F

Roundhouse at Bayview Rezoning

File No: REZ00729

Final Submission

September 12, 2023

Appendix F: Transportation and Mobility

FILE: app-F-transportation-mobility-REZ00729_20230912.indd

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1.0 INTRODUCTION

This traffic impact assessment is for the rezoning application for the north portion of the Roundhouse at Bayview. The Bayview development is a 20 acres site consisting of the Bayview Place Hillside (10 acres) and Roundhouse (10 acres). The Roundhouse site is composed of two areas: the north and the south. For the purposes of this study transportation will be reviewed for the entire Roundhouse site. See **Figure 1** for the Bayview Place Hillside and Roundhouse.

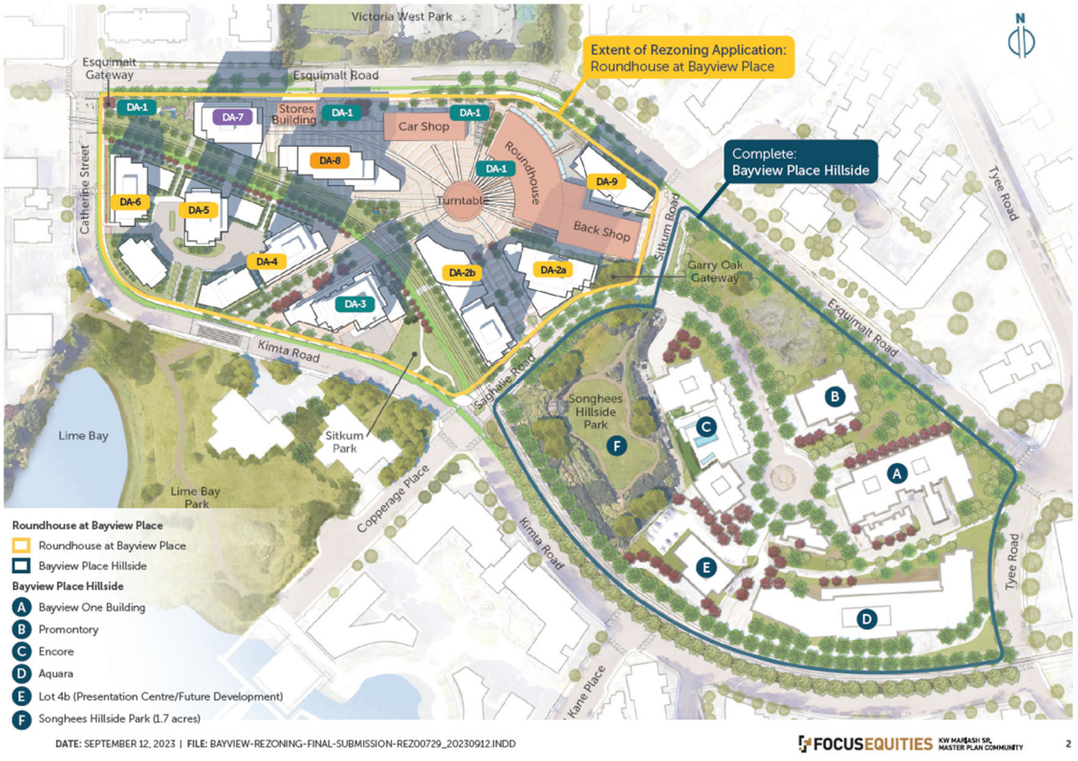

Figure 1: Site Context Map

1.1 STUDY AREA

The study area for the project includes Victoria West from Bay Street to Harbour Road and to Kimta Road. A total of 10 key intersections are included in the study area. See **Figure 2** for the study area and key intersections.

Figure 2: Study Area and Key Intersections

2.0 EXISTING CONDITIONS

2.1 TRANSPORTATION SYSTEMS

2.1.1 ROAD NETWORK

The following are the key roads within the study area:

Esquimalt Road: is a three to four lane arterial roadway that connects Esquimalt and Victoria West to downtown Victoria. East of Tyee Road Esquimalt Road is two lanes westbound, one lane eastbound with a fourth lanes used for left turns. West of Tyee Road, Esquimalt Road becomes one lane in each direction with the middle lanes consisting of raised medians / left turn lanes.

Catherine Street/Kimta Road: is a two lane collector roadway that currently has on street parking on both sides of the road; however, this will be modified slightly with the City's AAA facility added on Kimta Road.

Catherine Street / Bay Street: is a two to three lane arterial road. South of Wilson Street Catherine/Bay is two lanes, while north to Tyee Road there are three lanes (one per direction plus left turn). There is a short section where there is on-street parking on the east side of Bay Street.

Tyee Road: is a two to three lane collector roadway. South of Wilson Road to Esquimalt Road the road is one lane per direction with on-street parking on both sides of the road. South of Esquimalt Road Tyee Road is a two lane road with on-street parking on both sides. North of Wilson Road there is an additional lane used for centre median or left turn lanes. In this section on-street parking is provided on the east side only.

Harbour Road / Sitkum Road: are both two lane local roads with on-street parking.

2.1.2 PEDESTRIAN NETWORK

There are sidewalks around the entire Bayview development on both side of the roads. There are crosswalks at the following locations:

- Catherine Street / Esquimalt Road on all four legs (signal)
- Mid-block special crosswalk (overhead flashers, internally illuminated signs overhead, offset pedestrian refuge island) across Esquimalt Road approximately 90m from Sitkum Road
- Tyee Road / Esquimalt Road on all four legs (signal)
- Harbour Road / Esquimalt Road on all four legs (signal)
- Mid-block crosswalk at 356 Harbour Road
- Mid-block crosswalk at Galloping Goose Connection on Harbour Road
- Mid-block crosswalk at Johnson Street Bridge Multi-use Path on Harbour Road
- Across Tyee Road at Wilson Road
- Harbour Road / Tyee Road on all three legs (signal)
- Bay Street / Tyee Road on all four legs (signal)
- Wilson Street / Bay Street on all four legs (signal)

2.1.3 CYCLING NETWORK

The E&N Trail approaches the site from the west; however, is discontinued at Russell Street. The City is working to extend E&N Trail to Catherine Street where cyclists will cross Catherine Street to a two way protected bike lane on the north side of Kimta Road. This connection and Kimta Road upgrade are planned for 2022. This connection will extend to Harbour Road where it will connect to the Galloping Goose and Johnson Street multi-use pathway.

Painted bicycle lanes are currently provided on Esquimalt Road, Catherine Street/Bay Street, Tyee Road, and portions of Harbour Road. Harbour Road also as a new two-way cycle track from the Johnson Street multi-use path to the Galloping Goose. There are no separate bicycle facilities on Wilson Street.

