TRANSPORTATION PLANNERS AND ENGINEERS

bunt & associates

2002 Richmond Road

Transportation Impact Assessment

Version 3

Prepared for

Empresa Properties

Date

April 4, 2024

Project No.

08-23-0004

April 4, 2024
08-23-0004

Karl Robertson
Empresa Properties
655 Tyee Road #204
Victoria, BC
V9A 6X5

Dear Karl:

Re: 2002 Richmond Road
Transportation Impact Assessment (TIA)

Please find attached our Transportation Impact Assessment (TIA) report for the proposed development at 2002 Richmond Road in Victoria, BC. This study reviews existing and future (with and without site) traffic operations in the local road network, provides a parking and loading supply review and parking variance rationale, outlines a Transportation Demand Management (TDM) Plan, and provides a swept path analysis of on-site vehicle manoeuvres.

We trust this study will be helpful in the development rezoning application. Please do not hesitate to contact us if you have any questions.

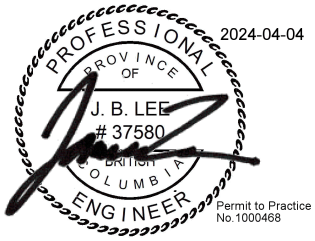
Yours truly,
Bunt & Associates

Jason Potter, M.Sc., PTP
Associate | Senior Transportation Planner

Kieran Quan, EIT
Transportation Analyst

CORPORATE AUTHORIZATION

Prepared By:	Kieran Quan, EIT Transportation Analyst	Bunt & Associates Engineering Ltd. 530-645 Fort Street Victoria, BC V8W 1G2 Canada
Reviewed By:	Jason Potter, M.Sc., PTP Senior Transportation Planner	Telephone: +1 604 685 6427 Facsimile: +1 604 685 6579
		Date: 2024-04-04 Project No. 08-23-0004
Approved By:	James Lee, P.Eng., PMP, MBA Senior Transportation Engineer	Status: Version 3



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EXECUTIVE SUMMARY

Empresa Properties proposes the development of a 6-storey, 55-unit residential building with approximately 356 m^2 of ground-floor commercial space located at 2002 Richmond Road in Victoria, BC.

Bunt was retained to examine the traffic and parking impacts of the proposed development.

Traffic

Traffic operations at three existing study area intersections were shown to operate with peak period delays that warrant mitigation. They are the Pembroke Street & Richmond Road intersection, the Birch Street & Richmond Road intersection, and the Ashgrove Street & Fort Street intersection. At each of these intersections, vehicles attempting to turn left from the minor road onto the major road are shown to encounter problematic delays.

The proposed development site is conservatively anticipated to add approximately 40-60 total two-way vehicle trips during peak hour periods. This was calculated using Institute of Transportation Engineer (ITE) rates, which are likely overstated for this site due to the anticipated low vehicle ownership of residents and the commercial units being local area serving amenities. The site trips associated with the currently under construction Amica buildings on Birch Street were also added to the analysis of future vehicle operation analysis.

To mitigate the existing operational constraints along Richmond Road, Bunt in collaboration with City staff examined the merits of closing Birch Street at its intersection with Richmond Road. This traffic would then be redirected to the Pembroke Street & Richmond Road intersection. Traffic control modifications at this Pembroke Street & Richmond Road intersection were proposed to assist vehicles turning from Pembroke Street to Richmond Road. During consultation with City staff and in appreciation of the close proximity of nearby signals on Richmond Road, a new pedestrian crossing of Richmond Road at Pembroke Street with a Rectangular Rapid Flashing Beacon (RRFB) is proposed. This treatment would both augment the existing pedestrian connectivity and also help create gaps in Richmond Road traffic which is anticipated to help facilitate the eastbound Pembroke Street to northbound Richmond Road left turn movement. The analysis also provided support for retention of the existing northbound left turn lane on Richmond Road to reduce the likelihood of northbound queues extending south to Fort Street.

Begbie Street currently operates as a one-way route with only westbound vehicle travel. This restriction was put in place to reduce cut-through traffic through the neighbourhood. Considering the closure of Birch Street and the low anticipated demand for cut-through movements given the current surrounding road network, reopening this segment of Begbie Street may assist with vehicle circulation through the area. For example, loading vehicles such as garbage collection vehicles could more easily circulation from Richmond Road to and from Fort Street with reduced reliance on turnaround maneuvers.

Finally, Bunt recommends that the southbound to eastbound left turn movement at Ashgrove Street & Fort Street be restricted to address the operational concerns identified. Specifically, in addition to experiencing long delays, this movement crosses a recently installed protected bike route on Fort Street and turns into the left turn lane of the adjacent Fort Street intersection resulting in potential conflict. Given the low number of vehicles attempting this movement, restricting the southbound left turn is not anticipated to result in any operational issues.

Parking

The development seeks a vehicle parking variance to supply vehicle spaces below the bylaw rate for the apartment and visitor uses. The requested variances are summarized below:

- Apartment: -52 spaces (from a requirement of 1.02 spaces / unit to a proposed 0.05 spaces / unit); and,
- Visitor: -6 spaces (from a requirement of 0.1 spaces / unit to a proposed 0.00 spaces / unit) as these are proposed to be shared with the site's commercial spaces.

The proposed supply of 12 spaces (plus 1 car share space and vehicle) is 58 spaces below the bylaw requirement of 70 spaces.

It is acknowledged that the proposed parking supply and variances sought are progressive. The development is attempting to align with the City's future transportation policy goals to reduce reliance on private vehicle usage by leveraging the site's inherent proximity to existing transit, cycling, and walking networks, while also leaning on nearby alternative supply options to complement the development's own parking provision. The following factors are anticipated to support the proposed reduced parking supply:

- The proposed site is well-connected to existing transit, cycling, and walking networks. Given the site's location, its commercial parking demand is expected to reflect a "Village/Centre" rate, despite being in an "Other Area" zone;
- The site is located near Jubilee Village, which offers many services that are anticipated to allow future residents to complete shopping and daily errands by walking and/or cycling;
- The proposed rental tenure of the residential units allows for management of the on-site parking spaces;
- The parking demand for the residential visitor and commercial retail land uses would generally peak at different times of the day, enabling a shared parking arrangement. The exception to this may be during weekend daytime periods;
- On-street parking exists in the vicinity of the site. While the development is not expected to rely on these spaces, they will complement the off-street supply at certain times/days of the week (e.g., during times when peak visitor and retail demand may coincide);
- Residents seeking long-term vehicle parking will have the option of renting a space at the adjacent 2020 Richmond Road building; and
- The development proposes to provide a comprehensive suite of TDM measures.

Transportation Demand Management (TDM)

To support the proposed reduced parking supply by reducing the reliance on private vehicle ownership, the developer proposes the following TDM measures:

- Transit incentives for commercial employees,
- Car-share on-site parking space and Modo memberships for each residential unit,
- Parking spaces to be "unbundled", as opposed to being included with units,
- Improvements to bicycle storage room access and lighting,
- Bicycle wash and/or repair station,
- Extra-large cargo bicycle spaces,
- Cycling end-of-trip facilities (two showers) for commercial employees, and
- Pedestrian plaza offers improved local area pedestrian realm.

Site Design

Bunt's AutoTURN analysis confirmed that no issues are expected with regards to passenger vehicle parking or circulation. However, our analysis of loading and waste collection vehicles on Birch Street indicate challenging turnaround movements on Birch Street which are not advisable. Instead, the development is encouraged to allow permeability though the plaza to enable egress of the occasional large loading truck onto Richmond Road and to work with a waste collection company to establish a collection plan that does not rely on large sized vehicles using Birch Street.

1. INTRODUCTION

1.1 Study Purpose & Objectives

Empresa Properties (the developer) is seeking a development permit from the City of Victoria (City) for a 55-unit rental residential building with approximately 356 m^2 of ground-floor commercial space located at 2002 Richmond Road. The developer is seeking to provide vehicle parking below the City's Zoning Bylaw requirement. Vehicle access to the surface level parking is proposed via Pembroke Street.

Bunt & Associates Engineering Ltd. (Bunt) has prepared this Transportation Impact Assessment (TIA) as a part of the development application.

The purpose of this study is to:

- Provide information on land use, relevant plans, as well as existing and future land road, transit, cycling, and walking networks in the study area;
- Assess the potential for traffic impacts due to the introduction of site traffic;
- Provide recommended mitigation options for any traffic performance issues;
- Summarize the requirements from the City of Victoria Zoning Bylaw and assess the viability of the proposed vehicle parking supply;
- Confirm functionality of required vehicle maneuvers on the proposed site plan; and,
- Provide a Transportation Demand Management (TDM) Strategy for the proposed development that is appropriate for the site and level of parking variance sought.

1.2 Study Area

Exhibit 1.1 illustrates the site location and study area. The study area includes the following intersections:

- Pembroke Street & Birch Street;
- Pembroke Street & Site Access;
- Richmond Road & Pembroke Street;
- Richmond Road & Birch Street;
- Fort Street & Ashgrove Street; and,
- Fort Street & Richmond Road.

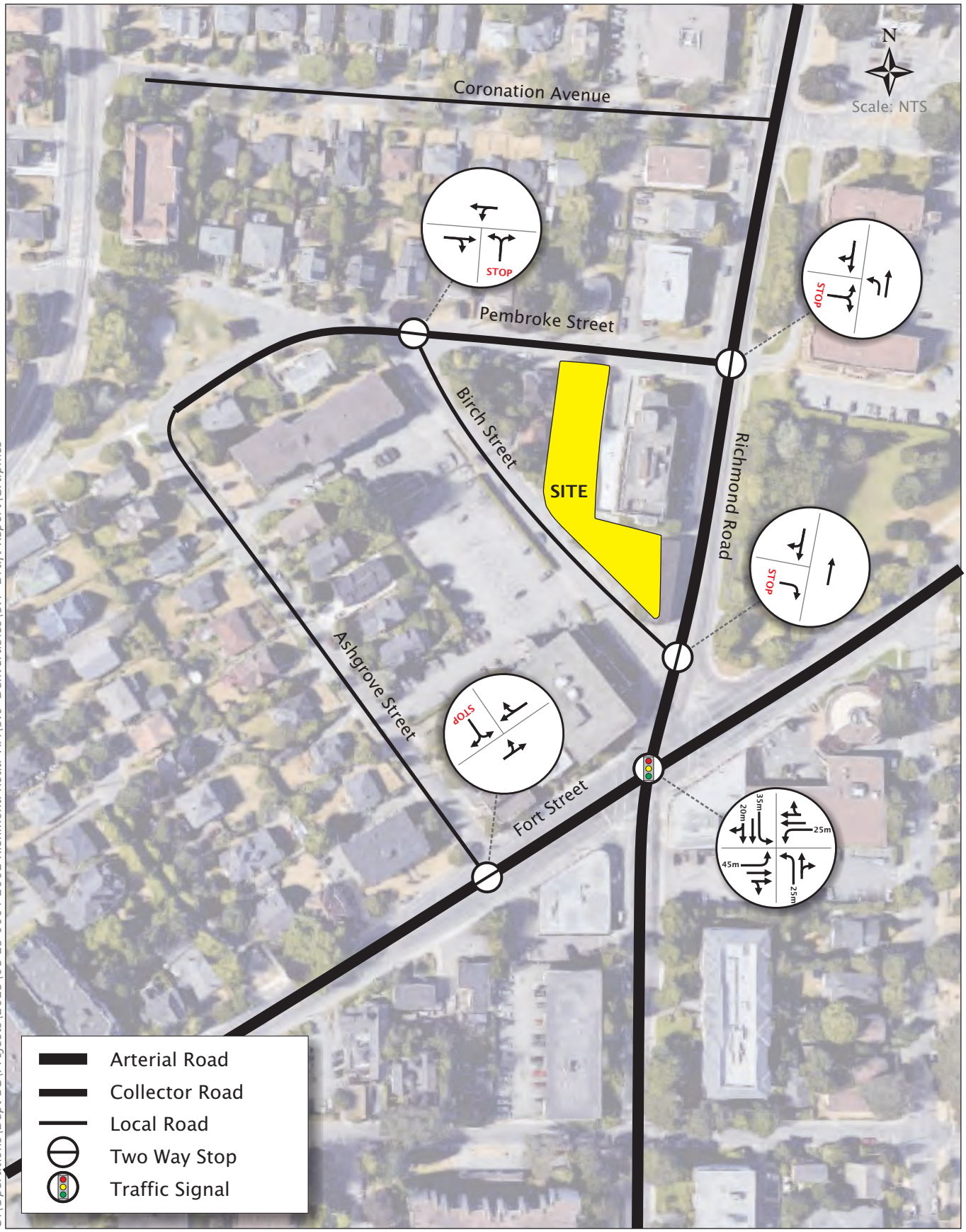

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Exhibit 1.1

Site Location, Study Area & Existing Traffic Control

2002 Richmond Road
08-23-0004 October 2023

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1.3 Organization of Report

This report is organized as follows:

Section 1 presents the study purpose, study scope, study area, and details of the proposed development.

Section 2 describes existing conditions including land use, local transportation network, relevant policies and plans, and existing traffic volumes and operations.

Section 3 describes future traffic volumes and operations and the anticipated traffic impact on the study area as well as provides recommended mitigations for any traffic performance issues.

Section 4 reviews the proposed parking supply and discusses the viability of the proposed parking supply variance.

Section 5 assesses the site's vehicle access, on-site circulation, and service vehicle maneuvers.

Section 6 provides a Transportation Demand Management (TDM) strategy to support the proposed parking supply for the development by encouraging active and sustainable modes of transportation.

Section 7 summarizes the study findings and recommendations.

1.4 Proposed Development

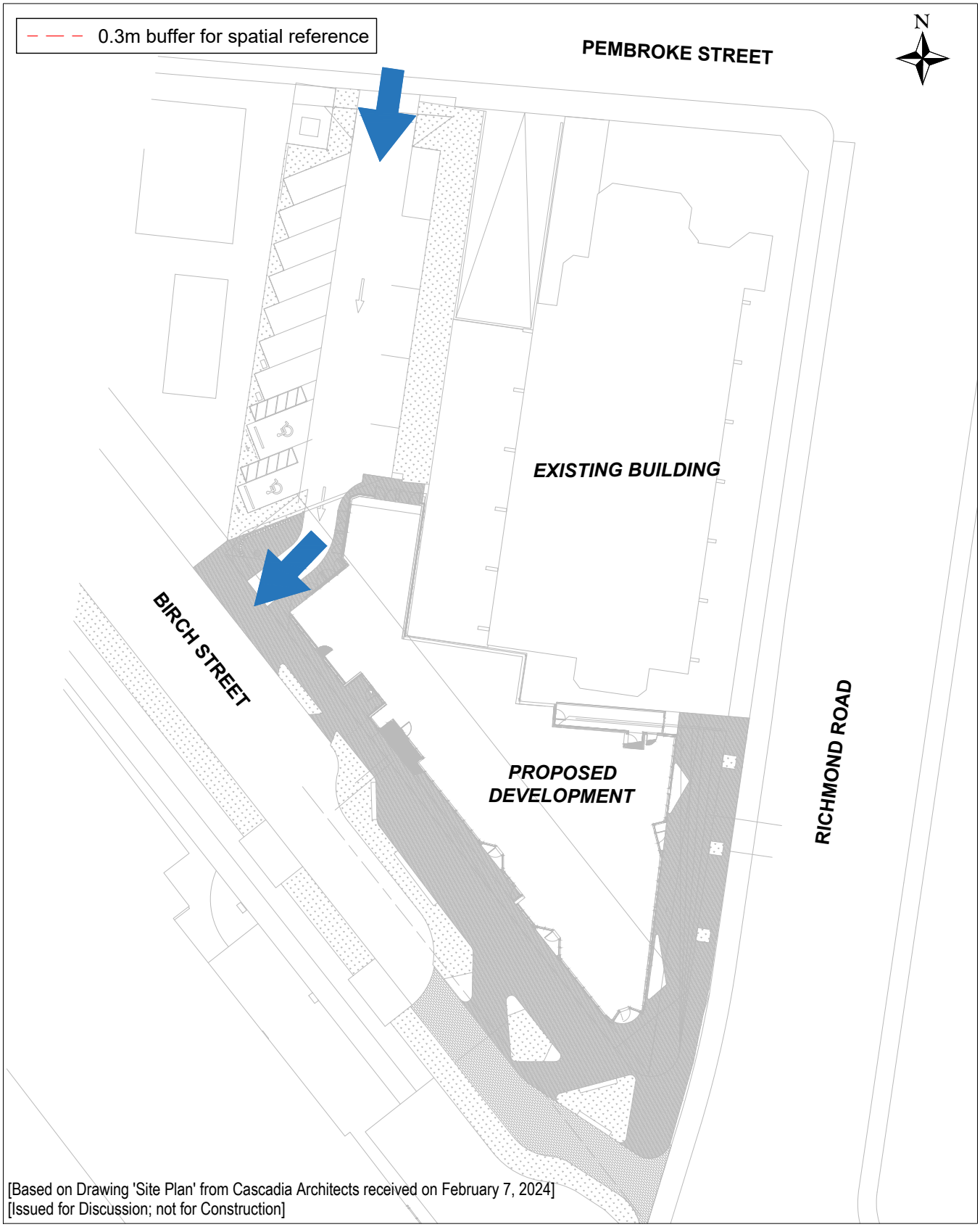
The proposed development consists of 55 rental residential units and approximately 356 m^2 of ground-floor commercial space. At this stage of development planning, it is assumed that half of the commercial space will be a Pharmacy and the other half will be a café or restaurant. **Table 1.1** summarizes the proposed land uses.

Table 1.1: Proposed Land Uses

LAND USE	DENSITY	UNITS
Apartment (Rental)	55	Dwelling Units
Café / Restaurant	232	Square Metres
Retail	124	Square Metres

The development proposes 12 at-grade vehicle parking spaces. In addition, an additional parking space will be provided that will be dedicated for a car-share vehicle.

By the opening day of the proposed development, it is anticipated that Birch Street will be closed at its intersection with Richmond Road. On Birch Street, where it intersects with Richmond Road in the existing condition, a plaza will be constructed to serve as pedestrian space as well as outdoor seating for the proposed restaurant/café land uses. This study will review the impacts of closing Birch Street & Richmond Road from a traffic perspective as well as from a service vehicle operations perspective. **Exhibit 1.2** illustrates the proposed site plan.



[Based on Drawing 'Site Plan' from Cascadia Architects received on February 7, 2024]
[Issued for Discussion; not for Construction]

Exhibit 1.2
Site Plan

08-23-0004 February 2024 Scale 1:500_1 on Letter 2002 Richmond Road Prepared by KQ

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2. EXISTING CONDITIONS

2.1 Land Use

The proposed site will combine the properties of 1769 Pembroke Street, 1909 Birch Street, and 2002 Richmond Road. 1769 Pembroke Street and 1909 Birch Street are currently zoned as '*R1-B Single Family Dwelling*' and 2002 Richmond Road is currently zoned as '*C-1 Limited Commercial District*'. The proposed site shares a triangle-shaped block with two single-family homes on the west corner and a medical clinic on the northeast corner.

2.2 Existing Transportation Network

A site visit was conducted on May 17th, 2023, to document existing conditions in the study area. The existing road, transit, cycling, and walking networks are described below.

2.2.1 Road Network

The proposed site is bounded by Pembroke Street to the north, Birch Street to the southwest, and Richmond Road to the east. Fort Street is a major east-west arterial road that intersects with Richmond Road just south of the site. Ashgrove Street is a one-way local road located one block west of Birch Street; Ashgrove Street provides an alternative inbound route to the site. **Table 2.1** summarizes the existing street characteristics of the study area road network.

Table 2.1: Existing Street Characteristics

STREET	CLASSIFICATION	NUMBER OF TOTAL TRAVEL LANES	POSTED SPEED	PARKING FACILITIES
Pembroke Street	Local	2	50 km/h	Both Sides
Birch Street	Local	2	30 km/h	Intermittent 1-Hour Parking on Both Sides
Richmond Road	Arterial	2	40 km/h	Intermittent 1-Hour Parking on West Side
Fort Street	Arterial	3	50 km/h	None
Ashgrove Street	Local	2	30 km/h	Residential Parking Only

2.2.2 Transit Network

Six bus routes have stops within 200-metres walking distance of the proposed site. **Table 2.2** summarizes the nearby transit service.

Table 2.2: Transit Stops within 200m Walking Distance of Site

STOP LOCATION	DIRECTION	STOP #	AMENITY	ROUTES SERVICED	WALKING DISTANCE
Richmond at Coronation	SB	100441	Shelter, Bench, Waste Bin	8, 14	150m
Richmond at Fort	NB	100434	Shelter, Bench, Waste Bin	8, 14	50m
Fort at Richmond	WB	100438	Shelter, Bench, Waste Bin	3, 10, 11, 15	100m
Fort at Richmond	EB	100427	Waste Bin	11, 15	150m

The #3, #8, #10, and #11 connect Royal Jubilee Hospital to James Bay, Oak Bay Marina to Camosun College Interurban Campus, Royal Jubilee Hospital to James Bay via Bay Street, and University of Victoria to Tillicum Mall, respectively. These routes are classified as 'local' routes, meaning they provide less frequent (30-minute or more headway) service to local areas.

The #14 connects Victoria General Hospital to the University of Victoria via the Town of Esquimalt and Downtown Victoria. The #14 is classified as a 'frequent' route meaning that it sees 15-minute or better service at peak commute times.

The #15 connects the Town of Esquimalt to the University of Victoria via Downtown Victoria. The #15 is considered a 'regional' route meaning it runs through more than one municipality and it provides 15-minute or better service at peak commute times.

2.2.3 Cycling & Walking Networks

Fort Street and Richmond Road currently provide painted bike lanes on both sides. The painted bike lanes on Fort Street become protected bike lanes to the west of the intersection with Cook Street. This will allow future residents to travel to Downtown Victoria and connect with the All-Ages and Abilities (AAA) Regional Bike Network entirely on existing cycling infrastructure. Plans to upgrade the painted bike lanes on Fort Street to the All-Ages and Abilities (AAA) standard are confirmed and are discussed in Section 3.1.1.

Sidewalks are provided on both sides of all study area roads. The Fort Street & Richmond Road intersection features a pedestrian crossing phase on all four legs. The land parcels adjacent along Fort Street adjacent to and east of the site are part of Jubilee Village, which is classified as a 'Village/Centre' in the Victoria Zoning Bylaw. Villages provide a variety of goods and services (e.g., restaurants, gyms, Save-On-Foods, liquor stores) to the local neighbourhood. These amenities are all within 1-kilometres walking distance of

the site. In addition, Oak Bay Recreation Centre is within 1-kilometres walking distance from the site, offering a wide range of activities and facilities.

Exhibit 2.1 illustrates the existing road, transit, cycling, and walking networks.

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Exhibit 2.1

Existing Transportation Context

2002 Richmond Road
08-23-0004 October 2023

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2.3 Current Relevant Policies & Plans

The following provides a high-level review of the relevant plans as they relate to the site.

2.3.1 GoVictoria Sustainable Mobility Strategy

The GoVictoria Sustainable Mobility Strategy provides a framework to guide transportation policies, priorities, and investments for the City's transportation networks. The GoVictoria strategy includes accessible mobility options, active transportation, high-occupancy modes like transit, and cleaner vehicles.

2.3.2 Victoria Strategic Plan – Sustainable Transportation

Sustainable transportation is the seventh strategic objective in Victoria's 2019-2022 Strategic Plan. Actions in the objective include increasing transit accessibility to the public, introducing a "floating" car share service to Victoria, and lowering speed limits on local neighbourhood streets.

2.3.3 BC Transit Victoria Regional Rapid Transit Project

The Victoria Regional Rapid Transit Project aims to provide a safe, reliable, attractive, and green alternative to traveling around the Capital Region. The project will introduce new bus routes that will provide improved travel times, frequency, and reliability compared to the existing bus service. The project will be completed in three phases: the Westshore Line between Downtown Victoria and Langford, the McKenzie Line between Uptown and the University of Victoria, and the Peninsula Line between Downtown Victoria and the Swartz Bay Ferry Terminal.

2.4 Existing Traffic Volumes

2.4.1 Peak Hour Traffic Volumes

Bunt collected traffic volumes at the study intersections between May 18th, 2023, and May 25th, 2023. **Table 2.3** summarizes the available and counted traffic data used in this study.

Table 2.3: Summary of Available and Counted Traffic Data

INTERSECTION	SOURCE	DATE OF COUNT
Richmond Road & Coronation Avenue	Bunt	May 18, 2023
Richmond Road & Pembroke Street	Bunt	May 18, 2023
Fort Street & Ashgrove Street	Bunt	May 25, 2023
Fort Street & Richmond Road	Bunt	May 18, 2023

The AM and PM Peak Hours were found to be 8:00 - 9:00 and 4:00 - 5:00, respectively.

Birch Street was closed to vehicle traffic due to construction at the time of the counts. As such, Bunt assumed ten vehicles in each travel direction in both the AM and PM peak hours on Birch Street by applying industry standard vehicle trip generation rates for the existing land uses on this road.

In addition to the counted traffic data, Bunt accounted for vehicle traffic from the new Amica Seniors development (Amica), which was under construction at the time of the counts. Vehicle trip generation was taken from the Amica Traffic Impact Assessment report, attached in **Appendix A**, prepared by Watt Consulting Group, and provided by the City of Victoria. The report estimated 48 two-way trips in the AM peak hour and 65 two-way trips in the PM peak hour. Bunt distributed these vehicle trips across the study network based on existing travel patterns.

Typically, vehicle trips from nearby other developments that are not yet complete would be added to existing volumes to create a background condition for analysis. Since this study will not be applying a growth factor to forecast future volumes, the Amica building volumes were layered onto the existing condition to streamline the analysis. This approach was vetted through City staff. **Exhibit 2.2** illustrates existing peak hour vehicle traffic volumes in the study area (with the estimated Amica vehicle trips added onto the counted traffic volumes to establish the existing peak hour traffic volumes).

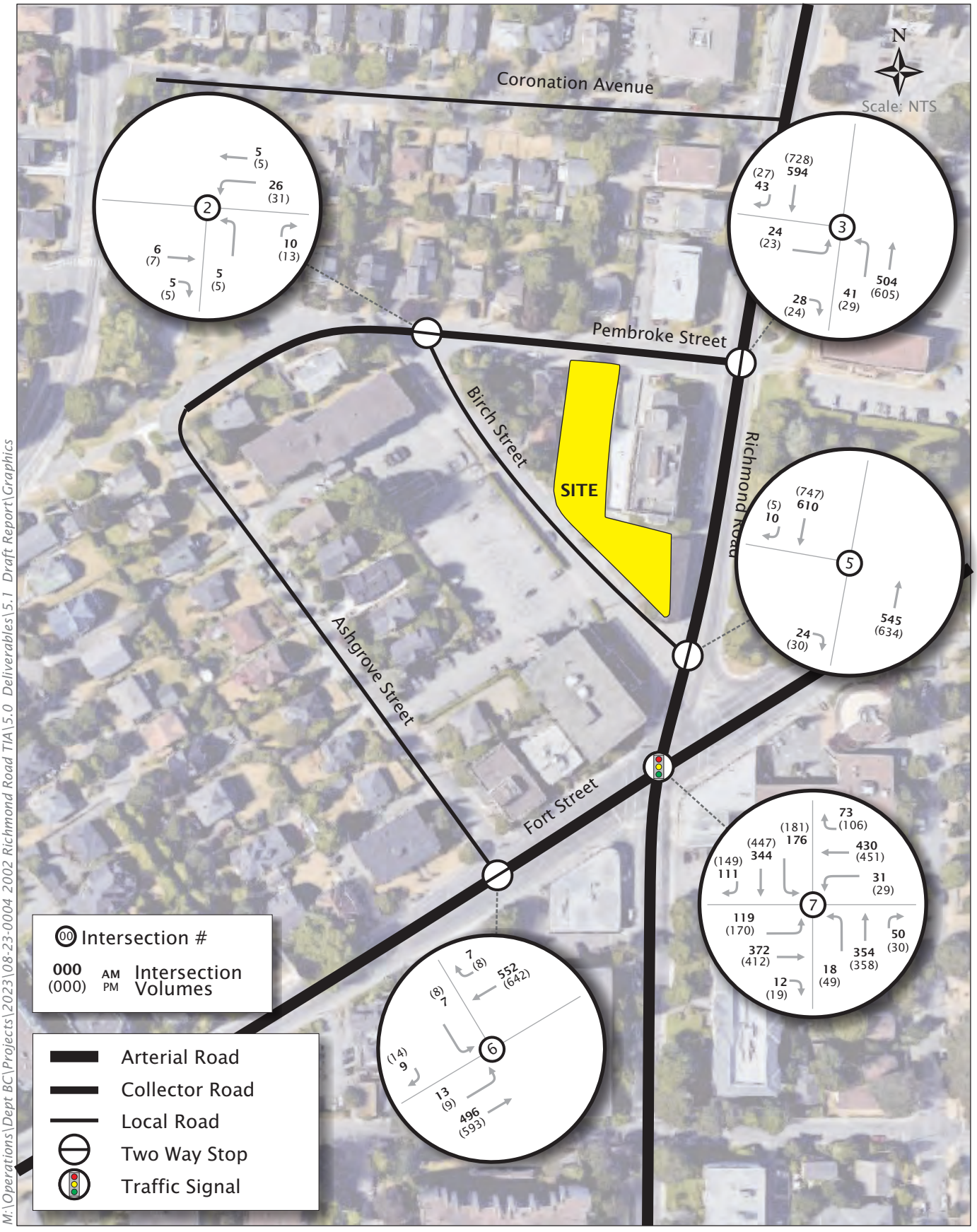

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Exhibit 2.2

Existing Peak Hour Vehicle Traffic Volumes

2002 Richmond Road
08-23-0004 October 2023

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2.5 Existing Operations

2.5.1 Performance Thresholds

The existing operations of study area intersections and access points were assessed using the methods outlined in the Highway Capacity Manual (HCM), 6th Ed., using Synchro 11 analysis software. The traffic 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 2.4 below summarizes the LOS thresholds for the six Levels of Service, for both signalized and unsignalized intersections.

Table 2.4: 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 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.

For reference, the general performance thresholds used to trigger consideration of roadway or traffic control improvements are listed below:

Signalized Intersections:

- Overall intersection Level of Service = LOS D or better;
- Overall intersection V/C ratio = 0.85 or less;

- Individual movement Level of Service = LOS E or better; and,
- Individual movement V/C ratio = 0.90 or less.

Unsignalized Intersections and Roundabouts:

- Individual movement Level of Service = LOS E or better unless the volume is very low in which case LOS F is acceptable.

In interpreting of 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 6th Ed. output for overall LOS and V/C as well as individual movement LOS and V/C is reported. 95th Percentile Queues are reported as estimated by Synchro or SimTraffic, the micro-simulation module of the Synchro software;

- For unsignalized two-way stop-controlled intersections: SimTraffic estimated queues and delays have been reported, as the HCM 6th Ed. methodology does not directly consider the gaps afforded by adjacent signalized intersections.

The performance reporting conventions noted above have been consistently applied throughout this document and the detailed outputs are provided in **Appendices B and C** for Synchro and SimTraffic reports, respectively.

2.5.2 Existing Conditions Analysis Assumptions

The following assumptions were made in Synchro 11 software:

Signal Timing:

In addition to the Fort Street & Richmond Road study intersection, Bunt included the Richmond Road & Coronation Avenue intersection in the traffic model to simulate the gapping effects of adjacent signals on the Richmond Road & Pembroke Street intersection.

Signal timing plans for both Fort Street & Richmond Road and the Richmond Road & Coronation Avenue were provided by the City of Victoria and input directly into the traffic model.

Synchro Parameters

Default Synchro parameters were used, except:

- Overall intersection Peak Hour Factor (PHF) was applied to each movement; and,
- Heavy vehicle percentage was set to 2% for all movements except for Fort Street & Richmond Road, in which case heavy vehicle percentages were available and applied to each movement.

2.5.3 Existing Operational Analysis Results

Table 2.5 summarizes the existing peak hour traffic operations in the study area.

Table 2.5: Existing Traffic Operations

INTERSECTION/ TRAFFIC CONTROL	MOVEMENT	AM			PM		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
Pembroke Street & Birch Street (Unsignalized)	NBLR	A	0.02	10	A	0.02	10
	EBTR	A	0.00	5	A	0.00	5
	WBTL	A	0.02	-	A	0.02	5
Richmond Road & Pembroke Street (Unsignalized)	NBL	A	0.06	15	B	0.04	15
	NBT	A	0.00	5	A	0.00	10
	EBLR	E	0.27	25	**F**	0.32	35
	SBTR	A	0.00	60	C	0.00	95
Richmond Road & Birch Street (Unsignalized)	NBT	A	0.00	20	A	0.00	20
	EBR	**F**	0.06	25	**F**	0.09	60
	SBTR	C	0.00	90	D	0.00	90
Fort Street & Ashgrove Street (Unsignalized)	EBTL	B	0.02	60	C	0.01	60
	WBT	A	0.00	5	A	0.00	5
	WBTR	A	0.00	5	A	0.00	20
	SBL	D	0.06	10	E	0.10	15
Richmond Road & Fort Street (Signalized)	EBL	B	0.36	25	B	0.43	35
	EBTR	B	0.29	35	B	0.28	40
	WBL	C	0.10	10	C	0.09	10
	WBTR	C	0.49	55	C	0.48	65
	NBL	C	0.06	10	C	0.21	15
	NBT	A	0.00	120	A	0.00	115
	NBR	D	0.90	120	D	0.80	115
	SBL	C	0.62	#40	C	0.63	#40
	SBT	B	0.47	50	C	0.62	65
	SBR	B	0.19	10	B	0.26	15

Notes: NB = Northbound, EB = Eastbound, WB= Westbound, SB = Southbound, L = left, T = through, R = right

Bolded results indicate values that do not meet acceptable performance criteria.

"#" indicates that the 95th percentile volume exceeds capacity; therefore, vehicle queue may be longer than reported.

The following movements exceed acceptable performance thresholds in the existing condition:

- The eastbound approach to the Richmond Road & Pembroke Street intersection operates at LOS F in the PM peak hour; and
- The eastbound right turn at Richmond Road & Birch Street operates at LOS F in both the AM and PM peak hours.

