Queue Length 95th (m)	39.4	9.4	16.3	36.3	4.9	12.4	27.6	13.4	11.8	4.7
Internal Link Dist (m)	1111.2			86.8			126.9		80.4	
Turn Bay Length (m)		10.0			35.0			10.0		10.0
Base Capacity (vph)	1236	725	280	800	709	496	784	667	1247	693
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.15	0.33	0.36	0.07	0.16	0.28	0.14	0.15	0.07

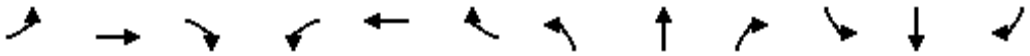
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	111	482	101	84	268	47	73	199	85	50	123	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor		0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected		0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	1.00
Satd. Flow (prot)		3545	1601	1789	1883	1601	1789	1883	1601		3528	1601
Flt Permitted		0.81	1.00	0.35	1.00	1.00	0.63	1.00	1.00		0.84	1.00
Satd. Flow (perm)		2908	1601	660	1883	1601	1193	1883	1601		2994	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	121	524	110	91	291	51	79	216	92	54	134	46
RTOR Reduction (vph)	0	0	45	0	0	29	0	0	0	0	0	27
Lane Group Flow (vph)	0	645	65	91	291	22	79	216	92	0	188	19
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		25.5	25.5	25.5	25.5	25.5	25.0	25.0	25.0		25.0	25.0
Effective Green, g (s)		25.5	25.5	25.5	25.5	25.5	25.0	25.0	25.0		25.0	25.0
Actuated g/C Ratio		0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42		0.42	0.42
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Grp Cap (vph)		1235	680	280	800	680	497	784	667		1247	667
v/s Ratio Prot					0.15			c0.11				
v/s Ratio Perm		c0.22	0.04	0.14		0.01	0.07		0.06		0.06	0.01
v/c Ratio		0.52	0.10	0.33	0.36	0.03	0.16	0.28	0.14		0.15	0.03
Uniform Delay, d1		12.7	10.3	11.5	11.7	10.1	10.9	11.5	10.8		10.9	10.3
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2		1.6	0.3	3.1	1.3	0.1	0.7	0.9	0.4		0.3	0.1
Delay (s)		14.3	10.6	14.6	13.0	10.1	11.6	12.4	11.3		11.1	10.4
Level of Service		B	B	B	B	B	B	B	B		B	B
Approach Delay (s)		13.8			13.0			12.0			11.0	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	12.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.5
Intersection Capacity Utilization	61.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	515	13	4	280	22	16	17	3	17	37	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	560	14	4	304	24	17	18	3	18	40	11
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		Raised			Raised							
Median storage veh)		1			1							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	328			574			934	915	567	915	910	316
vC1, stage 1 conf vol							578	578		325	325	
vC2, stage 2 conf vol							356	337		590	585	
vCu, unblocked vol	328			574			934	915	567	915	910	316
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			95	95	99	95	89	98
cM capacity (veh/h)	1231			999			349	375	523	356	374	724

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	579	333	39	70
Volume Left	5	4	17	18
Volume Right	14	24	3	11
cSH	1231	999	371	399
Volume to Capacity	0.00	0.00	0.11	0.17
Queue Length 95th (m)	0.1	0.1	2.7	4.7
Control Delay (s)	0.1	0.2	15.8	15.9
Lane LOS	A	A	C	C
Approach Delay (s)	0.1	0.2	15.8	15.9
Approach LOS			C	C

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	41.3%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX B

Observed Residential Trip Rates from UBC South Campus

Observed Vehicle Trip Rates from Market Housing at UBC South Campus Area (i.e. not exclusive to UBC students)

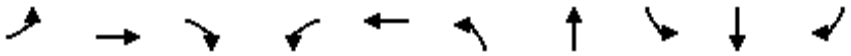
Location	Address	AM # of Vehicles			PM # of Vehicles			# of Units	Trip Rates AM			Trip Rates PM		
		In	Out	Total	In	Out	Total		In	Out	Total	In	Out	Total
Keenlyeside	5788 Birney Avenue	18	26	44	28	12	40	93	0.13	0.18	0.31	0.20	0.09	0.29
Larkspur House	3428 Westbrook Mall							48						

Note: Both buildings access from a single parking ramp, on-street parking activites were captured as well.

APPENDIX C

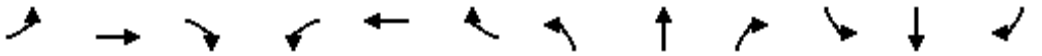
Synchro and Sidra Model Output – Future

(to be provided electronically only)



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	118	116	30	87	152	320	713	44	312	179
v/c Ratio	0.33	0.20	0.06	0.45	0.52	0.60	0.74	0.23	0.65	0.33
Control Delay	21.4	19.7	7.2	38.9	32.9	16.9	20.6	27.7	33.4	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.4	19.7	7.2	38.9	32.9	16.9	20.6	27.7	33.4	6.2
Queue Length 50th (m)	12.2	12.0	0.0	12.0	17.4	26.3	76.7	5.2	41.1	0.0
Queue Length 95th (m)	21.9	21.3	4.5	23.1	31.3	42.7	112.6	12.9	63.1	10.8
Internal Link Dist (m)		131.0			44.8		163.9		585.5	
Turn Bay Length (m)	70.0		50.0	25.0		110.0		55.0		75.0
Base Capacity (vph)	373	1178	1012	529	753	545	1097	234	593	627
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.10	0.03	0.16	0.20	0.59	0.65	0.19	0.53	0.29

Intersection Summary

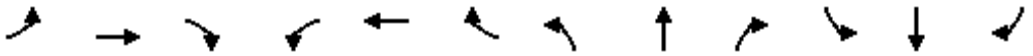


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	97	95	25	71	84	41	262	445	139	36	256	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Lane Util. Factor	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	0.95		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1791		1789	1816		1789	1883	1601
Flt Permitted	0.42	1.00	1.00	0.68	1.00		0.30	1.00		0.39	1.00	1.00
Satd. Flow (perm)	800	1883	1601	1285	1791		568	1816		742	1883	1601
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	118	116	30	87	102	50	320	543	170	44	312	179
RTOR Reduction (vph)	0	0	20	0	22	0	0	10	0	0	0	134
Lane Group Flow (vph)	118	116	10	87	130	0	320	703	0	44	312	45
Turn Type	pm+pt	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	7	4			8		5	2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	23.7	23.7	23.7	11.0	11.0		38.6	38.6		18.8	18.8	18.8
Effective Green, g (s)	23.7	23.7	23.7	11.0	11.0		38.6	38.6		18.8	18.8	18.8
Actuated g/C Ratio	0.32	0.32	0.32	0.15	0.15		0.52	0.52		0.25	0.25	0.25
Clearance Time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	343	601	511	190	265		524	943		188	476	405
v/s Ratio Prot	c0.03	0.06			c0.07		0.11	c0.39			0.17	
v/s Ratio Perm	0.08		0.01	0.07			0.20			0.06		0.03
v/c Ratio	0.34	0.19	0.02	0.46	0.49		0.61	0.75		0.23	0.66	0.11
Uniform Delay, d1	18.7	18.4	17.3	28.9	29.1		11.7	14.0		22.0	24.8	21.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.6	0.2	0.0	1.7	1.4		2.1	3.5		0.9	3.6	0.2
Delay (s)	19.3	18.5	17.3	30.7	30.5		13.9	17.5		22.9	28.4	21.5
Level of Service	B	B	B	C	C		B	B		C	C	C
Approach Delay (s)		18.7			30.6			16.3			25.7	
Approach LOS		B			C			B			C	

Intersection Summary			
HCM Average Control Delay	20.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	74.3	Sum of lost time (s)	18.1
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	61	245	259	326	28	462	126	151	423
v/c Ratio	0.13	0.39	0.36	0.38	0.05	0.48	0.24	0.31	0.33
Control Delay	17.9	14.1	13.6	2.9	12.3	24.3	6.8	13.9	18.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.9	14.1	13.6	2.9	12.3	24.3	6.8	13.9	18.8
Queue Length 50th (m)	4.4	19.0	20.3	0.0	2.1	28.8	0.0	12.2	19.1
Queue Length 95th (m)	12.3	32.6	34.2	8.5	5.8	40.1	9.6	20.8	35.0
Internal Link Dist (m)	106.7		487.7			585.5			116.0
Turn Bay Length (m)		40.0			25.0		50.0	75.0	
Base Capacity (vph)	672	748	1292	1303	784	1322	671	753	1486
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	0.09	0.33	0.20	0.25	0.04	0.35	0.19	0.20	0.28

Intersection Summary

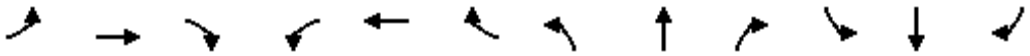


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	33	16	291	122	267	23	379	103	124	339	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt		0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1799		1700	1752	1601	1789	3579	1601	1789	3566	
Flt Permitted		0.99		0.61	0.92	1.00	0.51	1.00	1.00	0.34	1.00	
Satd. Flow (perm)		1786		1086	1649	1601	951	3579	1601	635	3566	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	1	40	20	355	149	326	28	462	126	151	413	10
RTOR Reduction (vph)	0	18	0	0	0	185	0	0	92	0	1	0
Lane Group Flow (vph)	0	43	0	245	259	141	28	462	34	151	422	0
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		7.6		27.7	27.7	27.7	20.9	17.5	17.5	28.4	22.0	
Effective Green, g (s)		7.6		27.7	27.7	27.7	20.9	17.5	17.5	28.4	22.0	
Actuated g/C Ratio		0.12		0.43	0.43	0.43	0.33	0.27	0.27	0.44	0.34	
Clearance Time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Vehicle Extension (s)		2.5		2.5	2.5	2.5	2.5	0.2	0.2	3.0	2.5	
Lane Grp Cap (vph)		212		624	738	692	355	977	437	424	1224	
v/s Ratio Prot				c0.10	0.09		0.00	c0.13		c0.04	0.12	
v/s Ratio Perm		0.02		c0.07	0.06	0.09	0.02		0.02	0.11		
v/c Ratio		0.20		0.39	0.35	0.20	0.08	0.47	0.08	0.36	0.34	
Uniform Delay, d1		25.5		12.3	12.2	11.3	14.8	19.4	17.3	11.2	15.7	
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.3		0.3	0.2	0.1	0.1	0.1	0.0	0.5	0.1	
Delay (s)		25.9		12.6	12.4	11.4	14.9	19.6	17.3	11.7	15.8	
Level of Service		C		B	B	B	B	B	B	B	B	
Approach Delay (s)		25.9			12.1			18.9			14.7	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	64.1	Sum of lost time (s)	11.0
Intersection Capacity Utilization	51.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

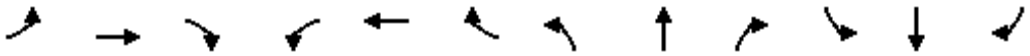
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	493	868	158	95
v/c Ratio	0.38	0.66	0.45	0.26
Control Delay	5.4	9.2	22.8	18.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	5.4	9.2	22.8	18.5
Queue Length 50th (m)	16.0	39.7	10.6	5.6
Queue Length 95th (m)	29.7	70.5	26.8	16.6
Internal Link Dist (m)	487.7	114.8	84.4	98.2
Turn Bay Length (m)				
Base Capacity (vph)	1538	1566	500	522
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	0.32	0.55	0.32	0.18

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	363	35	1	696	15	48	81	0	20	51	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			1.00			1.00			0.99	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		1860			1878			1849			1836	
Flt Permitted		0.99			1.00			0.88			0.92	
Satd. Flow (perm)		1844			1878			1657			1711	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	7	443	43	1	849	18	59	99	0	24	62	9
RTOR Reduction (vph)	0	5	0	0	1	0	0	0	0	0	7	0
Lane Group Flow (vph)	0	488	0	0	867	0	0	158	0	0	88	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		30.9			30.9			7.9			7.9	
Effective Green, g (s)		30.9			30.9			7.9			7.9	
Actuated g/C Ratio		0.66			0.66			0.17			0.17	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1218			1240			280			289	
v/s Ratio Prot												
v/s Ratio Perm		0.26			0.46			c0.10			0.05	
v/c Ratio		0.40			0.70			0.56			0.31	
Uniform Delay, d1		3.7			5.0			17.9			17.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.2			1.7			2.6			0.6	
Delay (s)		3.9			6.8			20.5			17.6	
Level of Service		A			A			C			B	
Approach Delay (s)		3.9			6.8			20.5			17.6	
Approach LOS		A			A			C			B	

Intersection Summary			
HCM Average Control Delay	7.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	46.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	59	22	169	50	0	26	126	98	0	89	4
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	2	72	27	206	61	0	32	154	120	0	109	5

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	101	267	305	113
Volume Left (vph)	2	206	32	0
Volume Right (vph)	27	0	120	5
Hadj (s)	-0.12	0.19	-0.18	0.01
Departure Headway (s)	5.3	5.3	4.9	5.4
Degree Utilization, x	0.15	0.40	0.42	0.17
Capacity (veh/h)	605	630	682	605
Control Delay (s)	9.3	11.8	11.4	9.5
Approach Delay (s)	9.3	11.8	11.4	9.5
Approach LOS	A	B	B	A

Intersection Summary				
Delay		11.0		
HCM Level of Service		B		
Intersection Capacity Utilization		46.0%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBR	EBR2	NWL2	NWL	NEL	NER
Lane Configurations						
Volume (veh/h)	374	0	224	696	4	181
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	456	0	273	849	5	221
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh)	1			1		
Upstream signal (m)	139					
pX, platoon unblocked			0.92		0.92	0.92
vC, conflicting volume			456		1851	456
vC1, stage 1 conf vol					456	
vC2, stage 2 conf vol					1395	
vCu, unblocked vol			362		1883	362
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			75		96	65
cM capacity (veh/h)			1098		139	626