2.1.4 TRANSIT NETWORK

There is currently good transit service to this portion of Victoria West. There are a total of five routes that travel within the study area including:

- **Route 10 – James Bay / Royal Jubilee:** which travels through James Bay, past the Legislature, along Esquimalt Road to Bay Street to Royal Jubilee Hospital with headways of 25 to 30 minutes The closest stop for this route is along the development frontage on Esquimalt Road.
- **Route 14 – Vic General / UVic:** which travels from Victoria General Hospital, Helmcken, Island Highway/Craigflower/Skinner to Tyee through Downtown to Richmond Road, Cedar Hill X to UVic every 15 to 20 minutes. The closest stops for this route are on Esquimalt Road at Harbour Road or on Tyee Road near Wilson Street.
- **Route 15 – Esquimalt / UVic:** which travels from HMC Dockyards, along Esquimalt Road, through Downtown to Foul Bay / Henderson to UVic on 15 minute headways. The closest stop is along the development frontage on Esquimalt Road.
- **Route 24 - Cedar Hill / Admirals Walk:** travels along Wilson Road to Tyee Road to Esquimalt Road to downtown Victoria to Shelbourne/McKenzie every 30 minutes to 1 hour. The closest stops for this route are on Esquimalt Road at Harbour Road or on Tyee Road near Wilson Street.
- **Route 25 – Maplewood/Admirals Walk: which travels** between Admirals Walk, through Esquimalt, Downtown Victoria and along Cook/Maplewood to Quadra/McKenzie. Route 25 is a frequent transit service with 5 to 15 minute headways. The closest stop for this route is along the development frontage on Esquimalt Road.

2.1.5 RAILWAY CORRIDOR

Although trains are not currently utilizing the E&N Railway line there is an existing railway line that crosses Catherine Street, immediately south of Esquimalt Road and then travels through the middle of the Roundhouse site, across Sitkum Road, and along the south edge of Bayview Hillside. The E&N rail line enters the Roundhouse site as a

single track and then adds a second track within the site. Two sets of tracks continue to the east along Bayview Hillside. There are additional spur lines on the Roundhouse site that were historically used to move trains in/out of the Roundhouse.

2.2 TRAVEL MODE SPLIT

The CRD's 2017 Origin Destination Survey has Victoria West as part of the 'Victoria North' District of the survey. The mode splits for Victoria North outlined in Table 1 for the AM, PM and 24 hour periods.

TABLE 1: MODAL SPLITS FOR VICTORIA NORTH

Mode	AM (0600-0900)			PM (1500-1800)			24 Hour		
	From	To	Internal	From	To	Internal	From	To	Internal
Auto Driver	46%	67%	30%	64%	49%	45%	58%	58%	40%
Auto Passenger	11%	13%	8%	16%	15%	8%	16%	15%	9%
Transit	17%	8%	3%	8%	14%	3%	10%	10%	2%
Bicycle	16%	7%	10%	6%	11%	7%	7%	7%	5%
Walk	9%	5%	47%	6%	10%	36%	7%	8%	44%
Other	1%	0%	1%	1%	1%	1%	1%	1%	1%

As Table 1 illustrates a significant portion of the trips to, from, and within Victoria North are made by walking. Transit and bicycle use are also well utilized modes of transportation in this area of the region.

2.3 COLLISION DATA

Collision data was collected from ICBC's statistics website. The data is for the five years from 2015 to 2019. See **Table 2** for historical collision data in the study area.

TABLE 2: COLLISION DATA FROM 2015 TO 2019

Intersection	Vehicle Collisions	Involving Ped + Bike
Esquimalt / Harbour	22	5
Esquimalt / Tyee	54	7
Esquimalt / Sitkum	10	4
Esquimalt / Catherine	55	10
Kimta / Sitkum / Cooperage	1	0
Tyee / Wilson	18	0
Tyee / Harbour	11	2
Tyee / Bay	89	4
Bay / Wilson	21	1
Catherine / Bay / Dunas	2	1

The intersection of Catherin Street / Esquimalt Road has the highest number of pedestrian / bicycle collision in the past five years with an average of two per year. Without additional data the cause / contributing factors for these collisions is not known; however, may be contributed to the railway crossing, which is at a skewed angle, located in close proximity to the Esquimalt Road / Catherine Street intersection.

2.4 TRAFFIC CONDITIONS

2.4.1 EXISTING VOLUMES

The traffic data for the key intersections was provided by the City. The existing AM and PM peak hour volumes are shown in **Figures 3 and 4**.


2020 EXISTING VOLUMES - AM PEAK
ROUNDHOUSE @ BAYVIEW PLACE
TRAFFIC STUDY
WATT Consulting Group
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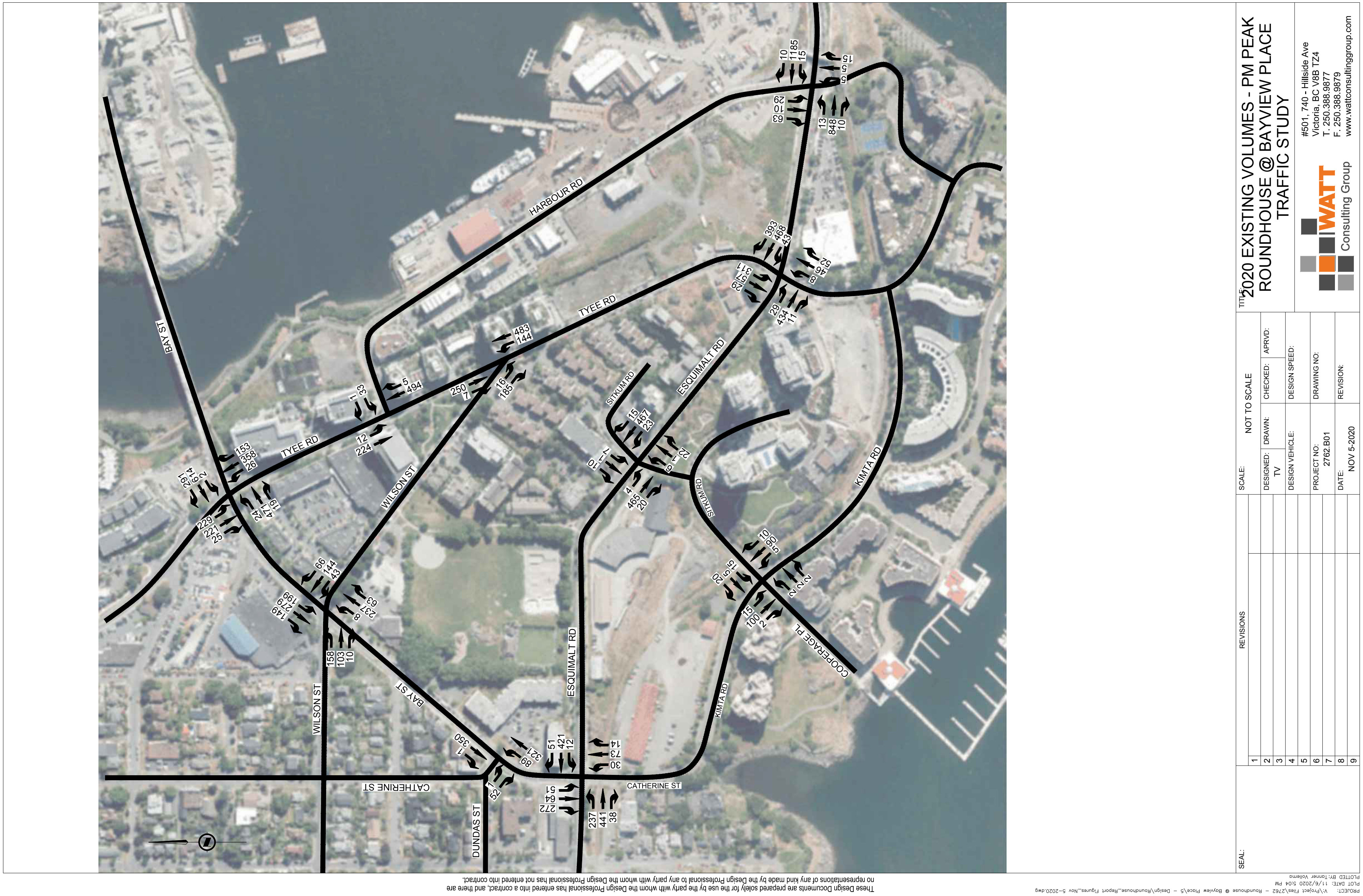
NOT TO SCALE
DESIGNED: TV
PROJECT NO: 2762.B01
DATE: NOV 5-2020
REVISIONS
BAY ST
TYEE RD
HARBOUR RD
WILSON ST
ESQUIMALT RD
SITKUM RD
KIMTA RD
COOPERAGE PL
CATHERINE ST
DUNDAS ST
These Design Documents are prepared solely for the use by the party with whom the Design Professional has entered into a contract, and there are no representations of any kind made by the Design Professional to any party with whom the Design Professional has not entered into a contract.