The performance issues in the existing condition are likely due to the long southbound queues that extend from the Richmond Road & Fort Street intersection. The southbound queues, especially in the PM peak hour, limit opportunities for vehicles on the unsignalized approaches of Pembroke Street and Birch Street to turn onto Richmond Road. These minor turning vehicles are forced to rely on drivers leaving gaps at intersections while queued or may be forced to rush their turn movements.

3. FUTURE TRAFFIC CONDITIONS

3.1 Traffic Forecasts

3.1.1 Future Transportation Network

The following changes to the local transportation network are planned to be completed before the opening day of the development:

Fort Street AAA Bike Lane Upgrade

The existing painted bike lanes on Fort Street will be removed and replaced with a two-way protected cycle track on the north edge of the street. This new cycle track will expand the regional All-Ages and Abilities (AAA) bike network and connect with the existing cycle track west of Cook Street. This will be a significant upgrade to the cycling infrastructure in the local area.

Birch Street Closed at Richmond Road

By the opening day of the proposed development, it is anticipated that Birch Street will be closed where it currently intersects with Richmond Road. This closure is supported by both the traffic analysis described in Section 2.5.3 and by City of Victoria staff. Therefore, **Bunt has assumed the Birch Street closure in all future traffic scenarios**. Due to this closure, traffic that would have been destined to Richmond Road was redistributed to Pembroke Street to the north.

In addition, the following changes to the local transportation network are being contemplated by the developer and the City of Victoria:

Northbound Left Turn Lane at Richmond Road & Pembroke Street Removed

The developer and the City of Victoria are interested in the anticipated traffic impact of removing the dedicated northbound left turn lane at Richmond Road & Pembroke Street. Bunt performed a sensitivity analysis for this scenario; this is described in Section 3.2.4.

3.1.2 Background Traffic Forecasts

Background traffic is traffic that would be present on the road network if the site did not redevelop. Historical traffic data suggests that there is no significant year-by-year growth in traffic in the City of Victoria. Therefore, no background traffic growth has been assumed for this study.

However, Bunt assumed Birch Street is closed at Richmond Road in all future scenarios. As a result, traffic patterns would change to avoid the closure. Therefore, Bunt redistributed traffic volumes from the Birch Street & Richmond Road intersection to the Pembroke Street & Richmond Road intersection in future scenarios.

Exhibit 3.1 illustrates future background (without site) peak hour traffic volumes.

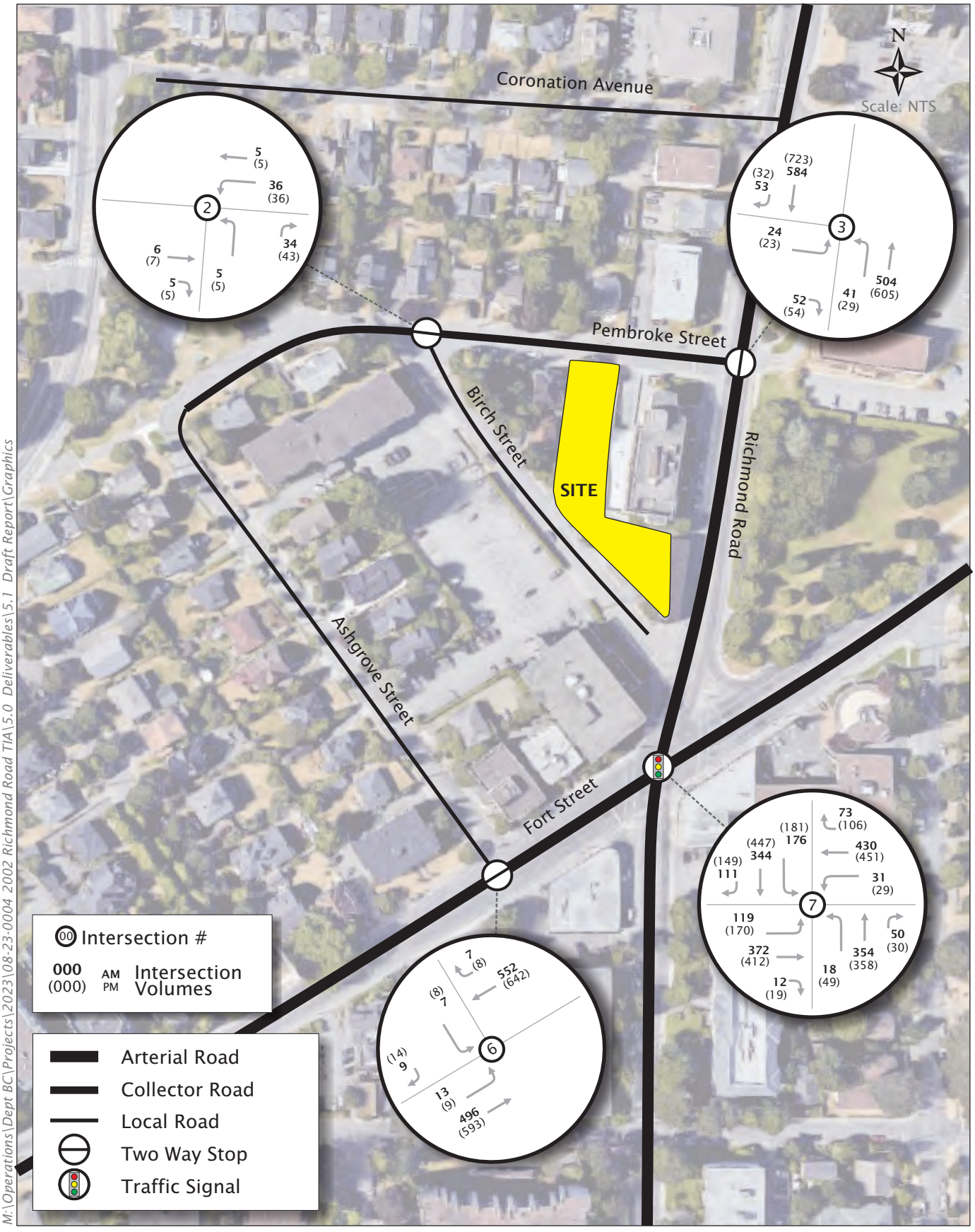

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Exhibit 3.1

Future Background Peak Hour Traffic Volumes

2002 Richmond Road
08-23-0004 October 2023

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3.1.3 Site Traffic

Bunt estimated future site traffic using the most appropriate rates from the Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition. **Table 3.1** summarizes the trip generation rates applied to each of the proposed land uses. To be conservative, a higher trip generating restaurant land use was used for one of the three commercial retail units.

Table 3.1: Peak Hour Vehicle Trip Rates

LAND USE	UNITS	AM PEAK HOUR			PM PEAK HOUR		
		IN	OUT	TOTAL	IN	OUT	TOTAL
ITE 221 – Multifamily Housing (Mid-Rise)	Dwelling Units	23%	77%	0.37	61%	39%	0.39
ITE 932 – High-Turnover (Sit-Down) Restaurant	1,000 ft²	55%	45%	9.57	61%	39%	9.05
ITE 880 – Pharmacy/Drugstore without Drive-Through Window	1,000 ft²	65%	35%	2.94	49%	49%	8.51

Table 3.2 summarizes the anticipated future site generated vehicle trips for the proposed development based on the above rates.

Table 3.2: Estimated Peak Hour Site Vehicle Trips

LAND USE	AM PEAK HOUR			PM PEAK HOUR		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Apartment (55 Units)	5	16	21	13	8	21
Café / Restaurant (2,150 ft²)	11	9	20	12	8	19
Pharmacy (2,150 ft²)	4	2	6	9	9	18
TOTAL	20	27	47	34	25	59

The proposed development is anticipated to generate approximately 45 (20 inbound, 25 outbound) and 60 (35 inbound, 25 outbound) vehicle trips in the AM and PM peak hours, respectively. This equates to a new vehicle trip in the study area road network every 1-2 minutes at peak times, on average.

It should be noted that given the proposed reduced parking supply for the development (discussed in Section 4.1), it is unlikely that the site would be able to generate this number of vehicle trips. As such, while this estimate likely overstates the actual trip demand, it is considered a conservative approach to the analysis.

The site generated vehicle trips were distributed throughout the study area based on existing traffic patterns. **Exhibit 3.2** illustrates site traffic forecasts.

3.1.4 Total Traffic

Bunt estimated the future total (with site) peak hour traffic volumes by adding the site traffic forecasts onto the future background traffic forecasts. **Exhibit 3.3** illustrates future total (with site) peak hour traffic volumes.

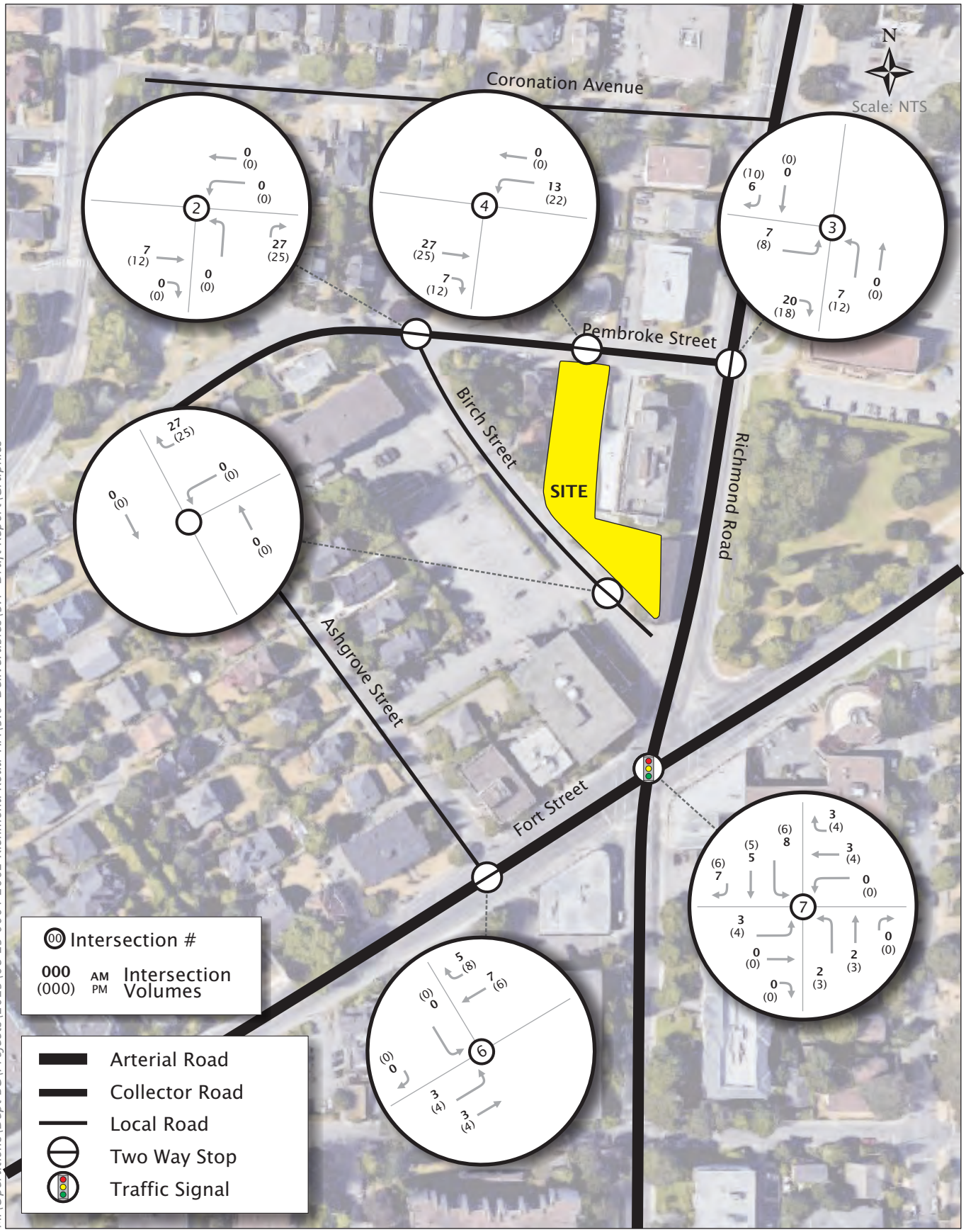

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Exhibit 3.2

Site Traffic Forecasts

2002 Richmond Road
08-23-0004 October 2023

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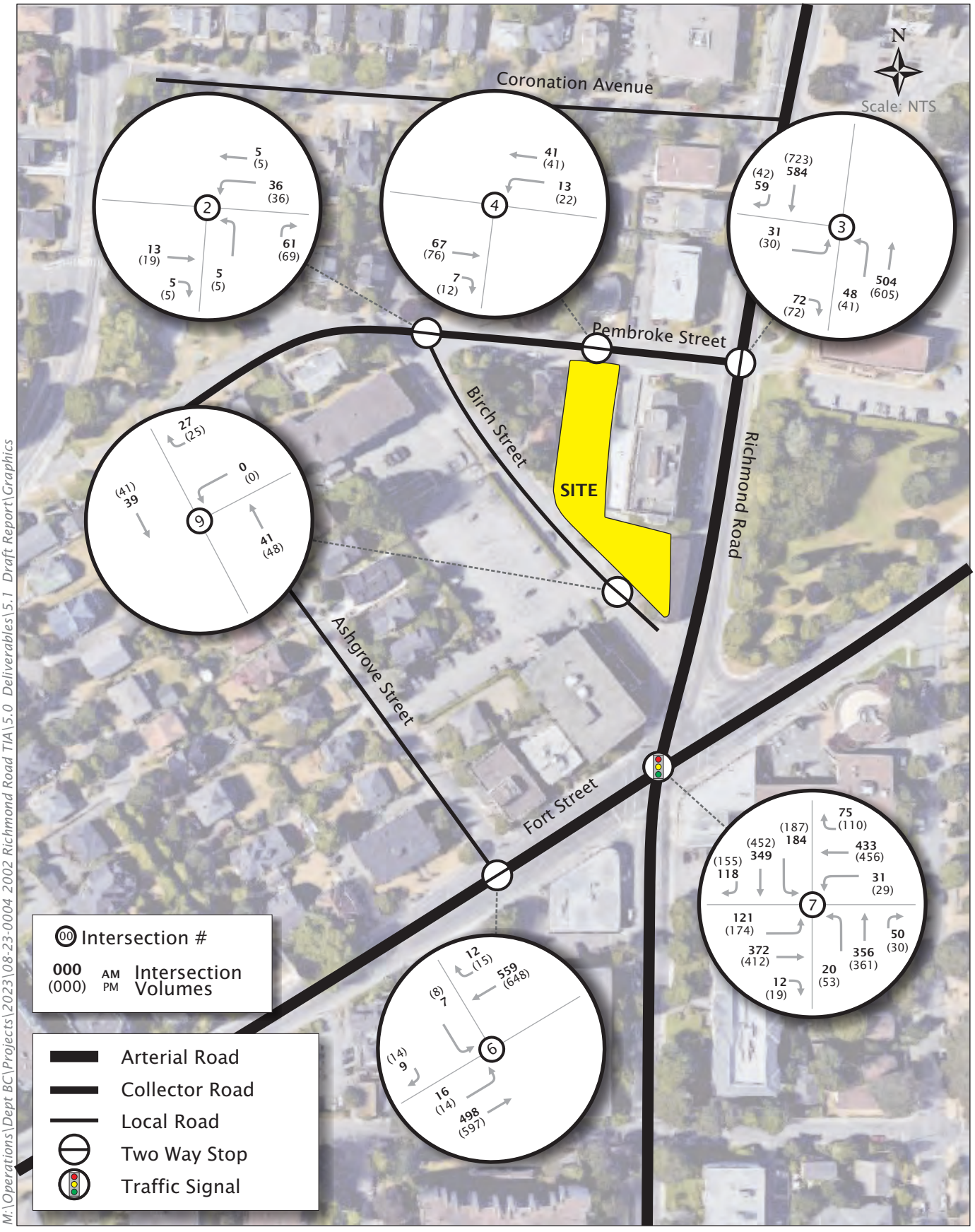

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Exhibit 3.3

Future Total Peak Hour Traffic Volumes

2002 Richmond Road
08-23-0004 October 2023

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3.2 Future Traffic Operations

3.2.1 Future Conditions Analysis Assumptions

The Synchro 11 software analysis assumptions outlined in Section 2.5.2 were also applied to the future conditions analysis.

3.2.2 Future Background Traffic Operations

Table 3.3 summarizes the future background (without site) peak hour traffic operations in the study area. Note that the Richmond Road & Birch Street intersection is assumed to be removed in all future scenarios.

Table 3.3: Future Background (Without Site) Traffic Operations

INTERSECTION/ TRAFFIC CONTROL	MOVEMENT	AM			PM		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
Pembroke Street & Birch Street (Unsignalized)	NBLR	A	0.04	10	A	0.05	15
	EBTR	A	0.00	5	A	0.00	5
	WBTL	A	0.02	5	A	0.02	5
Richmond Road & Pembroke Street (Unsignalized)	NBL	B	0.06	15	B	0.04	15
	NBT	B	0.00	10	A	0.00	5
	EBLR	**F**	0.33	35	**F**	0.42	45
	SBTR	A	0.00	60	C	0.00	95
Fort Street & Ashgrove Street (Unsignalized)	EBTL	A	0.02	50	B	0.01	65
	WBT	A	0.00	5	A	0.00	10
	WBTR	A	0.00	5	A	0.00	15
	SBL	D	0.06	15	D	0.10	15
Richmond Road & Fort Street (Signalized)	EBL	B	0.36	25	B	0.43	35
	EBTR	B	0.29	35	B	0.28	40
	WBL	C	0.10	10	C	0.09	10
	WBTR	C	0.49	55	C	0.48	65
	NBL	C	0.06	10	C	0.21	15
	NBT	A	0.00	120	A	0.00	120
	NBR	D	0.90	120	D	0.80	120
	SBL	C	0.62	#40	C	0.63	#40
	SBT	B	0.47	50	C	0.62	65
	SBR	B	0.19	10	B	0.26	15

Notes: NB = Northbound, EB = Eastbound, WB= Westbound, SB = Southbound, L = left, T = through, R = right

Bolded results indicate values that do not meet acceptable performance criteria.

"#" indicates that the 95th percentile volume exceeds capacity; therefore, vehicle queue may be longer than reported.

The following movement exceeds acceptable performance thresholds in the future background condition:

- The eastbound approach to the Richmond Road & Pembroke Street intersection operates at LOS F in both the AM and PM peak hour.

The assumed closure of Birch Street at Richmond Road successfully removed the failing eastbound right turn movement at that intersection. However, those vehicle trips were diverted to the eastbound right turn at the Richmond Road & Pembroke Street intersection. This increase in vehicle volume to the eastbound approach at the Richmond Road & Pembroke Street intersection was significant enough to induce LOS F in the AM peak hour, which previously operated at LOS E. However, as the V/C ratios are still well within acceptable thresholds in either peak hour, capacity of this movement is not considered to be a concern despite the delay experienced by the vehicles that are making this movement.

3.2.3 Future Total Traffic Operations

Table 3.4 summarizes the future total (with site) peak hour traffic operations in the study area.

Table 3.4: Future Total (With Site) Traffic Operations

INTERSECTION/ TRAFFIC CONTROL	MOVEMENT	AM			PM		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
Pembroke Street & Birch Street (Unsignalized)	NBLR	A	0.04	10	B	0.05	15
	EBTR	A	0.00	5	A	0.00	5
	WBTL	A	0.03	5	A	0.03	5
Richmond Road & Pembroke Street (Unsignalized)	NBL	A	0.06	15	B	0.06	15
	NBT	A	0.00	15	A	0.00	15
	EBLR	E	0.45	35	**F**	0.57	45
	SBTR	A	0.00	55	C	0.00	90
Pembroke Street & North Site Access (Unsignalized)	EBTR	A	0.00	15	D	0.00	25
	WBTL	A	0.01	5	A	0.02	5
Fort Street & Ashgrove Street (Unsignalized)	EBTL	A	0.02	45	B	0.02	65
	WBT	A	0.00	5	A	0.00	25
	WBTR	A	0.00	5	A	0.00	25
	SBL	E	0.07	10	**F**	0.10	20
Richmond Road & Fort Street (Signalized)	EBL	B	0.37	25	B	0.45	35
	EBTR	B	0.29	35	B	0.28	40
	WBL	C	0.10	10	C	0.09	10
	WBTR	C	0.49	55	C	0.48	65
	NBL	C	0.07	10	C	0.24	20
	NBT	A	0.00	120	A	0.00	120
	NBR	D	**0.91**	120	D	0.80	120
	SBL	C	0.65	#45	C	0.65	#45
	SBT	B	0.48	50	C	0.62	65
	SBR	B	0.20	10	B	0.27	15

Notes: NB = Northbound, EB = Eastbound, WB= Westbound, SB = Southbound, L = left, T = through, R = right

Bolded results indicate values that do not meet acceptable performance criteria.

"#" indicates that the 95th percentile volume exceeds capacity; therefore vehicle queue may be longer than reported.

The following movements exceed acceptable performance thresholds in the future total condition:

- The eastbound approach to the Richmond Road & Pembroke Street intersection operates at LOS F in the PM peak hour.
- The southbound left turn at the Fort Street & Ashgrove Street intersection operates at LOS F in the PM peak hour.

The introduction of estimated site traffic is anticipated to increase the vehicle volume for the eastbound approach to the Richmond Road & Pembroke Street intersection. As such, similar to under background traffic conditions, this approach is shown to operate at LOS F under total conditions. For the AM peak hour, while Bunt's analysis results indicated this movement operates at an LOS F under background conditions, but LOS E under total conditions despite having slightly higher vehicle trips, this discrepancy can be attributed to the randomness of the SimTraffic software simulation runs. In reality, the delays are expected to be quite similar between the two scenarios.

3.2.4 Future Total Traffic Operations – Northbound Left Turn Lane at Richmond Road & Pembroke Street Removed

The City of Victoria asked Bunt to evaluate the option of removing the northbound to westbound left turn lane on Richmond Road at the Pembroke Street intersection. Bunt did this by reviewing SimTraffic results at the intersection with the left turn lane removed. While this scenario was technically shown to function within acceptable thresholds for delays and V/C ratio, the model assumes that southbound vehicles queuing from the Fort Street intersection will leave a gap along Richmond Road at Pembroke Street for northbound vehicles on Richmond Road to turn left through. Based on site observations, this is often not the case, and left turning vehicles would be blocked. As such, the northbound queues are expected to be longer than what the model has reported, likely extending further south on Richmond Road towards the Fort Street & Richmond Road intersection. Given this anticipated result, Bunt recommends retaining the existing northbound left turn lane on Richmond Road at its current location and length.

3.2.5 Summary of Traffic Impacts

The results of the traffic analysis in Synchro software indicate that closing Birch Street at its intersection with Richmond Road will successfully remove its failing eastbound right turn movement. However, vehicle traffic will be diverted to the eastbound right turn movement at Richmond Road & Pembroke Street; this is shown to worsen the delays at this movement to LOS F.

The introduction of site traffic is not anticipated to induce any new performance issues that are not already anticipated for the future background scenario. However, a significant portion of the site traffic will rely on the eastbound approach to the Richmond Road & Pembroke Street intersection, which is anticipated to experience long delays in either peak hour period.

3.2.6 Potential Mitigation – Traffic Signal at Richmond Road & Pembroke Street

To mitigate the long eastbound vehicle delays experienced at the at Richmond Road & Pembroke Street, Bunt tested the effectiveness of upgrading this intersection from stop control to a traffic signal. The following assumptions were applied to the traffic signal in Bunt's Synchro model:

- The control type was set to 'Actuated - Coordinated'; and,
- The Synchro 'Optimize Network Cycle Lengths' tool was applied to optimize the signal timing for the intersection while retaining the signal coordination with the adjacent Richmond Road & Coronation Avenue and Richmond Road & Fort Street intersections.

Table 3.5 presents the future total (with site) peak hour traffic operations with the Richmond Road & Pembroke Street intersection signalized.

Table 3.5: Future Total (With Site) Traffic Operations – Traffic Signal at Richmond Road & Pembroke Street

INTERSECTION/ TRAFFIC CONTROL	MOVEMENT	AM			PM		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
Richmond Road & Pembroke Street **(Signalized)**	EBL	D	0.78	20	D	0.79	20
	EBR	A	0.00	20	A	0.00	20
	NBL	A	0.09	5	A	0.09	5
	NBT	A	0.36	25	A	0.43	55
	SBT	A	0.00	5	A	0.00	10
	SBR	A	0.47	5	A	0.55	10

As shown above, all movements are shown to operate within performance and queuing limits in the future total condition with the Richmond Road & Pembroke Street intersection signalized. These results indicate that signalizing the intersection would be an effective mitigation measure.

To determine if signalizing the intersection would be warranted, Bunt applied the Transportation Association of Canada (TAC) signal warrant methodology. The results of this analysis indicated that based on the projected future total traffic volumes, a traffic signal would not technically be warranted. However, regardless of this result, because the vehicle delays for the eastbound approach affect a significant number of both background and site vehicle trips, access to/from this area is relatively limited (i.e., due to the closure of Birch Street to Richmond Road, the one-way restriction of Begbie Street, etc.), and long delays could lead to drivers attempting dangerous turns from Pembroke Street onto Richmond Road where there are insufficient gaps, a traffic signal may still be considered. This mitigation measure would effectively remove the long eastbound delays and provide drivers with a controlled opportunity to turn to/from Pembroke Street.

Rectangular Rapid Flashing Beacon

Alternative to a traffic signal, a pedestrian-actuated Rectangular Rapid Flashing Beacon (RRFB) pedestrian crossing along the intersection's south leg would be a mitigation option. Following Bunt's initial submission of this study to the City of Victoria, City staff indicated that an RRFB pedestrian crossing was its preferred mitigation approach rather than implementing a full traffic signal, particularly given the results of Bunt's signal warrant analysis and in consideration of signal spacing along Richmond Road. While this control type would not provide vehicle actuation, during periods of high pedestrian activity, an RRFB would operate similar to a traffic signal in terms of providing both controlled pedestrian crossing opportunities and opportunities for vehicles to turn left out from Pembroke Street onto Richmond Road when the beacon is activated and traffic along Richmond Road is momentarily stopped.

3.2.7 Potential Mitigation – Restrict Southbound to Eastbound Left Turn at Ashgrove Street & Fort Street Intersection

The City of Victoria may consider restricting the southbound to eastbound left turn movement at the Ashgrove Street & Fort Street intersection for various reasons such as its high peak period delays, it crosses a new protected bike route on Fort Street, and it leads into the left turn lane of the adjacent Fort Street intersection resulting in potential conflict. Given the low number of vehicles attempting this movement, combined with the viable and improved alternative routes (particularly if Richmond Road & Pembroke Street were to be signalized), restricting this movement is not anticipated to result in any operational issues.

4. PARKING SUPPLY REVIEW

4.1 Parking Supply

4.1.1 Vehicle Parking

The vehicle parking requirements for the City of Victoria are specified in *Schedule C: Off-Street Parking Regulations* of Zoning Bylaw No. 80-159 (the bylaw). **Table 4.1** summarizes the required vehicle parking supply and proposed provision for each land use using the City of Victoria's 'Other Area' subcategory. It is however noted that the site is immediately adjacent to the Jubilee Hospital Village and, as discussed in Section 4.2, is anticipated to function similar to a Village or Urban Centre.

The commercial tenants for the three Commercial/Retail units are unknown at this stage. At this time, they are estimated to be a restaurant, a local serving coffee shop, and a retail land use. As these tenants are not yet confirmed, the site's parking requirements were calculated using Victoria's 'general retail' parking rate for the 'Other Area' subcategory.

Table 4.1: Vehicle Parking Supply Requirement & Provision

LAND USE	DENSITY	BYLAW RATE	BYLAW SUPPLY REQUIREMENT (SPACES)	PROVIDED (SPACES)	DIFFERENCE (SPACES)
Apartment	14 units (< 45 m^2)	0.75 / unit	10.5	3	-52
	22 units (45–70 m^2)	0.90 / unit	19.8		
	19 units (> 70 m^2)	1.30 / unit	24.7		
Visitor (Apartment)	55 units	0.1 / unit	6	(shared with Commercial)	-6
Commercial (Retail)	356 m^2	1 / 37.5 m^2	9	9	-
Car-Share Vehicle			0	1	+1
		TOTAL	**70**	**12, PLUS 1 CAR SHARE**	**-58 (+1 CAR SHARE)**

The vehicle parking supply requirement for the proposed development is 70 parking spaces, including 55 spaces for residents, 6 spaces for residential visitors, and 9 spaces for commercial land uses.

Given the site's proximity to nearby amenities and alternative transportation facilities, combined with general site constraints, the developer proposes a reduced parking supply of 12 spaces plus 1 car share space (and vehicle). There is also one motorcycle space, however this space does not technically count towards the site's parking supply.

While the site's parking supply is compliant with the bylaw in regard to commercial parking spaces, as the overall provision would fall short of the City's bylaw requirement, the project is seeking a vehicle parking variance. The requested variances are summarized below:

- Apartment: -52 spaces (from a requirement of 1.02 spaces / unit to a proposed 0.05 spaces / unit);
- Visitor: -6 spaces (from a requirement of 0.1 spaces / unit to a proposed 0.00 spaces / unit) as they will be shared with the commercial spaces.

The appropriateness of these variances is reviewed in Section 4.2.

Table 4.2 summarizes the required accessible parking supply and proposed provision for each land use.

Table 4.2: Accessible Parking Supply Requirement & Provision

LAND USE	DENSITY	BYLAW RATE	BYLAW SUPPLY REQUIREMENT (SPACES)	PROVIDED (SPACES)	DIFFERENCE (SPACES)
Apartment	55 req. parking paces	2 accessible and 1 van accessible for 51-75 parking spaces	2 accessible, 1 van accessible	1 accessible 1 van accessible	-1 accessible
Visitor (Apartment)	6 req. parking paces	1 van accessible for 6-25 parking spaces	1 van accessible	-	-1 van accessible
Retail	9 req. parking paces	1 van accessible for 6-25 parking spaces	1 van accessible	-	-1 van accessible
		TOTAL	2 ACCESSIBLE 3 VAN ACCESSIBLE	1 ACCESSIBLE 1 VAN ACCESSIBLE	-1 ACCESSIBLE -2 VAN ACCESSIBLE

The proposed accessible parking supply includes 1 accessible space and 1 van accessible space shared between the commercial component and visitors to the apartment. This proposed supply represents a variance of 1 accessible space and 2 van-accessible spaces below the bylaw requirement. Note, an additional van accessible space is proposed to be provided on-street on the site's Birch Street frontage, but this space has not been included as part of the supply.

4.1.2 Bicycle Parking

The bicycle parking requirements for the City of Victoria are specified in *Schedule C: Off-Street Parking Regulations* of Zoning Bylaw No. 80-159. **Table 4.1** summarizes the required bicycle parking supply and proposed provision for each land use.

Table 4.3: Bicycle Parking Supply Requirement & Provision

LAND USE	DENSITY	BYLAW RATE	BYLAW SUPPLY REQUIREMENT (SPACES)	PROVIDED (SPACES)	DIFFERENCE (SPACES)
Apartment, Long Term	14 units (< 45 m^2)	1 / unit	14 Long Term	110 Long Term	+45 Long Term
	41 units (> 45 m^2)	1.25 / unit	51 Long Term		
Apartment, Short Term	1 building, 55 units	Greater of: 6 / building OR 0.1 / unit	6 Short Term	6 Short Term	-
Retail, Long Term	356 m^2	1 / 200 m^2	2 Long Term	2 Long Term	-
Retail, Short Term	356 m^2	1 / 200 m^2	2 Short Term	6 Short Term	+4 Short Term
		TOTAL	67 LONG TERM 8 SHORT TERM	112 LONG TERM 12 SHORT TERM	+45 LONG TERM +4 SHORT TERM

The bicycle parking supply requirement for the proposed development is 65 long-term and 6 short-term for the apartment land use and 2 long-term and 6 short-term for the commercial land uses.

The proposed development will exceed the requirement for long term bicycle parking for the apartment land use; from 65 spaces required (1.18 / unit) to 110 proposed (2.00 / unit). The proposed development will meet the long-term bicycle parking requirements for commercial land use and exceed the short-term requirements.

4.2 Vehicle Parking Supply and Demand Analysis

As noted in Section 4.1.1, the developer is seeking the following parking variances:

- Apartment: -52 spaces (from a requirement of 1.02 spaces / unit to a proposed 0.05 spaces / unit); and,
- Visitor: -6 spaces (from a requirement of 0.1 spaces / unit to a proposed 0.00 spaces / unit) as they will be shared with the commercial spaces.

It is acknowledged that the proposed parking supply and variances sought are progressive. The development is attempting to align with the City's future transportation policy goals to reduce reliance on private vehicle usage by leveraging the site's inherent proximity to existing transit, cycling, and walking networks, while also leaning on nearby alternative supply options to complement the development's own provision.