Direction, Lane #	EB 1	EB 2	NW 1	NE 1
Volume Total	456	0	1122	226
Volume Left	0	0	273	5
Volume Right	0	0	0	221
cSH	1700	1700	1098	582
Volume to Capacity	0.27	0.00	0.25	0.39
Queue Length 95th (m)	0.0	0.0	7.5	13.9
Control Delay (s)	0.0	0.0	5.8	15.0
Lane LOS			A	C
Approach Delay (s)	0.0		5.8	15.0
Approach LOS				C

Intersection Summary			
Average Delay	5.5		
Intersection Capacity Utilization	69.1%	ICU Level of Service	C
Analysis Period (min)	15		

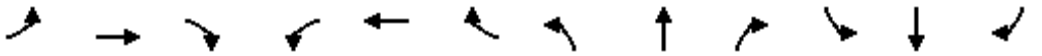
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (veh/h)	16	534	913	21	8	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	20	651	1113	26	10	7
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		Raised	Raised			
Median storage veh)		1	1			
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1139				1816	1126
vC1, stage 1 conf vol					1126	
vC2, stage 2 conf vol					690	
vCu, unblocked vol	1139				1816	1126
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	97				95	97
cM capacity (veh/h)	613				208	249

Direction, Lane #	SE 1	NW 1	SW 1
Volume Total	671	1139	17
Volume Left	20	0	10
Volume Right	0	26	7
cSH	613	1700	224
Volume to Capacity	0.03	0.67	0.08
Queue Length 95th (m)	0.7	0.0	1.9
Control Delay (s)	0.9	0.0	22.4
Lane LOS	A		C
Approach Delay (s)	0.9	0.0	22.4
Approach LOS			C

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	113	450	130	137	784	90	187	271	117	317	191
v/c Ratio	0.56	0.43	0.14	0.30	0.74	0.10	0.61	0.49	0.25	0.38	0.32
Control Delay	22.8	9.8	3.3	9.7	16.1	2.5	29.8	22.7	19.4	19.9	5.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.8	9.8	3.3	9.7	16.1	2.5	29.8	22.7	19.4	19.9	5.8
Queue Length 50th (m)	7.8	28.1	2.2	7.8	64.0	0.4	19.2	26.8	10.7	15.8	1.5
Queue Length 95th (m)	21.0	40.1	7.1	15.2	86.3	4.4	33.8	41.3	19.8	23.0	11.1
Internal Link Dist (m)		1111.2			86.8			126.9		80.4	
Turn Bay Length (m)	50.0		10.0			35.0			10.0		10.0
Base Capacity (vph)	203	1057	936	459	1057	935	308	550	468	837	591
Starvation Cap Reductn	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
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.43	0.14	0.30	0.74	0.10	0.61	0.49	0.25	0.38	0.32

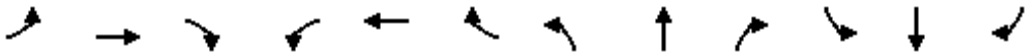
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	93	369	107	112	643	74	153	222	96	56	204	157
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	1883	1601		3541	1601
Flt Permitted	0.19	1.00	1.00	0.43	1.00	1.00	0.56	1.00	1.00		0.80	1.00
Satd. Flow (perm)	362	1883	1601	817	1883	1601	1054	1883	1601		2863	1601
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	113	450	130	137	784	90	187	271	117	68	249	191
RTOR Reduction (vph)	0	0	37	0	0	36	0	0	0	0	0	123
Lane Group Flow (vph)	113	450	93	137	784	54	187	271	117	0	317	68
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	36.5	36.5	36.5	36.5	36.5	36.5	19.0	19.0	19.0		19.0	19.0
Effective Green, g (s)	36.5	36.5	36.5	36.5	36.5	36.5	19.0	19.0	19.0		19.0	19.0
Actuated g/C Ratio	0.56	0.56	0.56	0.56	0.56	0.56	0.29	0.29	0.29		0.29	0.29
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Grp Cap (vph)	203	1057	899	459	1057	899	308	550	468		837	468
v/s Ratio Prot		0.24			c0.42			0.14				
v/s Ratio Perm	0.31		0.06	0.17		0.03	c0.18		0.07		0.11	0.04
v/c Ratio	0.56	0.43	0.10	0.30	0.74	0.06	0.61	0.49	0.25		0.38	0.15
Uniform Delay, d1	9.1	8.2	6.6	7.5	10.7	6.5	19.8	19.0	17.6		18.3	17.0
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	10.6	1.3	0.2	1.7	4.7	0.1	8.6	3.1	1.3		1.3	0.7
Delay (s)	19.7	9.5	6.9	9.2	15.4	6.6	28.4	22.2	18.8		19.6	17.6
Level of Service	B	A	A	A	B	A	C	C	B		B	B
Approach Delay (s)		10.6			13.8			23.5			18.9	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM Average Control Delay	15.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	9.5
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

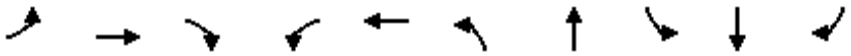
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	6	363	35	1	696	15	48	81	0	20	51	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	7	443	43	1	849	18	59	99	0	24	62	9
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		Raised			Raised							
Median storage veh)		1			1							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	867			485			1379	1348	464	1388	1360	858
vC1, stage 1 conf vol							479	479		860	860	
vC2, stage 2 conf vol							900	870		528	500	
vCu, unblocked vol	867			485			1379	1348	464	1388	1360	858
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			71	62	100	89	76	98
cM capacity (veh/h)	777			1078			200	263	598	215	264	357

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	493	868	157	95
Volume Left	7	1	59	24
Volume Right	43	18	0	9
cSH	777	1078	235	255
Volume to Capacity	0.01	0.00	0.67	0.37
Queue Length 95th (m)	0.2	0.0	32.1	12.5
Control Delay (s)	0.3	0.0	46.5	27.3
Lane LOS	A	A	E	D
Approach Delay (s)	0.3	0.0	46.5	27.3
Approach LOS			E	D

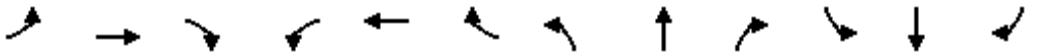
Intersection Summary			
Average Delay	6.2		
Intersection Capacity Utilization	55.5%	ICU Level of Service	B
Analysis Period (min)	15		



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	284	66	147	84	86	102	449	67	529	97
v/c Ratio	0.87	0.12	0.26	0.40	0.28	0.30	0.48	0.21	0.84	0.16
Control Delay	49.2	17.3	4.8	33.0	16.0	11.8	13.0	22.2	39.5	6.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.2	17.3	4.8	33.0	16.0	11.8	13.0	22.2	39.5	6.1
Queue Length 50th (m)	28.9	5.9	0.0	9.9	4.0	6.3	33.4	6.4	65.2	0.1
Queue Length 95th (m)	#67.5	14.0	10.7	22.5	15.2	14.7	61.7	17.5	#137.0	10.1
Internal Link Dist (m)		131.0			44.8		163.9		585.5	
Turn Bay Length (m)	70.0		50.0	25.0		110.0		55.0		75.0
Base Capacity (vph)	326	1155	1039	557	740	645	1353	316	629	599
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.87	0.06	0.14	0.15	0.12	0.16	0.33	0.21	0.84	0.16

Intersection Summary

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

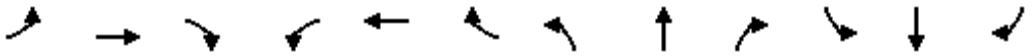


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	261	61	135	77	32	47	94	360	53	62	487	89
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Lane Util. Factor	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	0.91		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1716		1789	1847		1789	1883	1601
Flt Permitted	0.39	1.00	1.00	0.71	1.00		0.15	1.00		0.50	1.00	1.00
Satd. Flow (perm)	737	1883	1601	1345	1716		278	1847		948	1883	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	284	66	147	84	35	51	102	391	58	67	529	97
RTOR Reduction (vph)	0	0	102	0	45	0	0	5	0	0	0	65
Lane Group Flow (vph)	284	66	45	84	41	0	102	444	0	67	529	32
Turn Type	pm+pt	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	7	4			8		5	2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	20.4	20.4	20.4	7.7	7.7		33.7	33.7		21.2	21.2	21.2
Effective Green, g (s)	20.4	20.4	20.4	7.7	7.7		33.7	33.7		21.2	21.2	21.2
Actuated g/C Ratio	0.31	0.31	0.31	0.12	0.12		0.51	0.51		0.32	0.32	0.32
Clearance Time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	332	581	494	157	200		293	942		304	604	513
v/s Ratio Prot	c0.09	0.04			0.02		0.03	c0.24			c0.28	
v/s Ratio Perm	c0.18		0.03	0.06			0.14			0.07		0.02
v/c Ratio	0.86	0.11	0.09	0.54	0.20		0.35	0.47		0.22	0.88	0.06
Uniform Delay, d1	20.5	16.4	16.3	27.5	26.4		11.4	10.4		16.4	21.2	15.6
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	18.9	0.1	0.1	3.5	0.5		0.7	0.5		0.5	13.8	0.1
Delay (s)	39.4	16.5	16.3	31.0	26.9		12.1	11.0		16.9	35.0	15.6
Level of Service	D	B	B	C	C		B	B		B	C	B
Approach Delay (s)		29.5			28.9			11.2			30.5	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	24.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	66.1	Sum of lost time (s)	17.9
Intersection Capacity Utilization	66.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	153	91	95	152	15	401	315	271	418
v/c Ratio	0.31	0.15	0.13	0.18	0.03	0.43	0.48	0.46	0.24
Control Delay	25.8	11.4	11.2	2.8	12.1	25.6	6.3	16.2	16.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.8	11.4	11.2	2.8	12.1	25.6	6.3	16.2	16.4
Queue Length 50th (m)	17.1	6.8	7.1	0.0	1.1	25.5	0.0	23.6	18.8
Queue Length 95th (m)	32.7	14.5	14.9	8.3	4.1	38.5	18.4	40.1	38.4
Internal Link Dist (m)	106.7		487.7			585.5			116.0
Turn Bay Length (m)		40.0			25.0		50.0	75.0	
Base Capacity (vph)	518	613	949	1024	639	996	673	604	1772
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	0.15	0.10	0.15	0.02	0.40	0.47	0.45	0.24

Intersection Summary

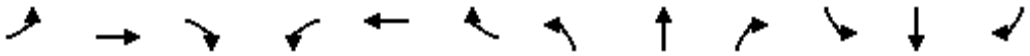


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	122	14	137	34	140	14	369	290	249	381	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt		0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1855		1700	1736	1601	1789	3579	1601	1789	3573	
Flt Permitted		0.99		0.39	0.85	1.00	0.51	1.00	1.00	0.39	1.00	
Satd. Flow (perm)		1841		694	1517	1601	956	3579	1601	735	3573	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	133	15	149	37	152	15	401	315	271	414	4
RTOR Reduction (vph)	0	6	0	0	0	95	0	0	225	0	1	0
Lane Group Flow (vph)	0	147	0	91	95	57	15	401	90	271	417	0
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		10.7		25.4	25.4	25.4	21.3	19.5	19.5	34.8	30.0	
Effective Green, g (s)		10.7		25.4	25.4	25.4	21.3	19.5	19.5	34.8	30.0	
Actuated g/C Ratio		0.16		0.37	0.37	0.37	0.31	0.29	0.29	0.51	0.44	
Clearance Time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Vehicle Extension (s)		2.5		2.5	2.5	2.5	2.5	0.2	0.2	3.0	2.5	
Lane Grp Cap (vph)		289		416	599	596	321	1023	458	565	1572	
v/s Ratio Prot				c0.03	0.02		0.00	0.11		c0.09	0.12	
v/s Ratio Perm		c0.08		0.05	0.03	0.04	0.01		0.06	c0.16		
v/c Ratio		0.51		0.22	0.16	0.09	0.05	0.39	0.20	0.48	0.27	
Uniform Delay, d1		26.3		14.9	14.3	13.9	16.3	19.6	18.4	9.9	12.1	
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		1.0		0.2	0.1	0.1	0.0	0.1	0.1	0.6	0.1	
Delay (s)		27.4		15.0	14.4	14.0	16.3	19.7	18.5	10.6	12.2	
Level of Service		C		B	B	B	B	B	B	B	B	
Approach Delay (s)		27.4			14.4			19.1			11.6	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM Average Control Delay	16.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	68.2	Sum of lost time (s)	11.0
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

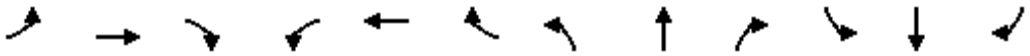
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	678	390	47	82
v/c Ratio	0.47	0.27	0.15	0.24
Control Delay	5.3	3.7	15.1	14.9
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	5.3	3.7	15.1	14.9
Queue Length 50th (m)	20.6	9.3	2.7	4.3
Queue Length 95th (m)	47.9	22.0	9.4	13.5
Internal Link Dist (m)	487.7	114.8	84.4	98.2
Turn Bay Length (m)				
Base Capacity (vph)	1742	1725	608	664
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	0.39	0.23	0.08	0.12

