TRANSPORTATION PLANNERS AND ENGINEERS

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3554 Ryder Hesjedal Way

Transportation Impact Assessment and Parking Study

Final

Prepared for

District Group

Date

May 25, 2021

Project No.

04-20-0409

May 25, 2021
04-20-0409

Michael Fujii
Development Manager
District Group

Dear Michael:

Re: 3554 Ryder Hesjedal Way
Transportation Impact Assessment and Parking Study - Final

Please find attached our Transportation Impact Assessment and Parking Study for the proposed mixed-use development at 3554 Ryder Hesjedal Way which incorporates comments from the City of Colwood regarding our Draft Report. The study follows the Terms of Reference provided by the City of Colwood and includes an operational assessment of the Ryder Hesjedal Way & Latoria Road intersection and an evaluation of the proposed vehicle parking supply. We found that the development does not impact the findings of the previously completed transportation plans for South Latoria and Royal Beach. In addition, South Latoria's vehicle parking rates are applicable to the proposed development.

We trust that this study assists you in advancing your project. Please contact us should you need any further assistance.

Yours truly,
Bunt & Associates

Simon Button, P.Eng., M.Eng., PMP
Transportation Engineer

CORPORATE AUTHORIZATION

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1. INTRODUCTION

1.1 Study Purpose & Objectives

District Group is proposing to rezone the property at 3554 Ryder Hesjedal Way to provide two mid-rise rental residential buildings along with a small commercial component. **Exhibit 1.1** illustrates the site's location as well as the South Latoria and Royal Beach areas which are currently being planned. The property is in the Royal Bay area for which the transportation considerations have already been analyzed. The previous transportation assessments assumed that the property would become townhouses that have a lower trip generation than the proposed development.

The City of Colwood (City) requested that a Transportation Impact Assessment be prepared since the proposed development's vehicle trip generation will be higher than what was assumed in the previous studies. **Appendix A** provides the study Terms of Reference provided by the City. The City requested that the operational analysis be conducted for the 2031 and 2043 horizon years. In addition, South Latoria recently received approval to use lower minimum vehicle parking rates. The proposed District Group development requested to use these lower minimum vehicle parking rates and the City has requested a parking study to support the request. This report provides these two studies as one document.

1.2 Organization of Report

The report sections of the study have been organized as follows:

- **Section 1** of the report presents the study purpose, details of the proposed development, and the study area.
- **Section 2** of the report describes the existing conditions at the site location, including current site characteristics, the existing street network, and key findings from the South Latoria & Royal Beach transportation studies.
- **Section 3** of the report reviews the overall site layout, summarizes the bicycle parking supply, and assesses the adequacy of the proposed vehicle parking supply.
- **Section 4** of the report forecasts the future vehicle volumes in the study area with and without the proposed development and assesses the net impact of the site-generated vehicle trips on the surrounding street network compared to the previously assumed townhouse development.
- **Section 5** of the report summarizes the study and its recommendations.

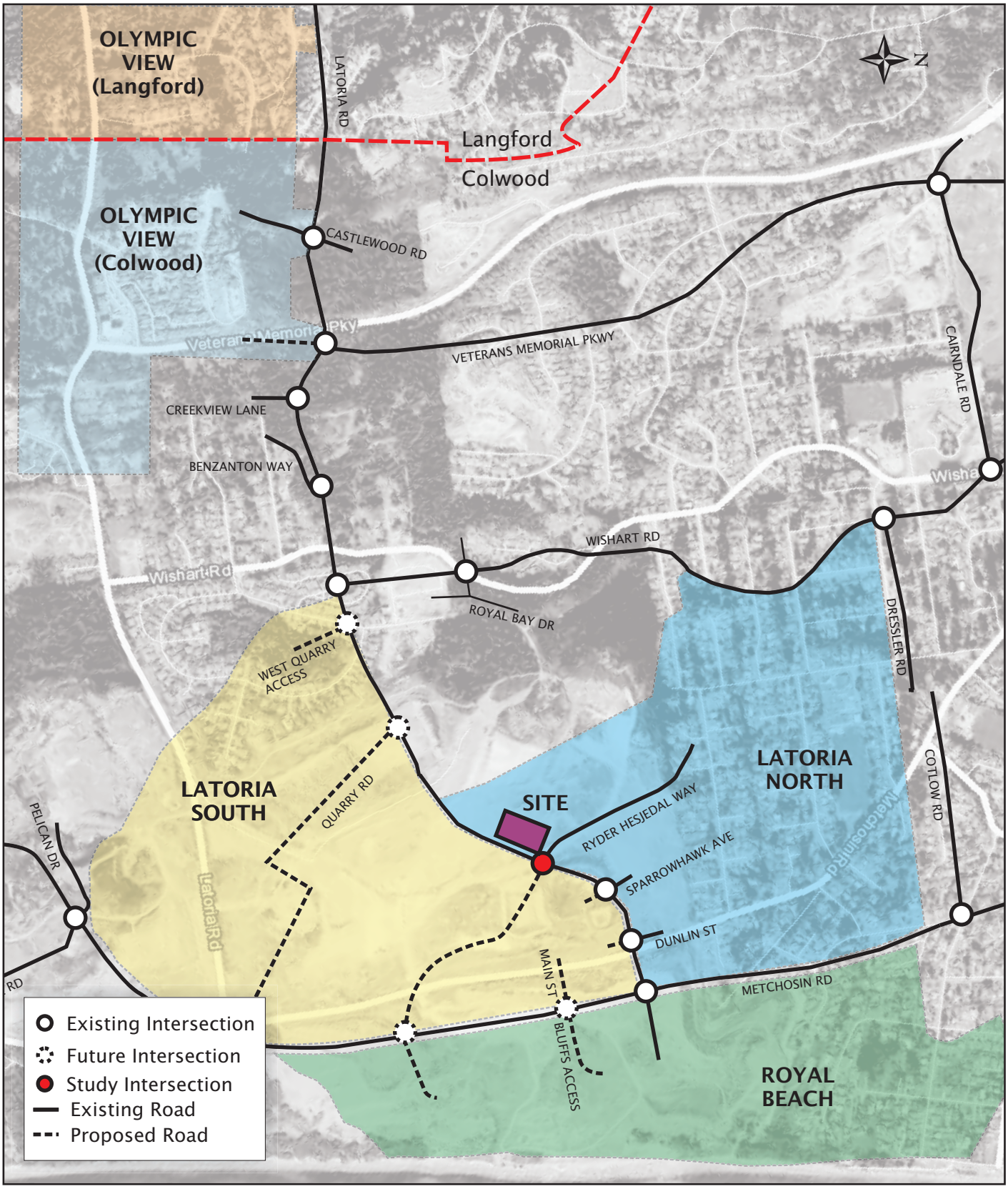

Exhibit 1

Site Location

3554 Ryder Hesjedal Way
04-20-0409 March 2021

1.3 Proposed Development

The development includes 129 residential units distributed across two mid-rise buildings. All residential units are intended to be rented. However, this study will assume that the residential units could be either rental or strata.

The north building includes 57 residential units. The south building has an approved Development Permit and is currently under construction with 72 residential units and two small ground-floor commercial units totalling 163 square metres. District Group anticipates that the commercial units will be leased by professional office tenants. **Figure 1.1** illustrates the proposed site plan. One single vehicle access on Ryder Hesjedal Way is proposed which will provide access to the surface parking area and a single level of underground parking below each building.

Figure 1.1: Site Plan

2. SITE CONTEXT

2.1 Existing Land Use

The site is in the Royal Bay area which comprises mostly of new or developing residential land. The site is directly south of the Royal Bay Secondary School which has a 400-metre track and a soccer field. There are several nearby outdoor destinations including Latoria Creek Park to the southwest and Royal Bay Beach Park to the east. **Exhibit 2.1** illustrates surrounding land uses, roads, bus stops and bike lanes.

2.2 Previous Transportation Studies

Due to the significant amount of development in the surrounding area, multiple Transportation Impact Assessments have been prepared including for

- Latoria North (includes the development site; partially built);
- Latoria South (undergoing development approvals);
- Olympic View (undergoing development approvals, includes land in Colwood and Langford); and,
- Royal Beach (undergoing development approvals).

The most recent transportation assessment for the area was summarized in the Joint Memo (October 28, 2019) prepared by Bunt & Associates and Watt Consulting Group. Key findings relevant to this study include:

- At 50% build-out, Latoria Road should be widened to four lanes, however, the City noted challenges to achieving this;
- Left turn lanes should be constructed on Latoria Road at key intersections (including Ryder Hesjedal Way); and,
- Ryder Hesjedal Way approaches to Latoria Road should include two lanes (left and through/right).

The Latoria Road & Ryder Hesjedal Way intersection has already been built with left-turn lanes on Latoria Road as well as separate left-turn and through/right-turn movements on Ryder Hesjedal Way. Therefore, except for the potential of widening Latoria Road to four lanes, the intersection is already constructed to meet the vehicle demands for the build-out of the neighbourhood.

2.3 Street Network

The site is located at the northwest corner of Latoria Boulevard and Ryder Hesjedal Way. Latoria Boulevard is an east-west arterial road connecting Happy Valley Road in Langford to Metchosin Road just east of the site. This route serves the Olympic View, Latoria North, and future Latoria South and Royal Beach communities. Ryder Hesjedal Way is a north-south collector road that serves Royal Bay Secondary School and the Latoria North community as well as extending southwards in the future into South Latoria. The site will be accessed from Ryder Hesjedal Way.

2.4 Active Transportation

The site is well served by local walking and cycling amenities. Latoria Boulevard features newly constructed sidewalks and bike lanes on both sides in the section adjacent to the site and leading to Royal Bay Beach Park. Ryder Hesjedal Way features sidewalks on both sides along its entire length. All intersections in the surrounding area feature at least one zebra crosswalk, where crossing pedestrians are given the right-of-way. Conflict areas between vehicles and cyclists or pedestrians such as major driveways and bike lanes through intersections are painted in green. The active transportation facilities in the neighbourhood will be improved as additional development occurs.