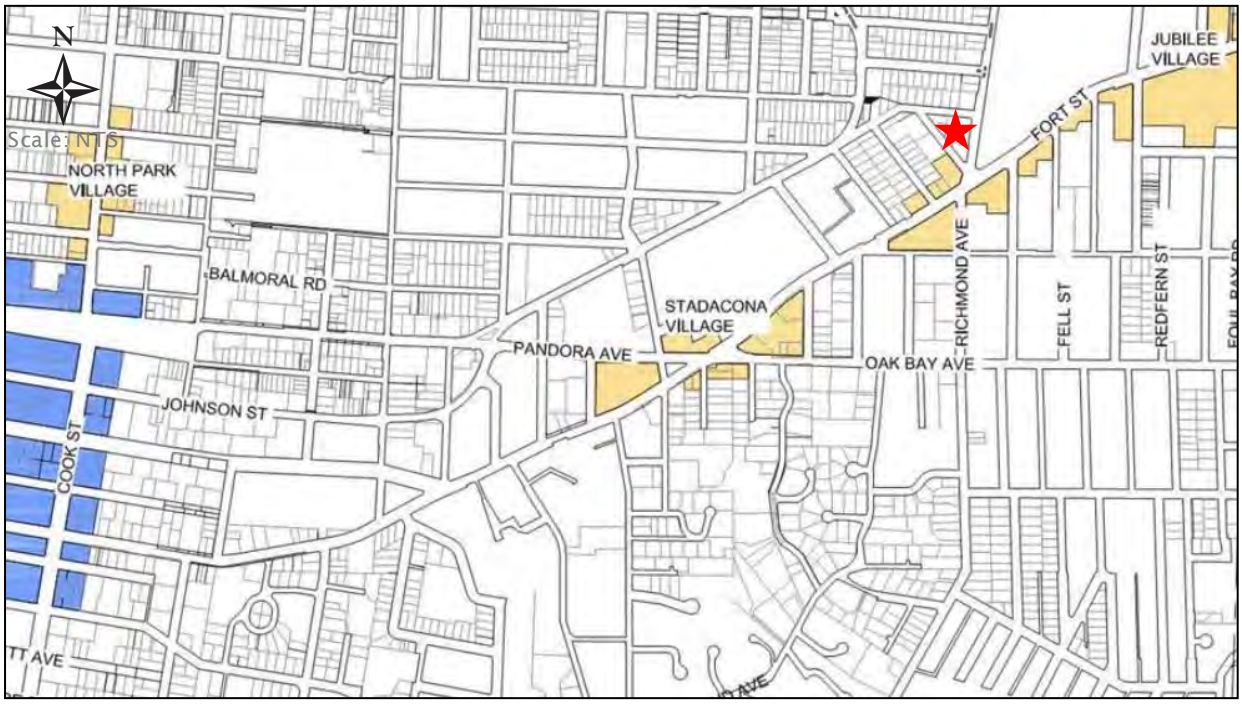
This section reviews factors that influence demand to help support a lower parking provision (i.e., the site location, parking demand patterns, and the application transportation demand management (TDM) measures) and presents nearby alternative parking options that would help complement the proposed supply.

4.2.1 Site Location

As described in Section 2.2, the proposed site is well-connected to existing transit, cycling, and walking networks. The local transportation network and proximity of amenities is anticipated to allow residents and visitors to commute and run daily errands without a private vehicle. In addition, the future two-way protected cycle track on Fort Street will be an excellent addition to the local cycling network and is anticipated to further encourage cycling to/from the development.

The bylaw requirements for vehicle parking are based on the location of the proposed site. Different parking supply rates are specified for developments considered to be in different geographic sub-types: 'Core Area', 'Village/Centre', or 'Other Area'. **Figure 4.1** illustrates the site location overlaid onto a screen capture from the City of Victoria Parking Bylaw, with 'Core Area' shown in blue, 'Village/Centre' shown in beige, and 'Other Area' shown in white.

Figure 4.1: Site Location: Off-Street Parking Sub-Areas



As shown, the proposed site is located in an 'Other Area' which has the highest vehicle parking requirements of the three sub-types. However, the proposed site is near many 'Village/Centre' areas (approx. 20 metres from the nearest 'Village/Centre'). As a result, it is reasonable to view the proposed site as a 'Village/Centre' sub-type. If it were considered to be in a Village/ Centre area then the development would need just 7 commercial parking spaces which is two spaces less than what is being provided.

4.2.2 Rental Tenure Parking Management

As the proposed development includes rental residential units, rather than strata owned units, this would allow for management of the on-site parking spaces. In this way, the site's operator will be able to screen prospective tenants and ensure there is mutual understanding of the limited available site parking before the tenant enters into a rental agreement. This would help minimize the chances of vehicle parking ownership exceeding the available supply.

4.2.3 Different Time-of-Day Peak Demands

The proposed development will not dedicate on-site parking spaces to visitors to the apartments. Instead, the developer proposes to allow visitors to park in the shared commercial/visitor parking supply of 9 spaces. This arrangement is meant to take advantage of the fact that the parking demand for these uses tends to peak at different times of the day and on different days. For example, residential visitor parking

tends to peak both in the early evening on weekdays and during the daytime on weekends. Generally speaking, the parking demand for the commercial retail use is expected to be highest during the weekday daytime, and considerably lower during the weekday evenings. By sharing the commercial parking with residential visitors, visitor demand will be accommodated without needing to construct additional parking that may sit vacant at most times of the day.

As a result, Bunt recommends that the 9 commercial visitor spaces be marked as "Visitor" spaces allowing them to be used by both commercial and residential visitors. Further, they should be regulated with a time restriction (i.e. 2-hour maximum) to ensure they are used as intended.

Depending on the future commercial retail tenants, it is acknowledged that there may be time periods when both residential visitor and commercial parking demand coincide, such as daytime on the weekends. During these periods, should the combined demand exceed the off-street supply, visitors and commercial patrons are also anticipated to park within publicly available on-street parking, which would help accommodate the demand during these specific time periods. The nearby on-street parking is discussed further below.

4.2.4 On-Street Parking Supply

On-street parking exists in the vicinity of the site, which includes a mix of primarily time-restricted spaces and "Resident Only" spaces. Most of the publicly available time-restricted spaces are located on Birch Street, Pembroke Street, and Richmond Road. While these on-street spaces are not expected to be relied on for the proposed development, at certain times/days of the week these on-street spaces would help complement the on-site supply (e.g., periods when commercial retail and residential visitor peak parking demand coincide). **Exhibit 4.1** illustrates on-street parking regulations within the study area. As shown, 1 and 2-hour short-term parking is available on multiple street edges within 200 metres of the proposed site.

4.2.5 Rentable Parking Spaces in Adjacent Buildings

In terms of other complementary supply options, there are long-term (monthly) parking spaces available for rent at the adjacent 2020 Richmond Road building. Robbins Parking, the company that manages these spaces, offers exclusive use of a parking space for $141.75 per month. There are also long-term parking opportunities at the neighboring Jubilee Hospital should some residents also work at the hospital. These nearby available parking spaces provide a valuable contingency should resident vehicle ownership be greater than anticipated.

4.2.6 Transportation Demand Management (TDM) Measures

Transportation Demand Management (TDM) is defined as the "application of strategies and policies to reduce travel demand (specifically that of single-occupancy private vehicles), or to redistribute this demand in space or in time". A successful TDM program can influence travel behaviour away from Single Occupant Vehicle (SOV) travel during peak periods towards more sustainable modes such as High Occupancy Vehicle (HOV) travel, transit, cycling or walking. The responsibility for implementation of TDM

measures can range across many groups, including regional and municipal governments, transit agencies, private developers, residents/resident associations or employers.

To help support the proposed reduced parking supply, the developer proposes to implement a comprehensive TDM strategy for the development. This strategy, which was developed in coordination with Bunt, includes a suite of measures intended to promote the use of alternative transportation modes and reduce the site's reliance on private vehicle ownership. Details of the proposed TDM measures are provided in Section 6.

4.2.7 Vehicle Parking Demand Summary

In summary, the following items are anticipated to collectively reduce the parking demand and provide alternative supply options for the proposed development to support the proposed reduced parking supply:

- The proposed site is well-connected to existing transit, cycling, and walking networks, which reduces the reliance of private vehicle ownership. Given the site's location, its commercial parking demand is expected to reflect a "Village/Centre" rate, despite being in an "Other Area" zone;
- The site is located near Jubilee Village, which offers many services that are anticipated to allow future residents to complete shopping and daily errands by walking and/or cycling;
- The proposed rental tenure of the residential units allows for management of the on-site parking spaces where prospective tenants would be informed of the limited parking space availability before entering into a rental agreement;
- The parking demand for the residential visitor and commercial retail land uses are expected to peak at different times of the day, enabling a shared parking arrangement. The exception to this may be during weekend daytime periods, depending on the commercial use;
- On-street parking exists in the vicinity of the site, including 1 and 2-hour short-term parking on Birch Street, Pembroke Street, and Richmond Road. While the development is not expected to rely on these spaces, they will complement the off-street supply at certain times/days of the week (e.g., periods when commercial retail and residential visitor peak parking demand may coincide).
- Residents seeking long-term vehicle parking will have the option of renting a space at the adjacent 2020 Richmond Road building; and
- The development proposes to provide a comprehensive suite of TDM measures to promote the use of alternative transportation modes and reduce the site's reliance on private vehicle ownership.

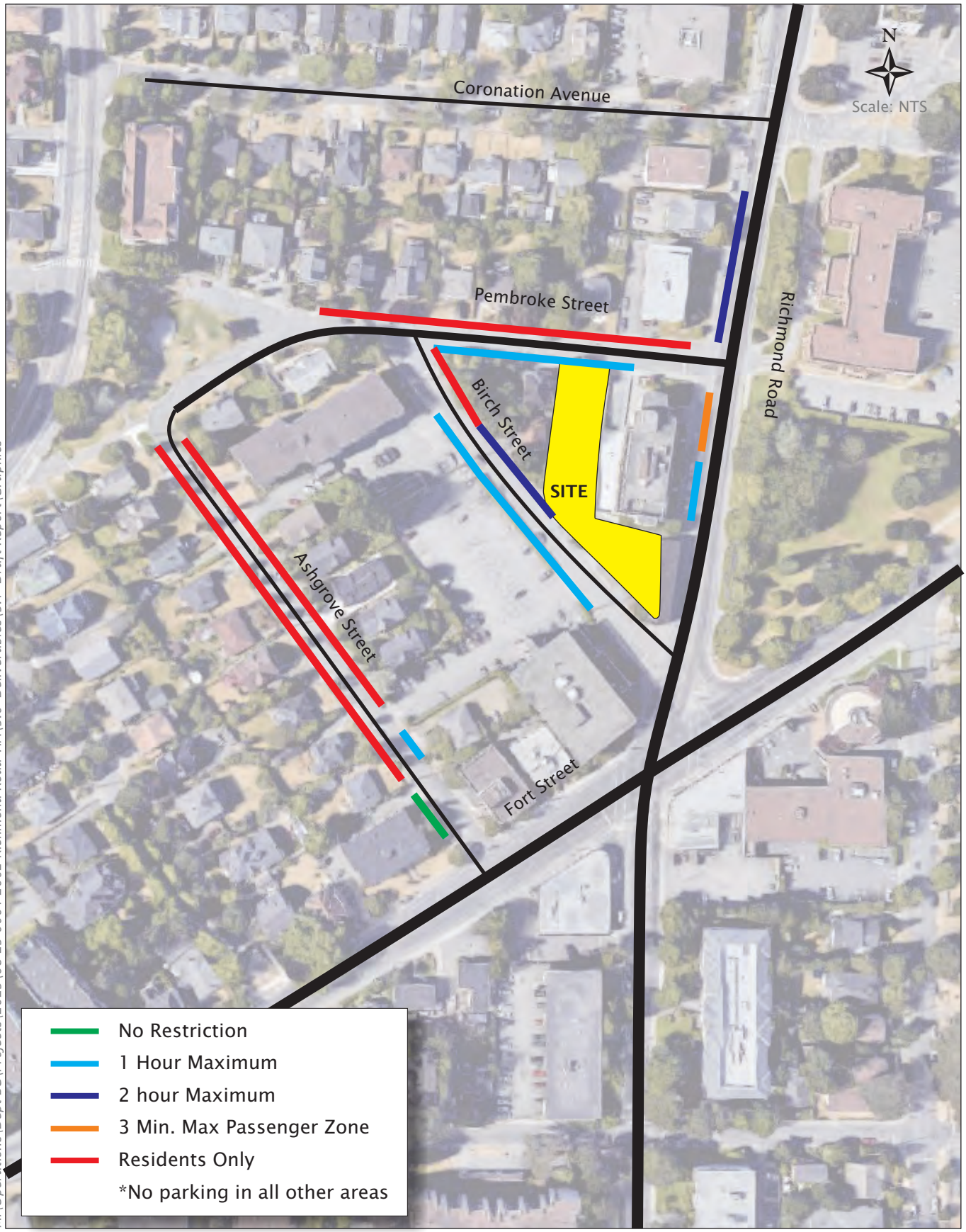


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Exhibit 4.1

On-Street Parking Regulations

2002 Richmond Road
08-23-0004 October 2023

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5. SITE DESIGN REVIEW

5.1 Swept Path Analysis

Bunt completed a swept path analysis, attached in **Appendix D**, of the proposed site plan using AutoTURN software. Bunt confirmed functionality of waste collection and passenger vehicle maneuvers in and around the proposed development. The following summarizes the analysis:

- **Exhibit D.1a** illustrates a waste collection vehicle turnaround movement. As shown, the turn path requires multiple point turns while still coming closer than advisable to the proposed building. This diagram illustrates the difficultly of turning around a large loading vehicle on Birch Street. Due to this analysis, it is recommended that the plaza area be made permeable to loading vehicles to allow egress of the occasional large loading truck onto Richmond Road. It is also recommended that the site pursue a waste collection plan that reduces or removes the need for large sized garbage collection vehicles to use Birch Street. For example, a handheld electric waste bin tug (e.g., V-Move Dumpster Mover) could be used to pull garbage bins from the site to Pembroke Street. Further, the developer should explore opportunities to develop a tailored collection plan for the site with a waste collection company that minimizes reliance on Birch Street and accounts for the one-way circulation of the parking area.
- **Exhibit D.1b** illustrates an alternative option to a waste collection vehicle turning around on Birch Street (as shown in Exhibit D.1a). This option allows the waste vehicle to use the proposed pedestrian plaza, which will be located on Birch Street where it meets with Richmond Road, as an outbound route onto Richmond Road. The pedestrian plaza would need to be constructed to allow service vehicle access but deter all other vehicle use. Waste collection and large loading vehicles would be scheduled outside of peak pedestrian traffic hours to limit conflicts. One public on-street parking space would need to be removed to accommodate this option.
- **Exhibit D.2** illustrates passenger vehicle circulation through the surface parking lot. The parking lot will be one-way southbound (inbound only from Pembroke Street, outbound only to Birch Street). The hatched surfaces shown on the site plan will be mountable for vehicles.
- **Exhibits D.3 and D.4** illustrate inbound and outbound passenger vehicle parking maneuvers, respectively. No issues were identified.

6. TRANSPORTATION DEMAND MANAGEMENT

6.1 Proposed TDM Strategy

The following section describes the individual TDM measures proposed for the development. These measures are intended to support the reduced parking supply by promoting the use of alternative transportation modes and reducing the site's reliance on private vehicle ownership. The measures were identified have by Bunt to be suitable for the size, location, and requested parking variance of the proposed development, and have been agreed to by the developer.

6.1.1 Transit Passes

The developer proposes to provide a subsidized annual transit pass from BC Transit for employees of the proposed commercial land uses. Employees would be given the option of purchasing an annual transit pass for a reduced fee via the development manager. Transit passes provide unlimited use of the BC Transit bus service in the Greater Victoria area. This measure in combination with the proposed development's proximity to frequent transit services is anticipated to greatly increase transit use from the development and reduce the need for commuting by private vehicle.

6.1.2 Car-Share Parking Space and Memberships

The developer will provide an on-site dedicated car-share parking space. The inclusion of this space is accounted for in this report's parking calculations.

Modo is the primary car-share service in Greater Victoria, offering round trips for members. A car-share vehicle will enable residents to have short-term access to a vehicle, without having to buy or maintain their own. The developer is proposing to provide $500 Modo memberships for each unit. Each membership is tied to a unit and can be transferred between units or to new tenants, as needed.

The Metro Vancouver Car-Share Study provides information on the effects of car-share on vehicle ownership. Each shared car has been shown to remove 3-11 private vehicles from the street system. In addition, the number of vehicles owned per household was reduced by 27% when a Modo membership was acquired[1].

Figure 6.1, taken from Modo's website, illustrates the location of existing Modo vehicles near the proposed site. Two Modo car share vehicles are located within 500 metres. A new Modo vehicle located adjacent to the proposed site will be a valuable addition to the neighbourhood and reduce resident vehicle ownership.

[1] http://www.metrovancouver.org/services/regional-planning/PlanningPublications/MetroVancouverCarShareStudyTechnicalReport.pdf

Figure 6.1: Nearby Existing Modo Car Share Vehicles

6.1.3 Unbundled Parking Spaces

The development manager will not package parking spaces with the proposed rental units. Instead, tenants will have the option of renting a parking space for an additional monthly fee, subject to availability. Because the monthly rental price will not include a parking space, tenants will not feel an obligation to own a vehicle to utilize an amenity they are already paying for. This policy will also help attract tenants who do not own a vehicle and help incentivise a car-free lifestyle.

6.1.4 Additional Long-Term Bicycle Parking

The developer is committed to providing additional long-term bicycle parking for residents. The proposed supply of 110 spaces (2.00 / unit) will allow more residents to securely store their bicycles and will encourage cycling as a viable means of local travel.

6.1.5 Improved Bicycle Parking and Access

The developer is planning to provide high-quality lighting, grades, surfacing, and other amenities that will improve the access to and experience of the bicycle storage rooms. This may include installation of bright LED lights along the access path and in the bicycle room, at-grade or ramp access to the bicycle rooms, extra-wide automatic doors for large bicycle access.

6.1.6 Bicycle Maintenance Facilities

The developer is planning to provide a bicycle wash station and/or repair stand in or near the bicycle storage room. A bicycle wash station features a hose, stand, and drain for washing bicycles. A bicycle repair stand provides a stand with tools for repairing and maintaining a bicycle (e.g., allen keys, pump, tire

patches, screwdrivers, etc.). **Figures 6.2** and **6.3** illustrate an example of a bicycle wash station and a bicycle repair stand, respectively.

Figure 6.2: Bicycle Wash Station Example

Figure 6.3: Bicycle Repair Stand Example

6.1.7 Cargo Bicycle Spaces

The developer will provide extra-large spaces for cargo bicycles in the bicycle storage room. Electric cargo bicycles have high storage capacity and power and are excellent for commutes and for errands, such as grocery shopping. For these reasons, cargo bicycles are more effective at replacing the need for a private vehicle than standard bicycles. **Figure 6.4** illustrates an example of a cargo bicycle.

Figure 6.4: Cargo Bicycle Example

6.1.8 End-of-trip Facilities

The developer will provide showers, change rooms, and lockers for the employees of the proposed commercial uses. This measure would encourage employees to commute by active modes.

6.1.9 Pedestrian Plaza

The proposed pedestrian plaza, which is anticipated to be completed by the opening day of the development, will provide a shared pedestrian-only space with outdoor seating. This neighbourhood amenity is anticipated to augment the walkability of the area as well as provide pedestrian level placemaking.

7. CONCLUSIONS & RECOMMENDATIONS

7.1 Conclusions

7.1.1 Proposed Development

- Empresa Properties proposes the development of a 6-storey, 55-unit residential rental building with approximately 356 m^2 of ground-floor commercial space.

7.1.2 Existing Transportation Network

- The proposed development is well-connected to local transit, cycling, and pedestrian networks. Six bus routes have stops within 200 metres of the site, two of which are classified as 'frequent' routes; these routes cover a comprehensive service area with two-way service to Victoria General Hospital, University of Victoria, Esquimalt, Downtown Victora, and Oak Bay. Painted bike lanes are provided within the study area on Fort Street and on Richmond Road, with the Fort Street bike lanes transitioning to a two-way protected cycle track to the west as part of the All-Ages and Abilities (AAA) regional cycling network. Sidewalks are provided on both sides of all study area roads; many amenities are available within walking distance due to the site's proximity to Jubilee Village.

7.1.3 Existing Traffic Conditions

- Synchro 11 analysis indicated that the following movements exceed acceptable performance limits in the existing condition:
    - The eastbound approach to the Richmond Road & Pembroke Street intersection operates at LOS F in the PM peak hour; and
    - The eastbound right turn at Richmond Road & Birch Street operates at LOS F in both the AM and PM peak hours.

7.1.4 Future Traffic Conditions

- The proposed development is anticipated to generate approximately 45 and 60 vehicle trips in the AM and PM peak hours, respectively. This equates to a new vehicle trip every 1-2 minutes, on average. Given the reduced parking supply proposed for the development, this estimate likely overstates the actual number of trips that would be generated by the site and is therefore conservative.
- The Richmond Road & Birch Street intersection is assumed to be closed by the opening day of the proposed development.
- Bunt's analysis indicated that in addition to the performance issues in the existing condition, the eastbound approach to the Richmond Road & Pembroke Street intersection operates at LOS F with or without future site traffic present in most future time periods. This is partly attributed to traffic previously exiting from Birch Street onto Richmond Road now using Pembroke Street.

7.1.5 Future Traffic Conditions – Potential Mitigations

- SimTraffic 11 analysis indicated that removing the northbound left turn lane at the Richmond Road & Pembroke Street intersection would operate within performance and capacity limits. However, this level of performance is dependent on southbound drivers leaving a gap in the queue at Pembroke Street, which is an inconsistent situation based on site observations.
- Synchro 11 analysis indicated that a traffic signal at the Richmond Road & Pembroke Street intersection can mitigate performance issues at this location. The City has expressed a preference for a pedestrian crossing with a rectangular rapid flashing beacon (RRFB) at this location, rather than a full traffic signal, given that the signal is not technically warranted and in consideration of signal spacing along Richmond Road. This is anticipated to create gaps in Richmond Road traffic which can also help facilitate left turn vehicle movements from Pembroke Street onto Richmond Road.

7.1.6 Parking Supply Review

- The vehicle parking supply requirement for the development is 70 parking spaces, including 55 residential, 6 residential visitor, and 9 commercial retail spaces.
- The developer is seeking to provide a total of 12 parking spaces plus one car share space (and vehicle). Of this supply, 3 spaces will be for residents and 9 spaces will be shared between residential and commercial visitors.
- The proposed supply results in the following required parking variance:
    - Apartment: -52 spaces (from a requirement of 1.02 spaces / unit to a proposed 0.05 spaces / unit); and,
    - Visitor: -6 spaces (from a requirement of 0.1 spaces / unit to a proposed 0.00 spaces / unit) as these will be shared with the commercial spaces.
- The proposed accessible parking supply is 1 accessible space and 1 van accessible space shared between the commercial component and visitors to the apartment. An additional van accessible space is proposed to be provided on-street near the development along the site's Birch frontage. This proposed supply represents a variance of 1 accessible space and 2 van-accessible spaces below the bylaw requirement.
- The bicycle parking supply requirement for the proposed development is 65 long-term and 6 short-term for the apartment land use and 2 long-term and 6 short-term for the commercial land uses. The proposed development will exceed the requirement for long term bicycle parking for the apartment land use; from 65 spaces required (1.18 / unit) to 110 proposed (2.00 / unit). The proposed development will meet the long-term bicycle parking requirements for commercial land use and exceed the short-term requirements.

7.1.7 Vehicle Parking Supply and Demand Analysis

- The following factors are anticipated to help support a lower parking provision by reducing demand and providing nearby alternative parking supply options:

- The proposed site is well-connected to existing transit, cycling, and walking networks. Given the site's location, its commercial parking demand is expected to reflect a "Village/Centre" rate, despite being in an "Other Area" zone;
- The site is located near Jubilee Village, which offers many services that are anticipated to allow future residents to complete shopping and daily errands by walking and/or cycling;
- The proposed rental tenure of the residential units allows for management of the on-site parking spaces;
- The parking demand for the residential visitor and commercial retail land uses would generally peak at different times of the day, enabling a shared parking arrangement. The exception to this may be during weekend daytime periods;
- On-street parking exists in the vicinity of the site. While the development is not expected to rely on these spaces, they will complement the off-street supply at certain times/days of the week (e.g., during times when peak visitor and retail demand may coincide);
- Residents seeking long-term vehicle parking will have the option of renting a space at the adjacent 2020 Richmond Road building; and
- The development proposes to provide a comprehensive suite of TDM measures, including, but not limited to, transit incentives and improvements, a car share vehicle and memberships, excess secure bicycle parking and amenities, and a pedestrian plaza.

7.1.8 Site Design Review

- Bunt completed a swept path analysis of the proposed site plan using AutoTURN software. The analysis indicates that garbage collection vehicle (MSU) turnaround on Birch is not feasible. Instead, the development is encouraged to allow permeability though the plaza and to work with a waste collection company to establish a collection plan that does not rely on large sized vehicles on Birch Street. No issues were identified with passenger vehicle parking or circulation.

7.2 Recommendations

7.2.1 Future Traffic Operations – Potential Mitigations

- Bunt recommends that the intersection of Richmond Road & Pembroke Street be upgraded to address vehicular delays and queuing. Bunt's analysis indicated that signalizing the intersection with a full traffic signal to help facilitate minor road turn movements would be an effective mitigation measure. However, City staff indicated that an RRFB pedestrian crossing was its preferred mitigation approach rather than implementing a full traffic signal, particularly given the results of Bunt's signal warrant analysis and in consideration of signal spacing along Richmond Road. During periods of high pedestrian activity, an RRFB would operate similar to a traffic signal in terms of providing both controlled pedestrian crossing opportunities and opportunities for vehicles to turn left out from Pembroke Street onto Richmond Road when the beacon is activated.
- Bunt recommends that the existing northbound left turn lane at the Richmond Road & Pembroke Street intersection be retained in the future to reduce the likelihood of northbound queues at the intersection.

- Bunt recommends the southbound left turn at the Fort Street & Ashgrove Street intersection be restricted at all times as this movement is difficult and highly delayed with a low traffic volume.

7.2.2 Site Design

- Bunt recommends that the plaza be made permeable to enable egress of the occasional large loading truck onto Richmond Road. This area would need to be carefully designed to enable occasional service vehicle access but deter all other vehicle use.
- Bunt recommends that the developer work with a waste collection company to establish a collection plan that does not rely on large sized vehicles on Birch Street.
- Bunt recommends that the 9 commercial visitor spaces be marked as "Visitor" spaces allowing them to be used by both commercial and residential visitors. Further, they should be regulated with a time restriction (i.e. 2-hour maximum) to ensure they are used as intended.

7.2.3 Transportation Demand Management (TDM)

Bunt has identified the TDM measures suitable to the size, location, and parking variance sought of the development. The developer has committed to provide the following measures:

- Transit incentives for commercial employees,
- Car-share parking space and Modo memberships for each residential unit,
- Parking spaces to be "unbundled", as opposed to being included with units,
- Improvements to bicycle storage room access and lighting,
- Bicycle wash and/or repair station,
- Extra-large cargo bicycle spaces, and,
- End-of-trip facilities with two showers, a change room, and lockers for each of the commercial uses.

Also anticipated to be completed by the opening day of the proposed development, which will bolster the TDM strategy, is:

- The pedestrian plaza where Birch Street meets Richmond Road.

*****

The attached information is provided to support the agency's review process and shall not be distributed to other parties without written consent from Bunt & Associates Engineering Ltd.

APPENDIX A

Amica Seniors Development TIA (Watt Consulting Group)

AMICA SENIOR LIFESTYLES PHASE 2

Traffic Impact Assessment

2022-07-19

MJ Oh – Transportation Technologist
Author

Andy Kading, P.Eng., P.E. – Transportation Engineer
Reviewer

Prepared For: Milliken Developments
Date: July 19, 2022
Our File No: 3302.B01

WATT VICTORIA
#302, 740 Hillside Avenue
Victoria, BC V8T 1Z4
(250) 388-9877

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APPENDIX A: Synchro Information

1.0 INTRODUCTION

Watt Consulting Group was retained by Milliken Developments to conduct a traffic impact assessment (TIA) for the proposed development at 1900 Richmond Road and 1929, 1931-1933, 1935 Ashgrove Street, in the City of Victoria. This study assesses the traffic impacts of the proposed land use, reviews traffic conditions at key intersections, and assesses the need for any mitigation measures. The study reviews the existing traffic operations along with the post development and long-term conditions for all modes of transportation.

1.1 Study Area

See **Figure 1** for the study area and location. The study area includes the site accesses and following intersections:

- Fort Street / Richmond Road (Signalized)
- Fort Street / Ashgrove Street
- Richmond Road / Pembroke Street

Figure 1: Study Area and Site Location

2.0 EXISTING CONDITIONS

2.1 Land Use

The site is located to the north of Fort Street between Ashgrove Street and Birch Street. The proposed site is currently a combination of C1-R (Limited Commercial 2 District), R3-2 (Multiple Dwelling District), and R1-B (Single Family Dwelling District). The surrounding land use is a mix of residential, commercial, and shopping. There are several single-family residences near the development site along Ashgrove Street. Along the north side there are 3 multi-family apartments. Along Birch Street to the east there are single dwelling units and light commercial. The Royal Jubilee Hospital is located east of the site along Richmond Road. Along the south end of the development there are offices, shopping, and restaurants along Fort Street.

2.2 Road Network

The development site (Phase 1 & 2) faces Birch Street and Ashgrove Street.

- **Fort Street** is an undivided, four-lane, major arterial road that runs east/west within the study area. There are dedicated bike lanes on both northbound and southbound lanes.
- **Richmond Road** is an undivided, two-lane, minor arterial road that runs north/south within the study area. Bike lanes begin north of Fort Street. Richmond Road becomes Richmond Avenue south of Fort Street.
- **Birch Street** is an undivided, two-lane, minor local road that runs north/south within the study area.
- **Ashgrove Street** is an undivided, two-lane, minor local road that runs north/south within the study area.
- **Begbie Street** is a one-way minor local road with a short section between Ashgrove Street and Pembroke Street within the study area.
- **Pembroke Street** is an undivided, two-lane, minor local road that runs north/south within the study area.

The speed zone on all study roads is 50 km/h except Richmond Avenue (south of Fort Road) which is 40 km/h. Three key intersections were identified within the study area:

- **Fort Street / Richmond Road** is a skewed four-leg, signalized intersection. There are separate left turn lanes on all approaches and the southbound, eastbound, and westbound approaches have a dedicated right turn lane. The eastbound and southbound approaches are protected / permitted left turn phases while two other approaches are permitted left turns. Intersection improvements are currently proposed by the City to implement enhanced bike lanes with raised medians on Fort Street and one eastbound lane on Fort Street will be redistributed to the changes.
- **Fort Street / Ashgrove Street** is a three-leg, stop-controlled intersection. The southbound approach is stop-controlled while the eastbound and westbound approaches are free flow.
- **Richmond Road / Pembroke Street** is a three-leg, stop-controlled intersection. The westbound approach is stop-controlled while the northbound and southbound approaches are free flow.

2.3 Traffic Modelling – Background Information

Analysis of the traffic conditions at the intersections within the study area were undertaken using Synchro software (for signalized and stop-controlled intersections).

Synchro / SimTraffic is a two-part traffic modelling software that provides analysis of traffic conditions based on traffic control, geometry, volumes, and traffic operations. Synchro software is used because of its ability to provide analysis using the Highway Capacity Manual (2010) methodology, while SimTraffic integrates established driver behaviours and characteristics to simulate actual conditions by randomly "seeding" or positioning vehicles travelling throughout the network. These measures of effectiveness include level of service (LOS), delay and 95th percentile queue length.

The delays and type of traffic control are used to determine the Level of Service (LOS). The LOS is broken down into six letter grades with LOS A being excellent operations and LOS F being unstable / failure operations. LOS C is generally considered to be an acceptable LOS by most municipalities. LOS D is generally considered to be on the threshold between acceptable and unacceptable operations. A description of LOS and Synchro is provided in **Appendix A**.

2.4 2022 Existing Conditions

Traffic counts were conducted at the three study intersections on Wednesday May 25, 2022. At the adjacent streets (Ashgrove Street and Birch Street), it was observed that 2022 existing volumes decreased compared to 2018 volumes, it is speculated that the on-going construction for Phase 1 of the Amica Seniors project, which touches both streets, is the likely culprit.

A 0.0% average annual growth rate was used for the background to match the growth rate provided by the City of Victoria's Screenline (2019) which shows volume is not increasing. A combination of the growth rate and balancing of the counts was used to obtain 2022 traffic volumes.

Existing conditions were analyzed for the three key intersections on Fort Street and Richmond Road. The signalized intersection of Fort Street / Richmond Road currently operates at a LOS D or better for all movements during the AM and PM peak hours. At Fort Street / Ashgrove Street, all movements operate at a LOS C or better. At Richmond Road / Pembroke Street, all movements operate at a LOS D or better. See **Figure 2 / 3** for the existing AM / PM peak hour traffic volumes and traffic conditions.

