Appendix C

MUNICIPAL SERVICING REPORT
LEXINGTON VILLAGE

Prepared for:
Palliser

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April 2013

File: 116807230

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1.0 Introduction

This brief has been prepared for submission to the City of Winnipeg as a requirement of their development review and subsequent approval on behalf of the developer, Palliser. The brief covers the design criteria and parameters utilized for the water, wastewater and land drainage systems for the concept shown in the Figures.

The proposed development encompasses approximately 23.3 hectares and is bounded:

- on the north by Springfield Road.
- on the east by an existing single family development.
- on the south by Burnett Ave.
- and on the west by Gateway Road.

The development will require the construction of:
• Internal connections to the existing Trunk Land Drainage Sewer along Lexington Park that drain to Lake 4-2.
• Wastewater sewer connections to existing sewers on Springfield Road and Gateway Raod.
• Watermain abandonment and re-installation along Springfield Road with internal connections.
• Internal Pavement Work.

2.0 Water System

The overall water service area for the concept including watermain sizes and available fire flows are shown on Figure 1.0. The major watermains already exist as shown in the figures. The existing 300 mm watermain running east-west located through the Palliser Land will have to be abandoned and a new 300 mm watermain will be installed on the south side of Springfield Rd. within the right of way and will be reconnected to the existing 300 mm WM near Chief Peguis Trail. The overall system has three feedpoint that are located at:

- Gateway Rd. and Lexington Park off an existing 250 watermain,
- Springfield Rd. and the Development's proposed north-south roadway off and existing 300 watermain
- And Burnett Ave. and Brunswick St. off an existing 200/250 watermain.

The systems performance was analyzed under various operating conditions using EPA NET 2.0, a computer simulation program produced by the Environmental Protection Agency (EPA).

For our analysis, the City of Winnipeg's Water and Waste Department provided us with simulated conditions at the above feedpoints that were inputted into our model. The simulated feedpoint pressures were representative of maximum day demand conditions in the distribution system.

The following design criteria and assumptions were used in the analysis of the watermains:

1. Hazen-Williams coefficient of friction ("C" value) for all pipe diameters was assumed to be 120.
2. Population based on 2.30 persons per multifamily dwelling unit.
3. The number of dwelling units served by each node was calculated based on:
   - The two concept plans shown in the figures.
4. The average daily per capita consumption used was 270 L.
5. The assumed peak daily consumption for:
   - Commercial is 28,100 l/day/ha.
   - Industrial is 37,600 l/day/ha.
6. The maximum day demand used was 1.6 x average day rate.
7. The peak hour multiplier used was 2.5.
8. Minimum design fire flows to be provided with maximum day demand on the system to be 100 l/s or greater for single family, 200 l/s or greater for multi family and 250 l/s or greater for commercial and industrial based on the FUS method.

9. For analysis purposes, the watermains were assumed to be at a constant elevation considering the subdivision's ground elevations vary slightly. The watermain system was tied into feedpoint nodes where simulated hydrant flow test data was provided by the City of Winnipeg.
10. Hydrant losses were accounted for by calculating available fire flows using 25 psi as opposed to 20 psi.

Based on the above conditions, the proposed watermain system can meet the required operating criteria of:

- A minimum pressure of 207 kPa (30 psi) under maximum hour consumption.
- The minimum fire flow specified above at 140 kPa (20 psi) with maximum day consumption.

We are providing adequate fire flow protection within the right of ways around the multifamily, commercial and industrial site. It will be the responsibility of the Design Engineer for the sites to design an internal watermain system to provide adequate fire protection within the site.

Below are the average water demand calculations for the entire development;

- Multi-Family = 4742 people x 225 L/c/day + 10% = 1,173,645 L/day
- Commercial Site = 3.2 Ha x 16,800 L/ha/day = 53,760 L/day
- TOTAL = 1,227,405 L/day

These calculations do not include existing North Kildonan Mennonite Brethren Church and Manitoba Public Insurance.

3.0 Wastewater Sewer System

The proposed development is located within the Area 4 and Area 4.1 Sewer Districts. These sewer districts flow to the North End Pollution Control Centre.

The City has indicated that they prefer only one connection to the existing 1825mm Combined Sewer on Springfield Rd. Therefore, the existing 250mm wastewater that currently connects to it will have to be abandoned and a new 375mm installed in its place to handle the increased flows from the proposed development.

A schematic of the overall wastewater sewer system and sewer subcatchments for the concept is shown in Figures 2.0

The design criteria and assumptions for the wastewater sewer system are:

1. Peak Design Flow = domestic sewage x peaking factor plus extraneous flow.
   The extraneous flows include groundwater infiltration and manhole cover inflow.

2. Domestic Sewage (Residential)
   Average Flow: 270 L/capita/day
   Peaking Factor: Harman's = $1 + 14/(4+p^{0.5})$
   Population/dwelling = 2.30 persons (multi family)
   Dwelling Density = based on densities provided by planners as shown on figures

3. Peak Commercial Flow: 28,100 L/ha/day
   Peak Light Industrial Flow: 37,600 L/ha/day

4. Extraneous Flow
   a) Groundwater Infiltration: 2200 L/ha/day
   b) Manhole Infiltration: 12 L/min/manhole
      Manhole Spacing: 1.6 Manholes/ha

5. Pipe selection was based on full flow pipe with Manning's N = 0.013 and minimum velocity of 0.6 m/sec (2.0 ft/sec). Adequate pipe cover and slope will be demonstrated on the detailed design drawings.

The wastewater sewer system design calculations for this subdivision for peak design flows is presented in Appendix A. The table shows that the pipe sizing demonstrated on Figures 2.0 can handle the peak flows from this development.

4.0 Land Drainage Sewer

4.1 BACKGROUND

The proposed 23.3 hectare development is located within Area B of the Bunn's Creek Drainage Area. The Development has an existing trunk land drainage sewer running through the site that was designed to pick up runoff from the entire catchment as shown on Figures 5.0 and 6.0. The trunk sewer drains through Lake 4-2 and is then conveyed to the Red River via Bunn's Creek. Future Internal development will be required to control runoff to a c-value equal to 0.50. The detailed catchment areas and existing pipe sizes are shown in Figure 3.0.

4.2 DESIGN CRITERIA AND DETAILED ANALYSIS

4.2.1 Land Drainage Sewers

This section details the design criteria, parameters, and assumptions used in the design of the land drainage sewers. The piped system was designed using the Rational Design method and was based on the following criteria:

5 year storm intensity equation $I = 47.2/(t+8)^{0.828}$ ---> (MacLaren 1974).

Pipe friction factor (Manning's n): 0.013 (Concrete and PVC).

Minimum full flow velocity: 3 ft /s.

Maximum full flow velocity: 10 ft /s.

The 1:5 year return frequency was used for the design of the storm sewer system.

Runoff Design Criteria

The rational design method was used to estimate rainfall runoff to be handled by the piped system:

$Q = CiA$

Where:

Q = runoff (CFS)

C = runoff coefficient

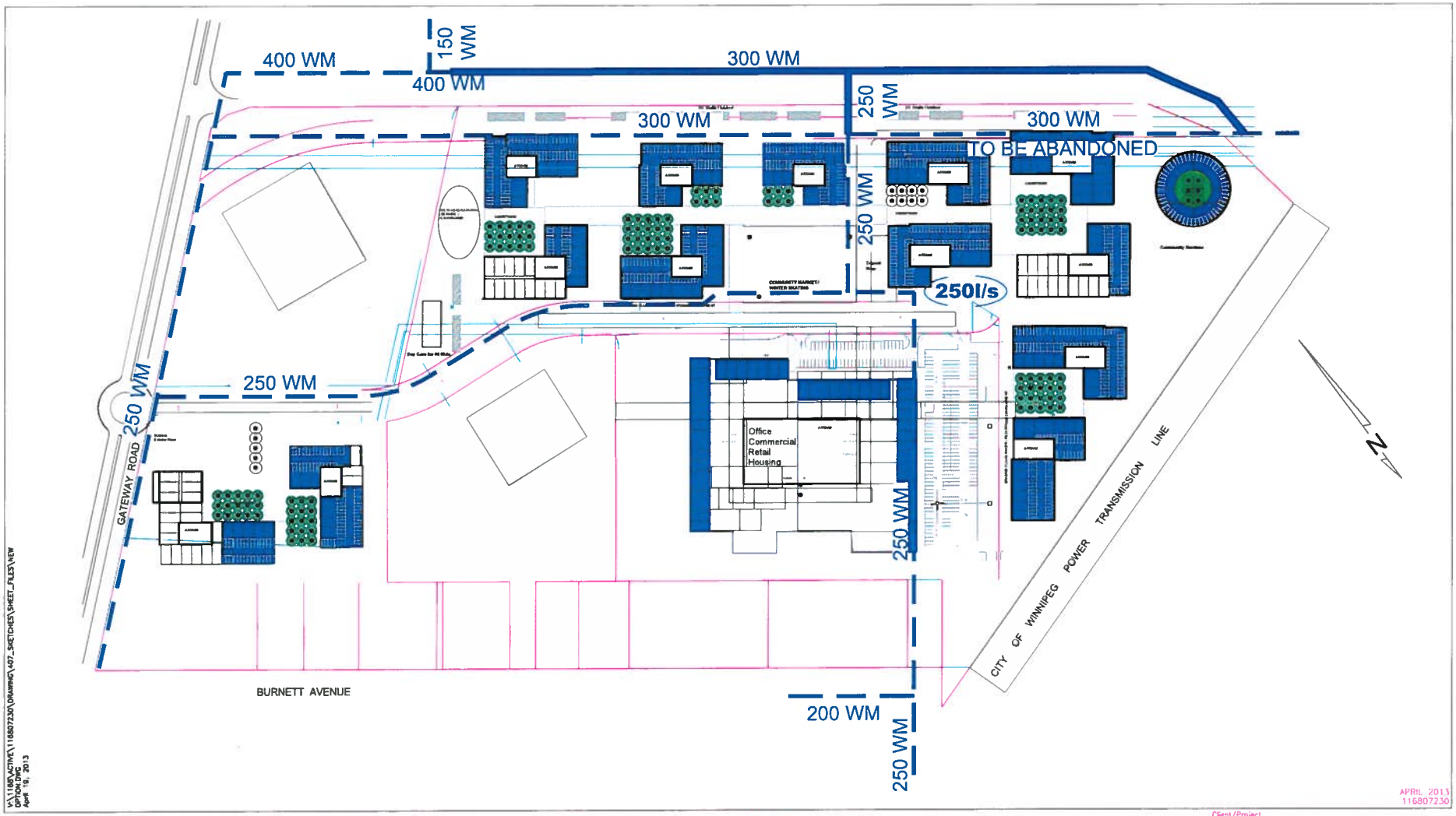
i = rainfall intensity (in/hr)

A = area (acres)

The drainage catchments include multi-family residential and commercial zoning, which reflect runoff coefficients ("C" values) of 0.50.

System Design Criteria

The land drainage sewers in this subdivision were designed as surcharged pipe systems to accommodate the calculated runoffs. The surcharge level of the system was designed to be at a minimum of 0.15m below the proposed gutter elevations. The Manning's Equation with an N = 0.013 for concrete or PVC pipe was used to determine pipe sizes and hydraulic losses within the system.



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Legend

PROPOSED WATERMAIN

EXISTING WATERMAIN

XXX l/s AVAILABLE FIRE FLOW

Notes

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PALLISER
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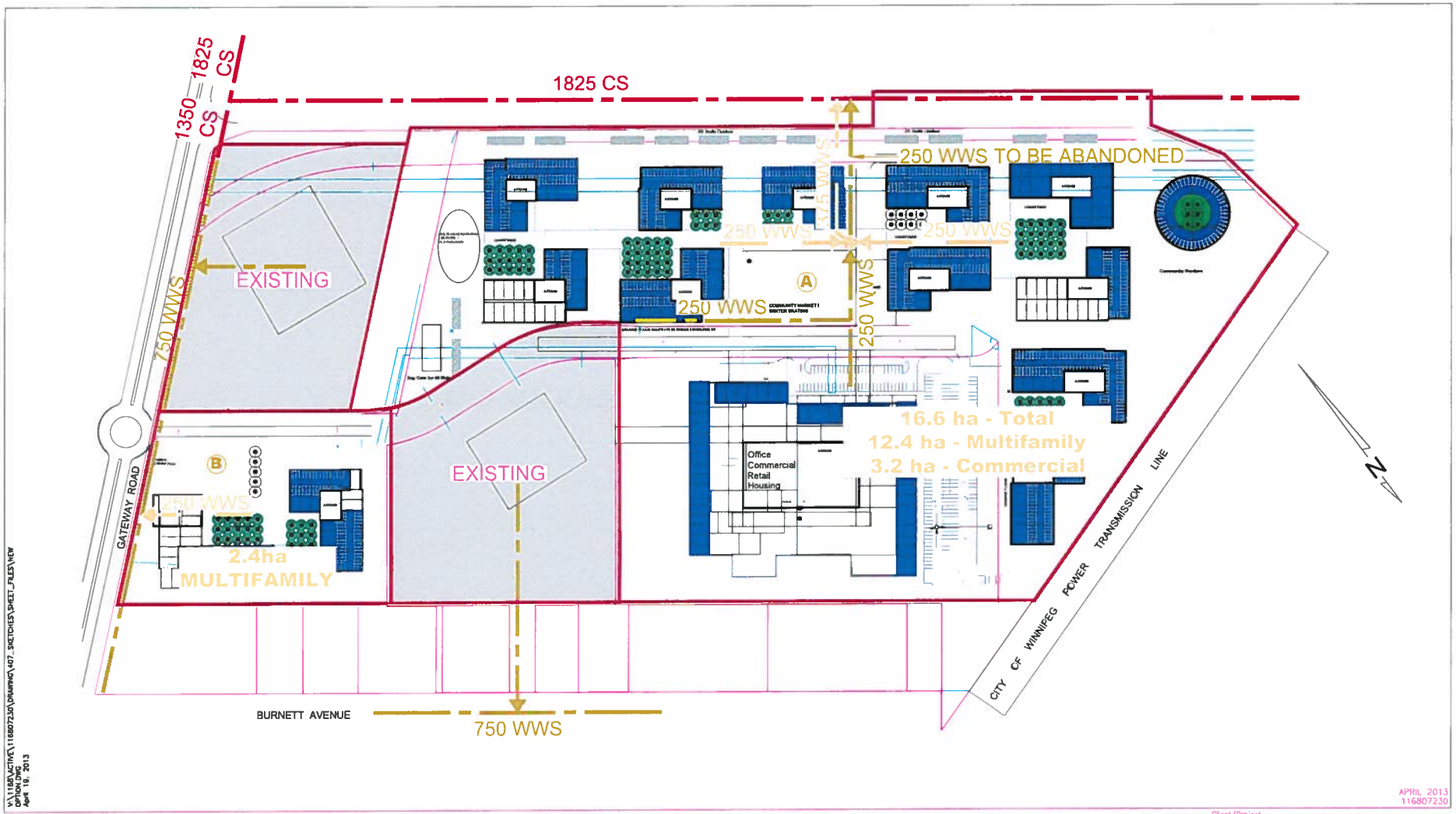
Figure No.
1.0

Title
WATERMAINS
AVAILABLE FIRE FLOWS

ORIGINAL SHEET - ANSI B



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- WASTE WATER SEWER CATCHMENT AREA
- EXISTING COMBINED SEWER
- EXISTING WASTE WATER SEWER
- FUTURE WASTE WATER SEWER

Notes

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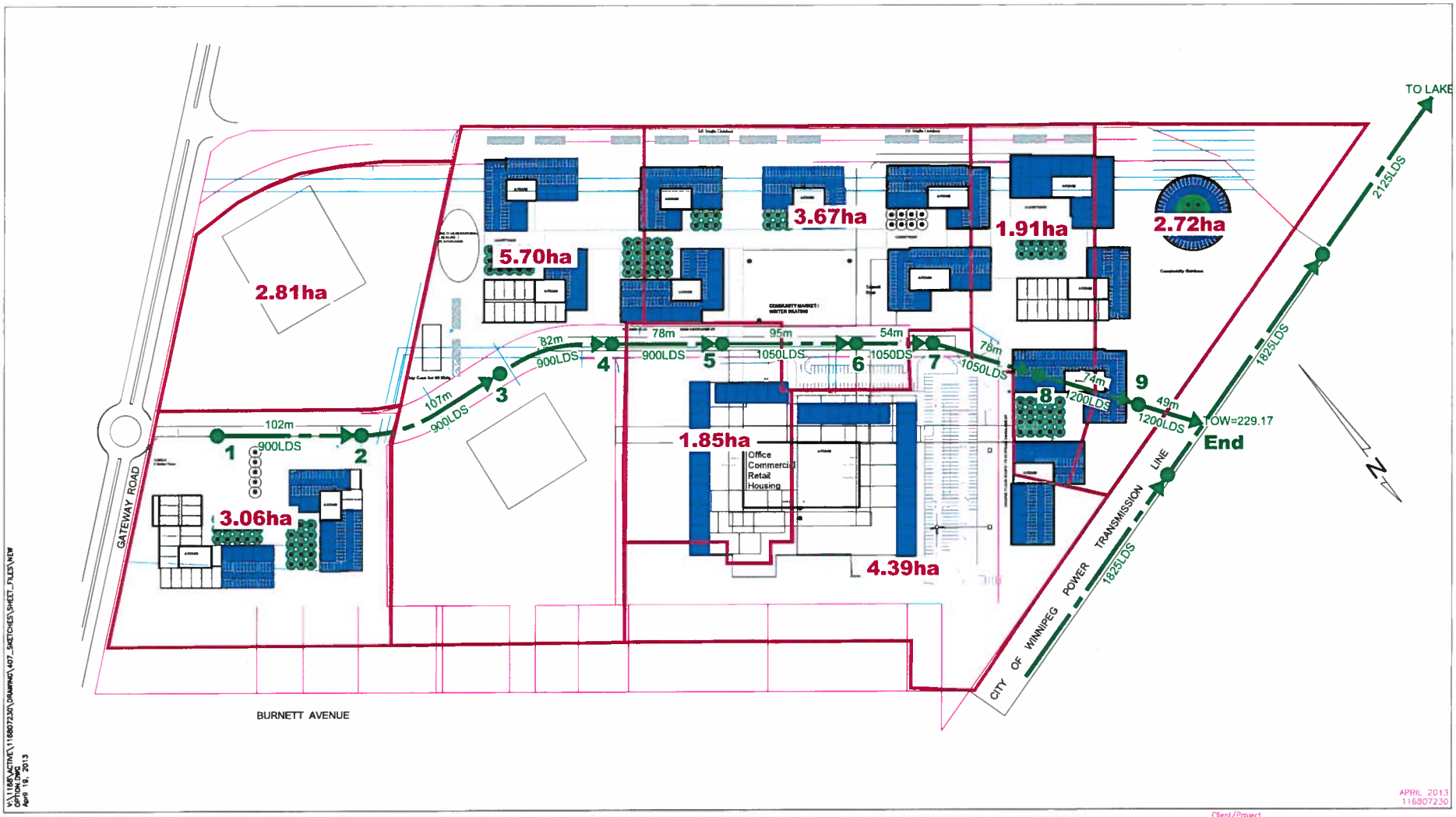
Winnipeg, Manitoba

Figure No.
20

Title
WASTE WATER SEWERS



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CATCHMENT BOUNDARY

EXISTING LAND DRAINAGE SEWER

Notes

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Figure No.
3.0

Title
LAND DRAINAGE SEWERS

APPENDIX A - Sanitary Sewer Design Spreadsheet

WASTEWATER SEWER DESIGN SHEET

DESCRIPTION: Peak Flow Calculations

OWNER Palliser
SUB/DIV. NAME Lexington Village

Area No.	M.H. From	M.H. To	No. of SF Dwelling Units	No. of MF Dwelling Units	Incremental SF Area (ha)	Incremental MF Area (ha)	Cumulative SF Area (ha)	Cumulative MF Area (ha)	Incremental SF Population (Persons)	Incremental MF Population (Persons)	Incremental Total Population (Persons)	Cumulative Population (Persons)	Peaking Factor M	Peak Res Flow (l/s)	Incremental Com. Area (Ha)	Cumulative Com. Area (Ha)	Incremental Ind. Area (Ha)	Cumulative Ind. Area (Ha)	Cumulative Total Area (Ha)	Ground Water Infiltration (l/s)	Manhole Inflow (l/s)	Peak Com. Flow (l/s)	Cum Com. Flow (l/s)	Peak Ind. Flow (l/s)	Cum Ind. Flow (l/s)	Peak Design Flow (l/s)	Proposed Sewer Dia. (mm)	Slope %	Crit. Slope %	Dec. Slope %	Capacity @ (l/s)	Velocity (m/s)
A			0	1684	0.0000	13.4000	0.0000	13.4000	0	3035	3035	3035	3.344	40.71	3.2000	3.2000	0.0000	0.0000	16.6000	0.42	5.31	1.04	1.04	0.00	0.00	47.46	375	0.15%	1.25%	0.15%	67.91	0.61
B			0	368	0.0000	2.4000	0.0000	2.4000	0	846	846	846	3.846	10.17	0.0000	0.0000	0.0000	0.0000	2.4000	0.06	0.77	0.00	0.00	0.00	0.00	11.00	250	0.25%	1.43%	0.25%	29.73	0.61

Notes:

Single Family
3.05 Persons per Unit (Single Family)
12.29 Dwellings per Hectare (Single Family)
2.3 Persons per Unit (Multi Family)
74.13 Dwellings per Hectare (Multi Family)

Design Flow Factor F = 0.003125 l/sec/person
80 L Gal/person/day = 270 l/person/day
Harman Factor FM=1+(14/(4+(p)^.5)) P = thousands of persons
2<=P<=4.5

Infiltration Factor	F=	2200	l/Ha/day	
Manhole Inflow		12	l/MH/min	
Manhole Quantity		18	MH/Ha	

Peak Commercial Flow			28100	L/day/Ha	0.325	L/sec/Ha
Peak Industrial Flow			37000	L/day/Ha	0.428	L/sec/Ha

Calculated By K. DeVroser
Checked By D. Magee
Date 18-Apr-13
File 118007230

Lexington Village Mixed-Use Development on Springfield Road and Gateway Road
Traffic Impact Assessment

FINAL REPORT

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January 2013

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1.0 Introduction

1.1 BACKGROUND

Lexington Real Estate Holdings, (the proponents), are proposing to develop the Lexington Mixed-Use Subdivision (the proposed subdivision) located on the southeast corner of Springfield Road and Gateway Road in The City of Winnipeg. The mixed-use development includes single family residential, multi-family residential, and commercial components.

The development area is bound by Springfield Road on the north, Gateway Road on the west, Burnett Avenue on the south and Brunswick Street on the east. The proposed development totals 20 hectares (50+/- acres), of which a significant portion is already developed with a new Manitoba Public Insurance Service Center, a large church and the Omega Center, a combined office and warehouse development. The resulting "new" development is 14 hectares (+/- 34 acres).

Two (2) *Conceptual Master Plans* have been developed for this site, of which both are included in this Traffic Impact Assessment for consideration. The features of each Concept Design will be discussed in later sections of this report.

1.2 OBJECTIVES

The objectives of this study are as follows:

- review the existing transportation network and peak hour traffic conditions in the study area;
- project the existing traffic volumes to future design years;
- estimate the magnitude and characteristics of additional traffic activity generated by the proposed development during the AM / PM weekday peak periods;
- evaluate the impacts of new vehicular traffic generated by the proposed development on roadways adjacent to the site; and,
- identify/recommend any improvements to adjacent roadways / existing traffic control mechanisms required to accommodate the proposed development or to mitigate development impacts.

2.0 Site Context

2.1 TRAFFIC IMPACT ASSESSMENT PARAMATERS

Based on discussions with The City of Winnipeg Public Works Department, the TIA is to assess the immediate intersection of the study area, including:

- Chief Peguis Trail at Gateway Road
- Springfield Road at Gateway Road
- Springfield Road at Raleigh Street
- Lexington Park Road at Gateway Road
- McLeod Avenue at Gateway Road
- McLeod Avenue at Raleigh Street

2.2 STUDY AREA

The site bound by Springfield Road to the north, Burnett Avenue to south, Gateway Street to the west, and Brunswick Street to the east is currently accessed via Lexington Park Road at Gateway Street.

There are three (3) existing developments within the study boundaries of this site: a Manitoba Public Insurance Service Center, the North Kildonan Mennonite Brethren Church; and a 250,000 sq ft office and warehouse complex owned and operated by the Palliser Furniture group. Figure 1 illustrates the location of the proposed subdivision.

2.3 EXISTING TRANSPORTATION SYSTEMS

General information on the primary roads within the study is provided below for consideration. Regrettably, no Average Annual Daily Traffic was obtained within the study area since the opening of the Chief Peguis Trail in December 2011.

- **Springfield Road** (north of the proposed subdivision) is a two-lane collector street that starts at Henderson Highway at the western limit to east of Springfield Road and terminates before crossing the newly constructed Chief Peguis Trail. The posted speed is 50 km/h. Traffic control is a mix of two-way stop control at minor streets and signals at major intersections.

- **Chief Peguis Trail** (north of the proposed subdivision) is a four-lane divided expressway that was opened to traffic in December 2011. Chief Peguis Trail now extends from Main Street, crosses the Red River and extends to Lagimodiere Boulevard with a posted speed of 80 km/h. Traffic control is achieved through traffic signals at Main Street, Henderson Highway and Lagimodiere Boulevard.

- **Burnett Avenue** (south of the proposed subdivision) is a mixed residential/industrial street that provides access to existing residences and businesses adjacent to the proposed subdivision. The posted speed limit is 50 km / hour; on-street parking is permitted and volumes are expected to be less than 1,000 vehicles per day. Traffic control is two-way stop control on Burnett Avenue.

- **Gateway Road** (west of the proposed subdivision) is a two-lane arterial roadway and truck route with a posted speed limit of 60 km / hour. Gateway Road extends from Talbot Avenue to the south and terminates at McIvor Avenue to the north. Gateway Road adjacent to the study area has experienced a significant increase in volumes since the closure of Raleigh Street associated with the Chief Peguis Trail construction and opening to the general public. Traffic control on Gateway Road is through two-way stop control to Gateway Road or through traffic signals at major intersections.

- **Brunswick Street** (east of the proposed subdivision) is a two-lane roadway that services the south side of the Palliser land. It is currently gated at the south edge of the development. South of the development, it has a 10-meter pavement width and terminates at McLeod Avenue. Traffic control on Brunswick Street is via stop-control.

2.4 DEVELOPMENT SITE PLAN

The proposed subdivision has two (2) *Conceptual Master Plans* for consideration under this traffic assessment, and are identified in Figure 2 and Figure 3. As shown, an east-west collector roadway (Lexington Park) is in place and currently serves the MPI facility and the Palliser Omega complex. Within the proposed development includes a mix of commercial space and multi-family development covering an area of 18 hectares (45 acres). The primary difference between the two (2) *Conceptual Master Plans* are the height of the buildings: *Concept Master Plan 1* includes a maximum height of 15 story multi-family buildings which includes commercial components on the main floor. *Conceptual Master Plan – Option 2* includes a maximum height of 8 story multi-family buildings with no commercial components on the main floor.

The proposed development option for each master plan is discussed below:

Conceptual Master Plan 1

- Commercial site along Gateway is a 5.01 acre site with 65,000 s.f. of floor area which is anticipated to include:
    - Grocery store with a floor area of 45,300 s.f.
    - High-Turnover Sit-Down Restaurant with a floor area of 4,700 s.f.
    - Specialty Retail with a floor area of 15,000 s.f.
- Commercial sites within Lexington Village which includes 27,000 s.f.

- Residential Multi-Family Sites totaling 1,916 units
- Redevelopment of the existing Omega site to commercial / office with a floor area of 61,000 s.f. and development of 150 units of condominiums.

Conceptual Master Plan 2

- Commercial site is the same as *Conceptual Master Plan1* as listed above (5.01 acres)
- Commercial sites within Lexington Village which includes 42,000 s.f.
- Residential Multi-Family Sites totaling 1,052 units
- Redevelopment of the existing Omega site to commercial / office with a floor area of 61,000 s.f. and development of 150 units of condominiums.

Although the specific commercial use for individual buildings is undetermined at the present time, the development is expected to include retail activity that will complement one another and will not include "big-box" development.

Access to the site is obtained by a combination of private road connections and driveway to surrounding area streets, listed as follows:

- utilization of the existing Lexington Park Road to Gateway Road,
- one (1) private road connection north to Springfield Road,
- private access(es) north to Springfield Road east of the Church,
- one (1) private road connection south to Burnett Avenue,
- private access west to Gateway Road.

The Lexington Village active transportation network is conceptually planned outside of the study area to connect with the existing Chief Peguis Trail Greenway, the existing sidewalk on the east side of Gateway Road. The concept plan also identifies a potential active transportation trail connection in the Manitoba Hydro right of way east of Lexington Village, and a potential sidewalk connection on the south side of Springfield Road. These connections provide sufficient access to the City-wide active transportation network and Transit service in North Kildonan.

Based on discussions with the developers, it is anticipated that the development would be completed within an 8 – 10 year timeframe, regardless of the final configuration of the site (i.e. Concept Master Plan 1 or 2). For purposes of this traffic impact assessment, Stantec used a 10-year timeframe for ultimate build-out of the site.

2.5 POTENTIAL FUTURE DEVELOPMENT

Stantec reviewed the immediate area for potential development within a 15-year timeframe for consideration into the report. There are no known areas of land that have been identified as future development in the local area other than continued residential development north of Gateway Road and Knowles Avenue and construction of a new residential subdivision on the southeast corner of Henderson Highway and the North Perimeter. However, the transportation impacts from this development through Gateway Road are likely small due to commuter traffic patterns and the reduced commercial component of Lexington Park.

It is also expected that the land on the southwest corner of the North Perimeter and Lagimodiere Boulevard would be developed, but the timing and development scheme of this property is unknown and has been excluded for consideration within this report.

2.6 KNOWN FUTURE ROAD IMPROVEMENTS

Through discussions with The City of Winnipeg, it is understood that there are improvements planned for the intersection of Gateway Road and McLeod Avenue. The improvements will be geometrically similar to the improvements completed in 2011 at Gateway Road and Springfield Road and will include a by-pass lane for both the northbound lane and the southbound lane in efforts to improve intersection performance and improve safety to the general public. It is understood that these improvements are slated for construction in summer 2012. These improvements need to be considered for future analysis of intersections within the study area.

2.7 EXISTING TRAFFIC

2.7.1 AVAILABLE DATA

The City of Winnipeg Public Works Department conducted manual intersection counts at numerous intersections within the study area in January and February of 2012, which falls approximately 2-3 months after opening day of the Chief Peguis Trail. However, no recent tube count data was obtained following the completion of Chief Peguis Trail. As such, no reliable AADT data is available.

Manual counts by Stantec staff at the intersection of Gateway Road and Lexington Park Road were completed in September 2010, and were implemented into this traffic impact assessment.

The date of the counts provided by The City of Winnipeg are as follows:

- Gateway Road at Chief Peguis Trail – January 25, 2012
- Gateway Road at Springfield Road – February 02, 2012
- Raleigh Street at Springfield Road - February 01, 2012
- Gateway Road at McLeod Avenue – January 18, 2012
- Raleigh Street at McLeod Avenue – January 18, 2012

All relevant intersection turning movement counts related to this study are included in Appendix "A".

2.8 GROWTH RATE

As a result of the Chief Peguis Trail opening and the closure of Raleigh Street north and south of Chief Peguis Trail, the study area volumes continue to adjust and balance as drivers adjust to the new road system. As such, there are no background data to support the actual background traffic growth in the area.

As such, the background traffic for this study was assumed to be 1.0%. This compound annual growth rate is based on historical background growth rates within The City of Winnipeg and through past approvals with The City of Winnipeg Public Works Department.

All traffic volume projections were performed according to the formula below:

$$\text{Future traffic volume} = \text{initial traffic volume} * (1 + \text{annual growth rate})^{\text{number of years}}$$

Where annual growth rate = 1.0%

3.0 Development Traffic

3.1 TRIP GENERATION

The traffic generated by the proposed development is based on the expected commercial and residential land uses as identified on the current development plans and as discussed in Section 2.4 within this report. Full development expected within a 10-year time frame.

However, more formal land use development assumptions were included into the development related volume calculations for each of the two (2) Concept Master Plan scenarios, as discussed below.

3.2 CONCEPT MASTER PLAN – OPTION 1

The concept drawings contain proposed land uses and the number of units for each land use, including commercial space, residential space (RMU Sites, RMF-L Sites, RMF-M Sites).

Also identified on the concept plans is the change in use of the existing Omega site from a warehousing / manufacturing site to a specialty retail/office and residential site. As part of this study, the existing traffic generated from the Omega site was deducted from the proposed land use.

Using this information and based on discussions with the developer, the following land uses are presumed to be included into this development for *Concept Master Plan – Option 1*:

- Specialty Retail (ITE Land Use 814) for the three sites of 27,000 s.f., 15,000 s.f. and 20,000 s.f. for a total area of 62,000 s.f.
- High-Turnover Sit-Down Restaurant (ITE Land Use 932) with 4,714 s.f. Gross Floor Area (GFA).
- Supermarket (ITE 850) for the 45,300 s.f. site.
- Mid-Rise Apartments (ITE Land Use 223) for the 48 identified units.
- High-Rise Apartments (ITE Land Use 222) for one-half of the 1,660 identified units (830 units total),
- Residential Condominium / Townhouse for one half of the 1,660 identified units plus the 208 identified units (1,038 units total)
- Luxury Condominiums (ITE Land Use 233) for 150 identified units.
- Omega site of 104,000 s.f. reduction in development volumes for an assumed 52,000 s.f. manufacturing (ITE Land Use 140) and 52,000 s.f. of warehousing (ITE Land Use 150).

It is important to note that there are 180 units included in bullet 5 above that are proposed as known future development of the North Kildonan Mennonite Brethren Church. For purposes of

this study, it was assumed that residential multi-family units will be developed within the 10-year timeframe.

Trip generation rates are based on data from the ITE *Trip Generation Manual*, 8th edition, for the peak hour of adjacent street traffic for one hour between 7:00 am – 9:00 am, for one hour between 4:00 pm - 6:00 pm and the weekday. Although average trip generation rates per unit of development or 1000 sq.ft. of gross floor area / gross leasable area are listed in the ITE Trip Generation Manuals, the fitted curve equations were used to calculate the actual trip generation.

Table 1: Land Use and Traffic Generation
Concept Option 1

Building and Land Use	ITE Land Use Code	Number of Units	Generation Rate (AM / PM / Weekday)	Traffic Generation
NEW DEVELOPMENT				
Specialty Retail	814	62,000 s.f.	T = rate of 1/1000 s.f. T = 2.4(X) + 21.48 T = 42.78(X)+37.66	AM = 62 vph PM = 170 vph ADT = 2,690 vpd
High-Turnover Site-Down Restaurant	932	4,714 s.f.	T = 11.52(X) T = 15(X) T = 127(X)	AM = 54 vph PM = 71 vph ADT = 597 vpd
Supermarket	850	45,300 s.f.	T = 3.6 (X3) Ln(T) = 0.61Ln(X) + 3.95 T = 66.95(X) + 1391.56	AM = 163 vph PM = 532 vph ADT = 4,424 vpd
Mid-Rise Apartments	223	48 units	T = 0.41(X) + 13.06 T = 0.48(X) – 11.07 T = 5.12(X) + 387.53	AM = 33 vph PM = 12 vph ADT = 633 vpd
High-Rise Apartments	222	830 units	Ln(T) = 0.99Ln(X) – 1.14 T = 0.32(X) + 12.3 Ln(T) = 0.83 Ln9X) + 2.50	AM = 248 vph PM = 278 vph ADT = 3,225 vpd
Residential Condominium / Townhouse	230	1,038 units	Ln9T) = 0.8Ln(X) + 0.26 Ln(T) = 0.82Ln(X) + 0.32 Ln(T) = 0.87Ln(X) + 2.46	AM = 336 vph PM = 410 vph ADT = 4,926 vpd
OMEGA SITE				
Manufacturing (REDUCTION)	140	52,000 s.f.	T = 0.83(X) – 29.52 T = 0.78(X) – 15.97 T = 3.88(X) - 20.70	{AM = 14 vph} {PM = 25 vph} ADT = 181 vpd}
Warehousing (REDUCTION)	150	52,000 s.f.	Ln(T) = 0.55Ln(X) = 1.88 Ln(T) = 0.64Ln(X) + 1.14 Ln(T) = 0.86Ln(X) = 2.24	{AM = 58 vpd} {PM = 39 trips} {ADT = 281vpd}
Specialty Retail	814	61,000 s.f.	T = rate of 1/1000 s.f. T = 2.4(X) + 21.48 T = 42.78(X)+37.66	AM = 61 vph PM = 168 vph ADT = 2,647 vpd
Luxury Condominium	233	150 units	Ln(T) = 0.80Ln(X) + 0.26 Ln(T) = 0.82Ln(X) + 0.32 Ln(T) = 0.87Ln(X) = 2.46	AM = 71 vph PM = 83 vph ADT = 915 vpd
Total Generated Trips				*AM = 956 vph* *PM = (1,660 vph)* *ADT = 19,595 vpd*

Note: AM = AM Peak Hour of Adjacent Street Traffic
PM = PM Peak Hour of Adjacent Street Traffic
ADT = Average Annual Daily Traffic

The resultant trip generation is 956 trips during the AM peak hour, 1,660 trips during the PM peak hour and 19,595 trips during an average weekday.

3.2.1 Trip Reductions due to Internal Capture Rates and Modal Splits

The listed trip generation rates / equations in Table 1 above do not include reductions to reflect the internal capture rate for site multi-use or for the modal splits.

From the 2004 ITE *Trip Generation Handbook, 2nd Edition*,

> "*The internal trip-making characteristics of multi-use development sites are directly related to the mix of on-site land uses (which are typically a combination of residential, office, retail, restaurant, entertainment and hotel/motel). When combined within a single mixed-use development, these land uses tend to interact, and thus to attract a portion of each other's trip generation".*

However, for the development as a whole, the complementary nature of the proposed commercial development land uses and the residential component of the site, a significant number of the generated trips will be made internally as multi-use trips rather than as external trips attracted from the adjacent road system. Tables within the ITE *Trip Generation Handbook* list an unconstrained internal capture rate of 20% for retail to retail land uses within a multi-use development for both trip origins and destinations. However, Stantec completed a site specific site evaluation to determine the actual Internal Capture Rate for this site. The result is an internal capture rate of 11%, of which was implemented for purposes of this study. Appendix B provides the background to support this calculation.

Within the proposed development, a Lexington Transit Station is identified and is assumed that appropriate transit service will be provided within the site. Adjacent the site, The City of Winnipeg Transit operates Transit Route 11, 44, 77, 85, 90. Specifically, Route 44 passes immediately through the site and Routes 85 and 90 travels on Gateway Road fronting the site. For the purposes of this study, an assumed transit modal split of 15% was implemented.

The resulting trip generation following the application of the internal capture rate and the transit modal split is identified in Table 2 and is coupled with the inbound distributions for each land use.

Table 2: Land Use and Traffic Generation – Reductions Applied Concept Option 1

Building and Land Use	Traffic Generation (Raw Generation)	Traffic Generation (Reductions Applied)	Inbound / Outbound Volumes
NEW DEVELOPMENT			
Specialty Retail	AM = 62 vph PM = 170 vph ADT = 2,690 vpd	AM = 46 vph PM = 125 vph ADT = 1,991 vpd	AM = 28/17 PM = 55/70
High-Turnover Site-Down Restaurant	AM = 54 vph PM = 71 vph ADT = 597 vpd	AM = 40 vph PM = 52 vph ADT = 441 vpd	AM = 21/19 PM = 31/21
Supermarket	AM = 163 vph PM = 532 vph ADT = 4,424 vpd	AM = 121 vph PM = 393 vph ADT = 3,273 vpd	AM = 73/48 PM = 200/193
Mid-Rise Apartments	AM = 33 vph PM = 12 vph ADT = 633 vpd	AM = 24 vph PM = 9 vph ADT = 468 vpd	AM = 7/17 PM = 5/4
High-Rise Apartments	AM = 248 vph PM = 278 vph ADT = 3,225 vpd	AM = 184 vph PM = 205 vph ADT = 2,386 vpd	AM = 46/138 PM = 125/80
Residential Condominium / Townhouse	AM = 336 vph PM = 410 vph ADT = 4,926 vpd	AM = 249 vph PM = 303 vph ADT = 3,645 vpd	AM = 43/206 PM = 203/100
OMEGA SITE			
Manufacturing (REDUCTION)	{AM = 14 vph} {PM = 25 vph} {ADT = 181 vpd}	{AM = 10 vph} {PM = 19 vph} {ADT = 134 vpd}	{AM = 8/2} {PM = 7/12}
Warehousing (REDUCTION)	{AM = 58 vpd} {PM = 39 trips} {ADT = 281vpd}	{AM = 43 vpd} {PM = 29 trips} {ADT = 208 vpd}	{AM = 34/9} {PM = 7/22}
Specialty Retail	AM = 61 vph PM = 168 vph ADT = 2,647 vpd	AM = 45 vph PM = 124 vph ADT = 1,959 vpd	AM = 27/18 PM = 55/69
Luxury Condominium	AM = 71 vph PM = 83 vph ADT = 915 vpd	AM = 53 vph PM = 61 vph ADT = 677 vpd	AM = 9/44 PM = 41/20
Total Generated Trips	*AM = 956 vph* *PM = (1,660 vph)* *WD = 19,595 vpd*	*AM = 707 vph* *PM = (1,228 vph)* *WD = 14,500 vpd*	*Inbound = 212 (701)* *Outbound = 496 (523)*

Note: AM = AM Peak Hour of Adjacent Street Traffic
PM = PM Peak Hour of Adjacent Street Traffic
ADT = Average Annual Daily Traffic

The resultant trip generation following the application of the internal capture rate and the modal split is 707 trips during the AM peak hour, 1,228 trips during the PM peak hour and 14,500 trips during an average weekday. Inbound trips are 212 vph for the AM and 496 vph for the PM peak

hour. Outbound trips during the AM peak hour are 701 vph and 523 vph during the PM peak hour.