2.5 Transit

Several bus routes serve the development site. The #52, #54 and #59 routes stop next to the site in both travel directions on Latoria Boulevard. The #52 provides service to local neighbourhoods and connects the Colwood Exchange with Langford Exchange and Bear Mountain. The #52 deviates from its regular route only six times per day to stop at Latoria & Ryder Hesjedal and is aimed at students attending Royal Bay Secondary School. The #54 connects the communities of Colwood with Langford and Metchosin. Route #59 connect the Triangle Mountain community with Langford exchange, stopping at Latoria & Ryder Hesjedal on an alternate route three times per day.

Transit service is anticipated to improve as the neighbourhood's population increases and creates more ridership.

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Exhibit 2.1
Site Context

3554 Ryder Hesjedal Way
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3. VEHICLE OPERATIONS REVIEW

3.1 Assessment Overview

The study assesses the vehicle operations at the Latoria Road & Ryder Hesjedal Way intersection during the weekday AM and PM peak hours for the 2031 and 2043 horizon years. Each scenario is analyzed based on the background conditions (if the proposed rezoning did not proceed) and the total conditions (if the proposed rezoning did proceed). The ToR provided by the City requested that the study area include the following intersections:

- Latoria Road & Ryder Hesjedal Way;
- Latoria Road & Metchosin Road; and,
- Latoria Road & Wishart Road.

Due to the proposed rezoning only having a modest vehicle trip generation (see Section 3.4.1), the operational analysis was only conducted at the Latoria Road & Ryder Hesjedal Way intersection which is where the rezoning would have the largest impact. The study's analysis will show that the development's impact on this intersection is negligible. Due to the remaining two intersections being further away, the rezoning would have an even smaller impact on these intersections.

While vehicle operations are typically also analyzed for the existing conditions, this was not included in this study due to the difficulty in estimating typical 2021 vehicle volumes due to the COVID-19 Pandemic and the high rate of development in the surrounding area which limits the use of previously collected data. Moreover, due to the magnitude of future development in the area, the future vehicle operations at the intersection are more important than the existing conditions.

The Joint Memo identified that the existing intersection laning and traffic control can manage the vehicle trips generated until 50% of the neighbourhood build-out, at which time widening Latoria to 4 lanes could be considered. Therefore, no operational issues are anticipated in the existing conditions.

3.2 Assessment Methodology

The study intersection's operations were assessed using the methods outlined in the 2010 Highway Capacity Manual (HCM), using the Synchro 9.2 analysis software (Build 914 Revision 6). The operations were assessed using the performance measures of Level of Service (LOS) and volume-to-capacity (V/C) ratio.

The LOS rating is based on average vehicle delay and ranges from "A" to "F" based on the quality of operation at the intersection. LOS "A" represents optimal, minimal delay conditions while a LOS "F" represents an over-capacity condition with considerable congestion and/or delay. Delay is calculated in seconds and is based on the average intersection delay per vehicle.

Table 3.1 below summarizes the LOS thresholds for the six Levels of Service, for both signalized and unsignalized intersections.

Table 3.1: Intersection Level of Service Thresholds

LEVEL OF SERVICE	AVERAGE CONTROL DELAY PER VEHICLE (SECONDS)	
	SIGNALIZED	UNSIGNALIZED
A	≤10	≤10
B	>10 and ≤20	>10 and ≤15
C	>20 and ≤35	>15 and ≤25
D	>35 and ≤55	>25 and ≤35
E	>55 and ≤80	>35 and ≤50
F	>80	>50

Source: Highway Capacity Manual

The volume to capacity (V/C) ratio of an intersection represents the ratio between the demand volume and the available capacity. A V/C ratio less than 0.85 indicates that there is sufficient capacity to accommodate demands and generally represents reasonable traffic conditions in suburban settings. A V/C value between 0.85 and 0.95 indicates an intersection is approaching practical capacity; a V/C ratio over 0.95 indicates that traffic demands are close to exceeding the available capacity, resulting in saturated conditions. A V/C ratio over 1.0 indicates a very congested intersection where drivers may have to wait through several signal cycles. In downtown and Town Centre contexts, during peak demand periods, V/C ratios over 0.90 and even 1.0 are common.

As agreed with the City of Colwood on the Latoria South Master Plan, the performance thresholds that were used to trigger consideration of roadway or traffic control improvements to support roadway or traffic control improvements employed in this study are listed below:

- Overall intersection Level of Service = LOS D or better;
- Individual movement Level of Service = LOS E or better; and,
- Individual movement V/C ratio = 0.95 or less.

In interpreting the analysis results, note that the HCM methodology reports performance differently for various types of intersection traffic control. In this report, the performance reporting convention is as follows:

- For signalized intersections: HCM 2010 output for overall LOS as well as individual movement LOS and V/C are reported. 95th Percentile Queues are reported as estimated by Synchro.

The performance reporting conventions noted above have been consistently applied throughout this document and the detailed outputs are provided in **Appendix B**.

In general, Synchro default parameters were used for the analysis. The signal timing plan proposed by Bunt for the Latoria Road & Ryder Hesjedal Way intersection, provided to the City of Colwood as part of a

separate study, was used for the analysis. Splits were optimized for the 2031and 2043 scenarios, however, the phasing and cycle lengths were retained. Latoria Road was assumed to be widened to four through lanes as this was a key finding from the joint South Latoria and Royal Beach transportation analysis.

3.3 Background Conditions

3.3.1 Background Vehicle Forecasts

The Latoria South Master Plan total vehicle forecasts (which includes the Latoria South and Royal Beach development) were used to generate the background vehicle forecasts for this study. These forecasts assumed that the development site would be a townhouse development that would have a lower vehicle trip generation than the proposed development. The background vehicle forecasts were estimated by taking the Latoria South Master Plan total vehicle forecasts, subtracting the assumed townhouse development, and adding the site's south building which already has an approved Development Permit and excavation is underway.

The number of vehicle trips was estimated using trip rates from the Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition. **Table 3.2** lists the utilized trip rates which were obtained for a General Urban/Suburban location where vehicle use is the primary transportation mode.

Table 3.2: Peak Hour Vehicle Trip Rates

LAND USE	DENSITY	AM PEAK HOUR			PM PEAK HOUR		
		IN	OUT	TOTAL	IN	OUT	TOTAL
South Building (Approved Development Permit)							
Multifamily Housing (Mid-Rise) *LUC 221*	72 units	26%	74%	0.36	61%	39%	0.44
General Office Building *LUC 710*	1755 sf	86%	14%	1.16	16%	84%	1.15
Previously Assumed Development Scheme (entire site)							
Multifamily Housing (Low-Rise) *LUC 220*	44 units	20%	80%	0.35	60%	40%	0.42

Table 3.3 summarizes the vehicle trips generated by the approved south building and the previously assumed townhouse development based on the above rates. **Exhibits 3.1** and **3.2** illustrate the 2031 and 2043 Background AM and PM peak hour vehicle forecasts.

Table 3.3: South Building Net Peak Hour Vehicle Trips

LAND USE	AM PEAK HOUR			PM PEAK HOUR		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Multifamily Housing (Mid-Rise) *LUC 221*	7	19	26	20	12	32
General Office Building *LUC 710*	2	0	2	0	2	2
Total South Building	**9**	**19**	**28**	**20**	**12**	**32**
Multifamily Housing (Low-Rise) *LUC 220)*	-2	-10	-12	-9	-6	-15
ADDITIONAL	7	9	16	11	6	17

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Exhibit 3.1
Background 2031 Peak Hour Vehicle Traffic Volumes

3554 Ryder Hesjedal Way
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Exhibit 3.2

Background 2043 Average Daily Vehicle Traffic Volumes

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3554 Ryder Hesjedal Way
04-20-0409 April 2021

3.3.2 Background Vehicle Operations

Tables 3.4 and **3.5** summarize the 2031 and 2043 vehicle operations. All intersections operate within the previously stated operational thresholds, except for a few movements with 95th percentile queues slightly exceeding the available storage. This is not seen as a significant issue as the 95th percentile queues are only reached one out of twenty signal cycles during the peak hour, and therefore, rarely occur.

Table 3.4: 2031 Background Vehicle Operations

MOVEMENT	AM			PM		
	LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
OVERALL	*B*			*B*		
EBL	B	0.25	15	B	0.19	15
EBTR	B	0.42	40	B	0.45	50
WBL	B	0.07	10	B	0.11	10
WBTR	C	0.43	35	B	0.46	55
NBL	B	0.28	25	B	0.38	35
NBTR	B	0.11	10	B	0.08	10
SBL	C	0.09	10	C	0.07	10
SBTR	C	0.22	10	C	0.18	10

Table 3.5: 2043 Background Vehicle Operations

MOVEMENT	AM			PM		
	LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
OVERALL	*C*			*C*		
EBL	C	0.64	45	B	0.54	30
EBTR	B	0.69	80	B	0.73	100
WBL	C	0.21	15	C	0.37	25
WBTR	C	0.77	70	C	0.77	100
NBL	C	0.56	35	C	0.71	65
NBTR	B	0.22	20	B	0.17	15
SBL	C	0.19	20	C	0.16	15
SBTR	C	0.44	15	C	0.39	20

The nearby Royal Bay Secondary School is a major trip generator with acute peaks of traffic generated at start time (9 am) and dismissal (3:20 pm). The eastbound left turn (from Latoria Road onto Ryder Hesjedal Way) signal timing has previously been adjusted to better accommodate the brief period of increased traffic. While the signal timing should be routinely reviewed and improved, it is expected that some degree of congestion will exist around the school at pick-up and drop-off times. The school's drop-off time is at

the tail end of the morning street peak period and the school's pick-up time is at the start of the afternoon street period. This leads to the school's peak traffic period not overlapping with the peak traffic period for the remainder of the vehicles on the nearby streets.

