WATT Consulting Group

ESQUIMALT & LAMPSON CORNERS

Traffic Impact Assessment

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Author: MJ Oh

Reviewer: Nadine King, P.Eng., PTOE

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1.0 INTRODUCTION

Watt Consulting Group was retained by GT Mann Contracting to conduct a traffic impact assessment for the proposed multi-family residential development on the northwest corner of Esquimalt Road / Lampson Street in the Township of Esquimalt. The study will review 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 key intersection of Esquimalt Road / Lampson Street.

Figure 1: Study Area and Site Location

2.0 EXISTING CONDITIONS

2.1 LAND USE

There are five (5) single-family houses on the existing site and the current zoning is multi-family residential (RM-1: 3 Lots on Esquimalt Road) and comprehensive development (CD-22: 2 Lots on Lampson Street). The area surrounding the development site is a mix of multi-family and single-family residential. The Esquimalt Plaza shopping mall and recreation centre are located within walking distance (300m, 4-minute walk) from the site to the west.

2.2 ROAD NETWORK

Esquimalt Road is an east-west major road with a three-lane cross section (centre medians or two-way left turn lane) through the town. There are sidewalks and bike lanes on both sides of Esquimalt Road. Lampson Street is a two-lane major road running north-south and connects to Craigflower Road to the north. The speed limit is 40 km/h for all roads in the study area.

The Esquimalt Road / Lampson Street intersection is signalized with split phasing on Esquimalt Road. The existing laning at the intersection is a left / through lane and a right lane for all four (4) approaches.

2.3 TRAFFIC VOLUMES

Traffic counts for Esquimalt Road / Lampson Street were collected from the 2018 Township of Esquimalt City-Wide Network Study. The traffic counts were undertaken at the intersection during the AM and PM peak hours on March 8, 2018. Background volumes for the analysis (short term and 10-year horizon) were obtained using an annual 2.0% growth rate. See **Figure 2** for 2021 peak hour background volumes.

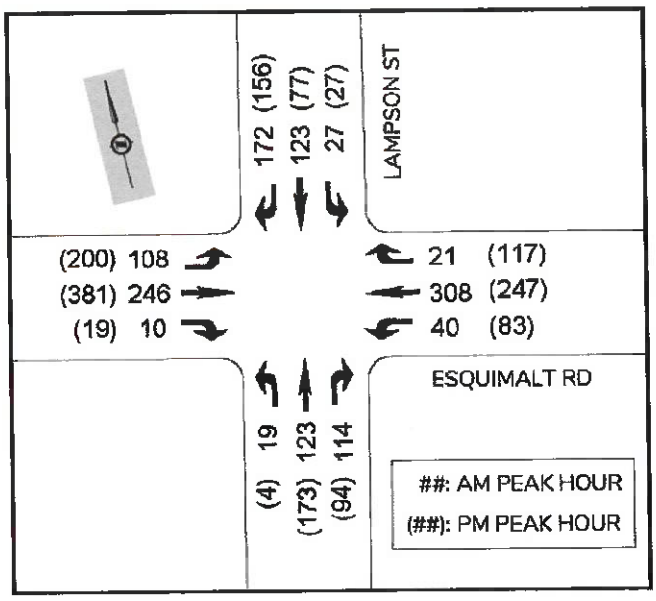

Figure 2: 2021 Peak Hour Background Volumes

2.4 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 (Synchro 9/10) 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 (7.5m for a vehicle).

The delays and type of traffic control are used to determine the level of service. The level of services are broken down into six letter grades with LOS A being excellent operations and LOS F being unstable / failure operations. Level of service C is generally considered

to be an acceptable LOS by most municipalities. Level of service D is generally considered to be on the threshold between acceptable and unacceptable operations. A description of level of service and Synchro is provided in **Appendix A**.

2.5 2021 BACKGROUND TRAFFIC CONDITIONS

The 2021 background traffic conditions were analyzed for Esquimalt Road / Lampson Street during the AM and PM peak hours.

In the AM peak hour, the intersection operates at a LOS D or better for all movements except the southbound left/through movement (on Lampson Road) which operates at a LOS E. In the PM peak hour, the southbound left/through movement is at a LOS F, and the westbound left/through and northbound left/through movements operate at a LOS E. In the PM peak hour, the westbound right turn movement exceeds the right turn lane storage. See **Table 1** for opening day background LOS, delays, and queues.