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	603	15	5	328	26	19	20	4	20	43	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			0.99			0.98	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		1876			1864			1821			1819	
Flt Permitted		1.00			0.99			0.82			0.89	
Satd. Flow (perm)		1871			1854			1521			1646	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	655	16	5	357	28	21	22	4	22	47	13
RTOR Reduction (vph)	0	1	0	0	4	0	0	4	0	0	12	0
Lane Group Flow (vph)	0	677	0	0	386	0	0	43	0	0	70	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		26.5			26.5			4.3			4.3	
Effective Green, g (s)		26.5			26.5			4.3			4.3	
Actuated g/C Ratio		0.68			0.68			0.11			0.11	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1278			1266			169			182	
v/s Ratio Prot												
v/s Ratio Perm		c0.36			0.21			0.03			c0.04	
v/c Ratio		0.53			0.30			0.26			0.39	
Uniform Delay, d1		3.1			2.5			15.8			16.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.4			0.1			0.8			1.4	
Delay (s)		3.5			2.6			16.6			17.4	
Level of Service		A			A			B			B	
Approach Delay (s)		3.5			2.6			16.6			17.4	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	4.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	38.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	1	64	21	82	28	0	21	30	121	1	44	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	70	23	89	30	0	23	33	132	1	48	5

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	93	120	187	54
Volume Left (vph)	1	89	23	1
Volume Right (vph)	23	0	132	5
Hadj (s)	-0.11	0.18	-0.36	-0.02
Departure Headway (s)	4.5	4.7	4.1	4.6
Degree Utilization, x	0.12	0.16	0.21	0.07
Capacity (veh/h)	757	714	830	728
Control Delay (s)	8.1	8.6	8.2	7.9
Approach Delay (s)	8.1	8.6	8.2	7.9
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.3		
HCM Level of Service	A		
Intersection Capacity Utilization	36.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBR	EBR2	NWL2	NWL	NEL	NER
Lane Configurations						
Volume (veh/h)	614	0	106	357	1	180
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	667	0	115	388	1	196
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh)	1			1		
Upstream signal (m)	139					
pX, platoon unblocked			0.81		0.81	0.81
vC, conflicting volume			667		1286	667
vC1, stage 1 conf vol					667	
vC2, stage 2 conf vol					618	
vCu, unblocked vol			477		1237	477
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			87		100	59
cM capacity (veh/h)			883		285	479

Direction, Lane #	EB 1	EB 2	NW 1	NE 1
Volume Total	667	0	503	197
Volume Left	0	0	115	1
Volume Right	0	0	0	196
cSH	1700	1700	883	477
Volume to Capacity	0.39	0.00	0.13	0.41
Queue Length 95th (m)	0.0	0.0	3.4	15.2
Control Delay (s)	0.0	0.0	3.5	17.8
Lane LOS			A	C
Approach Delay (s)	0.0		3.5	17.8
Approach LOS				C

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	43.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (veh/h)	4	778	462	1	20	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	846	502	1	22	7
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		Raised	Raised			
Median storage veh)		1	1			
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	503				1357	503
vC1, stage 1 conf vol					503	
vC2, stage 2 conf vol					854	
vCu, unblocked vol	503				1357	503
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	100				93	99
cM capacity (veh/h)	1061				296	569

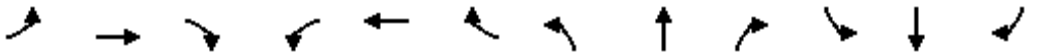
Direction, Lane #	SE 1	NW 1	SW 1
Volume Total	850	503	28
Volume Left	4	0	22
Volume Right	0	1	7
cSH	1061	1700	333
Volume to Capacity	0.00	0.30	0.08
Queue Length 95th (m)	0.1	0.0	2.1
Control Delay (s)	0.1	0.0	16.8
Lane LOS	A		C
Approach Delay (s)	0.1	0.0	16.8
Approach LOS			C

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	141	613	128	107	341	60	92	253	108	221	53
v/c Ratio	0.33	0.71	0.16	0.52	0.40	0.08	0.21	0.35	0.18	0.20	0.08
Control Delay	13.2	18.7	2.7	23.0	12.5	3.3	14.0	14.9	13.3	13.0	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.2	18.7	2.7	23.0	12.5	3.3	14.0	14.9	13.3	13.0	4.5
Queue Length 50th (m)	9.3	50.8	0.0	7.9	23.3	0.0	6.5	19.2	7.6	8.2	0.0
Queue Length 95th (m)	20.6	84.0	7.1	#26.5	40.0	4.9	15.2	34.3	16.4	14.5	5.4
Internal Link Dist (m)		1111.2			86.8			126.9		80.4	
Turn Bay Length (m)	50.0		10.0						10.0		10.0
Base Capacity (vph)	426	863	803	206	863	766	443	722	614	1121	646
Starvation Cap Reductn	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
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.71	0.16	0.52	0.40	0.08	0.21	0.35	0.18	0.20	0.08

Intersection Summary

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	130	564	118	98	314	55	85	233	99	59	144	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	1883	1601		3527	1601
Flt Permitted	0.49	1.00	1.00	0.24	1.00	1.00	0.61	1.00	1.00		0.82	1.00
Satd. Flow (perm)	929	1883	1601	451	1883	1601	1156	1883	1601		2922	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	141	613	128	107	341	60	92	253	108	64	157	53
RTOR Reduction (vph)	0	0	69	0	0	33	0	0	0	0	0	33
Lane Group Flow (vph)	141	613	59	107	341	28	92	253	108	0	221	20
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	27.5	27.5	27.5	27.5	27.5	27.5	23.0	23.0	23.0		23.0	23.0
Effective Green, g (s)	27.5	27.5	27.5	27.5	27.5	27.5	23.0	23.0	23.0		23.0	23.0
Actuated g/C Ratio	0.46	0.46	0.46	0.46	0.46	0.46	0.38	0.38	0.38		0.38	0.38
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Grp Cap (vph)	426	863	734	207	863	734	443	722	614		1120	614
v/s Ratio Prot		c0.33			0.18			c0.13				
v/s Ratio Perm	0.15		0.04	0.24		0.02	0.08		0.07		0.08	0.01
v/c Ratio	0.33	0.71	0.08	0.52	0.40	0.04	0.21	0.35	0.18		0.20	0.03
Uniform Delay, d1	10.4	13.1	9.1	11.5	10.7	9.0	12.4	13.2	12.2		12.3	11.6
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	2.1	4.9	0.2	8.9	1.4	0.1	1.1	1.3	0.6		0.4	0.1
Delay (s)	12.5	18.0	9.3	20.5	12.1	9.1	13.5	14.5	12.9		12.7	11.7
Level of Service	B	B	A	C	B	A	B	B	B		B	B
Approach Delay (s)		15.8			13.5			13.9			12.5	
Approach LOS		B			B			B			B	

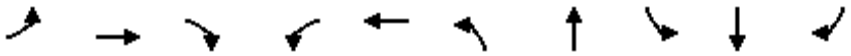
Intersection Summary					
HCM Average Control Delay	14.4	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.55				
Actuated Cycle Length (s)	60.0	Sum of lost time (s)		9.5	
Intersection Capacity Utilization	68.9%	ICU Level of Service		C	
Analysis Period (min)	15				

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	6	603	15	5	328	26	19	20	4	20	43	12
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	655	16	5	357	28	21	22	4	22	47	13
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		Raised			Raised							
Median storage veh)		1			1							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	385			672			1095	1072	664	1073	1066	371
vC1, stage 1 conf vol							677	677		382	382	
vC2, stage 2 conf vol							418	396		692	685	
vCu, unblocked vol	385			672			1095	1072	664	1073	1066	371
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			93	93	99	93	86	98
cM capacity (veh/h)	1174			919			297	330	461	302	329	675

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	678	390	47	82
Volume Left	7	5	21	22
Volume Right	16	28	4	13
cSH	1174	919	322	350
Volume to Capacity	0.01	0.01	0.14	0.23
Queue Length 95th (m)	0.1	0.1	3.8	6.8
Control Delay (s)	0.2	0.2	18.1	18.4
Lane LOS	A	A	C	C
Approach Delay (s)	0.2	0.2	18.1	18.4
Approach LOS			C	C

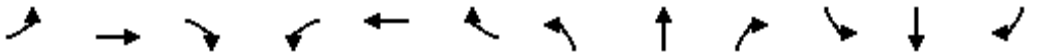
Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	47.3%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	118	123	30	134	160	320	766	44	329	182
v/c Ratio	0.32	0.20	0.06	0.59	0.47	0.63	0.80	0.28	0.66	0.33
Control Delay	20.8	19.4	6.6	42.6	30.6	20.0	25.8	31.7	35.3	6.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.8	19.4	6.6	42.6	30.6	20.0	25.8	31.7	35.3	6.3
Queue Length 50th (m)	12.9	13.4	0.0	20.0	19.6	28.6	94.2	5.5	46.2	0.0
Queue Length 95th (m)	21.5	22.1	4.3	33.1	32.7	48.7	#148.6	14.5	72.5	11.5
Internal Link Dist (m)		131.0			44.8		163.9		585.5	
Turn Bay Length (m)	70.0		50.0	25.0		110.0		55.0		75.0
Base Capacity (vph)	384	1098	946	490	704	517	1023	179	555	600
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.11	0.03	0.27	0.23	0.62	0.75	0.25	0.59	0.30

Intersection Summary

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

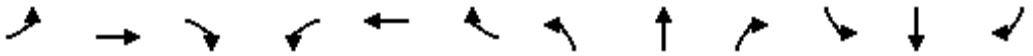


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	97	101	25	110	90	41	262	463	165	36	270	149
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Lane Util. Factor	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	0.95		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1795		1789	1809		1789	1883	1601
Flt Permitted	0.45	1.00	1.00	0.68	1.00		0.29	1.00		0.32	1.00	1.00
Satd. Flow (perm)	842	1883	1601	1277	1795		544	1809		607	1883	1601
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	118	123	30	134	110	50	320	565	201	44	329	182
RTOR Reduction (vph)	0	0	20	0	20	0	0	11	0	0	0	134
Lane Group Flow (vph)	118	123	10	134	140	0	320	755	0	44	329	48
Turn Type	pm+pt	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	7	4			8		5	2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	26.7	26.7	26.7	14.0	14.0		40.8	40.8		21.0	21.0	21.0
Effective Green, g (s)	26.7	26.7	26.7	14.0	14.0		40.8	40.8		21.0	21.0	21.0
Actuated g/C Ratio	0.34	0.34	0.34	0.18	0.18		0.51	0.51		0.26	0.26	0.26
Clearance Time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	361	632	538	225	316		497	928		160	497	423
v/s Ratio Prot	c0.03	0.07			0.08		0.11	c0.42			0.17	
v/s Ratio Perm	0.08		0.01	c0.10			0.22			0.07		0.03
v/c Ratio	0.33	0.19	0.02	0.60	0.44		0.64	0.81		0.28	0.66	0.11
Uniform Delay, d1	19.1	18.8	17.6	30.1	29.3		13.0	16.2		23.2	26.1	22.2
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.2	0.0	4.2	1.0		2.9	5.8		1.3	3.6	0.2
Delay (s)	19.6	18.9	17.7	34.3	30.3		15.9	22.0		24.5	29.7	22.4
Level of Service	B	B	B	C	C		B	C		C	C	C
Approach Delay (s)		19.1			32.1			20.2			26.9	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM Average Control Delay	23.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	79.5	Sum of lost time (s)	18.1
Intersection Capacity Utilization	75.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	61	258	265	339	28	462	148	166	423
v/c Ratio	0.14	0.44	0.39	0.40	0.05	0.52	0.29	0.33	0.30
Control Delay	18.4	15.2	14.4	3.0	12.4	25.5	6.8	14.0	18.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.4	15.2	14.4	3.0	12.4	25.5	6.8	14.0	18.3
Queue Length 50th (m)	4.4	20.3	20.8	0.0	2.1	28.8	0.0	13.5	19.1
Queue Length 95th (m)	12.6	35.1	35.7	8.6	5.8	41.2	10.3	23.2	35.4
Internal Link Dist (m)	106.7		487.7			585.5			116.0
Turn Bay Length (m)		40.0			25.0		50.0	70.0	
Base Capacity (vph)	619	697	1230	1276	756	1214	641	714	1477
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	0.10	0.37	0.22	0.27	0.04	0.38	0.23	0.23	0.29

Intersection Summary

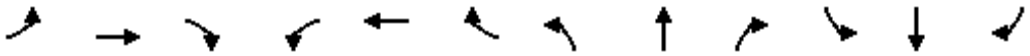


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	33	16	307	122	278	23	379	121	136	339	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt		0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1799		1700	1751	1601	1789	3579	1601	1789	3566	
Flt Permitted		0.99		0.60	0.90	1.00	0.51	1.00	1.00	0.33	1.00	
Satd. Flow (perm)		1786		1071	1609	1601	951	3579	1601	617	3566	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	1	40	20	374	149	339	28	462	148	166	413	10
RTOR Reduction (vph)	0	18	0	0	0	200	0	0	109	0	1	0
Lane Group Flow (vph)	0	43	0	258	265	139	28	462	39	166	422	0
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		7.9		27.6	27.6	27.6	21.2	17.7	17.7	31.7	25.2	
Effective Green, g (s)		7.9		27.6	27.6	27.6	21.2	17.7	17.7	31.7	25.2	
Actuated g/C Ratio		0.12		0.41	0.41	0.41	0.32	0.26	0.26	0.47	0.37	
Clearance Time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Vehicle Extension (s)		2.5		2.5	2.5	2.5	2.5	0.2	0.2	3.0	2.5	
Lane Grp Cap (vph)		210		586	693	657	343	941	421	482	1335	
v/s Ratio Prot				c0.10	0.09		0.00	c0.13		c0.06	0.12	
v/s Ratio Perm		0.02		c0.08	0.07	0.09	0.02		0.02	0.11		
v/c Ratio		0.21		0.44	0.38	0.21	0.08	0.49	0.09	0.34	0.32	
Uniform Delay, d1		26.9		14.0	13.9	12.8	16.0	21.0	18.7	10.8	14.9	
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.4		0.4	0.3	0.1	0.1	0.1	0.0	0.4	0.1	
Delay (s)		27.2		14.4	14.1	12.9	16.1	21.1	18.8	11.2	15.0	
Level of Service		C		B	B	B	B	C	B	B	B	
Approach Delay (s)		27.2			13.7			20.4			14.0	
Approach LOS		C			B			C			B	