3.4 Site Vehicle Trips

3.4.1 Trip Generation

The proposed rezoning (adding the north building to the site) will add 57 residential units to the site which is already approved to provide 72 residential units and 1755 sf of ground-floor office space in the south building. Based on the same ITE trip rates provided in Section 3.3.1 for the south building, the north building would add 21 vehicle trips (5 in, 16 out) during the AM peak hour and 25 (10 in, 15 out) during the PM peak hour. **Table 3.6** summarizes the change in vehicle trips generated by the site compared to the South Latoria and Royal Beach Joint Memo and compared to the approved Development Permit for the site.

Table 3.5: 3544 Ryder Hesjedal Way Vehicle Trips (Both Buildings)

PEAK HOUR	JOINT MEMO	APPROVED DP	PROPOSED REZONING	CHANGE FROM JOINT MEMO	CHANGE FROM APPROVED DP
AM	12	28	49	+37	+21
PM	15	34	59	+44	+25

The proposed Rezoning will add approximately 40 vehicle trips per peak hour (approximately 400 trips per day) to the vehicle forecasts submitting for the proposed rezonings of South Latoria and Royal Beach. Compared to the approved Development Permit for the site, the proposed rezoning will add 20 to 25 vehicle trips per peak hour (200 to 250 trips per day).

3.4.2 Trip Distribution & Assignment

The trip distribution is based on the distribution from the South Latoria Master Plan and is summarized in **Table 3.6**. **Exhibit 3.3** illustrates the site traffic assigned to the street network.

Table 3.6: Estimated Trip Distribution

ORIGIN/DESTINATION	AM PEAK HOUR		PM PEAK HOUR	
	IN (%)	OUT (%)	IN (%)	OUT (%)
Latoria Boulevard – to/from West	28%	29%	28%	30%
Latoria Boulevard – to/from East	70%	69%	70%	66%
Ryder Hesjedal way – to/from South	2%	2%	2%	4%
TOTAL	100%	100%	100%	100%

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Exhibit 3.3
Rezoning Additional Vehicle Trips

3554 Ryder Hesjedal Way
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3.5 Total (with Rezoning) Conditions

Exhibits 3.4 and **3.5** present the forecasted total vehicle volumes for 2031 and 2043 horizon years. Total traffic consists of the proposed development's vehicle trips added to the background vehicle volumes.

Tables 3.7 and **3.8** summarize the Total AM and PM peak hour vehicle operations. The additional development-generated trips negligibly impact the intersection operations and do not impact the findings of the previously completed joint analysis for Latoria South and Royal Beach. All intersections operate within thresholds, except for a few movements with 95th percentile queues exceeding the available storage. This is not a significant concern and is a common occurrence in urban areas.

Table 3.7: 2031 Total Vehicle Operations

MOVEMENT	AM			PM		
	LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
OVERALL	*C*			*B*		
EBL	C	0.65	45	B	0.21	15
EBTR	C	0.73	85	B	0.45	50
WBL	C	0.23	15	B	0.11	10
WBTR	C	0.78	70	B	0.47	55
NBL	C	0.56	35	B	0.38	35
NBTR	B	0.22	20	B	0.08	10
SBL	C	0.19	20	C	0.11	15
SBTR	C	0.44	15	C	0.20	10

Table 3.8: 2043 Total Vehicle Operations

MOVEMENT	AM			PM		
	LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
OVERALL	*C*			*C*		
EBL	C	0.69	50	C	0.59	35
EBTR	C	0.71	80	B	0.73	100
WBL	C	0.22	15	C	0.37	25
WBTR	D	0.82	80	C	0.79	105
NBL	B	0.54	35	C	0.72	65
NBTR	B	0.21	20	B	0.17	15
SBL	C	0.23	20	C	0.19	20
SBTR	C	0.46	15	C	0.40	20

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Exhibit 3.4
Total 2031 Peak Hour Vehicle Traffic Volumes

3554 Ryder Hesjedal Way
04-20-0409 April 2021

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Exhibit 3.5
Total 2043 Peak Hour Vehicle Traffic Volumes

3554 Ryder Hesjedal Way
04-20-0409 April 2021

4. DEVELOPMENT REVIEW

4.1 Site Overview

The development site contains a single vehicle access which is located on Ryder Hesjedal Way, just south of the opposing local street on the east side of Ryder Hesjedal Way. The site access location is appropriate as it is a sufficient distance from the adjacent Latoria Road intersection and the Secondary School driveway. Its slight offset from the opposing local street is not anticipated to cause significant concerns since there will be clear sightlines and vehicles waiting to turn left off of Ryder Hesjedal Way will not block the opposing access.

4.2 Bicycle Parking

Well-managed, secure, and accessible bicycle parking will be provided as part of the development. **Table 4.1** summarizes the City's bicycle parking requirement which the development will satisfy.

Table 4.1: Bicycle Parking Requirement

LAND USE	DENSITY	BYLAW RATE	BYLAW SUPPLY REQUIREMENT
Apartment / Townhouse	122 units	1 Class 1 space per unit, plus 1 six space Class 2 rack at each entrance of an apartment	122 Class 1 space 2 six space Class 2 racks
Office	1,755 sf (153 sm)	1 per 250 sm GFA for the first 5000 sm, and 1 per 500 sm GFA for any additional area (50% Class 1, 50% Class 2)	1 Class 1 space 1 Class 2 space

4.3 Vehicle Parking

4.3.1 Overview

The development is comprised of 122 residential units and 1755 sf (163 m^2) of commercial floor area. The residential units are intended to be rental which are known to have a lower parking demand than strata residential units. However, to provide a more general analysis, the vehicle parking analysis in this study is completed assuming the residential units will strata which have a higher parking demand. Two small commercial CRUs are provided on the ground floor of the south building which are anticipated to accommodate professional offices. The two applicable minimum vehicle parking rates from the current Land Use Bylaw are:

- Residential, Multi-family: 1.5 per dwelling plus 1 per 100 m^2 of building floor area exceeding 60 m^2 times the number of dwelling units
- Offices, Multi-tenant: 1 per 30 m^2 Gross Floor Area

The development is seeking to have the minimum vehicle parking requirements for South Latoria (opposing side of Latoria Road from the proposed development) applied. The approved rates for South Latoria are:

- Multi-family Residential
    - Bachelor - 0.8 spaces per dwelling unit
    - One-bedroom - 1.0 spaces per dwelling unit
    - Two-bedroom - 1.3 spaces per dwelling unit
    - Three-bedroom or greater - 1.5 spaces per dwelling unit
    - Visitor parking - 0.15 spaces per dwelling unit
- Commercial
    - Retail (including Grocery) - 0.43 spaces per 10m^2 of gross floor area
    - Office - 0.28 spaces per 10 m^2 of gross floor area

The South Latoria parking rates were established by a comprehensive parking study which compared the off-street parking requirement in municipalities that were representative of Colwood including communities on the Westshore and the Saanich Peninsula and select communities elsewhere on Vancouver Island. Parking observations were completed to estimate the peak demand for each land use. The study recommended that parking rates could be reduced once frequent transit service is in place. The study also noted that the recommended rates are for strata tenure; supply rates could be reduced for rental tenure.

The following sections review the suitability of applying the South Latoria residential parking rates to the proposed development. The South Latoria office parking rate is only slightly different from the existing city-wide rate, so a detailed review is not provided.

4.3.2 Residential Parking Observations

To validate the South Latoria parking study findings, Bunt observed the peak residential parking at comparable multi-family buildings. Peak vehicle demand rates were estimated by counting the number of parked vehicles in the late evening and then increasing the values based on a time-of-day factor from the Institute of Transportation Engineers Parking Generation Manual. This adjustment factor is intended to account for people that typically park their vehicles on the property but were not parked during the observations.

Table 4.2: Residential Parking Observations

ADDRESS	MUNICIPALITY	YEAR	TENURE	UNITS	VEHICLES/UNIT	SPACES/UNIT
3319A/B Painter Road	Colwood	2021	Strata	36	1.25	1.33
2885 Jacklin Road	Langford	2021	Rental	94	0.89	0.98
3142 – 3148 Jacklin Road	Langford	2020	Rental	222	0.95	1.33
6472 Paddle Road	North Cowichan	2020	Rental	112	0.96	1.38
618 Anderton Road	Comox	2020	Rental	87	0.95	1.01
6025 Linley Valley Drive	Nanaimo	2020	Rental	73	0.77	1.31

Key findings include:

- All six rental residential buildings have a parking demand of less than one vehicle per unit.
- The majority of the rental residential buildings have a parking demand between 0.90 and 0.95 vehicles/unit.
- The sole strata residential building had the highest parking demand (1.25 vehicles/unit) which is anticipated since strata residential buildings typically have a higher parking demand than rental residential buildings. The strata building surveyed was also not in a town centre, so it is anticipated to have a higher parking demand than the proposed development location.

The parking observations conducted by Bunt indicate that the South Latoria residential parking rates are anticipated to exceed the parking demand at the proposed buildings.

4.3.3 Residential Visitor Parking

The current Land Use Bylaw does not specify an amount of residential parking spaces to be reserved for visitors. The supply of 0.15 residential visitor spaces/unit is higher than the anticipated demand. Bunt typically recommends between 0.05 and 0.10 visitor spaces/unit for locations across BC depending on the local context. This recommendation stems from the Metro Vancouver Residential Apartment Parking Study which found that visitor parking demand never exceeded 0.06 vehicles per dwelling unit during the study period. These rates have been further substantiated by previous Bunt studies on Vancouver Island and in Greater Vancouver. Bunt has previously observed visitor parking demand at numerous residential properties with the peak demand typically being between 0.05 and 0.10 vehicles/unit. Bunt has never observed a visitor parking demand at a multi-family building greater than 0.15 vehicles/unit.

4.3.4 Recommendations

The data indicates that the approved off-street parking rates for South Latoria are applicable to the proposed development. **Table 4.3** summarizes the development's minimum vehicle parking requirement based on the Land Use Bylaw's existing parking requirement for North Latoria and the approved rates for South Latoria which are recommended for the proposed development.