TABLE 1: 2021 BACKGROUND CONDITIONS AT ESQUIMALT RD/LAMPSON ST

MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
	LOS	Delay (s)	Queue (m)	LOS	Delay (s)	Queue (m)
EBLT	D	42.8	86.0	D	51.7	156.1
EBR	A	0.2	20.1 (25)	A	1.2	30.3 (25)
WBLT	C	34.4	87.1	**E**	59.3	102.7
WBR	A	0.2	25.7 (40)	B	14.8	60.8 (40)
NBLT	D	51.0	43.5	**E**	66.4	68.0
NBR	A	9.3	15.1 (40)	B	11.3	30.2 (40)
SBLT	E	56.6	41.0	**F**	102.7	48.7
SBR	A	9.5	32.1 (35)	B	11.2	31.2 (35)

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

3.0 POST DEVELOPMENT

3.1 PROPOSED LAND USE

The proposed development is for two mid-rise multi-family residential buildings with a total of 89 dwelling units.

3.2 SITE ACCESS

Two site accesses are proposed: one (Access 1) is on Esquimalt Road and the other (Access 2) on Lampson Street. Access 1 is located 40m from Esquimalt Road. Access 2 is located 50m from Esquimalt Road and is offset from Wordsley Street. See **Figure 3** for the site plan and accesses.

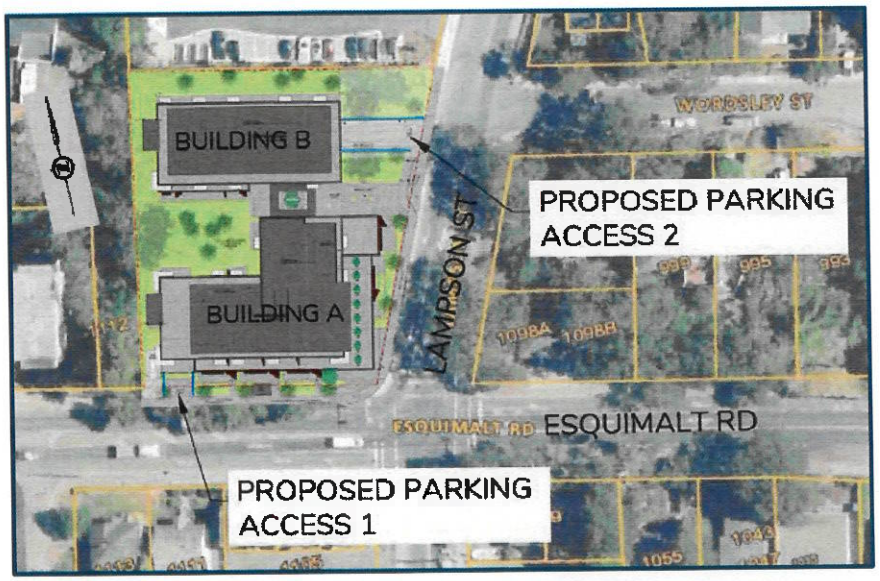

Figure 3: Site Plan and Accesses

The proposed site access on Esquimalt Road does not meet the TAC's suggested minimum corner clearance for collector road (55m) or arterial road (70m) at major intersections. The placement of the access is also within the eastbound left/through lane and the westbound left turn lane for Joffre Street. Further, the 95th percentile eastbound queue lengths are 91m during the AM peak hour and 159m during the PM based on the

opening day post development analysis results. Therefore, Access 1 on Esquimalt Road is to be a right in and right out for safety.

The proposed site access on Lampson Street is 5m less than TAC's suggested minimum corner clearance (55m) for collector road from Esquimalt Road; however, the 95th percentile southbound queue lengths are 46m to 49m (28m on average) during the peak hours based on opening day analysis results. Therefore, the queues from the intersection will not block the proposed access. The northbound queues at the access on Lampson Street will not queue back to Esquimalt Road (less than 2 vehicle queue on average). Based on the 2021 post development analysis, the exiting movement (left turns) from the access will operate at a LOS B and therefore there is no operational issues with a full movement access on Lampson Street.