3.2.2 Primary and Pass-By Traffic Volumes

Development related trip generation for a mixed use retail/residential site is usually separated into two distinct trip types:

- Primary Trips - trips made for the specific purpose of visiting the commercial site, for which the commercial traffic generator is the primary reason for the trip. These are considered "new" trips and contribute to the traffic loading on the adjacent street system.
- Pass-by Trips - these trips are intercepted from the existing stream of traffic passing the site; while they do contribute to traffic volumes on site accesses, they do not contribute new traffic loading to the adjacent street system.

The net number of primary/pass-by trips resulting from the commercial component of the proposed Lexington Village development is also to be considered due to the nature of pass-by trips. As such, the resultant trip activities due to the development from applying the pass-by traffic component of the development is summarized in Table 3.

The proportion of trips in the commercial retail category depends on the mix of commercial land and residential components of the development and other site specific factors, including accessibility, road alignments, intersection operations, etc. In review of the percentage of pass-by trips for the commercial retail land use as listed from the ITE Manual, the published rate varies based on the style of commercial development. Table 3 summarizes the primary and pass-by trip generation for the commercial components of the site.

Table 3: Primary and Pass-By Traffic Volumes for AM (PM) Peak – Concept Option 1

Land Use	Total Volume (AM/PM)	Entering / Exiting Volumes	Primary Inbound	Primary Outbound	Pass-By Inbound	Pass-By Outbound
High-Quality Sit-Down Restaurant	40 (52)	21/19 (31/21)	21 (18)	19 (12)	0 (13)	0 (9)
Supermarket	121 (393	73/48 (200/193)	73 (128)	48 124)	0 (72)	0 (69)

3.3 CONCEPTUAL MASTER PLAN – OPTION 2

In similar fashion to the layout of *Concept Master Plan - Option 1* in Section 3.2 of this report, the following sections identify the characteristics of *Concept Master Plan - Option 2*.

The following land uses are presumed to be included into this development:

- Specialty Retail (ITE Land Use 814) for the three sites of 47,000 s.f., 15,000 s.f. and 20,000 s.f. for a total of 82,000 s.f.
- High-Turnover Sit-Down Restaurant (ITE Land Use 932) with 4,714 s.f. Gross Floor Area (GFA).
- Supermarket (ITE 850) for the 45,300 s.f. site.
- Mid-Rise Apartments (ITE Land Use 223) for the 316 identified units.
- High-Rise Apartments (ITE Land Use 222) for one-half of the 736 identified units (316 units total),
- Residential Condominium / Townhouse for one half of the 736 identified units (316 units total)
- Luxury Condominiums (ITE Land Use 233) for 150 identified units.
- Omega site of 104,000 s.f. reduction in development volumes for an assumed 52,000 s.f. manufacturing (ITE Land Use 140) and 52,000 s.f. of warehousing (ITE Land Use 150).

It is important to note that there are 180 units included in bullet 5 above that are proposed as known future development of the North Kildonan Mennonite Brethren Church. For purposes of this study, it was assumed that residential multi-family units will be developed within the 10-year timeframe.

A summary of the development related trip generation is provided in Table 4.

Table 4: Lexington Village – Ultimate Build-Out - Land Use and Traffic Generation Conceptual Master Plan - Option 2

Building and Land Use	ITE Land Use Code	Number of Units	Generation Rate (AM / PM / Weekday)	Traffic Generation
NEW DEVELOPMENT				
Specialty Retail	814	82,000 s.f.	T = rate of 1/1000 s.f. T = 2.4(X) + 21.48 T = 42.78(X)+37.66	AM = 82 vph PM = 200 vph ADT = 3,546 vpd
High-Turnover Site-Down Restaurant	932	4,714 s.f.	T = 11.52(X) T = 15(X) T = 127(X)	AM = 54 vph PM = 71 vph ADT = 597 vpd
Supermarket	850	45,300 s.f.	T = 3.6 (X3) Ln(T) = 0.61Ln(X) + 3.95 T = 66.95(X) + 1391.56	AM = 163 vph PM = 532 vph ADT = 4,424 vpd
Mid-Rise Apartments	223	316 units	T = 0.41(X) + 13.06 T = 0.48(X) – 11.07 T = 5.12(X) + 387.53	AM = 142 vph PM = 140 vph ADT = 2,004 vpd
High-Rise Apartments	222	368 units	Ln(T) = 0.99Ln(X) – 1.14 T = 0.32(X) + 12.3 Ln(T) = 0.83 Ln9X) + 2.50	AM = 110 vph PM = 130 vph ADT = 1,642 vpd
Residential Condominium / Townhouse	230	1,038 units	Ln9T) = 0.8Ln(X) + 0.26 Ln(T) = 0.82Ln(X) + 0.32 Ln(T) = 0.87Ln(X) + 2.46	AM = 146 vph PM = 175 vph ADT = 1,998 vpd
OMEGA SITE			Same as Table 1.0	
Total Generated Trips				*AM = 901 vph* *PM = (1,563 vph)* *ADT = 18,235 vpd*

Note: AM = AM Peak Hour of Adjacent Street Traffic
PM = PM Peak Hour of Adjacent Street Traffic
ADT = Average Annual Daily Traffic

The resultant trip generation is 775 trips during the AM peak hour, 1,539 trips during the PM peak hour and 19,496 trips during an average weekday.

3.3.1 Trip Reductions due to Internal Capture Rates and Modal Splits

As described in Section 3.2.1 above, the listed trip generation rates / equations in Table 4 above does not include reductions to reflect the internal capture rate for site multi-use or for the modal splits. Using the internal capture rate of 11% and the modal split of 15%, the resulting volumes are identified in Table 5;

Table 5: Land Use and Traffic Generation – Reductions Applied Conceptual Master Plan - Option 2

Building and Land Use	Traffic Generation (Raw Generation)	Traffic Generation (Reductions Applied)	Inbound / Outbound Volumes
NEW DEVELOPMENT			
Specialty Retail	AM = 82 vph PM = 200 vph ADT = 3,546 vpd	AM = 61 vph PM = 148 vph ADT = 2,624 vpd	AM = 36/25 PM = 65/83
High-Turnover Site-Down Restaurant	AM = 54 vph PM = 71 vph ADT = 597 vpd	AM = 40 vph PM = 52 vph ADT = 441 vpd	AM = 21/19 PM = 31/21
Supermarket	AM = 163 vph PM = 532 vph ADT = 4,424 vpd	AM = 121 vph PM = 393 vph ADT = 3,273 vpd	AM = 73/48 PM = 200/193
Mid-Rise Apartments	AM = 142 vph PM = 140 vph ADT = 2,004 vpd	AM = 105 vph PM = 104 vph ADT = 1,483 vpd	AM = 32/73 PM = 61/43
High-Rise Apartments	AM = 110 vph PM = 130 vph ADT = 1,642 vpd	AM = 81 vph PM = 96 vph ADT = 1,215 vpd	AM = 21/60 PM = 58/38
Residential Condominium / Townhouse	AM = 146 vph PM = 175 vph ADT = 1,998 vpd	AM = 108 vph PM = 130 vph ADT = 1,478 vpd	AM = 18/90 PM = 86/44
OMEGA SITE		Same as Table 2	
Total Generated Trips	*AM = 901 vph* *PM = (1,563 vph)* *WD = 18,235 vpd*	*AM = 561 vph* *PM = (1,060 vph)* *WD = 12,808 vpd*	*Inbound = 195 (366)* *Outbound = 583 (477)*

Note: AM = AM Peak Hour of Adjacent Street Traffic
PM = PM Peak Hour of Adjacent Street Traffic
ADT = Average Annual Daily Traffic

The resultant trip generation following the application of the internal capture rate and the modal split is 561 trips during the AM peak hour, 1,060 trips during the PM peak hour and 12,808 trips during an average weekday. Inbound trips are 195 vph for the AM and 583 vph for the PM peak hour. Outbound trips during the AM peak hour are 366 vph and 477 vph during the PM peak hour.

3.3.2 Primary and Pass-By Traffic Volumes

The commercial land uses listed in Option 1 are the same in Option 2. Therefore, Table 3 remains the same for the primary / pass-by trips under Option 2. As such, Table 3 is still valid for this option.

3.4 TRIP DISTRIBUTION / ASSIGNMENT

The directional distribution of trips generated by the proposed Lexington Park was determined based on the author's local knowledge of the area and partially based on the traffic volumes in the immediate area. The distribution is also reasonably close to other TIA's completed by Stantec in the immediate area. Therefore, the trip distribution / assignment percentages area as follows:

- **Both Option 1 and Option 2**
  - Entering:
    - 50% from northbound Gateway Road, with further distribution at McLeod
      - 25% from the south, 15 % from west and 5% from east
        - 80% of the commercial traffic enters at south access
        - 20% of the commercial traffic and 100% of the residential traffic proceeds north to enter via Lexington
    - 25% from southbound Gateway Road with further distribution at Springfield Road
      - 10% from west, 15% from north, which is further distributed at Chief Peguis Trail, 10% from north 5% from east and 10% from west
    - 15% from eastbound Springfield Road to local access and local roads
    - 5% from Burnett Avenue
  - Exiting:
    - 45% to southbound Gateway Road
      - 80% of the commercial traffic from the south access, 20% of the commercial traffic and 100% of the residential traffic via Lexington
        - 25% south, 15% west and 5% east at MacLeod
    - 25% to northbound Gateway Road
      - 60% of the commercial traffic via the south access, 40% of the commercial traffic and 100% of the residential traffic via Lexington, 10% via south access
        - 5% west at Springfield Road, 20% north to Chief Peguis Trail
    - 25% to Springfield Road via private road and access,
      - 10% to the north at Gateway
      - 15% to the west at Gateway
    - 5% south via Burnett

3.5 DESIGN VOLUMES

Based on all the discussion above related to base traffic volumes, primary trips, pass-by trips and the two (2) options being considered under this development, the following Figures have been developed for consideration in the analysis.

- Figure 4 - 2022 AM (PM) Peak Hour Pre-Development Volumes (Balanced)
- Figure 5 - Development Related Traffic Volume Distribution
- Figure 6 - Development Related Volumes to 2022 - Pass-By Trips – Option 1 and Option 2
- Figure 7 - Development Related Volumes to 2022 – Option 1 Primary Trips
- Figure 8 - AM (PM) Peak Hour Post-Development Volumes to 2022 – Option 1
- Figure 9 - Development Related Volumes to 2022 – Option 2 Primary Trips
- Figure 10 - AM (PM) Peak Hour Post-Development Volumes to 2022 – Option 2
- Figure 11 - Geometric and Traffic Control Requirements to 2022 Post-Development

4.0 Traffic Analysis

4.1 ANALYSIS BACKGROUND

The purpose of this section is to analyze traffic operations on the roadway network within the study area of the proposed Lexington Village, assess the impact of projected traffic volume increases and develop appropriate mitigation and traffic control strategies. Both the weekday AM peak hour and the weekday PM peak hour were analyzed to ensure the maximum impacts of the trips generated by the proposed development were considered.

The first task is to bring the background volumes to the projected 2022 base volume conditions using the previously discussed background growth rate. The 2022 traffic volumes will allow a direct comparison of the pre-development and post-development conditions and identify what improvements are required to satisfy the increase traffic demands on the local area system.

The second task of the traffic analysis was to investigate the impact of the newly generated traffic volumes derived from the proposed Lexington Village Development only. By completing the analysis in this fashion, this will identify the need for road improvements and traffic control based on the subject development only.

It is important to note that the existing 2012 conditions were not modeled under this study. Further, the analysis of the existing conditions in 2012 does not provide any useful information under the 2022 Ultimate Development" scenario being considered.

4.1.1 Vehicle Delay Based Intersection Analysis (Highway Capacity Manual Methodology)

Traffic analyses for signalized and unsignalized intersections are typically conducted according to methodology developed by the Transportation Research Board (TRB) and as published by the *2010 Highway Capacity Manual* (HCM). Most of the analyses estimate vehicle delay under various traffic volumes, roadway configurations, and traffic control strategies. The delay estimates are used as the basis for determining intersection performance. According to the HCM, the relative performance of an intersection depends on a number of different factors including:

- **Level of service (LOS)** measures the average signal delay per vehicle during a 15-minute analysis period. Levels of service range from A to F (minimal delay to unacceptable delay).
- **Degree of saturation** measures the ratio of demand flow rate (v) to maximum capacity (c); intersections with volume to capacity (v/c) ratios $\geq$ 1.0 are at full capacity and typically experience congested traffic conditions.

- **Vehicle delay** indicates average vehicle delay at an intersection, on an approach, or by movement, and is measured in seconds / vehicle or total hours of delay during the period analyzed.

For design and planning purposes, LOS of D or better is typically considered acceptable during the peak period. Tables 5.1 and 5.2 summarize the LOS for signalized and unsignalized intersections respectively as listed in the 2000 edition of the HCM.

Table 6 - HCM LOS Characteristics - Signalized Intersections

HCM Level of Service	Average Signal Delay per Vehicle (sec/veh)	Characteristics
A	≤ 10	Free flow, low volumes and high speeds, most drivers can select own speed
B	> 10 and ≤ 20	Stable flow, speed restricted slightly by traffic
C	> 20 and ≤ 35	Stable flow, speed controlled by traffic
D	> 35 and ≤ 55	Approaching unstable flow, low speed
E	> 55 and ≤ 80	Unstable flow & speeds, volumes at/near capacity
F	> 80	Forced flow, low speed, volume above capacity

Table 7 - HCM LOS Characteristics - Unsignalized Two-Way & All-Way Stop Control Intersections

HCM Level of Service	Average Total Delay (sec/veh)
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

Note that for two-way stop-controlled intersections, the LOS is defined for main street left turns and minor approaches. Unlike signalized intersections, the LOS for a stop-controlled intersection is not defined for the entire intersection.

4.1.2 Intersection Capacity Utilization

The Intersection Capacity Utilization Level of Service (ICU LOS) gives insight into how an intersection is functioning and how much extra capacity is available to handle traffic fluctuations and incidents. ICU is not a value that can be measured with a stopwatch, but it does give a good reading on the conditions that can be expected at the intersection. ICU LOS and HCM LOS are not equivalent and cannot be directly compared, as the units of measurement and scale are different. A description of the conditions expected for each level of service follows:

Table 8 ICU Level of Service

Level of Service	Intersection Capacity Utilization (%)	Characteristics
A	≤ 60%	The intersection has no congestion. A cycle length of 80 sec. or less will move traffic efficiently. All traffic should be served on the first cycle. Traffic fluctuations, accidents, and lane closures can be handled with minimal congestion. This intersection can accommodate up to 40% more traffic on all movements.
B	> 60% and ≤ 70%	The intersection has very little congestion. Almost all traffic will be served on the first cycle. A cycle length of 90 sec. or less will move traffic efficiently. Traffic fluctuations, accidents, and lane closures can be handled with minimal congestion. This intersection can accommodate up to 30% more traffic on all movements
C	> 70% and ≤ 80%	The intersection has no major congestion. Most traffic should be served on the first cycle. A cycle length of 100 sec. or less will move traffic efficiently. Traffic fluctuations, accidents, and lane closures may cause some congestion. This intersection can accommodate up to 20% more traffic on all movements.
D	> 80% and ≤ 90%	The intersection normally has no congestion. The majority of traffic should be served on the first cycle. A cycle length of 110 sec. or less will move traffic efficiently. Traffic fluctuations, accidents, lane closures and sub-optimal timing can cause congestion. This intersection can accommodate up to 10% more traffic on all movements.
E	>90% and ≤ 100%	The intersection is on the verge of congested conditions. Many vehicles are not served on the first cycle. A cycle length of 120 sec. is required to move all traffic. Minor traffic fluctuations, accidents, lane closures and sub-optimal timing can cause significant congestion. This intersection has less than 10% reserve capacity available.
F	> 100% and ≤ 110%	The intersection is over capacity and likely experiences congestion periods of 15 to 60 min. per day. Residual queues at the end of green are common. A cycle length over 120 sec. is required to move all traffic. Minor traffic fluctuations, accidents, and lane closures can cause increased congestion. Sub optimal signal timings can cause increased congestion.
G	> 110% and ≤ 120%	The intersection is 10% to 20% over capacity and likely experiences congestion periods of 60 to 120 min. per day. Long queues are common. A cycle length over 120 sec. is required to move all traffic. Motorists may be choosing alternate routes, if they exist, or making fewer trips during the peak hour. Signal timings can be used to "ration" capacity to the priority movements.
H	> 120%	The intersection is 20% over capacity and could experience congestion periods of over 120 min. per day. Long queues are common. A cycle length over 120 sec. is required to move all traffic. Motorists may be choosing alternate routes, if they exist, or make fewer trips during the peak hour. Signal timings can be used to "ration" capacity to the priority movements.

4.2 METHODOLOGY

4.2.1 Introduction

Study area intersections were analyzed using Trafficware Synchro and SimTraffic (version 8.0, build 801, revision 563), as well as Sidra Intersection 5.1 (Version 5.1.10.2069) for the roundabout analysis. Synchro analyzes signalized and unsignalized intersections in terms of LOS, delay, and queuing, according to the methodology detailed in the 2000 edition of the HCM. Synchro is used to evaluate existing operations or to optimize traffic signal phase configurations, timing splits, and cycle lengths and can optimize coordinated signal networks and their associated cycle offsets. SimTraffic was used to simulate operation of the study area network and ensure that actual conditions were accurately modeled. Historically, The City of Winnipeg uses Synchro to analyze stop-controlled and signalized intersections.

The Sidra Intersection software is for use as an aid for design and evaluation of signalized intersections (fixed-time / pre-timed and actuated), signalized pedestrian crossings, single point interchanges (signalized), roundabouts, roundabout metering, two-way stop sign control, all-way stop sign control, and give-way / yield sign-control. The flexibility of SIDRA INTERSECTION allows its application to many other situations, including uninterrupted traffic flow conditions and merging analysis. SIDRA INTERSECTION is an advanced micro-analytical traffic evaluation tool that employs lane-by-lane and vehicle drive-cycle models coupled with an iterative approximation method to provide estimates of capacity and performance statistics (delay, queue length, stop rate, etc). Although SIDRA INTERSECTION is a single intersection analysis package, you can perform traffic signal analysis as an isolated intersection (default) or as a coordinated intersection by specifying platooned arrival data.

The existing geometry / traffic control at each intersection was used as the basis for lane configurations, storage lane lengths, turning restrictions, etc. incorporated into the Synchro and Sidra models.

4.2.2 Assumptions

To analyze the impact of development-generated traffic, a number of assumptions were made regarding existing study area traffic conditions, including:

- the 85th percentile speed on all roadways was assumed to equal the posted speed limit;
- heavy vehicles = 2%;
- pedestrian / bicycle crossings = 10 each / hour / approach;
- vehicle length = 7.6 m;
- the peak hour factor (PHF) was assumed to be 0.95 for all intersections;
- ideal saturated flow = 1,900 vehicles per hour per lane based on HCM methods; and,
- turning movement volumes < 5 vehicles / hour or = 0 vehicles / hour were rounded up to five (5) vehicles / hour.

4.2.3 Traffic Control Assumptions

Based on the traffic control data gathered for the study and in consideration of the intersections under analysis, the intersections in the study area that currently operate under traffic signal control include:

- Gateway Road at Springfield Road,
- Raleigh Street at Springfield Road,
- Gateway Road at McLeod Avenue,
- Raleigh Street at McLeod Avenue,

Stop-controlled intersections within the study area include:

- Gateway Road at Lexington Park Road,
- Lexington Village Private Access to Gateway Road,

All signalized intersections were assumed to operate as pre-timed un-coordinated due to spacing between signalized intersections. Detection, minimum gap, and extension data criteria was based on the Synchro default values.

The timings developed using Synchro are based on actuated green times rather than maximum green times. If there is very little side-street vehicular demand the analyzed green times may be less than the pedestrian clearance minimums. If there is a substantial side-street vehicular demand the need for longer cross-street splits will be reflected in the actuated green times.

Any new access (i.e. driveways) under this analysis were initially assumed to operate using stop-control, typically two-way stop control. If intersection operations were inadequate with stop-control, the intersection was then analyzed using either conventional traffic signals or under a modern roundabout. Initial roundabout analysis was a single-lane roundabout.

4.2.4 Allowable Left-Turn Phasing

Due to projections to 2022, it was assumed that the traffic signals could accommodate complex signal timing control plans in order to obtain appropriate efficiencies within the signalized intersection. A variety of left turn phase combinations was applied to gauge operational improvements. Where applicable, these included:

- **Permissible** – on a green ball indication, vehicles may turn left with opposing traffic when it is safe to do so. There is no separate left turn indication.
- **Fully protected** – on a left turn indication, vehicles may turn left without opposing traffic.
- **Protected-permissible** – a combination of fully protected and permissible lefts where vehicles receive a separate protected left indication followed/preceded by a green ball that allows only permissible lefts with opposing traffic.

4.3 TRAFFIC ANALYSIS RESULTS

As discussed above, the street network were analyzed under 2022 pre-development and 2022 post-development (ultimate development) traffic conditions during the weekday AM and PM peak hours to determine the development impact and traffic control requirements. The intersections under analysis were identified in Section 2.6 of this report, but are listed below for consideration:

- Gateway Road at Chief Peguis Trail – January 25, 2012
- Gateway Road at Springfield Road – February 02, 2012
- Raleigh Street at Springfield Road - February 01, 2012
- Gateway Road at McLeod Avenue – January 18, 2012
- Raleigh Street at McLeod Avenue – January 18, 2012

Modifications to the existing intersection geometry or traffic control (signals or stop condition) were made only when required to obtain an intersection LOS D and ensure that all approaches do not operate under a LOS E or worse. Three-way stop control and a single lane roundabout was examined for the intersection of Lexington Park Road and Gateway Road.

The calculated LOS is provided on an intersection basis in the following output sheets, along with delays per vehicle and maximum volume to capacity ratios. All queue lengths discussed below refer to 95th percentile queues calculated by Synchro or Sidra for the left-turning movements exclusively. Detailed Synchro analysis results are available for review in Appendix C.

4.3.1 Impact of Raleigh Street Closure at Chief Peguis Trail

It is important to note that recent changes in routing have occurred due to the new Chief Peguis Trail Extension project and the closure on Raleigh Street at Chief Peguis Trail, as the author frequents the site during the AM and PM peak hours of each weekday. With the closure of Raleigh Street, the intersections along Gateway Road have been negatively impacted regarding intersection performance as the volume have increased due to reduced roadway capacity.

Although the pavement width along Gateway Road is 10 meters, the intersection operations can be considerably different for each light cycle. This variation of intersection operations is due to road users developing a left-turn lane and the thru+right lane and "crowding" at the intersections and effectively developing a three (3) lane undivided cross-section roadway at each intersection along the study area using a lane width of 3.3 meters at a travel speed up to 60 km/hr. This "crowding" is specifically noticed at the following intersections:

- Gateway Road at Burnett Avenue for the southbound direction,
- Gateway Road at Furniture Park Road for the southbound direction,
- Gateway Road at Co-Op/Tim Horton access for the southbound direction,

- Gateway Road at Co-Op south access for the southbound direction,
- Gateway Road at McLeod Avenue for both the northbound and southbound directions,
- Raleigh Street at McLeod Avenue for the southbound direction.

Although the "crowding" is noticed at McLeod Avenue, is anticipated to be corrected with the construction of a proper by-pass intersection in summer of 2012.

When road users use Gateway as a two-lane facility, the left-turn blocking potential is very high and excessive queues can develop for the northbound and southbound directions, causing high localized delays and poor intersection operations.

It is understood that Gateway Road is legally a two-lane facility and the Synchro models developed for this study include a two-lane facility. However traffic in the field does not use the facilities as designed. The statements above are to ensure the reader appreciates the high variations in intersection traffic operations with using Gateway Road as a two (2) lane or three (3) lane facility.

4.3.2 2022 Pre-Development Results – Existing Geometry

The 2022 AM (PM) peak hour pre-development traffic volumes as shown in Figure 4 were used with the Synchro software to determine the existing traffic characteristics at the intersections within the study area by projecting the existing base volumes from 2012 to 2022. The tabulations of the results are intended to establish 2022 base conditions if no development was to occur within the study area with an assumed 1.0% compound annual background growth rate discussed in Section 2.7.

Using the existing geometry as the basis for analysis and including the planned improvements at Gateway Road at McLeod Avenue, the results of the 2022 pre-development scenario are presented in Table 9.

Table 9 2022 AM (PM) Peak Hour Pre-Development Intersection Performance Existing Lane Geometry

	Intersection Performance	HCM LOS / Delay (sec)[1]			
		EB Approach (LOS / delay / queue)	WB Approach (LOS / delay / queue)	NB Approach (LOS / delay / queue)	SB Approach (LOS / delay / queue)
Gateway at Chief Peguis Trail (signals)	HCM LOS = C (C) ICU LOS = C (D) ICU = 73% (78.3%) Delay = 21.2 (27.5)	C / 31 / 56 (C / 29 / 64)	C / 30 / 59 (D / 40 / 90)	B / 11 / 41 (C / 19 / 115)	B / 13 / 99 (B / 17 / 77)
Raleigh at Springfield (signals)	HCM LOS = C (C) ICU LOS = B (C) ICU = 55.3% (65.8%) Delay = 25 (26)	C / 29 / 18 (C / 30 / 24)	D / 39 / 47 (D / 44 / 50)	A / 7.5 / 28 (A / 10 / 53)	A / 6.8 / 21 (A / 6.1 / 12)
Gateway at Springfield (signals)	HCM LOS = B (B) ICU LOS = C (E) ICU = 70.0% (82.7%) Delay = 14.7 (14)	D / 41 / 33 (C / 32 / 47)	C / 32 / 7 (C / 27 / 4)	A / 4.9 / 22 (B / 10 / 56)	A / 8.3 / 31 (A / 8.0 / 42)
Gateway at Lexington (stop control)	HCM LOS = A (A) ICU LOS = B (A) Delay = 1.0 (1.8)	n/a (n/a)	C / 16 (D / 25)	free (free)	free (free)
Raleigh at McLeod (signals)	HCM LOS = C (C) ICU LOS = E (E) ICU = 86.3% (86.0%) Delay = 21.7 (25)	C / 22 / 29 (C / 29 / 41)	C / 32 / 58 (D / 40 / 53)	B / 11 / 28 (A / 9.4 / 49)	A / 9.3 / 34 (A / 7.0 / 30)
Gateway at McLeod (signals)	HCM LOS = C (C) ICU LOS = E (F) ICU = 83.0% (92.2%) Delay = 24.7 (25)	D / 41 / 56 (D / 42 / 71)	C / 31 / 61 (C / 29 / 55)	B / 11 / 33 (B / 13 / 49)	B / 13 / 48 (B / 16 / 70)

From the above table and looking exclusively at the intersection LOS, it appears that under 2022 pre-development volumes, the existing intersection configurations and/or traffic control is adequate during both the AM and PM peak hours. However, when reviewing specific movements, there are some approaches that experience a LOS D and high queuing.

The section below identifies the current operations using the existing intersection geometry and traffic control plans (i.e. traffic signals or stop control) and provides further analysis with improvements for each intersection to allow the intersection and specific approaches to improve in operation.

4.3.3 2022 Pre-Development Results – Existing and Modified Geometry or Traffic Signal Plans

Gateway Road at Chief Peguis Trail

During both the AM and PM peak hour, the eastbound left operates under a LOS D with 41 seconds and 47 seconds of delay with 213 vehicles completing this specific movement. This is a relatively high movement to be satisfied with one (1) lane. Due to the increased timing requirements for this movement, it is likely that other movements would gain efficiencies with implementing a second eastbound left lane to increase capacity. Although the results are acceptable under this analysis, it is important to note that this specific movement (i.e. the eastbound left) is operating at or near capacity and consumes a considerable amount of green time during the signal timing plan. This also applies to the westbound left with 186 vehicles per hour.

Gateway Road and Springfield Road

Under 2022 pre-development volumes, no major concerns are raised with the intersection performance other than the eastbound approach during the PM peak hour operating at LOS D. Under this planning exercise, this is acceptable operations. However, it is important to note that this intersection is influenced by the adjacent intersection of Raleigh Street at Springfield Road due to the close proximity of 50 meters from center to center of the intersections. There are times during the AM and PM peak hour that left-turn movements can block the thru movements or extend the queue through the adjacent intersection (i.e. Raleigh Street) for the eastbound direction. This has been experienced on-site on multiple days of the week and time of the day.

Raleigh Street at Springfield Road

Under 2022 pre-development volumes, no major concerns are raised with the intersection performance other than the westbound approach during the PM peak hour operating at LOS D. This westbound movement is the opposite of the intersection of Gateway Road at Springfield Road and identifies the influence of traffic volumes between these two intersections. Similarly to the intersection of Gateway at Springfield, there are times during the AM and PM peak hour that left-turn movements can block the thru movements and extend the queue through the adjacent intersection (i.e. Gateway Road) in the westbound direction. This has been experienced on-site on multiple days of the week and time of the day.

Gateway Road at Lexington Park

Under two-way stop control, no intersection operational deficiencies are noted at this intersection.

Gateway Road at McLeod Avenue

The intersection of Gateway Road at McLeod Avenue operates nearly identical for the AM and PM peak hour, with the eastbound approach operating at a LOS D with 42 seconds of delay. Currently in the field, the intersection does exhibit operational deficiencies due to increased

volumes, the combined left+thru+right lane and the influx to traffic partly associated with the Superstore. However, under this analysis, the intersection improvements are known for 2012 and are similar in geometry to Gateway at Springfield (i.e. by-pass intersection). As such, this intersection was modeled with a by-pass intersection. This intersection is also influenced by the Raleigh Street at McLeod Avenue intersection, similar to the Springfield Road paired intersections of Raleigh Street and Gateway Road.

Raleigh Street at McLeod Avenue

Overall, this intersection operates well and does not identify any major intersection operational issues.

4.3.4 Conceptual Master Plan Option 1 - 2022 Post-Development Results - Existing Geometry

As no additional geometric improvements are required under the 2022 pre-development scenario, the existing conditions formed the basis for analysis under the 2022 post-development conditions.

With the inclusion of the development related volumes onto the existing system, the results of the 2022 post-development scenario is provided in Table 10.

It is important to note that there is a PM peak rush of traffic following the end-of-day closures of the businesses located along Furniture Park as a rush of cars are introduced into the system, but this is a very specific time of day (i.e. 3:30pm - 4:00pm) and is not coincidental with the area-wide PM peak hour of adjacent street traffic.

Table 10 2022 AM (PM) Peak Hour Post-Development Intersection Performance Option 1 - Existing Lane Geometry

	Intersection Performance	HCM LOS / Delay (sec)[1]			
		EB Approach (LOS / delay / queue)	WB Approach (LOS / delay / queue)	NB Approach (LOS / delay / queue)	SB Approach (LOS / delay / queue)
Gateway at Chief Peguis Trail (signals)	HCM LOS = C (C) ICU LOS = D (E) ICU = 77.8% (85.6%) Delay = 23.2 (33.6)	C / 31 / 56 (D / 38 / 75)	C / 31 / 61 (D / 52 / 97)	B / 19 / 62 (C / 23 / 123)	B / 14 / 101 (B / 15 / 86)
Raleigh at Springfield (signals)	HCM LOS = C (C) ICU LOS = B (C) ICU = 59.2% (72.0%) Delay = 25 (25)	C / 24 / 21 (C / 26 / 39)	D / 34 / 60 (D / 36 / 64)	B / 11 / 34 (B / 14 / 63)	A / 9.8 / 26 (A / 9.0 / 15)
Gateway at Springfield (signals)	HCM LOS = B (B) ICU LOS = D (F) ICU = 81.1% (99.6%) Delay = 14 (20)	C / 29 / 26 (C / 31 / 26)	C / 31 / 16 (C / 25 / 16)	A / 6.8 / 28 (B / 18 / 87)	A / 7.7 / 52 (B / 13 / 67)
Gateway at Lexington (stop control)	HCM LOS = F (F) ICU LOS = E (H) Delay = 67 (>400)	n/a (n/a)	F / 254 (F / >400)	free (free)	free (free)
Gateway at Commercial Access (stop control)	HCM LOS = A (F) ICU LOS = B (E) Delay = 0.3 (14.5)	n/a (n/a)	C / 21 / 5 (F / >250 / 58)	free (free)	free (free)
Raleigh at McLeod (traffic signals)	HCM LOS = B (B) ICU LOS = E (F) ICU = 88.4% (92.3%) Delay = 15 (19.2)	B / 19 / 27 (C / 25 / 46)	B / 16 / 28 (C / 22 / 31)	B / 14 / 31 (B / 13 / 58)	B / 10 / 37 (A / 9.3 / 33)
Gateway at McLeod (traffic signals)	HCM LOS = C (D) ICU LOS = F (H) ICU = 91.3% (110.7%) Delay = 23.8 (40)	C / 26 / 51 (E / 58 / 108)	C / 27 / 56 (C / 23 / 54)	B / 12 / 39 (B / 20 / 70)	B / 20 / 81 (D / 41 / 128)

From the above table, it is evident that under 2022 post-development volumes with the development of Option 1, the existing intersection configurations and/or traffic control is inadequate and provides for poor intersection or approach operations during the AM and/or PM peak hour. This is evident for the intersection of Gateway Road at Lexington Park Road as well as specific approaches at various intersections within the study area.

4.3.5 2022 Post-Development Results – Modified Geometry or Traffic Signal Plans – Conceptual Master Plan – Option 1

Due to the poor intersection operations as noted in Table 10 above, numerous changes to traffic control and/or geometry are required to provide adequate levels of service. The discussion of the required improvements and the impacts to intersection operations are noted below.

Gateway Road at Chief Peguis Trail

The intersection operations are not significantly affected by the increase in related to the Lexington Village development. The northbound left increases from 147 vehicles per hour to 200 vehicles per hour in the AM peak hour and operates at a LOS C with 21 seconds of delay under the pre-development scenario. During the post-development PM peak hour, the northbound left increases from 198 vehicles per hour to 257 vehicles per hour and operates under a post-development LOS D with 41 seconds of delay. Both operations maintain the permitted left movement. Marginal increases in delay are also associated with the increased traffic from the development, specifically the northbound thru and the southbound thru. However, the changes are relatively small and do not significantly impact the intersection or approach performances.

As such, no improvements are required at this intersection for enhancing performance under the post-development scenario.

Gateway Road at Springfield Road

The intersection and approach operations are mildly decreased due to the proposed development. This mild decrease is partly due to the low volumes currently using the east leg and associated movements to the east leg of the intersection (i.e. eastbound thru, northbound right, southbound left, westbound left, westbound thru and westbound right). With the new development related volumes, the northbound approach LOS is reduced from a LOS A with 9.7 seconds of delay in the pre-development PM peak to a post-development PM peak hour LOS B with 18 seconds of delay. Other movements are mildly affected, but with little or no detrimental characteristics to the intersection.

As such, no improvements are required at this intersection for enhancing performance under the post-development scenario.

Raleigh Street at Springfield Road

The intersection and approach operations are mildly decreased due to the proposed development, even to a lesser extent than at Gateway and Springfield. The subtle changes in intersection and approach operations are due to non-conflicting increased in volumes (i.e. little or no increases in left-turning traffic) and the increases in volumes are typically eastbound and westbound thru movements. An example is the westbound movement during the AM peak hour. Under the pre-development scenario, the approach has an eastbound thru volume of 137 vehicles per hour and an approach LOS of D with 38 seconds of delay. Under post-development conditions, the approach operates at a LOS C with 35 seconds of delay using an alternate signal timing control plan.

Similarly, the eastbound approach during the PM peak hour has a pre-development volume of 175 vehicles per hour with a LOS C and 30 seconds of delay. Under the post-development condition, the eastbound approach volume is increased to 333 vehicles per hour and operates with a LOS C and 26 seconds of delay with a modified signal timing plan.

As such, no improvements are required at this intersection for enhancing performance under the post-development scenario.

Gateway Road at Lexington Park Road

Under post-development conditions, the intersection of Gateway Road and Lexington Park Road operates very poorly under two-way stop control (i.e. stop control on Lexington Park Road to Gateway Road).

Investigating alternatives, the intersection of Gateway Road at Lexington Park Road was widened to include a by-pass lane for both the northbound and southbound directions while maintaining the two-way stop-control on Lexington Park Road. The overall results were improved, but the westbound left maintained an AM peak hour LOS F with 59 seconds of delay with queues of 87 meters. During the PM peak hour, the intersection LOS was F and the westbound approach operated under LOS F with >500 seconds of delay. This is considered unacceptable.

Traffic signals were then implemented to this intersection using the existing two (2) lane road width with no further geometric improvements. The implementation of traffic signals improves the intersection operations considerably with an AM peak hour intersection LOS B with 12.5 seconds of delay. All movements during the AM peak hour at this intersection are also improved to a LOS B or better.

However, under the PM peak hour using the two (2) lane undivided road section, the intersection operates at a LOS F with overall intersection delays >200 seconds. This is predominantly due to the southbound left blocking the southbound through movement, creating excessive delays and queues.

The next iteration included a signalized by-pass intersection for the southbound direction to include a southbound left-turn lane. Also implemented was a protected-permitted southbound left-turn movement with consideration of the PM peak hour volumes of northbound thru movements (i.e. 679 vph) and the westbound left-turn movement (i.e. 279 vph). Under this scenario, the intersection does improve in operations with a PM peak hour intersection LOS of C with 34 seconds of delay, but the PM peak hour includes a westbound LOS E with 62 seconds of delay and a northbound left LOS D with 40 seconds of delay. For planning exercises, this is marginally acceptable as the intersection LOS is C. The changes listed above are assumed as the minimum treatment to accommodate the increases in traffic associated with the proposed development.

Another iteration of this intersection was to implement a single-lane roundabout in lieu of traffic signals. Through use of a single-lane roundabout, the intersection operations operate very well under both the AM and PM peak hour under post-development traffic conditions. The roundabout operates with a LOS A and all approaches operate with a LOS B or better.

Table 11 below provides additional intersection operational results for consideration. Please note that the table includes separate rows for Lexington Park Road at Gateway Road; one row

identifies the resulting traffic operations for traffic signals and one row for single-lane roundabout operation.

For consideration purposes and under the PM peak hour only, another iteration of this intersection included the development of a four (4) lane divided facility with an exclusive southbound left-turn lane. With these additional geometric improvements and under the PM peak hour only, the intersection LOS is C with 21 seconds of delay and the westbound left is improved further to a LOS D with 37 seconds of delay. The remaining two (2) approaches operate under LOS C or better.

Gateway at Commercial Access

The analysis identifies a high delay for the two (2) stop controlled intersection in the westbound direction with a LOS F during the PM peak hour. To improve the intersection performance would require either three (3) way stop-control or the installation of traffic signals. However, due to the distance from this intersection to Lexington Park Road, the installation of signals is not recommended. It is likely that some of the projected traffic would redirect to the signalized intersection rather than experience the high delays associated with the stop control under peak time periods. As such, no additional geometric improvements or traffic control improvements are recommended for this intersection.

Gateway Road at McLeod Avenue

This intersection is moderately impacted from pre-development to post-development conditions primarily due to the increased eastbound left PM peak volumes from 69 vehicles per hour to 180 vehicles per hour.