Table 4.3: Vehicle Parking Requirements

LAND USE	QUANTITY	NORTH LATORIA		SOUTH LATORIA	
		MIN. RATE	MIN. REQUIRED	MIN. RATE	MIN. REQUIRED
Bachelor	8	1.5 per unit plus 1 for each 100 SM of building floor area exceeding 60 SM times the number of dwelling units	217	0.8 per unit	6
One-bedroom	85			1.0 per unit	81
Two-bedroom	36			1.3 per unit	44
Residential Sub-total					**131**
Visitor	129 units			0.15 per unit	18
Office	163 SM	1 per 30 SM	5	0.28 per 10 m2	4
TOTAL	-		222	-	153

4.4 Parking Supply

Building A current satisfies the bylaw parking requirement which is 1.5 per dwelling unit plus 1 for each 100 m^2 of building floor area, exceeding 60 m^2 times the number of dwelling units. 121 residential spaces are currently supplied including visitor parking. 21 commercial parking spaces are currently provided for the retail component of the building, bringing the total to 142 parking spaces for Building A which satisfies the bylaw required amount of parking.

As the intent of the currently proposed rezoning is to rezone the entire site to facilitate Building B. This would include updated parking requirement ratios for both Building A and B. Since the applicant's proposed parking ratios are below the current bylaw requirement, some of the excess Building A parking spaces would be re-assigned to Building B.

As discussed in Section 4.3.4, Bunt recommends that the South Latoria parking rates by applied to the proposed rezoning and the rates result in a minimum vehicle parking requirement of 153 spaces for both buildings. The total parking supply for both buildings is 174 spaces which exceeds this amount. Therefore both buildings would be in compliance if the South Latoria rates were applied.

5. SUMMARY & RECOMMENDATIONS

5.1 Summary

1. The proposed development includes 129 residential units and 163 m^2 of commercial floor area. Vehicle access will on Ryder Hesjedal Way, midway along the site's east edge.

2. The development site is located in a rapidly growing neighbourhood with an increased number of amenities within walking distance anticipated in the coming years.

3. The development will comply with the City's short-term and long-term bicycle parking requirements.

4. The development is seeking to have the South Latoria vehicle parking rates applied as opposed to the typical City requirements. The South Latoria area is directly across Latoria Road from the development site. The parking usage at multiple similar buildings was analyzed and was found to be less than South Latoria rates. The development's proposed parking supply of 174 spaces exceeds the requirements if the South Latoria rates were applied.

5. Using conservative (i.e. high) assumptions, the development is anticipated to generate 40 vehicle trips per peak hour (400 trips per day) more than was previously assumed in the joint transportation analyses for South Latoria and Royal Beach. This modest vehicle trip generation does impact the findings of the previous transportation plans for the area.

5.2 Recommendations

6. The South Latoria parking rates are appropriate for the development.

7. The findings of the previously completed joint transportation analysis for South Latoria and Royal Beach are not noticeably impacted by the proposed development. The findings from the joint study are still applicable.

APPENDIX A

Terms of Reference

TERMS OF REFERENCE FOR A TRAFFIC IMPACT ASSESSMENT

Colwood

Colwood's project number: RZ-20-011

Proposed Development Location:

- 3554 Ryder Hesjedal Way
- Colwood, B.C.

Legal Description for the Proposed Development:

- PID: 030-310-521
- Legal Description: Lot 2; ED; EPP65598

1. PURPOSE

A Traffic Impact Assessment (TIA) for current traffic and horizon years of 2031 and 2043 is required to determine and assess the impact of traffic likely generated by the proposed development on the existing road, cycling, pedestrian and transit networks. The study shall identify what improvements (both onsite and offsite) will be required to adequately and safely accommodate the increase in traffic generated by the proposed development and provide cost estimates to mitigate these impacts on the existing networks.

This study must also determine and evaluate any possible alternatives to the proposed improvements and provide information which will assist the City in determining the acceptability of the proposed improvements.

2. TERMS OF REFERENCE AND SCOPE

2.1. This TIA is required, at a minimum, to encompass Ryder Hesjedal Way (RHW), the access from the lands onto Ryder Hesjedal Way, Latoria Boulevard, and the following intersections: RHW at Latoria Boulevard, Latoria Boulevard at Metchosin Road, and increase in traffic due to this development relative to Latoria at Wishart Road and all connecting roads.

2.2. This TIA should not be limited to intersections only, but should also include existing road widths, driving lanes, parking, cycle lanes and pedestrian movements of this and all other pending developments in the neighbourhoods that will affect the road network for this area and recommendations of priority improvements in Section 5 of Colwood's Transportation Master Plan and as considered with the zoning

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considerations relative to Royal bay Developments North and South as it relates to Latoria Boulevard.

2.3. Previous relevant studies and plans shall be identified and cross-referenced in the TIA. Please consider and reference the following previous studies:

- Latoria Traffic Study – Joint Memo as prepared by Watt / Bunt dated 2019, October 28 and as updated
- Royal Bay Master Transportation Plan (2014) and updates (2017) with specificity to RHW and Latoria Boulevard.
- Draft Olympic View Transportation Impact Assessment (2017)
- Relevant Langford traffic studies for the Latoria Road corridor and all development activities that affect it

2.4. Document the **current land use** and transportation plans with reference to the City's current Official Community Plan (OCP) and the City's current Transportation Master Plan as they pertain to the study area.

2.5. Estimate the peak hour **trip generation** resulting from all proposed developments in the study area. This should include the anticipated number of trips that will be generated by pending developments in the area as well as growth rates based on population, land use, employment projection, and similar.

2.6. Identify generation and distribution of trips (origin and destination).

2.7. Identify any **existing constraints** and/or existing problems (such as geometric parameters of existing roads, transportation system performance, and traffic circulation) within the existing road network in addition to the any proposed future road network plan and provide recommendations to mitigate same.

2.8. Evaluate **parking requirements** and on-site circulation needs for pick-ups and drop-offs when applicable and where this hasn't been provided in another report. If it is in a separate report, please provide reference to the document as a text reference.

- Consideration for the Royal Bay and Royal Beach Parking Standards adopted for multiple residential may be proposed as comparable parking standards (see the City's Parking standard update [DRAFT] available upon request)
- Consideration for shared parking / sustainable transportation as it relates to the site (current and future)

2.9. Evaluate **pedestrian and cycling connections**, walkways, multi-use pathways and networks both proposed onsite and offsite in relation to the proposed building and property entrances using desire lines and giving consideration to people with disabilities. Include the pedestrian and cycling infrastructure relationship with both the existing and proposed future road networks within the study area, and identify where additional off-site sidewalks, walkways, bicycle lanes and roadway crossings may be required.

2.10. Evaluate the potential demand for **BC Transit**. Review and recommend both onsite and offsite facilities (including transit stops) to accommodate public transit and school buses where appropriate, review and recommend transit improvements necessary to serve all future development.

- Identify and update the bicycle route and pedestrian connections from the study area to accommodate this capacity.

2.11. Analyse the **intersection capacities** with and without development and identify future capacity deficiencies. Provide analysis for all horizon years both with and without development traffic.

2.12. Complete a **capacity analysis** with development and improvement (mitigated built condition) for intersections, queuing, signal and special warrant analysis.

2.13. Provide a signal and other operations (such as left-turn bays) warrant analysis if and as traffic from this sites necessitates.

2.14. Review turning vehicle storage space (queue length vs. length of turn bay).

2.15. Develop feasible road layout, laning and traffic control options, and alternatives for handling future traffic.

2.16. Assess road safety implications of all proposed modifications.

2.17. Identify truck and emergency vehicle movements and access (including fire vehicles).

2.18. Estimate cost to modify the existing road network to accommodate the additional traffic generated by future developments (functional design

improvements). Mitigation measures to address the future traffic impact on surrounding roads and intersections.

2.19. Summarize modifications and/or improvements required to:

- serve existing and opening day traffic.
- serve future background traffic at identified horizon years; and
- serve future combined background and development-generated traffic.

2.20. Prepare a draft report for the City's review and comments and provide a final report incorporating said comments.

METHOD

The study shall include the following elements:

2.21. Identification of a suitable study area, which shall extend beyond the boundaries of the development as directed by the City.

2.22. Inventory and plans of the existing and proposed road network in the study area corridor for the given horizon years.

2.23. Existing and proposed geometrics of all affected intersections (including road grades and geometry for sightlines)

2.24. Current traffic counts and forecast traffic volumes at all major intersections, and access points for pedestrians, cyclists and motor vehicles for the following scenarios:

- Existing – to the current regional model
- Developed to the development potential of the current application (overlayed onto the present or existing condition)
- At full build-out
- The timing of improvements outlined in reference reports and/or as a result of the development.

2.25. Details of the proposed development must be defined and include the following:

- Specific peak hour (both am and pm) for all land uses; if a commercial development, weekends are to be considered in addition to weekdays.
- Mix and size of each land use within the development.
- Timing and development size of each phase.

- Proposed layout of each phase of the site.
- Parking requirements for bicycles and motor vehicles.

2.26. Identification of the Road Network, including the following:

- Existing City and Provincial road classifications and right-of-way requirements of the surrounding road network
- Geometrics (laning, channelization, and traffic control, and grades) of any/all intersections or interchanges
- Proposed road network and improvements planned by the City and the Province
- Proposed road layout within the development, major access points, and classifications.

2.27. Using trip generation rates established by the Institute of Transportation Engineers (I.T.E. current edition), identify traffic generation volumes for each phase of the development and at the required horizon years. Other trip generation studies for similar developments at other local sites will be considered as a replacement for the I.T.E. rates, subject to the City's discretion. Identify the percentage modal split for transit, cycling and pedestrian trips.