At Access 2 on Lampson Street, the available sight distance (100m) to the left and right (through the intersection) meets the TAC's required intersection sight distance (85m) for a 40 km/h speed limit (posted speed). For vehicles turning from Esquimalt Road to be observed, the sight distance is only 55m; however, these vehicles will be travelling at 20 to 25km/h, which requires a left turning sight distance of 45m which is exceeded. Across from the site access, Wordsley Street has no restricted turn movements. The offset between the Wordsley Street intersection and the site access minimizes left turning (into each access/road). Based on the assessment the Lampson Street access can be full movement in the short term; however, in the long term left turns from Lampson into the driveway may need to be restricted. Significant left turns into the Lampson Street access are not expected as only traffic from west of Lampson Road (travelling eastbound) would need to turn left into the access which would only be several trips per peak hour. For the purpose of the study, no left turns into the Lampson Street access were analyzed.

3.3 TRIP GENERATION

Trip generation rates were estimated using the 10th Edition of the ITE Trip Generation Manual. Trip generation rates for the weekday AM and PM peak hours are shown in **Table 2**. **Table 3** shows the estimated trips generated by the proposed development with multi-family residential use. The existing site trips were deducted from the generated site trips. The development is expected to generate 28 new weekday AM peak hour trips and 34 new weekday PM peak hour trips to the surrounding road network.

TABLE 2: PEAK HOUR TRIP GENERATION RATES

ITE Land Use		Weekday AM			Weekday PM		
Code	Description	Rate	In	Out	Rate	In	Out
221	Multi-Family Housing (Mid-Rise)	0.36	26%	74%	0.44	61%	39%

TABLE 3: ESTIMATED DEVELOPMENT TRIPS

Description	Units	Weekday AM			Weekday PM		
		In	Out	Total	In	Out	Total
Multi-family (Mid-Rise)	89	8	24	32	24	15	39
Existing Trips Deduction *	5	(-1)	(-3)	(-4)	(-3)	(-2)	(-5)
Net Trips Total		7	21	28	21	13	34

* Existing trips estimated based on existing land uses of the site (5 Single-Family Homes).

3.4 TRIP ASSIGNMENT

The site trip assignment is based on the 2017 CRD Origin-Destination Household Travel Survey Report and existing trip distributions at the study intersection in the area. **Table 4** illustrates the site trip distributions for AM and PM peak hours. The resulted trip assignments for peak hours are shown in **Figure 4**.

TABLE 4: DISTRIBUTION PERCENTAGES OF SITE TRIPS

AM Peak Hour	PM Peak Hour
• 60% of trips from/to the East • 10% of trips from/to the West • 25% of trips from/to the North • 5% of trips from/to the South	• 60% of trips from the East • 10% of trips from the West • 25% of trips from the North • 5% of trips from the South • 50% of trips to the East • 15% of trips to the West • 30% of trips to the North • 5% of trips to the South

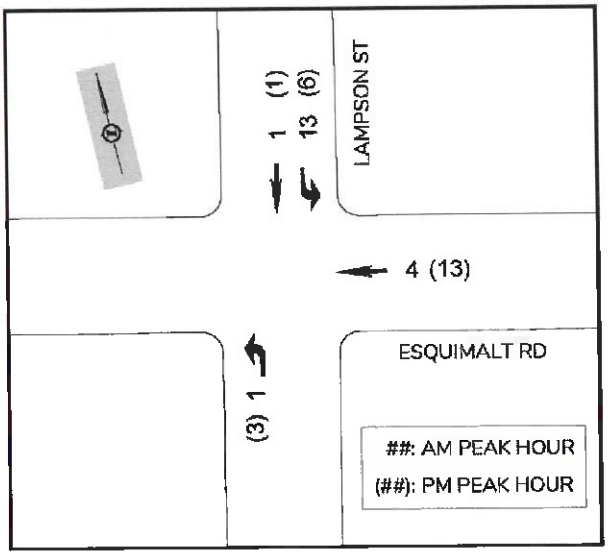

Figure 4: Trip Assignment

3.5 OPENING DAY POST DEVELOPMENT TRAFFIC CONDITIONS

The opening day post development conditions were analyzed for the intersection of Esquimalt Road / Lampson Street during the AM and PM peak hours.

In the AM peak hour with the development, the westbound left/through movement will drop to a LOS D, but the additional delay by the development will be less than two (2) seconds. All other movements will continue to operate at the same levels of service as

background conditions. In the PM peak hour with the development, all movements will operate at the same levels of service as the background conditions. The estimated additional queues by the development will be minor with less than 5m added for any movements except for the Esquimalt Road westbound left/through, which increases from 103m to 125m in the PM peak hour.