Intersection Summary			
HCM Average Control Delay	16.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	67.3	Sum of lost time (s)	11.0
Intersection Capacity Utilization	52.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

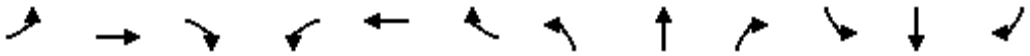
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	529	879	186	103
v/c Ratio	0.42	0.68	0.50	0.27
Control Delay	6.0	10.1	23.4	18.6
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	6.0	10.1	23.4	18.6
Queue Length 50th (m)	18.4	44.2	13.3	6.4
Queue Length 95th (m)	33.8	77.1	30.4	17.3
Internal Link Dist (m)	487.7	114.8	84.4	98.2
Turn Bay Length (m)				
Base Capacity (vph)	1477	1516	528	554
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	0.36	0.58	0.35	0.19

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	358	70	1	711	9	60	93	0	20	57	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			1.00			1.00			0.99	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		1841			1880			1847			1840	
Flt Permitted		0.99			1.00			0.87			0.92	
Satd. Flow (perm)		1826			1880			1645			1712	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	7	437	85	1	867	11	73	113	0	24	70	9
RTOR Reduction (vph)	0	11	0	0	1	0	0	0	0	0	6	0
Lane Group Flow (vph)	0	518	0	0	878	0	0	186	0	0	97	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		31.1			31.1			8.6			8.6	
Effective Green, g (s)		31.1			31.1			8.6			8.6	
Actuated g/C Ratio		0.65			0.65			0.18			0.18	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1191			1226			297			309	
v/s Ratio Prot												
v/s Ratio Perm		0.28			0.47			c0.11			0.06	
v/c Ratio		0.44			0.72			0.63			0.31	
Uniform Delay, d1		4.0			5.4			18.1			17.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.3			2.0			4.1			0.6	
Delay (s)		4.3			7.4			22.1			17.6	
Level of Service		A			A			C			B	
Approach Delay (s)		4.3			7.4			22.1			17.6	
Approach LOS		A			A			C			B	

Intersection Summary			
HCM Average Control Delay	8.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	47.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	59	22	50	50	0	26	150	32	7	123	4
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	2	72	27	61	61	0	32	183	39	9	150	5

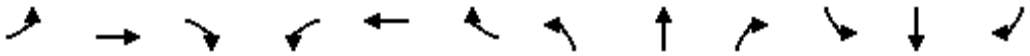
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	101	122	254	163
Volume Left (vph)	2	61	32	9
Volume Right (vph)	27	0	39	5
Hadj (s)	-0.12	0.13	-0.03	0.03
Departure Headway (s)	5.0	5.2	4.7	4.8
Degree Utilization, x	0.14	0.18	0.33	0.22
Capacity (veh/h)	652	631	734	697
Control Delay (s)	8.8	9.3	9.9	9.2
Approach Delay (s)	8.8	9.3	9.9	9.2
Approach LOS	A	A	A	A

Intersection Summary			
Delay	9.4		
HCM Level of Service	A		
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBR	EBR2	NWL2	NWL	NEL	NER
Lane Configurations						
Volume (veh/h)	369	0	100	705	4	115
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	450	0	122	860	5	140
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh)	1			1		
Upstream signal (m)	139					
pX, platoon unblocked			0.92		0.92	0.92
vC, conflicting volume			450		1554	450
vC1, stage 1 conf vol					450	
vC2, stage 2 conf vol					1104	
vCu, unblocked vol			354		1559	354
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			89		98	78
cM capacity (veh/h)			1104		217	632

Direction, Lane #	EB 1	EB 2	NW 1	NE 1
Volume Total	450	0	982	145
Volume Left	0	0	122	5
Volume Right	0	0	0	140
cSH	1700	1700	1104	594
Volume to Capacity	0.26	0.00	0.11	0.24
Queue Length 95th (m)	0.0	0.0	2.8	7.3
Control Delay (s)	0.0	0.0	2.8	13.0
Lane LOS			A	B
Approach Delay (s)	0.0		2.8	13.0
Approach LOS				B

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	16	461	2	171	783	21	15	0	130	8	0	6
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	20	562	2	209	955	26	18	0	159	10	0	7
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		Raised			Raised							
Median storage veh)		1			1							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	980			565			1982	2000	563	2145	1988	968
vC1, stage 1 conf vol							602	602		1385	1385	
vC2, stage 2 conf vol							1379	1398		760	604	
vCu, unblocked vol	980			565			1982	2000	563	2145	1988	968
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			79			81	100	70	79	100	98
cM capacity (veh/h)	704			1007			97	116	525	47	114	308

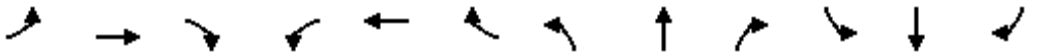
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total	20	565	209	980	18	159	17
Volume Left	20	0	209	0	18	0	10
Volume Right	0	2	0	26	0	159	7
cSH	704	1700	1007	1700	97	525	73
Volume to Capacity	0.03	0.33	0.21	0.58	0.19	0.30	0.23
Queue Length 95th (m)	0.6	0.0	5.9	0.0	5.0	9.6	6.2
Control Delay (s)	10.3	0.0	9.5	0.0	50.8	14.8	68.2
Lane LOS	B		A		F	B	F
Approach Delay (s)	0.3		1.7		18.5		68.2
Approach LOS					C		F

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	148	622	148	137	910	90	213	271	117	317	218
v/c Ratio	0.82	0.56	0.15	0.38	0.78	0.09	0.83	0.57	0.26	0.47	0.42
Control Delay	50.6	10.7	3.7	10.8	16.5	2.4	55.1	29.9	13.2	26.5	10.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.6	10.7	3.7	10.8	16.5	2.4	55.1	29.9	13.2	26.5	10.3
Queue Length 50th (m)	14.4	47.3	4.0	8.5	83.9	1.0	28.5	33.4	5.8	20.0	6.6
Queue Length 95th (m)	#43.5	63.2	9.1	16.9	107.8	4.7	#54.8	49.6	15.3	28.2	18.7
Internal Link Dist (m)		1111.2			186.8			126.9		80.4	
Turn Bay Length (m)	50.0		10.0			35.0			10.0		10.0
Base Capacity (vph)	180	1106	970	363	1167	1019	257	477	453	674	524
Starvation Cap Reductn	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
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.82	0.56	0.15	0.38	0.78	0.09	0.83	0.57	0.26	0.47	0.42

Intersection Summary

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	121	496	135	112	746	74	175	222	96	56	204	179
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00		0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	1.00
Satd. Flow (prot)	1789	1782	1521	1789	1883	1601	1789	1883	1601		3541	1601
Flt Permitted	0.15	1.00	1.00	0.31	1.00	1.00	0.54	1.00	1.00		0.74	1.00
Satd. Flow (perm)	290	1782	1521	585	1883	1601	1014	1883	1601		2658	1601
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	148	605	165	137	910	90	213	271	117	68	249	218
RTOR Reduction (vph)	0	2	27	0	0	27	0	0	48	0	0	118
Lane Group Flow (vph)	148	620	121	137	910	63	213	271	69	0	317	100
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6		6	4		4	8		8
Actuated Green, G (s)	46.5	46.5	46.5	46.5	46.5	46.5	19.0	19.0	19.0		19.0	19.0
Effective Green, g (s)	46.5	46.5	46.5	46.5	46.5	46.5	19.0	19.0	19.0		19.0	19.0
Actuated g/C Ratio	0.62	0.62	0.62	0.62	0.62	0.62	0.25	0.25	0.25		0.25	0.25
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Grp Cap (vph)	180	1105	943	363	1167	993	257	477	406		673	406
v/s Ratio Prot		0.35			0.48			0.14				
v/s Ratio Perm	c0.51		0.08	0.23		0.04	c0.21		0.04		0.12	0.06
v/c Ratio	0.82	0.56	0.13	0.38	0.78	0.06	0.83	0.57	0.17		0.47	0.25
Uniform Delay, d1	11.0	8.3	5.9	7.1	10.5	5.6	26.5	24.4	21.9		23.7	22.3
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	32.8	2.1	0.3	3.0	5.2	0.1	25.5	4.8	0.9		2.4	1.4
Delay (s)	43.8	10.4	6.2	10.0	15.7	5.8	51.9	29.3	22.8		26.1	23.7
Level of Service	D	B	A	B	B	A	D	C	C		C	C
Approach Delay (s)		15.1			14.2			36.0			25.1	
Approach LOS		B			B			D			C	

Intersection Summary			
HCM Average Control Delay	20.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.5
Intersection Capacity Utilization	80.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	101	30	194	70	14	175
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	123	37	237	85	17	213
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	527	279			322	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	527	279			322	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	76	95			99	
cM capacity (veh/h)	505	760			1238	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	160	322	230
Volume Left	123	0	17
Volume Right	37	85	0
cSH	547	1700	1238
Volume to Capacity	0.29	0.19	0.01
Queue Length 95th (m)	9.2	0.0	0.3
Control Delay (s)	14.3	0.0	0.7
Lane LOS	B		A
Approach Delay (s)	14.3	0.0	0.7
Approach LOS	B		

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	34.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	71	9	245	48	9	257
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	87	11	299	59	11	313
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	663	328			357	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	663	328			357	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	79	98			99	
cM capacity (veh/h)	422	713			1201	

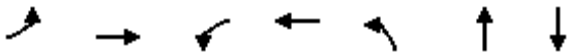
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	98	357	324
Volume Left	87	0	11
Volume Right	11	59	0
cSH	442	1700	1201
Volume to Capacity	0.22	0.21	0.01
Queue Length 95th (m)	6.3	0.0	0.2
Control Delay (s)	15.4	0.0	0.4
Lane LOS	C		A
Approach Delay (s)	15.4	0.0	0.4
Approach LOS	C		

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	31.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	590	7	106	970	0	131
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	720	9	129	1183	0	160
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh)	1			1		
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			728		2165	724
vC1, stage 1 conf vol					724	
vC2, stage 2 conf vol					1441	
vCu, unblocked vol			728		2165	724
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			85		100	62
cM capacity (veh/h)			875		138	426

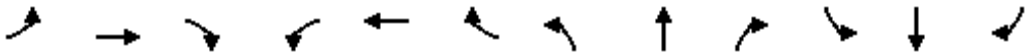
Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	728	129	1183	160
Volume Left	0	129	0	0
Volume Right	9	0	0	160
cSH	1700	875	1700	426
Volume to Capacity	0.43	0.15	0.70	0.38
Queue Length 95th (m)	0.0	3.9	0.0	13.0
Control Delay (s)	0.0	9.8	0.0	18.4
Lane LOS		A		C
Approach Delay (s)	0.0	1.0		18.4
Approach LOS				C

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		



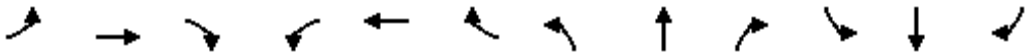
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	20	564	209	981	18	159	17
v/c Ratio	0.07	0.39	0.33	0.67	0.08	0.30	0.10
Control Delay	2.9	3.7	4.5	7.1	21.5	1.5	18.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.9	3.7	4.5	7.1	21.5	1.5	18.1
Queue Length 50th (m)	0.4	13.9	4.8	35.0	1.4	0.0	0.8
Queue Length 95th (m)	1.6	24.0	11.4	60.2	5.6	0.0	4.8
Internal Link Dist (m)		114.7		295.5		123.5	55.5
Turn Bay Length (m)	30.0		50.0		20.0		
Base Capacity (vph)	321	1536	659	1532	431	702	345
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.37	0.32	0.64	0.04	0.23	0.05

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	16	461	2	171	783	21	15	0	130	8	0	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.85			0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.97	
Satd. Flow (prot)	1789	1882		1789	1876		1789	1601			1728	
Flt Permitted	0.21	1.00		0.43	1.00		0.83	1.00			0.70	
Satd. Flow (perm)	394	1882		808	1876		1570	1601			1238	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	20	562	2	209	955	26	18	0	159	10	0	7
RTOR Reduction (vph)	0	0	0	0	1	0	0	143	0	0	6	0
Lane Group Flow (vph)	20	564	0	209	980	0	18	16	0	0	11	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	35.6	35.6		35.6	35.6		4.8	4.8			4.8	
Effective Green, g (s)	35.6	35.6		35.6	35.6		4.8	4.8			4.8	
Actuated g/C Ratio	0.74	0.74		0.74	0.74		0.10	0.10			0.10	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	290	1384		594	1380		156	159			123	
v/s Ratio Prot		0.30			c0.52			0.01				
v/s Ratio Perm	0.05			0.26			c0.01				0.01	
v/c Ratio	0.07	0.41		0.35	0.71		0.12	0.10			0.09	
Uniform Delay, d1	1.8	2.4		2.3	3.5		19.9	19.8			19.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.1	0.2		0.4	1.7		0.3	0.3			0.3	
Delay (s)	1.9	2.6		2.6	5.2		20.2	20.1			20.1	
Level of Service	A	A		A	A		C	C			C	
Approach Delay (s)		2.6			4.8			20.1			20.1	
Approach LOS		A			A			C			C	

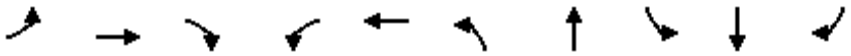
Intersection Summary			
HCM Average Control Delay	5.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	48.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	6	358	70	1	711	9	60	93	0	20	57	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	7	437	85	1	867	11	73	113	0	24	70	9
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		Raised			Raised							
Median storage veh)		1			1							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	878			522			1412	1374	479	1426	1412	873
vC1, stage 1 conf vol							494	494		875	875	
vC2, stage 2 conf vol							918	880		551	537	
vCu, unblocked vol	878			522			1412	1374	479	1426	1412	873
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			61	56	100	88	73	98
cM capacity (veh/h)	769			1044			190	258	586	203	255	350