2.28. Analyze and document the distribution of traffic.

2.29. Clearly demonstrate and document the assignment of traffic, using existing and proposed road networks. For congested or complex road networks, computer modelling of each horizon may be required. If computer modelling is used, clearly document the principles and the model used in the program, including zonal inputs and assumptions.

2.30. Clearly establish and document the base traffic volumes, development volumes, and the combined traffic volumes at all intersections and access points identified for all scenarios.

2.31. Using methods and procedures outlined in the Canadian Capacity Guide (CCG), or the Highway Capacity software (H.C.S.), calculate the volume/capacity ratios, and levels of Service of all intersections and access points for each horizon year for background traffic and combined volumes.

2.32. If a new traffic signal is proposed, signal warrant calculations shall be conducted. If traffic signal progression is affected (where the existing signal spacing is one kilometre or less), the before and after impact on

the traffic signal progression shall be evaluated using an accepted software.

2.33. If any Level of Service exceeds “D” at intersections designed to its ultimate configuration, then reassign trips (where reasonable) to obtain a more balanced network. Where not possible, identify alternative improvements necessary to maintain a L.O.S. “C” for straight roadways, and a V/C as outlined by the most current version of the CCG.

2.34. Identify feasible improvement alternatives for locations having a V/C ratio exceeding the level referenced in 3.1.3 and evaluate these alternatives by calculating their V/C ratios. Improvement alternatives may be considered when the overall V/C ratio referenced in 3.13 or less is achieved using a maximum cycle length of 120 seconds.

2.35. Estimate costs (as required or requested) to upgrade the existing road system for each time horizon. The Traffic Engineer is to recommend an optimum construction program, and the proportion contributed by the developer and development for improvements required for development traffic. The City may request a cost analysis from the developer’s engineer.

2.36. The report shall document all assumptions, findings, analyses, evaluations, conclusions and recommendations. The City requires one (1) paper copy and one (1) PDF electronic copy of the final report and submission of the modelling data.

3. THE REPORT

The report shall include the following elements:

3.1. Executive Summary
- Study Purpose
- Key Findings
- Study Conclusion
- Study Recommendations

3.2. Introduction
- Study Purpose and Background
- Site Location and Study Area
- Development Description
- Approved Study Scope Elements

3.3. Proposed Development

- Offsite Development
- Description of Onsite Development
- Land Use, Intensity, And Zoning
- Location and Site Plan
- Environmental Considerations
- Sustainability Considerations

3.4. Area Conditions

- Study Area
- Definition
- Field observations
- Study Area Land Use
- Existing land uses and zoning.
- Anticipated future development.
- Related studies and plans
- Site Accessibility
- Pedestrian and cycling facilities.
- Transit service
- Area roadway system - existing and future (including functional classification and goals and strategies defined in relevant plans like system plans, corridor plans and access management plans)
- Existing traffic volumes and conditions
- Existing relevant transportation system management programs

3.5. Projected Traffic

- Site Traffic (each horizon year)
- Horizon years
- Peak period(s)
- Trip generation
- Trip distribution
- Modal split
- Trip assignment
- Through Traffic (each horizon year)
- Horizon years
- Peak period(s)
- Method of projection
- Non-site traffic for anticipated development in study area
- Through traffic volumes
- Estimated volumes.
- Total Traffic (each horizon year)

3.6. Traffic Analysis

- Capacity Analysis
- Corridor Analysis
- Safety Analysis
- Sight Distance
- Intersection Analysis
- Traffic Signal Phasing Analysis

3.7. Mitigation Measures

- Analysis of Site Access Alternatives (if appropriate)
- Off-Site Road Network Improvement Alternatives
- On-Site Mitigation Measures
- Corner Clearances
- Transportation Demand Management Measures
- Site Circulation and Parking as a summary of findings and recommended parking supply rates as compared to the draft rates of the City.

3.8. Improvement Analysis

- Plans and Studies Reviewed
- Improvements to Accommodate Base Traffic
- Improvements to Accommodate Site Traffic
- Alternative Improvements
- Transportation System Improvements Already Funded
- Evaluation

3.9. 9. Findings

- Site Accessibility
- Traffic Impacts
- Need for Any Improvements
- Compliance with Applicable Local Bylaws
- Cost Estimates

3.10. Recommendations

- Site Access/Circulation Plan
- Roadway Improvements
- Onsite
- Offsite
- Phasing (if applicable)

3.11. Conclusion

APPENDIX B

Synchro Reports

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	103	629	22	423	140	77	39	89
v/c Ratio	0.22	0.35	0.08	0.30	0.32	0.11	0.12	0.19
Control Delay	14.1	13.0	21.9	21.2	15.0	9.9	20.9	8.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.1	13.0	21.9	21.2	15.0	9.9	20.9	8.5
Queue Length 50th (m)	8.4	28.0	2.3	24.8	11.0	4.0	3.9	1.5
Queue Length 95th (m)	17.0	40.8	7.7	37.3	22.5	11.4	11.0	11.2
Internal Link Dist (m)		278.9		134.2		80.4		68.9
Turn Bay Length (m)	40.0		20.0		50.0		15.0	
Base Capacity (vph)	479	1832	297	1454	444	948	446	597
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.34	0.07	0.29	0.32	0.08	0.09	0.15

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	95	452	127	20	350	40	129	49	22	36	14	68
Future Volume (veh/h)	95	452	127	20	350	40	129	49	22	36	14	68
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.95		0.89	0.93		0.83	0.92		0.93	0.90		0.89
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	103	491	138	22	380	43	140	53	24	39	15	74
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	419	1169	325	311	901	100	505	493	223	421	67	332
Arrive On Green	0.08	0.44	0.44	0.29	0.29	0.29	0.08	0.42	0.42	0.27	0.27	0.27
Sat Flow, veh/h	1774	2653	738	736	3134	350	1774	1183	536	1186	248	1221
Grp Volume(v), veh/h	103	326	303	22	212	211	140	0	77	39	0	89
Grp Sat Flow(s),veh/h/ln	1774	1770	1621	736	1770	1714	1774	0	1719	1186	0	1469
Q Serve(g_s), s	2.7	9.2	9.4	1.6	7.1	7.3	3.9	0.0	2.0	1.8	0.0	3.4
Cycle Q Clear(g_c), s	2.7	9.2	9.4	1.6	7.1	7.3	3.9	0.0	2.0	1.8	0.0	3.4
Prop In Lane	1.00		0.45	1.00		0.20	1.00		0.31	1.00		0.83
Lane Grp Cap(c), veh/h	419	779	714	311	509	493	505	0	716	421	0	399
V/C Ratio(X)	0.25	0.42	0.42	0.07	0.42	0.43	0.28	0.00	0.11	0.09	0.00	0.22
Avail Cap(c_a), veh/h	440	793	727	311	509	493	515	0	756	441	0	424
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.6	14.0	14.0	19.0	21.0	21.1	15.6	0.0	13.0	20.0	0.0	20.5
Incr Delay (d2), s/veh	0.3	0.4	0.4	0.1	0.5	0.6	0.3	0.0	0.1	0.1	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	4.5	4.2	0.3	3.5	3.5	1.9	0.0	1.0	0.6	0.0	1.4
LnGrp Delay(d),s/veh	14.9	14.3	14.4	19.1	21.5	21.6	15.9	0.0	13.0	20.1	0.0	20.8
LnGrp LOS	B	B	B	B	C	C	B		B	C		C
Approach Vol, veh/h		732			445			217			128	
Approach Delay, s/veh		14.4			21.5			14.9			20.6	
Approach LOS		B			C			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		37.2		35.5	11.1	26.1	10.6	24.9
Change Period (Y+Rc), s		5.2		5.2	5.0	5.2	5.0	5.2
Max Green Setting (Gmax), s		32.6		32.0	7.0	20.6	6.0	21.0
Max Q Clear Time (g_c+I1), s		11.4		4.0	4.7	9.3	5.9	5.4
Green Ext Time (p_c), s		20.7		9.0	0.1	11.2	0.0	5.9

Intersection Summary	
HCM 2010 Ctrl Delay	17.1
HCM 2010 LOS	B

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	71	722	35	595	190	53	25	58
v/c Ratio	0.20	0.46	0.15	0.46	0.42	0.09	0.10	0.17
Control Delay	14.0	13.9	22.0	22.2	18.7	9.3	27.0	13.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.0	13.9	22.0	22.2	18.7	9.3	27.0	13.7
Queue Length 50th (m)	6.0	34.8	3.9	38.9	17.8	2.2	3.0	2.0
Queue Length 95th (m)	12.8	49.1	10.8	54.0	33.5	8.9	9.5	11.3
Internal Link Dist (m)		278.9		134.2		80.4		55.4
Turn Bay Length (m)	40.0		15.0		50.0		15.0	
Base Capacity (vph)	355	1807	257	1391	479	833	333	454
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.40	0.14	0.43	0.40	0.06	0.08	0.13