2020 EXISTING VOLUMES - PM PEAK
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DESIGNED: TV
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APRVD:
DESIGN VEHICLE:
DESIGN SPEED:
PROJECT NO: 2762.B01
DRAWING NO:
DATE: NOV 5-2020
REVISION:
REVISIONS
SEAL:
HARBOUR RD
TYEE RD
BAY ST
WILSON ST
ESQUIMALT RD
SITKUM RD
KIMTA RD
COOPERAGE PL
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2.4.2 TRAFFIC MODELLING – BACKGROUND INFORMATION

Analysis of the traffic conditions at the study intersections was undertaken using Synchro Studio (Version 9). Synchro / SimTraffic is a two-part traffic modelling software that provides analysis of the traffic conditions based on the Highway Capacity Manual (2010) evaluation methodology. A detailed description is provided in **Appendix A**. Synchro was used to determine the LOS and delays of each intersection while SimTraffic was used to determine the 95th percentile queue lengths.

For unsignalized (stop-controlled) intersections, the level of service (LOS) is based on the computed delay on each of the critical movements. LOS A represents minimal delays for minor street traffic movements, and LOS F represents a scenario with an insufficient number of gaps on the major street for minor street motorists to complete their movements without significant delays.

For signalized intersections, the methodology considers the intersection geometry, traffic volumes, the traffic signal phasing / timing plan, and pedestrian/bicycle volumes. The average delay for each lane group is calculated, as well as the delay for the overall intersection.

2.4.3 ANALYSIS RESULTS

The existing volumes were analyzed in Synchro / SimTraffic (version 9/10) to determine the existing conditions during the AM and PM peak hours. Synchro was used to determine the LOS and delays of each intersection while SimTraffic was used to determine the 95th percentile queue lengths. The analysis results are summarized in **Table 3**.

TABLE 3: EXISTING CONDITIONS – AM AND PM PEAK HOUR

Intersection (EW / NS)	Movement	Existing Conditions – AM Peak			Existing Conditions – PM Peak		
		LOS	Delay (s)	95th % Queue (m)	LOS	Delay (s)	95th % Queue (m)
Esquimalt Rd / Harbour Rd (signalized)	EBL	A	6.1	33.1	A	9.8	17.4
	EB T/R	D	35.6	140.4	C	24.7	112.3
	WBL	A	8.4	9.8	A	9.6	20.9
	WB T/R	A	6.0	41.1	B	12.4	61.2
	NB L/T/R	B	17.2	11.5	B	10.1	12.5
	SB L/T/R	B	12.9	17.0	B	15.0	25.5
Esquimalt Rd / Tyee Rd (signalized)	EBL	B	14.6	18.5	A	9.3	15.9
	EB T/R	B	18.0	60.5	B	11.9	56.6
	WBL	B	14.7	17.2	A	9.5	28.6
	WBT	B	15.2	49.5	B	11.5	69.6
	WBR	A	3.0	0.0	A	2.0	12.6
	NBL	C	27.7	5.5	C	27.6	7.9
	NB T/R	C	26.2	29.6	C	29.7	28.4
	SBL	C	27.2	43.0	**E**	**70.5**	44.6
	SB T/R	A	6.5	73.4	B	15.7	83.2
Esquimalt Rd / Sitkum Rd (stop control)	EBL	A	7.9	3.6	A	8.5	2.3
	EB T/R	A	0.0	0.0	A	0.0	0.8
	WBL	A	8.2	6.5	A	8.5	7.6
	WB T/R	A	0.0	0.0	A	0.0	0.0
	NB L/T/R	B	13.5	11.7	C	15.4	10.9
	SB L/T/R	C	17.1	10.0	C	18.4	9.7
Esquimalt Rd / Catherine St (signalized)	EBL	B	10.5	39.3	A	8.1	43.0
	EB T/R	A	7.9	50.6	A	7.1	51.8
	WBL	B	11.4	6.7	B	11.8	12.4
	WB T/R	B	19.3	56.5	B	178	88.6
	NB L/T/R	B	18.0	17.2	**E**	**57.2**	40.9
	SB L/T	C	20.1	22.7	D	46.3	44.6
	SBR	A	6.5	27.0	A	9.4	45.8
Kimta Rd / Sitkum Rd / Cooperage Pl (stop control)	EB L/T/R	A	2.0	2.1	A	1.0	4.7
	WB L/T/R	A	0.3	0.0	A	0.4	1.8
	NB L/T/R	A	9.6	7.5	B	10.0	7.2
	SB L/T/R	A	9.2	8.8	A	9.8	11.8

TABLE 3: EXISTING CONDITIONS – AM AND PM PEAK HOUR (CONTINUED)