The proposed development does not trigger the need for any mitigation measures at Esquimalt Road / Lampson Street. See **Table 5** for opening day post development LOS, delays, and queues.

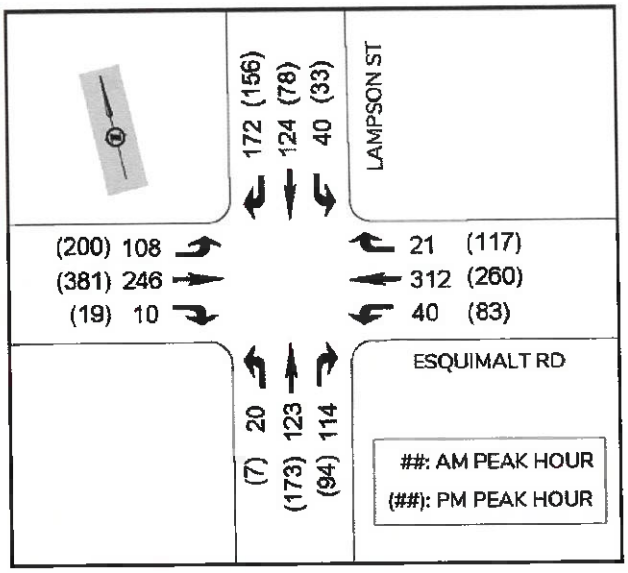

Figure 5: Opening Day Post Development Volumes

TABLE 5: OPENING DAY POST DEVELOPMENT AT ESQUIMALT RD/LAMPSON ST

MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
	LOS	Delay (s)	Queue (m)	LOS	Delay (s)	Queue (m)
EBLT	D	44.1	91.2	D	53.8	158.6
EBR	A	0.2	23.3 (25)	A	1.2	28.8 (25)
WBLT	D	35.9	88.1	**E**	**63.7**	125.2
WBR	A	0.2	21.0 (40)	B	15.5	70.0 (40)
NBLT	D	49.5	43.6	**E**	**64.1**	65.9
NBR	A	8.9	16.4 (40)	B	11.0	27.9 (40)
SBLT	**E**	**67.1**	46.0	**F**	**109.0**	45.7
SBR	A	9.1	39.9 (35)	B	10.8	39.7 (35)

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

4.0 2031 10-YEAR HORIZON TRAFFIC CONDITIONS

For the ten-year horizon analysis, 2031 background volumes were obtained using an annual growth rate of 2.0%, which is based on the Esquimalt City-Wide Network Study. See **Figure 6** for 2031 peak hour background volumes.

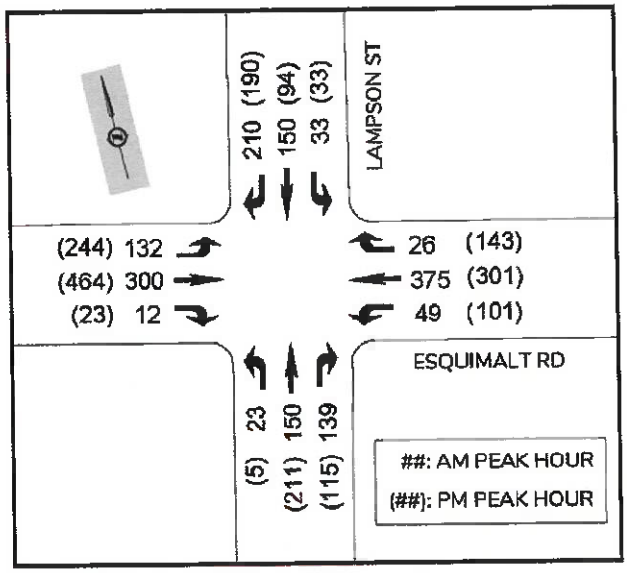

Figure 6: 2031 Background Volumes

4.1 2031 BACKGROUND CONDITIONS ANALYSIS RESULTS

The 2031 background conditions were analyzed for the intersection of Esquimalt Road / Lampson Street during the AM and PM peak hours with projected volumes.