On an intersection basis, the AM peak hour operates at a LOS C for both the pre-development and post-development scenario with most approaches operating at a LOS C or better. During the PM peak hour and under pre-development conditions, the intersection operates at a LOS C with 25 seconds of overall delay and the eastbound approach operates at a LOS C with 26 seconds of delay. Under the PM peak hour post-development conditions, the intersection operates at a LOS D with 36 seconds of overall delay, with the eastbound approach reduced to a LOS E with 58 seconds of delay. Also, the southbound approach is reduced to a LOS D with 42 seconds of delay during the PM peak hour.

Also, the queue lengths are increased for the southbound and eastbound directions. The southbound queue is increased in the AM peak hour from 48 meters to 81 meters and during the PM peak hour, the queue is increased from 70 meters to 108 meters. Consideration of driveway blocking may be of concern.

Although marginal, the intersection operations are acceptable and no additional geometric improvements are required. It should be reiterated that this intersection is analyzed under the known future intersection improvements that are planned for summer 2012.

Raleigh Street at McLeod Avenue

The impacts from the proposed Lexington Village to this intersection are negligible with the optimized timing plan developed for this intersection. The AM and PM peak hour LOS is C for pre-development and post-development conditions. Only one approach operates at a LOS D, with the remainder of the approaches operating at a LOS C or better.

No intersection improvements are required at this intersection.

4.3.6 Summary of Post-Development Results – Modified Geometry or Traffic Signal Plans

As described in earlier sections of this report, there should be consideration for modifying the lane geometry under pre-development conditions due to the site specific public use of the roads within the study area, specifically along Gateway Road and along Raleigh Street. Along Gateway Road, the public frequently uses the 10 meter, two (2) lane undivided road as a three (3) lane undivided road, resulting in potentially unsafe conditions for the general public. However, this discussion is beyond the scope of this study. For purposes of this study, a two (2) lane road on Gateway Road and Raleigh Street was implemented:

Modifications to either traffic control or geometric intersection improvements for each intersection are listed below for consideration of recommended improvements to accommodate *Conceptual Master Plan – Option 1* for the Lexington Village site:

- Gateway Road at Chief Peguis Trail
  - No geometric improvements required.
  - Analyze and modify the traffic signal timing plans to accommodate net increases in volumes.
- Gateway Road at Springfield Road
  - No geometric improvements required.
  - Analyze and modify the traffic signal timing plans to accommodate net increases in volumes.
- Raleigh Street at Springfield Road
  - No geometric improvements required.
  - Analyze and modify the traffic signal timing plans to accommodate net increases in volumes.
- Gateway Road at Lexington Park Road
  - Install traffic signals or single-lane modern roundabout
  - Construct a by-pass intersection similar to Springfield Road at Gateway Road

- Gateway Road at Commercial Access
    - Installation of two-way stop control
    - Construction of a by-pass intersection for southbound-left turning traffic
- Gateway Road at Co-Op / Tim Horton's North Access
    - Consideration for the construction of a by-pass intersection (pre-development condition, to be constructed by others)
- Gateway Road at McLeod Avenue
    - Known future construction of a by-pass intersection
    - No further geometric improvements required
    - Analyze and modify the traffic signal timing plans to accommodate net increases in volumes.
- Raleigh Street at McLeod Avenue
    - No geometric improvements required.
    - Analyze and modify the traffic signal timing plans to accommodate net increases in volumes.

Table 11 2022 AM (PM) Peak Hour Post-Development Intersection Performance with Modified Geometry and Traffic Control – Conceptual Master Plan Option 1

	Intersection Performance	HCM LOS / Delay (sec)[1]			
		EB Approach (LOS / delay / queue)	WB Approach (LOS / delay / queue)	NB Approach (LOS / delay / queue)	SB Approach (LOS / delay / queue)
Gateway at Chief Peguis Trail (signals)	HCM LOS = C (C) ICU LOS = D (E) ICU = 77.8% (85.6%) Delay = 23.2 (33.6)	C / 31 / 56 (D / 38 / 75)	C / 31 / 61 (D / 52 / 97)	B / 20 / 66 (C / 24 / 123)	B / 14 / 101 (B / 15 / 86)
Raleigh at Springfield (signals)	HCM LOS = C (C) ICU LOS = B (C) ICU = 59.2% (72.0%) Delay = 25 (25)	C / 24 / 21 (C / 26 / 39)	D / 35 / 61 (D / 36 / 64)	B / 12 / 33 (B / 14 / 63)	A / 9.8 / 26 (A / 9.0 / 15)
Gateway at Springfield (signals)	HCM LOS = B (B) ICU LOS = D (F) ICU = 81.1% (99.6%) Delay = 14 (17)	C / 30 / 27 (C / 31 / 26)	C / 31 / 16 (C / 25 / 16)	A / 6.8 / 34 (B / 11 / 33)	A / 7.7 / 52 (B / 13 / 67)
Gateway at Lexington (signals)	**HCM LOS = B (D) ICU LOS = B (G) ICU = 62.6% (101%) Delay = 11 (41)**	**n/a (n/a)**	**B / 13 / 40 (E / 62 / 100)**	**B / 11 / 61 (D / 46 / 17)**	**B / 11 / 65 (C / 21 / 54)**
Gateway at Lexington (single-lane roundabout)	**HCM LOS = A (A)**	**n/a (n/a)**	**B / 10.7 / 17.9 (A / 10.6 / 45.7)**	**A / 4.1 / 17.6 (A / 6.8 / 108)**	**A / 5.5 / 20 (A / 6.9 / 76)**
Gateway at Commercial Access (stop control)	HCM LOS = A (F) ICU LOS = B (E) Delay = 0.3 (15.3)	n/a (n/a)	C / 23 / 5 (F / >250 / 58)	free (free)	free (free)
Raleigh at McLeod (traffic signals)	HCM LOS = B (B) ICU LOS = D (F) ICU = 79.4% (92.3%) Delay = 15 (19.2)	B / 19 / 25 (C / 25 / 46)	B / 16 / 29 (C / 22 / 31)	B / 14 / 33 (B / 13 / 58)	B / 11 / 26 (A / 9.3 / 33)
Gateway at McLeod (traffic signals)	HCM LOS = C (C) ICU LOS = F (H) ICU = 91.3% (110.7%) Delay = 21.2 (34)	C / 31 / 47 (E / 58 / 108)	C / 27 / 56 (C / 23 / 54)	B / 13 / 39 (B / 20 / 70)	B / 16 / 73 (C / 33 / 120)

4.3.7 Conceptual Master Plan Option 2 - 2022 Post-Development Results - Existing Geometry

Under this option, the analysis begins with using the existing geometry and traffic control found under the pre-development conditions, similar to what was completed with the *Conceptual Master Plan – Option 1*. It is also important to note that the post-development volumes on the intersections within the study area are quite similar between *Conceptual Master Plan – Option 1* and *Conceptual Master Plan - Option 2.* Therefore, the results of the analysis and the geometric improvements are anticipated to be similar.

The following discussion of each intersection follows the same format as *Conceptual Master Plan – Option 1* as discussed above.

4.3.8 Conceptual Master Plan Option 2 - 2022 Post-Development Results - Existing Geometry

As identified in Section 4.3.3, no additional geometric improvements are required under the 2022 pre-development scenario. The pre-development geometries were implemented into the software modeling for *Conceptual Master Plan – Option 2* to identify what deficiencies may arise during the traffic analysis.

With the inclusion of the development related volumes onto the existing system, the results of the 2022 post-development scenario is provided in Table 12.

Table 12 2022 AM (PM) Peak Hour Post-Development Intersection Performance Option 2 - Existing Lane Geometry

	Intersection Performance	HCM LOS / Delay (sec)[1]			
		EB Approach (LOS / delay / queue)	WB Approach (LOS / delay / queue)	NB Approach (LOS / delay / queue)	SB Approach (LOS / delay / queue)
Gateway at Chief Peguis Trail (signals)	HCM LOS = C (C) ICU LOS = D (E) ICU = 77.8% (84.5%) Delay = 24.0 (32.2)	C / 31 / 56 (C / 35 / 74)	C / 31 / 61 (D / 49 / 97)	C / 20 / 54 (C / 25 / 125)	B / 16 / 104 (B / 16 / 84)
Raleigh at Springfield (signals)	HCM LOS = C (C) ICU LOS = B (C) ICU = 57.3% (69.0%) Delay = 24 (26)	C / 25 / 18 (C / 27 / 37)	C / 33 / 57 (D / 37 / 62)	B / 10 / 37 (B / 16 / 82)	A / 8.7 / 24 (A / 9.0 / 20)
Gateway at Springfield (signals)	HCM LOS = B (C) ICU LOS = D (F) ICU = 78.1% (98.5%) Delay = 12 (21)	C / 28 / 21 (C / 33 / 28)	C / 32 / 14 (C / 24 / 13)	A / 3.9 / 18 (B / 10 / 33)	A / 7.1 / 48 (B / 13 / 66)
Gateway at Lexington (signals)	**HCM LOS = F (F) ICU LOS = D (H) ICU = 81.9% (122.4%) Delay = 68 (>400)**	**n/a (n/a)**	**F / 68 (F / >400)**	**free (free)**	**free (free)**
Gateway at Lexington (single-lane roundabout)	**HCM LOS = A (A)**	**n/a (n/a)**	**B / 10.3 / 11.4 (A / 8.8 / 33.6)**	**A / 3.7 / 15.9 (A / 4.1 / 73)**	**A / 5.4 / 18 (A / 4.7 / 58)**
Gateway at Commercial Access (stop control)	HCM LOS = A (F) ICU LOS = B (E) Delay = 0.3 (14.5)	n/a (n/a)	C / 19 / 5 (F / >250 / 58)	free (free)	free (free)
Raleigh at McLeod (traffic signals)	HCM LOS = B (B) ICU LOS = E (G) ICU = 90.4% (101.5%) Delay = 16.2 (19.1)	B / 20 / 30 (C / 24 / 46)	B / 17 / 26 (C / 23 / 31)	B / 14 / 39 (B / 15 / 90)	B / 12 / 42 (A / 9.2 / 37)
Gateway at McLeod (traffic signals)	HCM LOS = C (C) ICU LOS = E (H) ICU = 89.2% (119.4%) Delay = 21.2 (35)	C / 24 / 56 (E / 56 / 105)	C / 25 / 54 (C / 24 / 55)	B / 13 / 38 (B / 17 / 57)	C / 21 / 77 (D / 38 / 133)

From the above table, it is evident that under 2022 post-development volumes with the development of *Conceptual Master Plan – Option 2*, at some locations the existing intersection configurations and/or traffic control is inadequate and provides for poor intersection or approach operations during the AM and/or PM peak hour. This is evident for the intersection of Gateway Road at Lexington Park Road as well as specific approaches at various intersections within the study area.

4.3.9 2022 Post-Development Results – Modified Geometry or Traffic Signal Plans – Conceptual Master Plan – Option 1

Due to the poor intersection operations as noted in Table 12 above, several modifications to traffic control and/or geometry are required to provide adequate levels of service to specific intersections and/or approaches within the study area. The discussion of the required improvements and the impacts to intersection operations are discussed below.

Gateway Road at Chief Peguis Trail

This intersection generally performs the same as in *Conceptual Master Plan – Option 1* and requires no geometric modifications and changes to the intersection are directed toward modifying the traffic signal timing plan. The northbound left increases from 147 vehicles per hour 186 vehicles per hour in the AM peak hour and operates at a post-development LOS D with 39 seconds of delay. Similar to the Option 1, the northbound and southbound movements maintain the permitted left movement. There are also marginal increases in delay for the northbound thru and the southbound thru, but these changes are relatively small and do not significantly impact the intersection or approach performances.

As such, no improvements are required at this intersection for enhancing performance under the post-development scenario.

Gateway Road at Springfield Road

The same statements identified under *Conceptual Master Plan – Option 1* in Section 4.3.5 applies to the *Conceptual Master Plan – Option 2.*

The northbound approach LOS is reduced from a pre-development PM peak hour LOS A with 9.7 seconds of delay to a post-development PM peak hour LOS C with 20 seconds of delay and is largely due to the northbound left-turn movement. Other movements are mildly affected, but with little or no detrimental characteristics to the intersection.

As such, no improvements are required at this intersection for enhancing performance under the post-development scenario.

Raleigh Street at Springfield Road

Similar to *Conceptual Master Plan – Option* 1, the intersection and approach operations are mildly decreased due to the proposed development, even to a lesser extent than at Gateway and Springfield. The subtle changes in intersection and approach operations are due to non-conflicting increased in volumes (i.e. little or no increases in left-turning traffic) and the increases in volumes are typically eastbound and westbound thru movements. All approach movements operate at LOS D or better during the AM and PM peak hour and the intersection LOS is C during both the AM and PM peak hour.

As such, no improvements are required at this intersection for enhancing performance under the post-development scenario.

Gateway Road at Lexington Park Road

As shown in the previous option, this intersection requires the installation of traffic signals and, at a minimum, the installation of a southbound by-pass lane at the intersection to facilitate the traffic movements during the AM and PM peak hour. An alternate treatment is the installation of a single lane roundabout.

Under analysis, the traffic signals included a protected-permitted southbound left-turn movement with consideration of the PM peak hour volumes of northbound thru movements (i.e. 688 vph) and the westbound left-turn movement (i.e. 259 vph). Under Option 2, the intersection does improve in operations with an AM peak hour intersection LOS of B and westbound approach operating at a LOS D with 37 seconds of delay. During the post-development PM peak hour, the intersection improves to an intersection LOS D with 35 seconds of overall delay, but the PM peak hour includes a westbound LOS D with 54 seconds of delay and a northbound left LOS D with 39 seconds of delay. For planning exercises, this is marginally acceptable as the intersection LOS is C. The changes listed above are assumed as the minimum treatment to accommodate the increases in traffic associated with the proposed development.

For consideration purposes and under the PM peak hour only, another iteration of this intersection included the development of a four (4) lane divided facility with an exclusive southbound left-turn lane. With these additional geometric improvements and under the PM peak hour only, the intersection LOS is B with 19 seconds of delay and the westbound left is improved further to a LOS C with 30 seconds of delay. The remaining two (2) approaches operate under LOS C or better.

Another iteration of this intersection was to implement a single-lane roundabout in lieu of traffic signals. Through use of a single-lane roundabout, the intersection operations operate very well under both the AM and PM peak hour under post-development traffic conditions. The roundabout operates with a LOS A and all approaches operate with a LOS B or better.

Gateway at Commercial Access

The comments provided for this intersection remain the same as from Option 1. The analysis identifies a high delay for the two (2) stop controlled intersection in the westbound direction with a LOS F during the PM peak hour and it is likely that some of the projected traffic would redirect to the signalized intersection rather than experience the high delays associated with the stop control under peak time periods. As such, no additional geometric improvements nor traffic control improvements are recommended for this intersection.

Gateway Road at McLeod Avenue

This intersection is moderately impacted from pre-development to post-development conditions primarily due to the increased eastbound left PM peak volumes from 69 vehicles per hour to 162 vehicles per hour, with the implementation of the known intersection improvements planned for 2012.

On an intersection basis, the AM peak hour operates at a LOS C for both the pre-development and post-development scenario with most approaches operating at a LOS C or better. During the PM peak hour and under pre-development conditions, the intersection operates at a LOS C with 25 seconds of overall delay and the eastbound approach operates at a LOS D with 42 seconds of delay. Under the PM peak hour post-development conditions, the intersection operates at a LOS C with 32 seconds of overall delay, with the eastbound approach reduced to a LOS E with 55 seconds of delay. All remaining approaches operate at a LOS C or better.

Raleigh Street at McLeod Avenue

The impacts from the proposed Lexington Village to this intersection are negligible with the optimized timing plan developed for this intersection. The AM and PM peak hour LOS is C for pre-development and post-development conditions with all approaches operating at a LOS C or better during the AM and PM peak hours.

No intersection improvements are required at this intersection.

4.3.10 Summary of Post-Development Results – Modified Geometry or Traffic Signal Plans – Conceptual Master Plan – Option 2

Option 1 and Option 2 have the same summary of improvements required for each intersection as the net development related trip generation between the two options is negligible. As such, the recommendations for improvements are found in Section 4.3.6 of this report.

4.4 GEOMETRIC DESIGN CONSIDERATIONS

Through the analysis process in section 4.3, there is an anticipated need for installing traffic signals and construction of a by-pass lane at Gateway Road and Lexington Park Road. However, in consideration of the site conditions, there may be a considerable design issue to consider.

The centerline to centerline distance along Gateway Road to Springfield Road is approximately 225 meters. The current by-pass lanes created at Springfield Road are designed with an approximate full-lane distance of 45 meters followed by a taper length of 35 meters for a total of 80 meters. Implementing the same design criteria for southbound Gateway at Lexington yields an improvement of another 80 meters. The remainder of the "existing full width lane" on Gateway Road then becomes 65 meters, and is likely undesirable from a detail design and operations perspective due to the "coke bottle" effect.

The implementation of the by-pass intersection would also benefit other accesses and intersections along Gateway Road. Consideration should be made to develop Gateway Road as either a three-lane divided or four (4) lane divided road from south of McLeod Avenue to north of Springfield Road.

Alternatively, the roundabout option for traffic control will not require the additional widening along the length of Gateway Road, but may require additional property on the east side of the Gateway right-of-way to accommodate the roundabout inscribed circle, boulevard and sidewalk.

4.5 ADDITIONAL CONSIDERATIONS

4.5.1 Sensitivity Analysis of Pedestrian Crossings

Stantec completed a sensitivity analysis of the effect of increasing conflicting pedestrians on intersection level of service and delay as the previous analysis included ten pedestrian crossing per hour per approach. The 2022 Option 1 AM Peak Hour Post-Development scenario has been used for this analysis, and a comparison of the intersection level of service and total delay is found in Table 13 below.

Table 13 2022 Option 1 AM Peak Hour Post-Development Intersection Performance Sensitivity Analysis Results

Intersection	10 Conflicting Pedestrians/hr/crossing (LOS, delay)	25 Conflicting Pedestrians/hr/crossing (LOS, delay)
McLeod at Raleigh	B 15.5 s	B 15.5 s
McLeod at Gateway	C 21.9 s	C 22.0 s
Gateway at Lexington Park	B 13.6 s	B 13.6 s
Raleigh at Springfield	C 21.2 s	C 21.0 s
Gateway at Springfield	B 11.7 s	B 12.6 s
Gateway at Chief Peguis Trail	C 25.1 s	C 25.3 s

Increasing the conflicting pedestrians causes negligible adverse effects on overall intersection operation. The net change in intersection performance represents less of an impact than the daily fluctuation in peak hour traffic volumes.

4.5.2 Gateway Road at Lexington Park Drive Intersection Improvement

Intersection operation at Gateway Road at Lexington Park Drive was further analyzed with inclusion of a northbound right-turn storage lane in consideration of the PM Peak Hour movement for the northbound right of 321 vehicles. Level of service and delay are compared in

Table 14 for the shared approach and separate northbound right turn lane using the 2022 Option 1 PM Peak Hour Post-Development scenario.

Table 14 2022 Option 1 PM Peak Hour Post-Development Intersection Performance Comparison, Gateway Road at Lexington Park Drive

Movement	Single Shared Lane (LOS, delay)	Separate Northbound Through & Right Lanes (LOS, delay)
Overall Intersection	D 39.1 s	C 21.1 s
Northbound Approach	D 46.2 s	C 23.7 s

The additional northbound right turn storage lane at the intersection of Gateway Road at Lexington Park Drive improves intersection level of service and delay. Note that prior to including the storage lane (with post-development volumes), the intersection was operating satisfactorily as per City of Winnipeg Public Works Department guidelines.

4.5.3 Gateway Road Improvement

Further analysis was conducted for the PM Peak Hour by extending the northbound right turn storage lane at the intersection of Gateway Road at Lexington Park Drive through to the intersection of Gateway Road at Springfield Road. The differences in intersection performance have been evaluated using the 2022 Option 1 PM Peak Hour scenario and are listed in Table 15 for the intersection of Gateway Road at Lexington Park Drive, and Table 16 for the intersection of Gateway Road at Springfield Road.

Table 15 2022 Option 1 PM Peak Hour Post-Development Intersection Performance Comparison, Gateway Road at Lexington Park Drive

Movement	Separate Northbound Through & Right Lanes (LOS, delay)	Extended Lane (LOS, delay)
Overall Intersection	C 21.4 s	C 20.2 s
Northbound Approach	C 22.6 s	C 22.0 s

Table 16 2022 Option 1 PM Peak Hour Post-Development Intersection Performance Comparison

Movement	Separate Northbound Through & Right Lanes (LOS, delay)	Extended Lane (LOS, delay)
Overall Intersection	C 28.1 s	C 25.3 s
Northbound Approach	D 37.7 s	C 29.1 s

The continuation of the northbound right turn storage lane through the Gateway Road at Lexington Park Drive intersection does not substantially improve intersection operation at the Gateway Road at Springfield Road intersection. Furthermore, intersection and movement level of service and delay remains relatively constant at the Gateway Road at Lexington Park Drive intersection.

5.0 Conclusions

Based on the traffic analysis described, the following conclusions regarding the impact of the proposed development on the adjacent roadway system can be drawn:

- The site covers an area of approximately 18 hectares (45 acres) with a blend of multi-family residential, single-family residential and commercial use.
- Two plans are envisioned for this site, identified as *Conceptual Master Plan – Option 1* and *Conceptual Master Plan – Option 2.*
- *Conceptual Master Plan 1* includes the following:
    - Commercial site along Gateway is a 5.01 acre site with 65,000 s.f. of floor area which is anticipated to include:
        - Grocery store with a floor area of 45,300 s.f.
        - High-Turnover Sit-Down Restaurant with a floor area of 4,700 s.f.
        - Specialty Retail with a floor area of 15,000 s.f.
    - Commercial sites within Lexington Village which includes 27,000 s.f.
    - Residential Multi-Family Sites totaling 1,916 units of which 180 units are proposed by the North Kildonan Brethren Church)
    - Redevelopment of the existing Omega site to commercial / office with a floor area of 61,000 s.f. and development of 150 units of condominiums.
- *Conceptual Master Plan 2*
    - Commercial site is the same as *Conceptual Master Plan1* as listed above (5.01 acres)
    - Commercial sites within Lexington Village which includes 42,000 s.f.
    - Residential Multi-Family Sites totaling 1,052 units of which 180 units are proposed by the North Kildonan Brethren Church)
    - Redevelopment of the existing Omega site to commercial / office with a floor area of 61,000 s.f. and development of 150 units of condominiums.

- For *Conceptual Master Plan - Option 1,* The Lexington Village is expected to generate approximately 707 (1,228) average vehicle trip ends during the AM (PM) peak hour under full development. The AADT projected from this development is approximately 14,500 vehicles per day. Inbound trips are 212 vph for the AM and 701 vph for the PM peak hour. Outbound trips during the AM peak hour are 496 vph and 523 vph during the PM peak hour.

- For *Conceptual Master Plan - Option 2,* The Lexington Village is expected to generate approximately 561 (1,060) average vehicle trip ends during the AM (PM) peak hour under full development. The AADT projected from this development is approximately 12,800 vehicles per day. Inbound trips are 195 vph for the AM and 366 vph for the PM peak hour. Outbound trips during the AM peak hour are 583 vph and 477 vph during the PM peak hour.

- Access to the site is through use of the existing Lexington Park Road to Gateway Road, a private commercial access to Gateway Road and multiple connections to Springfield Road east of Gateway Road.
- The surrounding area compound annual growth rate discussed with The City of Winnipeg was assumed to be Gr = 1.0%.
- The development related traffic distribution is anticipated to be as follows:
    - Entering:
        - 50% from northbound Gateway Road, with further distribution at McLeod
            - 25% from the south, 15 % from west and 5% from east
                - 80% of the commercial traffic enters at south access
                - 20% of the commercial traffic and 100% of the residential traffic proceeds north to enter via Lexington
        - 25% from southbound Gateway Road with further distribution at Springfield Road
            - 10% from west, 15% from north, which is further distributed at Chief Peguis Trail, 10% from north 5% from east and 10% from west
        - 15% from westbound Springfield Road to local access and local roads
        - 5% from Burnett Avenue

    - Exiting:
        - 45% to southbound Gateway Road
            - 80% of the commercial traffic from the south access, 20% of the commercial traffic and 100% of the residential traffic via Lexington
                - 25% south, 15% west and 5% east at MacLeod

    - 25% to northbound Gateway Road
        - 60% of the commercial traffic via the south access, 40% of the commercial traffic and 100% of the residential traffic via Lexington, 10% via south access
            - 5% west at Springfield Road, 20% north to Chief Peguis Trail
    - 25% to Springfield Road via private road and access,
        - 10% to the north at Gateway
        - 15% to the west at Gateway
    - 5% south via Burnett

- Under pre-development conditions to 2022, there are no identified traffic control and geometric improvements required to intersections within the study area. However, it is assumed that the traffic signal equipment can accommodate varying signals timing plans to accommodate future projections of traffic on the road system.
- Under post-development conditions to 2022, there following identifies the required improvements within the study area that can be related to the proposed Lexington Village.
    - Intersection approach widening at McLeod Avenue (to be completed by others in 2012)
    - enhanced traffic control timing plans to intersections within the study area
    - installation of traffic signals and intersection widening for Lexington Park Road at Gateway Road or the installation of a single-lane roundabout. The traffic control and geometric improvements are applicable under *Conceptual Master Plan – Option 1* and *Conceptual Master Plan – Option 2.*
- Consideration should be made by external parties to extend the widening of Gateway Road from north of Springfield Road to south of McLeod Avenue in response to volumes associated with the construction of Chief Peguis Trail, the closure of Raleigh Street at Chief Peguis Trail and to enhance pre-development deficiencies along Gateway Road (i.e. left-turn blocking, narrow intersection approaches).

6.0 Recommendations

Based on the conclusions listed above, the following recommendations can be made:

- The intersection widening of Gateway Road and McLeod Avenue is a pre-development requirement and is understood to be completed in 2012. This is a high recommendation to enhance traffic operations at this intersection.
- Ensure that the traffic signal equipment found on-site can accommodate the detailed signal timing plans with multiple time periods to accommodate the projected traffic volume increases, including background traffic and development traffic.
- Under the 2022 Post-Development Analysis, the intersection of Lexington Park Road and Gateway Road must include enhancements. Enhancement can be either the installation of traffic signals with localized intersection geometric improvements (with consideration towards construction of a northbound right-turn storage lane) or the installation of a single-lane roundabout. Additional details of the improvements can be found on Figure 11.
- Consideration should be made by The City of Winnipeg at large for the widening of Gateway Road from north of Springfield Road to south of McLeod Avenue to enhance traffic operations at intersections and approaches, as well as improve public safety with proper turn-lanes, specifically the left-turn lanes to eliminate left-turn blocking and decision sight distance issues. This consideration is directly related to the newly distributed traffic from the closure of Raleigh Street at Chief Peguis Trail and to the newly constructed Chief Peguis Trail extension from Henderson Highway to Lagimodiere Boulevard.
- Continued monitoring of traffic within the study area should be completed to ensure that the traffic projections contained within this report are reflected in the field. Intersection improvements (i.e. traffic control and geometric requirements) identified in this report may need to be adjusted based on actual field measurements.

Report Figures



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LEGEND
PROPOSED DEVELOPMENT AREA

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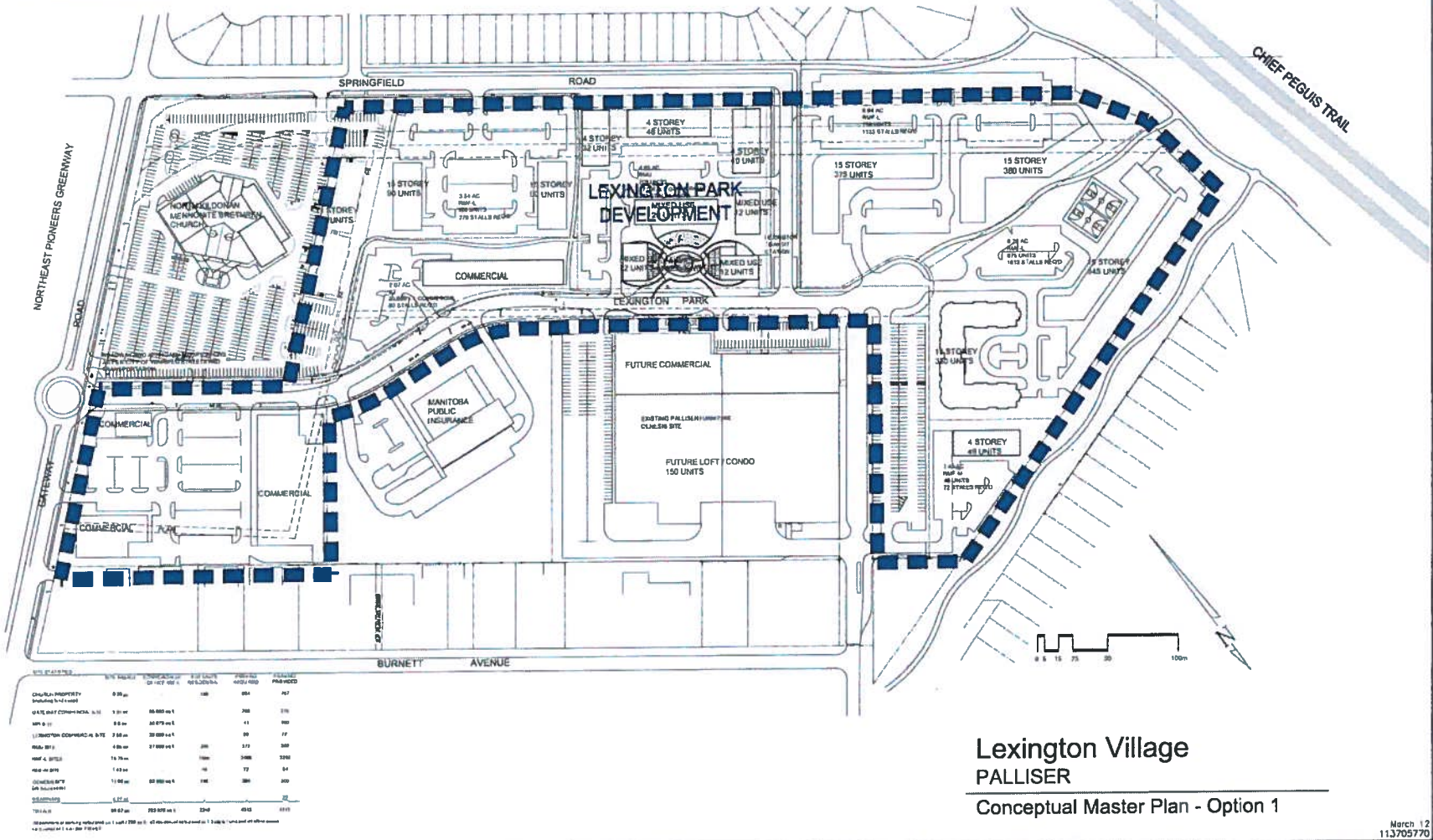
LEXINGTON VILLAGE TIA

Figure No.
1

Title
SITE LOCATION PLAN



Lexington Village

PALLISER

Conceptual Master Plan - Option 1

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PROPOSED DEVELOPMENT AREA

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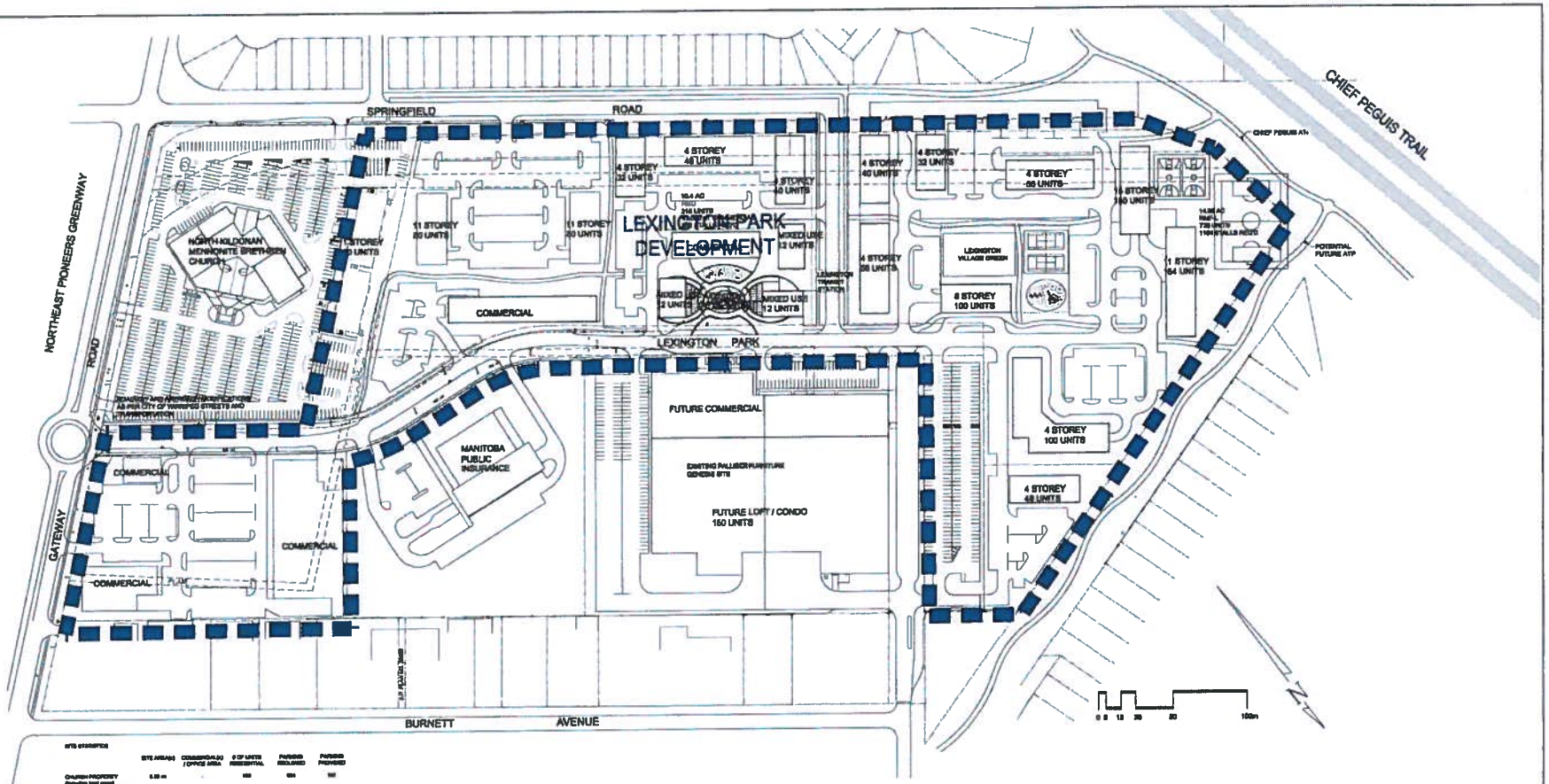
Figure No.
2

Title
CONCEPTUAL MASTER PLAN
OPTION 1



Lexington Village
PALLISER
Conceptual Master Plan - Option 2

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PROPOSED DEVELOPMENT AREA

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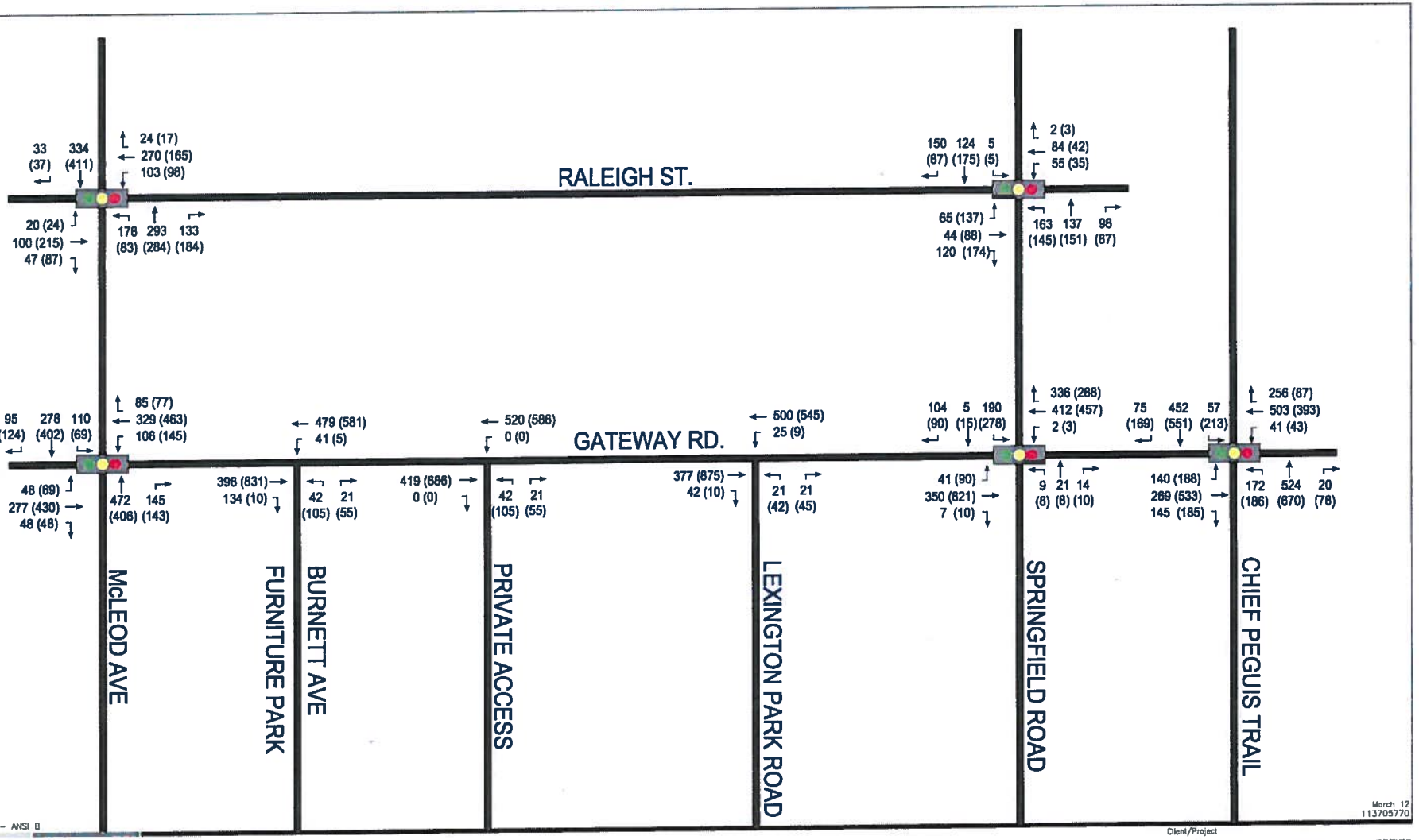
Figure No.
3

Title
CONCEPTUAL MASTER PLAN
OPTION 2



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LEGEND - 123 (456) AM (PM) PEAK HOUR TRAFFIC VOLUMES