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	529	879	187	102
Volume Left	7	1	73	24
Volume Right	85	11	0	9
cSH	769	1044	226	246
Volume to Capacity	0.01	0.00	0.83	0.42
Queue Length 95th (m)	0.2	0.0	47.5	14.7
Control Delay (s)	0.3	0.0	67.9	29.7
Lane LOS	A	A	F	D
Approach Delay (s)	0.3	0.0	67.9	29.7
Approach LOS			F	D

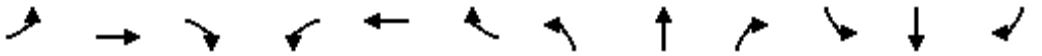
Intersection Summary			
Average Delay	9.4		
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	284	76	147	110	89	102	519	67	540	99
v/c Ratio	0.83	0.13	0.25	0.48	0.26	0.30	0.57	0.23	0.87	0.17
Control Delay	41.8	16.9	4.6	34.4	15.5	12.8	15.2	23.6	43.3	6.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.8	16.9	4.6	34.4	15.5	12.8	15.2	23.6	43.3	6.5
Queue Length 50th (m)	28.8	6.8	0.0	13.3	4.3	6.6	42.5	6.6	69.0	0.3
Queue Length 95th (m)	#62.4	15.5	10.5	28.0	15.6	15.7	79.2	18.3	#146.6	10.7
Internal Link Dist (m)		131.0			44.8		163.9		585.5	
Turn Bay Length (m)	70.0		50.0	25.0		110.0		55.0		75.0
Base Capacity (vph)	343	1139	1026	544	732	635	1321	293	620	592
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.83	0.07	0.14	0.20	0.12	0.16	0.39	0.23	0.87	0.17

Intersection Summary

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

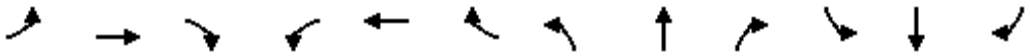


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	261	70	135	101	35	47	94	386	91	62	497	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Lane Util. Factor	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	0.91		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1722		1789	1830		1789	1883	1601
Flt Permitted	0.41	1.00	1.00	0.71	1.00		0.15	1.00		0.47	1.00	1.00
Satd. Flow (perm)	781	1883	1601	1333	1722		277	1830		889	1883	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	284	76	147	110	38	51	102	420	99	67	540	99
RTOR Reduction (vph)	0	0	100	0	44	0	0	8	0	0	0	66
Lane Group Flow (vph)	284	76	47	110	45	0	102	511	0	67	540	33
Turn Type	pm+pt	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	7	4			8		5	2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	21.6	21.6	21.6	8.9	8.9		33.7	33.7		21.3	21.3	21.3
Effective Green, g (s)	21.6	21.6	21.6	8.9	8.9		33.7	33.7		21.3	21.3	21.3
Actuated g/C Ratio	0.32	0.32	0.32	0.13	0.13		0.50	0.50		0.32	0.32	0.32
Clearance Time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	350	604	514	176	228		285	916		281	596	507
v/s Ratio Prot	c0.08	0.04			0.03		0.03	c0.28			c0.29	
v/s Ratio Perm	c0.18		0.03	0.08			0.14			0.08		0.02
v/c Ratio	0.81	0.13	0.09	0.62	0.20		0.36	0.56		0.24	0.91	0.07
Uniform Delay, d1	20.1	16.2	16.0	27.6	26.0		12.1	11.6		17.0	22.0	16.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	13.3	0.1	0.1	6.8	0.4		0.8	0.9		0.6	17.7	0.1
Delay (s)	33.4	16.3	16.1	34.4	26.4		12.9	12.5		17.6	39.7	16.1
Level of Service	C	B	B	C	C		B	B		B	D	B
Approach Delay (s)		25.8			30.8			12.6			34.3	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	25.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	67.3	Sum of lost time (s)	17.9
Intersection Capacity Utilization	70.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	153	97	102	164	15	401	345	290	418
v/c Ratio	0.32	0.16	0.14	0.19	0.03	0.43	0.51	0.49	0.24
Control Delay	25.8	11.5	11.3	2.8	12.1	25.6	6.4	16.7	16.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.8	11.5	11.3	2.8	12.1	25.6	6.4	16.7	16.4
Queue Length 50th (m)	17.1	7.3	7.6	0.0	1.1	25.5	0.0	25.6	18.8
Queue Length 95th (m)	32.7	15.2	15.8	8.7	4.1	38.5	19.2	43.1	38.4
Internal Link Dist (m)	106.7		487.7			585.5			116.0
Turn Bay Length (m)		40.0			25.0		50.0	70.0	
Base Capacity (vph)	517	611	914	1028	639	995	694	603	1775
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	0.16	0.11	0.16	0.02	0.40	0.50	0.48	0.24

Intersection Summary

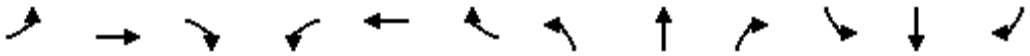


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	122	14	149	34	151	14	369	317	267	381	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt		0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1855		1700	1734	1601	1789	3579	1601	1789	3573	
Flt Permitted		0.99		0.39	0.81	1.00	0.51	1.00	1.00	0.39	1.00	
Satd. Flow (perm)		1841		693	1441	1601	956	3579	1601	735	3573	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	133	15	162	37	164	15	401	345	290	414	4
RTOR Reduction (vph)	0	6	0	0	0	103	0	0	247	0	1	0
Lane Group Flow (vph)	0	147	0	97	102	61	15	401	98	290	417	0
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		10.7		25.4	25.4	25.4	21.3	19.5	19.5	34.9	30.1	
Effective Green, g (s)		10.7		25.4	25.4	25.4	21.3	19.5	19.5	34.9	30.1	
Actuated g/C Ratio		0.16		0.37	0.37	0.37	0.31	0.29	0.29	0.51	0.44	
Clearance Time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Vehicle Extension (s)		2.5		2.5	2.5	2.5	2.5	0.2	0.2	3.0	2.5	
Lane Grp Cap (vph)		288		415	582	595	320	1022	457	567	1575	
v/s Ratio Prot				c0.04	0.03		0.00	0.11		c0.09	0.12	
v/s Ratio Perm		c0.08		0.05	0.04	0.04	0.01		0.06	c0.17		
v/c Ratio		0.51		0.23	0.18	0.10	0.05	0.39	0.22	0.51	0.27	
Uniform Delay, d1		26.4		15.0	14.4	14.0	16.3	19.6	18.6	10.1	12.1	
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		1.1		0.2	0.1	0.1	0.0	0.1	0.1	0.8	0.1	
Delay (s)		27.5		15.2	14.5	14.1	16.4	19.7	18.7	10.8	12.2	
Level of Service		C		B	B	B	B	B	B	B	B	
Approach Delay (s)		27.5			14.5			19.2			11.6	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM Average Control Delay	16.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	68.3	Sum of lost time (s)	11.0
Intersection Capacity Utilization	65.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

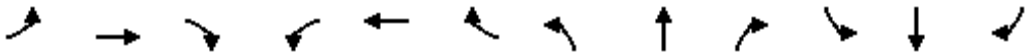
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	726	390	79	93
v/c Ratio	0.51	0.27	0.24	0.27
Control Delay	5.7	3.9	16.6	15.9
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	5.7	3.9	16.6	15.9
Queue Length 50th (m)	22.6	9.5	4.2	4.5
Queue Length 95th (m)	55.6	23.2	15.0	16.2
Internal Link Dist (m)	487.7	114.8	84.4	98.2
Turn Bay Length (m)				
Base Capacity (vph)	1721	1727	630	640
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	0.42	0.23	0.13	0.15

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	592	70	5	336	18	34	35	4	20	53	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.98	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		1856			1869			1828			1826	
Flt Permitted		1.00			0.99			0.88			0.89	
Satd. Flow (perm)		1851			1858			1642			1654	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	643	76	5	365	20	37	38	4	22	58	13
RTOR Reduction (vph)	0	6	0	0	3	0	0	4	0	0	12	0
Lane Group Flow (vph)	0	720	0	0	387	0	0	75	0	0	81	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		27.5			27.5			4.6			4.6	
Effective Green, g (s)		27.5			27.5			4.6			4.6	
Actuated g/C Ratio		0.69			0.69			0.11			0.11	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1269			1274			188			190	
v/s Ratio Prot												
v/s Ratio Perm		c0.39			0.21			0.05			c0.05	
v/c Ratio		0.57			0.30			0.40			0.43	
Uniform Delay, d1		3.2			2.5			16.5			16.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.6			0.1			1.4			1.6	
Delay (s)		3.8			2.6			17.9			18.1	
Level of Service		A			A			B			B	
Approach Delay (s)		3.8			2.6			17.9			18.1	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	5.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	40.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	52.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	1	64	21	24	28	0	21	60	43	12	97	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	70	23	26	30	0	23	65	47	13	105	5

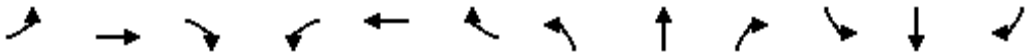
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	93	57	135	124
Volume Left (vph)	1	26	23	13
Volume Right (vph)	23	0	47	5
Hadj (s)	-0.11	0.13	-0.14	0.03
Departure Headway (s)	4.4	4.7	4.3	4.4
Degree Utilization, x	0.12	0.07	0.16	0.15
Capacity (veh/h)	753	708	807	770
Control Delay (s)	8.0	8.1	8.1	8.2
Approach Delay (s)	8.0	8.1	8.1	8.2
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.1		
HCM Level of Service	A		
Intersection Capacity Utilization	27.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBR	EBR2	NWL2	NWL	NEL	NER
Lane Configurations						
Volume (veh/h)	603	0	39	357	1	125
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	655	0	42	388	1	136
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh)	1			1		
Upstream signal (m)	139					
pX, platoon unblocked			0.81		0.81	0.81
vC, conflicting volume			655		1128	655
vC1, stage 1 conf vol					655	
vC2, stage 2 conf vol					473	
vCu, unblocked vol			463		1044	463
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			95		100	72
cM capacity (veh/h)			894		342	488

Direction, Lane #	EB 1	EB 2	NW 1	NE 1
Volume Total	655	0	430	137
Volume Left	0	0	42	1
Volume Right	0	0	0	136
cSH	1700	1700	894	486
Volume to Capacity	0.39	0.00	0.05	0.28
Queue Length 95th (m)	0.0	0.0	1.1	8.7
Control Delay (s)	0.0	0.0	1.4	15.3
Lane LOS			A	C
Approach Delay (s)	0.0		1.4	15.3
Approach LOS				C

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	40.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	4	710	2	147	386	1	9	0	117	20	0	6
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	772	2	160	420	1	10	0	127	22	0	7
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		Raised			Raised							
Median storage veh)		1			1							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	421			774			1527	1522	773	1647	1522	420
vC1, stage 1 conf vol							782	782		740	740	
vC2, stage 2 conf vol							746	740		908	783	
vCu, unblocked vol	421			774			1527	1522	773	1647	1522	420
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			81			95	100	68	62	100	99
cM capacity (veh/h)	1138			842			197	211	399	58	172	633

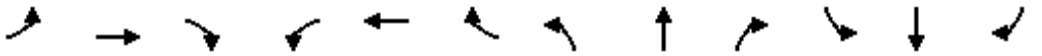
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total	4	774	160	421	10	127	28
Volume Left	4	0	160	0	10	0	22
Volume Right	0	2	0	1	0	127	7
cSH	1138	1700	842	1700	197	399	73
Volume to Capacity	0.00	0.46	0.19	0.25	0.05	0.32	0.39
Queue Length 95th (m)	0.1	0.0	5.3	0.0	1.2	10.3	11.4
Control Delay (s)	8.2	0.0	10.3	0.0	24.3	18.2	82.9
Lane LOS	A		B		C	C	F
Approach Delay (s)	0.0		2.8		18.6		82.9
Approach LOS					C		F

Intersection Summary			
Average Delay	4.3		
Intersection Capacity Utilization	63.8%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	160	698	147	107	504	60	128	253	108	221	89
v/c Ratio	0.55	0.81	0.19	0.75	0.58	0.08	0.29	0.35	0.18	0.20	0.13
Control Delay	20.7	23.7	7.1	50.6	15.5	3.3	15.1	14.9	13.3	13.0	3.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.7	23.7	7.1	50.6	15.5	3.3	15.1	14.9	13.3	13.0	3.9
Queue Length 50th (m)	12.0	62.1	5.5	9.1	38.5	0.0	9.4	19.2	7.6	8.2	0.0
Queue Length 95th (m)	29.7	#118.4	14.1	#33.9	64.0	4.9	20.4	34.3	16.4	14.5	6.9
Internal Link Dist (m)		1111.2			86.8			126.9		80.4	
Turn Bay Length (m)	50.0		10.0			35.0			10.0		10.0
Base Capacity (vph)	291	863	763	143	863	766	443	722	614	1121	669
Starvation Cap Reductn	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
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.55	0.81	0.19	0.75	0.58	0.08	0.29	0.35	0.18	0.20	0.13