Intersection (EW / NS)	Movement	Existing Conditions – AM Peak			Existing Conditions – PM Peak		
		LOS	Delay (s)	95th % Queue (m)	LOS	Delay (s)	95th % Queue (m)
Wilson St / Tyee Rd (stop control)	EB L/R	C	20.1	19.9	C	17.2	30.5
	NBL	A	8.7	15.1	A	8.5	20.3
	NBT	A	0.0	3.2	A	0.0	2.7
	SB T/R	A	0.0	9.9	A	0.0	5.0
Harbour Rd / Tyee Rd (stop control)	WB L/R	B	13.0	5.5	C	17.2	13.9
	NB T/R	A	0.0	5.1	A	0.0	29.0
	SBL	A	8.0	0.9	A	8.6	6.1
	SBT	A	0.0	9.6	A	0.0	0.0
Bay St / Tyee Rd (signalized)	EBL	B	19.2	9.7	A	9.7	26.3
	EB T/R	C	27.0	67.7	B	12.7	66.4
	WB L/T	C	26.7	102.6	C	27.1	**579.4**
	WBR	A	5.5	47.7	A	6.8	49.1
	NBL	C	29.2	13.6	C	29.7	16.1
	NBT	C	29.9	37.2	**E**	**57.3**	191.1
	NBR	A	7.3	9.0	A	7.5	112.1
	SBL	B	17.8	59.7	D	53.8	58.7
	SB T/R	B	18.2	68.2	C	20.9	54.3
Wilson St / Bay St (signalized)	EB L/T/R	D	41.5	55.6	**E**	**63.9**	84.3
	WB L/T	C	28.3	29.7	D	51.4	65.9
	WBR	A	1.0	21.2	A	2.1	22.9
	NBL	C	26.2	6.0	C	21.4	10.0
	NB T/R	D	45.7	47.7	C	31.1	57.4
	SBL	C	24.4	29.3	B	17.6	37.5
	SB T/R	C	32.1	32.2	B	16.4	59.9
Catherine St / Bay St (stop control)	EB L/R	B	10.9	19.0	B	11.9	14.2
	NBL	A	7.8	9.6	A	8.6	14.9
	NBT	A	0.0	2.2	A	0.0	9.3
	SB T/R	A	0.0	0.0	A	0.0	7.8

Overall, the traffic operations in the Songhees area of Victoria West are at a LOS D or better for the majority of the study area. However, there are four existing movements that have poor operations (LOS E/F) during the PM peak hour.

These include:

- Southbound Left at Tyee Road/Esquimalt Road
- Southbound Left at Catherine Street/Esquimalt Road
- Northbound Through at Tyee Road/Bay Street
- Eastbound movement at Bay Street/Wilson Street

3.0 PROPOSED DEVELOPMENT

3.1 LAND USE

The land use, utilized for this study, is for the Roundhouse portion of Bayview Place. The Roundhouse site consists of the two areas separated by the E&N Railway line. The north area consists of five buildings (DA-2a, DA-2b, DA-7, DA-8, and DA-9), and the DA-1 historical buildings (Stores, Carshop, Roundhouse, and Backshop). The south area consists of DA-3, DA-4a, DA-4b, DA-5, DA-6a and DA-6b. See **Figure 5** for placement of buildings on the site.

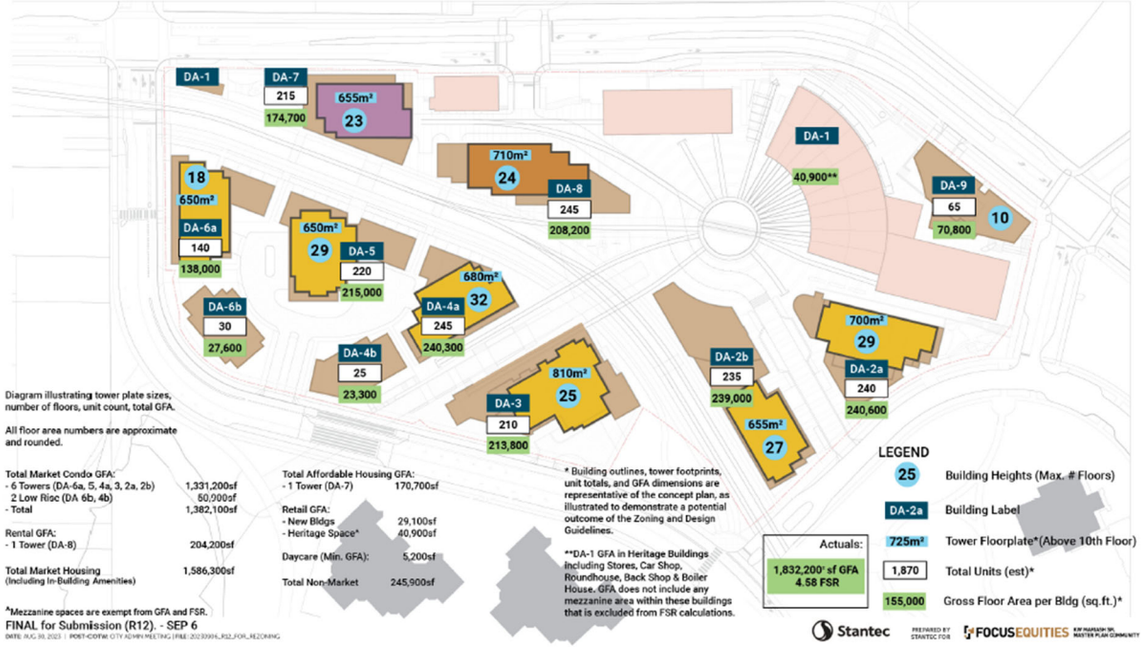


Figure 5: Site Plan

The land use for the north parcels consists of condominium / hotel, rental apartments, affordable housing, and commercial retail space. The south parcel consists of condominium / hotel units, and commercial retail space. Tables 4 and 5 outline the land use by building.

TABLE 4: LAND USE BY BUILDING/LOT

Building	Land Use	Units
DA-1 (heritage buildings)	Commercial	40,900 sq. ft.
DA-2a	Apartment	240 units
	Commercial	3,350 sq. ft.
DA-2b	Condominium	235 units
	Commercial	5,640 sq. ft.
DA-3 (E&N Building)	Condominium	210 units
	Commercial	8,610 sq. ft.
DA-4a	Condominium	245 units
	Commercial	3,500 sq. ft.
DA-4b	Condominium	25 units
DA-5	Condominium	220 units
DA-6a	Condominium	140 units
DA-6b	Condominium	30 units
DA-7	Affordable Housing	215 units
	Daycare	5,200 sq. ft.
	Retail	4,000 sq. ft.
DA-8	Apartment (Rental)	245 units
	Commercial	4,000 sq. ft.
DA-9	Condominium	65 units

TABLE 5: LAND USE SUMMARY

Location on Site	Land Use	Total
North of Railway	Apartment Rental / Affordable Housing	460 units
	Condominium / Apartment	540 units
	Commercial + Daycare	63,090 sq. ft.
South of Railway	Condominium	870 units
	Commercial	12,110 sq. ft.

3.2 SITE ACCESSES

The E&N railway line creates a barrier for having internal vehicle travel between the North Parcel and the South Parcel. Vehicle access for the North Parcel will be via a main intersection located between the Stores Building and the Carshop. This will be a full movement signalized intersection. The second access point for the North area is off Sitkum Road between the railway crossing and Saghalie Road. Internally the main access road travels east through the site to the Sitkum Road access.

The access for DA-9 will be located off Esquimalt Road across from the driveway to 222 Esquimalt Road. The minimum stopping sight distance at 30km/h (35m) is met for an access at this location. For vehicles turning left or right from the access 65m of sight distance can be provided which meets the 30km/h turning sight distance from a turn; however, it requires drivers see along the sidewalk / boulevard space to achieve the 65m. Although there is an existing two way left turn lane at this proposed access location the City is requiring that the access be restricted to right in / right out since the access is on the higher road classification for the corner lot. The access will be restricted by extending the centre median to the east. This new median will also restrict the existing driveway for 222 Esquimalt Road to right in / right out.