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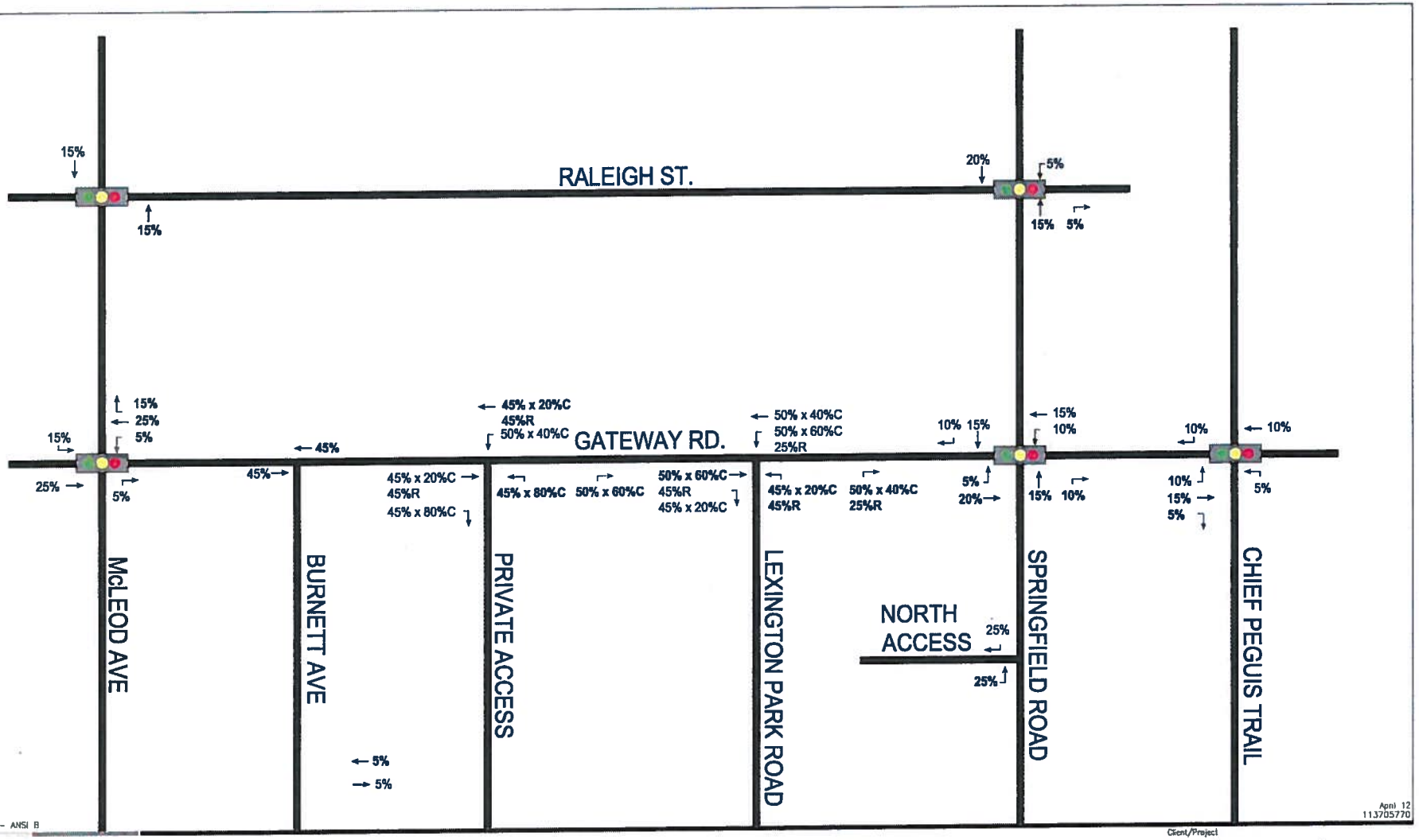
Figure No.
4

Title
2022 AM (PM) PEAK HOUR
PRE-DEVELOPMENT VOLUMES



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10% OUTBOUND TRIPS PERCENTAGE

NOTE:
C = COMMERCIAL TRIPS
R = RESIDENTIAL TRIPS

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Figure No.
5

Title
DEVELOPMENT RELATED
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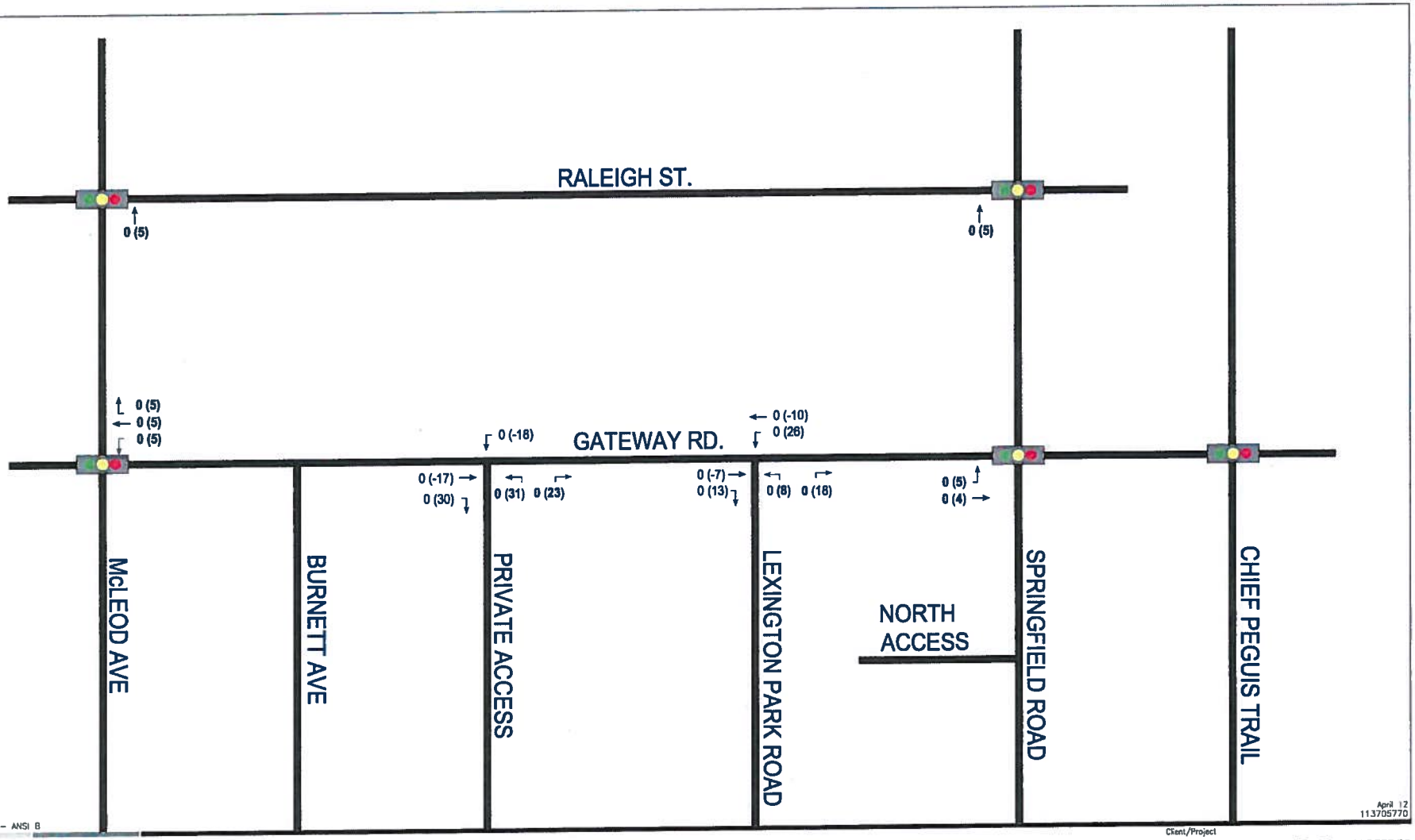

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0 (16) AM PM OUTBOUND TRIPS PERCENTAGE

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Figure No.
6

Title
DEVELOPMENT RELATED VOLUMES
TO 2022 - OPTION 1 & OPTION 2
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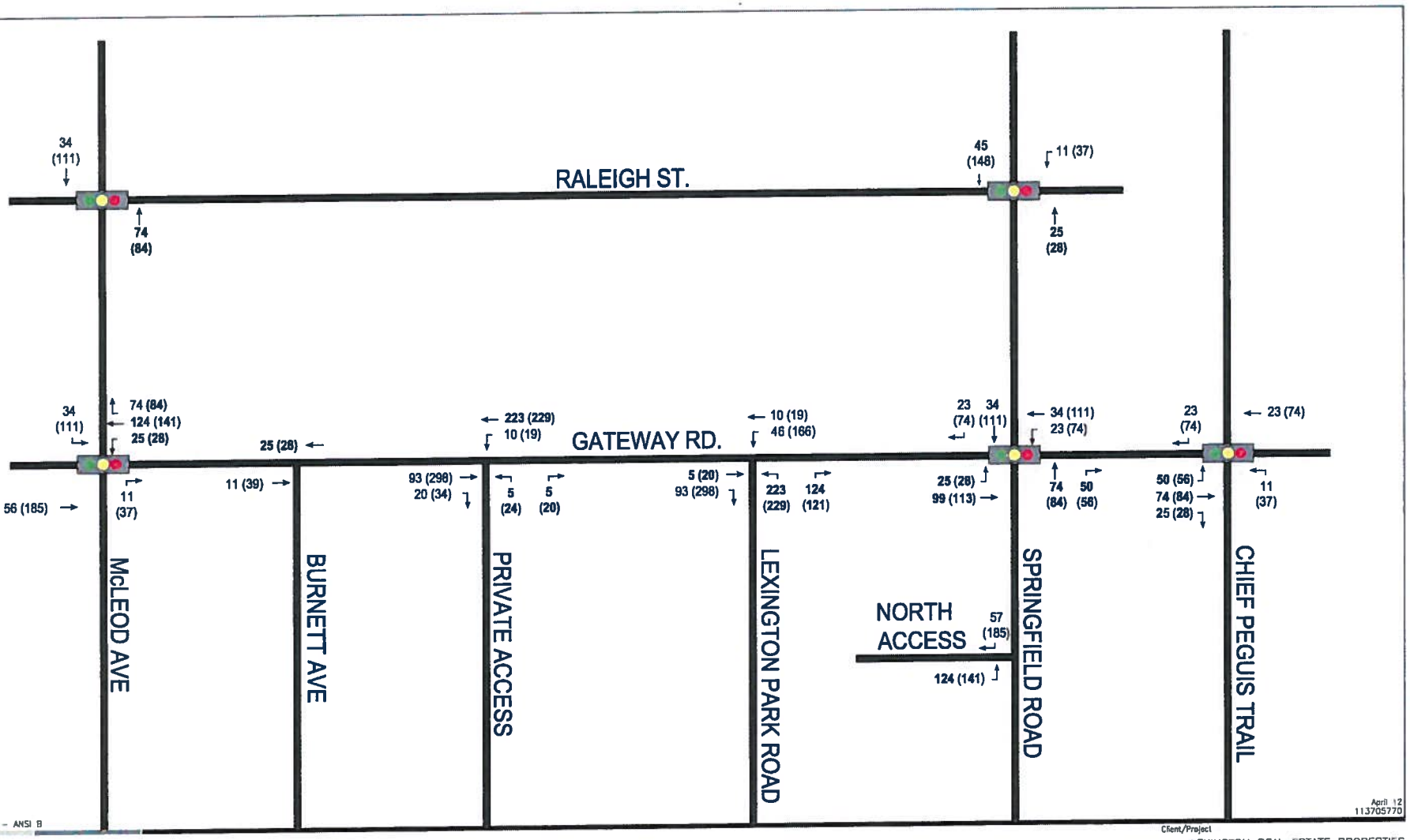

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LEGEND - 99 (113) INBOUND AM (PM) PEAK HOUR TRAFFIC VOLUMES
34 (111) OUTBOUND AM (PM) PEAK HOUR TRAFFIC VOLUMES

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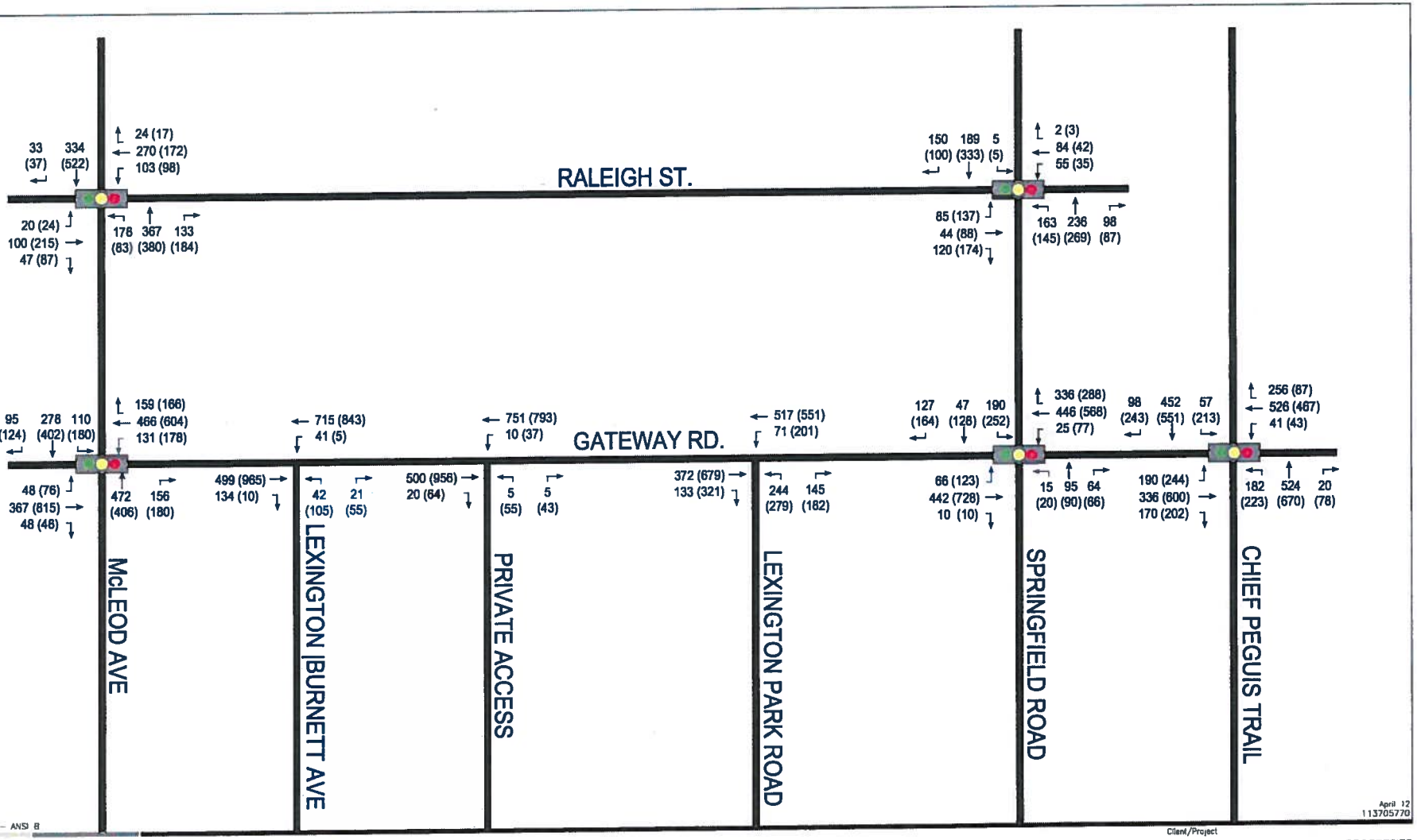
LEXINGTON VILLAGE TIA

Figure No.
7

Title
DEVELOPMENT RELATED VOLUMES TO 2022 - OPTION 1 PRIMARY TRIPS



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LEGEND - 123 (456) AM (PM) PEAK HOUR TRAFFIC VOLUMES

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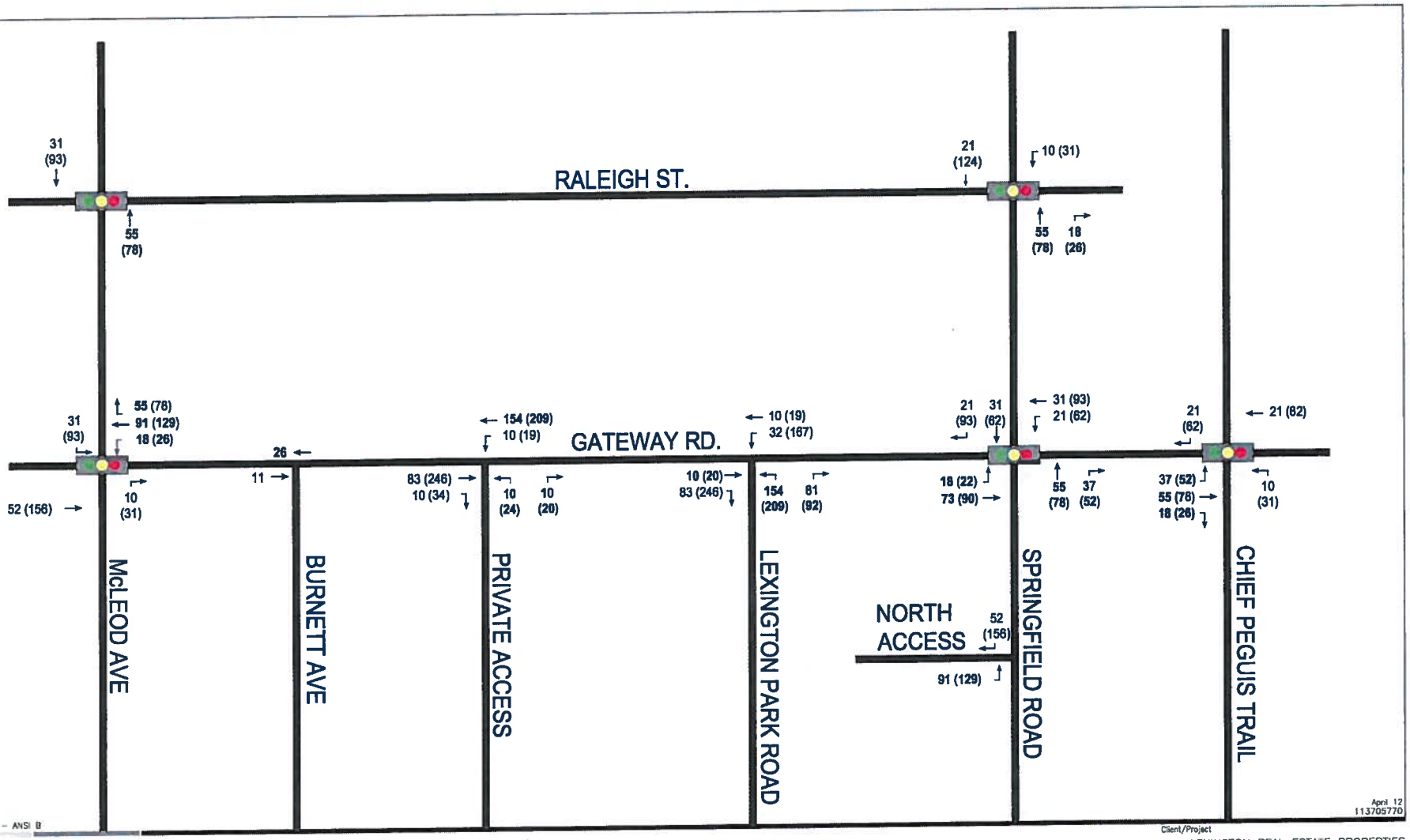
Figure No.
8

Title
AM (PM) PEAK HOUR
POST DEVELOPMENT VOLUMES
TO 2022 - OPTION 1



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LEGEND - 99 (113) INBOUND AM (PM) PEAK HOUR TRAFFIC VOLUMES
34 (111) OUTBOUND AM (PM) PEAK HOUR TRAFFIC VOLUMES

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Figure No.
9

Title
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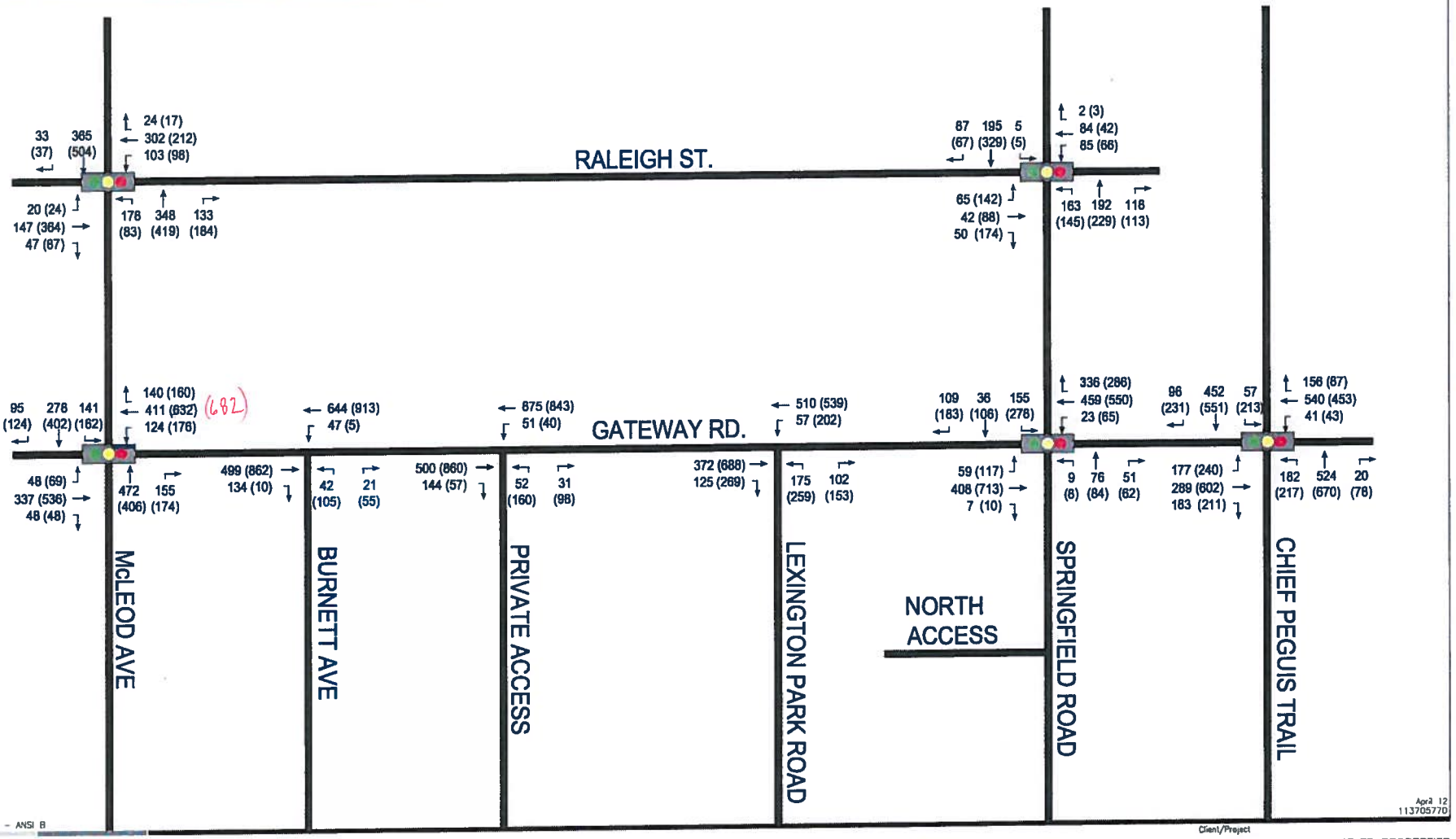
PRIMARY TRIPS



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LEGEND - 123 (456) AM (PM) PEAK HOUR TRAFFIC VOLUMES

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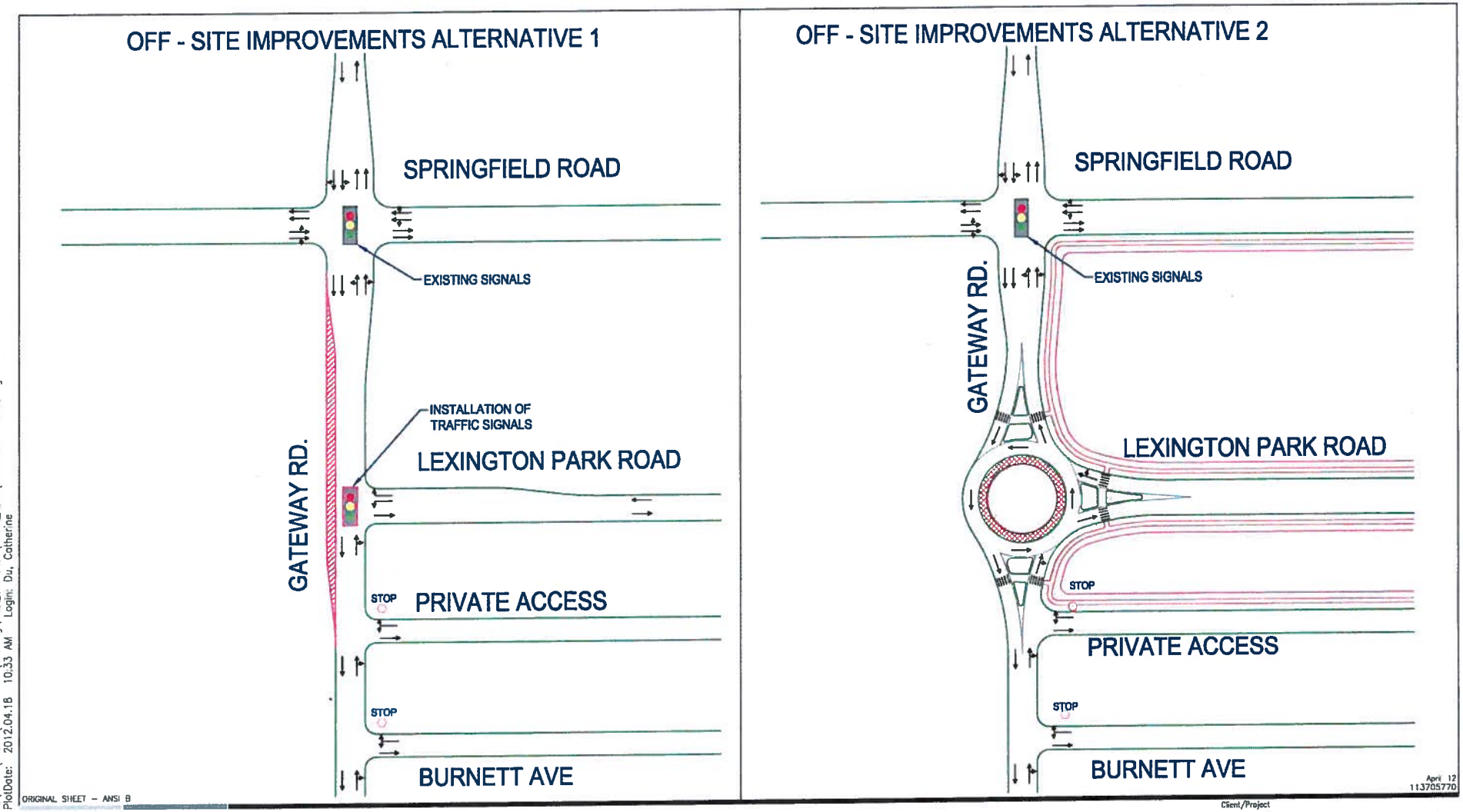
Figure No.
10

Title
AM (PM) PEAK HOUR
POST - DEVELOPMENT VOLUMES
TO 2022 - OPTION 2



V:\1137\active\113705770\drawing\407_sketches\sheet_files\05770c-709-11.dwg
PlotDate: 2012.04.18 10:33 AM Login: Du, Catherine

ORIGINAL SHEET – ANSI B

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Winnipeg MB Canada
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www.stantec.com

N

LEGEND

DEVELOPMENT AREA
NEW RIGHT - OF - WAY

April 12
113705770

Client/Project
LEXINGTON REAL ESTATE PROPERTIES
LEXINGTON VILLAGE TIA

Figure No.
11

Title
GEOMETRIC AND TRAFFIC CONTROL REQUIREMENTS TO 2022 POST - DEVELOPMENT

Appendix A

Study Area Traffic Counts

THE CITY OF WINNIPEG
PUBLIC WORKS DEPARTMENT

8 Hour Manual Vehicle Count
Intersection Turning Movement

Traffic Studies
Phone: 986-5034

Time	NORTHBOUND ON				SOUTHBOUND ON				EASTBOUND ON				WESTBOUND ON				Previous Count
Start 7:00	Gateway Rd				Gateway Rd				Chief Peguis Trail				Chief Peguis Trail				None
Time Ending	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	TOTAL
7:15		31	23	24		10	71	62		5	75	11		75	76	7	470
7:30		21	24	28	1	6	127	63		12	76	22		70	91	9	550
7:45		32	49	33		9	150	63		9	94	19		66	109	5	638
8:00		39	43	46		5	156	56		17	104	23		51	116	1	657
8:15		26	45	31	2	8	157	52		12	93	30		50	115	1	622
8:30		43	71	38	1	11	118	50		12	98	18		36	111	10	617
8:45		31	58	24	2	11	96	36		13	85	26		26	100	10	518
9:00		38	52	39		13	89	31		5	84	24	1	28	87	9	500
10:00																	
11:00																	
12:00																	
13:00		103	256	100		25	189	55	1	74	325	82		80	317	24	1631
14:00		98	246	116		22	185	49	1	86	340	92		84	336	22	1677
15:00		95	266	117		19	180	54		103	363	88		89	351	25	1750
15:15		44	98	41		5	66	18		37	113	27		33	128	8	618
15:30		41	119	51		5	65	22		47	122	25		32	107	10	646
15:45		62	120	54		8	81	14		39	137	14		29	122	9	689
16:00		46	102	30		2	74	25		37	98	44		44	184	10	696
16:15		37	92	37	1	3	72	14		41	100	30		40	139	12	618
16:30		34	117	34		4	68	22		50	98	38		48	127	9	649
16:45		49	124	50		14	101	24		35	120	41		29	143	12	742
17:00		46	124	41		4	80	13		41	127	44		36	178	9	743
17:15		38	112	38		9	79	19		63	99	36		37	131	21	682
17:30		29	99	30		10	79	19		45	128	25		58	125	26	673
17:45		36	117	31		11	78	23		50	119	29		30	110	5	639
18:00	1	32	111	30		6	60	18		32	111	36		36	116	10	599
19:00																	
20:00																	
21:00																	
22:00																	
8 hr.	1	885	2021	879	8	185	2140	732		714	2529	675	2	970	2860	228	14829
TOTAL		3786				3065				3918				4060			
AM Peak Hour					AM Peak Hour (between 7:00 and 9:00), based on total volume, is from:									7:30 - 8:30			2680
		140	208	148	3	33	581	221		50	389	90		203	451	17	2534
Off-Peak Hour					Highest Off-Peak Hour (between 9:00 and 15:30) is from:									14:30 - 15:30			2221
		139	345	156		18	222	66		138	428	101		117	427	28	2185
PM Peak Hour					PM Peak Hour (between 15:30 and 17:30), based on total volume, is from:									16:30 - 17:30			2924
		162	459	159		37	339	75		184	474	146		160	577	68	2840
Peak 15 Minute Time & PHF		8:15 - 8:30				7:30 - 7:45				7:45 - 8:00				7:30 - 7:45			A.M. Peak
		0.81	0.80	0.80		0.92	0.94	0.97		0.79	0.94	0.82		0.87	0.97	0.75	PHF
		15:15 - 15:30				12:45 - 13:00				15:15 - 15:30				15:00 - 15:15			Average
		0.79	0.72	0.76		0.86	0.87	0.82		0.73	0.88	0.90		0.89	0.83	0.58	PHF
		15:30 - 15:45				16:30 - 16:45				16:45 - 17:00				15:45 - 16:00			P.M. Peak
		0.72	0.96	0.75		0.66	0.84	0.85		0.75	0.86	0.90		0.69	0.81	0.65	PHF

Ratio: E/W to N/S =	1.16	Shift	AM	PM	EVE
E/W =	53.8%	Weather:	Clear	Clear	
N/S =	46.2%	Temperature:	-8C	-10C	
		Counted/Compiled By:	SD-CM/SD		
Location:		Count Date:	20120125	20120124	
Gateway Rd & Chief Peguis Trail		Requested By:	SC		

Notes:

THE CITY OF WINNIPEG
PUBLIC WORKS DEPARTMENT

8 Hour Manual Vehicle Count
Intersection Turning Movement

Traffic Studies
Phone: 986-5034

Time	NORTHBOUND ON				SOUTHBOUND ON				EASTBOUND ON				WESTBOUND ON				Previous Count
Start 7:00	Gateway Rd				Gateway Rd				Springfield Rd				Springfield Rd				2003 TOTAL
Time Ending	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
7:15		3	31	1			64	41		16	1	18		3	4	3	185
7:30		11	56	1			107	68		30		19		1	5	4	302
7:45		2	73	2			89	52		22		17		2	6		265
8:00		9	66	1		2	100	72		34	1	18		3	5	1	312
8:15		9	73	1			103	71		26	2	21		4	5	7	322
8:30		9	69	3			83	76		39	1	16		1	3	3	303
8:45		8	69	1			82	71		35	1	22			5	2	296
9:00		8	61	1			67	42		34	4	20			6	3	246
10:00																	
11:00																	
12:00																	
13:00		66	302	11		1	190	131		94	16	72		9	8	11	911
14:00		69	307	14		1	201	135		95	14	67		8	9	14	934
15:00		68	321	11		2	216	138		109	13	71		10	10	12	981
15:15		22	120	4		1	71	44		44	5	17		2	3	3	336
15:30		25	125	2		1	75	47		46	6	23		3	1	2	356
15:45		20	162	6		4	69	51		53	8	16		3	5	2	399
16:00		27	119	2			78	55		54	3	17		2	2	2	361
16:15		17	118	1		1	84	70		37	4	17		3	1	1	354
16:30		16	105	3			103	62		46	6	20		2	3		366
16:45		14	139	2		1	94	39		74	3	23		3		3	395
17:00		23	161	3		2	107	76		59	3	12		2		3	451
17:15		25	130	1		1	91	70		49	2	23			2	2	396
17:30		12	127	2		1	69	68		57	2	12		2	1	1	354
17:45		19	102	5		1	86	66		64	7	16		2	3	3	374
18:00		19	109	4		1	101	71		50	3	12		4	3	2	379
19:00																	
20:00																	
21:00																	
22:00																	
8 hr.		374	2401	58		18	2014	1407		1013	78	451		52	79	62	8007
TOTAL		2833				3439				1542				193			
AM Peak Hour	AM Peak Hour (between 7:00 and 9:00), based on total volume, is from:												7:45 - 8:45				1281
		35	277	6		2	368	290		134	5	77		8	18	13	1233
Off-Peak Hour	Highest Off-Peak Hour (between 9:00 and 15:30) is from:												14:30 - 15:30				1208
		82	407	14		3	266	151		144	19	72		9	9	15	1191
PM Peak Hour	PM Peak Hour (between 15:30 and 17:30), based on total volume, is from:												16:15 - 17:15				1670
		78	535	9		4	395	247		228	14	78		7	5	8	1608
Peak 15 Minute Time & PHF	8:00 - 8:15				7:15 - 7:30				8:30 - 8:45				8:00 - 8:15				A.M. Peak
		0.80	0.96	0.58		0.25	0.93	0.95		0.86	0.50	0.90		0.63	0.88	0.54	PHF
	15:15 - 15:30				15:15 - 15:30				15:15 - 15:30				14:30 - 14:45				Average
		0.82	0.81	0.58		0.31	0.89	0.80		0.78	0.79	0.68		0.55	0.92	0.54	PHF
	15:30 - 15:45				16:45 - 17:00				16:30 - 16:45				15:30 - 15:45				P.M. Peak
		0.74	0.86	0.50		0.31	0.92	0.83		0.81	0.66	0.85		0.83	0.55	0.75	PHF

Ratio: E/W to N/S =	0.28	Shift	AM / PM / EVE
E/W =	21.7%	Weather:	Fog/Overcast / Clear
N/S =	78.3%	Temperature:	-8C / -5C
		Counted/Compiled By:	CM-SD/CM
Location:		Count Date:	20120202 / 20120201
Gateway Rd & Springfield Rd		Requested By:	SC

Notes:

THE CITY OF WINNIPEG
PUBLIC WORKS DEPARTMENT

8 Hour Manual Vehicle Count
Intersection Turning Movement

Traffic Studies
Phone: 986-5034

Time	NORTHBOUND ON				SOUTHBOUND ON				EASTBOUND ON				WESTBOUND ON				Previous Count 2003
Start 7:00	Raleigh St				Raleigh St				Springfield Rd				Springfield Rd				TOTAL
Time Ending	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
7:15		5	1	8		5	8				20	15		28	14	7	111
7:30		5		14		11	11				25	19		50	30	5	170
7:45		13	4	10		4	22				28	11		39	20	3	154
8:00		13	4	10		14	11				29	17		55	24	7	184
8:15		14	9	6		7	19				35	13		41	31	10	185
8:30		19	4	14		13	18	1			30	19		40	33	17	208
8:45		10	11	14		15	24	1			33	15		55	22	12	212
9:00		19	8	19		12	13				27	21		27	18	12	176
10:00																	
11:00																	
12:00																	
13:00		58	28	46		25	30	2		3	114	59		80	94	30	569
14:00		60	30	45		23	28	3		1	111	54		77	101	32	565
15:00		64	33	51		24	27	4		1	121	49		76	104	37	591
15:15		22	14	26		7	10	1		1	41	14		24	36	13	209
15:30		27	17	23		10	9	1			53	20		33	34	16	243
15:45		17	17	40		8	12			2	46	15		30	37	17	241
16:00		29	11	30		9	11				36	10		25	46	12	219
16:15		28	18	20		4	12				37	18		33	38	20	228
16:30		22	17	26		7	10			1	39	18		37	34	13	224
16:45		27	22	44		11	11	2			51	22		23	22	14	249
17:00		37	18	39		4	7				35	7		40	35	20	242
17:15		27	18	31		10	12				33	12		36	40	16	235
17:30		28	18	37		6	6	1		2	33	17		26	33	25	232
17:45		18	9	41		9	6			1	45	21		27	43	15	235
18:00		20	17	24		6	16				36	13		31	40	20	223
19:00																	
20:00																	
21:00																	
22:00																	
8 hr.		479	280	544		210	294	12		8	863	384		817	754	323	4968
TOTAL		1303				516				1255				1894			
AM Peak Hour	AM Peak Hour (between 7:00 and 9:00), based on total volume, is from:													7:45 - 8:45			819
		56	28	44		49	72	2			127	64		191	110	46	789
Off-Peak Hour	Highest Off-Peak Hour (between 9:00 and 15:30) is from:													14:30 - 15:30			780
		83	50	73		26	32	4		1	158	58		88	123	46	742
PM Peak Hour	PM Peak Hour (between 15:30 and 17:30), based on total volume, is from:													16:30 - 17:30			1026
		119	76	151		31	36	3		2	152	58		125	130	75	958
Peak 15 Minute Time & PHF		8:45 - 9:00				8:30 - 8:45				8:15 - 8:30				8:15 - 8:30			A.M. Peak
		0.82	0.73	0.70		0.82	0.77	0.50			0.91	0.81		0.87	0.83	0.75	PHF
		15:15 - 15:30				12:30 - 12:45				15:15 - 15:30				15:15 - 15:30			Average
		0.77	0.74	0.70		0.59	0.72	0.50		0.38	0.75	0.76		0.79	0.85	0.72	PHF
		16:45 - 17:00				16:30 - 16:45				16:30 - 16:45				16:45 - 17:00			P.M. Peak
		0.80	0.86	0.86		0.73	0.94	0.38		0.38	0.80	0.77		0.85	0.84	0.75	PHF

Ratio E/W to N/S =	1.73	Shift	AM	PM	EVE
E/W =	63.4%	Weather	Fog/Overcast	Clear	
N/S =	36.6%	Temperature	-8C	-5C	
		Counted/Compiled By:	CM-SD/CM		
Location:		Count Date:	20120202	20120201	
Raleigh St & Springfield Rd		Requested By:	SC		

Notes:

THE CITY OF WINNIPEG
PUBLIC WORKS DEPARTMENT

11 Hour Manual Vehicle Count
Intersection Turning Movement

Traffic Studies
Phone: 986-5034

Time	NORTHBOUND ON				SOUTHBOUND ON				EASTBOUND ON				WESTBOUND ON				Previous Count 2006
Start 7:00	Gateway Rd				Gateway Rd				McLeod Ave				McLeod Ave				TOTAL
Time Ending	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
7:15		6	38	4		16	48	11		11	43	7			52	28	264
7:30		7	47	2		18	48	9		30	50	5			57	47	320
7:45		8	43	9		26	60	17		31	65	10			66	27	362
8:00		3	42	10		23	81	15		35	67	18			99	39	432
8:15		10	63	12		24	85	28		18	48	19			99	30	436
8:30		14	65	8		25	84	19		15	60	22			113	24	449
8:45		15	54	12		27	55	18		17	53	20			100	25	396
9:00		11	46	7		19	62	10		28	90	24		1	93	26	417
10:00		46	182	27		97	193	55		53	236	71		2	225	110	1,297
11:00		46	169	26		90	160	43		44	233	54			205	97	1,167
12:00		52	178	27		105	156	62		53	251	61		5	262	129	1,341
13:00		55	204	60		106	191	73		52	276	70		2	285	140	1,514
14:00		45	204	45		89	203	48		63	236	69		5	276	123	1,406
15:00		63	213	57		75	223	40		48	297	76			305	130	1,527
15:15		17	69	13		23	71	25		16	79	20			83	40	456
15:30		20	70	13		24	65	14		21	76	20			99	49	471
15:45		11	61	10		21	79	37		18	80	14			81	51	463
16:00		21	83	16		26	76	39		13	71	22		1	77	36	481
16:15		19	67	13		18	70	16		17	70	22		1	79	44	436
16:30		19	72	13		24	66	21		15	61	34			95	30	450
16:45		18	71	14		21	82	19		15	83	26			91	42	482
17:00		20	101	8		28	92	17		16	99	30			90	38	539
17:15		12	94	11		35	88	15		18	83	27			85	36	504
17:30		19	87	9		28	94	19		10	93	28		2	69	31	489
17:45		16	79	15		28	102	19		17	73	22		1	95	31	498
18:00		20	81	16		36	95	13		18	70	18			79	40	486
19:00																	
20:00																	
21:00																	
22:00																	
8 hr.		441	1,897	325		752	2,079	519		524	2,180	609		8	2,437	1,051	12,822
TOTAL		2,663				3,350				3,313				3,496			
11 hr.		593	2,483	457		1,052	2,629	702		692	2,943	809		20	3,260	1,443	18,593
TOTAL		3,533				4,383				4,444				4,723			
12 hr.est		639	2,751	471		1,090	3,015	753		760	3,161	883		12	3,534	1,524	
1.45		3,861				4,858				4,804				5,070			
24 hr. Est		850	3,659	626		1,450	4,010	1,001		1,011	4,204	1,174		16	4,700	2,027	24,728
1.33		5,135				6,461				6,389				6,743			
AM Peak Hour	AM Peak Hour (between 7:00 and 9:00), based on total volume, is from:													7:45 - 8:45			1,814
		42	224	42		99	305	80		85	228	79			411	118	1,713
Off-Peak Hour	Highest Off-Peak Hour (between 9:00 and 15:30) is from:													14:30 - 15:30			1,801
		70	259	53		86	257	59		63	317	84			339	149	1,736
PM Peak Hour	PM Peak Hour (between 15:30 and 17:30), based on total Truck volume, is from:													16:30 - 17:30			2,130
		69	353	42		112	356	70		59	358	111		2	335	147	2,014
Peak 15 Minute Time & PHF	8:15 - 8:30				8:00 - 8:15				8:45 - 9:00				7:45 - 8:00				A.M. Peak PHF
	0.83	0.88	0.88		0.92	0.91	0.71		0.81	0.70	0.89		0.25	0.91	0.76		
	15:15 - 15:30				15:00 - 15:15				14:30 - 14:45				15:15 - 15:30				Average PHF
	0.88	0.93	0.76		0.85	0.90	0.73		0.80	0.91	0.68		0.75	0.86	0.76		
	16:45 - 17:00				15:45 - 16:00				16:45 - 17:00				16:30 - 16:45				P.M. Peak PHF
	0.92	0.87	0.88		0.80	0.95	0.72		0.89	0.90	0.86		0.25	0.95	0.79		

Ratio: E/W to N/S = 1.16
E/W = 53.7%
N/S = 46.3%

	AM	PM	EVE
Shift			
Weather:	Clear	Clear	
Temperature:	-39C	-36C	
Counted/Compiled By:		SD/SD	
Count Date:	20120119	20120118	
Requested By:		MC	

Location:
Gateway Rd & McLeod Ave

Notes:

THE CITY OF WINNIPEG
PUBLIC WORKS DEPARTMENT

11 Hour Manual Vehicle Count
Intersection Turning Movement

Traffic Studies
Phone: 986-5034

Time	NORTHBOUND ON				SOUTHBOUND ON				EASTBOUND ON				WESTBOUND ON				Previous Count 2006
Start 7:00	Raleigh St				Raleigh St				McLeod Ave				McLeod Ave				TOTAL
Time Ending	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
7:15		2	15	6		19	50				39	4		13	43	12	203
7:30		2	12	9		19	61	4			54	9		21	49	8	248
7:45		3	18	23		20	73				70	8		42	39	6	302
8:00			12	19		20	87	4			69	7		36	59	21	334
8:15		6	29	6		22	84				60	9		51	48	33	348
8:30		3	36	11		21	81	7			62	4		51	66	30	372
8:45		3	29	8		23	45	8			64	6		29	77	26	318
9:00		5	33	15		21	50	6			98	10		24	64	28	354
10:00		17	72	39		83	116	13			245	25	1	71	174	77	933
11:00		15	51	29		68	83	5		1	234	16		57	157	71	787
12:00		8	70	48		64	75	9			246	16		49	231	83	899
13:00		14	87	50		72	89	10			274	19		86	215	88	1,004
14:00		16	82	42		72	84	4		1	251	24		51	199	97	923
15:00		10	143	50		85	133	7		1	272	21		77	201	113	1,113
15:15		4	50	17		18	31	4		1	80	6		25	64	35	335
15:30		6	45	21		15	41	4			84	5		19	75	41	356
15:45		4	51	18		12	17	4			77	6		28	63	35	315
16:00		4	60	14		19	32	6		1	72	8		29	65	37	347
16:15		7	50	19		17	25	3			73	4		18	52	40	308
16:30		3	50	23		18	35	5			71	4		21	70	50	350
16:45		4	85	17		18	31	5			87	13		21	65	44	390
17:00		4	89	24		21	46	1			95	6		17	65	42	410
17:15		10	77	15		21	51	5			91	10		15	58	34	387
17:30		3	62	18		24	55	4			79	4		18	53	36	356
17:45		10	67	15		20	46	4			76	9		23	63	38	371
18:00		10	42	22		18	42	5		1	74	11		17	70	31	343
19:00																	
20:00																	
21:00																	
22:00																	
8 hr.		135	1,178	438		622	1,315	104		5	2,226	205	1	723	1,740	888	9,580
TOTAL		1,751				2,041				2,436				3,352			
11 hr.		173	1,417	578		830	1,563	127		6	2,997	264	1	909	2,385	1,156	13,891
TOTAL		2,168				2,520				3,267				4,451			
12 hr est		196	1,708	635		902	1,907	151		7	3,228	297	1	1,048	2,523	1,288	
1.45		2,539				2,960				3,532				4,860			
24 hr. Est		261	2,272	845		1,200	2,536	201		9	4,293	395	1	1,394	3,356	1,713	18,476
1.33		3,378				3,937				4,697				6,464			
AM Peak Hour	AM Peak Hour (between 7:00 and 9:00), based on total volume, is from:													8:00 - 9:00			1,505
		17	127	40		87	260	21			284	29		155	255	117	1,392
Off-Peak Hour	Highest Off-Peak Hour (between 9:00 and 15:30) is from:													14:30 - 15:30			1,318
		16	176	66		77	142	12		2	320	19		86	246	134	1,296
PM Peak Hour	PM Peak Hour (between 15:30 and 17:30), based on total Truck volume, is from:													16:30 - 17:30			1,619
		21	313	74		84	183	15			352	33		71	241	156	1,543
Peak 15 Minute Time & PHF	8:45 - 9:00				7:45 - 8:00				8:45 - 9:00				8:15 - 8:30				A.M. Peak PHF
		0.71	0.88	0.64		0.95	0.93	0.66			0.72	0.83		0.88	0.83	0.89	
	15:15 - 15:30				9:15 - 9:30				14:30 - 14:45				15:15 - 15:30				Average PHF
		0.64	0.88	0.79		0.74	0.87	0.46		0.50	0.94	0.73		0.83	0.82	0.82	
	16:45 - 17:00				17:15 - 17:30				16:45 - 17:00				16:15 - 16:30				P.M. Peak PHF
		0.53	0.88	0.86		0.88	0.83	0.79		0.25	0.93	0.63		0.83	0.92	0.88	

		Shift	AM	PM	EVE
Ratio: E/W to N/S =	1.65	Weather:	Clear	Clear	
E/W =	62.2%	Temperature:	-39C	-36C	
N/S =	37.8%	Counted/Compiled By:	SD CM/SD		
		Count Date:	20120119	20120118	
Location: Raleigh St & McLeod Ave		Requested By:	MC		

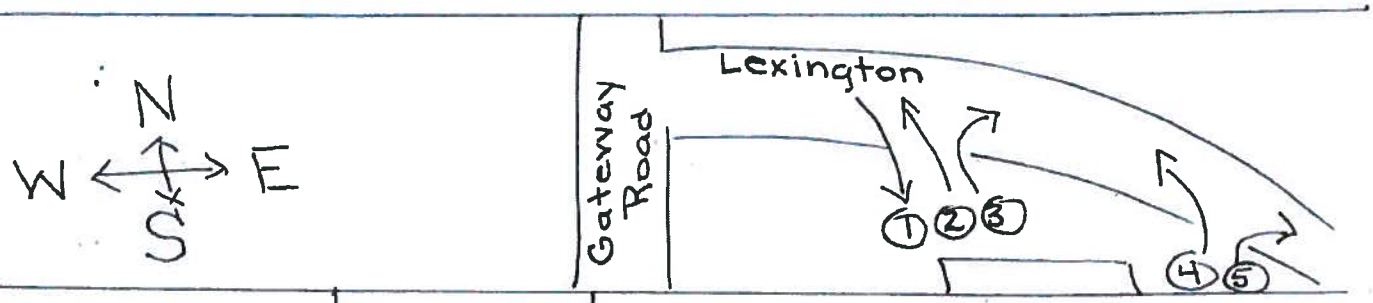
Notes:

Entrance / Exit Volume Count

N/S Street MPL ENTRANCE/EXIT Date SEPT 30/10

E/W Street LEXINGTON Weather CLEAR - SUNNY

Intersection Control NONE Observer AL BEZAK

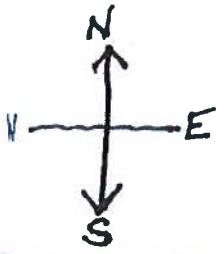


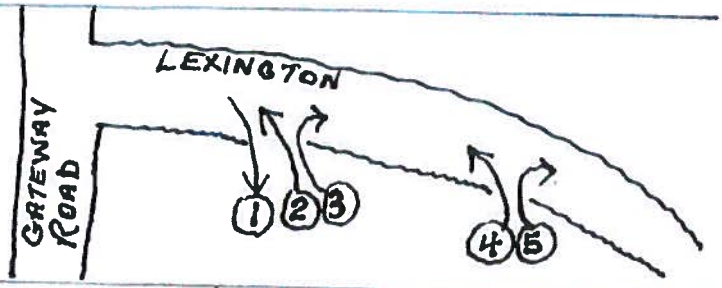
Time Slot	Entrance ①	Exit ② LT	③ RT	④ LT	⑤ RT
8:00 - 8:15	6	1		1	1
8:15 - 8:30	5	II		III	
8:30 - 8:45	8	~~IIII~~ I		~~IIII~~	
8:45 - 9:00	9	I		IIII	

ENTRANCE / EXIT VOLUME COUNT

N/S STREET MPE ENTRANCE/EXIT
E/W STREET LEXINGTON PARK
INTERSECTION CONTROL NONE

DATE SEPT 30/10
WEATHER SUNNY
OBSERVER AL BEZAK



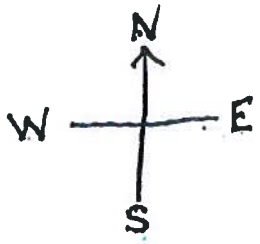


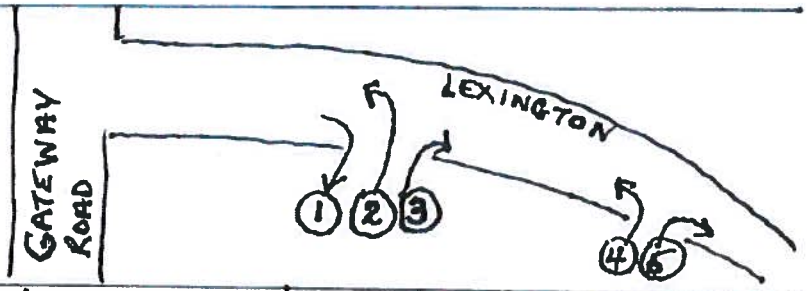
TIME SLOT	ENTRANCE (1)	EXIT (2) LT	EXIT (3) RT	EXIT (4) LT	EXIT (5) RT
3:30 - 3:45	6	12		1	
3:45 - 4:00	7	5			
4:00 - 4:15	8	2		1	
4:15 - 4:30	4	3		1	

ENTRANCE/EXIT VOLUME COUNT

N/S STREET MPE ENTRANCE/EXIT
E/W STREET LEXINGTON PARK
INTERSECTION CONTROL NONE

DATE SEPT 30/10
WEATHER SUNNY - SCATTERED CLOUD
OBSERVER AL BEZAK



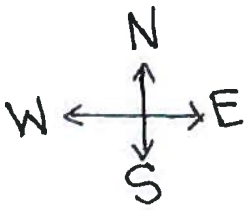


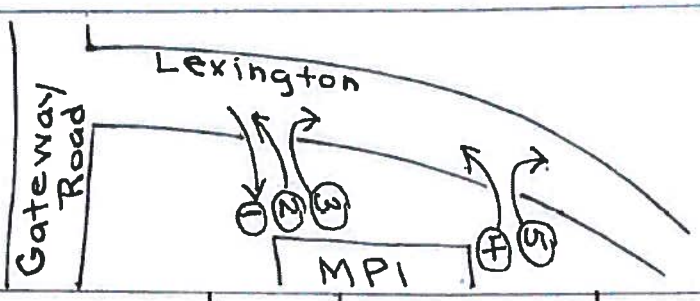
TIME SLOT	ENTRANCE (1)	EXIT (2) LT	EXIT (3) RT	EXIT (4) LT	EXIT (5) RT
4:30 - 4:45	𝍸 (5)	𝍸 (4)			
4:45 - 5:00	𝍸 |||| (9)	𝍸 | (6)		| (1)	
5:00 - 5:15	|||| (4)	|| (3)		|| (2)	
5:15 - 5:30	|||| (4)	|| (2)	| (1)		
5:30 - 5:45	|| (2)	𝍸 || (7)	| (1)	|| (2)	

Entrance / Exit Volume Count

N/S Street MPI ENTRANCE/EXIT
E/W Street LEXINGTON
Intersection Control NONE

Date SEPT 30/10
Weather CLEAR - SUNNY
Observer AL BEEAK





Time Slot	Entrance ①	← ② LT	Exit ③ RT	④ LT	⑤ RT →
7:00 - 7:15	7				
7:15 - 7:30	40				
7:30 - 7:45	12	1 (1)			
7:45 - 8:00	9 (1)	III (3)		II (2)	

LT - LEFT TURN, RT - RIGHT TURN

Appendix B

Internal Capture Summary Calculations

Analyst WB.
Date MARCH 21/12

MULTI-USE DEVELOPMENT TRIP GENERATION AND INTERNAL CAPTURE SUMMARY

Name of Dvlpt LEXINGTON TIA.
Time Period PM PEAK.

OPTION 1 - 15 STOREY

LAND USE A RESIDENTIAL

ITE LU Code BLEND
Size BLEND.

	Total	Internal	External
Enter	507	52	455
Exit	276	40	236
Total	783	92	691
%	100%	12%	88%

Exit to External
Enter from External

LAND USE B

ITE LU Code
Size

	Total	Internal	External
Enter			
Exit			
Total			
%			

Exit to External
Enter from External

LAND USE C RETAIL

ITE LU Code BLEND
Size BLEND.

	Total	Internal	External
Enter	443	40	403
Exit	434	52	382
Total	877	92	785
%		11%	89%

Enter from External
Exit to External

	Demand	Balanced	Demand
LU A → LU B	%		%
LU B → LU A	%		%
LU A → LU C	53% 146	40	31% 157
LU C → LU A	9% 40	52	12% 52
LU B → LU C	%		%
LU C → LU B	%		%

Net External Trips for Multi-Use Development

	LAND USE A	LAND USE B	LAND USE C	TOTAL
Enter	455	403		858
Exit	236	382		618
Total	691	785		1476
Single-Use Trip Gen. Est.	783	877		1660

Source: Kaku Associates, Inc.

INTERNAL CAPTURE 11%

Appendix C

Synchro Output Data Files

(Available on Request)

Queues
2: Gateway Rd & Chief Peguis Trail

4/4/2012

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	60	476	79	181	552	21	147	283	153	43	529	269
v/c Ratio	0.37	0.70	0.05	0.65	0.56	0.01	0.55	0.32	0.10	0.09	0.60	0.18
Control Delay	44.7	39.5	0.1	46.8	29.7	0.0	21.8	11.9	0.1	13.6	20.3	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.7	39.5	0.1	46.8	29.7	0.0	21.8	11.9	0.1	13.6	20.3	0.3
Queue Length 50th (m)	9.9	39.9	0.0	29.1	42.5	0.0	15.9	29.5	0.0	3.9	65.7	0.0
Queue Length 95th (m)	21.7	56.2	0.0	50.1	58.5	0.0	42.3	40.7	0.0	9.8	99.1	0.0
Internal Link Dist (m)		229.1			234.8			129.3			255.9	
Turn Bay Length (m)	175.0		185.0	180.0		180.0	115.0		95.0	100.0		115.0
Base Capacity (vph)	170	716	1479	301	1012	1479	269	878	1461	457	878	1461
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.66	0.05	0.60	0.55	0.01	0.55	0.32	0.10	0.09	0.60	0.18

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	452	75	172	524	20	140	269	145	41	503	256
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.7	3.7	3.7	3.7	3.7	3.7	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1695	3390	1479	1695	3390	1479	1651	1745	1461	1642	1745	1461
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.31	1.00	1.00	0.53	1.00	1.00
Satd. Flow (perm)	1695	3390	1479	1695	3390	1479	534	1745	1461	908	1745	1461
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	60	476	79	181	552	21	147	283	153	43	529	269
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	60	476	79	181	552	21	147	283	153	43	529	269
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Prot	NA	Free	Prot	NA	Free	Perm	NA	Free	Perm	NA	Free
Protected Phases	7	4		3	8			2			6	
Permitted Phases			Free			Free	2		Free	6		Free
Actuated Green, G (s)	5.6	17.2	90.0	12.7	24.3	90.0	42.1	42.1	90.0	42.1	42.1	90.0
Effective Green, g (s)	7.6	19.2	90.0	14.7	26.3	90.0	44.1	44.1	90.0	44.1	44.1	90.0
Actuated g/C Ratio	0.08	0.21	1.00	0.16	0.29	1.00	0.49	0.49	1.00	0.49	0.49	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	143	723	1479	277	991	1479	262	855	1461	445	855	1461
v/s Ratio Prot	0.04	c0.14		c0.11	0.16			0.16			c0.30	
v/s Ratio Perm			0.05			0.01	0.28		0.10	0.05		0.18
v/c Ratio	0.42	0.66	0.05	0.65	0.56	0.01	0.56	0.33	0.10	0.10	0.62	0.18
Uniform Delay, d1	39.1	32.4	0.0	35.3	26.9	0.0	16.1	14.0	0.0	12.3	16.8	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.77	0.77	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	2.2	0.1	5.4	0.7	0.0	8.3	1.0	0.1	0.4	3.4	0.3
Delay (s)	41.1	34.6	0.1	40.7	27.6	0.0	20.7	11.8	0.1	12.7	20.1	0.3
Level of Service	D	C	A	D	C	A	C	B	A	B	C	A
Approach Delay (s)		30.8			30.0			11.0			13.4	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	21.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	73.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	387	635	175	417
v/c Ratio	0.33	0.79	0.18	0.46
Control Delay	21.3	31.9	11.5	10.4
Queue Delay	0.0	12.1	0.0	0.0
Total Delay	21.3	44.0	11.5	10.4
Queue Length 50th (m)	23.8	47.8	12.5	23.1
Queue Length 95th (m)	29.2	58.1	28.4	34.3
Internal Link Dist (m)	36.0	28.1	267.0	425.3
Turn Bay Length (m)				
Base Capacity (vph)	1275	1063	956	908
Starvation Cap Reductn	0	406	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.30	0.97	0.18	0.46

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	334	33	178	293	133	20	100	47	103	270	24
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		*1.00			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.97			0.96			0.99	
Flt Protected		1.00			0.99			0.99			0.99	
Satd. Flow (prot)		3428			3112			1896			1949	
Flt Permitted		1.00			0.72			0.93			0.87	
Satd. Flow (perm)		3428			2269			1781			1709	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	352	35	187	308	140	21	105	49	108	284	25
RTOR Reduction (vph)	0	9	0	0	35	0	0	12	0	0	2	0
Lane Group Flow (vph)	0	378	0	0	600	0	0	163	0	0	415	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type		NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases				8			2			6		
Actuated Green, G (s)		30.3			30.3			47.7			47.7	
Effective Green, g (s)		30.3			30.3			47.7			47.7	
Actuated g/C Ratio		0.34			0.34			0.53			0.53	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1154			764			944			906	
v/s Ratio Prot		0.11										
v/s Ratio Perm					c0.26			0.09			c0.24	
v/c Ratio		0.33			0.79			0.17			0.46	
Uniform Delay, d1		22.3			26.9			10.9			13.1	
Progression Factor		1.00			1.00			1.00			0.58	
Incremental Delay, d2		0.2			5.3			0.4			1.6	
Delay (s)		22.4			32.2			11.3			9.3	
Level of Service		C			C			B			A	
Approach Delay (s)		22.4			32.2			11.3			9.3	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	21.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	509	650	394	547
v/c Ratio	0.83	0.64	0.26	0.39
Control Delay	40.8	29.8	12.0	13.5
Queue Delay	26.7	0.0	0.0	0.0
Total Delay	67.5	29.8	12.0	13.5
Queue Length 50th (m)	44.7	52.9	17.9	27.2
Queue Length 95th (m)	56.3	61.1	32.6	48.0
Internal Link Dist (m)	28.1	47.4	40.9	41.4
Turn Bay Length (m)				
Base Capacity (vph)	799	1101	1523	1415
Starvation Cap Reductn	301	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	1.02	0.59	0.26	0.39

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	110	278	95	0	472	145	48	277	48	106	329	85
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.97			0.96			0.98			0.98	
Flt Protected		0.99			1.00			0.99			0.99	
Satd. Flow (prot)		3159			3176			3214			3179	
Flt Permitted		0.59			1.00			0.82			0.77	
Satd. Flow (perm)		1894			3176			2664			2465	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	116	293	100	0	497	153	51	292	51	112	346	89
RTOR Reduction (vph)	0	25	0	0	29	0	0	10	0	0	13	0
Lane Group Flow (vph)	0	484	0	0	621	0	0	384	0	0	534	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA			NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4						2			6		
Actuated Green, G (s)		31.2			31.2			56.8			56.8	
Effective Green, g (s)		31.2			31.2			56.8			56.8	
Actuated g/C Ratio		0.31			0.31			0.57			0.57	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		591			991			1513			1400	
v/s Ratio Prot					0.20							
v/s Ratio Perm		c0.26						0.14			c0.22	
v/c Ratio		0.82			0.63			0.25			0.38	
Uniform Delay, d1		31.8			29.4			10.9			11.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		8.7			1.2			0.4			0.8	
Delay (s)		40.5			30.7			11.3			12.7	
Level of Service		D			C			B			B	
Approach Delay (s)		40.5			30.7			11.3			12.7	
Approach LOS		D			C			B			B	

Intersection Summary			
HCM Average Control Delay	24.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	83.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	21	21	377	42	25	500
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	22	22	397	44	26	526
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		9				
Median type			None			None
Median storage veh)						
Upstream signal (m)						226
pX, platoon unblocked	0.92					
vC, conflicting volume	998	419			397	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	954	419			397	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	97			98	
cM capacity (veh/h)	258	634			1162	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	44	441	553
Volume Left	22	0	26
Volume Right	22	44	0
cSH	516	1700	1162
Volume to Capacity	0.09	0.26	0.02
Queue Length 95th (m)	2.1	0.0	0.5
Control Delay (s)	15.6	0.0	0.6
Lane LOS	C		A
Approach Delay (s)	15.6	0.0	0.6
Approach LOS	C		

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	314	46	418	790
v/c Ratio	0.66	0.10	0.22	0.37
Control Delay	31.4	22.3	5.6	5.4
Queue Delay	0.2	0.0	0.0	0.1
Total Delay	31.6	22.3	5.6	5.5
Queue Length 50th (m)	19.9	2.4	11.2	13.9
Queue Length 95th (m)	32.6	6.5	21.5	30.5
Internal Link Dist (m)	26.6	66.6	41.6	44.5
Turn Bay Length (m)				
Base Capacity (vph)	892	616	1916	2153
Starvation Cap Reductn	144	0	0	0
Spillback Cap Reductn	0	3	246	266
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.42	0.08	0.25	0.42

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	190	5	104	9	21	14	41	350	7	2	412	336
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/blkes		0.99			0.99			1.00			0.99	
Flpb, ped/bikes		0.99			1.00			1.00			1.00	
Frt		0.95			0.95			1.00			0.93	
Flt Protected		0.97			0.99			0.99			1.00	
Satd. Flow (prot)		2985			3088			3287			3053	
Flt Permitted		0.77			0.86			0.82			0.95	
Satd. Flow (perm)		2379			2692			2720			2914	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	5	109	9	22	15	43	368	7	2	434	354
RTOR Reduction (vph)	0	91	0	0	13	0	0	1	0	0	101	0
Lane Group Flow (vph)	0	223	0	0	33	0	0	417	0	0	689	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		14.6			14.6			63.4			63.4	
Effective Green, g (s)		14.6			14.6			63.4			63.4	
Actuated g/C Ratio		0.16			0.16			0.70			0.70	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		386			437			1916			2053	
v/s Ratio Prot												
v/s Ratio Perm		c0.09			0.01			0.15			c0.24	
v/c Ratio		0.58			0.08			0.22			0.34	
Uniform Delay, d1		34.8			32.0			4.6			5.1	
Progression Factor		1.12			1.00			1.00			1.55	
Incremental Delay, d2		2.1			0.1			0.3			0.4	
Delay (s)		41.2			32.1			4.9			8.3	
Level of Service		D			C			A			A	
Approach Delay (s)		41.2			32.1			4.9			8.3	
Approach LOS		D			C			A			A	

Intersection Summary			
HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	70.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	294	419	240	148
v/c Ratio	0.38	0.74	0.23	0.14
Control Delay	13.6	36.1	6.4	8.1
Queue Delay	0.1	0.5	0.0	0.0
Total Delay	13.6	36.6	6.4	8.1
Queue Length 50th (m)	10.0	32.3	9.8	9.1
Queue Length 95th (m)	18.3	47.3	28.4	21.0
Internal Link Dist (m)	106.3	26.6	428.1	253.1
Turn Bay Length (m)				
Base Capacity (vph)	1100	1078	1051	1041
Starvation Cap Reductn	0	296	0	0
Spillback Cap Reductn	141	0	3	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.31	0.54	0.23	0.14

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	124	150	163	137	98	65	44	120	55	84	2
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.97			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			0.99			1.00			1.00	
Frt		0.92			0.96			0.93			1.00	
Flt Protected		1.00			0.98			0.99			0.98	
Satd. Flow (prot)		2967			3069			1798			1948	
Flt Permitted		0.95			0.71			0.88			0.82	
Satd. Flow (perm)		2809			2236			1608			1633	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	131	158	172	144	103	68	46	126	58	88	2
RTOR Reduction (vph)	0	122	0	0	50	0	0	27	0	0	0	0
Lane Group Flow (vph)	0	172	0	0	369	0	0	213	0	0	148	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.7			20.7			57.3			57.3	
Effective Green, g (s)		20.7			20.7			57.3			57.3	
Actuated g/C Ratio		0.23			0.23			0.64			0.64	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		646			514			1024			1040	
v/s Ratio Prot												
v/s Ratio Perm		0.06			c0.17			c0.13			0.09	
v/c Ratio		0.27			0.72			0.21			0.14	
Uniform Delay, d1		28.4			32.0			6.8			6.5	
Progression Factor		1.00			1.06			1.03			1.00	
Incremental Delay, d2		0.2			4.6			0.4			0.3	
Delay (s)		28.6			38.6			7.5			6.8	
Level of Service		C			D			A			A	
Approach Delay (s)		28.6			38.6			7.5			6.8	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM Average Control Delay	24.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	55.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	42	21	398	134	41	479
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	44	22	419	141	43	504
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	1080	489			560	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1080	489			560	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	81	96			96	
cM capacity (veh/h)	231	579			1011	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	66	560	547
Volume Left	44	0	43
Volume Right	22	141	0
cSH	289	1700	1011
Volume to Capacity	0.23	0.33	0.04
Queue Length 95th (m)	6.6	0.0	1.0
Control Delay (s)	21.1	0.0	1.2
Lane LOS	C		A
Approach Delay (s)	21.1	0.0	1.2
Approach LOS	C		

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	419	0	0	520
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	441	0	0	547
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						298
pX, platoon unblocked	0.95					
vC, conflicting volume	988	441			441	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	962	441			441	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	270	616			1119	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	441	547
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1119
Volume to Capacity	0.00	0.26	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	32.2%	ICU Level of Service	A
Analysis Period (min)	15		

Queues
2: Gateway Rd & Chief Peguis Trail

4/4/2012

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	224	580	178	196	705	82	198	561	195	45	414	92
v/c Ratio	0.77	0.65	0.12	0.76	0.86	0.06	0.66	0.71	0.13	0.23	0.52	0.06
Control Delay	54.3	33.6	0.2	56.8	44.9	0.1	30.1	23.8	0.2	19.3	20.9	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	54.3	33.6	0.2	56.8	44.9	0.1	30.1	23.8	0.2	19.3	20.9	0.1
Queue Length 50th (m)	37.1	46.6	0.0	32.8	61.3	0.0	21.7	65.8	0.0	4.7	50.5	0.0
Queue Length 95th (m)	#69.5	63.9	0.0	#64.0	#89.6	0.0	#57.8	114.7	0.0	12.7	77.3	0.0
Internal Link Dist (m)		229.1			234.8			129.3			255.9	
Turn Bay Length (m)	175.0		185.0	180.0		180.0	115.0		95.0	100.0		115.0
Base Capacity (vph)	301	904	1479	264	829	1479	301	791	1461	199	791	1461
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.64	0.12	0.74	0.85	0.06	0.66	0.71	0.13	0.23	0.52	0.06

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)	213	551	169	186	670	78	188	533	185	43	393	87
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.7	3.7	3.7	3.7	3.7	3.7	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1695	3390	1479	1695	3390	1479	1648	1745	1461	1658	1745	1461
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.38	1.00	1.00	0.25	1.00	1.00
Satd. Flow (perm)	1695	3390	1479	1695	3390	1479	665	1745	1461	437	1745	1461
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	224	580	178	196	705	82	198	561	195	45	414	92
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	224	580	178	196	705	82	198	561	195	45	414	92
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Prot	NA	Free	Prot	NA	Free	Perm	NA	Free	Perm	NA	Free
Protected Phases	7	4		3	8			2			6	
Permitted Phases			Free			Free	2		Free	6		Free
Actuated Green, G (s)	13.5	21.5	90.0	11.7	19.7	90.0	38.8	38.8	90.0	38.8	38.8	90.0
Effective Green, g (s)	15.5	23.5	90.0	13.7	21.7	90.0	40.8	40.8	90.0	40.8	40.8	90.0
Actuated g/C Ratio	0.17	0.26	1.00	0.15	0.24	1.00	0.45	0.45	1.00	0.45	0.45	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	292	885	1479	258	817	1479	301	791	1461	198	791	1461
v/s Ratio Prot	c0.13	0.17		0.12	c0.21			c0.32			0.24	
v/s Ratio Perm			0.12			0.06	0.30		c0.13	0.10		0.06
v/c Ratio	0.77	0.66	0.12	0.76	0.86	0.06	0.66	0.71	0.13	0.23	0.52	0.06
Uniform Delay, d1	35.5	29.6	0.0	36.6	32.7	0.0	19.2	19.8	0.0	15.0	17.6	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.94	0.92	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.4	1.8	0.2	12.1	9.3	0.1	9.5	4.7	0.2	2.7	2.5	0.1
Delay (s)	47.0	31.4	0.2	48.7	42.1	0.1	27.6	22.9	0.2	17.6	20.1	0.1
Level of Service	D	C	A	D	D	A	C	C	A	B	C	A
Approach Delay (s)		29.3			39.9			19.2			16.6	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM Average Control Delay	27.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	78.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	472	580	343	295
v/c Ratio	0.51	0.85	0.31	0.32
Control Delay	28.6	36.0	10.1	8.0
Queue Delay	0.0	1.8	0.0	0.0
Total Delay	28.6	37.8	10.1	8.0
Queue Length 50th (m)	33.8	40.1	24.0	9.5
Queue Length 95th (m)	41.1	52.6	49.3	29.9
Internal Link Dist (m)	36.0	28.1	267.0	425.3
Turn Bay Length (m)				
Base Capacity (vph)	1139	1046	1121	922
Starvation Cap Reductn	0	298	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.41	0.78	0.31	0.32

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	411	37	83	284	184	24	215	87	98	165	17
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		*1.00			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			0.98			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.95			0.96			0.99	
Flt Protected		1.00			0.99			1.00			0.98	
Satd. Flow (prot)		3433			3070			1904			1940	
Flt Permitted		1.00			0.73			0.97			0.77	
Satd. Flow (perm)		3433			2253			1845			1526	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	433	39	87	299	194	25	226	92	103	174	18
RTOR Reduction (vph)	0	9	0	0	90	0	0	10	0	0	2	0
Lane Group Flow (vph)	0	463	0	0	490	0	0	333	0	0	293	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type		NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases				8			2			6		
Actuated Green, G (s)		23.8			23.8			54.2			54.2	
Effective Green, g (s)		23.8			23.8			54.2			54.2	
Actuated g/C Ratio		0.26			0.26			0.60			0.60	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		908			596			1111			919	
v/s Ratio Prot		0.13										
v/s Ratio Perm					c0.22			0.18			c0.19	
v/c Ratio		0.51			0.82			0.30			0.32	
Uniform Delay, d1		28.1			31.1			8.7			8.8	
Progression Factor		1.00			1.00			1.00			0.70	
Incremental Delay, d2		0.5			8.9			0.7			0.9	
Delay (s)		28.6			40.0			9.4			7.0	
Level of Service		C			D			A			A	
Approach Delay (s)		28.6			40.0			9.4			7.0	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM Average Control Delay	24.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	627	578	577	721
v/c Ratio	0.86	0.57	0.40	0.57
Control Delay	42.4	27.9	13.7	16.6
Queue Delay	109.3	0.0	0.0	0.0
Total Delay	151.7	27.9	13.7	16.6
Queue Length 50th (m)	56.2	44.6	30.2	42.8
Queue Length 95th (m)	71.0	55.0	49.4	70.3
Internal Link Dist (m)	28.1	47.4	40.9	41.4
Turn Bay Length (m)				
Base Capacity (vph)	884	1048	1433	1274
Starvation Cap Reductn	376	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	1.23	0.55	0.40	0.57

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	69	402	124	0	406	143	69	430	48	145	463	77
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.97			0.96			0.99			0.98	
Flt Protected		0.99			1.00			0.99			0.99	
Satd. Flow (prot)		3171			3160			3240			3209	
Flt Permitted		0.71			1.00			0.77			0.69	
Satd. Flow (perm)		2265			3160			2504			2222	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	73	423	131	0	427	151	73	453	51	153	487	81
RTOR Reduction (vph)	0	26	0	0	34	0	0	6	0	0	9	0
Lane Group Flow (vph)	0	601	0	0	544	0	0	571	0	0	712	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA			NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4						2			6		
Actuated Green, G (s)		31.1			31.1			56.9			56.9	
Effective Green, g (s)		31.1			31.1			56.9			56.9	
Actuated g/C Ratio		0.31			0.31			0.57			0.57	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		704			983			1425			1264	
v/s Ratio Prot					0.17							
v/s Ratio Perm		c0.27						0.23			c0.32	
v/c Ratio		0.85			0.55			0.40			0.56	
Uniform Delay, d1		32.3			28.7			12.0			13.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		9.8			0.7			0.8			1.8	
Delay (s)		42.2			29.4			12.9			15.5	
Level of Service		D			C			B			B	
Approach Delay (s)		42.2			29.4			12.9			15.5	
Approach LOS		D			C			B			B	

Intersection Summary			
HCM Average Control Delay	24.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	92.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	42	45	676	10	9	545
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	44	47	712	11	9	574
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		9				
Median type			None			None
Median storage veh)						
Upstream signal (m)						226
pX, platoon unblocked	0.87					
vC, conflicting volume	1309	717			712	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1282	717			712	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	72	89			99	
cM capacity (veh/h)	158	430			888	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	92	722	583
Volume Left	44	0	9
Volume Right	47	11	0
cSH	326	1700	888
Volume to Capacity	0.28	0.42	0.01
Queue Length 95th (m)	8.6	0.0	0.2
Control Delay (s)	25.1	0.0	0.3
Lane LOS	D		A
Approach Delay (s)	25.1	0.0	0.3
Approach LOS	D		

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	48.2%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	404	25	760	787
v/c Ratio	0.90dl	0.04	0.49	0.40
Control Delay	31.1	17.0	10.7	6.1
Queue Delay	1.1	0.0	0.3	0.1
Total Delay	32.3	17.0	11.0	6.2
Queue Length 50th (m)	33.5	1.0	32.7	25.8
Queue Length 95th (m)	47.4	3.7	55.7	41.8
Internal Link Dist (m)	26.6	66.6	41.6	44.5
Turn Bay Length (m)				
Base Capacity (vph)	752	615	1566	1967
Starvation Cap Reductn	162	0	0	0
Spillback Cap Reductn	0	94	275	343
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.68	0.05	0.59	0.48

Intersection Summary

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	278	15	90	8	6	10	90	621	10	3	457	288
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			0.99	
Flpb, ped/bikes		0.99			1.00			1.00			1.00	
Frt		0.96			0.93			1.00			0.94	
Flt Protected		0.97			0.98			0.99			1.00	
Satd. Flow (prot)		3030			3001			3285			3089	
Flt Permitted		0.76			0.84			0.74			0.95	
Satd. Flow (perm)		2391			2562			2456			2945	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	293	16	95	8	6	11	95	654	11	3	481	303
RTOR Reduction (vph)	0	35	0	0	8	0	0	1	0	0	92	0
Lane Group Flow (vph)	0	369	0	0	17	0	0	759	0	0	695	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.7			20.7			57.3			57.3	
Effective Green, g (s)		20.7			20.7			57.3			57.3	
Actuated g/C Ratio		0.23			0.23			0.64			0.64	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		550			589			1564			1875	
v/s Ratio Prot												
v/s Ratio Perm		c0.15			0.01			c0.31			0.24	
v/c Ratio		0.90dl			0.03			0.49			0.37	
Uniform Delay, d1		31.5			26.9			8.6			7.8	
Progression Factor		0.91			1.00			1.00			0.96	
Incremental Delay, d2		3.1			0.0			1.1			0.5	
Delay (s)		31.9			26.9			9.7			8.0	
Level of Service		C			C			A			A	
Approach Delay (s)		31.9			26.9			9.7			8.0	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	13.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	82.7%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	260	404	420	84
v/c Ratio	0.38	0.74	0.40	0.08
Control Delay	24.0	41.9	9.5	7.1
Queue Delay	0.7	3.5	0.1	0.0
Total Delay	24.8	45.5	9.6	7.1
Queue Length 50th (m)	15.7	35.4	25.0	4.6
Queue Length 95th (m)	24.0	50.2	53.4	11.9
Internal Link Dist (m)	106.3	26.6	428.1	253.1
Turn Bay Length (m)				
Base Capacity (vph)	756	811	1054	1006
Starvation Cap Reductn	0	308	0	0
Spillback Cap Reductn	249	0	84	76
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.51	0.80	0.43	0.09

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	175	67	145	151	87	137	88	174	35	42	3
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			0.99			0.99			1.00	
Frt		0.96			0.97			0.94			1.00	
Flt Protected		1.00			0.98			0.98			0.98	
Satd. Flow (prot)		3135			3086			1818			1938	
Flt Permitted		0.94			0.74			0.86			0.78	
Satd. Flow (perm)		2964			2340			1589			1547	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	184	71	153	159	92	144	93	183	37	44	3
RTOR Reduction (vph)	0	43	0	0	36	0	0	23	0	0	1	0
Lane Group Flow (vph)	0	217	0	0	368	0	0	397	0	0	83	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		19.6			19.6			58.4			58.4	
Effective Green, g (s)		19.6			19.6			58.4			58.4	
Actuated g/C Ratio		0.22			0.22			0.65			0.65	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		645			510			1031			1004	
v/s Ratio Prot												
v/s Ratio Perm		0.07			c0.16			c0.25			0.05	
v/c Ratio		0.34			0.72			0.38			0.08	
Uniform Delay, d1		29.7			32.7			7.4			5.9	
Progression Factor		1.00			1.19			1.18			1.00	
Incremental Delay, d2		0.3			4.6			1.0			0.2	
Delay (s)		30.0			43.6			9.8			6.0	
Level of Service		C			D			A			A	
Approach Delay (s)		30.0			43.6			9.8			6.0	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM Average Control Delay	25.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	105	55	631	10	5	581
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	111	58	664	11	5	612
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	1292	669			675	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1292	669			675	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	38	87			99	
cM capacity (veh/h)	179	457			916	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	168	675	617
Volume Left	111	0	5
Volume Right	58	11	0
cSH	226	1700	916
Volume to Capacity	0.74	0.40	0.01
Queue Length 95th (m)	38.9	0.0	0.1
Control Delay (s)	56.3	0.0	0.2
Lane LOS	F		A
Approach Delay (s)	56.3	0.0	0.2
Approach LOS	F		