In the AM peak hour, the three left/through movements for the eastbound / northbound / southbound will operate at a LOS E and the westbound left/through will operate at a LOS D. In the PM peak hour, the three left/through approaches will operate at a LOS F and the westbound left/through will operate at a LOS E with the current signal phasing.

To improve intersection operations, the eastbound and westbound laning (on Esquimalt Road) should be revised to a left turn lane and a through/right. This laning change will allow for the split phasing to be removed. Protected/permitted left turn phases could be added for the Esquimalt Road movements while permitted left turn phases remain for the Lampson Street movements. With these improvements, operations will operate at a LOS D or better for all movements in 2031. See **Tables 5** for 2031 background LOS, delays and queues.

TABLE 6: 2031 BACKGROUND CONDITIONS AT ESQUIMALT RD/LAMPSON ST

MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
	LOS	Delay (s)	Queue (m)	LOS	Delay (s)	Queue (m)
EBLT	E	**61.0**	127.6	F	**98.8**	**262.1**
EBR	A	0.2	31.7 (25)	A	1.9	40.7 (25)
WBLT	D	54.4	100.3	**F**	**90.4**	**181.1**
WBR	A	**1.0**	**31.0 (40)**	B	18.7	86.8 (40)
NBLT	E	**61.5**	82.9	**E**	**71.1**	100.8
NBR	A	**8.6**	39.0 (40)	B	12.0	61.2 (40)
SBLT	E	**73.1**	48.4	**F**	**175.0**	**61.8**
SBR	A	8.9	43.4 (35)	B	10.6	57.4 (35)

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

4.2 2031 POST DEVELOPMENT ANALYSIS RESULTS

The 2031 post development conditions were analyzed by adding the development trips to 2031 background traffic volumes. In the 2031 AM peak hour at Esquimalt Road / Lampson Street, all movements remain at the same LOS except for the southbound left/through, which will drop to a LOS F with the existing signal timing. In the PM peak hour, all movements will remain at the same LOS as background conditions with the existing signal timing. As with the background conditions, changes in the laning and removal of the split phasing will improve long term conditions.

See **Table 7** for the results of the 2031 post development analysis. See **Figure 7** for 2031 post development volumes.

TABLE 7: 2031 POST DEVELOPMENT AT ESQUIMALT RD/LAMPSON ST

MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
	LOS	Delay (s)	Queue (m)	LOS	Delay (s)	Queue (m)
EBLT	**E**	**71.8**	137.2	**F**	**98.8**	**252.4**
EBR	A	0.2	35.4 (25)	A	1.9	35.6 (25)
WBLT	D	52.6	**108.1**	**F**	**96.5**	**168.1**
WBR	A	0.9	30.5 (40)	B	19.2	77.1 (40)
NBLT	**E**	**60.1**	68.1	**E**	**73.2**	87.2
NBR	A	8.3	42.1 (40)	B	12.2	43.5 (40)
SBLT	**F**	**96.4**	50.5	**F**	**254.0**	**59.9**
SBR	A	8.6	46.1 (35)	B	10.6	54.3 (35)

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

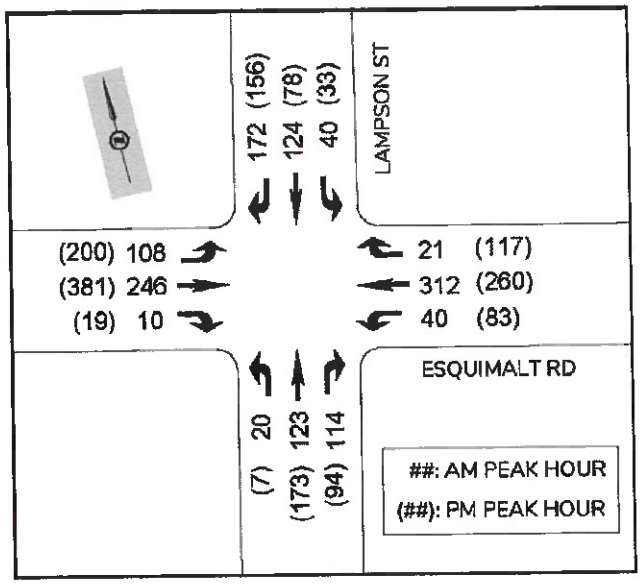

Figure 7: 2031 Post Development Volumes

5.0 ACTIVE TRANSPORTATION

5.1 PEDESTRIAN FACILITIES

Sidewalks are provided on both sides along Esquimalt Road and Lampson Street within the study area.