An access to DA-9 from Sitkum Road is not practical due to two primary reasons: given the close proximity to the intersection of Esquimalt it is difficult to accommodate a driveway at this location, and Sitkum Road is elevated from the site making an access

driveway down to grade and parking below the building impractical. The provision of parking under the Backshop and Roundhouse to connect to DA-9 is no longer planned to avoid disturbing the heritage structures; therefore, there is not alternative for access other than Esquimalt Road for DA-9.

For the South portion of the site three accesses are proposed: one for DA-3 (an in/out loop), and two shared accesses for DA-4a, DA-4b, DA-5, DA-6a and DA-6b. The northern most access to the DA-4 to DA-6 buildings will be located to avoid queues impacting the pedestrian/bicycle crosswalk north of the proposed access. See **Figure 6** for the proposed access points and internal road network.

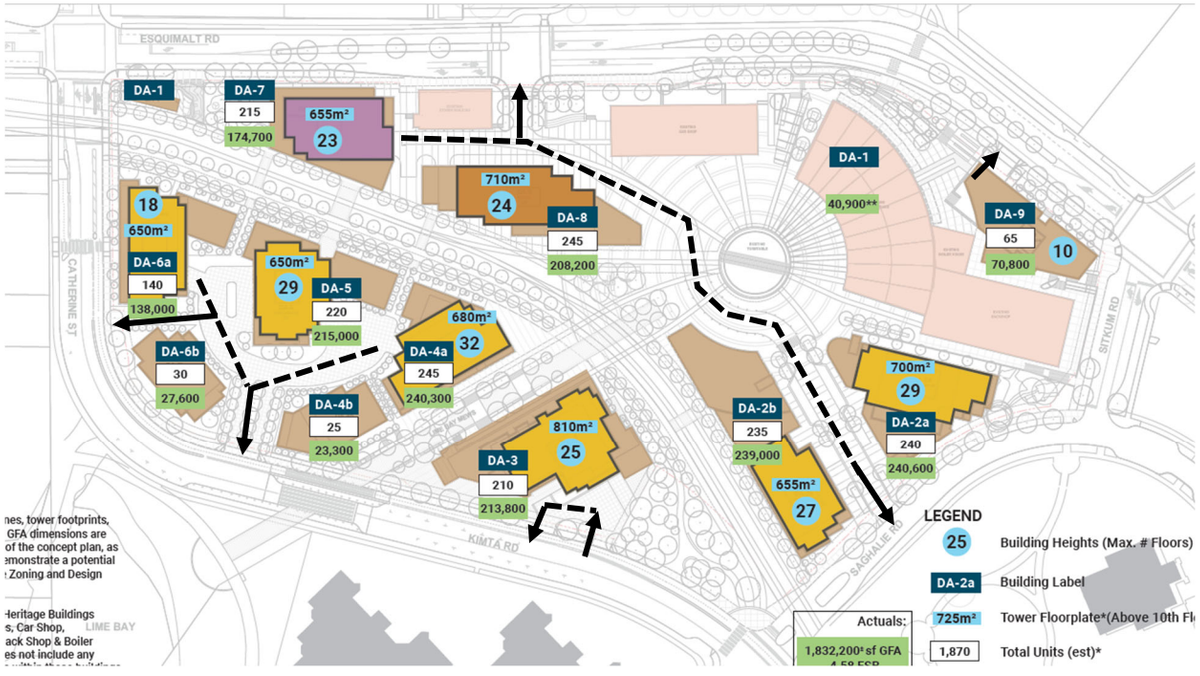


Figure 6: Site Accesses

3.3 TRIP GENERATION

3.3.1 SITE SPECIFIC RATES

A trip generation rate study was conducted to determine trip rates that would be applicable to the Roundhouse since the area is known for being having high use of transit, walking, and cycling that could impact the standard Institute of Transportation Engineers (ITE) trip generation rates.

Observations of four residential sites in Victoria West with similar contexts (size, location, context) was undertaken to determine a residential trip rate for the residential portion of the proposed development. Observations of the Westside Village Shopping Centre were also conducted to review the commercial trip generation rate for the commercial component.

Residential Observation Results

The observed residential trip generation and trip rate calculation results are summarized in **Table 6.**

TABLE 6: RESIDENTIAL OBSERVATIONS & TRIP RATES

Observation Site	Units	AM Peak Hour				PM Peak Hour			
		Trips In	Trips Out	Total Trips	Trip Rate	Trips In	Trips Out	Total Trips	Trip Rate
Encore	134	5	16	21	0.16	19	5	24	0.18
Promontory / Bayview One	318	8	33	41	0.13	51	36	87	0.27
Balance (Dockside)	172	3	13	16	0.09	24	8	32	0.19
Shutters	185	1	21	36	0.19	30	12	42	0.23
Average (AM):					**0.14**	**Average (PM):**			**0.22**

These rates are lower than ITE's multi-family residential (high-rise) rates but are considered to be reflective of this neighbourhood of Victoria West. Therefore, these rates will be utilized for the residential (apartment and condominium) land uses.

Commercial Observation Results

Although the Westside Village Shopping Centre would be of similar overall size to the commercial at Roundhouse the Westside Village Shopping Centre is anchored by Save-on-Foods which is in the range of 40 to 50% of the Westside Village Shopping Centre land use. Grocery stores have an approximately 2.5 times higher trip generation than general retail space. Based on the results of the observations the Westside Village Shopping Centre had a rate that was higher than ITE's retail (shopping) rate, but lower than the grocery store rate which is what would be expected. Since the Roundhouse development commercial is expected to be made up of smaller retail units and possibility a much smaller grocery store (5% of the commercial land use rather than

50%). Therefore, the ITE trip generation rate for a Shopping Centre land use (ITE Code 820) from the ITE Trip Generation Manual (10th Edition) will be used.

3.3.2 SITE TRIP GENERATION

The peak hour trip generation results are summarized in **Tables 7 to 10.** Internal trips were calculated using NCHRP and ITE methodologies. As a worst case scenario all commercial trips were assigned as new primary trips to the road network.

TABLE 7: AM PEAK HOUR TRIP GENERATION – NORTH ACCESSES

Building	Land Use	Units	Trip Rate	Trips In	Trips Out	Total Trips
DA-7	Affordable Housing	215 units	0.14 / unit	7	23	30
	Daycare	5,200 sq. ft.	11.0 / 1000 sq. ft.	30	27	57
	Commercial	4,000 sq. ft.	0.94 / 1000 sq. ft.	2	2	4
DA-8	Multi-family	245 units	0.14 / unit	8	26	34
	Commercial	4,000 sq. ft.	0.94 / 1000 sq. ft.	2	2	4
DA-9	Multi-family	65 units	0.14 / unit	2	7	9
DA-2b	Multi-family	235 units	0.14 / unit	8	25	33
	Commercial	5,640 sq. ft.	0.94 / 1000 sq. ft.	3	2	5
DA-2a	Multi-family	240 units	0.14 / unit	8	26	34
	Commercial	3,350 sq. ft.	0.94 / 1000 sq. ft.	2	1	3
DA-1	Commercial	40,900 sq. ft.	0.94 / 1000 sq. ft.	24	14	38
Total North Trips (AM Peak Hour):				**96**	**155**	**251**
*Internal Trips**:				*17*	16	33
External Trips:				***79***	***139***	***218***

*includes 50% reduction for internal use of daycare by Roundhouse residents and active transportation trips from surrounding neighbourhood to the daycare.