Intersection Summary			
Average Delay	6.6		
Intersection Capacity Utilization	52.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	686	0	0	586
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	722	0	0	617
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						298
pX, platoon unblocked	0.88					
vC, conflicting volume	1339	722			722	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1318	722			722	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	153	427			880	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	722	617
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	880
Volume to Capacity	0.00	0.42	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay		0.0	
Intersection Capacity Utilization		41.4%	ICU Level of Service A
Analysis Period (min)		15	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	60	476	103	192	552	21	200	354	179	43	554	269
v/c Ratio	0.37	0.70	0.07	0.74	0.58	0.01	0.77	0.40	0.12	0.10	0.62	0.18
Control Delay	44.7	39.5	0.1	54.3	31.0	0.0	40.2	15.9	0.2	12.9	19.9	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.7	39.5	0.1	54.3	31.0	0.0	40.2	15.9	0.2	12.9	19.9	0.3
Queue Length 50th (m)	9.9	39.9	0.0	32.0	44.0	0.0	23.2	37.5	0.0	3.8	67.0	0.0
Queue Length 95th (m)	21.7	56.2	0.0	#61.8	60.5	0.0	#65.0	62.3	0.0	9.4	100.7	0.0
Internal Link Dist (m)		229.1			234.8			129.3			255.9	
Turn Bay Length (m)	175.0		185.0	180.0		180.0	115.0		95.0	100.0		115.0
Base Capacity (vph)	170	716	1479	268	959	1479	261	895	1461	411	895	1461
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.66	0.07	0.72	0.58	0.01	0.77	0.40	0.12	0.10	0.62	0.18

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)	57	452	98	182	524	20	190	336	170	41	526	256
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.7	3.7	3.7	3.7	3.7	3.7	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1695	3390	1479	1695	3390	1479	1651	1745	1461	1645	1745	1461
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.29	1.00	1.00	0.46	1.00	1.00
Satd. Flow (perm)	1695	3390	1479	1695	3390	1479	510	1745	1461	802	1745	1461
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	60	476	103	192	552	21	200	354	179	43	554	269
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	60	476	103	192	552	21	200	354	179	43	554	269
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Prot	NA	Free	Prot	NA	Free	Perm	NA	Free	Perm	NA	Free
Protected Phases	7	4		3	8			2			6	
Permitted Phases			Free			Free	2		Free	6		Free
Actuated Green, G (s)	5.6	16.0	90.0	13.1	23.5	90.0	42.9	42.9	90.0	42.9	42.9	90.0
Effective Green, g (s)	7.6	18.0	90.0	15.1	25.5	90.0	44.9	44.9	90.0	44.9	44.9	90.0
Actuated g/C Ratio	0.08	0.20	1.00	0.17	0.28	1.00	0.50	0.50	1.00	0.50	0.50	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	143	678	1479	284	961	1479	254	871	1461	400	871	1461
v/s Ratio Prot	0.04	c0.14		c0.11	0.16			0.20			0.32	
v/s Ratio Perm			0.07			0.01	c0.39		0.12	0.05		0.18
v/c Ratio	0.42	0.70	0.07	0.68	0.57	0.01	0.79	0.41	0.12	0.11	0.64	0.18
Uniform Delay, d1	39.1	33.5	0.0	35.2	27.6	0.0	18.6	14.2	0.0	11.9	16.6	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.01	1.04	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	3.3	0.1	6.2	0.8	0.0	20.6	1.3	0.2	0.5	3.5	0.3
Delay (s)	41.1	36.8	0.1	41.4	28.4	0.0	39.4	16.0	0.2	12.5	20.1	0.3
Level of Service	D	D	A	D	C	A	D	B	A	B	C	A
Approach Delay (s)		31.3			30.9			18.5			13.6	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	23.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	77.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	387	713	175	417
v/c Ratio	0.29	0.77	0.20	0.50
Control Delay	18.2	16.5	13.6	11.7
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	18.2	16.5	13.6	11.7
Queue Length 50th (m)	21.5	22.8	14.2	23.2
Queue Length 95th (m)	27.2	28.4	30.5	37.0
Internal Link Dist (m)	36.0	28.1	267.0	425.3
Turn Bay Length (m)				
Base Capacity (vph)	1381	1117	872	826
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	125	0	1	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.31	0.64	0.20	0.50

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	334	33	178	367	133	20	100	47	103	270	24
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		*1.00			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.97			0.96			0.99	
Flt Protected		1.00			0.99			0.99			0.99	
Satd. Flow (prot)		3428			3133			1896			1949	
Flt Permitted		1.00			0.74			0.93			0.86	
Satd. Flow (perm)		3428			2340			1778			1706	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	352	35	187	386	140	21	105	49	108	284	25
RTOR Reduction (vph)	0	9	0	0	28	0	0	13	0	0	2	0
Lane Group Flow (vph)	0	378	0	0	685	0	0	162	0	0	415	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type		NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases				8			2			6		
Actuated Green, G (s)		34.5			34.5			43.5			43.5	
Effective Green, g (s)		34.5			34.5			43.5			43.5	
Actuated g/C Ratio		0.38			0.38			0.48			0.48	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1314			897			859			825	
v/s Ratio Prot		0.11										
v/s Ratio Perm					c0.29			0.09			c0.24	
v/c Ratio		0.29			0.76			0.19			0.50	
Uniform Delay, d1		19.2			24.2			13.2			15.9	
Progression Factor		1.00			0.52			1.00			0.53	
Incremental Delay, d2		0.1			3.2			0.5			2.1	
Delay (s)		19.4			15.8			13.7			10.6	
Level of Service		B			B			B			B	
Approach Delay (s)		19.4			15.8			13.7			10.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	88.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	509	661	488	796
v/c Ratio	0.78	0.62	0.34	0.61
Control Delay	26.5	25.6	13.0	20.6
Queue Delay	0.5	0.0	0.0	0.1
Total Delay	27.0	25.6	13.1	20.7
Queue Length 50th (m)	15.0	45.7	23.0	56.9
Queue Length 95th (m)	51.2	56.4	38.7	81.3
Internal Link Dist (m)	28.1	47.4	40.9	41.4
Turn Bay Length (m)				
Base Capacity (vph)	793	1102	1424	1313
Starvation Cap Reductn	67	0	0	0
Spillback Cap Reductn	0	4	56	52
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.70	0.60	0.36	0.63

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	110	278	95	0	472	156	48	367	48	131	466	159
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.97			0.96			0.98			0.97	
Flt Protected		0.99			1.00			0.99			0.99	
Satd. Flow (prot)		3160			3170			3236			3160	
Flt Permitted		0.60			1.00			0.80			0.75	
Satd. Flow (perm)		1921			3170			2614			2380	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	116	293	100	0	497	164	51	386	51	138	491	167
RTOR Reduction (vph)	0	27	0	0	34	0	0	9	0	0	23	0
Lane Group Flow (vph)	0	482	0	0	627	0	0	479	0	0	773	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA			NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4						2			6		
Actuated Green, G (s)		29.3			29.3			48.7			48.7	
Effective Green, g (s)		29.3			29.3			48.7			48.7	
Actuated g/C Ratio		0.33			0.33			0.54			0.54	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		625			1032			1414			1288	
v/s Ratio Prot					0.20							
v/s Ratio Perm		c0.25						0.18			c0.32	
v/c Ratio		0.77			0.61			0.34			0.60	
Uniform Delay, d1		27.3			25.5			11.6			14.0	
Progression Factor		0.73			1.00			1.00			1.26	
Incremental Delay, d2		5.7			1.0			0.7			2.0	
Delay (s)		25.5			26.5			12.3			19.8	
Level of Service		C			C			B			B	
Approach Delay (s)		25.5			26.5			12.3			19.8	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	21.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	91.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	244	145	372	133	71	517
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	257	153	392	140	75	544
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		9				
Median type			None			None
Median storage veh)						
Upstream signal (m)						226
pX, platoon unblocked	0.89					
vC, conflicting volume	1155	462			392	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1111	462			392	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	75			94	
cM capacity (veh/h)	192	600			1167	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	409	532	619
Volume Left	257	0	75
Volume Right	153	140	0
cSH	283	1700	1167
Volume to Capacity	1.45	0.31	0.06
Queue Length 95th (m)	171.8	0.0	1.6
Control Delay (s)	254.0	0.0	1.7
Lane LOS	F		A
Approach Delay (s)	254.0	0.0	1.7
Approach LOS	F		

Intersection Summary			
Average Delay	67.3		
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	383	183	545	849
v/c Ratio	0.70	0.30	0.33	0.42
Control Delay	24.5	19.1	6.1	5.7
Queue Delay	0.6	0.0	0.2	0.2
Total Delay	25.1	19.1	6.3	5.9
Queue Length 50th (m)	18.9	8.9	12.5	13.2
Queue Length 95th (m)	26.5	16.0	28.1	52.4
Internal Link Dist (m)	26.6	66.6	41.6	44.5
Turn Bay Length (m)				
Base Capacity (vph)	862	723	1674	2003
Starvation Cap Reductn	199	0	0	0
Spillback Cap Reductn	0	21	392	446
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.58	0.26	0.43	0.55

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	190	47	127	15	95	64	66	442	10	25	446	336
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			0.99	
Flpb, ped/bikes		0.99			1.00			1.00			1.00	
Frt		0.95			0.95			1.00			0.94	
Flt Protected		0.97			1.00			0.99			1.00	
Satd. Flow (prot)		3010			3085			3281			3066	
Flt Permitted		0.73			0.90			0.76			0.93	
Satd. Flow (perm)		2269			2774			2500			2847	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	49	134	16	100	67	69	465	11	26	469	354
RTOR Reduction (vph)	0	96	0	0	54	0	0	1	0	0	99	0
Lane Group Flow (vph)	0	287	0	0	129	0	0	544	0	0	750	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		17.8			17.8			60.2			60.2	
Effective Green, g (s)		17.8			17.8			60.2			60.2	
Actuated g/C Ratio		0.20			0.20			0.67			0.67	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		449			549			1672			1904	
v/s Ratio Prot												
v/s Ratio Perm		c0.13			0.05			0.22			c0.26	
v/c Ratio		0.64			0.24			0.33			0.39	
Uniform Delay, d1		33.1			30.4			6.3			6.7	
Progression Factor		0.79			1.00			0.78			1.07	
Incremental Delay, d2		2.9			0.2			0.5			0.5	
Delay (s)		29.1			30.6			5.4			7.7	
Level of Service		C			C			A			A	
Approach Delay (s)		29.1			30.6			5.4			7.7	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	13.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	362	523	240	148
v/c Ratio	0.37	0.74	0.26	0.16
Control Delay	13.4	33.4	9.8	11.6
Queue Delay	0.1	0.6	0.0	0.0
Total Delay	13.5	34.0	9.8	11.6
Queue Length 50th (m)	13.8	45.4	13.7	11.4
Queue Length 95th (m)	21.0	60.3	34.3	26.0
Internal Link Dist (m)	106.3	26.6	428.1	253.1
Turn Bay Length (m)				
Base Capacity (vph)	1173	1092	936	918
Starvation Cap Reductn	0	241	0	0
Spillback Cap Reductn	144	0	28	24
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.35	0.61	0.26	0.17

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	189	150	163	236	98	65	44	120	55	84	2
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.98			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			0.99			1.00			1.00	
Frt		0.93			0.97			0.93			1.00	
Flt Protected		1.00			0.98			0.99			0.98	
Satd. Flow (prot)		3032			3119			1798			1949	
Flt Permitted		0.95			0.70			0.88			0.82	
Satd. Flow (perm)		2873			2235			1604			1627	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	199	158	172	248	103	68	46	126	58	88	2
RTOR Reduction (vph)	0	110	0	0	32	0	0	31	0	0	0	0
Lane Group Flow (vph)	0	252	0	0	491	0	0	209	0	0	148	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		27.3			27.3			50.7			50.7	
Effective Green, g (s)		27.3			27.3			50.7			50.7	
Actuated g/C Ratio		0.30			0.30			0.56			0.56	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		871			678			904			917	
v/s Ratio Prot												
v/s Ratio Perm		0.09			c0.22			c0.13			0.09	
v/c Ratio		0.29			0.72			0.23			0.16	
Uniform Delay, d1		23.9			28.0			9.9			9.4	
Progression Factor		1.00			1.10			1.10			1.00	
Incremental Delay, d2		0.2			3.6			0.5			0.4	
Delay (s)		24.1			34.3			11.4			9.8	
Level of Service		C			C			B			A	
Approach Delay (s)		24.1			34.3			11.4			9.8	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	24.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	42	21	499	134	41	715
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	44	22	525	141	43	753
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	1435	596			666	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1435	596			666	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	69	96			95	
cM capacity (veh/h)	140	504			923	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	66	666	796
Volume Left	44	0	43
Volume Right	22	141	0
cSH	185	1700	923
Volume to Capacity	0.36	0.39	0.05
Queue Length 95th (m)	11.6	0.0	1.1
Control Delay (s)	35.0	0.0	1.2
Lane LOS	D		A
Approach Delay (s)	35.0	0.0	1.2
Approach LOS	D		

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	85.6%	ICU Level of Service	E
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	5	5	500	20	10	751
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	5	526	21	11	791
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						298
pX, platoon unblocked	0.93					
vC, conflicting volume	1348	537			547	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1338	537			547	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	99			99	
cM capacity (veh/h)	156	544			1022	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	11	547	801
Volume Left	5	0	11
Volume Right	5	21	0
cSH	243	1700	1022
Volume to Capacity	0.04	0.32	0.01
Queue Length 95th (m)	1.0	0.0	0.2
Control Delay (s)	20.5	0.0	0.3
Lane LOS	C		A
Approach Delay (s)	20.5	0.0	0.3
Approach LOS	C		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		

Queues
2: Gateway Rd & Chief Peguis Trail

4/10/2012



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	224	580	256	235	705	82	257	632	213	45	492	92
v/c Ratio	0.91	0.81	0.17	0.89	0.94	0.06	0.86	0.72	0.15	0.22	0.56	0.06
Control Delay	79.2	44.1	0.3	72.5	56.1	0.1	44.0	24.2	0.1	16.2	18.8	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	79.2	44.1	0.3	72.5	56.1	0.1	44.0	24.2	0.1	16.2	18.8	0.1
Queue Length 50th (m)	38.7	50.5	0.0	40.4	63.2	0.0	36.4	88.9	0.0	4.2	56.5	0.0
Queue Length 95th (m)	#79.8	#74.6	0.0	#81.1	#96.8	0.0	m#69.8	123.3	m0.0	11.5	85.6	0.0
Internal Link Dist (m)		229.1			234.8			129.3			255.9	
Turn Bay Length (m)	175.0		185.0	180.0		180.0	115.0		95.0	100.0		115.0
Base Capacity (vph)	245	716	1479	264	753	1479	300	873	1461	204	873	1461
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.91	0.81	0.17	0.89	0.94	0.06	0.86	0.72	0.15	0.22	0.56	0.06

Intersection Summary

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

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	213	551	243	223	670	78	244	600	202	43	467	87
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.7	3.7	3.7	3.7	3.7	3.7	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1695	3390	1479	1695	3390	1479	1650	1745	1461	1658	1745	1461
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.34	1.00	1.00	0.23	1.00	1.00
Satd. Flow (perm)	1695	3390	1479	1695	3390	1479	599	1745	1461	406	1745	1461
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	224	580	256	235	705	82	257	632	213	45	492	92
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	224	580	256	235	705	82	257	632	213	45	492	92
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Prot	NA	Free	Prot	NA	Free	Perm	NA	Free	Perm	NA	Free
Protected Phases	7	4		3	8			2			6	
Permitted Phases			Free			Free	2		Free	6		Free
Actuated Green, G (s)	11.0	17.0	90.0	12.0	18.0	90.0	43.0	43.0	90.0	43.0	43.0	90.0
Effective Green, g (s)	13.0	19.0	90.0	14.0	20.0	90.0	45.0	45.0	90.0	45.0	45.0	90.0
Actuated g/C Ratio	0.14	0.21	1.00	0.16	0.22	1.00	0.50	0.50	1.00	0.50	0.50	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	245	716	1479	264	753	1479	300	873	1461	203	873	1461
v/s Ratio Prot	0.13	0.17		c0.14	c0.21			0.36			0.28	
v/s Ratio Perm			c0.17			0.06	c0.43		0.15	0.11		0.06
v/c Ratio	0.91	0.81	0.17	0.89	0.94	0.06	0.86	0.72	0.15	0.22	0.56	0.06
Uniform Delay, d1	38.0	33.8	0.0	37.2	34.4	0.0	19.7	17.6	0.0	12.7	15.7	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.11	1.12	1.00	1.00	1.00	1.00
Incremental Delay, d2	35.1	6.9	0.3	28.8	18.8	0.1	18.8	3.6	0.1	2.5	2.6	0.1
Delay (s)	73.1	40.7	0.3	66.0	53.2	0.1	40.6	23.3	0.1	15.2	18.3	0.1
Level of Service	E	D	A	E	D	A	D	C	A	B	B	A
Approach Delay (s)		37.8			51.9			22.9			15.4	
Approach LOS		D			D			C			B	

Intersection Summary			
HCM Average Control Delay	33.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	85.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	588	681	343	302
v/c Ratio	0.51	0.85	0.34	0.36
Control Delay	24.7	22.0	13.6	10.6
Queue Delay	0.8	0.3	0.0	0.0
Total Delay	25.5	22.3	13.6	10.6
Queue Length 50th (m)	40.0	29.1	29.0	13.1
Queue Length 95th (m)	45.9	m31.3	57.7	32.6
Internal Link Dist (m)	36.0	28.1	267.0	425.3
Turn Bay Length (m)				
Base Capacity (vph)	1271	1064	999	830
Starvation Cap Reductn	0	74	0	0
Spillback Cap Reductn	383	0	15	10
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.66	0.69	0.35	0.37

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	522	37	83	380	184	24	215	87	98	172	17
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		*1.00			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.96			0.96			0.99	
Flt Protected		1.00			0.99			1.00			0.98	
Satd. Flow (prot)		3445			3107			1905			1942	
Flt Permitted		1.00			0.71			0.96			0.78	
Satd. Flow (perm)		3445			2234			1842			1547	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	549	39	87	400	194	25	226	92	103	181	18
RTOR Reduction (vph)	0	6	0	0	58	0	0	12	0	0	2	0
Lane Group Flow (vph)	0	582	0	0	623	0	0	331	0	0	300	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type		NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases				8			2			6		
Actuated Green, G (s)		29.8			29.8			48.2			48.2	
Effective Green, g (s)		29.8			29.8			48.2			48.2	
Actuated g/C Ratio		0.33			0.33			0.54			0.54	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1141			740			986			829	
v/s Ratio Prot		0.17										
v/s Ratio Perm					c0.28			0.18			c0.19	
v/c Ratio		0.51			0.84			0.34			0.36	
Uniform Delay, d1		24.2			27.9			11.8			12.0	
Progression Factor		1.00			0.56			1.00			0.68	
Incremental Delay, d2		0.4			6.6			0.9			1.1	
Delay (s)		24.6			22.2			12.8			9.3	
Level of Service		C			C			B			A	
Approach Delay (s)		24.6			22.2			12.8			9.3	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	19.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	92.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	743	616	778	998
v/c Ratio	1.02	0.53	0.68	0.96
Control Delay	59.4	22.0	19.9	42.0
Queue Delay	67.2	0.0	0.9	42.4
Total Delay	126.7	22.1	20.8	84.4
Queue Length 50th (m)	~64.8	38.3	49.5	85.4
Queue Length 95th (m)	#107.5	54.3	70.0	#127.8
Internal Link Dist (m)	28.1	47.4	40.9	41.4
Turn Bay Length (m)				
Base Capacity (vph)	726	1162	1151	1044
Starvation Cap Reductn	103	0	0	0
Spillback Cap Reductn	0	13	152	136
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	1.19	0.54	0.78	1.10

Intersection Summary

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

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	180	402	124	0	406	180	76	615	48	178	604	166
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.97			0.95			0.99			0.97	
Flt Protected		0.99			1.00			0.99			0.99	
Satd. Flow (prot)		3167			3135			3259			3180	
Flt Permitted		0.62			1.00			0.68			0.62	
Satd. Flow (perm)		1985			3135			2241			2004	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	189	423	131	0	427	189	80	647	51	187	636	175
RTOR Reduction (vph)	0	20	0	0	48	0	0	6	0	0	20	0
Lane Group Flow (vph)	0	723	0	0	568	0	0	772	0	0	978	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA			NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4						2			6		
Actuated Green, G (s)		32.0			32.0			46.0			46.0	
Effective Green, g (s)		32.0			32.0			46.0			46.0	
Actuated g/C Ratio		0.36			0.36			0.51			0.51	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		706			1115			1145			1024	
v/s Ratio Prot					0.18							
v/s Ratio Perm		c0.36						0.34			c0.49	
v/c Ratio		1.02			0.51			0.67			0.96	
Uniform Delay, d1		29.0			22.8			16.4			21.0	
Progression Factor		0.66			1.00			1.00			1.11	
Incremental Delay, d2		38.7			0.4			3.2			18.4	
Delay (s)		58.0			23.2			19.6			41.7	
Level of Service		E			C			B			D	
Approach Delay (s)		58.0			23.2			19.6			41.7	
Approach LOS		E			C			B			D	

Intersection Summary			
HCM Average Control Delay	36.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	110.7%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	279	182	679	321	201	551
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	294	192	715	338	212	580
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		9				
Median type			None			None
Median storage veh)						
Upstream signal (m)						226
pX, platoon unblocked	0.79					
vC, conflicting volume	1887	884			715	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1990	884			715	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	44			76	
cM capacity (veh/h)	40	345			886	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	485	1053	792
Volume Left	294	0	212
Volume Right	192	338	0
cSH	62	1700	886
Volume to Capacity	7.85	0.62	0.24
Queue Length 95th (m)	Err	0.0	7.1
Control Delay (s)	Err	0.0	5.5
Lane LOS	F		A
Approach Delay (s)	Err	0.0	5.5
Approach LOS	F		

Intersection Summary			
Average Delay	2084.8		
Intersection Capacity Utilization	127.0%	ICU Level of Service	H
Analysis Period (min)	15		

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	571	185	906	982
v/c Ratio	0.82	0.23	0.75	0.67
Control Delay	31.3	15.6	19.4	12.6
Queue Delay	6.5	0.0	25.0	3.7
Total Delay	37.8	15.7	44.3	16.3
Queue Length 50th (m)	18.4	7.6	59.6	46.0
Queue Length 95th (m)	26.4	15.5	86.7	m66.5
Internal Link Dist (m)	26.6	66.6	41.6	44.5
Turn Bay Length (m)				
Base Capacity (vph)	749	788	1202	1471
Starvation Cap Reductn	133	0	0	0
Spillback Cap Reductn	0	25	326	389
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.93	0.24	1.03	0.91

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	252	126	164	20	90	66	123	728	10	77	568	288
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			0.99	
Flpb, ped/bikes		0.99			1.00			1.00			1.00	
Frt		0.95			0.94			1.00			0.95	
Flt Protected		0.98			0.99			0.99			1.00	
Satd. Flow (prot)		3048			3077			3284			3121	
Flt Permitted		0.74			0.86			0.62			0.77	
Satd. Flow (perm)		2315			2659			2040			2408	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	265	133	173	21	95	69	129	766	11	81	598	303
RTOR Reduction (vph)	0	56	0	0	50	0	0	1	0	0	54	0
Lane Group Flow (vph)	0	515	0	0	135	0	0	905	0	0	928	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		25.0			25.0			53.0			53.0	
Effective Green, g (s)		25.0			25.0			53.0			53.0	
Actuated g/C Ratio		0.28			0.28			0.59			0.59	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		643			739			1201			1418	
v/s Ratio Prot												
v/s Ratio Perm		c0.22			0.05			c0.44			0.39	
v/c Ratio		0.80			0.18			0.75			0.65	
Uniform Delay, d1		30.2			24.7			13.7			12.4	
Progression Factor		0.83			1.00			1.00			0.92	
Incremental Delay, d2		6.6			0.1			4.4			2.0	
Delay (s)		31.7			24.8			18.1			13.4	
Level of Service		C			C			B			B	
Approach Delay (s)		31.7			24.8			18.1			13.4	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	19.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	99.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	461	528	420	84
v/c Ratio	0.49	0.80	0.46	0.10
Control Delay	24.1	36.2	13.9	10.9
Queue Delay	0.2	21.9	0.1	0.0
Total Delay	24.3	58.1	14.0	10.9
Queue Length 50th (m)	30.8	47.6	33.9	6.0
Queue Length 95th (m)	38.5	64.3	62.5	15.4
Internal Link Dist (m)	106.3	26.6	428.1	253.1
Turn Bay Length (m)				
Base Capacity (vph)	998	869	920	870
Starvation Cap Reductn	0	344	0	0
Spillback Cap Reductn	105	0	50	45
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.52	1.01	0.48	0.10

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	333	100	145	269	87	137	88	174	35	42	3
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			0.99			1.00	
Frt		0.97			0.97			0.94			1.00	
Flt Protected		1.00			0.99			0.98			0.98	
Satd. Flow (prot)		3166			3145			1818			1939	
Flt Permitted		0.95			0.66			0.86			0.78	
Satd. Flow (perm)		3005			2121			1584			1537	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	351	105	153	283	92	144	93	183	37	44	3
RTOR Reduction (vph)	0	30	0	0	23	0	0	25	0	0	1	0
Lane Group Flow (vph)	0	431	0	0	505	0	0	395	0	0	83	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		27.2			27.2			50.8			50.8	
Effective Green, g (s)		27.2			27.2			50.8			50.8	
Actuated g/C Ratio		0.30			0.30			0.56			0.56	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		908			641			894			868	
v/s Ratio Prot												
v/s Ratio Perm		0.14			c0.24			c0.25			0.05	
v/c Ratio		0.47			0.79			0.44			0.10	
Uniform Delay, d1		25.6			28.8			11.4			9.0	
Progression Factor		1.00			1.08			1.09			1.00	
Incremental Delay, d2		0.4			5.1			1.4			0.2	
Delay (s)		26.0			36.3			13.8			9.2	
Level of Service		C			D			B			A	
Approach Delay (s)		26.0			36.3			13.8			9.2	
Approach LOS		C			D			B			A	

Intersection Summary			
HCM Average Control Delay	25.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	105	55	965	10	5	843
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	111	58	1016	11	5	887
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	1919	1021			1026	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1919	1021			1026	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	80			99	
cM capacity (veh/h)	73	287			677	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	168	1026	893
Volume Left	111	0	5
Volume Right	58	11	0
cSH	99	1700	677
Volume to Capacity	1.71	0.60	0.01
Queue Length 95th (m)	102.0	0.0	0.2
Control Delay (s)	431.7	0.0	0.2
Lane LOS	F		A
Approach Delay (s)	431.7	0.0	0.2
Approach LOS	F		

Intersection Summary			
Average Delay	34.9		
Intersection Capacity Utilization	70.6%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	55	43	956	64	37	793
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	58	45	1006	67	39	835
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						298
pX, platoon unblocked	0.88					
vC, conflicting volume	1953	1040			1074	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2016	1040			1074	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	84			94	
cM capacity (veh/h)	53	280			649	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	103	1074	874
Volume Left	58	0	39
Volume Right	45	67	0
cSH	82	1700	649
Volume to Capacity	1.25	0.63	0.06
Queue Length 95th (m)	58.2	0.0	1.5
Control Delay (s)	273.3	0.0	1.7
Lane LOS	F		A
Approach Delay (s)	273.3	0.0	1.7
Approach LOS	F		

Intersection Summary			
Average Delay	14.5		
Intersection Capacity Utilization	88.5%	ICU Level of Service	E
Analysis Period (min)	15		

Queues
2: Gateway Rd & Chief Peguis Trail

4/11/2012



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	60	476	103	192	552	21	200	354	179	43	554	269
v/c Ratio	0.37	0.70	0.07	0.74	0.58	0.01	0.77	0.40	0.12	0.10	0.62	0.18
Control Delay	44.7	39.5	0.1	54.3	31.0	0.0	41.8	17.0	0.2	12.9	19.9	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.7	39.5	0.1	54.3	31.0	0.0	41.8	17.0	0.2	12.9	19.9	0.3
Queue Length 50th (m)	9.9	39.9	0.0	32.0	44.0	0.0	27.4	40.2	0.0	3.8	67.0	0.0
Queue Length 95th (m)	21.7	56.2	0.0	#61.8	60.5	0.0	#65.0	65.6	0.0	9.4	100.7	0.0
Internal Link Dist (m)		229.1			234.8			129.3			255.9	
Turn Bay Length (m)	175.0		185.0	180.0		180.0	115.0		95.0	100.0		115.0
Base Capacity (vph)	170	716	1479	268	959	1479	261	895	1461	411	895	1461
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.66	0.07	0.72	0.58	0.01	0.77	0.40	0.12	0.10	0.62	0.18

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)	57	452	98	182	524	20	190	336	170	41	526	256
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.7	3.7	3.7	3.7	3.7	3.7	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1695	3390	1479	1695	3390	1479	1651	1745	1461	1645	1745	1461
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.29	1.00	1.00	0.46	1.00	1.00
Satd. Flow (perm)	1695	3390	1479	1695	3390	1479	510	1745	1461	802	1745	1461
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	60	476	103	192	552	21	200	354	179	43	554	269
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	60	476	103	192	552	21	200	354	179	43	554	269
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Prot	NA	Free	Prot	NA	Free	Perm	NA	Free	Perm	NA	Free
Protected Phases	7	4		3	8			2			6	
Permitted Phases			Free			Free	2		Free	6		Free
Actuated Green, G (s)	5.6	16.0	90.0	13.1	23.5	90.0	42.9	42.9	90.0	42.9	42.9	90.0
Effective Green, g (s)	7.6	18.0	90.0	15.1	25.5	90.0	44.9	44.9	90.0	44.9	44.9	90.0
Actuated g/C Ratio	0.08	0.20	1.00	0.17	0.28	1.00	0.50	0.50	1.00	0.50	0.50	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	143	678	1479	284	961	1479	254	871	1461	400	871	1461
v/s Ratio Prot	0.04	c0.14		c0.11	0.16			0.20			0.32	
v/s Ratio Perm			0.07			0.01	c0.39		0.12	0.05		0.18
v/c Ratio	0.42	0.70	0.07	0.68	0.57	0.01	0.79	0.41	0.12	0.11	0.64	0.18
Uniform Delay, d1	39.1	33.5	0.0	35.2	27.6	0.0	18.6	14.2	0.0	11.9	16.6	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.10	1.12	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	3.3	0.1	6.2	0.8	0.0	20.6	1.3	0.2	0.5	3.5	0.3
Delay (s)	41.1	36.8	0.1	41.4	28.4	0.0	41.1	17.2	0.2	12.5	20.1	0.3
Level of Service	D	D	A	D	C	A	D	B	A	B	C	A
Approach Delay (s)		31.3			30.9			19.5			13.6	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	23.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	77.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	387	713	175	417
v/c Ratio	0.28	0.74	0.21	0.29
Control Delay	17.2	16.3	14.9	12.3
Queue Delay	0.0	0.3	0.0	0.0
Total Delay	17.2	16.6	14.9	12.3
Queue Length 50th (m)	21.0	24.3	14.8	12.6
Queue Length 95th (m)	24.8	29.3	33.1	26.0
Internal Link Dist (m)	36.0	28.1	155.6	173.4
Turn Bay Length (m)				
Base Capacity (vph)	1576	1329	847	1454
Starvation Cap Reductn	0	188	0	0
Spillback Cap Reductn	112	0	1	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.26	0.62	0.21	0.29

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	334	33	178	367	133	20	100	47	103	270	24
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		*1.00			0.95			1.00			0.95	
Frpb, ped/bikes		1.00			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.97			0.96			0.99	
Flt Protected		1.00			0.99			0.99			0.99	
Satd. Flow (prot)		3434			3139			1896			3699	
Flt Permitted		1.00			0.74			0.93			0.82	
Satd. Flow (perm)		3434			2347			1772			3076	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	352	35	187	386	140	21	105	49	108	284	25
RTOR Reduction (vph)	0	10	0	0	33	0	0	12	0	0	4	0
Lane Group Flow (vph)	0	377	0	0	680	0	0	163	0	0	413	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type		NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases				8			2			6		
Actuated Green, G (s)		35.6			35.6			42.4			42.4	
Effective Green, g (s)		35.6			35.6			42.4			42.4	
Actuated g/C Ratio		0.40			0.40			0.47			0.47	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1358			928			835			1449	
v/s Ratio Prot		0.11										
v/s Ratio Perm					c0.29			0.09			c0.13	
v/c Ratio		0.28			0.73			0.20			0.29	
Uniform Delay, d1		18.5			23.2			13.9			14.5	
Progression Factor		1.00			0.59			1.00			0.73	
Incremental Delay, d2		0.1			2.5			0.5			0.5	
Delay (s)		18.6			16.1			14.4			11.1	
Level of Service		B			B			B			B	
Approach Delay (s)		18.6			16.1			14.4			11.1	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	15.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	79.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	509	661	488	796
v/c Ratio	0.78	0.62	0.34	0.61
Control Delay	31.4	25.6	13.0	16.8
Queue Delay	1.6	0.0	0.0	0.2
Total Delay	33.0	25.6	13.1	17.0
Queue Length 50th (m)	14.1	45.7	23.0	44.4
Queue Length 95th (m)	46.8	56.4	38.7	73.3
Internal Link Dist (m)	28.1	74.8	70.9	81.7
Turn Bay Length (m)				
Base Capacity (vph)	793	1102	1424	1313
Starvation Cap Reductn	138	0	0	0
Spillback Cap Reductn	0	4	120	110
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.78	0.60	0.37	0.66

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	110	278	95	0	472	156	48	367	48	131	466	159
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.97			0.96			0.98			0.97	
Flt Protected		0.99			1.00			0.99			0.99	
Satd. Flow (prot)		3160			3170			3236			3160	
Flt Permitted		0.60			1.00			0.80			0.75	
Satd. Flow (perm)		1921			3170			2614			2380	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	116	293	100	0	497	164	51	386	51	138	491	167
RTOR Reduction (vph)	0	27	0	0	34	0	0	9	0	0	23	0
Lane Group Flow (vph)	0	482	0	0	627	0	0	479	0	0	773	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA			NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4						2			6		
Actuated Green, G (s)		29.3			29.3			48.7			48.7	
Effective Green, g (s)		29.3			29.3			48.7			48.7	
Actuated g/C Ratio		0.33			0.33			0.54			0.54	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		625			1032			1414			1288	
v/s Ratio Prot					0.20							
v/s Ratio Perm		c0.25						0.18			c0.32	
v/c Ratio		0.77			0.61			0.34			0.60	
Uniform Delay, d1		27.3			25.5			11.6			14.0	
Progression Factor		0.92			1.00			1.00			1.00	
Incremental Delay, d2		5.8			1.0			0.7			2.1	
Delay (s)		30.9			26.5			12.3			16.1	
Level of Service		C			C			B			B	
Approach Delay (s)		30.9			26.5			12.3			16.1	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	21.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	91.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	257	153	532	75	544
v/c Ratio	0.53	0.28	0.63	0.24	0.63
Control Delay	18.7	4.8	13.4	11.0	14.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	18.7	4.8	13.4	11.0	14.0
Queue Length 50th (m)	14.8	0.0	25.8	3.2	28.4
Queue Length 95th (m)	40.3	10.2	61.4	11.6	65.1
Internal Link Dist (m)	196.0		47.6		202.2
Turn Bay Length (m)		70.0		65.0	
Base Capacity (vph)	1203	1121	1850	690	1918
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.21	0.14	0.29	0.11	0.28

Intersection Summary



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	244	145	372	133	71	517
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Width	3.7	3.7	4.8	4.8	4.8	4.8
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.96		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1695	1517	1929		1900	2000
Flt Permitted	0.95	1.00	1.00		0.36	1.00
Satd. Flow (perm)	1695	1517	1929		720	2000
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	257	153	392	140	75	544
RTOR Reduction (vph)	0	109	17	0	0	0
Lane Group Flow (vph)	257	44	515	0	75	544
Turn Type	NA	Perm	NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases		8			6	
Actuated Green, G (s)	12.6	12.6	19.0		19.0	19.0
Effective Green, g (s)	12.6	12.6	19.0		19.0	19.0
Actuated g/C Ratio	0.29	0.29	0.44		0.44	0.44
Clearance Time (s)	6.0	6.0	6.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	490	438	841		314	872
v/s Ratio Prot	c0.15		0.27			c0.27
v/s Ratio Perm		0.03			0.10	
v/c Ratio	0.52	0.10	0.61		0.24	0.62
Uniform Delay, d1	13.0	11.4	9.5		7.7	9.5
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.0	0.1	1.3		0.4	1.4
Delay (s)	14.0	11.5	10.8		8.1	10.9
Level of Service	B	B	B		A	B
Approach Delay (s)	13.1		10.8			10.6
Approach LOS	B		B			B

Intersection Summary			
HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	43.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	62.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	383	183	545	849
v/c Ratio	0.70	0.30	0.33	0.42
Control Delay	25.2	19.1	7.8	5.8
Queue Delay	0.6	0.0	0.2	0.2
Total Delay	25.8	19.1	7.9	6.0
Queue Length 50th (m)	18.8	8.8	18.4	13.2
Queue Length 95th (m)	27.2	15.9	34.3	52.7
Internal Link Dist (m)	26.6	66.6	202.2	44.5
Turn Bay Length (m)				
Base Capacity (vph)	856	724	1671	2000
Starvation Cap Reductn	197	0	0	0
Spillback Cap Reductn	0	21	398	453
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.58	0.26	0.43	0.55

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑↑			↑↑↑			↑↑↑	
Volume (vph)	190	47	127	15	95	64	66	442	10	25	446	336
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.98			0.99			1.00			0.99	
Flpb, ped/bikes		0.99			1.00			1.00			1.00	
Frt		0.95			0.95			1.00			0.94	
Flt Protected		0.97			1.00			0.99			1.00	
Satd. Flow (prot)		2990			3083			3281			3066	
Flt Permitted		0.73			0.90			0.76			0.93	
Satd. Flow (perm)		2254			2773			2500			2847	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	49	134	16	100	67	69	465	11	26	469	354
RTOR Reduction (vph)	0	96	0	0	54	0	0	1	0	0	99	0
Lane Group Flow (vph)	0	287	0	0	129	0	0	544	0	0	750	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		17.9			17.9			60.1			60.1	
Effective Green, g (s)		17.9			17.9			60.1			60.1	
Actuated g/C Ratio		0.20			0.20			0.67			0.67	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		448			552			1669			1901	
v/s Ratio Prot												
v/s Ratio Perm		c0.13			0.05			0.22			c0.26	
v/c Ratio		0.64			0.23			0.33			0.39	
Uniform Delay, d1		33.1			30.3			6.3			6.7	
Progression Factor		0.82			1.00			1.00			1.07	
Incremental Delay, d2		3.0			0.2			0.5			0.5	
Delay (s)		30.2			30.5			6.9			7.7	
Level of Service		C			C			A			A	
Approach Delay (s)		30.2			30.5			6.9			7.7	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	362	523	240	148
v/c Ratio	0.37	0.74	0.26	0.16
Control Delay	13.3	33.7	10.3	11.6
Queue Delay	0.1	0.6	0.0	0.0
Total Delay	13.4	34.3	10.3	11.6
Queue Length 50th (m)	13.8	46.4	13.8	11.4
Queue Length 95th (m)	21.0	61.3	32.6	26.0
Internal Link Dist (m)	106.3	26.6	428.1	253.1
Turn Bay Length (m)				
Base Capacity (vph)	1182	1094	936	918
Starvation Cap Reductn	0	243	0	0
Spillback Cap Reductn	164	0	27	22
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.36	0.61	0.26	0.17

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	189	150	163	236	98	65	44	120	55	84	2
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.93			0.97			0.93			1.00	
Flt Protected		1.00			0.98			0.99			0.98	
Satd. Flow (prot)		3057			3126			1798			1949	
Flt Permitted		0.95			0.70			0.88			0.82	
Satd. Flow (perm)		2898			2240			1604			1627	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	199	158	172	248	103	68	46	126	58	88	2
RTOR Reduction (vph)	0	110	0	0	32	0	0	31	0	0	0	0
Lane Group Flow (vph)	0	252	0	0	491	0	0	209	0	0	148	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		27.3			27.3			50.7			50.7	
Effective Green, g (s)		27.3			27.3			50.7			50.7	
Actuated g/C Ratio		0.30			0.30			0.56			0.56	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		879			679			904			917	
v/s Ratio Prot												
v/s Ratio Perm		0.09			c0.22			c0.13			0.09	
v/c Ratio		0.29			0.72			0.23			0.16	
Uniform Delay, d1		23.9			28.0			9.9			9.4	
Progression Factor		1.00			1.11			1.16			1.00	
Incremental Delay, d2		0.2			3.6			0.6			0.4	
Delay (s)		24.1			34.7			12.0			9.8	
Level of Service		C			C			B			A	
Approach Delay (s)		24.1			34.7			12.0			9.8	
Approach LOS		C			C			B			A	

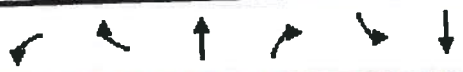
Intersection Summary			
HCM Average Control Delay	24.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	42	21	499	134	41	715
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	44	22	525	141	43	753
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						192
pX, platoon unblocked	0.77					
vC, conflicting volume	1435	596			666	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1415	596			666	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	60	96			95	
cM capacity (veh/h)	111	504			923	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	66	666	796
Volume Left	44	0	43
Volume Right	22	141	0
cSH	150	1700	923
Volume to Capacity	0.44	0.39	0.05
Queue Length 95th (m)	15.2	0.0	1.1
Control Delay (s)	47.0	0.0	1.2
Lane LOS	E		A
Approach Delay (s)	47.0	0.0	1.2
Approach LOS	E		

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	85.6%	ICU Level of Service	E
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	5	5	500	20	10	751
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	5	526	21	11	791
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						72
pX, platoon unblocked	0.77					
vC, conflicting volume	1348	537			547	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1303	537			547	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	99			99	
cM capacity (veh/h)	135	544			1022	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	11	547	801
Volume Left	5	0	11
Volume Right	5	21	0
cSH	216	1700	1022
Volume to Capacity	0.05	0.32	0.01
Queue Length 95th (m)	1.2	0.0	0.2
Control Delay (s)	22.5	0.0	0.3
Lane LOS	C		A
Approach Delay (s)	22.5	0.0	0.3
Approach LOS	C		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		

Queues
2: Gateway Rd & Chief Peguis Trail

4/11/2012

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	224	580	256	235	705	82	257	632	213	45	492	92
v/c Ratio	0.91	0.81	0.17	0.89	0.94	0.06	0.86	0.72	0.15	0.22	0.56	0.06
Control Delay	79.2	44.1	0.3	72.5	56.1	0.1	45.2	25.8	0.1	16.2	18.8	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	79.2	44.1	0.3	72.5	56.1	0.1	45.2	25.8	0.1	16.2	18.8	0.1
Queue Length 50th (m)	38.7	50.5	0.0	40.4	63.2	0.0	37.3	91.2	0.0	4.2	56.5	0.0
Queue Length 95th (m)	#79.8	#74.6	0.0	#81.1	#96.8	0.0	m#69.7	123.2	m0.0	11.5	85.6	0.0
Internal Link Dist (m)		229.1			234.8			129.3			255.9	
Turn Bay Length (m)	175.0		185.0	180.0		180.0	115.0		95.0	100.0		115.0
Base Capacity (vph)	245	716	1479	264	753	1479	300	873	1461	204	873	1461
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.91	0.81	0.17	0.89	0.94	0.06	0.86	0.72	0.15	0.22	0.56	0.06

Intersection Summary

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

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	213	551	243	223	670	78	244	600	202	43	467	87
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.7	3.7	3.7	3.7	3.7	3.7	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1695	3390	1479	1695	3390	1479	1650	1745	1461	1658	1745	1461
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.34	1.00	1.00	0.23	1.00	1.00
Satd. Flow (perm)	1695	3390	1479	1695	3390	1479	599	1745	1461	406	1745	1461
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	224	580	256	235	705	82	257	632	213	45	492	92
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	224	580	256	235	705	82	257	632	213	45	492	92
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Prot	NA	Free	Prot	NA	Free	Perm	NA	Free	Perm	NA	Free
Protected Phases	7	4		3	8			2			6	
Permitted Phases			Free			Free	2		Free	6		Free
Actuated Green, G (s)	11.0	17.0	90.0	12.0	18.0	90.0	43.0	43.0	90.0	43.0	43.0	90.0
Effective Green, g (s)	13.0	19.0	90.0	14.0	20.0	90.0	45.0	45.0	90.0	45.0	45.0	90.0
Actuated g/C Ratio	0.14	0.21	1.00	0.16	0.22	1.00	0.50	0.50	1.00	0.50	0.50	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	245	716	1479	264	753	1479	300	873	1461	203	873	1461
v/s Ratio Prot	0.13	0.17		c0.14	c0.21			0.36			0.28	
v/s Ratio Perm			c0.17			0.06	c0.43		0.15	0.11		0.06
v/c Ratio	0.91	0.81	0.17	0.89	0.94	0.06	0.86	0.72	0.15	0.22	0.56	0.06
Uniform Delay, d1	38.0	33.8	0.0	37.2	34.4	0.0	19.7	17.6	0.0	12.7	15.7	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.18	1.21	1.00	1.00	1.00	1.00
Incremental Delay, d2	35.1	6.9	0.3	28.8	18.8	0.1	18.8	3.6	0.1	2.5	2.6	0.1
Delay (s)	73.1	40.7	0.3	66.0	53.2	0.1	41.9	24.9	0.1	15.2	18.3	0.1
Level of Service	E	D	A	E	D	A	D	C	A	B	B	A
Approach Delay (s)		37.8			51.9			24.1			15.4	
Approach LOS		D			D			C			B	

Intersection Summary			
HCM Average Control Delay	33.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	85.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Queues
4: Raleigh St. & McLeod Ave.