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	65	487	178	32	517	30	175	24	25	23	16	38
Future Volume (veh/h)	65	487	178	32	517	30	175	24	25	23	16	38
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.90	0.96		0.86	0.90		0.92	0.87		0.86
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	71	529	193	35	562	33	190	26	27	25	17	41
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	373	1185	429	327	1236	72	503	309	321	344	93	225
Arrive On Green	0.05	0.48	0.48	0.37	0.37	0.37	0.11	0.39	0.39	0.22	0.22	0.22
Sat Flow, veh/h	1774	2462	892	696	3364	197	1774	801	832	1172	434	1046
Grp Volume(v), veh/h	71	379	343	35	295	300	190	0	53	25	0	58
Grp Sat Flow(s),veh/h/ln	1774	1770	1584	696	1770	1791	1774	0	1633	1172	0	1479
Q Serve(g_s), s	1.8	11.1	11.2	2.8	9.9	10.0	6.1	0.0	1.6	1.3	0.0	2.5
Cycle Q Clear(g_c), s	1.8	11.1	11.2	5.1	9.9	10.0	6.1	0.0	1.6	1.3	0.0	2.5
Prop In Lane	1.00		0.56	1.00		0.11	1.00		0.51	1.00		0.71
Lane Grp Cap(c), veh/h	373	852	762	327	650	658	503	0	631	344	0	319
V/C Ratio(X)	0.19	0.45	0.45	0.11	0.45	0.46	0.38	0.00	0.08	0.07	0.00	0.18
Avail Cap(c_a), veh/h	420	875	783	327	650	658	562	0	745	387	0	373
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.7	13.4	13.5	18.1	18.8	18.9	18.8	0.0	15.3	24.7	0.0	25.1
Incr Delay (d2), s/veh	0.2	0.4	0.4	0.1	0.5	0.5	0.5	0.0	0.1	0.1	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	5.5	4.9	0.5	4.9	5.0	3.0	0.0	0.7	0.4	0.0	1.1
LnGrp Delay(d),s/veh	13.9	13.8	13.9	18.3	19.3	19.4	19.3	0.0	15.3	24.8	0.0	25.4
LnGrp LOS	B	B	B	B	B	B	B		B	C		C
Approach Vol, veh/h		793			630			243			83	
Approach Delay, s/veh		13.9			19.3			18.4			25.2	
Approach LOS		B			B			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		43.0		35.5	8.9	34.0	13.4	22.1
Change Period (Y+Rc), s		5.2		5.2	5.0	5.2	5.0	5.2
Max Green Setting (Gmax), s		38.8		35.8	6.0	27.8	11.0	19.8
Max Q Clear Time (g_c+I1), s		13.2		3.6	3.8	12.0	8.1	4.5
Green Ext Time (p_c), s		24.5		6.4	0.1	15.7	0.4	3.8

Intersection Summary		
HCM 2010 Ctrl Delay		17.0
HCM 2010 LOS		B

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	208	1052	43	769	232	153	77	181
v/c Ratio	0.75	0.68	0.31	0.77	0.59	0.22	0.28	0.38
Control Delay	32.5	17.8	28.1	29.4	22.5	11.7	24.1	8.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.5	17.8	28.1	29.4	22.5	11.7	24.1	8.6
Queue Length 50th (m)	17.5	57.2	4.7	51.0	21.3	10.0	8.4	3.3
Queue Length 95th (m)	#45.0	78.5	13.6	70.8	36.7	21.1	18.8	17.2
Internal Link Dist (m)		278.9		134.2		80.4		68.9
Turn Bay Length (m)	40.0		20.0		50.0		15.0	
Base Capacity (vph)	279	1591	148	1053	393	774	335	545
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.66	0.29	0.73	0.59	0.20	0.23	0.33

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												
Traffic Volume (veh/h)	191	768	200	40	627	80	213	97	44	71	29	137
Future Volume (veh/h)	191	768	200	40	627	80	213	97	44	71	29	137
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.89	0.97		0.83	0.94		0.93	0.91		0.89
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	208	835	217	43	682	87	232	105	48	77	32	149
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	323	1218	316	203	891	113	413	483	221	406	72	335
Arrive On Green	0.09	0.45	0.45	0.29	0.29	0.29	0.07	0.41	0.41	0.28	0.28	0.28
Sat Flow, veh/h	1774	2703	702	518	3076	391	1774	1179	539	1121	261	1214
Grp Volume(v), veh/h	208	546	506	43	392	377	232	0	153	77	0	181
Grp Sat Flow(s),veh/h/ln	1774	1770	1636	518	1770	1698	1774	0	1718	1121	0	1474
Q Serve(g_s), s	5.8	18.3	18.3	5.4	15.1	15.1	5.0	0.0	4.3	4.0	0.0	7.6
Cycle Q Clear(g_c), s	5.8	18.3	18.3	11.7	15.1	15.1	5.0	0.0	4.3	4.0	0.0	7.6
Prop In Lane	1.00		0.43	1.00		0.23	1.00		0.31	1.00		0.82
Lane Grp Cap(c), veh/h	323	797	737	203	512	492	413	0	705	406	0	407
V/C Ratio(X)	0.64	0.69	0.69	0.21	0.76	0.77	0.56	0.00	0.22	0.19	0.00	0.44
Avail Cap(c_a), veh/h	323	797	737	203	512	492	413	0	714	412	0	415
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.5	16.3	16.3	25.7	24.2	24.2	20.2	0.0	14.2	21.0	0.0	22.3
Incr Delay (d2), s/veh	4.3	2.5	2.7	0.5	6.8	7.2	1.7	0.0	0.2	0.2	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.2	9.3	8.7	0.8	8.3	8.0	3.5	0.0	2.1	1.2	0.0	3.2
LnGrp Delay(d),s/veh	21.8	18.8	19.0	26.3	30.9	31.4	21.9	0.0	14.4	21.2	0.0	23.0
LnGrp LOS	C	B	B	C	C	C	C		B	C		C
Approach Vol, veh/h		1260			812			385			258	
Approach Delay, s/veh		19.3			30.9			18.9			22.5	
Approach LOS		B			C			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		38.8		35.8	12.0	26.8	10.0	25.8
Change Period (Y+Rc), s		5.2		5.2	5.0	5.2	5.0	5.2
Max Green Setting (Gmax), s		33.6		31.0	7.0	21.6	5.0	21.0
Max Q Clear Time (g_c+I1), s		20.3		6.3	7.8	17.1	7.0	9.6
Green Ext Time (p_c), s		13.3		15.6	0.0	4.5	0.0	8.1

Intersection Summary	
HCM 2010 Ctrl Delay	23.0
HCM 2010 LOS	C

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	140	1229	68	1050	311	105	50	118
v/c Ratio	0.69	0.74	0.55	0.78	0.75	0.17	0.23	0.34
Control Delay	32.4	18.4	41.3	27.1	34.2	10.5	30.9	13.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.4	18.4	41.3	27.1	34.2	10.5	30.9	13.8
Queue Length 50th (m)	11.6	75.0	8.5	77.0	37.1	5.2	6.7	4.5
Queue Length 95th (m)	#32.4	100.1	#27.0	101.1	#65.0	15.2	16.1	17.8
Internal Link Dist (m)		278.9		134.2		80.4		55.4
Turn Bay Length (m)	40.0		15.0		50.0		15.0	
Base Capacity (vph)	202	1691	126	1373	412	657	250	395
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.73	0.54	0.76	0.75	0.16	0.20	0.30

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	129	845	286	63	906	60	286	47	50	46	31	77
Future Volume (veh/h)	129	845	286	63	906	60	286	47	50	46	31	77
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.90	0.99		0.87	0.92		0.92	0.88		0.86
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	140	918	311	68	985	65	311	51	54	50	34	84
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	258	1268	427	182	1281	84	437	296	313	319	88	218
Arrive On Green	0.06	0.50	0.50	0.38	0.38	0.38	0.11	0.37	0.37	0.21	0.21	0.21
Sat Flow, veh/h	1774	2523	849	449	3335	220	1774	791	838	1124	424	1047
Grp Volume(v), veh/h	140	642	587	68	523	527	311	0	105	50	0	118
Grp Sat Flow(s),veh/h/ln	1774	1770	1603	449	1770	1785	1774	0	1629	1124	0	1471
Q Serve(g_s), s	3.9	23.9	24.3	11.8	21.8	21.8	9.0	0.0	3.6	3.1	0.0	5.8
Cycle Q Clear(g_c), s	3.9	23.9	24.3	26.1	21.8	21.8	9.0	0.0	3.6	3.1	0.0	5.8
Prop In Lane	1.00		0.53	1.00		0.12	1.00		0.51	1.00		0.71
Lane Grp Cap(c), veh/h	258	889	805	182	680	686	437	0	610	319	0	306
V/C Ratio(X)	0.54	0.72	0.73	0.37	0.77	0.77	0.71	0.00	0.17	0.16	0.00	0.39
Avail Cap(c_a), veh/h	258	889	805	182	680	686	437	0	622	328	0	317
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.6	16.4	16.5	30.6	22.7	22.7	24.7	0.0	17.7	27.7	0.0	28.8
Incr Delay (d2), s/veh	2.3	2.9	3.4	1.3	5.4	5.3	5.4	0.0	0.1	0.2	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	12.3	11.4	1.5	11.6	11.7	3.1	0.0	1.7	1.0	0.0	2.4
LnGrp Delay(d),s/veh	19.9	19.3	19.8	31.9	28.1	28.0	30.1	0.0	17.8	27.9	0.0	29.5
LnGrp LOS	B	B	B	C	C	C	C		B	C		C
Approach Vol, veh/h		1369			1118			416			168	
Approach Delay, s/veh		19.6			28.3			27.0			29.1	
Approach LOS		B			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		47.6		36.8	10.0	37.6	14.0	22.8
Change Period (Y+Rc), s		5.2		5.2	5.0	5.2	5.0	5.2
Max Green Setting (Gmax), s		42.4		32.2	5.0	32.4	9.0	18.2
Max Q Clear Time (g_c+I1), s		26.3		5.6	5.9	28.1	11.0	7.8
Green Ext Time (p_c), s		16.1		11.7	0.0	4.3	0.0	5.5

Intersection Summary	
HCM 2010 Ctrl Delay	24.3
HCM 2010 LOS	C

Lane Group	EBL	WBT	SBL	SBT
Lane Group Flow (vph)	3	8	17	8
v/c Ratio	0.00	0.01	0.04	0.01
Control Delay	8.0	0.0	14.6	0.0
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	8.0	0.0	14.6	0.0
Queue Length 50th (m)	0.2	0.0	1.4	0.0
Queue Length 95th (m)	1.3	0.0	4.7	0.0
Internal Link Dist (m)		134.2		68.9
Turn Bay Length (m)	40.0		15.0	
Base Capacity (vph)	717	1607	543	1084
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.00	0.00	0.03	0.01