Intersection Summary

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	147	642	135	98	464	55	118	233	99	59	144	82
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	1883	1601		3527	1601
Flt Permitted	0.34	1.00	1.00	0.17	1.00	1.00	0.61	1.00	1.00		0.82	1.00
Satd. Flow (perm)	634	1883	1601	312	1883	1601	1156	1883	1601		2922	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	160	698	147	107	504	60	128	253	108	64	157	89
RTOR Reduction (vph)	0	0	29	0	0	33	0	0	0	0	0	55
Lane Group Flow (vph)	160	698	118	107	504	28	128	253	108	0	221	34
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	27.5	27.5	27.5	27.5	27.5	27.5	23.0	23.0	23.0		23.0	23.0
Effective Green, g (s)	27.5	27.5	27.5	27.5	27.5	27.5	23.0	23.0	23.0		23.0	23.0
Actuated g/C Ratio	0.46	0.46	0.46	0.46	0.46	0.46	0.38	0.38	0.38		0.38	0.38
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Grp Cap (vph)	291	863	734	143	863	734	443	722	614		1120	614
v/s Ratio Prot		c0.37			0.27			c0.13				
v/s Ratio Perm	0.25		0.07	0.34		0.02	0.11		0.07		0.08	0.02
v/c Ratio	0.55	0.81	0.16	0.75	0.58	0.04	0.29	0.35	0.18		0.20	0.06
Uniform Delay, d1	11.8	14.0	9.5	13.4	12.0	9.0	12.8	13.2	12.2		12.3	11.7
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	7.3	8.1	0.5	29.7	2.9	0.1	1.6	1.3	0.6		0.4	0.2
Delay (s)	19.1	22.1	10.0	43.0	14.9	9.1	14.5	14.5	12.9		12.7	11.8
Level of Service	B	C	A	D	B	A	B	B	B		B	B
Approach Delay (s)		19.8			18.9			14.1			12.5	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	17.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.5
Intersection Capacity Utilization	73.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	49	45	107	88	11	111
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	53	49	116	96	12	121
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	309	164			212	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	309	164			212	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	94			99	
cM capacity (veh/h)	678	880			1358	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	102	212	133
Volume Left	53	0	12
Volume Right	49	96	0
cSH	762	1700	1358
Volume to Capacity	0.13	0.12	0.01
Queue Length 95th (m)	3.5	0.0	0.2
Control Delay (s)	10.5	0.0	0.8
Lane LOS	B		A
Approach Delay (s)	10.5	0.0	0.8
Approach LOS	B		

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	27.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	54	6	177	48	14	124
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	59	7	192	52	15	135
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	384	218			245	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	384	218			245	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	90	99			99	
cM capacity (veh/h)	612	821			1322	

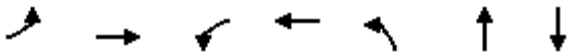
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	65	245	150
Volume Left	59	0	15
Volume Right	7	52	0
cSH	628	1700	1322
Volume to Capacity	0.10	0.14	0.01
Queue Length 95th (m)	2.6	0.0	0.3
Control Delay (s)	11.4	0.0	0.9
Lane LOS	B		A
Approach Delay (s)	11.4	0.0	0.9
Approach LOS	B		

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	28.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	829	10	143	533	0	72
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	901	11	155	579	0	78
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh)	1			1		
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			912		1797	907
vC1, stage 1 conf vol					907	
vC2, stage 2 conf vol					890	
vCu, unblocked vol			912		1797	907
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			79		100	77
cM capacity (veh/h)			747		192	334

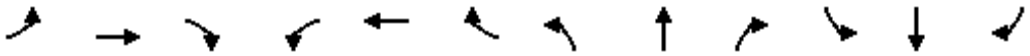
Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	912	155	579	78
Volume Left	0	155	0	0
Volume Right	11	0	0	78
cSH	1700	747	1700	334
Volume to Capacity	0.54	0.21	0.34	0.23
Queue Length 95th (m)	0.0	5.9	0.0	6.8
Control Delay (s)	0.0	11.1	0.0	19.0
Lane LOS		B		C
Approach Delay (s)	0.0	2.3		19.0
Approach LOS				C

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	66.6%	ICU Level of Service	C
Analysis Period (min)	15		



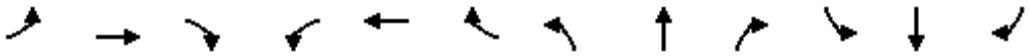
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	4	774	160	421	10	127	29
v/c Ratio	0.01	0.55	0.37	0.30	0.04	0.32	0.14
Control Delay	2.5	5.5	6.4	3.5	18.3	4.1	17.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.5	5.5	6.4	3.5	18.3	4.1	17.2
Queue Length 50th (m)	0.1	23.0	3.8	9.4	0.7	0.0	1.5
Queue Length 95th (m)	0.6	49.0	13.3	20.0	3.8	5.9	7.1
Internal Link Dist (m)		114.7		295.5		123.5	55.5
Turn Bay Length (m)	30.0		50.0		20.0		
Base Capacity (vph)	760	1472	449	1472	677	795	580
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.53	0.36	0.29	0.01	0.16	0.05

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	4	710	2	147	386	1	9	0	117	20	0	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.85			0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.96	
Satd. Flow (prot)	1789	1883		1789	1883		1789	1601			1755	
Flt Permitted	0.52	1.00		0.31	1.00		0.83	1.00			0.73	
Satd. Flow (perm)	973	1883		575	1883		1570	1601			1335	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	772	2	160	420	1	10	0	127	22	0	7
RTOR Reduction (vph)	0	0	0	0	0	0	0	113	0	0	6	0
Lane Group Flow (vph)	4	774	0	160	421	0	10	14	0	0	23	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	31.4	31.4		31.4	31.4		4.8	4.8			4.8	
Effective Green, g (s)	31.4	31.4		31.4	31.4		4.8	4.8			4.8	
Actuated g/C Ratio	0.71	0.71		0.71	0.71		0.11	0.11			0.11	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	691	1338		408	1338		170	174			145	
v/s Ratio Prot		c0.41			0.22			0.01				
v/s Ratio Perm	0.00			0.28			0.01				c0.02	
v/c Ratio	0.01	0.58		0.39	0.31		0.06	0.08			0.16	
Uniform Delay, d1	1.9	3.1		2.6	2.4		17.7	17.7			17.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.0	0.6		0.6	0.1		0.1	0.2			0.5	
Delay (s)	1.9	3.8		3.2	2.5		17.8	17.9			18.4	
Level of Service	A	A		A	A		B	B			B	
Approach Delay (s)		3.7			2.7			17.9			18.4	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	4.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	44.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	6	592	70	5	336	18	34	35	4	20	53	12
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	7	722	85	6	410	22	41	43	5	24	65	15
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		Raised			Raised							
Median storage veh)		1			1							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	432			807			1259	1223	765	1238	1255	421
vC1, stage 1 conf vol							779	779		433	433	
vC2, stage 2 conf vol							480	444		805	822	
vCu, unblocked vol	432			807			1259	1223	765	1238	1255	421
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			83	85	99	90	77	98
cM capacity (veh/h)	1128			818			248	292	403	245	281	633

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	815	438	89	104
Volume Left	7	6	41	24
Volume Right	85	22	5	15
cSH	1128	818	274	294
Volume to Capacity	0.01	0.01	0.33	0.35
Queue Length 95th (m)	0.1	0.2	10.4	11.7
Control Delay (s)	0.2	0.2	24.4	23.8
Lane LOS	A	A	C	C
Approach Delay (s)	0.2	0.2	24.4	23.8
Approach LOS			C	C

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	52.9%	ICU Level of Service	A
Analysis Period (min)	15		

LANE SUMMARY

Site: PM Peak Hour

New Site
Roundabout

Lane Use and Performance													
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Acadia Road													
Lane 1[d]	237	0.0	1475	0.161	100	4.9	LOS A	1.0	6.8	Full	500	0.0	0.0
Approach	237	0.0		0.161		4.9	LOS A	1.0	6.8				
East: Road B													
Lane 1[d]	63	0.0	1037	0.061	100	8.6	LOS A	0.3	2.2	Full	500	0.0	0.0
Approach	63	0.0		0.061		8.6	LOS A	0.3	2.2				
North: Acadia Road													
Lane 1[d]	145	0.0	1242	0.117	100	5.4	LOS A	0.7	4.9	Full	500	0.0	0.0
Approach	145	0.0		0.117		5.4	LOS A	0.7	4.9				
Intersection	445	0.0		0.161		5.6	LOS A	1.0	6.8				

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: AM Peak Hour

New Site
Roundabout

Lane Use and Performance	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Acadia Road													
Lane 1[d]	308	0.0	1547	0.199	100	4.8	LOS A	1.3	9.1	Full	500	0.0	0.0
Approach	308	0.0		0.199		4.8	LOS A	1.3	9.1				
East: Road B													
Lane 1[d]	84	0.0	970	0.087	100	9.0	LOS A	0.5	3.2	Full	500	0.0	0.0
Approach	84	0.0		0.087		9.0	LOS A	0.5	3.2				
North: Acadia Road													
Lane 1[d]	280	0.0	1246	0.225	100	5.4	LOS A	1.5	10.5	Full	500	0.0	0.0
Approach	280	0.0		0.225		5.4	LOS A	1.5	10.5				
Intersection	673	0.0		0.225		5.6	LOS A	1.5	10.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

APPENDIX D

Signal Warrant Analysis

WARRANT NO.1 MINIMUM VEHICULAR VOLUME

Number of Incoming Lanes on Approach		Large Urban Areas (> 10000 population)				Small Urban Areas (<10000 population)	
		Posted or 85th Percentile Speed					
		=< 70 km/hr		> 70 km/hr			
		Peak 7 Hour Volume (vph)		Peak 7 Hour Volume (vph)		Peak 7 Hour Volume (vph)	
Major	Minor	Major	Minor	Major	Minor	Major	Minor
1	1	500	150	350	105	350	105
2 or more	1	600	150	420	105	420	105
2 or more	2 or more	600	200	420	140	420	140
1	2 or more	500	200	350	140	350	140

Existing Scenario to be Considered			
Number of Incoming Lanes on Approach		Minimum Volumes	
Major	Minor	Major	Minor
1	1	500	150

Existing Traffic Volumes (by Approach)

8 hours traffic volume on an average day

Time Period	Total of Both Major Approaches	Higher than Minimum?
7am to 8am	733	Yes
8am to 9am	1167	Yes
10am to 11am	0	No
11am to 12am	575	Yes
12am to 1pm	788	Yes
3pm to 4pm	872	Yes
4pm to 5pm	890	Yes
5pm to 6pm	1018	Yes

Existing Traffic Volumes (by Approach)

8 hours traffic volume on an average day

Time Period	Higher of Each Minor Approaches	Higher than Minimum?
7am to 8am	26	No
8am to 9am	148	No
10am to 11am	0	No
11am to 12am	68	No
12am to 1pm	80	No
3pm to 4pm	220	Yes
4pm to 5pm	55	No
5pm to 6pm	88	No

Warrant Satisfied? No

Explanation: The warrant is not satisfied. Only 1 minor approach does not exceed the minimum volume criteria.

WARRANT NO.2 Interruption of Continuous Traffic

Number of Incoming Lanes on Approach		Large Urban Areas (> 10000 population)				Small Urban Areas (<10000 population)	
		Posted or 85th Percentile Speed					
		=< 70 km/hr		> 70 km/hr			
		Peak 7 Hour Volume (vph)		Peak 7 Hour Volume (vph)		Peak 7 Hour Volume (vph)	
Major	Minor	Major	Minor	Major	Minor	Major	Minor
1	1	750	75	525	50	525	50
2 or more	1	900	75	630	50	630	50
2 or more	2 or more	900	100	630	70	630	70
1	2 or more	750	100	525	70	525	70

Existing Scenario to be Considered			
Number of Incoming Lanes on Approach		Minimum Volumes	
Major	Minor	Major	Minor
1	1	750	75

Existing Traffic Volumes (by Approach)

8 hours traffic volume on an average day

Time Period	Total of Both Major Approaches	Higher than Minimum?
6am to 7am	733	No
7am to 8am	1167	Yes
8am to 9am	0	No
11am to 12am	575	No
12am to 1pm	788	Yes
3pm to 4pm	872	Yes
4pm to 5pm	890	Yes
5pm to 6pm	1018	Yes

Existing Traffic Volumes (by Approach)

8 hours traffic volume on an average day

Time Period	Higher of Each Minor Approaches	Higher than Minimum?
6am to 7am	26	No
7am to 8am	148	Yes
8am to 9am	0	No
11am to 12am	68	No
12am to 1pm	80	Yes
3pm to 4pm	220	Yes
4pm to 5pm	55	No
5pm to 6pm	88	Yes

Warrant Satisfied? No

Explanation: The warrant is not satisfied. Only 4 hours of traffic volume exceed the minimum vehicular volume criteria.

WARRANT NO.3 Progressive Movement

1) Is the distance to the nearest signal greater than or equal to 300m?	Yes	No
One Way Are the adjacent signals so far apart that they do not provide a necessary degree of vehicle platooning and speed control?	~~Yes~~	~~No~~
Two Way Do the adjacent signals constitute a progressive system?	Yes	No
Are the adjacent signals so far apart that they do not provide a necessary degree of vehicle platooning and speed control?	Yes	No

Warrant Satisfied? No

Explanation: Speed data is not know. Progression conditions are expected to be similar to existing conditions.

WARRANT NO.4 Accident Experience (based on ICBC Claims Data)

1) Have five or more reported accidents of types susceptible to correction by traffic signals occurred within a 12 month period, with each accident involving personal injury or damage exceeding $1000?	Yes	No
2) Have adequate trials of less restrictive remedies with satisfactory observance and enforcement failed to reduce the accident frequency?	Yes	No
3) Will the installation of a signal allow progressive traffic flow?	Yes	No

Warrant Satisfied? No

Explanation: Warrant not completed

WARRANT NO.5 System Warrant

1) Are both the major and minor streets "Major Routes"?	Yes	No
2) Does the total Peak Hour Volume over all approaches equal or exceed 1000 vph?	~~Yes~~	~~No~~
3) Are one or more of Warrants 1,2,6,7 and 9 satisfied using Projected 5 Year Volumes?	~~Yes~~	~~No~~
4) Does the Peak 5 Hour Weekend Volume equal or exceed 1000 vph?	~~Yes~~	~~No~~

Warrant Satisfied? No

Explanation: The warrant is not satisfied because University Boulevard is the only major route.