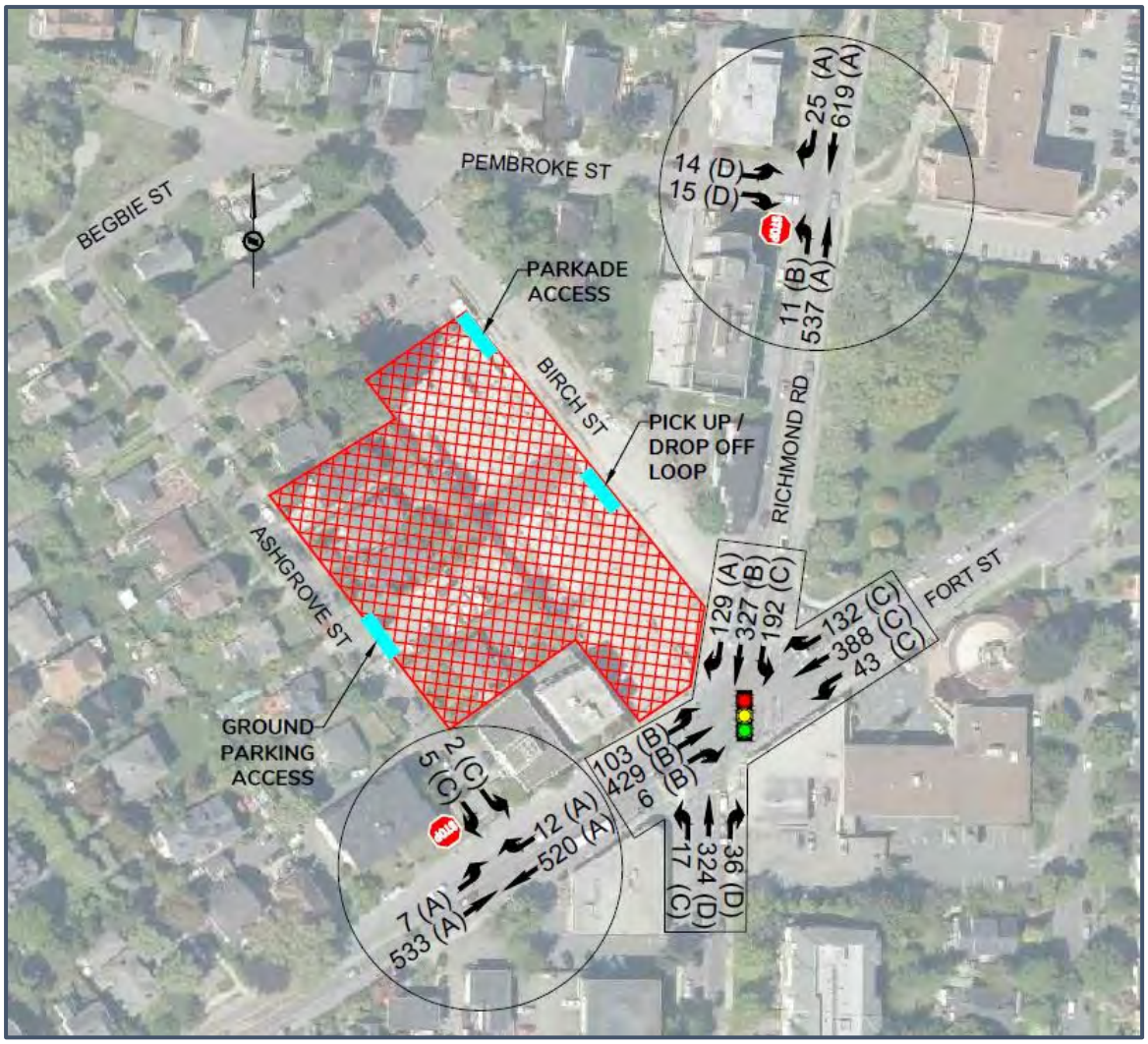


Figure 2: 2022 Existing AM Peak Hour Volumes and LOS

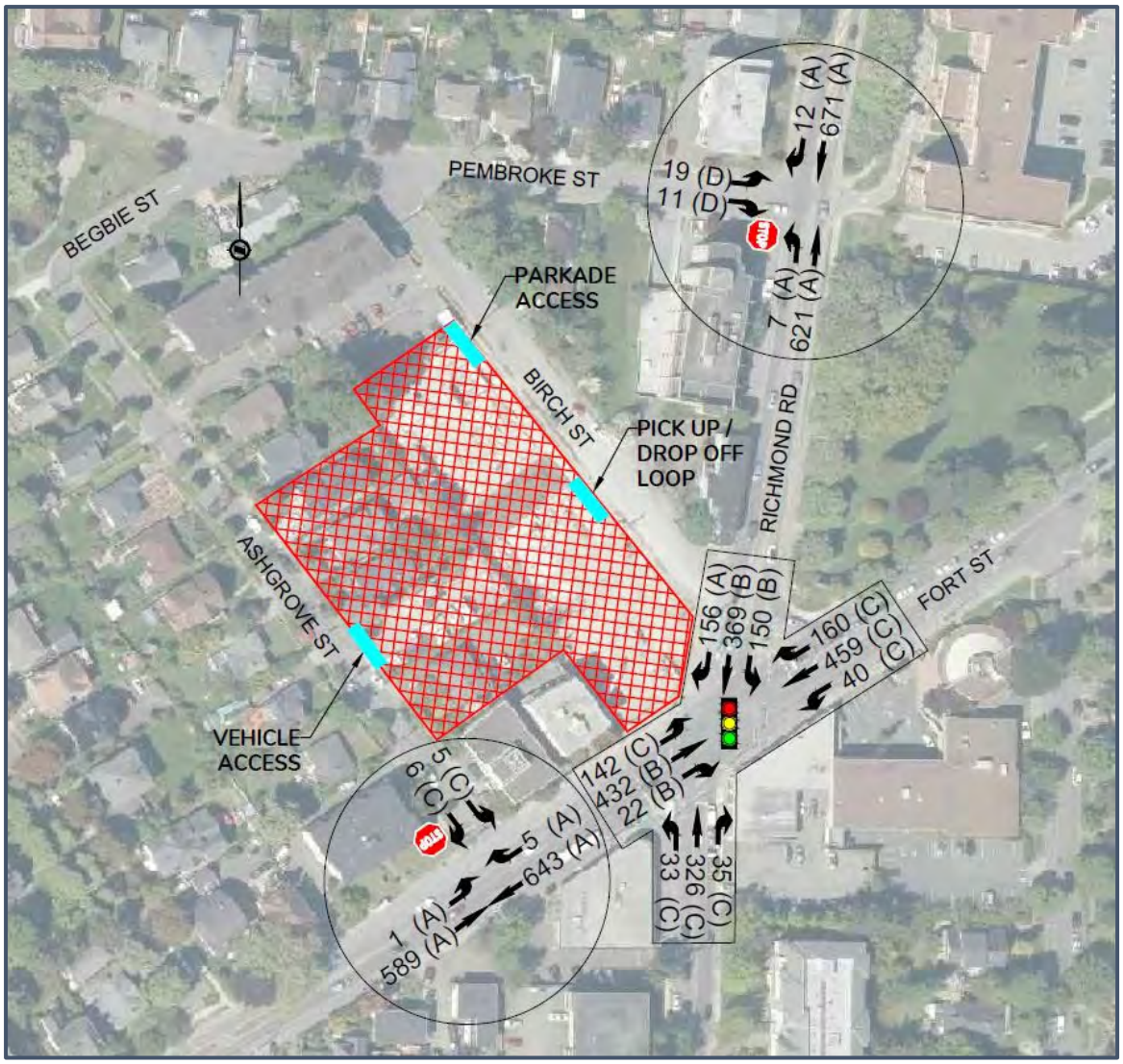


Figure 3: 2022 Existing PM Peak Hour Volumes and LOS

3.0 POST DEVELOPMENT

3.1 Proposed Land Use

The proposed development is a senior housing multi-family building with 88 dwelling units. The proposed building (Phase 2) will be connected to the (currently under construction) Phase 1 of the development.

3.2 Site Access

The development site can be accessed from Ashgrove Street and Birch Street. A ground parking access is proposed on Ashgrove Street. A parkade access to the underground parking lot is proposed on Birch Street. The parkade access on Birch Street would be used by a high percentage of the site trips due to the limited ground parking spaces. There is also a pick-up and drop-off loop proposed on Birch Street. See **Figure 4** for the proposed site plan and access location.

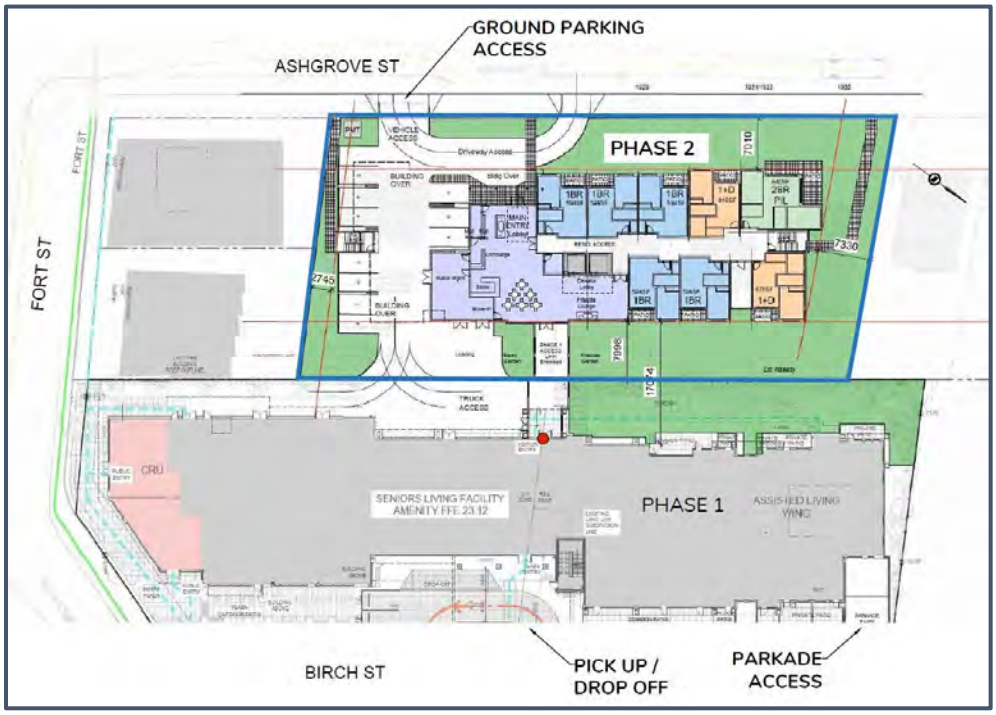


Figure 4: Proposed Site Plan and Access

The Transportation Association of Canada's *Geometric Design Guide for Canadian Roads (2017)* recommends a minimum corner clearance of 15m on a local road. The proposed location of this developments access exceeds TAC's minimum recommendation for a local road. At the proposed three site accesses, no sight line issues were found. The site access operates at LOS A for all movements into the ten-year horizon (2034) in both the AM and PM peak hours.

3.3 Trip Generation

Trip generation rates were estimated using the 11th Edition of the *ITE Trip Generation Manual*. Trip generation rates for the weekday AM and PM peak hours are shown in **Table 1**. **Table 2** shows the estimated site trips by proposed land use. The estimated site trips are 18 vehicles for the AM peak hour and 22 vehicles for the PM peak.

Table 1: Peak Hour Trip Generation Rates

ITE Land Use		Weekday AM			Weekday PM		
Code	Description	Rate	In	Out	Rate	In	Out
252	Senior Housing (Multi-family)	0.20	26%	74%	0.50	63%	37%

Table 2: Peak Hour Trip Generation

Proposed Density	Weekday AM			Weekday PM		
	Total	In	Out	Total	In	Out
MF Senior Housing: 88 Units	**18**	**6**	**12**	**22**	**12**	**10**

3.4 Background Trip Estimate for Opening Day

Existing traffic volumes were collected after the on-site existing buildings were demolished. The proposed Phase 1 development (Amica Seniors) is currently going on and the Phase 1 site trips will be added as background trips. Additionally, the traffic from two concurrent adjacent developments (1906-1912 Duchess Street and 1693-1699 Fort Street) was added to the background traffic.

Table 3 summarizes the AM and PM peak hour trip generation results for the proposed Phase 1 development. For the Phase 1 development, the site trips were estimated at 30 trips during the AM peak hour and 43 trips during the PM peak hour.

Table 3: Background Trip Generation 1 – Amica Seniors Phase 1

ITE Code	Land Use	Units / Area	AM Trips	In	Out	PM Trips	In	Out
254	Assisted Living / Memory Care	137	25	15	10	33	13	20
822	Commercial Retail Unit*	2.12	5	3	2	14	7	7
Internal Trip Deduction (2 land use)			-	-	-	(-4)	(-2)	(-2)
Net Trip Total			**30**	**18**	**12**	**43**	**18**	**25**

*Retail land use is based on a unit area (1000 ft^2). Internal trip calculation based on the *ITE Trip Generation Manual*. No pass-by trips applied.

The proposed development at 1906-1912 Duchess Street will generate 12 trips during the AM peak hour and 12 trips during the PM peak hour. The AM and PM peak hour trip generation results for the proposed development are summarized in **Table 4.**

Table 4: Background Trip Generation 2 – Duchess Street Development

ITE Code	Land Use	Units / Area	AM Trips	In	Out	PM Trips	In	Out
221	Multifamily (Mid-rise)	32	12	3	9	12	7	5

The proposed development at 1693-1699 Fort Street will generate 15 trips during the AM peak hour and 18 trips during the PM peak hour. The AM and PM peak hour trip generation results for the proposed development are summarized in **Table 5.**

Table 5: Background Trip Generation 3 – Fort Street Development

ITE Code	Land Use	Units / Area	AM Trips	In	Out	PM Trips	In	Out
221	Multifamily (Mid-rise)	34	13	3	10	13	8	5
822	Commercial Retail Unit*	0.83	2	1	1	5	3	2
Trip Total			**15**	**4**	**11**	**18**	**11**	**7**

*Retail land use is based on a unit area (1000 ft^2). Internal trip calculation based on the ITE Trip Generation Manual. No internal / pass-by trips assumed.

See **Figure 5** for the added background trip total (Phase 1 plus two concurrent site trips). The estimated background traffic total is 57 trips during the AM peak hour and 73 trips during the PM peak hour.

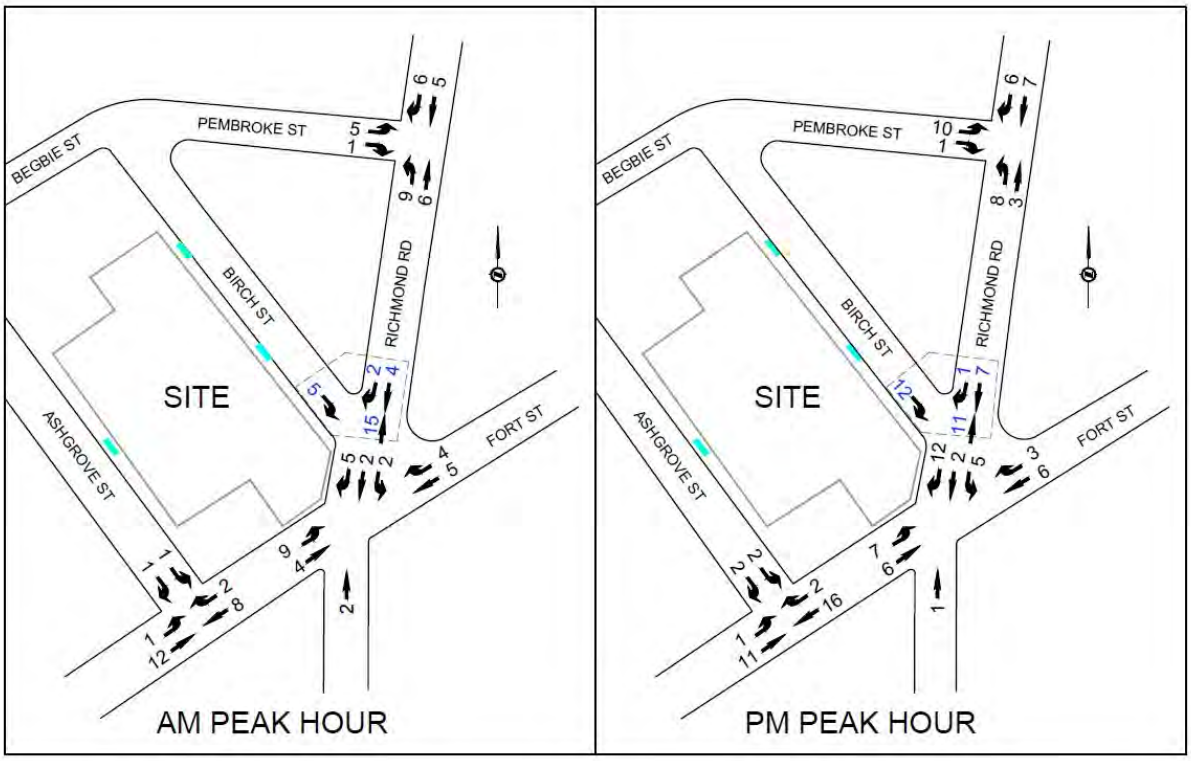


Figure 5: Added Background Trips

3.5 Trip Assignment

The trip assignment was based on the existing trip distribution and key destinations / origins for traffic in the area. The peak hour trip distributions are shown in **Figure 6.** The resulting trip assignments for the AM and PM peak hours are shown in **Figure 7**.

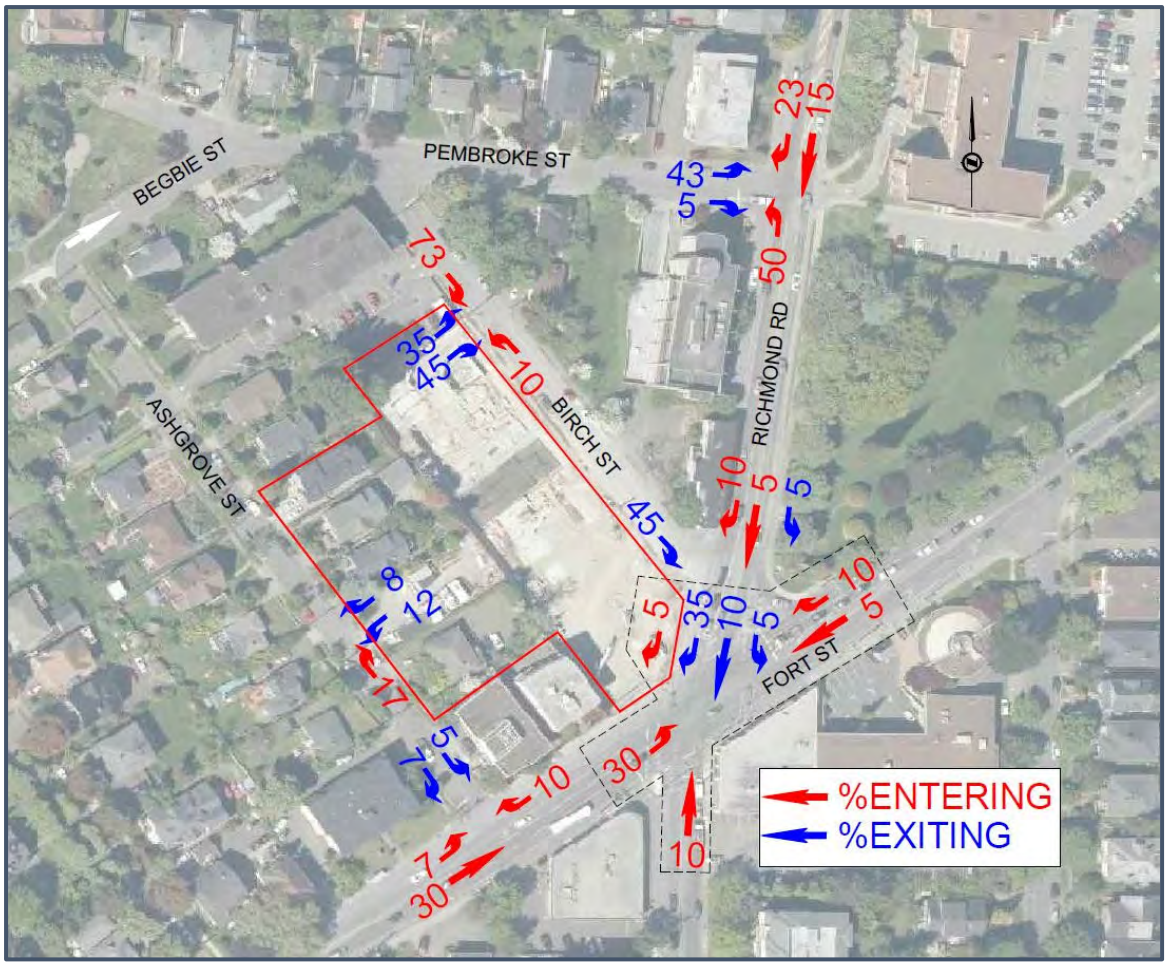


Figure 6: Peak Hour Trip Distributions

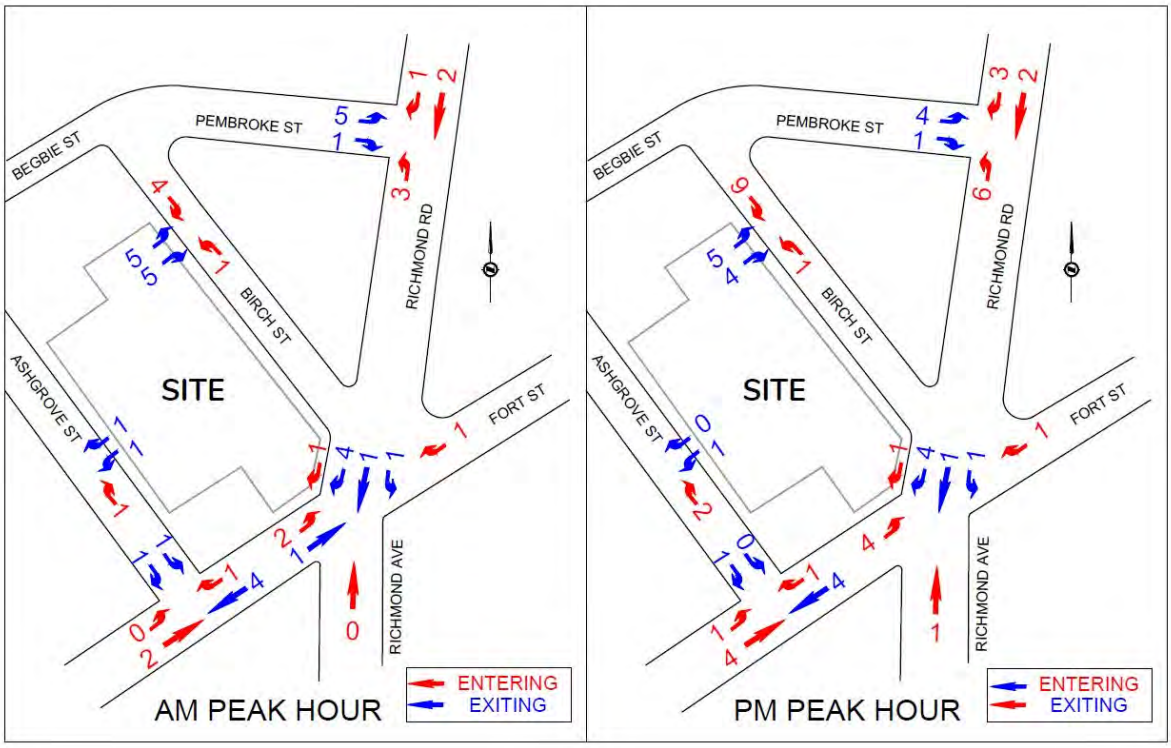


Figure 7: Trip Assignment

3.6 2024 Opening Day Background Conditions

It is assumed that the opening day occurs in 2024. 2024 background volumes were obtained by adding the Phase 1 plus two concurrent site trips onto the measured 2022 traffic volumes. 2024 background conditions for the opening day were analyzed for the three key intersections based on the estimated 2024 volumes and existing roadway network. See **Figure 8 / 9** for 2024 opening day background volumes and LOS.

Opening day background conditions were analyzed for the three key intersections within the study area. The signalized intersection of Fort Street / Richmond Road operates at a LOS D or better for all movements during the AM and PM peak hours. There is a minor queuing issue at the westbound left turn lane. The estimated 95th percentile queue lengths (32m to 33m) exceed the existing storage length (25m).

At Fort Street / Ashgrove Street, all movements operate at a LOS C or better. At Richmond Road / Pembroke Street, the stop controlled eastbound movement operates at a LOS E during the background AM and PM peak hours. All other movements operate at a LOS A/B. See **Table 6** for the results of the 2024 opening day background conditions analysis.

Figure 8: Opening Day Background Volumes and LOS – AM Peak Hour

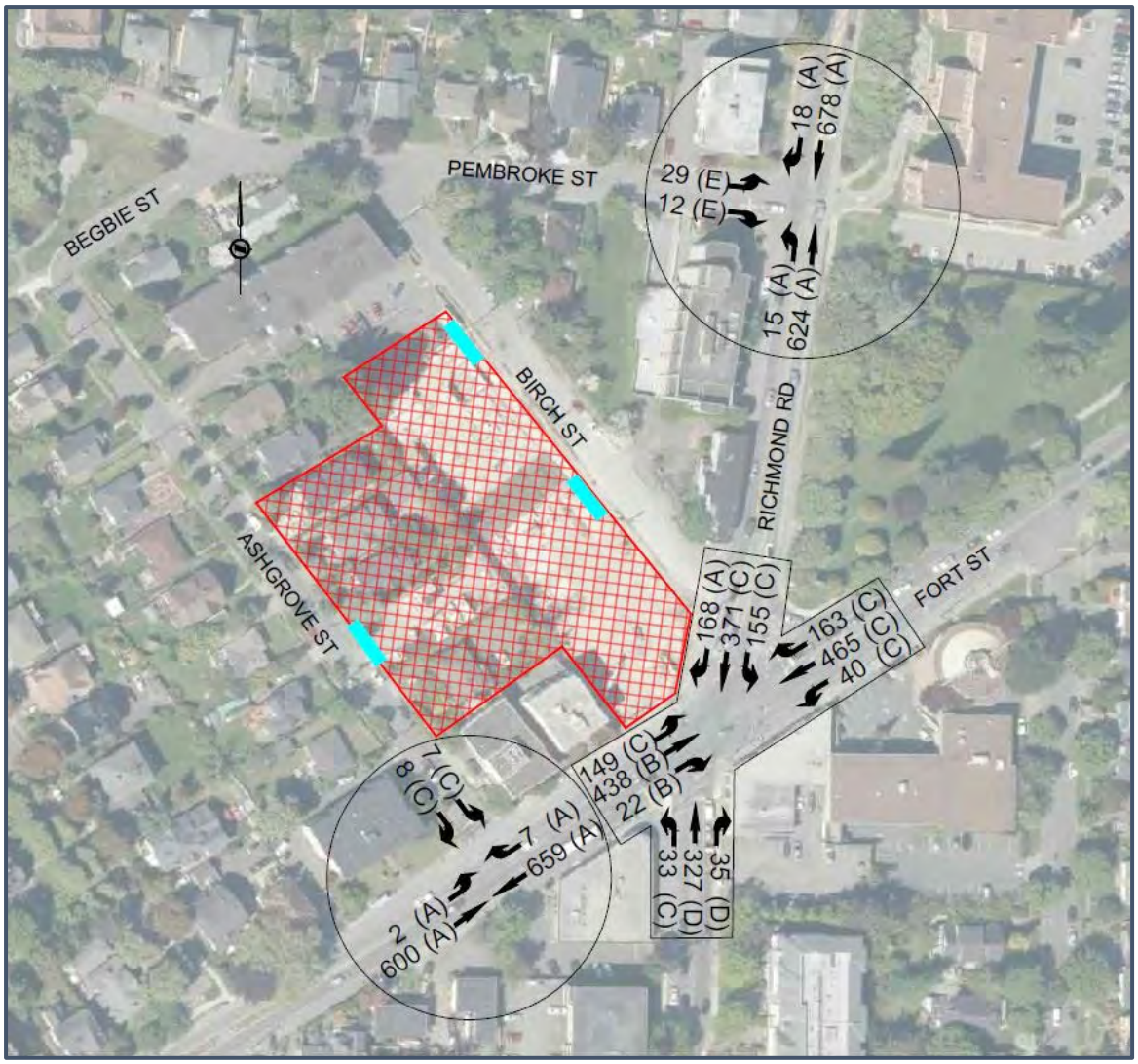


Figure 9: Opening Day Background Volumes and LOS – PM Peak Hour

Table 6: Opening Day Background Conditions

INTERSECTION	MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
		LOS	Delay (s)	Queue (m)*	LOS	Delay (s)	Queue (m)*
FORT ST / RICHMOND RD (SIGNALIZED)	EBL	B	19.8	25.7	C	23.6	31.4
	EBTR	B	15.8	43.1	B	15.7	44.8
	WBL	C	25.3	**32.1** (25)	C	26.6	**32.7** (25)
	WBTR	C	24.3	86.7	C	27.7	121
	NBL	C	21.7	26.6 (35)	C	24.8	32.9 (35)
	NBTR	D	41.4	108	D	39.5	83.9
	SBL	D	43.4	31.0 (45)	C	33.4	31.8 (45)
	SBT	B	17.7	52.7	C	21.2	55.3
	SBR	A	3.1	16.3	A	3.4	26.6
FORT ST / ASHGROVE ST (STOP CONTROL)	EBL	A	8.9	6.6 (10)	A	9.4	2.3 (10)
	EBT	A	0	34.3	A	0	32.8
	WBTR	A	0	4.9	A	0	2.1
	SBLR	C	15.6	7.1	C	17.4	10.2
RICHMOND RD / PEMBROKE ST (STOP CONTROL)	EBLR	**E**	**37.6**	17.9	**E**	**39.1**	15.3
	NBL	B	10.6	13.2 (15)	A	9.6	8.0 (15)
	NBT	A	0	12.2	A	0	12.6
	SBTR	A	0	12.7	A	0	17.9

*Note: 95th Queues based on SimTraffic results (averaged from five simulation runs); (##) = Existing Storage Length

3.7 Opening Day Post Development Conditions

Opening day post development conditions were analyzed for the three key intersections within the study area. See **Figure 10 / 11** for the post development AM / PM peak hour traffic volumes and LOS.

The development impacts to the three key intersections within the study area are minimal. At the signalized intersection of Fort Street / Richmond Road, all movements will continue to operate at the same levels of service (LOS D or better) during the AM / PM peak hour. Additional delays by the development would be minor with a maximum of less than a second during the AM and PM peak hours.

The proposed development will not change LOS for any movements at the two stop-controlled study intersections (Fort Street / Ashgrove Street and Richmond Road / Pembroke Street). No capacity improvements would be required at the two stop-controlled intersections based on Synchro results. At Richmond Road / Pembroke Street, no queuing issue was found at the northbound left turn lane on Richmond Road. See **Table 7** for the results of the opening day post development conditions analysis.

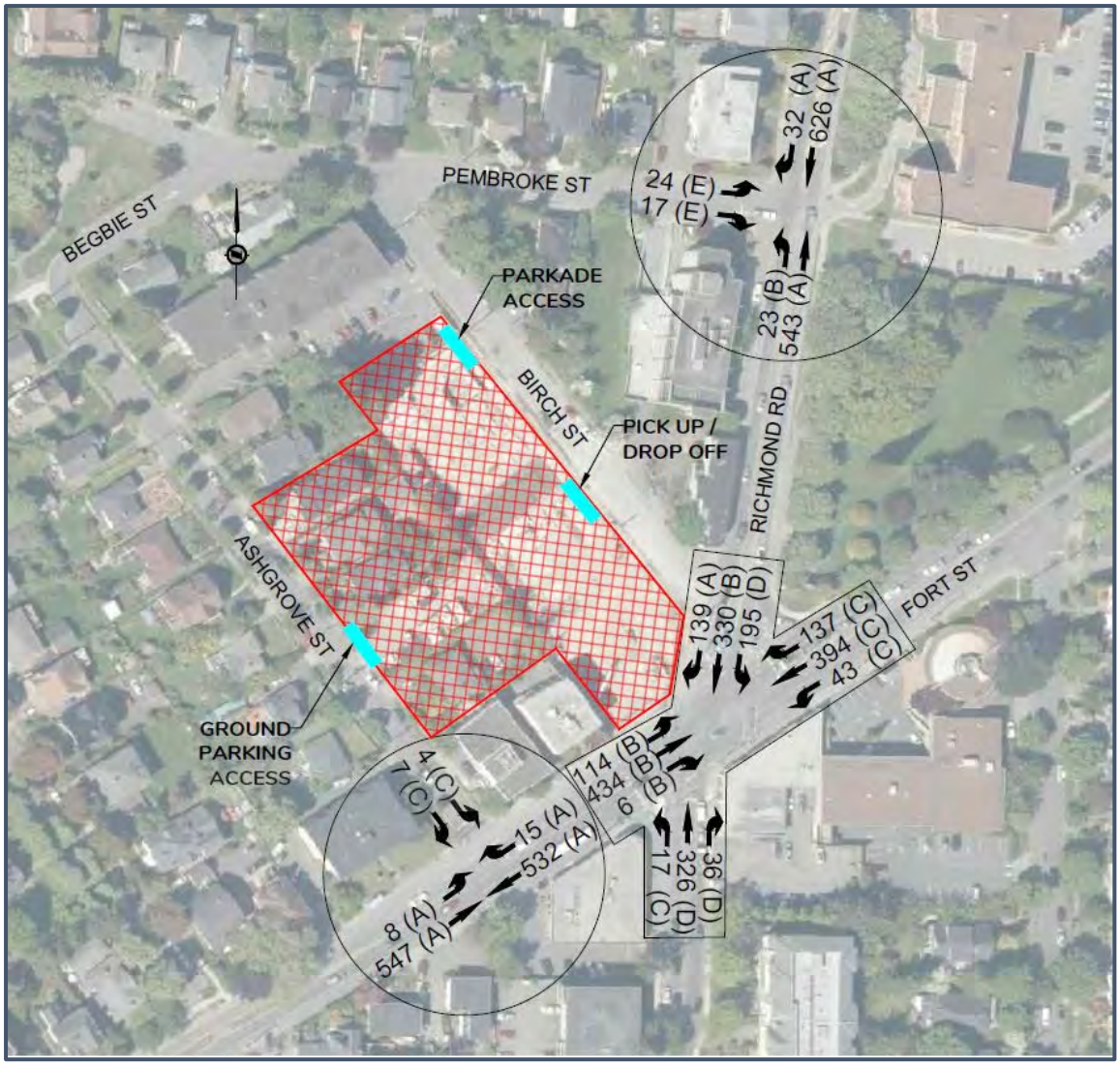


Figure 10: Opening Day Post Development Volumes and LOS - AM Peak Hour

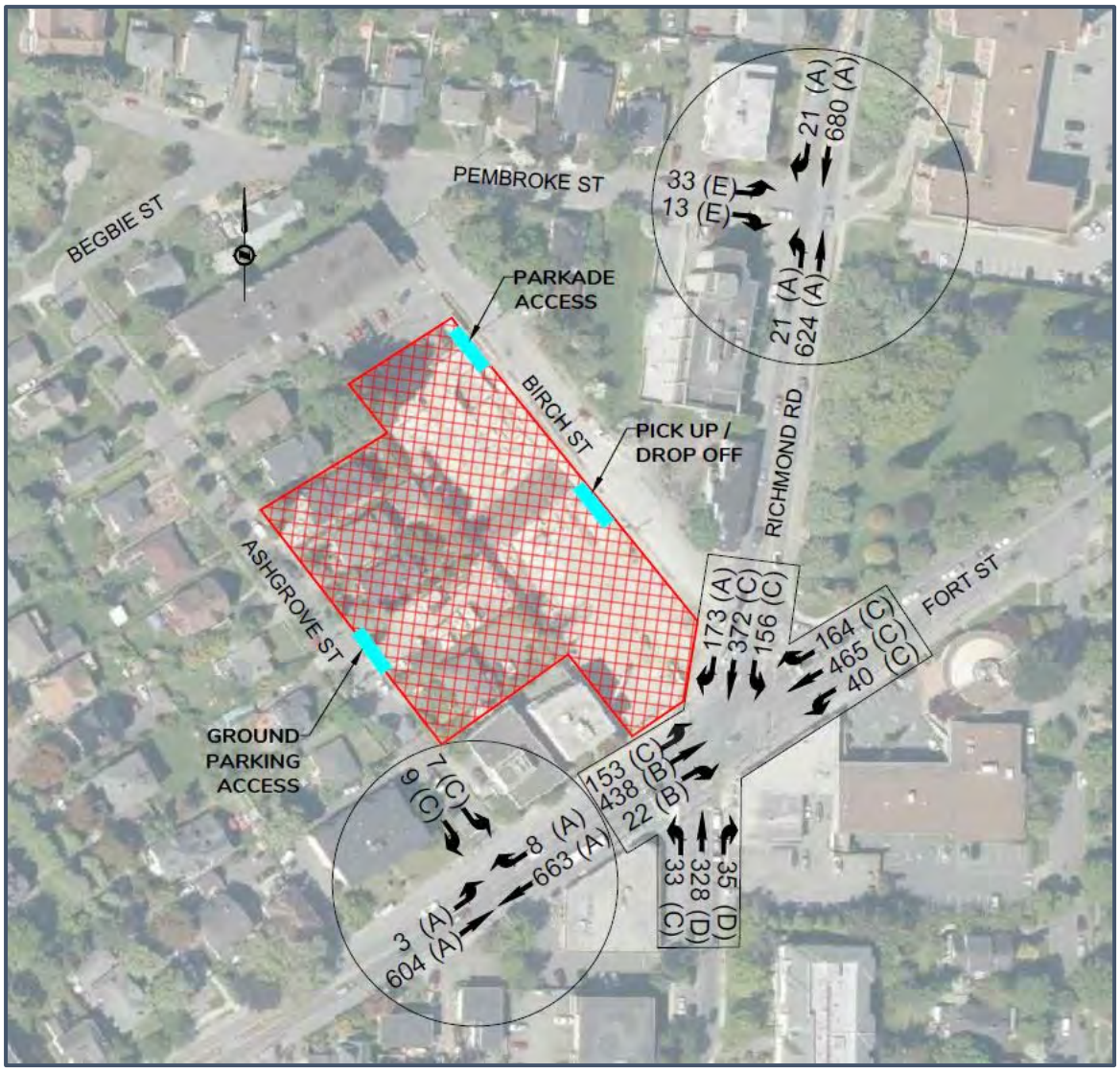


Figure 11: Opening Day Post Development Volumes and LOS - PM Peak Hour

Table 7: Opening Day Post Development Conditions

INTERSECTION	MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
		LOS	Delay (s)	Queue (m)*	LOS	Delay (s)	Queue (m)*
FORT ST / RICHMOND RD (SIGNALIZED)	EBL	B	20.0	27.6	C	24.4	35.1
	EBTR	B	15.8	43.6	B	15.7	45.1
	WBL	C	25.3	**38.9** (25)	C	26.6	**32.9** (25)
	WBTR	C	24.3	87.2	C	27.8	130
	NBL	C	21.7	23.2 (35)	C	24.8	30.0 (35)
	NBTR	D	41.4	93.6	D	39.6	90.7
	SBL	D	43.9	31.4 (45)	C	34.0	31.8 (45)
	SBT	B	17.8	54.4	C	21.2	53.1
	SBR	A	3.1	20.6	A	3.4	20.9
FORT ST / ASHGROVE ST (STOP CONTROL)	EBL	A	9.0	4.9 (10)	A	9.5	3.8 (10)
	EBT	A	0	39.0	A	0	35.1
	WBTR	A	0	3.8	A	0	4.7
	SBLR	C	15.7	9.9	C	17.3	10.7
RICHMOND RD / PEMBROKE ST (STOP CONTROL)	EBLR	**E**	**43.6**	21.7	**E**	**43.8**	14.9
	NBL	B	10.6	14.5 (15)	A	9.6	10.7 (15)
	NBT	A	0	12.7	A	0	12.7
	SBTR	A	0	12.9	A	0	8.3

*Note: 95th Queues based on SimTraffic results (averaged from five simulation runs); (##) = Existing Storage Length

3.8 Mitigation Measures for Short Term

At Fort Street / Richmond Road, there are potential queuing issues with the eastbound and westbound left turn lane. The estimated westbound left turn queues exceed the existing storage; however, this queuing issue is due to existing conditions. A westbound left turn storage extension could be considered if there is room provided for the westbound approach of Fort Street.