TABLE 8: AM PEAK HOUR TRIP GENERATION – SOUTH ACCESSES

Building	Land Use	Units	Trip Rate	Trips In	Trips Out	Total Trips
DA-3	Multi-family	210 units	0.14 / unit	7	22	29
	Commercial	8,610 sq. ft.	0.94 / 1000 sq. ft.	5	3	8
DA-4a	Multi-family	245 units	0.14 / unit	8	26	34
	Commercial	3,500 sq. ft.	0.94 / 1000 sq. ft.	2	1	3
DA-4b	Multi-family	25 units	0.14 / unit	1	3	4
DA-5	Multi-family	220 units	0.14 / unit	7	24	31
DA-6a	Multi-family	140 units	0.14 / unit	5	15	20
DA-6b	Multi-family	30 units	0.14 / unit	1	3	4
Total South Trips (AM Peak Hour):				**36**	**97**	**133**
Internal Trips:				2	2	4
External Trips:				**34**	**95**	**129**

TABLE 9: PM PEAK HOUR TRIP GENERATION – NORTH ACCESSES

Building	Land Use	Units	Trip Rate	Trips In	Trips Out	Total Trips
DA-7	Affordable Housing	215 units	0.22 / unit	29	18	47
	Daycare	5,200 sq. ft.	11.1 / 1000 sq. ft.	27	31	58
	Commercial	4,000 sq. ft.	3.81 / 1000 sq. ft.	7	8	15
DA-8	Multi-family	245 units	0.22 / unit	33	21	54
	Commercial	4,000 sq. ft.	3.81 / 1000 sq. ft.	7	8	15
DA-9	Multi-family	65 units	0.22 / unit	9	5	14
DA-2b	Multi-family	235 units	0.22 / unit	32	20	52
	Commercial	5,640 sq. ft.	3.81 / 1000 sq. ft.	10	11	21
DA-2a	Multi-family	240 units	0.22 / unit	32	21	53
	Commercial	3,350 sq. ft.	3.81 / 1000 sq. ft.	6	7	13
DA-1	Commercial	40,900 sq. ft.	3.81 / 1000 sq. ft.	75	81	156
			Total North Trips (PM Peak Hour):	**267**	**231**	**498**
			*Internal Trips**:	55	56	*111*
			External Trips:	**212**	**175**	**387**

*includes 50% reduction for internal use of daycare by Roundhouse residents and active transportation trips from surrounding neighbourhood to the daycare.

TABLE 10: PM PEAK HOUR TRIP GENERATION – SOUTH ACCESSES

Building	Land Use	Units	Trip Rate	Trips In	Trips Out	Total Trips
DA-3	Multi-family	210 units	0.22 / unit	28	18	46
	Commercial	8,610 sq. ft.	3.81 / 1000 sq. ft.	16	17	33
DA-4a	Multi-family	245 units	0.22 / unit	33	21	54
	Commercial	3,500 sq. ft.	3.81 / 1000 sq. ft.	6	7	13
DA-4b	Multi-family	25 units	0.22 / unit	4	2	6
DA-5	Multi-family	220 units	0.22 / unit	29	19	48
DA-6a	Multi-family	140 units	0.22 / unit	4	3	7
DA-6b	Multi-family	30 units	0.22 / unit	19	12	31
Total South Trips (PM Peak Hour):				**138**	**98**	**236**
Internal Trips:				*8*	*8*	*16*
External Trips:				**130**	**90**	**220**

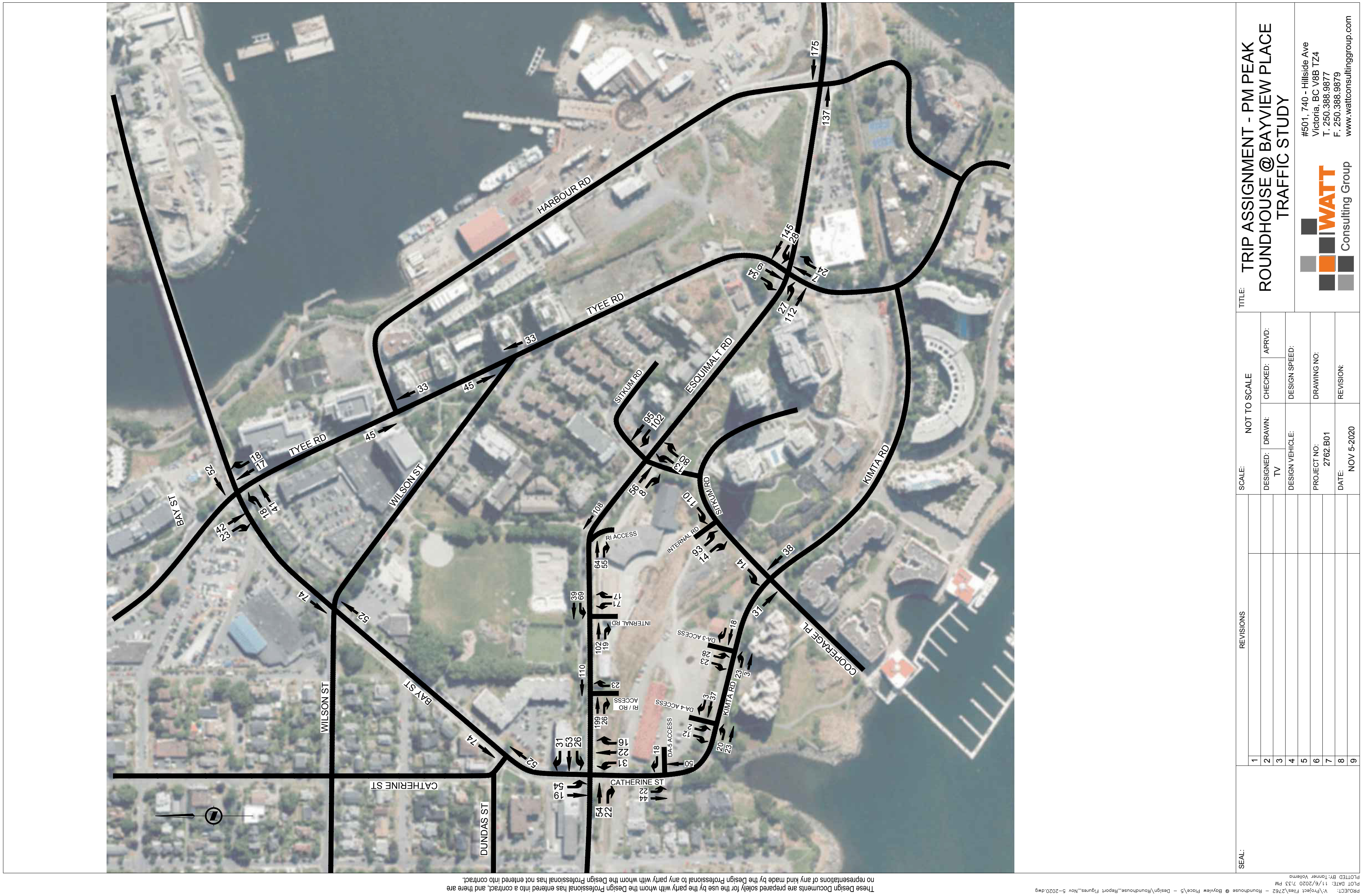
The above trip generation is based on the current plans for the site. However, the following trip assignment, traffic volumes and analysis are based on 186 more multi-family units and 22,200 sq. ft. more commercial / daycare space than outlined above. Overall, the difference in site trip generation between the above trip generation and the trip generation utilized in the analysis is 24 less trips in the AM peak hour and 82 less trips in the PM peak hour. The difference in trip generation is 7-12% less than in the analysis. Therefore, the results of the analysis are generally reflective of the current land use and the analysis is a worst case scenario.