4/11/2012

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	588	681	343	302
v/c Ratio	0.51	0.85	0.34	0.36
Control Delay	24.7	22.0	13.6	10.6
Queue Delay	0.8	0.3	0.0	0.0
Total Delay	25.5	22.3	13.6	10.6
Queue Length 50th (m)	40.0	29.1	29.0	13.1
Queue Length 95th (m)	45.9	m31.3	57.7	32.6
Internal Link Dist (m)	36.0	28.1	267.0	425.3
Turn Bay Length (m)				
Base Capacity (vph)	1271	1064	999	830
Starvation Cap Reductn	0	74	0	0
Spillback Cap Reductn	383	0	15	10
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.66	0.69	0.35	0.37

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	522	37	83	380	184	24	215	87	98	172	17
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		*1.00			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.96			0.96			0.99	
Flt Protected		1.00			0.99			1.00			0.98	
Satd. Flow (prot)		3445			3107			1905			1942	
Flt Permitted		1.00			0.71			0.96			0.78	
Satd. Flow (perm)		3445			2234			1842			1547	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	549	39	87	400	194	25	226	92	103	181	18
RTOR Reduction (vph)	0	6	0	0	58	0	0	12	0	0	2	0
Lane Group Flow (vph)	0	582	0	0	623	0	0	331	0	0	300	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type		NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases				8			2			6		
Actuated Green, G (s)		29.8			29.8			48.2			48.2	
Effective Green, g (s)		29.8			29.8			48.2			48.2	
Actuated g/C Ratio		0.33			0.33			0.54			0.54	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1141			740			986			829	
v/s Ratio Prot		0.17										
v/s Ratio Perm					c0.28			0.18			c0.19	
v/c Ratio		0.51			0.84			0.34			0.36	
Uniform Delay, d1		24.2			27.9			11.8			12.0	
Progression Factor		1.00			0.56			1.00			0.68	
Incremental Delay, d2		0.4			6.6			0.9			1.1	
Delay (s)		24.6			22.2			12.8			9.3	
Level of Service		C			C			B			A	
Approach Delay (s)		24.6			22.2			12.8			9.3	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	19.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	92.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	743	616	778	998
v/c Ratio	1.02	0.53	0.68	0.96
Control Delay	59.4	22.0	19.9	34.4
Queue Delay	67.2	0.0	0.9	42.4
Total Delay	126.7	22.1	20.8	76.8
Queue Length 50th (m)	~64.8	38.3	49.5	65.8
Queue Length 95th (m)	#107.5	54.3	70.0 m	#119.5
Internal Link Dist (m)	28.1	47.4	40.9	41.4
Turn Bay Length (m)				
Base Capacity (vph)	726	1162	1151	1044
Starvation Cap Reductn	103	0	0	0
Spillback Cap Reductn	0	13	152	136
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	1.19	0.54	0.78	1.10

Intersection Summary

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

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

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
6: Gateway Rd & McLeod Ave.

4/11/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	180	402	124	0	406	180	76	615	48	178	604	166
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.97			0.95			0.99			0.97	
Flt Protected		0.99			1.00			0.99			0.99	
Satd. Flow (prot)		3167			3135			3259			3180	
Flt Permitted		0.62			1.00			0.68			0.62	
Satd. Flow (perm)		1985			3135			2241			2004	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	189	423	131	0	427	189	80	647	51	187	636	175
RTOR Reduction (vph)	0	20	0	0	48	0	0	6	0	0	20	0
Lane Group Flow (vph)	0	723	0	0	568	0	0	772	0	0	978	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA			NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4						2			6		
Actuated Green, G (s)		32.0			32.0			46.0			46.0	
Effective Green, g (s)		32.0			32.0			46.0			46.0	
Actuated g/C Ratio		0.36			0.36			0.51			0.51	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		706			1115			1145			1024	
v/s Ratio Prot					0.18							
v/s Ratio Perm		c0.36						0.34			c0.49	
v/c Ratio		1.02			0.51			0.67			0.96	
Uniform Delay, d1		29.0			22.8			16.4			21.0	
Progression Factor		0.66			1.00			1.00			0.74	
Incremental Delay, d2		38.7			0.4			3.2			17.5	
Delay (s)		58.0			23.2			19.6			33.2	
Level of Service		E			C			B			C	
Approach Delay (s)		58.0			23.2			19.6			33.2	
Approach LOS		E			C			B			C	

Intersection Summary			
HCM Average Control Delay	33.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	110.7%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Queues
7: Gateway Rd & Lexington Park

4/11/2012



Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	294	192	1053	212	580
v/c Ratio	0.98	0.45	0.99	0.89	0.42
Control Delay	85.5	8.8	46.2	51.8	7.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	85.5	8.8	46.2	51.8	7.9
Queue Length 50th (m)	51.1	0.0	158.9	22.2	43.3
Queue Length 95th (m)	#99.7	17.0	m#242.3	m#53.9	47.2
Internal Link Dist (m)	196.0		47.6		136.6
Turn Bay Length (m)		70.0		100.0	
Base Capacity (vph)	301	428	1061	237	1378
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.98	0.45	0.99	0.89	0.42

Intersection Summary

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

m Volume for 95th percentile queue is metered by upstream signal.



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	279	182	679	321	201	551
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Width	3.7	3.7	4.8	4.8	4.8	4.8
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.96		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1695	1517	1913		1900	2000
Flt Permitted	0.95	1.00	1.00		0.07	1.00
Satd. Flow (perm)	1695	1517	1913		145	2000
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	294	192	715	338	212	580
RTOR Reduction (vph)	0	158	19	0	0	0
Lane Group Flow (vph)	294	34	1034	0	212	580
Turn Type	NA	Perm	NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Actuated Green, G (s)	16.0	16.0	49.0		62.0	62.0
Effective Green, g (s)	16.0	16.0	49.0		62.0	62.0
Actuated g/C Ratio	0.18	0.18	0.54		0.69	0.69
Clearance Time (s)	6.0	6.0	6.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	301	270	1042		236	1378
v/s Ratio Prot	c0.17		c0.54		c0.07	0.29
v/s Ratio Perm		0.02			0.55	
v/c Ratio	0.98	0.13	0.99		0.90	0.42
Uniform Delay, d1	36.8	31.1	20.3		27.1	6.1
Progression Factor	1.00	1.00	1.15		1.19	1.15
Incremental Delay, d2	45.1	0.2	22.5		25.8	0.7
Delay (s)	81.9	31.3	46.0		58.1	7.7
Level of Service	F	C	D		E	A
Approach Delay (s)	61.9		46.0			21.2
Approach LOS	E		D			C

Intersection Summary			
HCM Average Control Delay	40.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	101.4%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	571	185	906	982
v/c Ratio	0.82	0.23	0.75	0.67
Control Delay	31.2	15.6	11.9	12.6
Queue Delay	6.5	0.0	17.0	2.8
Total Delay	37.7	15.7	28.9	15.4
Queue Length 50th (m)	18.3	7.6	26.5	46.0
Queue Length 95th (m)	26.4	15.5	m32.5	m66.5
Internal Link Dist (m)	26.6	66.6	41.6	44.5
Turn Bay Length (m)				
Base Capacity (vph)	749	788	1202	1471
Starvation Cap Reductn	133	0	0	0
Spillback Cap Reductn	0	23	303	361
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.93	0.24	1.01	0.88

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	252	126	164	20	90	66	123	728	10	77	568	288
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			0.99	
Flpb, ped/bikes		0.99			1.00			1.00			1.00	
Frt		0.95			0.94			1.00			0.95	
Flt Protected		0.98			0.99			0.99			1.00	
Satd. Flow (prot)		3048			3077			3284			3121	
Flt Permitted		0.74			0.86			0.62			0.77	
Satd. Flow (perm)		2315			2659			2040			2408	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	265	133	173	21	95	69	129	766	11	81	598	303
RTOR Reduction (vph)	0	56	0	0	50	0	0	1	0	0	54	0
Lane Group Flow (vph)	0	515	0	0	135	0	0	905	0	0	928	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		25.0			25.0			53.0			53.0	
Effective Green, g (s)		25.0			25.0			53.0			53.0	
Actuated g/C Ratio		0.28			0.28			0.59			0.59	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		643			739			1201			1418	
v/s Ratio Prot												
v/s Ratio Perm		c0.22			0.05			c0.44			0.39	
v/c Ratio		0.80			0.18			0.75			0.65	
Uniform Delay, d1		30.2			24.7			13.7			12.4	
Progression Factor		0.83			1.00			0.66			0.92	
Incremental Delay, d2		6.6			0.1			2.0			2.0	
Delay (s)		31.6			24.8			11.1			13.4	
Level of Service		C			C			B			B	
Approach Delay (s)		31.6			24.8			11.1			13.4	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	17.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	99.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	461	528	420	84
v/c Ratio	0.49	0.80	0.46	0.10
Control Delay	24.1	35.6	13.7	10.9
Queue Delay	0.2	21.9	0.1	0.0
Total Delay	24.3	57.6	13.8	10.9
Queue Length 50th (m)	30.8	47.5	33.6	6.0
Queue Length 95th (m)	38.5	64.3	62.4	15.4
Internal Link Dist (m)	106.3	26.6	428.1	253.1
Turn Bay Length (m)				
Base Capacity (vph)	998	869	920	870
Starvation Cap Reductn	0	344	0	0
Spillback Cap Reductn	105	0	50	45
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.52	1.01	0.48	0.10

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	333	100	145	269	87	137	88	174	35	42	3
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			0.99			1.00	
Frt		0.97			0.97			0.94			1.00	
Flt Protected		1.00			0.99			0.98			0.98	
Satd. Flow (prot)		3166			3145			1818			1939	
Flt Permitted		0.95			0.66			0.86			0.78	
Satd. Flow (perm)		3005			2121			1584			1537	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	351	105	153	283	92	144	93	183	37	44	3
RTOR Reduction (vph)	0	30	0	0	23	0	0	25	0	0	1	0
Lane Group Flow (vph)	0	431	0	0	505	0	0	395	0	0	83	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		27.2			27.2			50.8			50.8	
Effective Green, g (s)		27.2			27.2			50.8			50.8	
Actuated g/C Ratio		0.30			0.30			0.56			0.56	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		908			641			894			868	
v/s Ratio Prot												
v/s Ratio Perm		0.14			c0.24			c0.25			0.05	
v/c Ratio		0.47			0.79			0.44			0.10	
Uniform Delay, d1		25.6			28.8			11.4			9.0	
Progression Factor		1.00			1.06			1.08			1.00	
Incremental Delay, d2		0.4			5.1			1.4			0.2	
Delay (s)		26.0			35.7			13.7			9.2	
Level of Service		C			D			B			A	
Approach Delay (s)		26.0			35.7			13.7			9.2	
Approach LOS		C			D			B			A	

Intersection Summary			
HCM Average Control Delay	25.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	105	55	965	10	5	843
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	111	58	1016	11	5	887
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						192
pX, platoon unblocked	0.86					
vC, conflicting volume	1919	1021			1026	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1987	1021			1026	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	80			99	
cM capacity (veh/h)	57	287			677	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	168	1026	893
Volume Left	111	0	5
Volume Right	58	11	0
cSH	79	1700	677
Volume to Capacity	2.13	0.60	0.01
Queue Length 95th (m)	116.3	0.0	0.2
Control Delay (s)	634.6	0.0	0.2
Lane LOS	F		A
Approach Delay (s)	634.6	0.0	0.2
Approach LOS	F		

Intersection Summary			
Average Delay	51.3		
Intersection Capacity Utilization	70.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	55	43	956	64	37	793
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	58	45	1006	67	39	835
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						72
pX, platoon unblocked	0.86					
vC, conflicting volume	1953	1040			1074	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2025	1040			1074	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	84			94	
cM capacity (veh/h)	51	280			649	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	103	1074	874
Volume Left	58	0	39
Volume Right	45	67	0
cSH	80	1700	649
Volume to Capacity	1.29	0.63	0.06
Queue Length 95th (m)	59.5	0.0	1.5
Control Delay (s)	289.0	0.0	1.7
Lane LOS	F		A
Approach Delay (s)	289.0	0.0	1.7
Approach LOS	F		

Intersection Summary			
Average Delay	15.3		
Intersection Capacity Utilization	88.5%	ICU Level of Service	E
Analysis Period (min)	15		

Queues
2: Gateway Rd & Chief Peguis Trail

4/13/2012

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	60	476	101	192	552	21	186	304	172	43	568	164
v/c Ratio	0.37	0.70	0.07	0.74	0.58	0.01	0.74	0.34	0.12	0.10	0.63	0.11
Control Delay	44.7	39.5	0.1	54.3	31.0	0.0	40.7	16.1	0.2	12.6	20.3	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.7	39.5	0.1	54.3	31.0	0.0	40.7	16.1	0.2	12.6	20.3	0.2
Queue Length 50th (m)	9.9	39.9	0.0	32.0	44.0	0.0	22.8	32.8	0.0	3.7	69.4	0.0
Queue Length 95th (m)	21.7	56.2	0.0	#61.8	60.5	0.0	#60.4	53.8	0.0	9.3	104.4	0.0
Internal Link Dist (m)		229.1			234.8			129.3			255.9	
Turn Bay Length (m)	175.0		185.0	180.0		180.0	115.0		95.0	100.0		115.0
Base Capacity (vph)	170	716	1479	268	959	1479	251	895	1461	451	895	1461
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.66	0.07	0.72	0.58	0.01	0.74	0.34	0.12	0.10	0.63	0.11

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
2: Gateway Rd & Chief Peguis Trail

4/13/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	452	96	182	524	20	177	289	163	41	540	156
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.7	3.7	3.7	3.7	3.7	3.7	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1695	3390	1479	1695	3390	1479	1652	1745	1461	1643	1745	1461
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.28	1.00	1.00	0.51	1.00	1.00
Satd. Flow (perm)	1695	3390	1479	1695	3390	1479	491	1745	1461	880	1745	1461
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	60	476	101	192	552	21	186	304	172	43	568	164
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	60	476	101	192	552	21	186	304	172	43	568	164
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Prot	NA	Free	Prot	NA	Free	Perm	NA	Free	Perm	NA	Free
Protected Phases	7	4		3	8			2			6	
Permitted Phases			Free			Free	2		Free	6		Free
Actuated Green, G (s)	5.6	16.0	90.0	13.1	23.5	90.0	42.9	42.9	90.0	42.9	42.9	90.0
Effective Green, g (s)	7.6	18.0	90.0	15.1	25.5	90.0	44.9	44.9	90.0	44.9	44.9	90.0
Actuated g/C Ratio	0.08	0.20	1.00	0.17	0.28	1.00	0.50	0.50	1.00	0.50	0.50	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	143	678	1479	284	961	1479	245	871	1461	439	871	1461
v/s Ratio Prot	0.04	c0.14		c0.11	0.16			0.17			0.33	
v/s Ratio Perm			0.07			0.01	c0.38		0.12	0.05		0.11
v/c Ratio	0.42	0.70	0.07	0.68	0.57	0.01	0.76	0.35	0.12	0.10	0.65	0.11
Uniform Delay, d1	39.1	33.5	0.0	35.2	27.6	0.0	18.2	13.7	0.0	11.9	16.7	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.12	1.10	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	3.3	0.1	6.2	0.8	0.0	19.0	1.1	0.2	0.4	3.8	0.2
Delay (s)	41.1	36.8	0.1	41.4	28.4	0.0	39.3	16.2	0.2	12.3	20.5	0.2
Level of Service	D	D	A	D	C	A	D	B	A	B	C	A
Approach Delay (s)		31.4			30.9			18.5			15.8	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	24.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	77.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Queues
4: Raleigh St. & McLeod Ave.

4/13/2012

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	419	693	225	451
v/c Ratio	0.32	0.78	0.25	0.54
Control Delay	19.0	18.0	14.7	13.3
Queue Delay	0.1	0.0	0.0	0.0
Total Delay	19.0	18.0	14.7	13.3
Queue Length 50th (m)	23.8	20.4	20.2	28.9
Queue Length 95th (m)	30.2	26.0	39.3	41.7
Internal Link Dist (m)	36.0	28.1	267.0	425.3
Turn Bay Length (m)				
Base Capacity (vph)	1354	1064	897	832
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	137	0	1	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.34	0.65	0.25	0.54

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	365	33	178	348	133	20	147	47	103	302	24
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		*1.00			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.97			0.97			0.99	
Flt Protected		1.00			0.99			1.00			0.99	
Satd. Flow (prot)		3433			3129			1919			1953	
Flt Permitted		1.00			0.72			0.94			0.86	
Satd. Flow (perm)		3433			2276			1818			1702	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	384	35	187	366	140	21	155	49	108	318	25
RTOR Reduction (vph)	0	7	0	0	29	0	0	10	0	0	2	0
Lane Group Flow (vph)	0	412	0	0	664	0	0	215	0	0	449	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type		NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases				8			2			6		
Actuated Green, G (s)		34.1			34.1			43.9			43.9	
Effective Green, g (s)		34.1			34.1			43.9			43.9	
Actuated g/C Ratio		0.38			0.38			0.49			0.49	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1301			862			887			830	
v/s Ratio Prot		0.12										
v/s Ratio Perm					c0.29			0.12			c0.26	
v/c Ratio		0.32			0.77			0.24			0.54	
Uniform Delay, d1		19.7			24.5			13.4			16.0	
Progression Factor		1.00			0.56			1.00			0.60	
Incremental Delay, d2		0.1			3.7			0.6			2.5	
Delay (s)		19.9			17.3			14.0			12.1	
Level of Service		B			B			B			B	
Approach Delay (s)		19.9			17.3			14.0			12.1	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	16.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	541	660	457	711
v/c Ratio	0.79	0.58	0.33	0.56
Control Delay	25.0	23.5	14.0	22.1
Queue Delay	0.2	0.2	0.0	0.1
Total Delay	25.2	23.7	14.0	22.2
Queue Length 50th (m)	41.7	43.8	22.3	54.3
Queue Length 95th (m)	55.7	53.8	37.5	77.0
Internal Link Dist (m)	28.1	47.4	40.9	41.4
Turn Bay Length (m)				
Base Capacity (vph)	822	1174	1378	1266
Starvation Cap Reductn	30	0	0	0
Spillback Cap Reductn	0	92	41	38
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.68	0.61	0.34	0.58

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	141	278	95	0	472	155	48	337	48	124	411	140
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.97			0.96			0.98			0.97	
Flt Protected		0.99			1.00			0.99			0.99	
Satd. Flow (prot)		3159			3170			3230			3160	
Flt Permitted		0.59			1.00			0.81			0.75	
Satd. Flow (perm)		1897			3170			2634			2392	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	148	293	100	0	497	163	51	355	51	131	433	147
RTOR Reduction (vph)	0	24	0	0	33	0	0	9	0	0	23	0
Lane Group Flow (vph)	0	517	0	0	627	0	0	448	0	0	688	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA			NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4						2			6		
Actuated Green, G (s)		31.2			31.2			46.8			46.8	
Effective Green, g (s)		31.2			31.2			46.8			46.8	
Actuated g/C Ratio		0.35			0.35			0.52			0.52	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		658			1099			1370			1244	
v/s Ratio Prot					0.20							
v/s Ratio Perm		c0.27						0.17			c0.29	
v/c Ratio		0.79			0.57			0.33			0.55	
Uniform Delay, d1		26.4			23.9			12.5			14.6	
Progression Factor		0.68			1.00			1.00			1.34	
Incremental Delay, d2		5.9			0.7			0.6			1.7	
Delay (s)		23.7			24.7			13.1			21.3	
Level of Service		C			C			B			C	
Approach Delay (s)		23.7			24.7			13.1			21.3	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	21.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	89.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	175	102	372	133	71	510
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	184	107	392	140	75	537
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		9				
Median type			None			None
Median storage veh)						
Upstream signal (m)						226
pX, platoon unblocked	0.89					
vC, conflicting volume	1148	462			392	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1105	462			392	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	5	82			94	
cM capacity (veh/h)	195	600			1167	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	292	532	612
Volume Left	184	0	75
Volume Right	107	140	0
cSH	308	1700	1167
Volume to Capacity	0.95	0.31	0.06
Queue Length 95th (m)	72.0	0.0	1.6
Control Delay (s)	68.3	0.0	1.7
Lane LOS	F		A
Approach Delay (s)	68.3	0.0	1.7
Approach LOS	F		

Intersection Summary			
Average Delay	14.6		
Intersection Capacity Utilization	81.9%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	332	143	498	861
v/c Ratio	0.67	0.27	0.28	0.41
Control Delay	23.2	19.9	4.4	5.3
Queue Delay	0.4	0.0	0.1	0.2
Total Delay	23.6	20.0	4.5	5.4
Queue Length 50th (m)	13.7	7.0	9.3	12.7
Queue Length 95th (m)	20.7	13.6	18.3	47.5
Internal Link Dist (m)	26.6	66.6	41.6	44.5
Turn Bay Length (m)				
Base Capacity (vph)	823	663	1761	2084
Starvation Cap Reductn	160	0	0	0
Spillback Cap Reductn	0	15	372	421
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.50	0.22	0.36	0.52

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	170	36	109	9	76	51	59	408	7	23	459	336
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			0.99	
Flpb, ped/bikes		0.99			1.00			1.00			1.00	
Frt		0.95			0.94			1.00			0.94	
Flt Protected		0.97			1.00			0.99			1.00	
Satd. Flow (prot)		3008			3083			3285			3070	
Flt Permitted		0.75			0.92			0.77			0.93	
Satd. Flow (perm)		2314			2841			2534			2867	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	179	38	115	9	80	54	62	429	7	24	483	354
RTOR Reduction (vph)	0	94	0	0	45	0	0	1	0	0	94	0
Lane Group Flow (vph)	0	238	0	0	98	0	0	497	0	0	767	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		15.5			15.5			62.5			62.5	
Effective Green, g (s)		15.5			15.5			62.5			62.5	
Actuated g/C Ratio		0.17			0.17			0.69			0.69	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		399			489			1760			1991	
v/s Ratio Prot												
v/s Ratio Perm		c0.10			0.03			0.20			c0.27	
v/c Ratio		0.60			0.20			0.28			0.39	
Uniform Delay, d1		34.4			31.9			5.2			5.7	
Progression Factor		0.74			1.00			0.67			1.16	
Incremental Delay, d2		2.4			0.2			0.4			0.5	
Delay (s)		27.9			32.1			3.9			7.1	
Level of Service		C			C			A			A	
Approach Delay (s)		27.9			32.1			3.9			7.1	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	12.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	78.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	316	496	233	148
v/c Ratio	0.35	0.73	0.24	0.15
Control Delay	12.5	31.3	8.9	10.4
Queue Delay	0.0	0.3	0.0	0.0
Total Delay	12.5	31.6	8.9	10.4
Queue Length 50th (m)	10.9	41.0	15.5	10.6
Queue Length 95th (m)	18.3	57.4	36.6	24.3
Internal Link Dist (m)	106.3	26.6	428.1	253.1
Turn Bay Length (m)				
Base Capacity (vph)	1141	1121	972	964
Starvation Cap Reductn	0	219	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.28	0.55	0.24	0.15

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	145	150	163	192	116	65	42	115	55	84	2
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.98			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			0.99			1.00			1.00	
Frt		0.93			0.96			0.93			1.00	
Flt Protected		1.00			0.98			0.99			0.98	
Satd. Flow (prot)		2991			3083			1799			1948	
Flt Permitted		0.95			0.72			0.88			0.82	
Satd. Flow (perm)		2832			2269			1601			1634	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	153	158	172	202	122	68	44	121	58	88	2
RTOR Reduction (vph)	0	114	0	0	48	0	0	29	0	0	0	0
Lane Group Flow (vph)	0	202	0	0	448	0	0	204	0	0	148	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		25.0			25.0			53.0			53.0	
Effective Green, g (s)		25.0			25.0			53.0			53.0	
Actuated g/C Ratio		0.28			0.28			0.59			0.59	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		787			630			943			962	
v/s Ratio Prot												
v/s Ratio Perm		0.07			c0.20			c0.13			0.09	
v/c Ratio		0.26			0.71			0.22			0.15	
Uniform Delay, d1		25.3			29.2			8.7			8.4	
Progression Factor		1.00			1.02			1.14			1.00	
Incremental Delay, d2		0.2			3.6			0.5			0.3	
Delay (s)		25.4			33.4			10.4			8.7	
Level of Service		C			C			B			A	
Approach Delay (s)		25.4			33.4			10.4			8.7	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	23.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	57.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	42	21	499	134	47	633
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	44	22	525	141	49	666
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	1361	596			666	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1361	596			666	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	71	96			95	
cM capacity (veh/h)	155	504			923	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	66	666	716
Volume Left	44	0	49
Volume Right	22	141	0
cSH	201	1700	923
Volume to Capacity	0.33	0.39	0.05
Queue Length 95th (m)	10.4	0.0	1.3
Control Delay (s)	31.5	0.0	1.4
Lane LOS	D		A
Approach Delay (s)	31.5	0.0	1.4
Approach LOS	D		

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	86.5%	ICU Level of Service	E
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	5	5	500	20	10	675
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	5	526	21	11	711
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						298
pX, platoon unblocked	0.94					
vC, conflicting volume	1268	537			547	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1254	537			547	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	99			99	
cM capacity (veh/h)	177	544			1022	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	11	547	721
Volume Left	5	0	11
Volume Right	5	21	0
cSH	267	1700	1022
Volume to Capacity	0.04	0.32	0.01
Queue Length 95th (m)	0.9	0.0	0.2
Control Delay (s)	19.1	0.0	0.3
Lane LOS	C		A
Approach Delay (s)	19.1	0.0	0.3
Approach LOS	C		

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization		55.9%	ICU Level of Service B
Analysis Period (min)		15	

Queues
2: Gateway Rd & Chief Peguis Trail

4/13/2012



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	224	580	243	228	705	82	253	634	222	45	477	92
v/c Ratio	0.85	0.80	0.16	0.82	0.94	0.06	0.85	0.74	0.15	0.24	0.56	0.06
Control Delay	66.1	43.5	0.2	60.4	56.1	0.1	44.7	25.8	0.2	17.5	19.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	66.1	43.5	0.2	60.4	56.1	0.1	44.7	25.8	0.2	17.5	19.4	0.1
Queue Length 50th (m)	38.1	50.5	0.0	38.4	63.2	0.0	36.5	90.9	0.0	4.3	55.6	0.0
Queue Length 95th (m)	#76.4	#74.6	0.0	#74.8	#96.8	0.0	m#70.5	125.0	m0.0	12.0	84.1	0.0
Internal Link Dist (m)		229.1			234.8			129.3			255.9	
Turn Bay Length (m)	175.0		185.0	180.0		180.0	115.0		95.0	100.0		115.0
Base Capacity (vph)	264	723	1479	283	753	1479	297	853	1461	189	853	1461
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.85	0.80	0.16	0.81	0.94	0.06	0.85	0.74	0.15	0.24	0.56	0.06

Intersection Summary

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

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	213	551	231	217	670	78	240	602	211	43	453	87
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.7	3.7	3.7	3.7	3.7	3.7	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1695	3390	1479	1695	3390	1479	1649	1745	1461	1658	1745	1461
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.35	1.00	1.00	0.22	1.00	1.00
Satd. Flow (perm)	1695	3390	1479	1695	3390	1479	608	1745	1461	387	1745	1461
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	224	580	243	228	705	82	253	634	222	45	477	92
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	224	580	243	228	705	82	253	634	222	45	477	92
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Prot	NA	Free	Prot	NA	Free	Perm	NA	Free	Perm	NA	Free
Protected Phases	7	4		3	8			2			6	
Permitted Phases			Free			Free	2		Free	6		Free
Actuated Green, G (s)	12.0	17.2	90.0	12.8	18.0	90.0	42.0	42.0	90.0	42.0	42.0	90.0
Effective Green, g (s)	14.0	19.2	90.0	14.8	20.0	90.0	44.0	44.0	90.0	44.0	44.0	90.0
Actuated g/C Ratio	0.16	0.21	1.00	0.16	0.22	1.00	0.49	0.49	1.00	0.49	0.49	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	264	723	1479	279	753	1479	297	853	1461	189	853	1461
v/s Ratio Prot	0.13	0.17		c0.13	c0.21			0.36			0.27	
v/s Ratio Perm			c0.16			0.06	c0.42		0.15	0.12		0.06
v/c Ratio	0.85	0.80	0.16	0.82	0.94	0.06	0.85	0.74	0.15	0.24	0.56	0.06
Uniform Delay, d1	37.0	33.6	0.0	36.3	34.4	0.0	20.1	18.5	0.0	13.3	16.2	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.12	1.12	1.00	1.00	1.00	1.00
Incremental Delay, d2	21.6	6.4	0.2	16.7	18.8	0.1	18.8	4.1	0.2	3.0	2.6	0.1
Delay (s)	58.5	40.0	0.2	53.0	53.2	0.1	41.5	24.8	0.2	16.3	18.8	0.1
Level of Service	E	D	A	D	D	A	D	C	A	B	B	A
Approach Delay (s)		34.7			48.9			23.7			15.8	
Approach LOS		C			D			C			B	

Intersection Summary			
HCM Average Control Delay	32.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Queues
4: Raleigh St. & McLeod Ave.

4/13/2012

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	570	668	500	344
v/c Ratio	0.50	0.84	0.49	0.44
Control Delay	24.4	23.5	16.1	10.2
Queue Delay	0.5	0.1	0.1	0.1
Total Delay	24.9	23.6	16.2	10.3
Queue Length 50th (m)	38.1	28.5	49.9	15.1
Queue Length 95th (m)	45.8	m30.7	89.6	36.6
Internal Link Dist (m)	36.0	28.1	267.0	425.3
Turn Bay Length (m)				
Base Capacity (vph)	1192	969	1016	788
Starvation Cap Reductn	0	24	0	0
Spillback Cap Reductn	260	0	46	35
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.61	0.71	0.52	0.46

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
4: Raleigh St. & McLeod Ave.

4/13/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	504	37	83	419	133	24	364	87	98	212	17
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		*1.00			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.97			0.98			0.99	
Flt Protected		1.00			0.99			1.00			0.99	
Satd. Flow (prot)		3443			3154			1934			1950	
Flt Permitted		1.00			0.72			0.97			0.74	
Satd. Flow (perm)		3443			2293			1886			1470	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	531	39	87	441	140	25	383	92	103	223	18
RTOR Reduction (vph)	0	6	0	0	30	0	0	8	0	0	2	0
Lane Group Flow (vph)	0	564	0	0	638	0	0	492	0	0	342	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type		NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases				8			2			6		
Actuated Green, G (s)		29.9			29.9			48.1			48.1	
Effective Green, g (s)		29.9			29.9			48.1			48.1	
Actuated g/C Ratio		0.33			0.33			0.53			0.53	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1144			762			1008			786	
v/s Ratio Prot		0.16										
v/s Ratio Perm					c0.28			c0.26			0.23	
v/c Ratio		0.49			0.84			0.49			0.44	
Uniform Delay, d1		24.0			27.8			13.2			12.7	
Progression Factor		1.00			0.60			1.00			0.59	
Incremental Delay, d2		0.3			6.2			1.7			1.7	
Delay (s)		24.3			22.8			14.9			9.2	
Level of Service		C			C			B			A	
Approach Delay (s)		24.3			22.8			14.9			9.2	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	19.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	101.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Queues
6: Gateway Rd & McLeod Ave.