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	0	0	0	0	7	0	0	0	16	0	7
Future Volume (veh/h)	3	0	0	0	0	7	0	0	0	16	0	7
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.87		1.00	1.00		0.85	1.00		1.00	0.91		0.91
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	3	0	0	0	0	8	0	0	0	17	0	8
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	555	1543	0	154	572	432	631	636	0	706	0	493
Arrive On Green	0.01	0.00	0.00	0.00	0.00	0.32	0.00	0.00	0.00	0.34	0.00	0.34
Sat Flow, veh/h	1774	3632	0	1412	1770	1338	1774	1863	0	1618	0	1444
Grp Volume(v), veh/h	3	0	0	0	0	8	0	0	0	17	0	8
Grp Sat Flow(s),veh/h/ln	1774	1770	0	1412	1770	1338	1774	1863	0	1618	0	1444
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.3	0.0	0.2
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.3	0.0	0.2
Prop In Lane	1.00		0.00	1.00		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	555	1543	0	154	572	432	631	636	0	706	0	493
V/C Ratio(X)	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.02
Avail Cap(c_a), veh/h	811	2549	0	352	819	620	818	1238	0	883	0	650
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.3	0.0	0.0	0.0	0.0	10.8	0.0	0.0	0.0	10.2	0.0	10.2
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1
LnGrp Delay(d),s/veh	9.3	0.0	0.0	0.0	0.0	10.8	0.0	0.0	0.0	10.2	0.0	10.2
LnGrp LOS	A					B				B		B
Approach Vol, veh/h		3			8			0			25	
Approach Delay, s/veh		9.3			10.8			0.0			10.2	
Approach LOS		A			B						B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		25.5		21.1	5.3	20.3	0.0	21.1
Change Period (Y+Rc), s		5.2		5.2	5.0	5.2	5.0	5.2
Max Green Setting (Gmax), s		33.6		31.0	7.0	21.6	5.0	21.0
Max Q Clear Time (g_c+I1), s		0.0		0.0	2.0	2.2	0.0	2.3
Green Ext Time (p_c), s		0.0		0.0	0.0	0.1	0.0	0.2

Intersection Summary	
HCM 2010 Ctrl Delay	10.3
HCM 2010 LOS	B

Lane Group	EBL	WBT	SBL	SBT
Lane Group Flow (vph)	8	18	12	6
v/c Ratio	0.01	0.01	0.03	0.01
Control Delay	6.7	0.0	15.5	10.8
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	6.7	0.0	15.5	10.8
Queue Length 50th (m)	0.4	0.0	1.0	0.1
Queue Length 95th (m)	1.9	0.0	3.9	2.2
Internal Link Dist (m)		134.2		55.4
Turn Bay Length (m)	40.0		15.0	
Base Capacity (vph)	737	1688	466	552
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.01	0.01	0.03	0.01

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	0	0	0	0	17	0	0	0	11	1	5
Future Volume (veh/h)	7	0	0	0	0	17	0	0	0	11	1	5
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.88		1.00	1.00		0.85	1.00		1.00	0.90		0.90
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	8	0	0	0	0	18	0	0	0	12	1	5
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	586	1636	0	164	598	456	587	560	0	645	74	372
Arrive On Green	0.01	0.00	0.00	0.00	0.00	0.34	0.00	0.00	0.00	0.30	0.30	0.30
Sat Flow, veh/h	1774	3632	0	1412	1770	1349	1774	1863	0	1597	247	1236
Grp Volume(v), veh/h	8	0	0	0	0	18	0	0	0	12	0	6
Grp Sat Flow(s),veh/h/ln	1774	1770	0	1412	1770	1349	1774	1863	0	1597	0	1484
Q Serve(g_s), s	0.1	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.2	0.0	0.1
Cycle Q Clear(g_c), s	0.1	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.2	0.0	0.1
Prop In Lane	1.00		0.00	1.00		1.00	1.00		0.00	1.00		0.83
Lane Grp Cap(c), veh/h	586	1636	0	164	598	456	587	560	0	645	0	446
V/C Ratio(X)	0.01	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.02	0.00	0.01
Avail Cap(c_a), veh/h	769	3418	0	729	1306	996	946	1366	0	826	0	615
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	8.2	0.0	0.0	0.0	0.0	9.8	0.0	0.0	0.0	10.8	0.0	10.8
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1
LnGrp Delay(d),s/veh	8.2	0.0	0.0	0.0	0.0	9.8	0.0	0.0	0.0	10.8	0.0	10.8
LnGrp LOS	A					A				B		B
Approach Vol, veh/h		8			18			0			18	
Approach Delay, s/veh		8.2			9.8			0.0			10.8	
Approach LOS		A			A						B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		25.5		18.4	5.5	20.0	0.0	18.4
Change Period (Y+Rc), s		5.2		5.2	5.0	5.2	5.0	5.2
Max Green Setting (Gmax), s		42.4		32.2	5.0	32.4	9.0	18.2
Max Q Clear Time (g_c+I1), s		0.0		0.0	2.1	2.4	0.0	2.2
Green Ext Time (p_c), s		0.0		0.0	0.0	0.5	0.0	0.1

Intersection Summary	
HCM 2010 Ctrl Delay	9.9
HCM 2010 LOS	A

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	208	1127	43	779	232	153	77	181
v/c Ratio	0.75	0.73	0.35	0.77	0.59	0.22	0.28	0.38
Control Delay	33.1	19.0	30.9	29.6	22.6	11.7	24.1	8.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.1	19.0	30.9	29.6	22.6	11.7	24.1	8.6
Queue Length 50th (m)	17.5	64.0	4.8	51.8	21.3	10.0	8.4	3.3
Queue Length 95th (m)	#45.8	87.1	14.2	71.8	36.7	21.1	18.8	17.2
Internal Link Dist (m)		278.9		134.2		80.4		68.9
Turn Bay Length (m)	40.0		20.0		50.0		15.0	
Base Capacity (vph)	277	1588	127	1048	391	770	333	542
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.71	0.34	0.74	0.59	0.20	0.23	0.33

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												
Traffic Volume (veh/h)	191	837	200	40	637	80	213	97	44	71	29	137
Future Volume (veh/h)	191	837	200	40	637	80	213	97	44	71	29	137
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.89	0.98		0.83	0.94		0.93	0.91		0.89
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	208	910	217	43	692	87	232	105	48	77	32	149
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	320	1244	296	184	893	112	413	483	221	406	72	335
Arrive On Green	0.09	0.45	0.45	0.29	0.29	0.29	0.07	0.41	0.41	0.28	0.28	0.28
Sat Flow, veh/h	1774	2762	657	485	3082	387	1774	1179	539	1121	261	1214
Grp Volume(v), veh/h	208	582	545	43	397	382	232	0	153	77	0	181
Grp Sat Flow(s),veh/h/ln	1774	1770	1650	485	1770	1700	1774	0	1718	1121	0	1474
Q Serve(g_s), s	5.8	20.1	20.2	5.9	15.3	15.4	5.0	0.0	4.3	4.0	0.0	7.6
Cycle Q Clear(g_c), s	5.8	20.1	20.2	14.1	15.3	15.4	5.0	0.0	4.3	4.0	0.0	7.6
Prop In Lane	1.00		0.40	1.00		0.23	1.00		0.31	1.00		0.82
Lane Grp Cap(c), veh/h	320	797	743	184	512	492	413	0	705	406	0	407
V/C Ratio(X)	0.65	0.73	0.73	0.23	0.77	0.78	0.56	0.00	0.22	0.19	0.00	0.44
Avail Cap(c_a), veh/h	320	797	743	184	512	492	413	0	714	412	0	415
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.6	16.8	16.8	27.5	24.3	24.3	20.2	0.0	14.2	21.0	0.0	22.3
Incr Delay (d2), s/veh	4.6	3.4	3.7	0.6	7.3	7.7	1.7	0.0	0.2	0.2	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.2	10.5	9.8	0.8	8.5	8.3	3.5	0.0	2.1	1.2	0.0	3.2
LnGrp Delay(d),s/veh	22.1	20.2	20.6	28.2	31.5	32.0	21.9	0.0	14.4	21.2	0.0	23.0
LnGrp LOS	C	C	C	C	C	C	C		B	C		C
Approach Vol, veh/h		1335			822			385			258	
Approach Delay, s/veh		20.7			31.6			18.9			22.5	
Approach LOS		C			C			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		38.8		35.8	12.0	26.8	10.0	25.8
Change Period (Y+Rc), s		5.2		5.2	5.0	5.2	5.0	5.2
Max Green Setting (Gmax), s		33.6		31.0	7.0	21.6	5.0	21.0
Max Q Clear Time (g_c+I1), s		22.2		6.3	7.8	17.4	7.0	9.6
Green Ext Time (p_c), s		11.4		15.6	0.0	4.2	0.0	8.1

Intersection Summary	
HCM 2010 Ctrl Delay	23.8
HCM 2010 LOS	C

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	78	722	35	613	190	53	37	64
v/c Ratio	0.24	0.47	0.15	0.47	0.41	0.09	0.15	0.18
Control Delay	14.8	14.3	21.8	22.0	18.2	9.2	28.1	13.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.8	14.3	21.8	22.0	18.2	9.2	28.1	13.4
Queue Length 50th (m)	6.8	35.7	3.9	40.1	17.4	2.2	4.5	2.0
Queue Length 95th (m)	14.1	50.2	10.8	55.4	33.3	8.8	12.7	11.9
Internal Link Dist (m)		278.9		134.2		80.4		55.4
Turn Bay Length (m)	40.0		15.0		50.0		15.0	
Base Capacity (vph)	329	1803	265	1425	499	831	315	432
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.40	0.13	0.43	0.38	0.06	0.12	0.15