3.4 TRIP ASSIGNMENT

The trips generated by the proposed development were distributed and assigned based on the existing traffic patterns and key origins and destinations for traffic in the area. Separate trip distributions were used for the residential and commercial components of the development. The distribution percentages are summarized in **Table 11**. The resulting trip assignments are shown in **Figures 7 and 8**.

TABLE 11: TRIP DISTRIBUTION

Origin / Destination	AM Peak Hour				PM Peak Hour			
	Inbound		Outbound		Inbound		Outbound	
	Res.	Comm.	Res.	Comm.	Res.	Comm.	Res.	Comm.
North	45%	15%	40%	15%	40%	15%	40%	15%
East	35%	50%	50%	50%	50%	50%	40%	50%
West	20%	35%	10%	35%	10%	35%	20%	35%


TRIP ASSIGNMENT - PM PEAK
ROUNDHOUSE @ BAYVIEW PLACE
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SCALE: NOT TO SCALE
DESIGNED: TV
PROJECT NO: 2762.B01
DATE: NOV 5-2020
REVISIONS
SEAL:
HARBOUR RD
TYEE RD
ESQUIMALT RD
SITKUM RD
KIMTA RD
WILSON ST
BAY ST
CATHERINE ST
DUNDAS ST
COOPERAGE PL
INTERNAL RD
RI ACCESS
RI / RO ACCESS
DA-3 ACCESS
DA-4 ACCESS
DA-5 ACCESS
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3.5 VOLUMES

The trips generated by the proposed development were added to the existing volumes to determine the post development volumes. The post development volumes are shown in **Figures 9 and 10** for the AM and PM peak hour.

3.6 ANALYSIS RESULTS

The AM and PM peak hour post development traffic volumes were analyzed using Synchro to determine the impacts due to the addition of the vehicle trips. **Table 12** summarizes the results of the traffic analysis. The intersection of Esquimalt Road / Main Site Access is analyzed as a signalized intersection due to the volumes expected from the access.

Subsequent to the vehicle analysis being undertaken the City has required a signal to be installed at Sitkum Road / Esquimalt Road. This signal is not included in the analysis as the need for the signal was not identified during the study. Therefore, the results for Sitkum Road / Esquimalt Road are based on the existing laning and traffic control. With the implementation of the signal at Sitkum Road / Esquimalt Road and the added northbound left turn lane (convert existing shared lane to a left turn lane and widen to add through/right turn lane). The side street operations will significantly improve while there will be a slight increase in east-west delays on Esquimalt Road (from free flow and no delays to minor delays). The addition of this traffic signal may draw some of the Roundhouse traffic from the Main Site Access, Catherine Street, and Tyee Road as well as from the surrounding area as an alternative route to Esquimalt Road.

TABLE 12: POST DEVELOPMENT CONDITIONS – AM AND PM PEAK HOUR

Intersection (EW / NS)	Movement	AM Peak			PM Peak		
		LOS	Delay (s)	95th % Queue (m)	LOS	Delay (s)	95th % Queue (m)
Esquimalt Rd / Harbour Rd (signalized)	EBL	A	5.5	28.3	B	10.7	23.6
	EB T/R	**E**	**66.4**	172.1	D	50.4	188.0
	WBL	A	8.6	11.6	A	9.6	18.0
	WB T/R	A	5.5	43.0	B	15.0	77.4
	NB L/T/R	C	20.2	12.7	B	10.1	11.3
	SB L/T/R	B	15.1	18.9	B	17.0	28.7
Esquimalt Rd / Tyee Rd (signalized)	EBL	B	16.7	27.2	B	14.4	28.7
	EB T/R	C	21.9	77.7	B	14.4	75.5
	WBL	B	17.5	25.4	B	12.5	33.8
	WBT	B	15.9	55.7	B	14.6	93.9
	WBR	A	3.0	0.0	A	2.0	15.5
	NBL	C	27.7	5.3	C	27.6	10.3
	NB T/R	C	25.7	28.8	C	34.2	34.1
	SBL	C	29.1	44.6	**F**	**93.4**	44.5
	SB T/R	A	6.0	105.9	B	15.6	120.4
Esquimalt Rd / Sitkum Rd (stop control)	EBL	A	8.0	3.0	A	8.8	3.7
	EB T/R	A	0.0	0.9	A	0.0	5.0
	WBL	A	8.6	12.4	A	9.3	20.0
	WB T/R	A	0.0	0.0	A	0.0	22.3
	NB L/T/R	C	16.1	17.3	D	28.5	22.7
	SB L/T/R	C	24.4	9.6	**E**	**37.0**	9.5
Esquimalt Rd / Catherine St (signalized)	EBL	B	14.9	39.4	B	11.5	48.8
	EB T/R	A	9.1	46.5	A	9.4	71.5
	WBL	B	13.1	11.8	B	13.3	22.5
	WB T/R	C	23.2	63.2	C	24.5	65.6
	NB L/T/R	C	22.9	26.3	**F**	**532.9**	102.0
	SB L/T	C	22.3	27.5	**F**	**148.0**	73.2
	SBR	A	6.1	27.1	A	8.5	53.3
Kimta Rd / Sitkum Rd / Cooperage Pl (stop control)	EB L/T/R	A	1.3	2.6	A	0.8	3.9
	WB L/T/R	A	0.2	1.2	A	0.3	2.5
	NB L/T/R	A	9.8	6.2	B	10.6	4.7
	SB L/T/R	A	9.2	10.9	B	10.1	11.7

TABLE 12: POST DEVELOPMENT CONDITIONS – AM AND PM PEAK HOUR (CONTINUED)