4/13/2012

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	725	610	688	1071
v/c Ratio	1.02	0.54	0.59	0.94
Control Delay	57.3	23.0	17.1	38.2
Queue Delay	25.6	0.0	0.4	36.4
Total Delay	82.9	23.1	17.5	74.6
Queue Length 50th (m)	~63.7	39.0	40.0	90.4
Queue Length 95th (m)	#105.0	55.0	57.1	#133.3
Internal Link Dist (m)	28.1	47.4	40.9	41.4
Turn Bay Length (m)				
Base Capacity (vph)	712	1126	1169	1138
Starvation Cap Reductn	47	0	0	0
Spillback Cap Reductn	0	24	151	147
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	1.09	0.55	0.68	1.08

Intersection Summary

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

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	162	402	124	0	406	174	69	536	48	176	682	160
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.97			0.95			0.99			0.98	
Flt Protected		0.99			1.00			0.99			0.99	
Satd. Flow (prot)		3168			3139			3254			3193	
Flt Permitted		0.63			1.00			0.68			0.67	
Satd. Flow (perm)		2005			3139			2224			2147	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	171	423	131	0	427	183	73	564	51	185	718	168
RTOR Reduction (vph)	0	21	0	0	45	0	0	7	0	0	17	0
Lane Group Flow (vph)	0	704	0	0	565	0	0	681	0	0	1054	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA			NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4						2			6		
Actuated Green, G (s)		31.0			31.0			47.0			47.0	
Effective Green, g (s)		31.0			31.0			47.0			47.0	
Actuated g/C Ratio		0.34			0.34			0.52			0.52	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		691			1081			1161			1121	
v/s Ratio Prot					0.18							
v/s Ratio Perm		c0.35						0.31			c0.49	
v/c Ratio		1.02			0.52			0.59			0.94	
Uniform Delay, d1		29.5			23.6			14.8			20.2	
Progression Factor		0.63			1.00			1.00			1.11	
Incremental Delay, d2		37.2			0.5			2.2			15.4	
Delay (s)		55.8			24.0			17.0			37.7	
Level of Service		E			C			B			D	
Approach Delay (s)		55.8			24.0			17.0			37.7	
Approach LOS		E			C			B			D	

Intersection Summary			
HCM Average Control Delay	34.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	109.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	259	153	688	269	202	539
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	273	161	724	283	213	567
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		9				
Median type			None			None
Median storage veh)						
Upstream signal (m)						226
pX, platoon unblocked	0.80					
vC, conflicting volume	1858	866			724	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1950	866			724	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	54			76	
cM capacity (veh/h)	43	353			878	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	434	1007	780
Volume Left	273	0	213
Volume Right	161	283	0
cSH	64	1700	878
Volume to Capacity	6.82	0.59	0.24
Queue Length 95th (m)	Err	0.0	7.2
Control Delay (s)	Err	0.0	5.6
Lane LOS	F		A
Approach Delay (s)	Err	0.0	5.6
Approach LOS	F		

Intersection Summary			
Average Delay	1954.4		
Intersection Capacity Utilization	122.4%	ICU Level of Service	H
Analysis Period (min)	15		

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	600	161	885	948
v/c Ratio	0.82	0.19	0.73	0.62
Control Delay	32.1	14.3	22.0	12.2
Queue Delay	6.7	0.0	8.8	1.5
Total Delay	38.8	14.3	30.7	13.7
Queue Length 50th (m)	20.2	6.2	59.4	43.5
Queue Length 95th (m)	28.8	13.3	m85.7	65.6
Internal Link Dist (m)	26.6	66.6	41.6	44.5
Turn Bay Length (m)				
Base Capacity (vph)	784	859	1214	1518
Starvation Cap Reductn	140	0	0	0
Spillback Cap Reductn	0	25	297	363
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.93	0.19	0.97	0.82

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	278	108	183	8	84	62	117	713	10	65	550	286
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			0.99	
Flpb, ped/bikes		0.99			1.00			1.00			1.00	
Frt		0.95			0.94			1.00			0.95	
Flt Protected		0.98			1.00			0.99			1.00	
Satd. Flow (prot)		3032			3071			3284			3117	
Flt Permitted		0.75			0.92			0.63			0.81	
Satd. Flow (perm)		2315			2832			2092			2521	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	293	114	193	8	88	65	123	751	11	68	579	301
RTOR Reduction (vph)	0	65	0	0	46	0	0	1	0	0	58	0
Lane Group Flow (vph)	0	535	0	0	115	0	0	884	0	0	890	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		25.8			25.8			52.2			52.2	
Effective Green, g (s)		25.8			25.8			52.2			52.2	
Actuated g/C Ratio		0.29			0.29			0.58			0.58	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		664			812			1213			1462	
v/s Ratio Prot												
v/s Ratio Perm		c0.23			0.04			c0.42			0.35	
v/c Ratio		0.81			0.14			0.73			0.61	
Uniform Delay, d1		29.8			23.9			13.8			12.3	
Progression Factor		0.90			1.00			1.23			0.94	
Incremental Delay, d2		6.6			0.1			3.5			1.6	
Delay (s)		33.3			23.9			20.4			13.2	
Level of Service		C			C			C			B	
Approach Delay (s)		33.3			23.9			20.4			13.2	
Approach LOS		C			C			C			B	

Intersection Summary			
HCM Average Control Delay	21.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	98.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	422	513	425	116
v/c Ratio	0.48	0.79	0.46	0.15
Control Delay	25.8	36.9	16.0	10.7
Queue Delay	0.2	11.1	0.1	0.0
Total Delay	26.0	48.1	16.1	10.8
Queue Length 50th (m)	29.6	45.7	47.0	8.3
Queue Length 95th (m)	37.2	61.7	81.8	20.2
Internal Link Dist (m)	106.3	26.6	428.1	253.1
Turn Bay Length (m)				
Base Capacity (vph)	953	864	931	776
Starvation Cap Reductn	0	323	0	0
Spillback Cap Reductn	110	0	81	67
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.50	0.95	0.50	0.16

Intersection Summary

HCM Signalized Intersection Capacity Analysis
13: Raleigh St & Springfield Rd

4/13/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	329	67	145	229	113	142	88	174	66	42	3
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			0.99			1.00	
Frt		0.97			0.97			0.94			1.00	
Flt Protected		1.00			0.99			0.98			0.97	
Satd. Flow (prot)		3204			3105			1819			1925	
Flt Permitted		0.95			0.68			0.84			0.67	
Satd. Flow (perm)		3039			2140			1557			1330	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	346	71	153	241	119	149	93	183	69	44	3
RTOR Reduction (vph)	0	19	0	0	37	0	0	24	0	0	1	0
Lane Group Flow (vph)	0	403	0	0	476	0	0	401	0	0	115	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		25.6			25.6			52.4			52.4	
Effective Green, g (s)		25.6			25.6			52.4			52.4	
Actuated g/C Ratio		0.28			0.28			0.58			0.58	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		864			609			907			774	
v/s Ratio Prot												
v/s Ratio Perm		0.13			c0.22			c0.26			0.09	
v/c Ratio		0.47			0.78			0.44			0.15	
Uniform Delay, d1		26.6			29.6			10.6			8.6	
Progression Factor		1.00			1.11			1.37			1.00	
Incremental Delay, d2		0.4			5.4			1.3			0.4	
Delay (s)		27.0			38.4			15.8			9.0	
Level of Service		C			D			B			A	
Approach Delay (s)		27.0			38.4			15.8			9.0	
Approach LOS		C			D			B			A	

Intersection Summary			
HCM Average Control Delay	26.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	105	55	862	10	5	913
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	111	58	907	11	5	961
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	1884	913			918	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1884	913			918	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	83			99	
cM capacity (veh/h)	77	332			743	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	168	918	966
Volume Left	111	0	5
Volume Right	58	11	0
cSH	105	1700	743
Volume to Capacity	1.61	0.54	0.01
Queue Length 95th (m)	97.7	0.0	0.2
Control Delay (s)	384.0	0.0	0.2
Lane LOS	F		A
Approach Delay (s)	384.0	0.0	0.2
Approach LOS	F		

Intersection Summary			
Average Delay	31.6		
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	160	98	860	57	40	758
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	168	103	905	60	42	798
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						298
pX, platoon unblocked	0.89					
vC, conflicting volume	1817	935			965	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1859	935			965	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	68			94	
cM capacity (veh/h)	67	322			713	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	272	965	840
Volume Left	168	0	42
Volume Right	103	60	0
cSH	96	1700	713
Volume to Capacity	2.83	0.57	0.06
Queue Length 95th (m)	196.6	0.0	1.4
Control Delay (s)	918.8	0.0	1.6
Lane LOS	F		A
Approach Delay (s)	918.8	0.0	1.6
Approach LOS	F		

Intersection Summary			
Average Delay	120.8		
Intersection Capacity Utilization	98.9%	ICU Level of Service	F
Analysis Period (min)	15		

Queues
2: Gateway Rd & Chief Peguis Trail

4/13/2012

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	60	476	101	192	552	21	186	304	172	43	568	164
v/c Ratio	0.37	0.70	0.07	0.74	0.58	0.01	0.74	0.34	0.12	0.10	0.63	0.11
Control Delay	44.7	39.5	0.1	54.3	31.0	0.0	45.2	19.1	0.2	12.6	20.3	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.7	39.5	0.1	54.3	31.0	0.0	45.2	19.1	0.2	12.6	20.3	0.2
Queue Length 50th (m)	9.9	39.9	0.0	32.0	44.0	0.0	29.9	44.2	0.0	3.7	69.4	0.0
Queue Length 95th (m)	21.7	56.2	0.0	#61.8	60.5	0.0	#60.3	61.2	0.0	9.3	104.4	0.0
Internal Link Dist (m)		229.1			234.8			129.3			255.9	
Turn Bay Length (m)	175.0		185.0	180.0		180.0	115.0		95.0	100.0		115.0
Base Capacity (vph)	170	716	1479	268	959	1479	251	895	1461	451	895	1461
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.66	0.07	0.72	0.58	0.01	0.74	0.34	0.12	0.10	0.63	0.11

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)	57	452	96	182	524	20	177	289	163	41	540	156
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.7	3.7	3.7	3.7	3.7	3.7	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1695	3390	1479	1695	3390	1479	1652	1745	1461	1643	1745	1461
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.28	1.00	1.00	0.51	1.00	1.00
Satd. Flow (perm)	1695	3390	1479	1695	3390	1479	491	1745	1461	880	1745	1461
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	60	476	101	192	552	21	186	304	172	43	568	164
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	60	476	101	192	552	21	186	304	172	43	568	164
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Prot	NA	Free	Prot	NA	Free	Perm	NA	Free	Perm	NA	Free
Protected Phases	7	4		3	8			2			6	
Permitted Phases			Free			Free	2		Free	6		Free
Actuated Green, G (s)	5.6	16.0	90.0	13.1	23.5	90.0	42.9	42.9	90.0	42.9	42.9	90.0
Effective Green, g (s)	7.6	18.0	90.0	15.1	25.5	90.0	44.9	44.9	90.0	44.9	44.9	90.0
Actuated g/C Ratio	0.08	0.20	1.00	0.17	0.28	1.00	0.50	0.50	1.00	0.50	0.50	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	143	678	1479	284	961	1479	245	871	1461	439	871	1461
v/s Ratio Prot	0.04	c0.14		c0.11	0.16			0.17			0.33	
v/s Ratio Perm			0.07			0.01	c0.38		0.12	0.05		0.11
v/c Ratio	0.42	0.70	0.07	0.68	0.57	0.01	0.76	0.35	0.12	0.10	0.65	0.11
Uniform Delay, d1	39.1	33.5	0.0	35.2	27.6	0.0	18.2	13.7	0.0	11.9	16.7	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.36	1.33	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	3.3	0.1	6.2	0.8	0.0	19.0	1.1	0.2	0.4	3.8	0.2
Delay (s)	41.1	36.8	0.1	41.4	28.4	0.0	43.8	19.2	0.2	12.3	20.5	0.2
Level of Service	D	D	A	D	C	A	D	B	A	B	C	A
Approach Delay (s)		31.4			30.9			21.2			15.8	
Approach LOS		C			C			C			B	

Intersection Summary			
HCM Average Control Delay	24.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	77.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Queues
4: Raleigh St. & McLeod Ave.

4/13/2012

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	419	693	225	451
v/c Ratio	0.32	0.78	0.25	0.54
Control Delay	19.0	18.1	14.7	13.2
Queue Delay	0.1	0.0	0.0	0.0
Total Delay	19.0	18.1	14.7	13.2
Queue Length 50th (m)	23.8	20.4	20.2	28.9
Queue Length 95th (m)	30.2	26.0	39.3	41.4
Internal Link Dist (m)	36.0	28.1	267.0	425.3
Turn Bay Length (m)				
Base Capacity (vph)	1354	1064	897	832
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	137	0	1	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.34	0.65	0.25	0.54

Intersection Summary

HCM Signalized Intersection Capacity Analysis
4: Raleigh St. & McLeod Ave.

4/13/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	365	33	178	348	133	20	147	47	103	302	24
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		*1.00			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.97			0.97			0.99	
Flt Protected		1.00			0.99			1.00			0.99	
Satd. Flow (prot)		3433			3129			1919			1953	
Flt Permitted		1.00			0.72			0.94			0.86	
Satd. Flow (perm)		3433			2276			1818			1702	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	384	35	187	366	140	21	155	49	108	318	25
RTOR Reduction (vph)	0	7	0	0	29	0	0	10	0	0	2	0
Lane Group Flow (vph)	0	412	0	0	664	0	0	215	0	0	449	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type		NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases				8			2			6		
Actuated Green, G (s)		34.1			34.1			43.9			43.9	
Effective Green, g (s)		34.1			34.1			43.9			43.9	
Actuated g/C Ratio		0.38			0.38			0.49			0.49	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1301			862			887			830	
v/s Ratio Prot		0.12										
v/s Ratio Perm					c0.29			0.12			c0.26	
v/c Ratio		0.32			0.77			0.24			0.54	
Uniform Delay, d1		19.7			24.5			13.4			16.0	
Progression Factor		1.00			0.56			1.00			0.60	
Incremental Delay, d2		0.1			3.7			0.6			2.5	
Delay (s)		19.9			17.4			14.0			12.0	
Level of Service		B			B			B			B	
Approach Delay (s)		19.9			17.4			14.0			12.0	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	16.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	541	660	457	711
v/c Ratio	0.79	0.58	0.33	0.56
Control Delay	25.0	23.5	14.0	16.9
Queue Delay	0.2	0.2	0.0	0.0
Total Delay	25.2	23.7	14.0	16.9
Queue Length 50th (m)	41.7	43.8	22.3	45.6
Queue Length 95th (m)	55.7	53.8	37.5	64.5
Internal Link Dist (m)	28.1	47.4	40.9	41.4
Turn Bay Length (m)				
Base Capacity (vph)	822	1174	1378	1266
Starvation Cap Reductn	30	0	0	0
Spillback Cap Reductn	0	91	27	26
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.68	0.61	0.34	0.57

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↑↑			↔			↔	
Volume (vph)	141	278	95	0	472	155	48	337	48	124	411	140
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.97			0.96			0.98			0.97	
Flt Protected		0.99			1.00			0.99			0.99	
Satd. Flow (prot)		3159			3170			3230			3160	
Flt Permitted		0.59			1.00			0.81			0.75	
Satd. Flow (perm)		1897			3170			2634			2392	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	148	293	100	0	497	163	51	355	51	131	433	147
RTOR Reduction (vph)	0	24	0	0	33	0	0	9	0	0	23	0
Lane Group Flow (vph)	0	517	0	0	627	0	0	448	0	0	688	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA			NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4						2			6		
Actuated Green, G (s)		31.2			31.2			46.8			46.8	
Effective Green, g (s)		31.2			31.2			46.8			46.8	
Actuated g/C Ratio		0.35			0.35			0.52			0.52	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		658			1099			1370			1244	
v/s Ratio Prot					0.20							
v/s Ratio Perm		c0.27						0.17			c0.29	
v/c Ratio		0.79			0.57			0.33			0.55	
Uniform Delay, d1		26.4			23.9			12.5			14.6	
Progression Factor		0.68			1.00			1.00			1.00	
Incremental Delay, d2		5.9			0.7			0.6			1.7	
Delay (s)		23.7			24.7			13.1			16.2	
Level of Service		C			C			B			B	
Approach Delay (s)		23.7			24.7			13.1			16.2	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	19.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	89.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	184	107	532	75	537
v/c Ratio	0.65	0.31	0.47	0.13	0.38
Control Delay	45.5	8.8	17.1	6.4	7.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	45.5	8.8	17.1	6.4	7.0
Queue Length 50th (m)	30.1	0.0	50.9	3.7	31.7
Queue Length 95th (m)	47.5	12.4	97.1	7.0	34.5
Internal Link Dist (m)	196.0		47.6		136.6
Turn Bay Length (m)		70.0		65.0	
Base Capacity (vph)	414	452	1142	562	1401
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.44	0.24	0.47	0.13	0.38

Intersection Summary



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	175	102	372	133	71	510
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Width	3.7	3.7	4.8	4.8	4.8	4.8
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.96		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1695	1517	1929		1900	2000
Flt Permitted	0.95	1.00	1.00		0.33	1.00
Satd. Flow (perm)	1695	1517	1929		669	2000
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	184	107	392	140	75	537
RTOR Reduction (vph)	0	89	12	0	0	0
Lane Group Flow (vph)	184	18	520	0	75	537
Turn Type	NA	Perm	NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Actuated Green, G (s)	15.0	15.0	51.4		63.0	63.0
Effective Green, g (s)	15.0	15.0	51.4		63.0	63.0
Actuated g/C Ratio	0.17	0.17	0.57		0.70	0.70
Clearance Time (s)	6.0	6.0	6.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	283	253	1102		545	1400
v/s Ratio Prot	c0.11		c0.27		0.01	c0.27
v/s Ratio Perm		0.01			0.09	
v/c Ratio	0.65	0.07	0.47		0.14	0.38
Uniform Delay, d1	35.0	31.6	11.3		5.8	5.5
Progression Factor	1.00	1.00	1.29		1.15	1.00
Incremental Delay, d2	5.3	0.1	1.3		0.1	0.7
Delay (s)	40.3	31.7	16.0		6.8	6.3
Level of Service	D	C	B		A	A
Approach Delay (s)	37.2		16.0			6.3
Approach LOS	D		B			A

Intersection Summary			
HCM Average Control Delay	16.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	332	143	498	861
v/c Ratio	0.67	0.27	0.28	0.41
Control Delay	23.2	19.9	3.9	5.3
Queue Delay	0.4	0.0	0.1	0.2
Total Delay	23.6	20.0	4.0	5.4
Queue Length 50th (m)	13.7	7.0	20.9	12.7
Queue Length 95th (m)	20.7	13.6	7.6	47.5
Internal Link Dist (m)	26.6	66.6	41.6	44.5
Turn Bay Length (m)				
Base Capacity (vph)	823	663	1761	2084
Starvation Cap Reductn	160	0	0	0
Spillback Cap Reductn	0	16	379	429
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.50	0.22	0.36	0.52

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	170	36	109	9	76	51	59	408	7	23	459	336
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			0.99	
Flpb, ped/bikes		0.99			1.00			1.00			1.00	
Frt		0.95			0.94			1.00			0.94	
Flt Protected		0.97			1.00			0.99			1.00	
Satd. Flow (prot)		3008			3083			3285			3070	
Flt Permitted		0.75			0.92			0.77			0.93	
Satd. Flow (perm)		2314			2841			2534			2867	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	179	38	115	9	80	54	62	429	7	24	483	354
RTOR Reduction (vph)	0	94	0	0	45	0	0	1	0	0	94	0
Lane Group Flow (vph)	0	238	0	0	98	0	0	497	0	0	767	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		15.5			15.5			62.5			62.5	
Effective Green, g (s)		15.5			15.5			62.5			62.5	
Actuated g/C Ratio		0.17			0.17			0.69			0.69	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		399			489			1760			1991	
v/s Ratio Prot												
v/s Ratio Perm		c0.10			0.03			0.20			c0.27	
v/c Ratio		0.60			0.20			0.28			0.39	
Uniform Delay, d1		34.4			31.9			5.2			5.7	
Progression Factor		0.74			1.00			0.59			1.16	
Incremental Delay, d2		2.4			0.2			0.4			0.5	
Delay (s)		27.9			32.1			3.4			7.1	
Level of Service		C			C			A			A	
Approach Delay (s)		27.9			32.1			3.4			7.1	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	78.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	316	496	233	148
v/c Ratio	0.35	0.73	0.24	0.15
Control Delay	12.5	32.2	8.9	10.4
Queue Delay	0.0	0.3	0.0	0.0
Total Delay	12.5	32.5	8.9	10.4
Queue Length 50th (m)	10.9	42.7	15.5	10.6
Queue Length 95th (m)	18.3	58.5	36.6	24.3
Internal Link Dist (m)	106.3	26.6	428.1	253.1
Turn Bay Length (m)				
Base Capacity (vph)	1141	1121	972	964
Starvation Cap Reductn	0	219	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.28	0.55	0.24	0.15

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	5	145	150	163	192	116	65	42	115	55	84	2
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.98			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			0.99			1.00			1.00	
Frt		0.93			0.96			0.93			1.00	
Flt Protected		1.00			0.98			0.99			0.98	
Satd. Flow (prot)		2991			3083			1799			1948	
Flt Permitted		0.95			0.72			0.88			0.82	
Satd. Flow (perm)		2832			2269			1601			1634	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	153	158	172	202	122	68	44	121	58	88	2
RTOR Reduction (vph)	0	114	0	0	48	0	0	29	0	0	0	0
Lane Group Flow (vph)	0	202	0	0	448	0	0	204	0	0	148	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		25.0			25.0			53.0			53.0	
Effective Green, g (s)		25.0			25.0			53.0			53.0	
Actuated g/C Ratio		0.28			0.28			0.59			0.59	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		787			630			943			962	
v/s Ratio Prot												
v/s Ratio Perm		0.07			c0.20			c0.13			0.09	
v/c Ratio		0.26			0.71			0.22			0.15	
Uniform Delay, d1		25.3			29.2			8.7			8.4	
Progression Factor		1.00			1.06			1.14			1.00	
Incremental Delay, d2		0.2			3.6			0.5			0.3	
Delay (s)		25.4			34.5			10.4			8.7	
Level of Service		C			C			B			A	
Approach Delay (s)		25.4			34.5			10.4			8.7	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	24.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	57.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	42	21	499	134	47	633
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	44	22	525	141	49	666
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						192
pX, platoon unblocked	0.88					
vC, conflicting volume	1361	596			666	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1342	596			666	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	68	96			95	
cM capacity (veh/h)	139	504			923	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	66	666	716
Volume Left	44	0	49
Volume Right	22	141	0
cSH	184	1700	923
Volume to Capacity	0.36	0.39	0.05
Queue Length 95th (m)	11.7	0.0	1.3
Control Delay (s)	35.3	0.0	1.4
Lane LOS	E		A
Approach Delay (s)	35.3	0.0	1.4
Approach LOS	E		

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	86.5%	ICU Level of Service	E
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	5	5	500	20	10	675
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	5	526	21	11	711
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						72
pX, platoon unblocked	0.88					
vC, conflicting volume	1268	537			547	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1237	537			547	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	99			99	
cM capacity (veh/h)	169	544			1022	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	11	547	721
Volume Left	5	0	11
Volume Right	5	21	0
cSH	258	1700	1022
Volume to Capacity	0.04	0.32	0.01
Queue Length 95th (m)	1.0	0.0	0.2
Control Delay (s)	19.5	0.0	0.3
Lane LOS	C		A
Approach Delay (s)	19.5	0.0	0.3
Approach LOS	C		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		

Queues
2: Gateway Rd & Chief Peguis Trail

4/13/2012

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	224	580	243	228	705	82	253	634	222	45	477	92
v/c Ratio	0.85	0.80	0.16	0.82	0.94	0.06	0.85	0.74	0.15	0.24	0.56	0.06
Control Delay	66.1	43.5	0.2	60.4	56.1	0.1	45.8	27.4	0.2	17.5	19.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	66.1	43.5	0.2	60.4	56.1	0.1	45.8	27.4	0.2	17.5	19.4	0.1
Queue Length 50th (m)	38.1	50.5	0.0	38.4	63.2	0.0	37.9	94.6	0.0	4.3	55.6	0.0
Queue Length 95th (m)	#76.4	#74.6	0.0	#74.8	#96.8	0.0	m#70.5	124.9	m0.0	12.0	84.1	0.0
Internal Link Dist (m)		229.1			234.8			129.3			255.9	
Turn Bay Length (m)	175.0		185.0	180.0		180.0	115.0		95.0	100.0		115.0
Base Capacity (vph)	264	723	1479	283	753	1479	297	853	1461	189	853	1461
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.85	0.80	0.16	0.81	0.94	0.06	0.85	0.74	0.15	0.24	0.56	0.06

Intersection Summary

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

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	213	551	231	217	670	78	240	602	211	43	453	87
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.7	3.7	3.7	3.7	3.7	3.7	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0	4.0	4.0	2.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1695	3390	1479	1695	3390	1479	1649	1745	1461	1658	1745	1461
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.35	1.00	1.00	0.22	1.00	1.00
Satd. Flow (perm)	1695	3390	1479	1695	3390	1479	608	1745	1461	387	1745	1461
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	224	580	243	228	705	82	253	634	222	45	477	92
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	224	580	243	228	705	82	253	634	222	45	477	92
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Prot	NA	Free	Prot	NA	Free	Perm	NA	Free	Perm	NA	Free
Protected Phases	7	4		3	8			2			6	
Permitted Phases			Free			Free	2		Free	6		Free
Actuated Green, G (s)	12.0	17.2	90.0	12.8	18.0	90.0	42.0	42.0	90.0	42.0	42.0	90.0
Effective Green, g (s)	14.0	19.2	90.0	14.8	20.0	90.0	44.0	44.0	90.0	44.0	44.0	90.0
Actuated g/C Ratio	0.16	0.21	1.00	0.16	0.22	1.00	0.49	0.49	1.00	0.49	0.49	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	264	723	1479	279	753	1479	297	853	1461	189	853	1461
v/s Ratio Prot	0.13	0.17		c0.13	c0.21			0.36			0.27	
v/s Ratio Perm			c0.16			0.06	c0.42		0.15	0.12		0.06
v/c Ratio	0.85	0.80	0.16	0.82	0.94	0.06	0.85	0.74	0.15	0.24	0.56	0.06
Uniform Delay, d1	37.0	33.6	0.0	36.3	34.4	0.0	20.1	18.5	0.0	13.3	16.2	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.18	1.21	1.00	1.00	1.00	1.00
Incremental Delay, d2	21.6	6.4	0.2	16.7	18.8	0.1	18.8	4.1	0.2	3.0	2.6	0.1
Delay (s)	58.5	40.0	0.2	53.0	53.2	0.1	42.7	26.4	0.2	16.3	18.8	0.1
Level of Service	E	D	A	D	D	A	D	C	A	B	B	A
Approach Delay (s)		34.7			48.9			24.9			15.8	
Approach LOS		C			D			C			B	

Intersection Summary			
HCM Average Control Delay	32.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	570	668	500	344
v/c Ratio	0.50	0.84	0.49	0.44
Control Delay	24.4	23.5	16.1	10.2
Queue Delay	0.5	0.1	0.1	0.1
Total Delay	24.9	23.7	16.2	10.3
Queue Length 50th (m)	38.1	28.5	49.9	15.1
Queue Length 95th (m)	45.8	m30.7	89.6	36.6
Internal Link Dist (m)	36.0	28.1	267.0	425.3
Turn Bay Length (m)				
Base Capacity (vph)	1192	969	1016	788
Starvation Cap Reductn	0	24	0	0
Spillback Cap Reductn	260	0	46	35
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.61	0.71	0.52	0.46

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	504	37	83	419	133	24	364	87	98	212	17
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		*1.00			0.95			1.00			1.00	
Frpb, ped/bikes		1.00			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.97			0.98			0.99	
Flt Protected		1.00			0.99			1.00			0.99	
Satd. Flow (prot)		3443			3154			1934			1950	
Flt Permitted		1.00			0.72			0.97			0.74	
Satd. Flow (perm)		3443			2293			1886			1470	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	531	39	87	441	140	25	383	92	103	223	18
RTOR Reduction (vph)	0	6	0	0	30	0	0	8	0	0	2	0
Lane Group Flow (vph)	0	564	0	0	638	0	0	492	0	0	342	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type		NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases				8			2			6		
Actuated Green, G (s)		29.9			29.9			48.1			48.1	
Effective Green, g (s)		29.9			29.9			48.1			48.1	
Actuated g/C Ratio		0.33			0.33			0.53			0.53	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1144			762			1008			786	
v/s Ratio Prot		0.16										
v/s Ratio Perm					c0.28			c0.26			0.23	
v/c Ratio		0.49			0.84			0.49			0.44	
Uniform Delay, d1		24.0			27.8			13.2			12.7	
Progression Factor		1.00			0.60			1.00			0.59	
Incremental Delay, d2		0.3			6.2			1.7			1.7	
Delay (s)		24.3			22.8			14.9			9.2	
Level of Service		C			C			B			A	
Approach Delay (s)		24.3			22.8			14.9			9.2	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	19.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	101.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Queues
6: Gateway Rd & McLeod Ave.

4/13/2012

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	725	610	688	1071
v/c Ratio	1.02	0.54	0.59	0.94
Control Delay	57.3	23.0	17.1	32.1
Queue Delay	25.6	0.0	0.4	36.4
Total Delay	82.9	23.1	17.5	68.5
Queue Length 50th (m)	~63.7	39.0	40.0	70.5
Queue Length 95th (m)	#105.0	55.0	57.1 m	#130.4
Internal Link Dist (m)	28.1	47.4	40.9	41.4
Turn Bay Length (m)				
Base Capacity (vph)	712	1126	1169	1138
Starvation Cap Reductn	47	0	0	0
Spillback Cap Reductn	0	24	152	147
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	1.09	0.55	0.68	1.08

Intersection Summary

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

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

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	162	402	124	0	406	174	69	536	48	176	682	160
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.97			0.95			0.99			0.98	
Flt Protected		0.99			1.00			0.99			0.99	
Satd. Flow (prot)		3168			3139			3254			3193	
Flt Permitted		0.63			1.00			0.68			0.67	
Satd. Flow (perm)		2005			3139			2224			2147	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	171	423	131	0	427	183	73	564	51	185	718	168
RTOR Reduction (vph)	0	21	0	0	45	0	0	7	0	0	17	0
Lane Group Flow (vph)	0	704	0	0	565	0	0	681	0	0	1054	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA			NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4						2			6		
Actuated Green, G (s)		31.0			31.0			47.0			47.0	
Effective Green, g (s)		31.0			31.0			47.0			47.0	
Actuated g/C Ratio		0.34			0.34			0.52			0.52	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		691			1081			1161			1121	
v/s Ratio Prot					0.18							
v/s Ratio Perm		c0.35						0.31			c0.49	
v/c Ratio		1.02			0.52			0.59			0.94	
Uniform Delay, d1		29.5			23.6			14.8			20.2	
Progression Factor		0.63			1.00			1.00			0.80	
Incremental Delay, d2		37.2			0.5			2.2			14.9	
Delay (s)		55.8			24.0			17.0			31.0	
Level of Service		E			C			B			C	
Approach Delay (s)		55.8			24.0			17.0			31.0	
Approach LOS		E			C			B			C	

Intersection Summary			
HCM Average Control Delay	32.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	109.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Queues
7: Gateway Rd & Lexington Park

4/13/2012



Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	273	161	1007	213	567
v/c Ratio	0.91	0.40	0.95	0.87	0.41
Control Delay	72.4	8.8	39.2	47.9	7.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	72.4	8.8	39.2	47.9	7.9
Queue Length 50th (m)	46.7	0.0	143.2	22.1	42.7
Queue Length 95th (m)	#91.0	15.9	m#225.2	m#55.9	44.9
Internal Link Dist (m)	196.0		47.6		136.6
Turn Bay Length (m)		70.0		65.0	
Base Capacity (vph)	301	402	1063	246	1381
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.91	0.40	0.95	0.87	0.41

Intersection Summary

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

m Volume for 95th percentile queue is metered by upstream signal.



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	259	153	688	269	202	539
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Width	3.7	3.7	4.8	4.8	4.8	4.8
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.96		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1695	1517	1924		1900	2000
Flt Permitted	0.95	1.00	1.00		0.07	1.00
Satd. Flow (perm)	1695	1517	1924		146	2000
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	273	161	724	283	213	567
RTOR Reduction (vph)	0	133	16	0	0	0
Lane Group Flow (vph)	273	28	991	0	213	567
Turn Type	NA	Perm	NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Actuated Green, G (s)	15.9	15.9	48.7		62.1	62.1
Effective Green, g (s)	15.9	15.9	48.7		62.1	62.1
Actuated g/C Ratio	0.18	0.18	0.54		0.69	0.69
Clearance Time (s)	6.0	6.0	6.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	299	268	1041		245	1380
v/s Ratio Prot	c0.16		c0.52		c0.07	0.28
v/s Ratio Perm		0.02			0.53	
v/c Ratio	0.91	0.11	0.95		0.87	0.41
Uniform Delay, d1	36.4	31.1	19.6		26.8	6.0
Progression Factor	1.00	1.00	1.14		1.18	1.15
Incremental Delay, d2	30.4	0.2	16.4		21.0	0.7
Delay (s)	66.8	31.3	38.7		52.6	7.6
Level of Service	E	C	D		D	A
Approach Delay (s)	53.6		38.7			19.9
Approach LOS	D		D			B

Intersection Summary			
HCM Average Control Delay	35.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	97.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	600	161	885	948
v/c Ratio	0.82	0.19	0.73	0.62
Control Delay	32.1	14.3	11.2	12.2
Queue Delay	6.7	0.0	4.9	1.1
Total Delay	38.8	14.3	16.1	13.3
Queue Length 50th (m)	20.2	6.2	23.8	43.5
Queue Length 95th (m)	28.8	13.3	m33.1	65.6
Internal Link Dist (m)	26.6	66.6	41.6	44.5
Turn Bay Length (m)				
Base Capacity (vph)	784	859	1214	1518
Starvation Cap Reductn	140	0	0	0
Spillback Cap Reductn	0	23	260	318
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.93	0.19	0.93	0.79

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	278	108	183	8	84	62	117	713	10	65	550	286
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			0.99	
Flpb, ped/bikes		0.99			1.00			1.00			1.00	
Frt		0.95			0.94			1.00			0.95	
Flt Protected		0.98			1.00			0.99			1.00	
Satd. Flow (prot)		3032			3071			3284			3117	
Flt Permitted		0.75			0.92			0.63			0.81	
Satd. Flow (perm)		2315			2832			2092			2521	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	293	114	193	8	88	65	123	751	11	68	579	301
RTOR Reduction (vph)	0	65	0	0	46	0	0	1	0	0	58	0
Lane Group Flow (vph)	0	535	0	0	115	0	0	884	0	0	890	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		25.8			25.8			52.2			52.2	
Effective Green, g (s)		25.8			25.8			52.2			52.2	
Actuated g/C Ratio		0.29			0.29			0.58			0.58	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		664			812			1213			1462	
v/s Ratio Prot												
v/s Ratio Perm		c0.23			0.04			c0.42			0.35	
v/c Ratio		0.81			0.14			0.73			0.61	
Uniform Delay, d1		29.8			23.9			13.8			12.3	
Progression Factor		0.90			1.00			0.61			0.94	
Incremental Delay, d2		6.6			0.1			2.0			1.6	
Delay (s)		33.3			23.9			10.4			13.2	
Level of Service		C			C			B			B	
Approach Delay (s)		33.3			23.9			10.4			13.2	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	17.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	98.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	422	513	425	116
v/c Ratio	0.48	0.79	0.46	0.15
Control Delay	25.8	36.1	16.0	10.7
Queue Delay	0.2	11.1	0.1	0.0
Total Delay	26.0	47.2	16.1	10.8
Queue Length 50th (m)	29.6	45.7	47.0	8.3
Queue Length 95th (m)	37.2	61.7	81.8	20.2
Internal Link Dist (m)	106.3	26.6	428.1	253.1
Turn Bay Length (m)				
Base Capacity (vph)	953	864	931	776
Starvation Cap Reductn	0	323	0	0
Spillback Cap Reductn	110	0	81	67
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.50	0.95	0.50	0.16

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	329	67	145	229	113	142	88	174	66	42	3
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.5	3.5	3.5	3.5	3.5	3.5	4.8	4.8	4.8	4.8	4.8	4.8
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			0.99			1.00	
Frt		0.97			0.97			0.94			1.00	
Flt Protected		1.00			0.99			0.98			0.97	
Satd. Flow (prot)		3204			3105			1819			1925	
Flt Permitted		0.95			0.68			0.84			0.67	
Satd. Flow (perm)		3039			2140			1557			1330	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	346	71	153	241	119	149	93	183	69	44	3
RTOR Reduction (vph)	0	19	0	0	37	0	0	24	0	0	1	0
Lane Group Flow (vph)	0	403	0	0	476	0	0	401	0	0	115	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		25.6			25.6			52.4			52.4	
Effective Green, g (s)		25.6			25.6			52.4			52.4	
Actuated g/C Ratio		0.28			0.28			0.58			0.58	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		864			609			907			774	
v/s Ratio Prot												
v/s Ratio Perm		0.13			c0.22			c0.26			0.09	
v/c Ratio		0.47			0.78			0.44			0.15	
Uniform Delay, d1		26.6			29.6			10.6			8.6	
Progression Factor		1.00			1.08			1.37			1.00	
Incremental Delay, d2		0.4			5.4			1.3			0.4	
Delay (s)		27.0			37.4			15.8			9.0	
Level of Service		C			D			B			A	
Approach Delay (s)		27.0			37.4			15.8			9.0	
Approach LOS		C			D			B			A	

Intersection Summary			
HCM Average Control Delay	26.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	105	55	862	10	5	913
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	111	58	907	11	5	961
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						192
pX, platoon unblocked	0.87					
vC, conflicting volume	1884	913			918	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1943	913			918	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	83			99	
cM capacity (veh/h)	62	332			743	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	168	918	966
Volume Left	111	0	5
Volume Right	58	11	0
cSH	85	1700	743
Volume to Capacity	1.97	0.54	0.01
Queue Length 95th (m)	111.5	0.0	0.2
Control Delay (s)	557.4	0.0	0.2
Lane LOS	F		A
Approach Delay (s)	557.4	0.0	0.2
Approach LOS	F		

Intersection Summary			
Average Delay	45.8		
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	160	98	860	57	40	758
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	168	103	905	60	42	798
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						72
pX, platoon unblocked	0.87					
vC, conflicting volume	1817	935			965	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1866	935			965	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	68			94	
cM capacity (veh/h)	65	322			713	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	272	965	840
Volume Left	168	0	42
Volume Right	103	60	0
cSH	93	1700	713
Volume to Capacity	2.91	0.57	0.06
Queue Length 95th (m)	198.9	0.0	1.4
Control Delay (s)	958.1	0.0	1.6
Lane LOS	F		A
Approach Delay (s)	958.1	0.0	1.6
Approach LOS	F		

Intersection Summary			
Average Delay	125.9		
Intersection Capacity Utilization	98.9%	ICU Level of Service	F
Analysis Period (min)	15		

Appendix D

SIDRA Roundabout Output Data Files

(Available on Request)

MOVEMENT SUMMARY

Site: Lexington at Gateway - AM Peak Hour - Single Lane - Option 1

Lexington Village TIA
2022 AM Peak Hour - Option 1
Single Lane Roundabout
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Gateway											
2	T	392	0.0	0.402	1.3	LOS A	2.5	17.6	0.37	0.21	33.7
3	R	140	0.0	0.402	11.8	LOS B	2.5	17.6	0.37	0.80	46.2
Approach		532	0.0	0.402	4.1	LOS A	2.5	17.6	0.37	0.36	39.4
East: Lexington											
4	L	257	0.0	0.421	8.8	LOS A	2.6	17.9	0.66	0.75	47.1
6	R	153	0.0	0.421	13.9	LOS B	2.6	17.9	0.66	0.85	44.5
Approach		409	0.0	0.421	10.7	LOS B	2.6	17.9	0.66	0.79	46.1
North: Gateway											
7	L	75	0.0	0.454	6.7	LOS A	2.8	19.7	0.35	0.58	49.6
8	T	544	0.0	0.454	5.4	LOS A	2.8	19.7	0.35	0.48	50.3
Approach		619	0.0	0.454	5.5	LOS A	2.8	19.7	0.35	0.49	50.2
All Vehicles		1560	0.0	0.454	6.4	LOS A	2.8	19.7	0.44	0.52	46.3

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Lexington at Gateway - PM Peak Hour - Single Lane - Option 1

Lexington Village
2022 PM Peak Hour
Single Lane Roundabout
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Gateway Road											
2	T	715	0.0	0.842	5.0	LOS A	15.4	107.7	0.95	0.74	28.0
3	R	338	0.0	0.842	10.5	LOS B	15.4	107.7	0.95	0.78	28.5
Approach		1053	0.0	0.842	6.8	LOS A	15.4	107.7	0.95	0.75	28.2
East: Lexington Park Road											
4	L	294	0.0	0.626	8.9	LOS A	6.5	45.7	0.93	1.01	26.2
6	R	192	0.0	0.626	13.1	LOS B	6.5	45.7	0.93	1.04	25.5
Approach		485	0.0	0.626	10.6	LOS B	6.5	45.7	0.93	1.02	25.9
North: Gateway Road											
7	L	212	0.0	0.761	7.9	LOS A	10.9	76.4	0.93	0.92	28.9
8	T	580	0.0	0.761	6.6	LOS A	10.9	76.4	0.93	0.90	28.8
Approach		792	0.0	0.761	6.9	LOS A	10.9	76.4	0.93	0.91	28.8
All Vehicles		2329	0.0	0.842	7.6	LOS A	15.4	107.7	0.94	0.86	27.8

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Lexington at Gateway - AM Peak Hour - Single Lane - Option 2

Lexington Village TIA
2022 AM Peak Hour - Option 2
Single Lane Roundabout
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Gateway											
2	T	392	0.0	0.376	1.1	LOS A	2.3	15.9	0.30	0.17	34.6
3	R	132	0.0	0.376	11.6	LOS B	2.3	15.9	0.30	0.80	46.3
Approach		523	0.0	0.376	3.7	LOS A	2.3	15.9	0.30	0.33	39.9
East: Lexington											
4	L	184	0.0	0.297	8.4	LOS A	1.6	11.4	0.59	0.71	47.5
6	R	107	0.0	0.297	13.6	LOS B	1.6	11.4	0.59	0.83	44.8
Approach		292	0.0	0.297	10.3	LOS B	1.6	11.4	0.59	0.75	46.4
North: Gateway											
7	L	60	0.0	0.434	6.6	LOS A	2.6	18.0	0.33	0.57	49.8
8	T	537	0.0	0.434	5.3	LOS A	2.6	18.0	0.33	0.47	50.5
Approach		597	0.0	0.434	5.4	LOS A	2.6	18.0	0.33	0.48	50.5
All Vehicles		1412	0.0	0.434	5.8	LOS A	2.6	18.0	0.37	0.48	46.6

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Lexington at Gateway - PM Peak Hour - Single Lane - Option 2

Lexington Village
2022 PM Peak Hour - Option 2
Single Lane Roundabout
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Gateway Road											
2	T	724	0.0	0.775	2.5	LOS A	10.5	73.3	0.79	0.41	29.5
3	R	283	0.0	0.775	8.1	LOS A	10.5	73.3	0.79	0.70	30.5
Approach		1007	0.0	0.775	4.1	LOS A	10.5	73.3	0.79	0.49	29.8
East: Lexington Park Road											
4	L	273	0.0	0.539	7.3	LOS A	4.8	33.6	0.87	0.89	27.9
6	R	161	0.0	0.539	11.5	LOS B	4.8	33.6	0.87	0.95	26.8
Approach		434	0.0	0.539	8.8	LOS A	4.8	33.6	0.87	0.91	27.4
North: Gateway Road											
7	L	213	0.0	0.698	5.7	LOS A	8.3	58.2	0.81	0.74	30.4
8	T	567	0.0	0.698	4.3	LOS A	8.3	58.2	0.81	0.69	29.8
Approach		780	0.0	0.698	4.7	LOS A	8.3	58.2	0.81	0.70	29.9
All Vehicles		2221	0.0	0.775	5.2	LOS A	10.5	73.3	0.81	0.65	29.3

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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