Additionally, there could be a traffic control issue with the eastbound left turns from Fort Street onto Ashgrove Street. Currently the eastbound left turn lane from Fort Street is shared for both the left turns onto Richmond Road and Ashgrove Street in one long left

turn lane. At Fort Street / Ashgrove Street, the eastbound left turn point on Fort Street is located 40m from the stop line of the intersection of Fort Street / Richmond Road. The estimated 95th percentile queue length is 39m during the AM peak hour and 35m during the PM peak. On the shared eastbound left turn lane on Fort Street, left turn traffic onto Ashgrove Street could interfere with left turn traffic onto Richmond Road as left turn queues will be sometimes extended up to Ashgrove Street. Traffic from the Amica developments is expected to add fewer than 10 of these Ashgrove left turns. The additional bicycle traffic expected as part of the Fort Street AAA project will further add to the safety issue with these turns as a person driving turning left onto Ashgrove Street will now have to turn across the oncoming vehicle and bicycle traffic. The City should monitor the situation and react with restriction on the Ashgrove left turns should the need arise.

4.0 LONG TERM TRAFFIC CONDITIONS

For the 2034 10-year horizon after opening day analysis, long term background volumes were adjusted with a -6% decrease from the measured 2022 traffic volumes, as per City guidance. The *GoVictoria* mode split data was examined, and showed that trips by car are anticipated to decrease from 61% (2017) to 55% (2030). Bicycle traffic increases were not accounted for in this study.

The 2034 long term analysis also reflects geometric changes at For Street / Richmond Road including eastbound through lane will be drop out. See **Figure 12 / 13** for 2034 10-year horizon after opening day background volumes and conditions.

4.1 2034 10-Year Horizon Background Conditions

2034 10-year horizon background conditions were analyzed for the three study intersections within the study area. See **Table 8** for the results of 2034 10-year horizon background conditions analysis.

The signalized intersection of Fort Street / Richmond Road continues to operate at a LOS D or better for all movements during the AM and PM peak hours. At Fort Street / Ashgrove Street, all movements continue to operate at a LOS C or better. At Richmond Road / Pembroke Street, the stop controlled eastbound movement operates at a LOS D during the background AM and PM peak hours and all other movements operate at a LOS A/B.

At Fort Street / Richmond Road, estimated 2034 background queue lengths slightly increase overall compared to 2024 background conditions as one eastbound through lane is drop out based on the proposed Fort Street AAA intersection design. For the eastbound through movement, estimated 2034 background queue lengths (47m to 50m) increase by 3m to 5m during the peak hours compared 2024 background conditions.

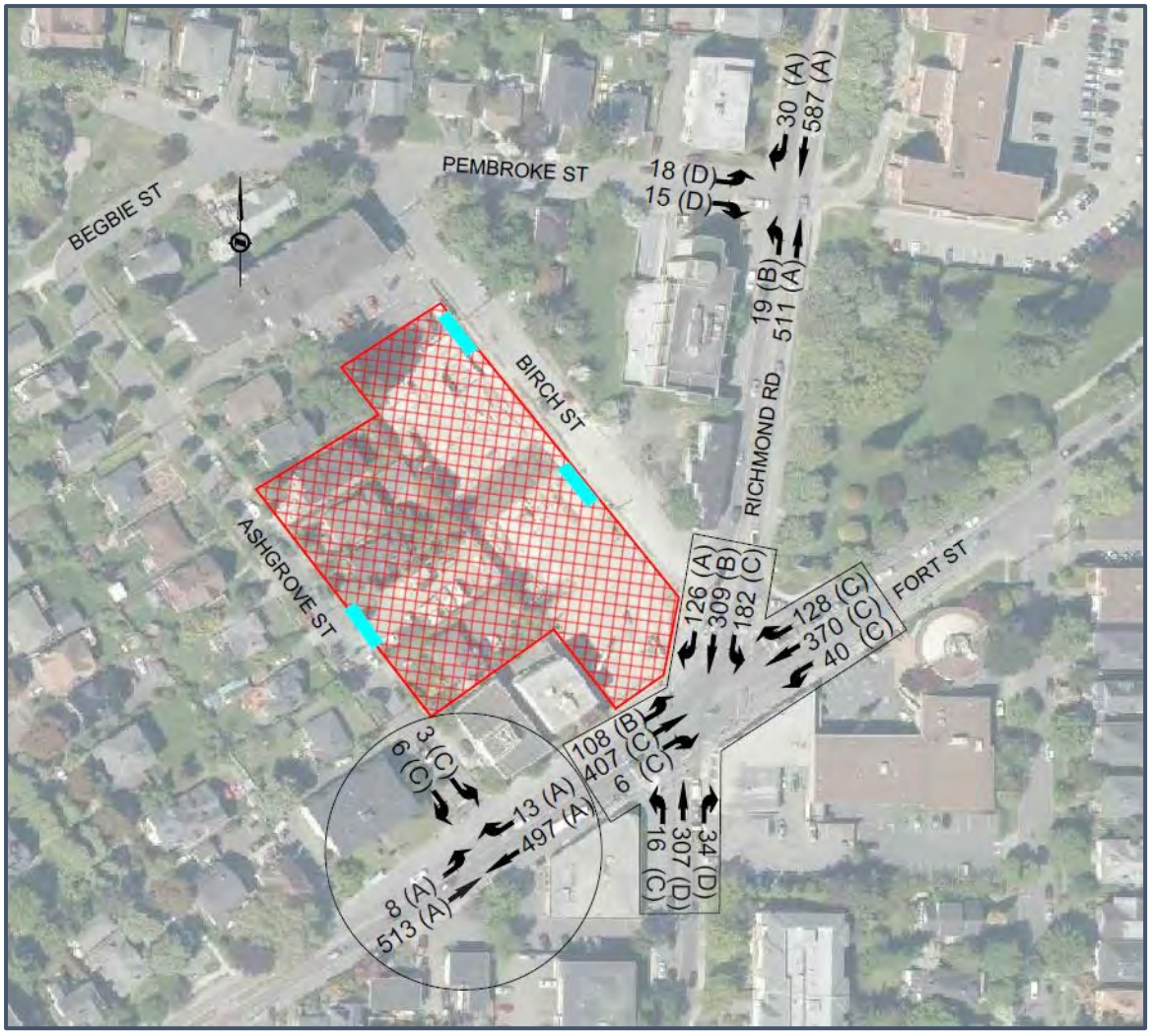


Figure 12: 2034 10-Year Horizon Background Volumes and LOS – AM Peak Hour

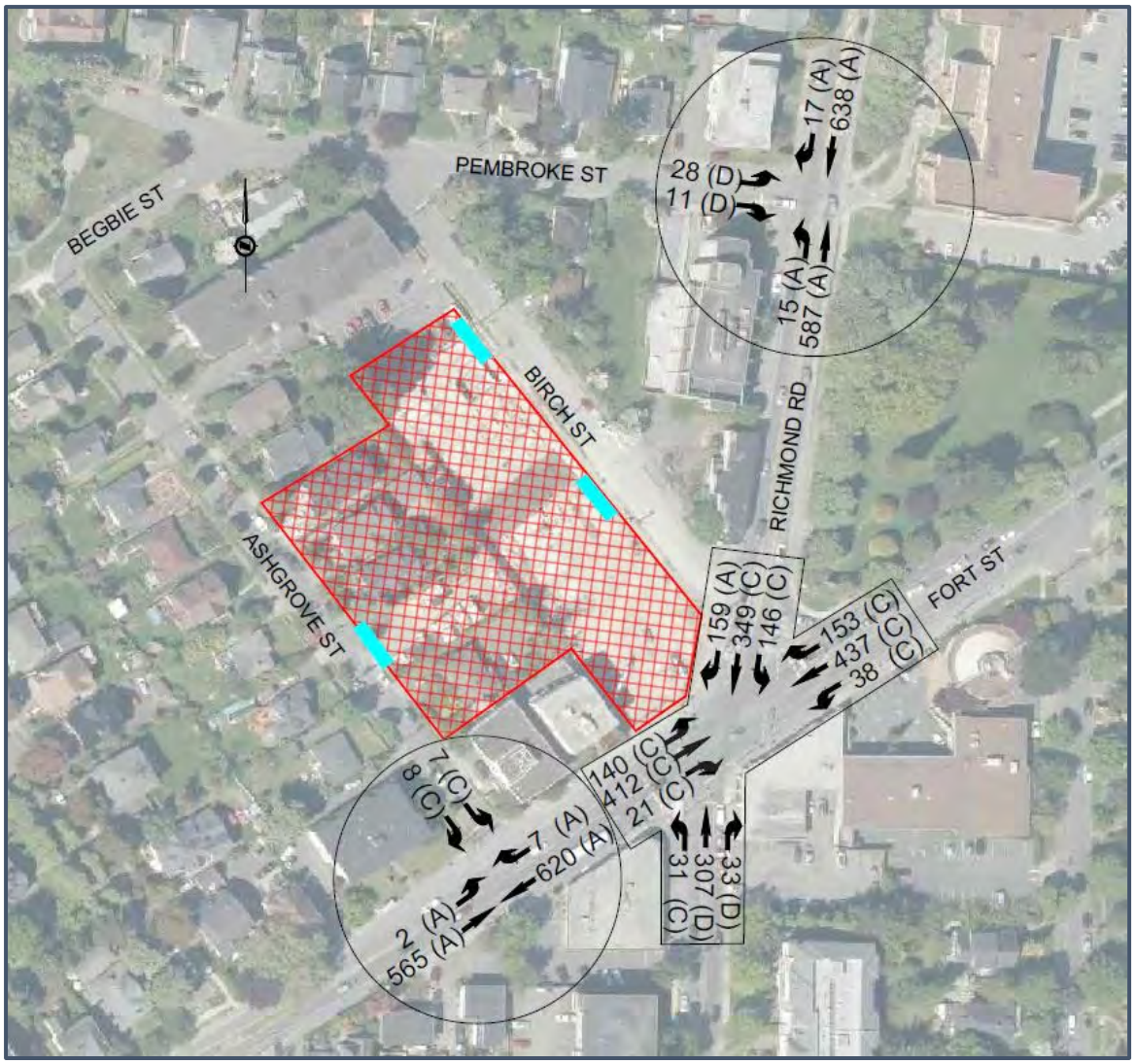


Figure 13: 2034 10-Year Horizon Background Volumes and LOS – PM Peak Hour

Table 8: 2034 10-year Horizon Background Conditions

INTERSECTION	MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
		LOS	Delay (s)	Queue (m)*	LOS	Delay (s)	Queue (m)*
FORT ST / RICHMOND RD (SIGNALIZED)	EBL	B	18.7	27.1	C	21.3	34.9
	EBTR	C	21.3	46.7	C	20.8	49.6
	WBL	C	24.6	**30.4** (25)	C	25.9	**38.1** (25)
	WBTR	C	23.5	84.3	C	26.6	102
	NBL	C	21.6	29.6 (35)	C	24.5	29.0 (35)
	NBTR	D	37.6	96.9	D	36.5	83.3
	SBL	C	31.9	30.9 (45)	C	26.9	30.5 (45)
	SBT	B	17.2	51.5	C	20.6	54.2
	SBR	A	3.2	13.3	A	3.4	14.2
FORT ST / ASHGROVE ST (STOP CONTROL)	EBL	A	8.8	6.3 (10)	A	9.3	5.4 (10)
	EBT	A	0	44.7	A	0	44.2
	WBTR	A	0	5.2	A	0	0
	SBLR	C	19.3	9.9	C	20.4	10.5
RICHMOND RD / PEMBROKE ST (STOP CONTROL)	EBLR	D	33.8	16.6	D	33.5	17.0
	NBL	B	10.3	12.6 (15)	A	9.4	9.0 (15)
	NBT	A	0	9.9	A	0	10.6
	SBTR	A	0	12.2	A	0	17.8

*Note: 95th Queues based on SimTraffic results (averaged from five simulation runs); (##) = Existing Storage Length

4.2 10-Year Horizon Post Development Analysis Results

10-year horizon post development conditions were analyzed by adding the development trips to 10-year horizon background traffic volumes. See **Figure 14 / 15** for 2034 10-year horizon post development volumes and LOS.

The development does not change the LOS (LOS D or better) for all movements at the intersection of Fort Street / Richmond Road. Additional delays by the development will be negligible with a maximum of less than a half seconds for all movements. No additional queuing issues were found at the intersection due to the development.

At Fort Street / Ashgrove Street, all movements continue to operate at a LOS C or better. At Richmond Road / Pembroke Street, the stop controlled eastbound movement drops to a LOS E during the background AM and PM peak hours; however, estimated delays are similar to 2024 background conditions with less than 38 seconds. The left turn movement with a LOS E would be acceptable without traffic control change. Richmond Road / Birch Street is a right-in / right-out and the right-out movement from Birch Street will operate at LOS B with no operational issue in the long term. See **Table 9** for the results of the 10-year horizon post development conditions analysis.

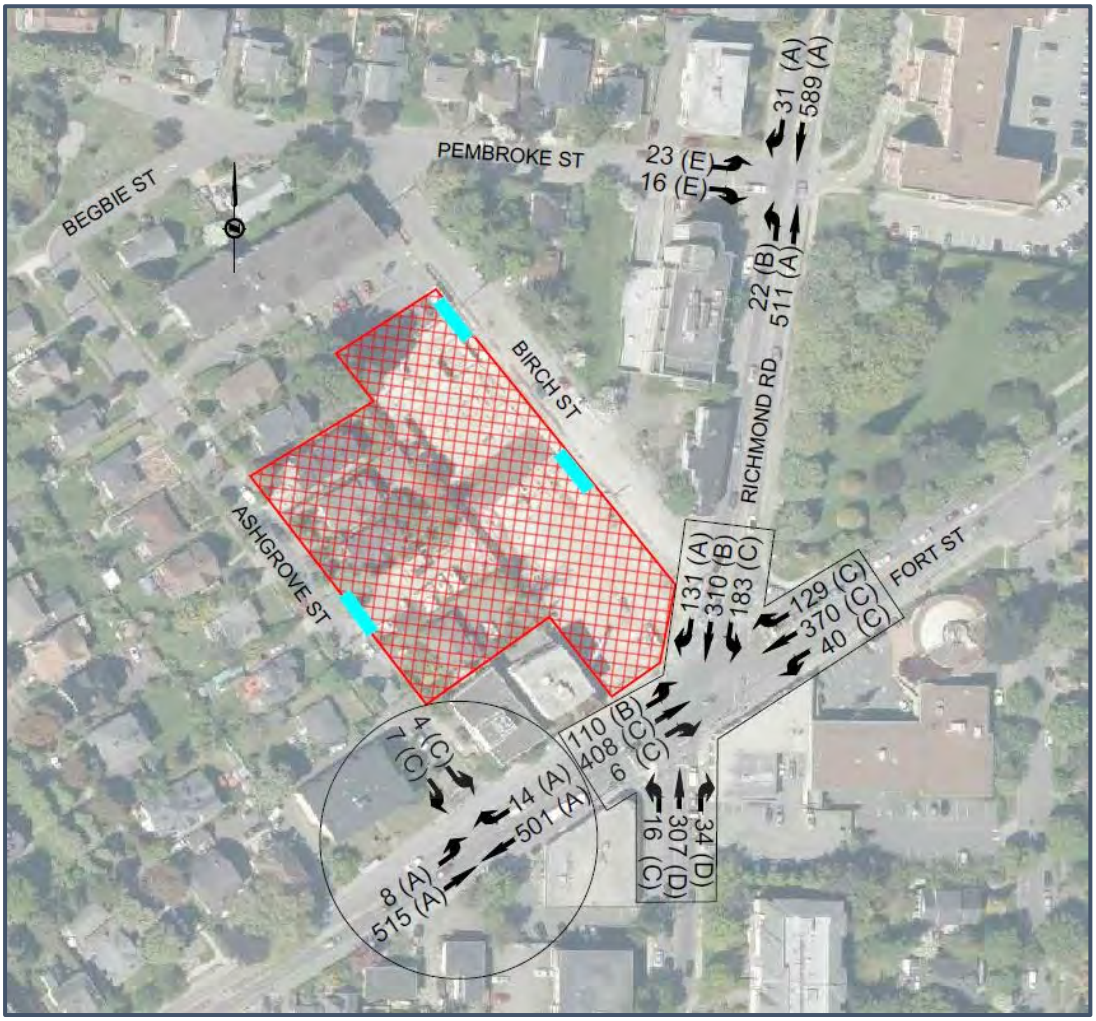


Figure 14: 2034 Post Development Volumes and LOS – AM Peak Hour

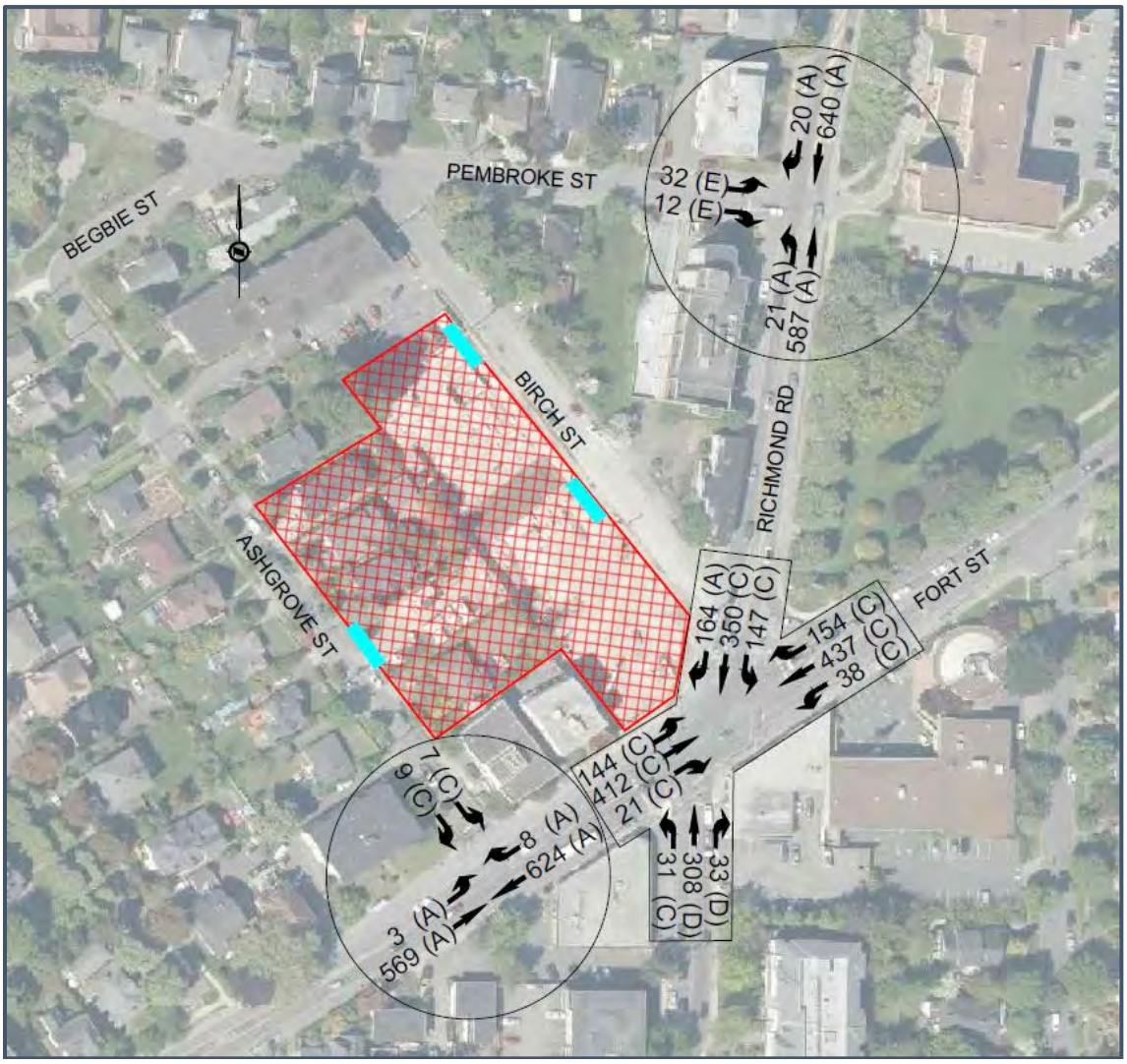


Figure 15: 2034 Post Development Volumes and LOS – PM Peak Hour

Table 9: 2034 10-Year Horizon Post Development Conditions

INTERSECTION	MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
		LOS	Delay (s)	Queue (m)*	LOS	Delay (s)	Queue (m)*
FORT ST / RICHMOND RD (SIGNALIZED)	EBL	B	18.9	27.2	C	21.6	34.0
	EBTR	C	21.3	47.4	C	20.8	49.5
	WBL	C	24.6	**33.6** (25)	C	25.9	**30.9** (25)
	WBTR	C	23.4	78.7	C	26.7	96.8
	NBL	C	21.6	26.0 (35)	C	24.5	34.4 (35)
	NBTR	D	37.6	95.0	D	36.6	74.2
	SBL	C	32.1	31.3 (45)	C	27.3	30.5 (45)
	SBT	B	17.2	51.2	C	20.6	51.5
	SBR	A	3.1	13.4	A	3.4	13.4
FORT ST / ASHGROVE ST (STOP CONTROL)	EBL	A	8.8	9.1 (10)	A	9.3	4.2 (10)
	EBT	A	0	42.3	A	0	41.3
	WBTR	A	0	3.2	A	0	2.7
	SBLR	C	20.3	9.6	C	20.4	11.0
RICHMOND RD / PEMBROKE ST (STOP CONTROL)	EBLR	**E**	**37.8**	19.4	**E**	**36.2**	16.8
	NBL	B	10.3	14.6 (15)	A	9.4	11.2 (15)
	NBT	A	0	11.4	A	0	11.0
	SBTR	A	0	9.5	A	0	10.8

*Note: 95th Queues based on SimTraffic results (averaged from five simulation runs); (##) = Existing Storage Length

4.3 Mitigation Measures for Long Term

In the long term with the development, no capacity issues were found at three study intersections. However, at Fort Street / Richmond Street, the proposed design (one eastbound lane drop out with new bike lanes) could make queue lengths slightly longer on Fort Street. At Fort Street / Ashgrove Street, left turn movements could be restricted during peak hours for safety; a No Left Turn signs could be installed with designated time periods. If Fort Street / Ashgrove Street is right in / right out during the peak hours, Begbie Street would need to be changed to two-way from one-way for the site trips-in (ground parking users) from Pembroke Street. Note that Begbie was recently narrowed (5m at the narrowest point) as part of a project. There is width to accommodate two vehicles but

warning signs would be need to clarify the narrowness to the approaching drivers. The two-way Begbie Street curve would function like a chicane limiting the curve to one vehicle at a time. Total volume using this is expected to be low.

5.0 ONSITE VEHICLE TURNING MOVEMENT REVIEW

At the proposed ground parking lot and truck loading zone, vehicle turning movements were reviewed using the AutoTURN Pro 11 software. The proposed parking design can accommodate a passenger car appropriately to enter/exit parking stalls and Ashgrove driveway access loop also accommodates an LSU (small delivery truck) and HandyDART (6.7m long) bus. An MSU truck can also maneuver securely to the loading zone area and enter/exit the parking lot access. The proposed parking lot / loading zone is properly designed based on the onsite vehicle turning movement review. See **Figure 16** for the onsite MSU truck turning template review.

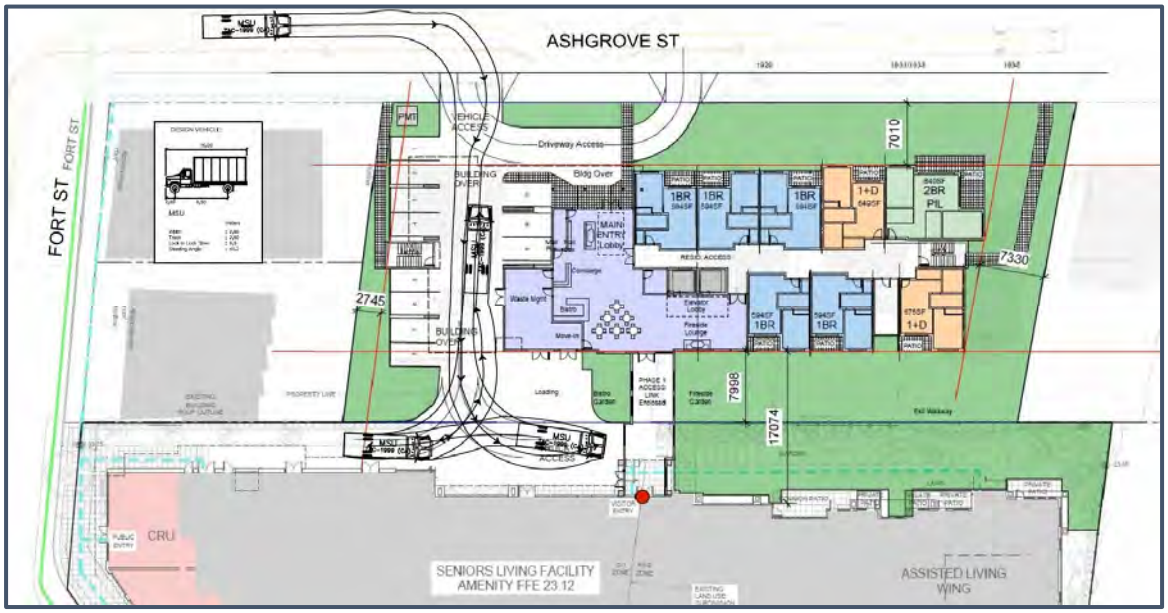


Figure 16: Onsite MSU Truck Turning Template Review

6.0 ACTIVE TRANSPORTATION

6.1 Pedestrians Facilities

Within the study area, there are sidewalks along both sides of all roads with the exception of Begbie Street (low volume road). There are signalized pedestrian crossings located at the Fort Street / Richmond Road intersection. No other marked crosswalks exist within the study area.

There are existing sidewalks along the property frontage. Given that the proposed land use is for seniors housing space, the sidewalks should be upgraded to ensure a smooth surface and sufficient width to meet the mobility requirements of the proposed residents. It is recommended that the adjacent sidewalks be upgraded to meet current design standards.

6.2 Bicycle Facilities

Fort Street has continuous bike lanes in the eastbound and westbound directions. Richmond Road has bike lanes on both sides of the road north of the study area. The City is currently proposing bike lane improvements with raised medians / elephant feet crossings on Fort Street at Richmond Avenue. The proposed development includes bike parking at the Birch Street entrance (Phase 1) as well as bike storage in the parkade.

6.3 Transit

Several bus routes are provided within a 150m walking distance from the site. BC Transit route 8 (Interurban / Tillicum Mall / Oak Bay) and route 14 (Vic General / UVic) provide service along Richmond Road. There is a northbound stop (route 8/14) with a shelter on Richmond at Fort Street, and a southbound stop on Richmond Road at Coronation Avenue. Route 3/10 (James Bay/Royal Jubilee), 11 (Tillicum Mall/Uvic), 14 and 15 (UVic / Esquimalt) run along Fort Street. There is an eastbound bus stop (route 11/15) on Fort St at Richmond Road, and a westbound bus stop (route 3/10/11/15) on Fort Street at Richmond Road and another westbound bus stop (route 11/14) is at Ashgrove Street. No transit improvements are required with the proposed development.

7.0 CONCLUSIONS

The proposed seniors housing development (Phase 2) at 1900 Richmond Road is expected to generate 18 vehicle trips during the AM peak hour and 22 vehicle trips during the PM peak hour. The estimated site trips total for the proposed development (Phase 1 + Phase 2) was identified to be lower than the previous land uses (2018 existing site trip counts at the parking lot).

The addition of development traffic is predicted to have minimal impact on the surrounding traffic network in the short-term and long-term. The intersection of Fort Street / Richmond Road will operate at a LOS D or better for all movements during the AM and PM peak hours in the long term with the development. No mitigation measures are required due to the development at all three study intersections.

However, a potential safety issue exists with left turns at Fort Street / Ashgrove Street. At the Fort Street / Richmond Road intersection, the proposed bike lane improvements include one eastbound lane drop out and this new design could make queues a bit longer on Fort Street. Currently left turns are allowed onto Ashgrove Street from Fort Street using the Fort Street eastbound left turn lane (onto Richmond Road) with no restriction. With the new intersection configuration, peak hour left turn restriction may be required for safety from Fort Street onto Ashgrove Street and left turns also restricted from Ashgrove Street onto Fort Street at the same time periods. Begbie Street is currently one-way with low volumes and two-way is recommended to allow trips in from the westbound Pembroke Street traffic in order to provide an alternative for the Ashgrove Street situation.

At the proposed access location on Ashgrove Street, no sight distance and intersection spacing issues were found. The proposed driveway access, parking stalls and loading zone are appropriately designed based on the vehicle turning movement review.

Existing sidewalks along the property frontage provide pedestrian access to and from the development site and nearby transit stops. The sidewalks adjacent to the development along Fort Street and Richmond Road should be upgraded to meet the current City of Victoria standards and to ensure adequate width and an even surface. The bike parking and storage included in the proposed development should be implemented. The

development site is well serviced by transit, with several major routes travelling along Fort Street and along Richmond Road thus transit improvements are not required.

8.0 RECOMMENDATIONS

The following recommendations are made for the proposed development:

- Upgrade sidewalks along the development frontage of Ashgrove Street to ensure a smooth surface and sufficient widths and to conform to current City standards.

The following is recommended of the City:

- Peak hour left turn restriction be required from Fort Street onto Ashgrove Street should be examined; no left turn signage with designated peak hour periods be required.
- On Begbie Street, conversion to two-way travel be considered to allow the Pembroke westbound traffic into Ashgrove Street should also be examined as part of the Ashgrove Street turn restrictions. The two-way should be enacted such that it functions like a chicane allowing only one vehicle at a time around the curve. Warning signs and other measures (to ensure only one car access at a time, example: bollards to further narrow at the mouths) would be required.