WARRANT NO.6 Combination Warrant

1) Have other measures been tried which cause less delay and invonvenience to traffic than traffic signals?

Yes	No

Number of Incoming Lanes on Approach		Large Urban Areas (> 10000 population)				Small Urban Areas (<10000 population)	
		Posted or 85th Percentile Speed					
		=< 70 km/hr		> 70 km/hr			
		Peak 7 Hour Volume (vph)		Peak 7 Hour Volume (vph)		Peak 7 Hour Volume (vph)	
Major	Minor	Major	Minor	Major	Minor	Major	Minor
1	1	600	120	420	85	420	85
2 or more	1	720	120	500	85	500	85
2 or more	2 or more	720	160	500	110	500	110
1	2 or more	600	160	420	110	420	110

Existing Scenario to be Considered			
Number of Incoming Lanes on Approach		Minimum Volumes	
Major	Minor	Major	Minor
1	1	600	120

Existing Traffic Volumes (by Approach)

8 hours traffic volume on an average day

Time Period	Total of Both Major Approaches	Higher than Minimum?
6am to 7am	733	Yes
7am to 8am	1167	Yes
8am to 9am	0	No
11am to 12am	575	No
12am to 1pm	788	Yes
3pm to 4pm	872	Yes
4pm to 5pm	890	Yes
5pm to 6pm	1018	Yes

Existing Traffic Volumes (by Approach)

8 hours traffic volume on an average day

Time Period	Higher of Each Minor Approaches	Higher than Minimum?
6am to 7am	26	No
7am to 8am	148	Yes
8am to 9am	0	No
11am to 12am	68	No
12am to 1pm	80	No
3pm to 4pm	220	Yes
4pm to 5pm	55	No
5pm to 6pm	88	No

Warrant Satisfied? No

Explanation: The warrant is not satisfied. The minor approach only exceeds the minimum volume criteria for 2 hours.

WARRANT NO.7 Four Hour Volumes

Location Type	Large Urban Areas (> 10000 population)	
	Posted or 85th Percentile Speed	
	=< 70 km/hr	> 70 km/hr
Rural	Figure 1	Figure 2
Large Urban (>10000 pop.)	Figure 1	Figure 2
Small Urban (<10000 pop.)	Figure 2	Figure 2

Existing Scenario to be Considered	
Location Type	Figure
Large Urban (>10000 pop.)	Figure 1

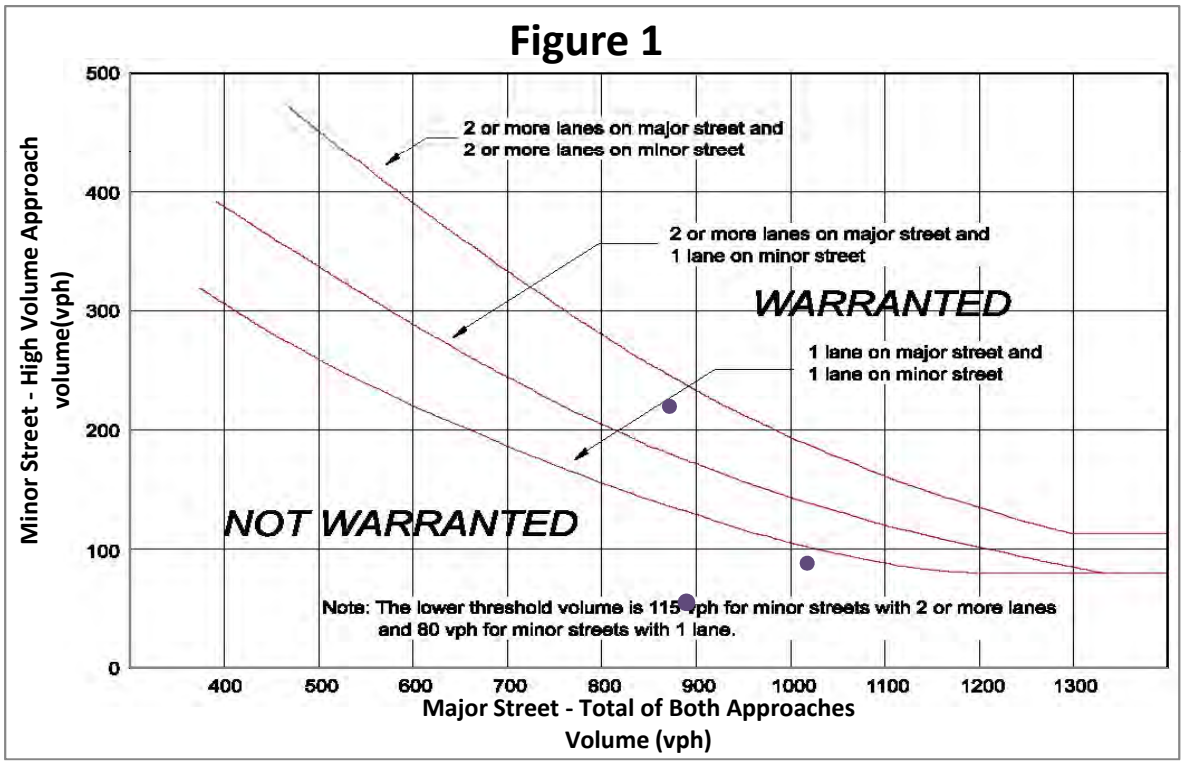
Highest of 4 consecutive hours on an average day

Time Period	Eastbound	Westbound	Total of Both
15:00 to 16:00	508	364	872
16:00 to 17:00	558	332	890
17:00 to 18:00	672	346	1018

Highest of 4 consecutive hours on an average day

Time Period	Southbound	Northbound	Higher of Each
15:00 to 16:00	220	113	220
16:00 to 17:00	52	55	55
17:00 to 18:00	88	63	88

Figure 1



Warrant Satisfied? No

Explanation: Only one hour is above the appropriate line

WARRANT NO.8 Peak Hour Delay

	Number of Minor Street Incoming Lanes on Approach with Highest Peak Hour Delay	
	1	2 or more
Minimum Peak Hour Delay (veh-hr)	4	5
Minimum Peak Hour Traffic (vph)	100	150

Number of Intersection Approaches	Minimum total Peak Hour Traffic for All Approaches Combined (vph)
3	650
4	800

Existing Scenario to be Considered	
Minimum Peak Hour Delay (veh-hr)	4
Minimum Peak Hour Traffic (vph)	100
Minimum total Peak Hour Traffic for All Approaches Combined (vph)	800

Peak hour traffic volumes on an average day

Time Period	Eastbound	Westbound	Total of Both
	440	727	1167
08:00 to 09:00			

Peak hour traffic volumes on an average day

Time Period	Southbound	Northbound	Higher of Each
	76	148	148
08:00 to 09:00			

Existing Peak Hour Delay (veh-hr):

Eastbound:	0.5
Westbound:	1.0

Warrant Satisfied? No

Explanation: Minimum Peak Hour Delay is not met

WARRANT NO.9 Peak Hour Volumes

Location Type	Large Urban Areas (> 10000 population)	
	Posted or 85th Percentile Speed	
	=< 70 km/hr	> 70 km/hr
Rural	Figure 3	Figure 4
Large Urban (>10000 pop.)	Figure 3	Figure 4
Small Urban (<10000 pop.)	Figure 4	Figure 4

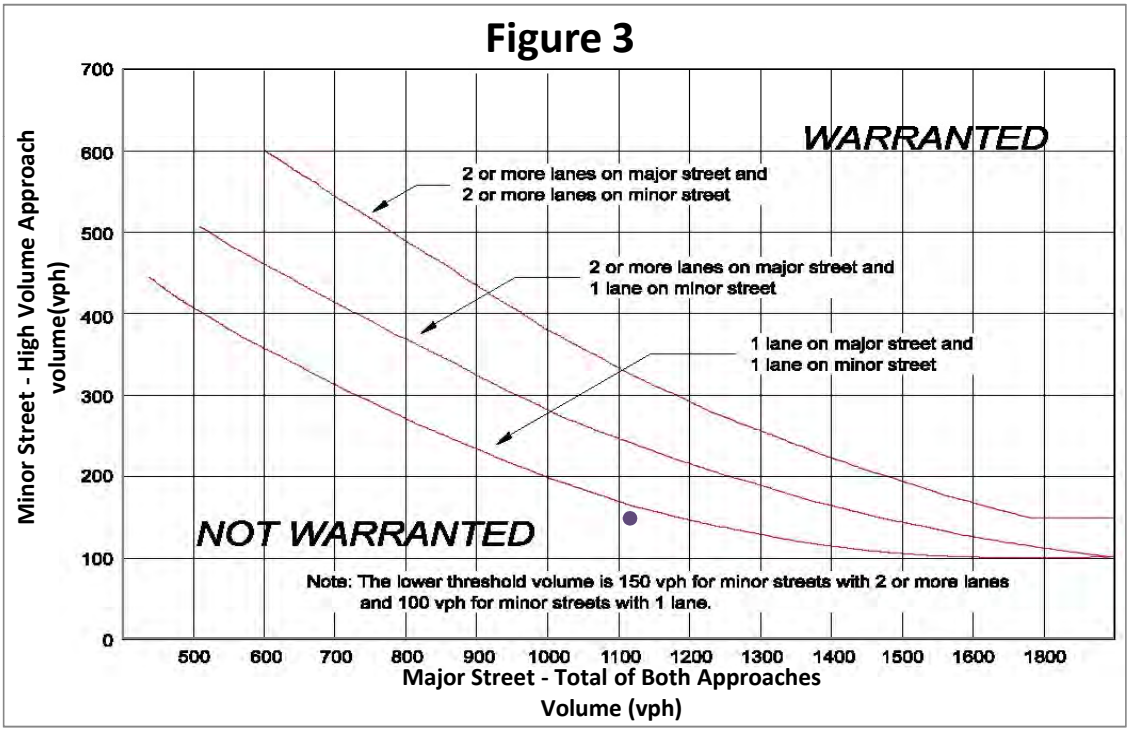
Existing Scenario to be Considered	
Location Type	Figure
Large Urban (>10000 pop.)	Figure 3

Peak hour traffic volumes on an average day

Time Period	Eastbound	Westbound	Total of Both
08:00 to 09:00	440	727	1167

Peak hour traffic volumes on an average day

Time Period	Southbound	Northbound	Higher of Each
08:00 to 09:00	76	148	148



Warrant Satisfied? No

Explanation: The point is below the specificed line.

Summary

Warrant		
1) Minimum Vehicular Volume	[ ] Satisfied	[x] Not Satisfied
2) Interruption of Continuous Traffic	[ ] Satisfied	[x] Not Satisfied
3) Progressive Movement	[ ] Satisfied	[x] Not Satisfied
4) Accident Experience	[ ] Satisfied	[x] Not Satisfied
5) System Warrant	[ ] Satisfied	[x] Not Satisfied
6) Combination Warrant	[ ] Satisfied	[x] Not Satisfied
7) Four Hour Volume	[ ] Satisfied	[x] Not Satisfied
8) Peak Hour Delay	[ ] Satisfied	[x] Not Satisfied
9) Peak Hour Volume	[ ] Satisfied	[x] Not Satisfied

Comments:

- This intersection does not warrant the installation of a traffic signal.
- The Accident Experience Warrant was not completed for this analysis

WARRANT NO.1 MINIMUM VEHICULAR VOLUME

Number of Incoming Lanes on Approach		Large Urban Areas (> 10000 population)				Small Urban Areas (<10000 population)	
		Posted or 85th Percentile Speed					
		=< 70 km/hr		> 70 km/hr			
		Peak 7 Hour Volume (vph)		Peak 7 Hour Volume (vph)		Peak 7 Hour Volume (vph)	
Major	Minor	Major	Minor	Major	Minor	Major	Minor
1	1	500	150	350	105	350	105
2 or more	1	600	150	420	105	420	105
2 or more	2 or more	600	200	420	140	420	140
1	2 or more	500	200	350	140	350	140

Existing Scenario to be Considered			
Number of Incoming Lanes on Approach		Minimum Volumes	
Major	Minor	Major	Minor
1	1	500	150

Existing Traffic Volumes (by Approach)

8 hours traffic volume on an average day

Time Period	Total of Both Major Approaches	Higher than Minimum?
7am to 8am	825	Yes
8am to 9am	1414	Yes
10am to 11am	0	No
11am to 12am	597	Yes
12am to 1pm	852	Yes
3pm to 4pm	849	Yes
4pm to 5pm	840	Yes
5pm to 6pm	960	Yes

Existing Traffic Volumes (by Approach)

8 hours traffic volume on an average day

Time Period	Higher of Each Minor Approaches	Higher than Minimum?
7am to 8am	59	No
8am to 9am	142	No
10am to 11am	0	No
11am to 12am	53	No
12am to 1pm	86	No
3pm to 4pm	88	No
4pm to 5pm	89	No
5pm to 6pm	111	No

Warrant Satisfied? No

Explanation: The warrant is not satisfied. The minor approach does not exceed the minimum volume criteria.