5.2 BICYCLE FACILITIES

Bike lanes are provided on Esquimalt Road with direct connection to downtown Victoria and the Galloping Goose Regional Trail. The site is also less than 1km from the Esquimalt + Nanaimo (E+N) Rail Trail, which provides a direct off-road cycling route to View Royal and the West Shore.

Currently, there are no bike facilities on Lampson Street; however, there are plans in the long-term for a bike facility on this road. The Township is currently undertaking its Active Transportation Network Plan. As part of that planning process, both technical analyses and public / stakeholder engagement will be undertaken to explore different

bike facility options on various corridors in the Township including Lampson Street. Therefore, a bike facility will likely be implemented on Lampson Street, but the specific facility has not yet been determined.

5.3 TRANSIT FACILITIES

The site has transit routes along the Lampson Street and Esquimalt Road frontages. Route 15 (Esquimalt/Uvic) is one of the region's frequent transit routes with service frequency of 15 minutes or less during weekdays. This route provides direct service between the DND and the University of Victoria, via downtown Victoria, and travels along Esquimalt Road. Route 26 (Dockyard/UVic) also provides services four (4) times an hour along Esquimalt Road and Lampson Street from DND to UVIC, via Tillicum & Uptown Mall.

There is a westbound transit stop directly on the Esquimalt frontage of the development. The current stop is approximately 50m in length (red curb) from Lampson Street to the east. At the intersection, there is a 20m bus bay / layby area; however, the painted curb extends beyond the layby area with another 30m as an on-street bus stop. The current bus stop sign and shelter are located at the west end of the stop in the on-street portion of the stop. Based on the current location of the bus stop sign and shelter, it is expected that buses are currently stopping in the vehicle travel lane; however, the actual operations of this stop should be reviewed with BC Transit to determine if the existing layby area is utilized. See **Figure 8** for current bus stop.