APPENDIX A: SYNCHRO INFORMATION

SYNCHRO MODELLING SOFTWARE DESCRIPTION

The traffic analysis was completed using Synchro and SimTraffic traffic modeling software. Results were measured in delay, level of service (LOS) and 95th percentile queue length. Synchro is based on the Highway Capacity Manual (HCM) methodology. SimTraffic integrates established driver behaviours and characteristics to simulate actual conditions by randomly "seeding" or positioning vehicles travelling throughout the network. The simulation is run five times (five different random seedings of vehicle types, behaviours and arrivals) to obtain statistical significance of the results.

Levels of Service

Traffic operations are typically described in terms of levels of service, which rates the amount of delay per vehicle for each movement and the entire intersection. Levels of service range from LOS A (representing best operations) to LOS E/F (LOS E being poor operations and LOS F being unpredictable / disruptive operations). LOS E/F are generally unacceptable levels of service under normal everyday conditions.

The hierarchy of criteria for grading an intersection or movement not only includes delay times, but also takes into account traffic control type (stop signs or traffic signal). For example, if a vehicle is delayed for 19 seconds at an unsignalized intersection, it is considered to have an average operation, and would therefore be graded as an LOS C. However, at a signalized intersection, a 19 second delay would be considered a good operation and therefore it would be given an LOS B. The table below indicates the range of delay for LOS for signalized and unsignalized intersections.

Table A1: LOS Criteria, by Intersection Traffic Control

Level of Service	Unsignalized Intersection Average Vehicle Delay (sec/veh)	Signalized Intersection Average Vehicle Delay (sec/veh)
A	Less than 10	Less than 10
B	10 to 15	11 to 20
C	15 to 25	20 to 35
D	25 to 35	35 to 55
E	35 to 50	55 to 80
F	More than 50	More than 80

The attached information is provided to support the agency's review process and shall not be distributed to other parties without written consent from Bunt & Associates Engineering Ltd.

APPENDIX B

Synchro Reports

Intersection	
Int Delay, s/veh	5.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	6	5	26	5	5	10
Future Vol, veh/h	6	5	26	5	5	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	5	28	5	5	11

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	12	0	71	10
Stage 1	-	-	-	-	10	-
Stage 2	-	-	-	-	61	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1607	-	933	1071
Stage 1	-	-	-	-	1013	-
Stage 2	-	-	-	-	962	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1607	-	917	1071
Mov Cap-2 Maneuver	-	-	-	-	917	-
Stage 1	-	-	-	-	1013	-
Stage 2	-	-	-	-	946	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.1	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1014	-	-	1607	-
HCM Lane V/C Ratio	0.016	-	-	0.018	-
HCM Control Delay (s)	8.6	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0.1	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	24	28	41	504	594	43
Future Vol, veh/h	24	28	41	504	594	43
Conflicting Peds, #/hr	0	0	60	0	0	60
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	15	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	26	30	45	548	646	47

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1368	730	753	0	-	0
Stage 1	730	-	-	-	-	-
Stage 2	638	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	162	422	857	-	-	-
Stage 1	477	-	-	-	-	-
Stage 2	526	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	138	401	813	-	-	-
Mov Cap-2 Maneuver	138	-	-	-	-	-
Stage 1	428	-	-	-	-	-
Stage 2	499	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	27.9	0.7	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	813	-	213	-	-
HCM Lane V/C Ratio	0.055	-	0.265	-	-
HCM Control Delay (s)	9.7	-	27.9	-	-
HCM Lane LOS	A	-	D	-	-
HCM 95th %tile Q(veh)	0.2	-	1	-	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	13	496	552	7	7	9
Future Vol, veh/h	13	496	552	7	7	9
Conflicting Peds, #/hr	60	0	0	60	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	539	600	8	8	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	668	0	-	0	1231	364
Stage 1	-	-	-	-	664	-
Stage 2	-	-	-	-	567	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	920	-	-	-	182	634
Stage 1	-	-	-	-	474	-
Stage 2	-	-	-	-	567	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	873	-	-	-	160	602
Mov Cap-2 Maneuver	-	-	-	-	160	-
Stage 1	-	-	-	-	439	-
Stage 2	-	-	-	-	538	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	19.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	873	-	-	-	273
HCM Lane V/C Ratio	0.016	-	-	-	0.064
HCM Control Delay (s)	9.2	0	-	-	19.1
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	134	431	35	565	20	454	198	387	125
v/c Ratio	0.42	0.30	0.15	0.59	0.07	0.90	0.65	0.47	0.17
Control Delay	18.2	16.3	23.9	26.9	22.5	50.6	32.0	17.8	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.2	16.3	23.9	26.9	22.5	50.6	32.0	17.8	6.0
Queue Length 50th (m)	12.6	23.3	4.2	39.2	2.4	68.4	18.6	42.9	2.8
Queue Length 95th (m)	23.5	33.4	11.4	55.0	7.5	#121.3	#42.8	50.5	11.6
Internal Link Dist (m)		41.3		108.4		99.8		120.3	
Turn Bay Length (m)	45.0		25.0		30.0		45.0		15.0
Base Capacity (vph)	317	1449	241	962	269	506	304	815	721
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.30	0.15	0.59	0.07	0.90	0.65	0.47	0.17

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	119	372	12	31	430	73	18	354	50	176	344	111
Future Volume (veh/h)	119	372	12	31	430	73	18	354	50	176	344	111
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		1.00	0.96		1.00	0.99		0.96	1.00		0.97
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1781	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	134	418	0	35	483	0	20	398	56	198	387	125
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	8	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	372	1466		349	993		333	441	62	321	818	675
Arrive On Green	0.08	0.41	0.00	0.28	0.28	0.00	0.28	0.28	0.28	0.11	0.44	0.44
Sat Flow, veh/h	1697	3647	0	926	3647	0	880	1595	224	1781	1870	1542
Grp Volume(v), veh/h	134	418	0	35	483	0	20	0	454	198	387	125
Grp Sat Flow(s),veh/h/ln	1697	1777	0	926	1777	0	880	0	1819	1781	1870	1542
Q Serve(g_s), s	4.2	6.3	0.0	2.3	9.1	0.0	1.3	0.0	19.3	5.9	11.7	4.0
Cycle Q Clear(g_c), s	4.2	6.3	0.0	2.3	9.1	0.0	1.3	0.0	19.3	5.9	11.7	4.0
Prop In Lane	1.00		0.00	1.00		0.00	1.00		0.12	1.00		1.00
Lane Grp Cap(c), veh/h	372	1466		349	993		333	0	503	321	818	675
V/C Ratio(X)	0.36	0.29		0.10	0.49		0.06	0.00	0.90	0.62	0.47	0.19
Avail Cap(c_a), veh/h	379	1466		349	993		333	0	503	324	818	675
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	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.2	15.6	0.0	21.6	24.0	0.0	21.4	0.0	27.9	18.9	16.0	13.8
Incr Delay (d2), s/veh	0.6	0.5	0.0	0.6	1.7	0.0	0.3	0.0	22.1	3.4	2.0	0.6
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	1.3	0.0	0.3	2.5	0.0	0.2	0.0	8.0	1.4	2.7	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.8	16.1	0.0	22.2	25.7	0.0	21.8	0.0	50.0	22.4	17.9	14.4
LnGrp LOS	B	B		C	C		C	A	D	C	B	B
Approach Vol, veh/h		552	A		518	A		474			710	
Approach Delay, s/veh		16.5			25.5			48.8			18.5	
Approach LOS		B			C			D			B	

Timer - Assigned Phs	1	2		4		6	7	8				
Phs Duration (G+Y+Rc), s	12.9	28.1		39.0		41.0	10.6	28.4				
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0	4.0	6.0				
Max Green Setting (Gmax), s	9.0	22.0		33.0		35.0	7.0	22.0				
Max Q Clear Time (g_c+I1), s	7.9	21.3		8.3		13.7	6.2	11.1				
Green Ext Time (p_c), s	0.1	0.3		3.4		3.5	0.0	2.9				

Intersection Summary	
HCM 6th Ctrl Delay	26.0
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	5.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	7	5	31	5	5	13
Future Vol, veh/h	7	5	31	5	5	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	5	34	5	5	14

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	13	0	84	11
Stage 1	-	-	-	-	11	-
Stage 2	-	-	-	-	73	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1606	-	918	1070
Stage 1	-	-	-	-	1012	-
Stage 2	-	-	-	-	950	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1606	-	899	1070
Mov Cap-2 Maneuver	-	-	-	-	899	-
Stage 1	-	-	-	-	1012	-
Stage 2	-	-	-	-	930	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.3	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1016	-	-	1606	-
HCM Lane V/C Ratio	0.019	-	-	0.021	-
HCM Control Delay (s)	8.6	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	23	24	29	605	728	27
Future Vol, veh/h	23	24	29	605	728	27
Conflicting Peds, #/hr	0	0	60	0	0	60
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	15	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	25	26	32	658	791	29

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1588	866	880	0	-	0
Stage 1	866	-	-	-	-	-
Stage 2	722	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	119	353	768	-	-	-
Stage 1	412	-	-	-	-	-
Stage 2	481	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	102	335	729	-	-	-
Mov Cap-2 Maneuver	102	-	-	-	-	-
Stage 1	374	-	-	-	-	-
Stage 2	456	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	38.3	0.5	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	729	-	158	-	-
HCM Lane V/C Ratio	0.043	-	0.323	-	-
HCM Control Delay (s)	10.2	-	38.3	-	-
HCM Lane LOS	B	-	E	-	-
HCM 95th %tile Q(veh)	0.1	-	1.3	-	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	9	593	642	8	8	14
Future Vol, veh/h	9	593	642	8	8	14
Conflicting Peds, #/hr	60	0	0	60	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	645	698	9	9	15

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	767	0	-	0	1428	414
Stage 1	-	-	-	-	763	-
Stage 2	-	-	-	-	665	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	845	-	-	-	137	588
Stage 1	-	-	-	-	422	-
Stage 2	-	-	-	-	510	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	802	-	-	-	121	558
Mov Cap-2 Maneuver	-	-	-	-	121	-
Stage 1	-	-	-	-	393	-
Stage 2	-	-	-	-	484	-

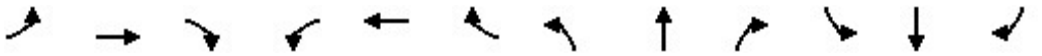
Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	21.6
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	802	-	-	-	241
HCM Lane V/C Ratio	0.012	-	-	-	0.099
HCM Control Delay (s)	9.5	0	-	-	21.6
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	185	469	32	605	53	422	197	486	162
v/c Ratio	0.52	0.30	0.13	0.61	0.22	0.79	0.67	0.62	0.25
Control Delay	20.0	16.5	25.6	29.1	27.3	41.9	29.0	20.6	8.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.0	16.5	25.6	29.1	27.3	41.9	29.0	20.6	8.2
Queue Length 50th (m)	19.3	27.4	4.3	47.1	7.3	69.8	16.2	42.8	4.9
Queue Length 95th (m)	33.0	38.7	11.8	65.1	17.4	#116.5	#39.9	64.4	15.9
Internal Link Dist (m)		41.3		108.4		99.8		120.3	
Turn Bay Length (m)	45.0		25.0		30.0		45.0		15.0
Base Capacity (vph)	356	1547	240	998	242	532	296	786	660
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.30	0.13	0.61	0.22	0.79	0.67	0.62	0.25

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)	170	412	19	29	451	106	49	358	30	181	447	149
Future Volume (veh/h)	170	412	19	29	451	106	49	358	30	181	447	149
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		1.00	0.95		1.00	0.99		0.94	1.00		0.95
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1870	1737	1870	1870	1870	1870	1870	1870	1870	1870	1841
Adj Flow Rate, veh/h	185	448	0	32	490	0	53	389	33	197	486	162
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, %	4	2	11	2	2	2	2	2	2	2	2	4
Cap, veh/h	427	1579		340	1030		250	488	41	312	790	629
Arrive On Green	0.11	0.44	0.00	0.29	0.29	0.00	0.29	0.29	0.29	0.09	0.42	0.42
Sat Flow, veh/h	1753	3647	0	897	3647	0	773	1691	143	1781	1870	1489
Grp Volume(v), veh/h	185	448	0	32	490	0	53	0	422	197	486	162
Grp Sat Flow(s),veh/h/ln	1753	1777	0	897	1777	0	773	0	1834	1781	1870	1489
Q Serve(g_s), s	6.1	7.2	0.0	2.4	10.2	0.0	5.2	0.0	19.1	6.7	18.3	6.3
Cycle Q Clear(g_c), s	6.1	7.2	0.0	2.4	10.2	0.0	11.4	0.0	19.1	6.7	18.3	6.3
Prop In Lane	1.00		0.00	1.00		0.00	1.00		0.08	1.00		1.00
Lane Grp Cap(c), veh/h	427	1579		340	1030		250	0	530	312	790	629
V/C Ratio(X)	0.43	0.28		0.09	0.48		0.21	0.00	0.80	0.63	0.62	0.26
Avail Cap(c_a), veh/h	429	1579		340	1030		250	0	530	312	790	629
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	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.8	15.9	0.0	23.5	26.3	0.0	29.4	0.0	29.6	21.3	20.3	16.9
Incr Delay (d2), s/veh	0.7	0.5	0.0	0.5	1.6	0.0	1.9	0.0	11.8	4.1	3.6	1.0
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	1.4	1.6	0.0	0.4	3.0	0.0	0.8	0.0	7.1	1.9	5.0	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.5	16.3	0.0	24.1	27.9	0.0	31.4	0.0	41.3	25.4	23.9	17.8
LnGrp LOS	B	B		C	C		C	A	D	C	C	B
Approach Vol, veh/h		633	A		522	A		475			845	
Approach Delay, s/veh		17.0			27.7			40.2			23.1	
Approach LOS		B			C			D			C	

Timer - Assigned Phs	1	2		4		6	7	8				
Phs Duration (G+Y+Rc), s	12.0	32.0		46.0		44.0	13.9	32.1				
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0	4.0	6.0				
Max Green Setting (Gmax), s	8.0	26.0		40.0		38.0	10.0	26.0				
Max Q Clear Time (g_c+I1), s	8.7	21.1		9.2		20.3	8.1	12.2				
Green Ext Time (p_c), s	0.0	1.5		3.9		4.4	0.1	3.4				

Intersection Summary	
HCM 6th Ctrl Delay	25.8
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	6.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	6	5	36	5	5	34
Future Vol, veh/h	6	5	36	5	5	34
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	5	39	5	5	37

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	12	0	93	10
Stage 1	-	-	-	-	10	-
Stage 2	-	-	-	-	83	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1607	-	907	1071
Stage 1	-	-	-	-	1013	-
Stage 2	-	-	-	-	940	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1607	-	885	1071
Mov Cap-2 Maneuver	-	-	-	-	885	-
Stage 1	-	-	-	-	1013	-
Stage 2	-	-	-	-	917	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.4	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1043	-	-	1607	-
HCM Lane V/C Ratio	0.041	-	-	0.024	-
HCM Control Delay (s)	8.6	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	24	52	41	504	584	53
Future Vol, veh/h	24	52	41	504	584	53
Conflicting Peds, #/hr	0	0	60	0	0	60
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	15	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	26	57	45	548	635	58

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1362	724	753	0	-	0
Stage 1	724	-	-	-	-	-
Stage 2	638	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	163	426	857	-	-	-
Stage 1	480	-	-	-	-	-
Stage 2	526	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	139	404	813	-	-	-
Mov Cap-2 Maneuver	139	-	-	-	-	-
Stage 1	431	-	-	-	-	-
Stage 2	499	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	26.1	0.7	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	813	-	252	-	-
HCM Lane V/C Ratio	0.055	-	0.328	-	-
HCM Control Delay (s)	9.7	-	26.1	-	-
HCM Lane LOS	A	-	D	-	-
HCM 95th %tile Q(veh)	0.2	-	1.4	-	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	13	496	552	7	7	9
Future Vol, veh/h	13	496	552	7	7	9
Conflicting Peds, #/hr	60	0	0	60	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	539	600	8	8	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	668	0	-	0	1231	364
Stage 1	-	-	-	-	664	-
Stage 2	-	-	-	-	567	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	920	-	-	-	182	634
Stage 1	-	-	-	-	474	-
Stage 2	-	-	-	-	567	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	873	-	-	-	160	602
Mov Cap-2 Maneuver	-	-	-	-	160	-
Stage 1	-	-	-	-	439	-
Stage 2	-	-	-	-	538	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	19.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	873	-	-	-	273
HCM Lane V/C Ratio	0.016	-	-	-	0.064
HCM Control Delay (s)	9.2	0	-	-	19.1
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	134	431	35	565	20	454	198	387	125
v/c Ratio	0.42	0.30	0.15	0.59	0.07	0.90	0.65	0.47	0.17
Control Delay	18.2	16.3	23.9	26.9	22.5	50.6	31.9	17.8	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.2	16.3	23.9	26.9	22.5	50.6	31.9	17.8	6.0
Queue Length 50th (m)	12.6	23.3	4.2	39.2	2.4	68.4	18.6	42.8	2.8
Queue Length 95th (m)	23.5	33.4	11.4	55.0	7.5	#121.3	#41.8	50.7	11.4
Internal Link Dist (m)		41.3		108.4		99.8		120.3	
Turn Bay Length (m)	45.0		25.0		30.0		45.0		15.0
Base Capacity (vph)	317	1449	241	962	269	506	304	815	721
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.30	0.15	0.59	0.07	0.90	0.65	0.47	0.17

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	119	372	12	31	430	73	18	354	50	176	344	111
Future Volume (veh/h)	119	372	12	31	430	73	18	354	50	176	344	111
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		1.00	0.96		1.00	0.99		0.96	1.00		0.97
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1781	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	134	418	0	35	483	0	20	398	56	198	387	125
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	8	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	372	1466		349	993		333	441	62	321	818	675
Arrive On Green	0.08	0.41	0.00	0.28	0.28	0.00	0.28	0.28	0.28	0.11	0.44	0.44
Sat Flow, veh/h	1697	3647	0	926	3647	0	880	1595	224	1781	1870	1542
Grp Volume(v), veh/h	134	418	0	35	483	0	20	0	454	198	387	125
Grp Sat Flow(s),veh/h/ln	1697	1777	0	926	1777	0	880	0	1819	1781	1870	1542
Q Serve(g_s), s	4.2	6.3	0.0	2.3	9.1	0.0	1.3	0.0	19.3	5.9	11.7	4.0
Cycle Q Clear(g_c), s	4.2	6.3	0.0	2.3	9.1	0.0	1.3	0.0	19.3	5.9	11.7	4.0
Prop In Lane	1.00		0.00	1.00		0.00	1.00		0.12	1.00		1.00
Lane Grp Cap(c), veh/h	372	1466		349	993		333	0	503	321	818	675
V/C Ratio(X)	0.36	0.29		0.10	0.49		0.06	0.00	0.90	0.62	0.47	0.19
Avail Cap(c_a), veh/h	379	1466		349	993		333	0	503	324	818	675
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	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.2	15.6	0.0	21.6	24.0	0.0	21.4	0.0	27.9	18.9	16.0	13.8
Incr Delay (d2), s/veh	0.6	0.5	0.0	0.6	1.7	0.0	0.3	0.0	22.1	3.4	2.0	0.6
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	1.3	0.0	0.3	2.5	0.0	0.2	0.0	8.0	1.4	2.7	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.8	16.1	0.0	22.2	25.7	0.0	21.8	0.0	50.0	22.4	17.9	14.4
LnGrp LOS	B	B		C	C		C	A	D	C	B	B
Approach Vol, veh/h		552	A		518	A		474			710	
Approach Delay, s/veh		16.5			25.5			48.8			18.5	
Approach LOS		B			C			D			B	

Timer - Assigned Phs	1	2		4		6	7	8				
Phs Duration (G+Y+Rc), s	12.9	28.1		39.0		41.0	10.6	28.4				
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0	4.0	6.0				
Max Green Setting (Gmax), s	9.0	22.0		33.0		35.0	7.0	22.0				
Max Q Clear Time (g_c+I1), s	7.9	21.3		8.3		13.7	6.2	11.1				
Green Ext Time (p_c), s	0.1	0.3		3.4		3.5	0.0	2.9				

Intersection Summary	
HCM 6th Ctrl Delay	26.0
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	6.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	7	5	36	5	5	43
Future Vol, veh/h	7	5	36	5	5	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	5	39	5	5	47

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	13	0	94	11
Stage 1	-	-	-	-	11	-
Stage 2	-	-	-	-	83	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1606	-	906	1070
Stage 1	-	-	-	-	1012	-
Stage 2	-	-	-	-	940	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1606	-	884	1070
Mov Cap-2 Maneuver	-	-	-	-	884	-
Stage 1	-	-	-	-	1012	-
Stage 2	-	-	-	-	917	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.4	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1047	-	-	1606	-
HCM Lane V/C Ratio	0.05	-	-	0.024	-
HCM Control Delay (s)	8.6	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	23	54	29	605	723	32
Future Vol, veh/h	23	54	29	605	723	32
Conflicting Peds, #/hr	0	0	60	0	0	60
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	15	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	25	59	32	658	786	35

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1586	864	881	0	-	0
Stage 1	864	-	-	-	-	-
Stage 2	722	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	119	354	767	-	-	-
Stage 1	413	-	-	-	-	-
Stage 2	481	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	102	336	728	-	-	-
Mov Cap-2 Maneuver	102	-	-	-	-	-
Stage 1	375	-	-	-	-	-
Stage 2	456	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	35.6	0.5	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	728	-	199	-	-
HCM Lane V/C Ratio	0.043	-	0.421	-	-
HCM Control Delay (s)	10.2	-	35.6	-	-
HCM Lane LOS	B	-	E	-	-
HCM 95th %tile Q(veh)	0.1	-	1.9	-	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	9	593	642	8	8	14
Future Vol, veh/h	9	593	642	8	8	14
Conflicting Peds, #/hr	60	0	0	60	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	645	698	9	9	15

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	767	0	-	0	1428	414
Stage 1	-	-	-	-	763	-
Stage 2	-	-	-	-	665	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	845	-	-	-	137	588
Stage 1	-	-	-	-	422	-
Stage 2	-	-	-	-	510	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	802	-	-	-	121	558
Mov Cap-2 Maneuver	-	-	-	-	121	-
Stage 1	-	-	-	-	393	-
Stage 2	-	-	-	-	484	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	21.6
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	802	-	-	-	241
HCM Lane V/C Ratio	0.012	-	-	-	0.099
HCM Control Delay (s)	9.5	0	-	-	21.6
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	185	469	32	605	53	422	197	486	162
v/c Ratio	0.52	0.30	0.13	0.61	0.22	0.79	0.67	0.62	0.25
Control Delay	20.0	16.5	25.6	29.1	27.3	41.9	29.0	20.6	8.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.0	16.5	25.6	29.1	27.3	41.9	29.0	20.6	8.2
Queue Length 50th (m)	19.3	27.4	4.3	47.1	7.3	69.8	16.2	42.9	4.9
Queue Length 95th (m)	33.0	38.7	11.8	65.1	17.4	#116.5	#40.0	64.5	15.8
Internal Link Dist (m)		41.3		108.4		99.8		120.3	
Turn Bay Length (m)	45.0		25.0		30.0		45.0		15.0
Base Capacity (vph)	356	1547	240	998	242	532	296	786	660
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.30	0.13	0.61	0.22	0.79	0.67	0.62	0.25

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)	170	412	19	29	451	106	49	358	30	181	447	149
Future Volume (veh/h)	170	412	19	29	451	106	49	358	30	181	447	149
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		1.00	0.95		1.00	0.99		0.94	1.00		0.95
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1870	1737	1870	1870	1870	1870	1870	1870	1870	1870	1841
Adj Flow Rate, veh/h	185	448	0	32	490	0	53	389	33	197	486	162
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, %	4	2	11	2	2	2	2	2	2	2	2	4
Cap, veh/h	427	1579		340	1030		250	488	41	312	790	629
Arrive On Green	0.11	0.44	0.00	0.29	0.29	0.00	0.29	0.29	0.29	0.09	0.42	0.42
Sat Flow, veh/h	1753	3647	0	897	3647	0	773	1691	143	1781	1870	1489
Grp Volume(v), veh/h	185	448	0	32	490	0	53	0	422	197	486	162
Grp Sat Flow(s),veh/h/ln	1753	1777	0	897	1777	0	773	0	1834	1781	1870	1489
Q Serve(g_s), s	6.1	7.2	0.0	2.4	10.2	0.0	5.2	0.0	19.1	6.7	18.3	6.3
Cycle Q Clear(g_c), s	6.1	7.2	0.0	2.4	10.2	0.0	11.4	0.0	19.1	6.7	18.3	6.3
Prop In Lane	1.00		0.00	1.00		0.00	1.00		0.08	1.00		1.00
Lane Grp Cap(c), veh/h	427	1579		340	1030		250	0	530	312	790	629
V/C Ratio(X)	0.43	0.28		0.09	0.48		0.21	0.00	0.80	0.63	0.62	0.26
Avail Cap(c_a), veh/h	429	1579		340	1030		250	0	530	312	790	629
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	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.8	15.9	0.0	23.5	26.3	0.0	29.4	0.0	29.6	21.3	20.3	16.9
Incr Delay (d2), s/veh	0.7	0.5	0.0	0.5	1.6	0.0	1.9	0.0	11.8	4.1	3.6	1.0
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	1.4	1.6	0.0	0.4	3.0	0.0	0.8	0.0	7.1	1.9	5.0	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.5	16.3	0.0	24.1	27.9	0.0	31.4	0.0	41.3	25.4	23.9	17.8
LnGrp LOS	B	B		C	C		C	A	D	C	C	B
Approach Vol, veh/h		633	A		522	A		475			845	
Approach Delay, s/veh		17.0			27.7			40.2			23.1	
Approach LOS		B			C			D			C	

Timer - Assigned Phs	1	2		4		6	7	8				
Phs Duration (G+Y+Rc), s	12.0	32.0		46.0		44.0	13.9	32.1				
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0	4.0	6.0				
Max Green Setting (Gmax), s	8.0	26.0		40.0		38.0	10.0	26.0				
Max Q Clear Time (g_c+I1), s	8.7	21.1		9.2		20.3	8.1	12.2				
Green Ext Time (p_c), s	0.0	1.5		3.9		4.4	0.1	3.4				

Intersection Summary	
HCM 6th Ctrl Delay	25.8
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	6.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	13	5	36	5	5	61
Future Vol, veh/h	13	5	36	5	5	61
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	5	39	5	5	66

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	19	0	100	17
Stage 1	-	-	-	-	17	-
Stage 2	-	-	-	-	83	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1597	-	899	1062
Stage 1	-	-	-	-	1006	-
Stage 2	-	-	-	-	940	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1597	-	877	1062
Mov Cap-2 Maneuver	-	-	-	-	877	-
Stage 1	-	-	-	-	1006	-
Stage 2	-	-	-	-	917	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.4	8.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1045	-	-	1597	-
HCM Lane V/C Ratio	0.069	-	-	0.025	-
HCM Control Delay (s)	8.7	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	31	72	48	504	584	59
Future Vol, veh/h	31	72	48	504	584	59
Conflicting Peds, #/hr	0	0	60	0	0	60
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	15	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	34	78	52	548	635	64

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1379	727	759	0	-	0
Stage 1	727	-	-	-	-	-
Stage 2	652	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	159	424	852	-	-	-
Stage 1	478	-	-	-	-	-
Stage 2	518	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	134	402	809	-	-	-
Mov Cap-2 Maneuver	134	-	-	-	-	-
Stage 1	424	-	-	-	-	-
Stage 2	492	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	30.4	0.8	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	809	-	251	-	-
HCM Lane V/C Ratio	0.064	-	0.446	-	-
HCM Control Delay (s)	9.8	-	30.4	-	-
HCM Lane LOS	A	-	D	-	-
HCM 95th %tile Q(veh)	0.2	-	2.1	-	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	16	498	559	12	7	9
Future Vol, veh/h	16	498	559	12	7	9
Conflicting Peds, #/hr	60	0	0	60	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	541	608	13	8	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	681	0	-	0	1250	371
Stage 1	-	-	-	-	675	-
Stage 2	-	-	-	-	575	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	910	-	-	-	177	627
Stage 1	-	-	-	-	468	-
Stage 2	-	-	-	-	562	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	864	-	-	-	155	595
Mov Cap-2 Maneuver	-	-	-	-	155	-
Stage 1	-	-	-	-	431	-
Stage 2	-	-	-	-	533	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	19.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	864	-	-	-	265
HCM Lane V/C Ratio	0.02	-	-	-	0.066
HCM Control Delay (s)	9.3	0	-	-	19.5
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	136	431	35	571	22	456	207	392	133
v/c Ratio	0.43	0.30	0.15	0.59	0.08	0.90	0.69	0.48	0.18
Control Delay	18.4	16.3	23.9	27.0	22.6	50.9	33.9	18.0	6.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.4	16.3	23.9	27.0	22.6	50.9	33.9	18.0	6.4
Queue Length 50th (m)	12.8	23.3	4.2	39.6	2.6	68.7	19.5	43.4	3.6
Queue Length 95th (m)	23.8	33.4	11.4	55.6	8.2	#122.3	#42.8	51.6	12.4
Internal Link Dist (m)		41.3		108.4		99.8		120.3	
Turn Bay Length (m)	45.0		25.0		30.0		45.0		15.0
Base Capacity (vph)	314	1449	241	961	268	507	302	815	721
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.43	0.30	0.15	0.59	0.08	0.90	0.69	0.48	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												
Traffic Volume (veh/h)	121	372	12	31	433	75	20	356	50	184	349	118
Future Volume (veh/h)	121	372	12	31	433	75	20	356	50	184	349	118
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		1.00	0.96		1.00	0.99		0.96	1.00		0.97
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1781	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	136	418	0	35	487	0	22	400	56	207	392	133
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	8	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	371	1466		349	992		330	441	62	320	818	675
Arrive On Green	0.08	0.41	0.00	0.28	0.28	0.00	0.28	0.28	0.28	0.11	0.44	0.44
Sat Flow, veh/h	1697	3647	0	926	3647	0	869	1596	223	1781	1870	1542
Grp Volume(v), veh/h	136	418	0	35	487	0	22	0	456	207	392	133
Grp Sat Flow(s),veh/h/ln	1697	1777	0	926	1777	0	869	0	1819	1781	1870	1542
Q Serve(g_s), s	4.3	6.3	0.0	2.3	9.2	0.0	1.5	0.0	19.4	6.2	11.9	4.2
Cycle Q Clear(g_c), s	4.3	6.3	0.0	2.3	9.2	0.0	1.5	0.0	19.4	6.2	11.9	4.2
Prop In Lane	1.00		0.00	1.00		0.00	1.00		0.12	1.00		1.00
Lane Grp Cap(c), veh/h	371	1466		349	992		330	0	502	320	818	675
V/C Ratio(X)	0.37	0.29		0.10	0.49		0.07	0.00	0.91	0.65	0.48	0.20
Avail Cap(c_a), veh/h	378	1466		349	992		330	0	502	322	818	675
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	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.2	15.6	0.0	21.6	24.1	0.0	21.5	0.0	28.0	19.0	16.0	13.9
Incr Delay (d2), s/veh	0.6	0.5	0.0	0.6	1.7	0.0	0.4	0.0	22.8	4.4	2.0	0.7
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	1.3	0.0	0.3	2.5	0.0	0.2	0.0	8.1	1.6	2.7	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.8	16.1	0.0	22.2	25.8	0.0	21.9	0.0	50.7	23.4	18.0	14.5
LnGrp LOS	B	B		C	C		C	A	D	C	B	B
Approach Vol, veh/h		554	A		522	A		478			732	
Approach Delay, s/veh		16.6			25.6			49.4			18.9	
Approach LOS		B			C			D			B	

Timer - Assigned Phs	1	2		4		6	7	8				
Phs Duration (G+Y+Rc), s	12.9	28.1		39.0		41.0	10.7	28.3				
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0	4.0	6.0				
Max Green Setting (Gmax), s	9.0	22.0		33.0		35.0	7.0	22.0				
Max Q Clear Time (g_c+I1), s	8.2	21.4		8.3		13.9	6.3	11.2				
Green Ext Time (p_c), s	0.1	0.2		3.4		3.6	0.0	3.0				

Intersection Summary	
HCM 6th Ctrl Delay	26.2
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	19	5	36	5	5	43
Future Vol, veh/h	19	5	36	5	5	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	5	39	5	5	47

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	26	0	107	24
Stage 1	-	-	-	-	24	-
Stage 2	-	-	-	-	83	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1588	-	891	1052
Stage 1	-	-	-	-	999	-
Stage 2	-	-	-	-	940	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1588	-	869	1052
Mov Cap-2 Maneuver	-	-	-	-	869	-
Stage 1	-	-	-	-	999	-
Stage 2	-	-	-	-	917	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.4	8.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1029	-	-	1588	-
HCM Lane V/C Ratio	0.051	-	-	0.025	-
HCM Control Delay (s)	8.7	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	30	72	41	605	723	42
Future Vol, veh/h	30	72	41	605	723	42
Conflicting Peds, #/hr	0	0	60	0	0	60
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	15	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	78	45	658	786	46

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1617	869	892	0	-	0
Stage 1	869	-	-	-	-	-
Stage 2	748	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	114	351	760	-	-	-
Stage 1	410	-	-	-	-	-
Stage 2	468	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	96	333	721	-	-	-
Mov Cap-2 Maneuver	96	-	-	-	-	-
Stage 1	365	-	-	-	-	-
Stage 2	444	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	46.2	0.7	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	721	-	193	-	-
HCM Lane V/C Ratio	0.062	-	0.574	-	-
HCM Control Delay (s)	10.3	-	46.2	-	-
HCM Lane LOS	B	-	E	-	-
HCM 95th %tile Q(veh)	0.2	-	3.1	-	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	14	597	648	15	8	14
Future Vol, veh/h	14	597	648	15	8	14
Conflicting Peds, #/hr	60	0	0	60	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	649	704	16	9	15

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	780	0	-	0	1451	420
Stage 1	-	-	-	-	772	-
Stage 2	-	-	-	-	679	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	835	-	-	-	132	583
Stage 1	-	-	-	-	417	-
Stage 2	-	-	-	-	503	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	793	-	-	-	115	553
Mov Cap-2 Maneuver	-	-	-	-	115	-
Stage 1	-	-	-	-	384	-
Stage 2	-	-	-	-	477	-