WARRANT NO.2 Interruption of Continuous Traffic

Number of Incoming Lanes on Approach		Large Urban Areas (> 10000 population)				Small Urban Areas (<10000 population)	
		Posted or 85th Percentile Speed					
		=< 70 km/hr		> 70 km/hr			
		Peak 7 Hour Volume (vph)		Peak 7 Hour Volume (vph)		Peak 7 Hour Volume (vph)	
Major	Minor	Major	Minor	Major	Minor	Major	Minor
1	1	750	75	525	50	525	50
2 or more	1	900	75	630	50	630	50
2 or more	2 or more	900	100	630	70	630	70
1	2 or more	750	100	525	70	525	70

Existing Scenario to be Considered			
Number of Incoming Lanes on Approach		Minimum Volumes	
Major	Minor	Major	Minor
1	1	750	75

Existing Traffic Volumes (by Approach)

8 hours traffic volume on an average day

Time Period	Total of Both Major Approaches	Higher than Minimum?
6am to 7am	825	Yes
7am to 8am	1414	Yes
8am to 9am	0	No
11am to 12am	597	No
12am to 1pm	852	Yes
3pm to 4pm	849	Yes
4pm to 5pm	840	Yes
5pm to 6pm	960	Yes

Existing Traffic Volumes (by Approach)

8 hours traffic volume on an average day

Time Period	Higher of Each Minor Approaches	Higher than Minimum?
6am to 7am	59	No
7am to 8am	142	Yes
8am to 9am	0	No
11am to 12am	53	No
12am to 1pm	86	Yes
3pm to 4pm	88	Yes
4pm to 5pm	89	Yes
5pm to 6pm	111	Yes

Warrant Satisfied? No

Explanation: The warrant is not satisfied. Only 5 hours of traffic volume exceed the minimum vehicular volume criteria.

WARRANT NO.3 Progressive Movement

1) Is the distance to the nearest signal greater than or equal to 300m? — Yes / **No**

One Way

Are the adjacent signals so far apart that they do not provide a necessary degree of vehicle platooning and speed control? — ~~Yes~~ / ~~No~~

Two Way

Do the adjacent signals constitute a progressive system? — Yes / No

Are the adjacent signals so far apart that they do not provide a necessary degree of vehicle platooning and speed control? — Yes / No

Warrant Satisfied? No

Explanation: The adjacent signal is within 300m of the porposed location.

WARRANT NO.4 Accident Experience (based on ICBC Claims Data)

1) Have five or more reported accidents of types susceptible to correction by traffic signals occurred within a 12 month period, with each accident involving personal injury or damage exceeding $1000? — Yes / No

2) Have adequate trials of less restrictive remedies with satisfactory observance and enforcement failed to reduce the accident frequency? — Yes / No

3) Will the installation of a signal allow progressive traffic flow? — Yes / No

Warrant Satisfied? No

Explanation: Warrant not completed

WARRANT NO.5 System Warrant

1) Are both the major and minor streets "Major Routes"? — Yes / **No**

2) Does the total Peak Hour Volume over all approaches equal or exceed 1000 vph? — ~~Yes~~ / ~~No~~

3) Are one or more of Warrants 1,2,6,7 and 9 satisfied using Projected 5 Year Volumes? — ~~Yes~~ / ~~No~~

4) Does the Peak 5 Hour Weekend Volume equal or exceed 1000 vph? — ~~Yes~~ / ~~No~~

Warrant Satisfied? No

Explanation: The warrant is not satisfied because University Boulevard is the only major route.

WARRANT NO.6 Combination Warrant

1) Have other measures been tried which cause less delay and invonvenience to traffic than traffic signals?

Yes	No

Number of Incoming Lanes on Approach		Large Urban Areas (> 10000 population)				Small Urban Areas (<10000 population)	
		Posted or 85th Percentile Speed					
		=< 70 km/hr		> 70 km/hr			
		Peak 7 Hour Volume (vph)		Peak 7 Hour Volume (vph)		Peak 7 Hour Volume (vph)	
Major	Minor	Major	Minor	Major	Minor	Major	Minor
1	1	600	120	420	85	420	85
2 or more	1	720	120	500	85	500	85
2 or more	2 or more	720	160	500	110	500	110
1	2 or more	600	160	420	110	420	110

Existing Scenario to be Considered			
Number of Incoming Lanes on Approach		Minimum Volumes	
Major	Minor	Major	Minor
1	1	600	120

Existing Traffic Volumes (by Approach)

8 hours traffic volume on an average day

Time Period	Total of Both Major Approaches	Higher than Minimum?
6am to 7am	825	Yes
7am to 8am	1414	Yes
8am to 9am	0	No
11am to 12am	597	No
12am to 1pm	852	Yes
3pm to 4pm	849	Yes
4pm to 5pm	840	Yes
5pm to 6pm	960	Yes

Existing Traffic Volumes (by Approach)

8 hours traffic volume on an average day

Time Period	Higher of Each Minor Approaches	Higher than Minimum?
6am to 7am	59	No
7am to 8am	142	Yes
8am to 9am	0	No
11am to 12am	53	No
12am to 1pm	86	No
3pm to 4pm	88	No
4pm to 5pm	89	No
5pm to 6pm	111	No

Warrant Satisfied? No

Explanation: The warrant is not satisfied. The minor approach only exceeds the minimum volume criteria for 1 hour.

WARRANT NO.7 Four Hour Volumes

Location Type	Large Urban Areas (> 10000 population)	
	Posted or 85th Percentile Speed	
	=< 70 km/hr	> 70 km/hr
Rural	Figure 1	Figure 2
Large Urban (>10000 pop.)	Figure 1	Figure 2
Small Urban (<10000 pop.)	Figure 2	Figure 2

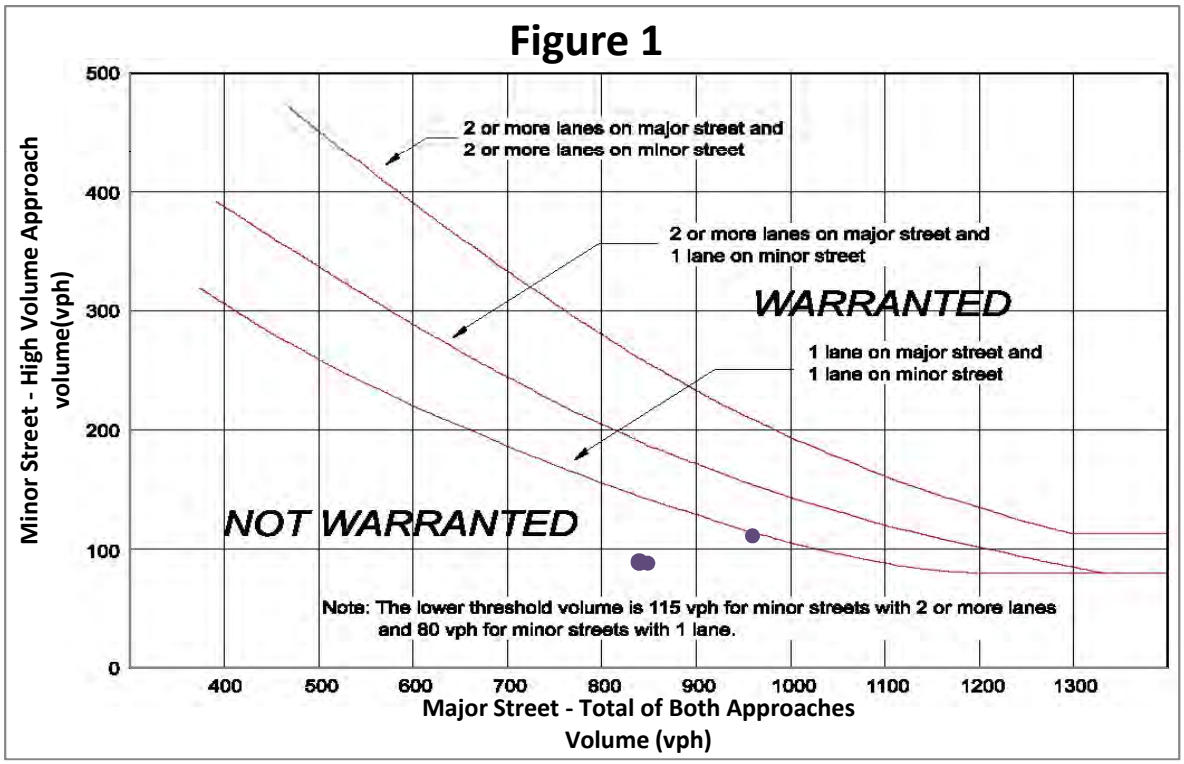
Existing Scenario to be Considered	
Location Type	Figure
Large Urban (>10000 pop.)	Figure 1

Highest of 4 consecutive hours on an average day

Time Period	Eastbound	Westbound	Total of Both
15:00 to 16:00	346	503	849
16:00 to 17:00	373	467	840
17:00 to 18:00	462	498	960

Highest of 4 consecutive hours on an average day

Time Period	Southbound	Northbound	Higher of Each
15:00 to 16:00	0	88	88
16:00 to 17:00	0	89	89
17:00 to 18:00	0	111	111



Warrant Satisfied? No

Explanation: No hour is above the appropriate line

WARRANT NO.8 Peak Hour Delay

	Number of Minor Street Incoming Lanes on Approach with Highest Peak Hour Delay	
	1	2 or more
Minimum Peak Hour Delay (veh-hr)	4	5
Minimum Peak Hour Traffic (vph)	100	150

Number of Intersection Approaches	Minimum total Peak Hour Traffic for All Approaches Combined (vph)
3	650
4	800

Existing Scenario to be Considered	
Minimum Peak Hour Delay (veh-hr)	4
Minimum Peak Hour Traffic (vph)	100
Minimum total Peak Hour Traffic for All Approaches Combined (vph)	800

Peak hour traffic volumes on an average day

Time Period	Eastbound	Westbound	Total of Both
	462	498	960
17:00 to 18:00			

Peak hour traffic volumes on an average day

Time Period	Southbound	Northbound	Higher of Each
	0	111	111
17:00 to 18:00			

Existing Peak Hour Delay (veh-hr):

Eastbound:	0.0
Westbound:	0.6

Warrant Satisfied? No

Explanation: Minimum Peak Hour Delay is not met

WARRANT NO.9 Peak Hour Volumes

Location Type	Large Urban Areas (> 10000 population)	
	Posted or 85th Percentile Speed	
	=< 70 km/hr	> 70 km/hr
Rural	Figure 3	Figure 4
Large Urban (>10000 pop.)	Figure 3	Figure 4
Small Urban (<10000 pop.)	Figure 4	Figure 4

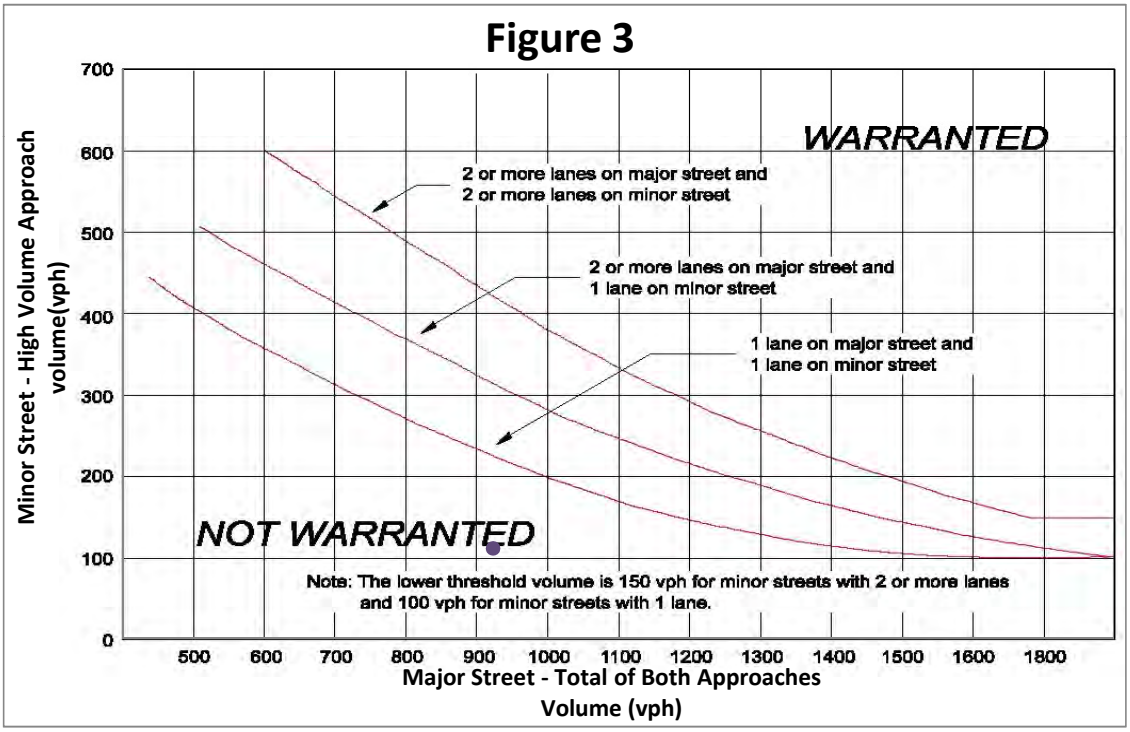
Existing Scenario to be Considered	
Location Type	Figure
Large Urban (>10000 pop.)	Figure 3

Peak hour traffic volumes on an average day

Time Period	Eastbound	Westbound	Total of Both
17:00 to 18:00	462	498	960

Peak hour traffic volumes on an average day

Time Period	Southbound	Northbound	Higher of Each
17:00 to 18:00	0	111	111



Warrant Satisfied? No

Explanation: The point is below the appropriate line

Summary

Warrant		
1) Minimum Vehicular Volume	[ ] Satisfied	[x] Not Satisfied
2) Interruption of Continuous Traffic	[ ] Satisfied	[x] Not Satisfied
3) Progressive Movement	[ ] Satisfied	[x] Not Satisfied
4) Accident Experience	[ ] Satisfied	[x] Not Satisfied
5) System Warrant	[ ] Satisfied	[x] Not Satisfied
6) Combination Warrant	[ ] Satisfied	[x] Not Satisfied
7) Four Hour Volume	[ ] Satisfied	[x] Not Satisfied
8) Peak Hour Delay	[ ] Satisfied	[x] Not Satisfied
9) Peak Hour Volume	[ ] Satisfied	[x] Not Satisfied

Comments:

- This intersection does not warrant the installation of a traffic signal.
- The Accident Experience Warrant was not completed for this analysis