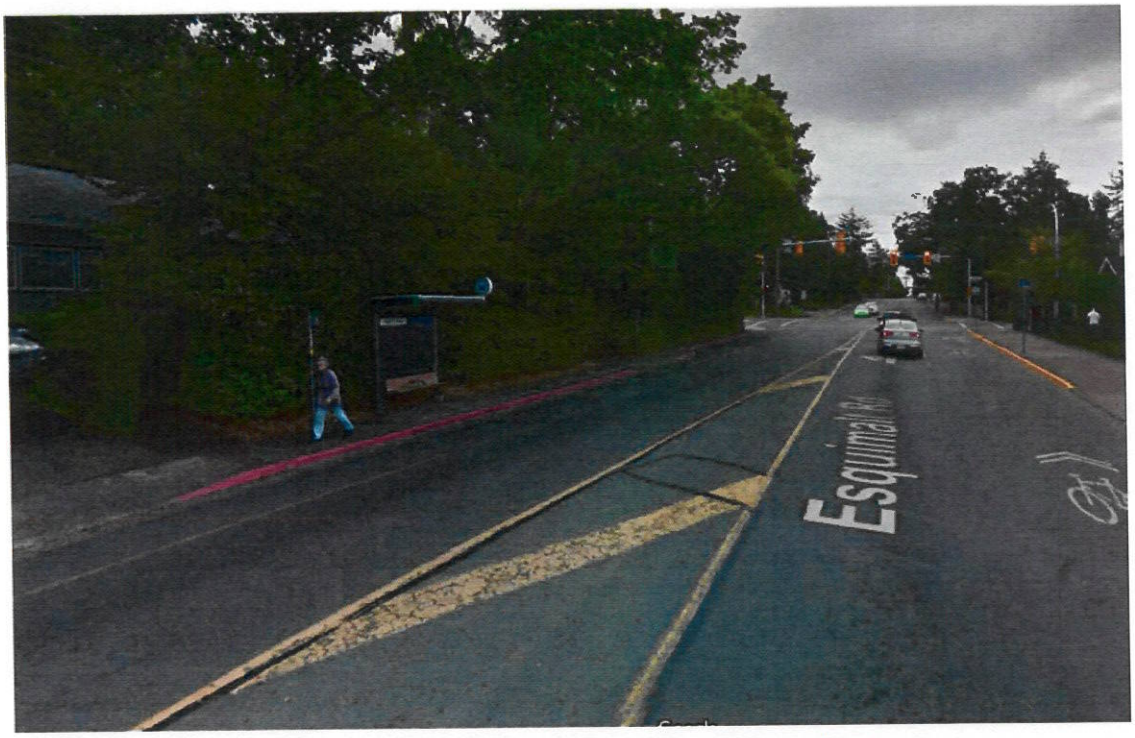

Figure 8: Existing Transit Stop on the Frontage

If the bus is currently stopping in the on-street portion of the stop, then the addition of the development traffic does not significantly impact operations at the signal as the westbound traffic would already be stopped behind the stopped transit vehicle. The added traffic on this section of Esquimalt Road is 4 vehicles per hour in the AM and 13 vehicles per hour in the PM or one additional vehicle every 15 minutes in the morning and one additional vehicle every 4.6 minutes or about one extra vehicle every three cycles of the traffic light. This additional traffic will not increase any existing queuing created by the on-street stop by more than one vehicle once and awhile.

If transit is utilizing the layby area only, the plan to switch to on-street operations may create queues behind the transit vehicle and block traffic when stopped. Most of this queueing would occur due to existing traffic as the development would add minimal additional traffic to this movement. It is recommended that BC Transit and the Township meet to discuss the current operations of this stop and BC Transit's preferred

stop type. Transit tends to prefer on-street stops as it allows them to re-enter traffic much easier than from a bus bay or layby area. If an on-street stop is preferred, then the stop should be located as far west of the intersection to allow for vehicles to queue behind the bus and make the signal. If the on-street stop is too close the intersection a stopped bus may block all westbound traffic per cycle from making the signal and since the intersection is split phases, it is a longer wait for the signal to return to westbound. This could frustrate drivers who may use the on-coming lane to try and pass the bus.

In addition to the westbound stop directly in front of the site on Esquimalt Road, there are two additional westbound stops within 130m. One is east of Lampson in front of the Westport/Southport residential buildings and one is west of Lampson Street at Fernhill Road. In the eastbound direction there are transit stops at Fernhill Road, the far side (east) of Lampson Street and then at Macaulay Street.

6.0 CONCLUSIONS

At the intersection of Esquimalt Road / Lampson Street, the three left/through movements currently operate at a LOS E/F with long queues on Esquimalt Road in the PM peak hour. In the AM peak hour, the southbound left/through movement operates at a LOS E while all other left/through movements operate at a LOS D or better. The proposed development does not impact traffic operations at the study intersection of Esquimalt Road / Lampson Street. The development will not change the existing levels of service at the intersection in the opening day peak hours as the added site trips are not significant. Therefore, no mitigation is required due to the development in the short term.

In 2031 ten-year horizon, without the development, all of the left/through movements will operate at a LOS E/F in the AM and PM peak hour except for the westbound left/through in the AM peak. The addition of the development drops the southbound left/through to a LOS F in the AM peak hour; all other movements and times of day remain at the same LOS. To mitigate these impacts in the long term, the eastbound and westbound approaches should be revised to a left turn lane and a through/right with

protected / permitted left turn phases for the Esquimalt Road movements. With these improvements, operations will operate at a LOS D or better for all movements.

At the site access on Esquimalt Road, traffic control should be a right in / right out due to the proximity of the signalized intersection and left/through lane, the eastbound left turn to Joffre Street, and the transit stop. At the site access on Lampson Street, the access can be full movement in the short term; however, left turn restrictions into the site in the long term may be required.

No bicycle or sidewalk changes are required due to this development. The existing bus stop on the site frontage should be reviewed with BC Transit to determine existing operations and their preference as to the type of stop. As indicated in Section 5.2, a bike facility is expected on Lampson Street in the near future.

7.0 RECOMMENDATIONS

The following recommendations are made for the proposed development in the short term:

- Restrict the Esquimalt Road access to right in / right out.
- Allow the Lampson Street access to be full movement.
- Consult with BC Transit and Township staff to determine if the existing layby is utilized by transit and if it can be removed leaving the stop approximately 50m from Esquimalt Road.

In the long term, for Esquimalt Road / Lampson Street, the City should consider changing the laning to a left and a through/right and protected / permitted left turn phases for the eastbound and westbound movements.

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