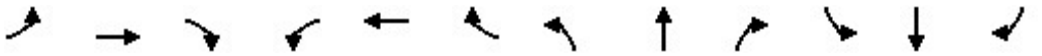
Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	22.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	793	-	-	-	232
HCM Lane V/C Ratio	0.019	-	-	-	0.103
HCM Control Delay (s)	9.6	0	-	-	22.3
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	189	469	32	616	58	425	203	491	168
v/c Ratio	0.54	0.30	0.13	0.62	0.24	0.80	0.69	0.62	0.25
Control Delay	20.4	16.5	25.6	29.3	27.9	42.3	30.7	20.9	8.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.4	16.5	25.6	29.3	27.9	42.3	30.7	20.9	8.6
Queue Length 50th (m)	19.8	27.4	4.3	48.1	8.1	70.5	16.8	43.7	5.3
Queue Length 95th (m)	33.7	38.7	11.8	66.4	18.6	#117.7	#42.5	66.4	17.0
Internal Link Dist (m)		41.3		108.4		99.8		120.3	
Turn Bay Length (m)	45.0		25.0		30.0		45.0		15.0
Base Capacity (vph)	352	1547	240	998	239	532	294	786	660
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.54	0.30	0.13	0.62	0.24	0.80	0.69	0.62	0.25

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)	174	412	19	29	456	110	53	361	30	187	452	155
Future Volume (veh/h)	174	412	19	29	456	110	53	361	30	187	452	155
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		1.00	0.95		1.00	0.99		0.94	1.00		0.95
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1870	1737	1870	1870	1870	1870	1870	1870	1870	1870	1841
Adj Flow Rate, veh/h	189	448	0	32	496	0	58	392	33	203	491	168
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, %	4	2	11	2	2	2	2	2	2	2	2	4
Cap, veh/h	425	1579		340	1030		246	489	41	310	790	629
Arrive On Green	0.11	0.44	0.00	0.29	0.29	0.00	0.29	0.29	0.29	0.09	0.42	0.42
Sat Flow, veh/h	1753	3647	0	897	3647	0	765	1692	142	1781	1870	1489
Grp Volume(v), veh/h	189	448	0	32	496	0	58	0	425	203	491	168
Grp Sat Flow(s),veh/h/ln	1753	1777	0	897	1777	0	765	0	1834	1781	1870	1489
Q Serve(g_s), s	6.3	7.2	0.0	2.4	10.4	0.0	5.8	0.0	19.3	6.9	18.5	6.6
Cycle Q Clear(g_c), s	6.3	7.2	0.0	2.4	10.4	0.0	12.3	0.0	19.3	6.9	18.5	6.6
Prop In Lane	1.00		0.00	1.00		0.00	1.00		0.08	1.00		1.00
Lane Grp Cap(c), veh/h	425	1579		340	1030		246	0	530	310	790	629
V/C Ratio(X)	0.45	0.28		0.09	0.48		0.24	0.00	0.80	0.65	0.62	0.27
Avail Cap(c_a), veh/h	426	1579		340	1030		246	0	530	310	790	629
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	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.9	15.9	0.0	23.5	26.4	0.0	29.9	0.0	29.6	21.5	20.4	16.9
Incr Delay (d2), s/veh	0.7	0.5	0.0	0.5	1.6	0.0	2.2	0.0	12.1	4.9	3.7	1.0
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	1.5	1.6	0.0	0.4	3.1	0.0	0.9	0.0	7.2	2.0	5.1	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.7	16.3	0.0	24.1	28.0	0.0	32.1	0.0	41.7	26.4	24.0	18.0
LnGrp LOS	B	B		C	C		C	A	D	C	C	B
Approach Vol, veh/h		637	A		528	A		483			862	
Approach Delay, s/veh		17.0			27.7			40.6			23.4	
Approach LOS		B			C			D			C	

Timer - Assigned Phs	1	2		4		6	7	8				
Phs Duration (G+Y+Rc), s	12.0	32.0		46.0		44.0	13.9	32.1				
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0	4.0	6.0				
Max Green Setting (Gmax), s	8.0	26.0		40.0		38.0	10.0	26.0				
Max Q Clear Time (g_c+I1), s	8.9	21.3		9.2		20.5	8.3	12.4				
Green Ext Time (p_c), s	0.0	1.5		3.9		4.4	0.1	3.4				

Intersection Summary	
HCM 6th Ctrl Delay	26.0
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	6.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	13	5	36	5	5	61
Future Vol, veh/h	13	5	36	5	5	61
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	5	39	5	5	66

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	19	0	100	17
Stage 1	-	-	-	-	17	-
Stage 2	-	-	-	-	83	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1597	-	899	1062
Stage 1	-	-	-	-	1006	-
Stage 2	-	-	-	-	940	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1597	-	877	1062
Mov Cap-2 Maneuver	-	-	-	-	877	-
Stage 1	-	-	-	-	1006	-
Stage 2	-	-	-	-	917	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.4	8.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1045	-	-	1597	-
HCM Lane V/C Ratio	0.069	-	-	0.025	-
HCM Control Delay (s)	8.7	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	16	498	559	12	7	9
Future Vol, veh/h	16	498	559	12	7	9
Conflicting Peds, #/hr	60	0	0	60	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	541	608	13	8	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	681	0	-	0	1250	371
Stage 1	-	-	-	-	675	-
Stage 2	-	-	-	-	575	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	910	-	-	-	177	627
Stage 1	-	-	-	-	468	-
Stage 2	-	-	-	-	562	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	864	-	-	-	155	595
Mov Cap-2 Maneuver	-	-	-	-	155	-
Stage 1	-	-	-	-	431	-
Stage 2	-	-	-	-	533	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	19.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	864	-	-	-	265
HCM Lane V/C Ratio	0.02	-	-	-	0.066
HCM Control Delay (s)	9.3	0	-	-	19.5
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2

Intersection	
Int Delay, s/veh	6.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	19	5	36	5	5	69
Future Vol, veh/h	19	5	36	5	5	69
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	5	39	5	5	75

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	26	0	107	24
Stage 1	-	-	-	-	24	-
Stage 2	-	-	-	-	83	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1588	-	891	1052
Stage 1	-	-	-	-	999	-
Stage 2	-	-	-	-	940	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1588	-	869	1052
Mov Cap-2 Maneuver	-	-	-	-	869	-
Stage 1	-	-	-	-	999	-
Stage 2	-	-	-	-	917	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.4	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1037	-	-	1588	-
HCM Lane V/C Ratio	0.078	-	-	0.025	-
HCM Control Delay (s)	8.8	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	14	597	648	15	8	14
Future Vol, veh/h	14	597	648	15	8	14
Conflicting Peds, #/hr	60	0	0	60	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	649	704	16	9	15

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	780	0	-	0	1451	420
Stage 1	-	-	-	-	772	-
Stage 2	-	-	-	-	679	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	835	-	-	-	132	583
Stage 1	-	-	-	-	417	-
Stage 2	-	-	-	-	503	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	793	-	-	-	115	553
Mov Cap-2 Maneuver	-	-	-	-	115	-
Stage 1	-	-	-	-	384	-
Stage 2	-	-	-	-	477	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	22.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	793	-	-	-	232
HCM Lane V/C Ratio	0.019	-	-	-	0.103
HCM Control Delay (s)	9.6	0	-	-	22.3
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3

2: Birch St & Pembroke St Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.8	0.2	1.3	0.2	4.9	2.1	1.4

3: Richmond Rd & Pembroke St Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.9	4.6	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	46.8	39.7	9.7	1.2	5.9	4.6	5.2

4: Site & Pembroke St Performance by movement

Movement	EBT	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	0.2	0.3	0.3

5: Richmond Rd & Birch St Performance by movement

Movement	EBT	EBR	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.2	86.5	2.9	18.3	16.4	12.7

6: Fort St & Ashgrove St Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Del/Veh (s)	14.4	4.7	2.4	0.8	33.1	4.6	3.8

7: Richmond Rd & Fort St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.3	0.1	0.0	0.0	0.0	0.0	26.2	29.9	22.4	0.3	0.3	0.3
Total Del/Veh (s)	26.5	17.4	3.0	48.2	42.2	6.5	69.3	74.2	66.2	33.0	15.8	5.9

7: Richmond Rd & Fort St Performance by movement

Movement	All
Denied Del/Veh (s)	6.2
Total Del/Veh (s)	35.1

8: Richmond Rd & Coronation Ave/RJH Performance by movement

Movement	EBR	WBL	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	3.6	0.1	0.0	0.0	3.4	0.9	1.0	0.7
Total Del/Veh (s)	7.2	22.4	11.2	5.8	5.4	9.0	5.4	1.7	5.9

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APPENDIX C

SimTraffic Reports

20: Begbie St & Pembroke St Performance by movement

Movement	EBT	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	0.0	0.4	0.1

Total Network Performance

Denied Del/Veh (s)	6.8
Total Del/Veh (s)	47.0

Intersection: 2: Birch St & Pembroke St

Movement	EB	NB
Directions Served	TR	LR
Maximum Queue (m)	1.8	6.7
Average Queue (m)	0.3	2.9
95th Queue (m)	2.7	8.1
Link Distance (m)		117.0
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Richmond Rd & Pembroke St

Movement	EB	NB	NB	SB
Directions Served	LR	L	T	TR
Maximum Queue (m)	20.1	12.6	5.7	44.8
Average Queue (m)	10.7	6.2	0.8	17.4
95th Queue (m)	23.2	14.0	7.3	60.0
Link Distance (m)	34.2		74.1	66.3
Upstream Blk Time (%)	0			1
Queuing Penalty (veh)	0			8
Storage Bay Dist (m)		15.0		
Storage Blk Time (%)		0	0	
Queuing Penalty (veh)		2	0	

Intersection: 4: Site & Pembroke St

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 5: Richmond Rd & Birch St

Movement	EB	NB	SB
Directions Served	R	T	TR
Maximum Queue (m)	22.1	16.8	73.0
Average Queue (m)	10.6	4.1	54.1
95th Queue (m)	23.6	16.4	91.9
Link Distance (m)	117.0	22.2	74.1
Upstream Blk Time (%)		0	9
Queuing Penalty (veh)		2	60
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Fort St & Ashgrove St

Movement	EB	B9	SB
Directions Served	LT	T	LR
Maximum Queue (m)	47.2	4.1	10.8
Average Queue (m)	22.0	0.9	4.1
95th Queue (m)	60.8	7.1	12.0
Link Distance (m)	51.2	81.6	
Upstream Blk Time (%)	2		
Queuing Penalty (veh)	0		
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 7: Richmond Rd & Fort St

Movement	EB	EB	EB	WB	WB	WB	B10	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	T	L	TR	L	T	R
Maximum Queue (m)	38.0	42.0	37.7	28.8	86.4	75.2	2.2	31.5	109.1	22.2	32.6	17.5
Average Queue (m)	22.4	34.7	16.3	9.5	66.3	48.5	1.6	10.2	94.9	18.4	27.8	11.0
95th Queue (m)	41.5	49.0	40.0	31.4	105.5	94.8	11.1	33.9	132.6	24.2	33.9	23.2
Link Distance (m)		38.4	38.4		102.4	102.4	17.8		103.4		22.2	
Upstream Blk Time (%)	1	8	1		5	0	5		43	9	36	0
Queuing Penalty (veh)	0	22	2		0	0	0		0	0	246	0
Storage Bay Dist (m)	45.0			25.0				30.0		25.0		10.0
Storage Blk Time (%)	1	8		0	51				65	9	38	1
Queuing Penalty (veh)	3	11		0	18				13	46	124	5

Intersection: 8: Richmond Rd & Coronation Ave/RJH

Movement	EB	WB	WB	NB	SB	SB
Directions Served	R	L	R	TR	L	TR
Maximum Queue (m)	8.8	9.4	9.7	54.6	22.8	64.9
Average Queue (m)	2.9	3.0	2.8	27.8	10.2	31.8
95th Queue (m)	9.6	9.5	9.9	57.6	24.1	73.0
Link Distance (m)	206.9		43.4	66.3		70.8
Upstream Blk Time (%)				0		1
Queuing Penalty (veh)				2		0
Storage Bay Dist (m)		10.0			20.0	
Storage Blk Time (%)		7	2		0	9
Queuing Penalty (veh)		1	0		1	6

Intersection: 20: Begbie St & Pembroke St

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 573

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APPENDIX C

SimTraffic Reports

2: Birch St & Pembroke St Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.1	0.1	0.0		0.1	0.1	0.0
Total Del/Veh (s)	1.0	0.1	1.6		4.1	2.3	1.8

3: Richmond Rd & Pembroke St Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	77.6	77.3	0.0	0.0	0.8	0.0	2.9
Total Del/Veh (s)	87.4	169.6	13.9	1.2	21.3	16.2	15.6

4: Site & Pembroke St Performance by movement

Movement	EBT	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	0.8	0.5	0.6

5: Richmond Rd & Birch St Performance by movement

Movement	EBT	EBR	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0	0.0
Total Del/Veh (s)	21.9	328.2	3.3	31.6	21.7	24.7

6: Fort St & Ashgrove St Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Del/Veh (s)	17.5	4.9	2.5	1.6	46.2	24.5	4.1

7: Richmond Rd & Fort St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	4.1	1.2	0.7	0.0	0.1	0.5
Total Del/Veh (s)	28.1	15.7	1.4	61.3	45.1	9.9	44.0	38.2	26.3	33.5	19.3	5.9

7: Richmond Rd & Fort St Performance by movement

Movement	All
Denied Del/Veh (s)	0.3
Total Del/Veh (s)	28.2

8: Richmond Rd & Coronation Ave/RJH Performance by movement

Movement	EBR	WBL	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	3.9	0.3	0.0	0.0	28.8	28.9	51.0	14.6
Total Del/Veh (s)	16.9	44.7	7.3	5.3	2.8	24.9	23.2	25.4	15.2

20: Begbie St & Pembroke St Performance by movement

Movement	EBT	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	0.0	0.3	0.1

Total Network Performance

Denied Del/Veh (s)	10.6
Total Del/Veh (s)	57.6

Intersection: 2: Birch St & Pembroke St

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (m)	0.9	0.9	6.7
Average Queue (m)	0.1	0.1	3.0
95th Queue (m)	1.9	1.9	8.5
Link Distance (m)		43.5	117.0
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Richmond Rd & Pembroke St

Movement	EB	NB	NB	SB
Directions Served	LR	L	T	TR
Maximum Queue (m)	27.7	12.3	7.5	69.6
Average Queue (m)	16.7	5.3	1.1	53.9
95th Queue (m)	32.5	14.3	9.2	95.2
Link Distance (m)	34.2		74.1	66.3
Upstream Blk Time (%)	4			16
Queuing Penalty (veh)	1			131
Storage Bay Dist (m)		15.0		
Storage Blk Time (%)		2	0	
Queuing Penalty (veh)		11	0	

Intersection: 4: Site & Pembroke St

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 5: Richmond Rd & Birch St

Movement	EB	NB	SB
Directions Served	R	T	TR
Maximum Queue (m)	40.7	16.3	78.4
Average Queue (m)	23.3	4.9	71.3
95th Queue (m)	58.6	18.9	91.9
Link Distance (m)	117.0	22.2	74.1
Upstream Blk Time (%)		1	31
Queuing Penalty (veh)		4	254
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Fort St & Ashgrove St

Movement	EB	B9	WB	SB
Directions Served	LT	T	T	LR
Maximum Queue (m)	58.9	13.1	1.7	12.7
Average Queue (m)	22.5	2.1	0.2	5.7
95th Queue (m)	60.7	17.6	3.5	15.4
Link Distance (m)	51.2	81.6	38.4	
Upstream Blk Time (%)	3			
Queuing Penalty (veh)	0			
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: Richmond Rd & Fort St

Movement	EB	EB	EB	WB	WB	WB	B10	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	T	L	TR	L	T	R
Maximum Queue (m)	35.6	41.8	33.4	27.4	100.8	85.0	4.5	37.1	94.4	22.1	32.9	17.5
Average Queue (m)	25.4	34.8	16.7	8.7	73.7	52.5	0.9	14.0	63.8	16.6	28.3	11.9
95th Queue (m)	40.4	48.5	40.0	29.5	118.3	107.2	7.5	36.5	108.8	25.4	34.3	24.4
Link Distance (m)		38.4	38.4		102.4	102.4	17.8		103.4		22.2	
Upstream Blk Time (%)	0	8	0		4	0	1		3	6	44	0
Queuing Penalty (veh)	0	27	1		0	0	0		0	0	369	0
Storage Bay Dist (m)	45.0			25.0				30.0		25.0		10.0
Storage Blk Time (%)	0	8			53			0	35	6	50	1
Queuing Penalty (veh)	1	15			17			1	19	36	180	8

Intersection: 8: Richmond Rd & Coronation Ave/RJH

Movement	EB	WB	WB	NB	SB	SB
Directions Served	R	L	R	TR	L	TR
Maximum Queue (m)	9.3	16.1	20.4	54.9	21.2	77.2
Average Queue (m)	3.2	9.5	9.8	28.8	5.2	61.5
95th Queue (m)	10.1	18.2	22.2	56.2	18.5	94.4
Link Distance (m)	206.9		43.4	66.3		70.8
Upstream Blk Time (%)			0	0		32
Queuing Penalty (veh)			0	1		0
Storage Bay Dist (m)		10.0			20.0	
Storage Blk Time (%)		34	10		0	41
Queuing Penalty (veh)		22	4		0	7

Intersection: 20: Begbie St & Pembroke St

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 1111

2: Birch St & Pembroke St Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.1	0.1	0.1
Total Del/Veh (s)	1.2	0.1	1.3	0.4	4.9	2.5	1.9

3: Richmond Rd & Pembroke St Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	21.7	21.2	0.0	0.0	0.0	0.0	1.3
Total Del/Veh (s)	41.4	53.7	10.9	1.2	6.8	4.4	7.0

4: Site & Pembroke St Performance by movement

Movement	EBT	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	17.0	0.3	5.4

5: Richmond Rd & Birch St Performance by movement

Movement	EBT	NBT	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.1	3.1	19.6	11.5

6: Fort St & Ashgrove St Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Del/Veh (s)	6.8	3.6	2.5	1.9	29.8	6.3	3.2

7: Richmond Rd & Fort St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.1	0.0	0.0	0.0	0.0	10.6	8.4	8.0	0.2	0.1	0.5
Total Del/Veh (s)	26.3	16.5	1.8	54.8	47.3	10.1	52.5	55.2	52.7	34.3	15.1	4.8

7: Richmond Rd & Fort St Performance by movement

Movement	All
Denied Del/Veh (s)	1.8
Total Del/Veh (s)	32.7

8: Richmond Rd & Coronation Ave/RJH Performance by movement

Movement	EBR	WBL	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	4.6	0.1	0.0	0.0	3.3	0.9	1.0	0.7
Total Del/Veh (s)	6.4	20.3	5.7	5.4	2.9	10.8	5.8	5.6	6.0

20: Begbie St & Pembroke St Performance by movement

Movement	EBT	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	0.0	0.4	0.1

Total Network Performance

Denied Del/Veh (s)	3.0
Total Del/Veh (s)	44.5

Intersection: 2: Birch St & Pembroke St

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (m)	0.9	10.2
Average Queue (m)	0.1	5.6
95th Queue (m)	1.9	11.9
Link Distance (m)	43.5	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Richmond Rd & Pembroke St

Movement	EB	NB	NB	SB
Directions Served	LR	L	T	TR
Maximum Queue (m)	28.3	14.3	6.8	47.0
Average Queue (m)	17.4	6.3	0.9	19.7
95th Queue (m)	32.5	15.7	8.5	61.4
Link Distance (m)	34.2		74.1	66.3
Upstream Blk Time (%)	6			1
Queuing Penalty (veh)	3			9
Storage Bay Dist (m)		15.0		
Storage Blk Time (%)		2	0	
Queuing Penalty (veh)		10	0	

Intersection: 4: Site & Pembroke St

Movement	EB
Directions Served	TR
Maximum Queue (m)	7.1
Average Queue (m)	2.0
95th Queue (m)	15.1
Link Distance (m)	43.5
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: Richmond Rd & Birch St

Movement	NB	SB
Directions Served	T	TR
Maximum Queue (m)	17.6	72.3
Average Queue (m)	3.7	55.3
95th Queue (m)	17.1	95.1
Link Distance (m)	22.2	74.1
Upstream Blk Time (%)	0	11
Queuing Penalty (veh)	2	74
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Fort St & Ashgrove St

Movement	EB	B9	WB	SB
Directions Served	LT	T	T	LR
Maximum Queue (m)	42.5	1.7	1.7	11.1
Average Queue (m)	17.3	0.4	0.2	4.4
95th Queue (m)	47.9	4.3	3.5	13.6
Link Distance (m)	51.2	81.6	38.4	
Upstream Blk Time (%)	1			
Queuing Penalty (veh)	0			
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: Richmond Rd & Fort St

Movement	EB	EB	EB	WB	WB	WB	B10	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	T	L	TR	L	T	R
Maximum Queue (m)	37.3	42.2	34.1	29.9	99.6	89.4	4.5	25.2	104.4	22.1	32.0	17.5
Average Queue (m)	22.3	32.8	16.0	10.4	74.7	56.6	1.5	7.3	78.3	18.0	27.0	11.5
95th Queue (m)	40.3	47.5	38.5	33.2	115.2	107.1	10.3	26.9	123.6	26.1	35.7	22.8
Link Distance (m)		38.4	38.4		102.4	102.4	17.8		103.4		22.2	
Upstream Blk Time (%)	0	6	0		4	1	2		20	14	35	0
Queuing Penalty (veh)	0	17	1		0	0	0		0	0	239	0
Storage Bay Dist (m)	45.0			25.0				30.0		25.0		10.0
Storage Blk Time (%)	0	6		0	59				53	14	38	0
Queuing Penalty (veh)	1	9		0	20				11	72	123	3

Intersection: 8: Richmond Rd & Coronation Ave/RJH

Movement	EB	WB	WB	NB	SB	SB
Directions Served	R	L	R	TR	L	TR
Maximum Queue (m)	9.3	9.0	9.7	51.4	21.5	68.2
Average Queue (m)	2.7	3.4	3.8	25.4	9.1	29.9
95th Queue (m)	9.4	10.8	11.3	56.5	22.5	69.9
Link Distance (m)	206.9		43.4	66.3		70.8
Upstream Blk Time (%)				0		1
Queuing Penalty (veh)				1		0
Storage Bay Dist (m)		10.0			20.0	
Storage Blk Time (%)		8	2		0	11
Queuing Penalty (veh)		1	0		1	7

Intersection: 20: Begbie St & Pembroke St

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 604

2: Birch St & Pembroke St Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.1	0.1	0.1
Total Del/Veh (s)	0.8	0.1	1.7	0.2	4.1	7.2	3.8

3: Richmond Rd & Pembroke St Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	39.3	85.9	0.0	0.0	0.2	0.0	3.5
Total Del/Veh (s)	205.4	217.8	12.0	1.0	24.1	17.3	20.2

4: Site & Pembroke St Performance by movement

Movement	EBT	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	86.2	0.5	37.2

5: Richmond Rd & Birch St Performance by movement

Movement	EBT	NBT	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.1	3.0	33.0	18.2

6: Fort St & Ashgrove St Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Del/Veh (s)	12.5	5.5	2.5	1.6	29.3	6.1	4.2

7: Richmond Rd & Fort St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.2	0.0	0.0	0.0	4.0	1.4	0.8	0.0	0.1	0.0
Total Del/Veh (s)	32.2	17.0	1.9	62.1	52.0	11.6	52.6	43.1	37.0	35.1	19.6	5.2

7: Richmond Rd & Fort St Performance by movement

Movement	All
Denied Del/Veh (s)	0.3
Total Del/Veh (s)	31.6

8: Richmond Rd & Coronation Ave/RJH Performance by movement

Movement	EBR	WBL	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	3.9	0.5	0.0	0.0	23.1	29.4	34.6	14.7
Total Del/Veh (s)	29.1	42.7	10.0	5.5	3.4	26.1	26.8	25.3	17.0

20: Begbie St & Pembroke St Performance by movement

Movement	EBT	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	0.0	0.3	0.1

Total Network Performance

Denied Del/Veh (s)	10.8
Total Del/Veh (s)	60.7

Intersection: 2: Birch St & Pembroke St

Movement	EB	NB
Directions Served	TR	LR
Maximum Queue (m)	1.7	12.1
Average Queue (m)	0.2	6.7
95th Queue (m)	2.6	15.9
Link Distance (m)		
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Richmond Rd & Pembroke St

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (m)	35.6	12.7	69.3
Average Queue (m)	27.2	5.9	56.6
95th Queue (m)	43.2	14.5	94.1
Link Distance (m)	34.2		66.3
Upstream Blk Time (%)	46		20
Queuing Penalty (veh)	25		160
Storage Bay Dist (m)		15.0	
Storage Blk Time (%)		1	
Queuing Penalty (veh)		6	

Intersection: 4: Site & Pembroke St

Movement	EB
Directions Served	TR
Maximum Queue (m)	25.5
Average Queue (m)	11.8
95th Queue (m)	37.0
Link Distance (m)	43.5
Upstream Blk Time (%)	5
Queuing Penalty (veh)	3
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: Richmond Rd & Birch St

Movement	NB	SB
Directions Served	T	TR
Maximum Queue (m)	17.8	78.1
Average Queue (m)	3.2	72.4
95th Queue (m)	15.9	91.7
Link Distance (m)	22.2	74.1
Upstream Blk Time (%)	0	34
Queuing Penalty (veh)	1	285
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Fort St & Ashgrove St

Movement	EB	B9	WB	SB
Directions Served	LT	T	T	LR
Maximum Queue (m)	60.6	10.5	4.5	11.5
Average Queue (m)	26.1	2.1	0.6	4.9
95th Queue (m)	62.9	17.2	7.8	12.9
Link Distance (m)	51.2	81.6	38.4	
Upstream Blk Time (%)	3		0	
Queuing Penalty (veh)	0		0	
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: Richmond Rd & Fort St

Movement	EB	EB	EB	WB	WB	WB	B10	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	T	L	TR	L	T	R
Maximum Queue (m)	38.1	44.1	36.9	30.5	108.3	88.5	11.6	37.3	97.6	22.0	32.6	17.1
Average Queue (m)	27.3	37.6	18.2	9.5	80.2	59.7	4.2	16.7	72.0	17.0	27.9	10.3
95th Queue (m)	43.3	49.0	42.1	31.3	126.7	112.0	18.6	40.1	118.6	25.4	35.0	23.1
Link Distance (m)		38.4	38.4		102.4	102.4	17.8		103.4		22.2	
Upstream Blk Time (%)	1	11	0		8	1	4		6	8	46	0
Queuing Penalty (veh)	0	36	2		0	0	0		0	0	391	0
Storage Bay Dist (m)	45.0			25.0				30.0		25.0		10.0
Storage Blk Time (%)	1	11		0	57			0	41	8	50	1
Queuing Penalty (veh)	3	20		0	18			2	22	51	178	4

Intersection: 8: Richmond Rd & Coronation Ave/RJH

Movement	EB	WB	WB	NB	SB	SB
Directions Served	R	L	R	TR	L	TR
Maximum Queue (m)	9.7	14.2	22.5	52.1	26.6	80.2
Average Queue (m)	3.2	7.4	10.5	28.4	6.3	66.5
95th Queue (m)	10.8	16.3	22.4	54.5	22.3	100.2
Link Distance (m)	206.9		43.4	66.3		70.8
Upstream Blk Time (%)			1	0		42
Queuing Penalty (veh)			0	1		0
Storage Bay Dist (m)		10.0			20.0	
Storage Blk Time (%)		26	15		0	47
Queuing Penalty (veh)		17	5		0	8

Intersection: 20: Begbie St & Pembroke St

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 1239

2: Birch St & Pembroke St Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBT	NBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	1.1	0.1	1.3	0.0	5.9	0.5	2.3	1.9

3: Richmond Rd & Pembroke St Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.7	0.7	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	23.2	14.8	10.6	4.1	2.6	1.6	4.6

4: North Access & Pembroke St Performance by movement

Movement	EBT	EBR	WBL	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.3	0.3	1.5	0.3	0.4

6: Fort St & Ashgrove St Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Del/Veh (s)	8.2	3.9	2.4	1.3	55.1	2.4	3.5

7: Richmond Rd & Fort St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.4	0.1	0.0	0.0	0.0	0.0	13.2	15.2	12.0	0.3	0.2	0.1
Total Del/Veh (s)	27.2	16.0	1.2	51.5	34.2	6.7	72.6	72.9	64.2	41.5	24.7	14.2

7: Richmond Rd & Fort St Performance by movement

Movement	All
Denied Del/Veh (s)	3.2
Total Del/Veh (s)	35.3

Total Zone Performance

Denied Del/Veh (s)	12.7
Total Del/Veh (s)	366.9

Intersection: 2: Birch St & Pembroke St

Movement	EB	NB
Directions Served	TR	LR
Maximum Queue (m)	2.7	7.4
Average Queue (m)	0.4	6.1
95th Queue (m)	3.4	9.5
Link Distance (m)		60.6
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Richmond Rd & Pembroke St

Movement	EB	NB	NB	SB
Directions Served	LR	L	T	TR
Maximum Queue (m)	25.6	12.5	5.0	12.7
Average Queue (m)	15.7	5.8	0.7	3.2
95th Queue (m)	27.2	14.5	10.6	15.8
Link Distance (m)	34.4		112.3	66.3
Upstream Blk Time (%)	1			
Queuing Penalty (veh)	1			
Storage Bay Dist (m)		15.0		
Storage Blk Time (%)		1		
Queuing Penalty (veh)		4		

Intersection: 4: North Access & Pembroke St

Movement	EB	WB
Directions Served	TR	LT
Maximum Queue (m)	0.9	3.6
Average Queue (m)	0.1	0.5
95th Queue (m)	1.9	4.0
Link Distance (m)	43.4	34.4
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Fort St & Ashgrove St

Movement	EB	B22	SB
Directions Served	LT	T	LR
Maximum Queue (m)	44.2	6.2	9.4
Average Queue (m)	16.0	1.4	4.0
95th Queue (m)	52.8	10.2	11.0
Link Distance (m)	51.2	81.6	
Upstream Blk Time (%)	2		
Queuing Penalty (veh)	0		
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 7: Richmond Rd & Fort St

Movement	EB	EB	EB	WB	WB	WB	B10	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	T	L	TR	L	T	R
Maximum Queue (m)	36.8	41.8	35.8	26.7	88.0	76.4	3.0	29.0	107.0	32.3	103.0	17.6
Average Queue (m)	20.0	32.2	15.2	8.0	58.2	40.1	0.4	8.5	93.3	27.8	64.4	14.3
95th Queue (m)	39.2	48.9	39.8	28.5	97.3	84.3	5.0	30.7	130.8	38.2	115.7	22.1
Link Distance (m)		38.4	38.4		101.3	101.3	17.8		103.4		112.3	
Upstream Blk Time (%)	1	7	1		1	0	0		33		1	
Queuing Penalty (veh)	0	20	2		0	0	0		0		8	
Storage Bay Dist (m)	45.0			25.0				30.0		25.0		10.0
Storage Blk Time (%)	1	7		0	42			0	65	21	31	1
Queuing Penalty (veh)	2	10		0	15			0	14	108	104	4

Zone Summary

Zone wide Queuing Penalty: 292

2: Birch St & Pembroke St Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.2	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	1.0	0.1	1.8	0.1	4.9	4.1	2.7

3: Richmond Rd & Pembroke St Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	42.1	16.2	0.0	0.0	0.0	0.0	1.5
Total Del/Veh (s)	65.8	98.9	17.8	4.2	9.4	6.8	12.2

4: North Access & Pembroke St Performance by movement

Movement	EBT	EBR	WBL	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	27.1	12.4	2.2	0.6	12.8

6: Fort St & Ashgrove St Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Del/Veh (s)	16.6	6.8	2.5	1.4	56.9	7.2	4.9

7: Richmond Rd & Fort St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	6.0	4.5	2.3	1.0	0.2	0.8
Total Del/Veh (s)	34.8	16.7	1.8	59.9	47.8	9.8	65.2	51.6	44.0	63.1	43.0	29.2

7: Richmond Rd & Fort St Performance by movement

Movement	All
Denied Del/Veh (s)	1.0
Total Del/Veh (s)	39.8

Total Zone Performance

Denied Del/Veh (s)	8.9
Total Del/Veh (s)	523.5

Intersection: 2: Birch St & Pembroke St

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (m)	0.8	0.9	9.3
Average Queue (m)	0.0	0.1	6.6
95th Queue (m)	0.0	1.9	10.3
Link Distance (m)		43.4	60.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Richmond Rd & Pembroke St

Movement	EB	NB	NB	SB
Directions Served	LR	L	T	TR
Maximum Queue (m)	32.9	13.5	4.3	51.5
Average Queue (m)	23.3	6.9	0.9	29.9
95th Queue (m)	41.2	15.6	9.0	77.1
Link Distance (m)	34.4		112.3	66.3
Upstream Blk Time (%)	22			3
Queuing Penalty (veh)	18			28
Storage Bay Dist (m)		15.0		
Storage Blk Time (%)		3	0	
Queuing Penalty (veh)		17	0	

Intersection: 4: North Access & Pembroke St

Movement	EB	WB
Directions Served	TR	LT
Maximum Queue (m)	22.1	5.3
Average Queue (m)	6.5	0.7
95th Queue (m)	26.4	4.7
Link Distance (m)	43.4	34.4
Upstream Blk Time (%)	3	
Queuing Penalty (veh)	3	
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Fort St & Ashgrove St

Movement	EB	B22	SB
Directions Served	LT	T	LR
Maximum Queue (m)	60.7	11.1	10.6
Average Queue (m)	29.7	2.0	4.7
95th Queue (m)	70.1	15.3	11.8
Link Distance (m)	51.2	81.6	
Upstream Blk Time (%)	4		
Queuing Penalty (veh)	0		
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 7: Richmond Rd & Fort St