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	72	487	178	32	517	47	175	24	25	34	16	43
Future Volume (veh/h)	72	487	178	32	517	47	175	24	25	34	16	43
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.90	0.96		0.86	0.90		0.92	0.87		0.86
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	78	529	193	35	562	51	190	26	27	37	17	47
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	368	1190	431	328	1192	108	498	309	321	342	83	231
Arrive On Green	0.05	0.48	0.48	0.37	0.37	0.37	0.11	0.39	0.39	0.21	0.21	0.21
Sat Flow, veh/h	1774	2462	892	696	3235	292	1774	801	832	1171	389	1077
Grp Volume(v), veh/h	78	379	343	35	306	307	190	0	53	37	0	64
Grp Sat Flow(s),veh/h/ln	1774	1770	1584	696	1770	1757	1774	0	1633	1171	0	1466
Q Serve(g_s), s	2.0	11.2	11.3	2.8	10.5	10.6	6.2	0.0	1.6	2.0	0.0	2.8
Cycle Q Clear(g_c), s	2.0	11.2	11.3	5.0	10.5	10.6	6.2	0.0	1.6	2.0	0.0	2.8
Prop In Lane	1.00		0.56	1.00		0.17	1.00		0.51	1.00		0.73
Lane Grp Cap(c), veh/h	368	855	766	328	652	647	498	0	630	342	0	314
V/C Ratio(X)	0.21	0.44	0.45	0.11	0.47	0.47	0.38	0.00	0.08	0.11	0.00	0.20
Avail Cap(c_a), veh/h	389	866	775	328	652	647	574	0	737	368	0	348
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.9	13.5	13.5	18.2	19.1	19.2	19.1	0.0	15.5	25.3	0.0	25.6
Incr Delay (d2), s/veh	0.3	0.4	0.4	0.1	0.5	0.5	0.5	0.0	0.1	0.1	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	5.5	5.0	0.5	5.2	5.2	3.0	0.0	0.7	0.7	0.0	1.2
LnGrp Delay(d),s/veh	14.1	13.8	13.9	18.3	19.7	19.7	19.5	0.0	15.5	25.4	0.0	25.9
LnGrp LOS	B	B	B	B	B	B	B		B	C		C
Approach Vol, veh/h		800			648			243			101	
Approach Delay, s/veh		13.9			19.6			18.7			25.7	
Approach LOS		B			B			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		43.5		35.8	9.1	34.4	13.6	22.2
Change Period (Y+Rc), s		5.2		5.2	5.0	5.2	5.0	5.2
Max Green Setting (Gmax), s		38.8		35.8	5.0	28.8	12.0	18.8
Max Q Clear Time (g_c+I1), s		13.3		3.6	4.0	12.6	8.2	4.8
Green Ext Time (p_c), s		25.0		6.9	0.0	16.2	0.5	3.8

Intersection Summary	
HCM 2010 Ctrl Delay	17.3
HCM 2010 LOS	B

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	211	1052	43	777	232	153	95	189
v/c Ratio	0.77	0.70	0.32	0.80	0.57	0.22	0.34	0.39
Control Delay	35.5	18.7	29.5	31.8	20.8	11.1	25.4	8.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.5	18.7	29.5	31.8	20.8	11.1	25.4	8.6
Queue Length 50th (m)	18.3	58.9	4.8	52.6	20.8	9.6	10.5	3.3
Queue Length 95th (m)	#47.6	80.8	13.9	#80.2	35.8	20.4	22.4	17.4
Internal Link Dist (m)		278.9		134.2		80.4		68.9
Turn Bay Length (m)	40.0		20.0		50.0		15.0	
Base Capacity (vph)	274	1527	138	992	408	789	331	544
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.69	0.31	0.78	0.57	0.19	0.29	0.35

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												
Traffic Volume (veh/h)	194	768	200	40	627	87	213	97	44	87	29	144
Future Volume (veh/h)	194	768	200	40	627	87	213	97	44	87	29	144
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.89	0.97		0.82	0.95		0.93	0.91		0.89
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	211	835	217	43	682	95	232	105	48	95	32	157
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	308	1180	306	192	836	116	430	500	229	406	69	338
Arrive On Green	0.09	0.44	0.44	0.28	0.28	0.28	0.08	0.42	0.42	0.28	0.28	0.28
Sat Flow, veh/h	1774	2700	701	517	3028	421	1774	1180	539	1121	249	1223
Grp Volume(v), veh/h	211	547	505	43	398	379	232	0	153	95	0	189
Grp Sat Flow(s),veh/h/ln	1774	1770	1632	517	1770	1679	1774	0	1719	1121	0	1472
Q Serve(g_s), s	6.1	18.8	18.8	5.5	15.7	15.8	6.0	0.0	4.2	5.0	0.0	8.0
Cycle Q Clear(g_c), s	6.1	18.8	18.8	12.3	15.7	15.8	6.0	0.0	4.2	5.0	0.0	8.0
Prop In Lane	1.00		0.43	1.00		0.25	1.00		0.31	1.00		0.83
Lane Grp Cap(c), veh/h	308	773	713	192	488	463	430	0	729	406	0	407
V/C Ratio(X)	0.69	0.71	0.71	0.22	0.81	0.82	0.54	0.00	0.21	0.23	0.00	0.46
Avail Cap(c_a), veh/h	308	773	713	192	488	463	430	0	737	412	0	414
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.3	17.1	17.1	27.1	25.2	25.3	18.2	0.0	13.6	21.3	0.0	22.4
Incr Delay (d2), s/veh	6.2	3.0	3.2	0.6	10.2	11.0	1.4	0.0	0.1	0.3	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.5	9.8	9.1	0.8	9.0	8.7	3.4	0.0	2.0	1.6	0.0	3.3
LnGrp Delay(d),s/veh	24.5	20.1	20.4	27.7	35.5	36.3	19.6	0.0	13.7	21.6	0.0	23.2
LnGrp LOS	C	C	C	C	D	D	B		B	C		C
Approach Vol, veh/h		1263			820			385			284	
Approach Delay, s/veh		21.0			35.4			17.2			22.7	
Approach LOS		C			D			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		37.8		36.8	12.0	25.8	11.0	25.8
Change Period (Y+Rc), s		5.2		5.2	5.0	5.2	5.0	5.2
Max Green Setting (Gmax), s		32.6		32.0	7.0	20.6	6.0	21.0
Max Q Clear Time (g_c+I1), s		20.8		6.2	8.1	17.8	8.0	10.0
Green Ext Time (p_c), s		11.8		16.6	0.0	2.8	0.0	8.0

Intersection Summary	
HCM 2010 Ctrl Delay	24.9
HCM 2010 LOS	C

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	148	1229	68	1069	311	106	62	124
v/c Ratio	0.74	0.73	0.55	0.79	0.76	0.17	0.29	0.35
Control Delay	37.3	18.4	41.2	27.8	34.4	10.5	32.1	13.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.3	18.4	41.2	27.8	34.4	10.5	32.1	13.7
Queue Length 50th (m)	12.4	75.0	8.5	79.0	37.1	5.3	8.4	4.6
Queue Length 95th (m)	#36.8	100.1	#27.0	103.9	#65.3	15.2	19.0	18.3
Internal Link Dist (m)		278.9		134.2		80.4		55.4
Turn Bay Length (m)	40.0		15.0		50.0		15.0	
Base Capacity (vph)	199	1687	125	1362	411	656	250	398
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.73	0.54	0.78	0.76	0.16	0.25	0.31

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												
Traffic Volume (veh/h)	136	845	286	63	906	77	286	48	50	57	32	82
Future Volume (veh/h)	136	845	286	63	906	77	286	48	50	57	32	82
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.90	0.99		0.87	0.92		0.92	0.88		0.86
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	148	918	311	68	985	84	311	52	54	62	35	89
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	252	1267	426	182	1250	107	432	300	311	320	86	220
Arrive On Green	0.06	0.50	0.50	0.38	0.38	0.38	0.11	0.37	0.37	0.21	0.21	0.21
Sat Flow, veh/h	1774	2523	849	449	3257	278	1774	800	831	1123	414	1054
Grp Volume(v), veh/h	148	642	587	68	535	534	311	0	106	62	0	124
Grp Sat Flow(s),veh/h/ln	1774	1770	1603	449	1770	1765	1774	0	1631	1123	0	1468
Q Serve(g_s), s	4.1	23.9	24.3	11.8	22.5	22.6	9.0	0.0	3.7	3.9	0.0	6.2
Cycle Q Clear(g_c), s	4.1	23.9	24.3	26.1	22.5	22.6	9.0	0.0	3.7	3.9	0.0	6.2
Prop In Lane	1.00		0.53	1.00		0.16	1.00		0.51	1.00		0.72
Lane Grp Cap(c), veh/h	252	889	805	182	679	677	432	0	611	320	0	306
V/C Ratio(X)	0.59	0.72	0.73	0.37	0.79	0.79	0.72	0.00	0.17	0.19	0.00	0.40
Avail Cap(c_a), veh/h	252	889	805	182	679	677	432	0	622	328	0	317
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.1	16.4	16.5	30.7	23.0	23.0	24.8	0.0	17.7	28.0	0.0	28.9
Incr Delay (d2), s/veh	3.5	2.9	3.4	1.3	6.2	6.2	5.7	0.0	0.1	0.3	0.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	12.3	11.4	1.5	12.2	12.1	3.1	0.0	1.7	1.2	0.0	2.6
LnGrp Delay(d),s/veh	21.6	19.3	19.9	31.9	29.1	29.2	30.6	0.0	17.8	28.3	0.0	29.7
LnGrp LOS	C	B	B	C	C	C	C		B	C		C
Approach Vol, veh/h		1377			1137			417			186	
Approach Delay, s/veh		19.8			29.3			27.3			29.2	
Approach LOS		B			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		47.6		36.8	10.0	37.6	14.0	22.8
Change Period (Y+Rc), s		5.2		5.2	5.0	5.2	5.0	5.2
Max Green Setting (Gmax), s		42.4		32.2	5.0	32.4	9.0	18.2
Max Q Clear Time (g_c+I1), s		26.3		5.7	6.1	28.1	11.0	8.2
Green Ext Time (p_c), s		16.1		12.1	0.0	4.3	0.0	5.6

Intersection Summary	
HCM 2010 Ctrl Delay	24.8
HCM 2010 LOS	C