Movement	EB	EB	EB	WB	WB	WB	B10	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	T	L	TR	L	T	R
Maximum Queue (m)	37.7	46.9	34.8	26.2	108.8	90.4	8.6	37.4	96.6	32.4	114.6	18.2
Average Queue (m)	26.9	38.4	17.4	8.6	73.8	57.7	2.4	20.2	74.5	28.3	101.1	14.6
95th Queue (m)	44.1	51.3	41.3	29.7	120.2	106.1	13.7	44.0	118.2	40.1	137.5	23.3
Link Distance (m)		38.4	38.4		101.3	101.3	17.8		103.4		112.3	
Upstream Blk Time (%)	4	14	0		6	1	2		11		15	
Queuing Penalty (veh)	0	45	1		0	0	0		0		128	
Storage Bay Dist (m)	45.0			25.0				30.0		25.0		10.0
Storage Blk Time (%)	4	14		0	55			0	49	20	48	1
Queuing Penalty (veh)	10	26		0	18			1	28	135	178	10

Zone Summary

Zone wide Queuing Penalty: 646

2: Birch St & Pembroke St Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.1	0.1	0.1
Total Del/Veh (s)	2.5	0.4	1.3	0.1	4.9	3.9	2.4

3: Richmond Rd & Pembroke St Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	12.1	22.7	0.0	0.0	0.0	0.0	1.5
Total Del/Veh (s)	55.2	43.2	10.3	3.7	6.9	4.5	8.6

4: Site & Pembroke St Performance by movement

Movement	EBT	EBR	WBL	WBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	2.9	0.4
Total Del/Veh (s)	17.8	28.5	1.2	0.3	24.7	8.9

5: Richmond Rd & Birch St Performance by movement

Movement	EBT	NBT	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.1	3.1	17.6	10.5

6: Fort St & Ashgrove St Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Del/Veh (s)	10.0	4.7	2.4	1.1	28.4	11.1	3.8

7: Richmond Rd & Fort St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.1	0.0	0.0	0.0	0.0	15.9	14.9	19.0	0.4	0.2	0.3
Total Del/Veh (s)	27.2	17.0	1.7	57.7	46.0	9.0	54.7	60.5	51.7	31.9	15.6	5.0

7: Richmond Rd & Fort St Performance by movement

Movement	All
Denied Del/Veh (s)	3.4
Total Del/Veh (s)	33.1

8: Richmond Rd & Coronation Ave/RJH Performance by movement

Movement	EBR	WBL	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	4.9	0.1	0.0	0.0	5.6	3.1	1.3	1.9
Total Del/Veh (s)	10.5	38.1	7.7	7.3	6.2	11.3	7.3	2.3	7.7

20: Begbie St & Pembroke St Performance by movement

Movement	EBT	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	0.0	0.2	0.1

Total Network Performance

Denied Del/Veh (s)	5.1
Total Del/Veh (s)	46.5

Intersection: 2: Birch St & Pembroke St

Movement	EB	NB
Directions Served	TR	LR
Maximum Queue (m)	2.7	9.6
Average Queue (m)	0.4	5.9
95th Queue (m)	3.4	12.1
Link Distance (m)		
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Richmond Rd & Pembroke St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	33.3	59.1	45.9
Average Queue (m)	21.0	24.8	17.8
95th Queue (m)	38.3	62.4	56.9
Link Distance (m)	35.9	74.2	66.2
Upstream Blk Time (%)	10	0	3
Queuing Penalty (veh)	7	1	23
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Site & Pembroke St

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (m)	6.6	0.9	16.6
Average Queue (m)	2.5	0.1	7.3
95th Queue (m)	18.5	1.9	18.0
Link Distance (m)	43.5	35.9	29.4
Upstream Blk Time (%)	3		1
Queuing Penalty (veh)	1		0
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Richmond Rd & Birch St

Movement	NB	SB
Directions Served	T	TR
Maximum Queue (m)	10.9	75.9
Average Queue (m)	1.6	52.0
95th Queue (m)	9.1	95.6
Link Distance (m)	22.2	74.2
Upstream Blk Time (%)	0	9
Queuing Penalty (veh)	0	66
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Fort St & Ashgrove St

Movement	EB	B9	WB	WB	SB
Directions Served	LT	T	T	TR	LR
Maximum Queue (m)	50.1	6.4	1.6	1.7	10.1
Average Queue (m)	21.5	1.4	0.2	0.2	4.0
95th Queue (m)	57.5	11.8	3.4	3.5	11.5
Link Distance (m)	51.2	81.6	38.4	38.4	
Upstream Blk Time (%)	2				
Queuing Penalty (veh)	0				
Storage Bay Dist (m)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 7: Richmond Rd & Fort St

Movement	EB	EB	EB	WB	WB	WB	B10	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	T	L	TR	L	T	R
Maximum Queue (m)	37.2	44.7	34.7	29.8	96.9	82.6	2.2	24.5	105.9	21.9	32.8	17.4
Average Queue (m)	21.2	35.5	14.0	11.4	69.8	52.4	0.7	6.0	83.9	18.2	27.5	12.4
95th Queue (m)	40.1	49.6	36.7	34.1	114.9	100.1	6.9	24.0	128.4	24.9	34.3	22.7
Link Distance (m)		38.4	38.4		102.4	102.4	17.8		103.4		22.2	
Upstream Blk Time (%)	1	9	0		4	1	0		29	10	33	0
Queuing Penalty (veh)	0	26	1		0	0	0		0	0	238	0
Storage Bay Dist (m)	45.0			25.0				30.0		25.0		10.0
Storage Blk Time (%)	1	9			53				55	10	38	1
Queuing Penalty (veh)	1	13			19				12	52	129	4

Intersection: 8: Richmond Rd & Coronation Ave/RJH

Movement	EB	WB	WB	NB	SB	SB
Directions Served	R	L	R	TR	L	TR
Maximum Queue (m)	8.8	8.3	9.7	60.5	24.9	69.9
Average Queue (m)	2.5	2.4	3.7	30.2	10.6	35.6
95th Queue (m)	8.8	9.3	11.1	66.0	24.5	80.2
Link Distance (m)	207.1		43.4	66.2		70.8
Upstream Blk Time (%)				1		4
Queuing Penalty (veh)				4		0
Storage Bay Dist (m)		10.0			20.0	
Storage Blk Time (%)		7	3		0	13
Queuing Penalty (veh)		1	0		0	9

Intersection: 20: Begbie St & Pembroke St

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 607

2: Birch St & Pembroke St Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	1.2	12.0	0.0	0.0	1.3	0.1	0.7
Total Del/Veh (s)	16.6	0.1	1.8	0.3	13.1	24.8	14.2

3: Richmond Rd & Pembroke St Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	144.4	118.3	0.0	0.0	0.0	0.0	6.3
Total Del/Veh (s)	169.5	260.1	13.1	5.5	22.0	18.8	23.5

4: Site & Pembroke St Performance by movement

Movement	EBT	EBR	WBL	WBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	9.7	1.4
Total Del/Veh (s)	138.7	114.4	1.9	0.4	134.4	68.5

5: Richmond Rd & Birch St Performance by movement

Movement	EBT	NBT	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.2	0.1
Total Del/Veh (s)	0.1	3.3	33.9	19.1

6: Fort St & Ashgrove St Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Del/Veh (s)	13.0	7.1	2.5	1.4	53.2	10.0	5.3

7: Richmond Rd & Fort St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	4.0	1.9	1.8	0.0	0.0	0.2
Total Del/Veh (s)	31.7	16.0	2.2	65.4	56.0	14.5	54.2	47.1	40.7	33.8	19.3	6.7

7: Richmond Rd & Fort St Performance by movement

Movement	All
Denied Del/Veh (s)	0.4
Total Del/Veh (s)	32.8

8: Richmond Rd & Coronation Ave/RJH Performance by movement

Movement	EBR	WBL	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.2	4.1	0.2	0.0	0.0	37.4	21.1	19.7	11.1
Total Del/Veh (s)	23.9	38.5	8.7	7.3	5.3	17.3	24.7	25.7	16.9

20: Begbie St & Pembroke St Performance by movement

Movement	EBT	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	0.0	0.2	0.0

Total Network Performance

Denied Del/Veh (s)	10.5
Total Del/Veh (s)	66.5

Intersection: 2: Birch St & Pembroke St

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (m)	4.0	0.9	17.7
Average Queue (m)	0.7	0.1	7.6
95th Queue (m)	4.8	1.9	18.8
Link Distance (m)		43.5	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Richmond Rd & Pembroke St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	37.5	71.6	69.8
Average Queue (m)	32.7	30.0	60.1
95th Queue (m)	46.7	80.0	89.1
Link Distance (m)	35.9	74.2	66.2
Upstream Blk Time (%)	69	1	13
Queuing Penalty (veh)	56	10	110
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Site & Pembroke St

Movement	EB	NB
Directions Served	TR	LR
Maximum Queue (m)	40.1	21.7
Average Queue (m)	20.2	10.8
95th Queue (m)	49.6	26.0
Link Distance (m)	43.5	29.4
Upstream Blk Time (%)	17	9
Queuing Penalty (veh)	11	0
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Richmond Rd & Birch St

Movement	NB	SB
Directions Served	T	TR
Maximum Queue (m)	30.1	78.7
Average Queue (m)	8.6	74.3
95th Queue (m)	28.6	88.2
Link Distance (m)	22.2	74.2
Upstream Blk Time (%)	2	34
Queuing Penalty (veh)	14	291
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Fort St & Ashgrove St

Movement	EB	B9	SB
Directions Served	LT	T	LR
Maximum Queue (m)	67.4	19.7	11.9
Average Queue (m)	31.4	3.5	5.1
95th Queue (m)	72.1	20.9	13.6
Link Distance (m)	51.2	81.6	
Upstream Blk Time (%)	5		
Queuing Penalty (veh)	0		
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 7: Richmond Rd & Fort St

Movement	EB	EB	EB	WB	WB	WB	B10	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	T	L	TR	L	T	R
Maximum Queue (m)	37.7	45.4	37.8	24.4	106.2	89.8	11.2	35.2	97.3	22.4	32.2	17.8
Average Queue (m)	25.8	37.9	16.7	9.3	79.4	61.9	4.7	13.7	70.6	17.3	27.6	12.1
95th Queue (m)	41.6	51.3	42.4	31.4	133.0	114.2	19.3	35.4	120.7	24.7	33.3	24.4
Link Distance (m)		38.4	38.4		102.4	102.4	17.8		103.4		22.2	
Upstream Blk Time (%)	2	12	1		13	1	7		8	7	47	0
Queuing Penalty (veh)	0	39	2		0	0	0		0	0	404	0
Storage Bay Dist (m)	45.0			25.0				30.0		25.0		10.0
Storage Blk Time (%)	2	12		0	56			1	42	7	52	2
Queuing Penalty (veh)	4	23		0	18			2	24	48	194	13

Intersection: 8: Richmond Rd & Coronation Ave/RJH

Movement	EB	WB	WB	NB	SB	SB
Directions Served	R	L	R	TR	L	TR
Maximum Queue (m)	9.5	14.7	17.3	65.5	15.4	81.4
Average Queue (m)	2.3	7.8	10.1	35.9	2.8	65.9
95th Queue (m)	9.5	17.2	17.8	71.3	12.6	100.5
Link Distance (m)	207.1		43.4	66.2		70.8
Upstream Blk Time (%)				1		36
Queuing Penalty (veh)				7		0
Storage Bay Dist (m)		10.0			20.0	
Storage Blk Time (%)		28	14		0	45
Queuing Penalty (veh)		18	5		0	8

Intersection: 20: Begbie St & Pembroke St

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 1301

2: Birch St & Pembroke St Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBT	NBR	All
Denied Del/Veh (s)	0.1	0.2	0.0	0.0	0.0		0.0	0.0
Total Del/Veh (s)	1.0	0.1	1.2	0.2	5.7		2.8	2.3

3: Richmond Rd & Pembroke St Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.4	1.4	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	37.1	18.9	13.2	4.1	3.6	2.2	5.5

4: Site & Pembroke St Performance by movement

Movement	EBT	EBR	WBL	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.3	0.1	1.6	0.3	0.4

6: Fort St & Ashgrove St Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Del/Veh (s)	9.5	4.2	2.5	1.2	33.5	7.6	3.6

7: Richmond Rd & Fort St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	3.6	0.8	0.9	0.4	0.1	0.1
Total Del/Veh (s)	28.6	19.8	2.3	81.8	57.9	12.0	34.6	38.9	32.9	35.8	21.2	13.0

7: Richmond Rd & Fort St Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	33.6

8: Richmond Rd & Coronation Ave/RJH Performance by movement

Movement	EBR	WBL	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	3.8	0.1	0.0	0.0	3.1	1.0	0.6	0.7
Total Del/Veh (s)	7.3	26.4	5.8	4.5	3.8	7.8	5.5	2.4	5.3

9: Birch St & South Access Performance by movement

Movement	WBR	NBT	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.1
Total Del/Veh (s)	1.8	0.9	0.1	0.8

20: Begbie St & Pembroke St Performance by movement

Movement	EBT	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	0.0	0.4	0.1

Total Network Performance

Denied Del/Veh (s)	0.9
Total Del/Veh (s)	38.5

Intersection: 2: Birch St & Pembroke St

Movement	EB	NB
Directions Served	TR	LR
Maximum Queue (m)	0.9	8.8
Average Queue (m)	0.1	6.2
95th Queue (m)	1.9	10.4
Link Distance (m)		67.5
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Richmond Rd & Pembroke St

Movement	EB	NB	NB	SB
Directions Served	LR	L	T	TR
Maximum Queue (m)	28.7	15.2	31.2	32.8
Average Queue (m)	17.5	7.3	8.1	12.5
95th Queue (m)	30.3	16.8	36.4	36.9
Link Distance (m)	34.4		112.3	66.3
Upstream Blk Time (%)	1			0
Queuing Penalty (veh)	1			0
Storage Bay Dist (m)		15.0		
Storage Blk Time (%)		2	2	
Queuing Penalty (veh)		10	1	

Intersection: 4: Site & Pembroke St

Movement	EB	WB
Directions Served	TR	LT
Maximum Queue (m)	1.8	3.7
Average Queue (m)	0.3	0.7
95th Queue (m)	2.8	4.6
Link Distance (m)	43.3	34.4
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Fort St & Ashgrove St

Movement	EB	B18	SB
Directions Served	LT	T	LR
Maximum Queue (m)	48.0	1.8	10.1
Average Queue (m)	19.6	0.5	3.5
95th Queue (m)	50.9	4.8	11.0
Link Distance (m)	51.2	81.6	
Upstream Blk Time (%)	1		
Queuing Penalty (veh)	0		
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 7: Richmond Rd & Fort St

Movement	EB	EB	EB	WB	WB	WB	B10	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	T	L	TR	L	T	R
Maximum Queue (m)	34.7	40.5	35.8	31.9	107.4	90.7	12.9	22.0	93.2	32.3	95.5	17.2
Average Queue (m)	19.6	34.1	13.9	11.0	78.0	58.7	2.6	5.5	61.8	26.9	59.4	11.2
95th Queue (m)	37.6	48.2	37.4	34.5	122.7	105.1	13.8	23.6	104.9	39.1	107.0	22.4
Link Distance (m)		38.4	38.4		101.3	101.3	17.8		103.4		112.3	
Upstream Blk Time (%)	0	8	0		7	0	2		3		0	
Queuing Penalty (veh)	0	23	1		0	0	0		0		2	
Storage Bay Dist (m)	45.0			25.0				30.0		25.0		10.0
Storage Blk Time (%)	0	8		0	62				40	19	29	1
Queuing Penalty (veh)	0	11		0	22				9	99	97	6

Intersection: 8: Richmond Rd & Coronation Ave/RJH

Movement	EB	WB	WB	NB	SB	SB
Directions Served	R	L	R	TR	L	TR
Maximum Queue (m)	7.7	8.6	9.0	47.2	17.6	70.8
Average Queue (m)	2.5	2.9	3.0	21.9	8.8	35.7
95th Queue (m)	8.7	9.8	9.8	47.9	19.0	77.2
Link Distance (m)	206.9		43.4	66.3		70.8
Upstream Blk Time (%)				0		1
Queuing Penalty (veh)				1		0
Storage Bay Dist (m)		10.0			20.0	
Storage Blk Time (%)		8	2		0	10
Queuing Penalty (veh)		1	0		1	6

Intersection: 9: Birch St & South Access

Movement	WB
Directions Served	LR
Maximum Queue (m)	10.8
Average Queue (m)	5.6
95th Queue (m)	13.2
Link Distance (m)	9.9
Upstream Blk Time (%)	2
Queuing Penalty (veh)	0
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20: Begbie St & Pembroke St

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 292

2: Birch St & Pembroke St Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.9	0.1	1.7	0.0	4.6	3.5	2.4

3: Richmond Rd & Pembroke St Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	3.0	2.2	0.0	0.0	0.0	0.0	0.2
Total Del/Veh (s)	34.6	30.0	23.6	6.5	9.8	7.1	10.2

4: Site & Pembroke St Performance by movement

Movement	EBT	EBR	WBL	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	1.5	0.3	2.2	0.5	1.2

6: Fort St & Ashgrove St Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Del/Veh (s)	14.1	7.7	2.4	1.2	75.4	68.0	6.0

7: Richmond Rd & Fort St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.0	0.0	0.0	0.0	0.0	5.0	2.2	1.8	1.3	0.4	0.0
Total Del/Veh (s)	35.8	17.7	1.8	65.5	52.0	12.6	55.7	42.7	37.0	54.9	36.5	25.2

7: Richmond Rd & Fort St Performance by movement

Movement	All
Denied Del/Veh (s)	0.7
Total Del/Veh (s)	37.1

8: Richmond Rd & Coronation Ave/RJH Performance by movement

Movement	EBR	WBL	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	4.0	0.3	0.0	0.0	5.2	4.1	4.3	2.2
Total Del/Veh (s)	9.0	35.4	9.2	7.2	6.0	15.1	11.8	8.2	10.3

9: Birch St & South Access Performance by movement

Movement	WBR	NBT	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.1
Total Del/Veh (s)	3.0	0.9	0.2	1.1

20: Begbie St & Pembroke St Performance by movement

Movement	EBT	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	0.0	0.4	0.1

Total Network Performance

Denied Del/Veh (s)	3.3
Total Del/Veh (s)	49.0

Intersection: 2: Birch St & Pembroke St

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (m)	1.8	0.9	11.3
Average Queue (m)	0.1	0.0	6.9
95th Queue (m)	1.9	0.0	11.5
Link Distance (m)		43.3	67.5
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Richmond Rd & Pembroke St

Movement	EB	NB	NB	SB
Directions Served	LR	L	T	TR
Maximum Queue (m)	31.4	14.3	54.7	61.3
Average Queue (m)	20.0	6.9	24.0	33.6
95th Queue (m)	34.2	16.6	57.5	78.5
Link Distance (m)	34.4		112.3	66.3
Upstream Blk Time (%)	3			4
Queuing Penalty (veh)	2			33
Storage Bay Dist (m)		15.0		
Storage Blk Time (%)		4	9	
Queuing Penalty (veh)		24	4	

Intersection: 4: Site & Pembroke St

Movement	EB	WB
Directions Served	TR	LT
Maximum Queue (m)	3.3	7.0
Average Queue (m)	0.6	0.9
95th Queue (m)	4.7	5.8
Link Distance (m)	43.3	34.4
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Fort St & Ashgrove St

Movement	EB	B18	SB
Directions Served	LT	T	LR
Maximum Queue (m)	65.4	11.6	15.0
Average Queue (m)	32.0	2.1	6.7
95th Queue (m)	74.7	12.5	22.3
Link Distance (m)	51.2	81.6	
Upstream Blk Time (%)	5		
Queuing Penalty (veh)	0		
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 7: Richmond Rd & Fort St

Movement	EB	EB	EB	WB	WB	WB	B10	NB	NB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	T	L	TR	L	T	R
Maximum Queue (m)	37.6	45.2	36.1	29.2	101.6	85.5	5.6	33.9	99.9	32.3	115.8	17.5
Average Queue (m)	26.3	37.9	13.0	7.0	78.2	54.7	2.7	15.7	71.2	27.4	89.7	13.1
95th Queue (m)	42.8	49.6	36.6	28.0	124.9	111.8	14.6	37.4	113.9	40.4	142.8	22.9
Link Distance (m)		38.4	38.4		101.3	101.3	17.8		103.4		112.3	
Upstream Blk Time (%)	2	16	0		10	1	8		7		9	
Queuing Penalty (veh)	0	54	1		0	0	0		0		80	
Storage Bay Dist (m)	45.0			25.0				30.0		25.0		10.0
Storage Blk Time (%)	2	16		0	55			1	41	20	44	1
Queuing Penalty (veh)	5	31		0	18			4	24	130	163	7

Intersection: 8: Richmond Rd & Coronation Ave/RJH

Movement	EB	WB	WB	NB	SB	SB
Directions Served	R	L	R	TR	L	TR
Maximum Queue (m)	8.5	15.5	18.5	54.8	18.2	75.3
Average Queue (m)	2.9	8.6	9.9	35.9	5.6	55.1
95th Queue (m)	9.8	18.2	19.4	63.2	18.7	88.9
Link Distance (m)	206.9		43.4	66.3		70.8
Upstream Blk Time (%)				0		10
Queuing Penalty (veh)				2		0
Storage Bay Dist (m)		10.0			20.0	
Storage Blk Time (%)		29	15		0	24
Queuing Penalty (veh)		19	5		0	4

Intersection: 9: Birch St & South Access

Movement	WB
Directions Served	LR
Maximum Queue (m)	10.2
Average Queue (m)	5.2
95th Queue (m)	12.8
Link Distance (m)	9.9
Upstream Blk Time (%)	2
Queuing Penalty (veh)	0
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20: Begbie St & Pembroke St

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

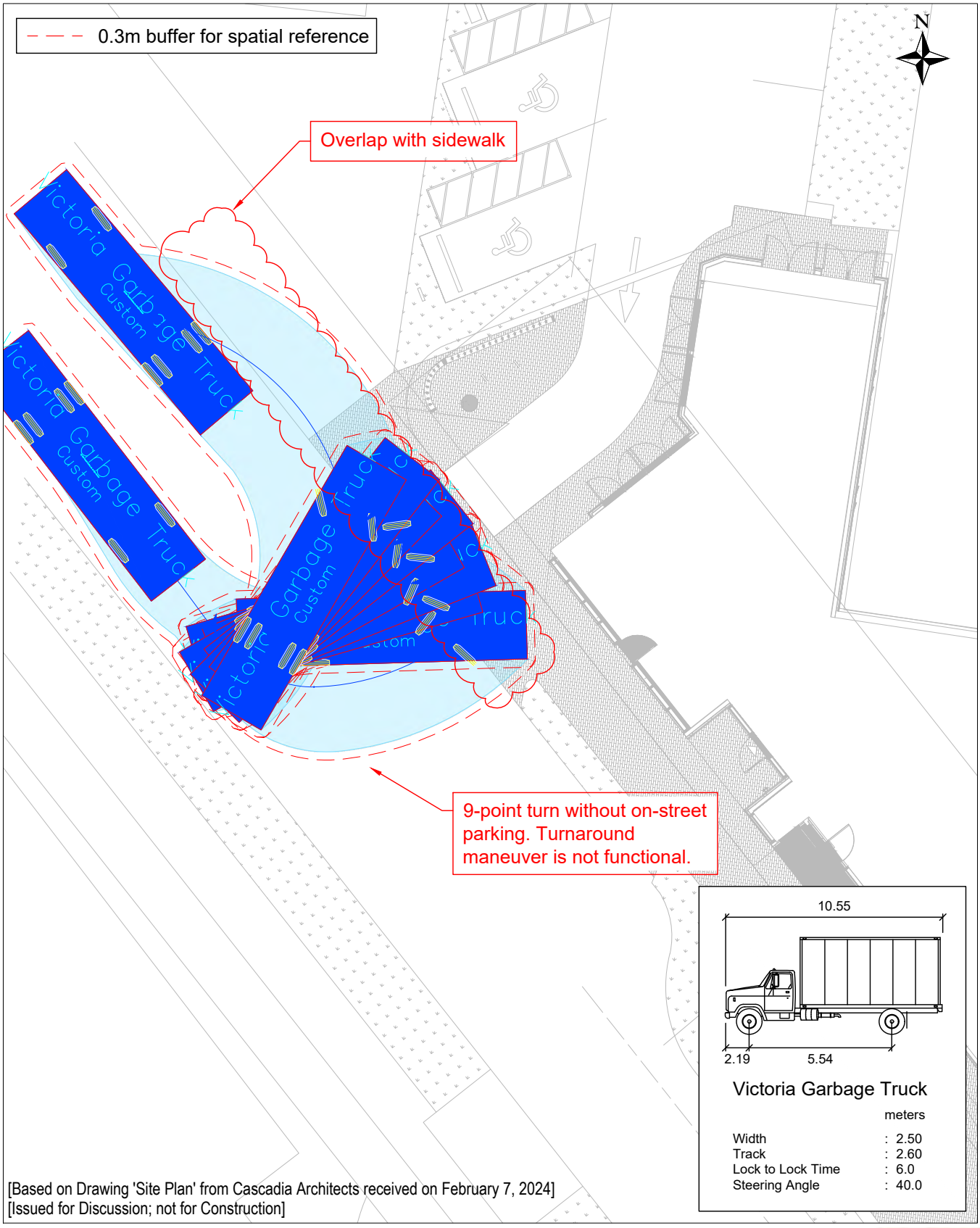
Network Summary

Network wide Queuing Penalty: 608

The attached information is provided to support the agency's review process and shall not be distributed to other parties without written consent from Bunt & Associates Engineering Ltd.

APPENDIX D

Swept Path Analysis



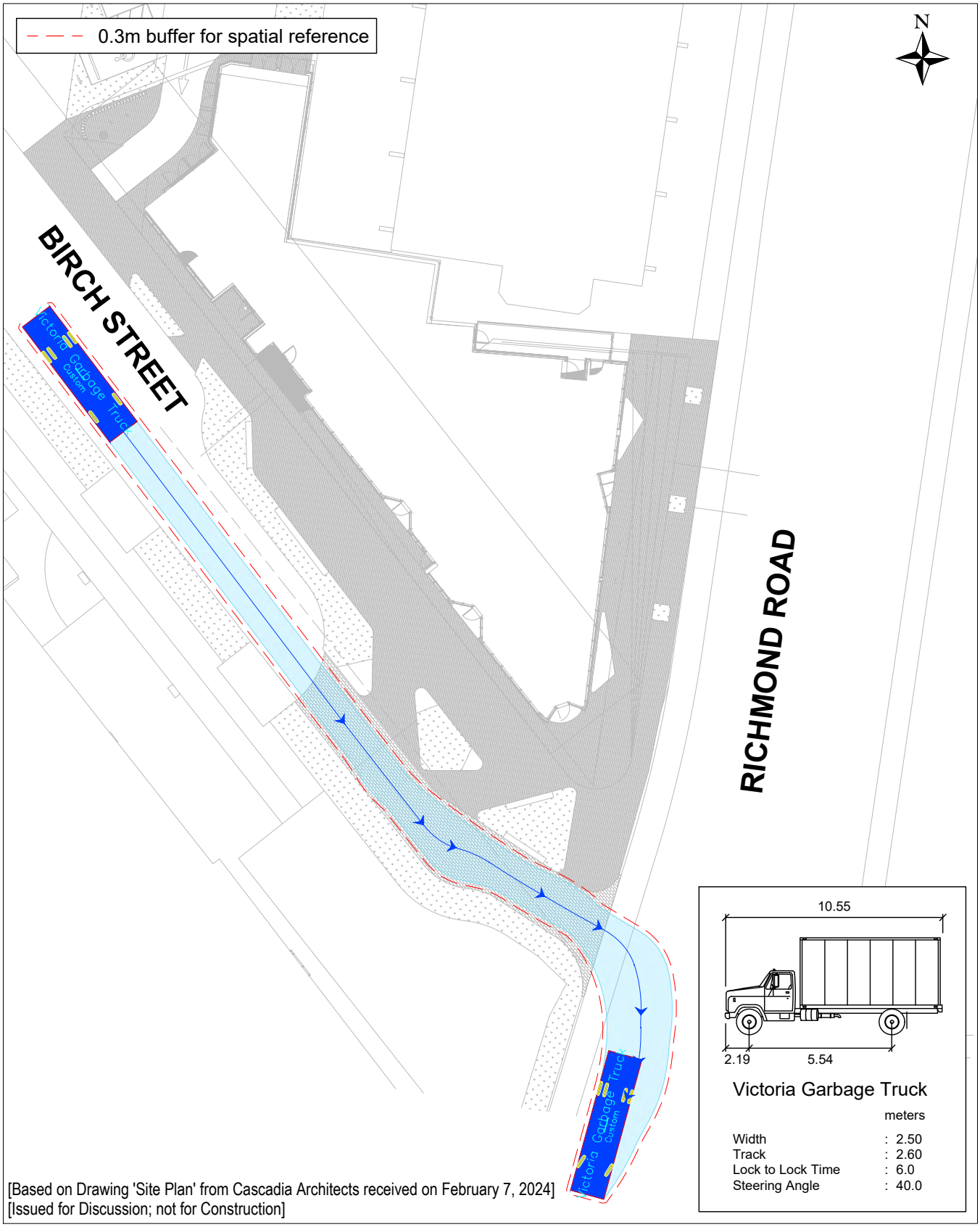
[Based on Drawing 'Site Plan' from Cascadia Architects received on February 7, 2024]
[Issued for Discussion; not for Construction]

Exhibit D.1a

Waste Collection Turnaround - Birch Street

2002 Richmond Road
08-23-0004 February 2024 Scale 1:200 on Letter Prepared by KQ

bunt & associates



[Based on Drawing 'Site Plan' from Cascadia Architects received on February 7, 2024]
[Issued for Discussion; not for Construction]

Exhibit D.1b

Waste Collection via Proposed Plaza

2002 Richmond Road
08-23-0004 February 2024 Scale 1:400 on Letter Prepared by KQ

bunt & associates

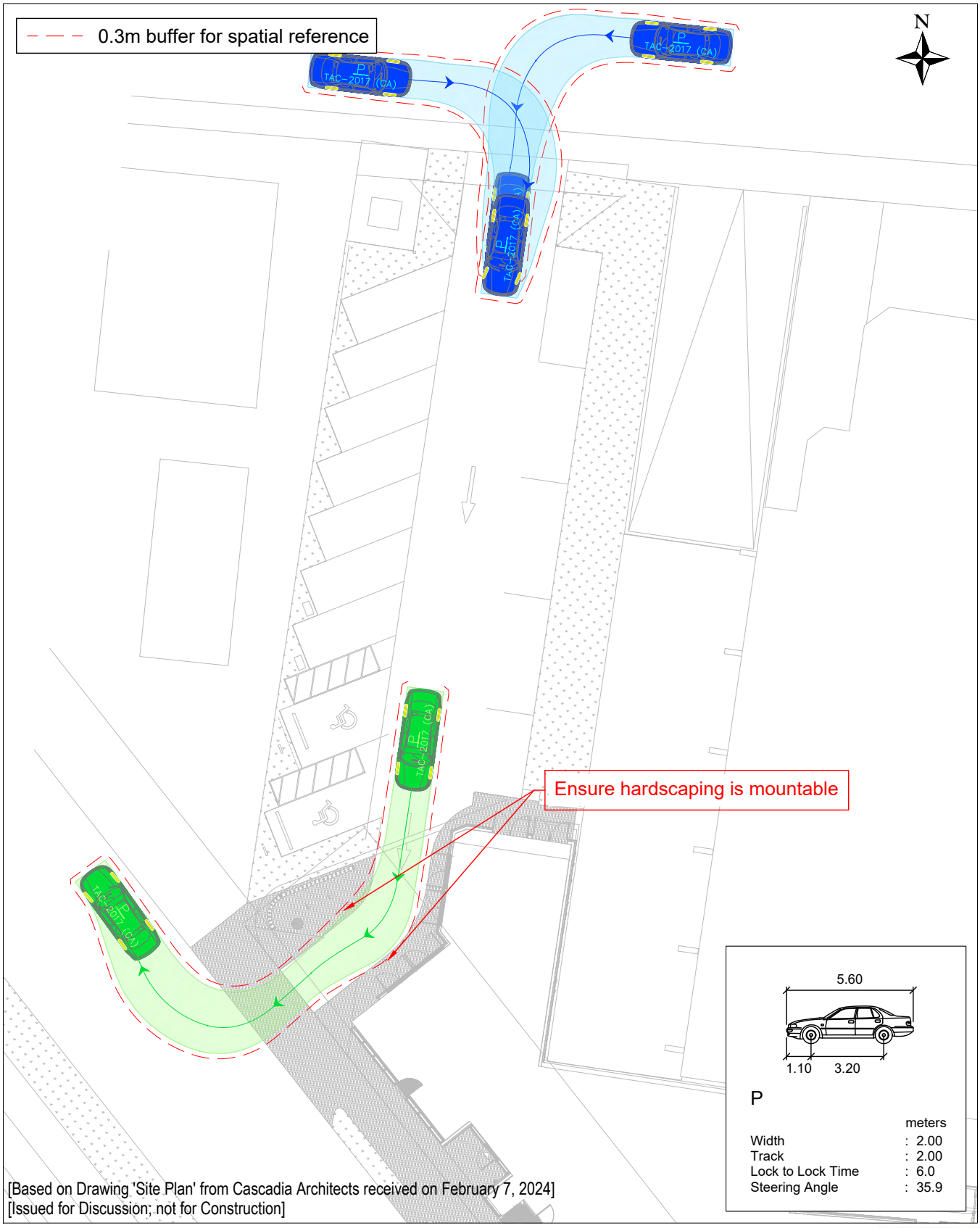


Exhibit D.2

Passenger Vehicle Circulation

08-23-0004 February 2024 Scale 1:300 on Letter Prepared by KQ

2002 Richmond Road

bunt & associates

[Based on Drawing 'Site Plan' from Cascadia Architects received on February 7, 2024]
[Issued for Discussion; not for Construction]

Exhibit D.3

Passenger Vehicle Parking - Inbound

08-23-0004 February 2024 Scale 1:300 on Letter Prepared by KQ

2002 Richmond Road

bunt & associates

[Based on Drawing 'Site Plan' from Cascadia Architects received on February 7, 2024]
[Issued for Discussion; not for Construction]

Exhibit D.4

Passenger Vehicle Parking - Outbound

08-23-0004 February 2024 Scale 1:300 on Letter Prepared by KQ

2002 Richmond Road

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