Intersection (EW / NS)	Movement	AM Peak			PM Peak		
		LOS	Delay (s)	95th % Queue (m)	LOS	Delay (s)	95th % Queue (m)
Wilson St / Tyee Rd (stop control)	EB L/R	C	21.4	20.9	C	19.2	126.3
	NBL	A	8.7	17.0	A	8.7	33.4
	NBT	A	0.0	5.5	A	0.0	136.4
	SB T/R	A	0.0	9.0	A	0.0	4.7
Harbour Rd / Tyee Rd (stop control)	WB L/R	B	13.6	6.1	C	18.8	14.0
	NB T/R	A	0.0	0.0	A	0.0	111.0
	SBL	A	8.0	10.0	A	8.7	6.3
	SBT	A	0.0	0.0	A	0.0	0.0
Bay St / Tyee Rd (signalized)	EBL	C	26.3	24.2	B	16.2	45.1
	EB T/R	C	29.4	79.1	B	14.8	86.9
	WB L/T	C	28.8	101.4	C	33.8	598.1
	WBR	A	5.8	48.0	A	7.4	0.0
	NBL	C	29.4	14.6	C	33.6	23.6
	NBT	C	30.9	45.4	**E**	**64.7**	222.3
	NBR	A	7.3	5.2	A	9.3	119.3
	SBL	B	18.2	59.9	D	53.8	66.7
	SB T/R	B	19.0	72.9	C	24.3	66.8
Wilson St / Bay St (signalized)	EB L/T/R	D	41.5	52.7	**E**	**63.9**	82.7
	WB L/T	C	28.2	34.5	D	51.4	79.3
	WBR	A	1.0	22.0	A	2.2	22.9
	NBL	C	26.2	8.1	C	22.1	8.8
	NB T/R	**E**	**68.3**	69.6	D	36.7	73.5
	SBL	C	30.2	31.3	C	20.8	46.3
	SB T/R	D	42.5	36.2	C	21.3	74.2
Catherine St / Bay St (stop control)	EB L/R	B	11.2	18.7	B	12.9	16.4
	NBL	A	7.9	9.1	A	8.9	15.7
	NBT	A	0.0	3.7	A	0.0	10.5
	SB T/R	A	0.0	0.0	A	0.0	23.7

In the AM peak hour, the addition of the eastbound through traffic on Esquimalt Road at Harbour Road (one lane eastbound) due to the development drops the eastbound through movement to a LOS E due to the high volume of eastbound through traffic (west of Tyee Road) with the existing southbound left turn volume from Tyee Road. The combination of the higher eastbound through traffic with the high southbound left turn traffic as eastbound traffic at Harbour Road is above 1,000 vph which creates poor operations.

At the Catherine St / Esquimalt Rd intersection, the northbound and southbound movements drop to a LOS F during the PM peak hour. Signal timing optimization improves the southbound movement to LOS C and the northbound to LOS E, however the westbound through / right movement drops to LOS E as a result. Installation of a 15m northbound left turn lane improves the intersection operations to LOS D or better for all movements. If the property on the northwest corner of the intersection develops the City may want to consider additional right-of-way from that property to allow for a separate southbound right turn in the future.

The northbound through / right movement at Bay Street / Wilson Street drops to LOS E during the AM peak with the addition of the development traffic. With optimization of the signal timing all movement operate at a LOS D or better.

The southbound queues at Building DA-4/DA-5/DA-6's access on Catherine Street is less than 10m (one vehicle) in length and therefore will not extend back to the railway or the crosswalk for the bicycle facility on Catherine/Kimta since the access is located 50m from the railway crossing. The access does not require a separate southbound left turn lane.

The northbound 95th percentile queues at Esquimalt Road / Main Site Access are 18 to 20m in the peak periods. There is approximately 16.5m of space between the stop bar at Esquimalt Road and the internal east-west road. When the 95th percentile queue occurs in the peak periods (which will not be all the time) one vehicle may be queued in the DA-8 driveway or on the internal road. During detailed design of this area of the

development increasing the distance from the stop bar to 20m would be ideal. However, with stop signs on the internal east-west road legs the last vehicle in the queue will wait on the east-west legs. Stop signs should not be located on the north-south portion of the internal intersection to avoid queues back to Esquimalt Road and a three way stop at a four legged intersection should also not be permitted as this creates driver confusion as to why the one leg doesn't stop. The signalization of Sitkum Road / Esquimalt Road may also reduce the northbound queues at this intersection as it may draw vehicles, particularly from DA-2a, DA-2b, and DA-1.

4.0 SUSTAINABLE TRANSPORTATION

The site is already well provided for in terms of sidewalks, bicycle facilities, and transit facilities within the area surrounding the site. As part of the development new crosswalks will be installed at the main site access with the signalization of the intersection. This will provide additional safe crossings across Esquimalt Road for pedestrians and cyclists.

The transit stop along the frontage of Roundhouse will be reviewed, in consultation with BC Transit, to ensure a fully accessible and furnished stop is provided. The current design for the Esquimalt stop is a bus bay and the installation of a right turn lane on the west side of the intersection could provide a queue jumper lane (shared with right turners) for this future BRT stop (current transit stop).

Internally a pedestrian / bicycle connection is proposed from the north to the south side of the property. This connection will extend across Kimta Road, with a proposed raised crosswalk to connect Lime Bay Park, Roundhouse, and Victoria West Park. Additional pedestrian connections through the site will be provided in the form of sidewalks and multi-use pathways. Ultimately an east-west multi-use pathway is proposed parallel to the E&N tracks to extend the E&N Trail through the site in place of the City's interim cycling facility that is on Kimta/Catherine.

5.0 CONCLUSIONS

The Roundhouse at Bayview Place is comprised of two parcels: North and South. An assessment of existing residential trip generation of existing condominium units in the Victoria West neighbourhood found that vehicle trips are generated at a lower rate than typical (ITE). This is consistent with the highly walkable, bikeable, and high transit service nature of area and the existing mode splits in Victoria. The trip generation for the site is based on site specific residential rate for Victoria West and ITE for the commercial land use. The traffic volumes analyzed are based on 186 more multi-family units and 22,200 sq. ft. more commercial than is identified in the trip generation tables which translates to 24 to 82 less vph expected on the network than was analyzed. The difference in trips does not change the required mitigations.

The existing road network operates at a LOS D or better in the AM peak hour. The addition of the development adds delays; however, only the eastbound direction on Esquimalt Road at Harbour Road drops in LOS (from D to an E). This is due to the high volume of traffic heading into downtown Victoria in the AM. The segments of Esquimalt Road west of Tyee Road are not impact; however, the combination of the high eastbound through volumes and the existing high southbound left turn volume off Tyee Road in the AM creates volumes above 1,000 vph which exceeds a single lane of traffic's capacity at Harbour Road. Continuing to work to shift traffic to active modes and transit will help to reduce the added delay in the eastbound direction.

In the PM peak hour there are four existing movements that operate at a LOS E/F. The addition of the development traffic impacts movements at Wilson Street / Bay Street; however, with adjustments in signal timing all movements will be at a LOS D or better. At Esquimalt Road/Sitkum Road the southbound movements (from the condominium driveway) will drop to a LOS E due to increased traffic on Esquimalt Road which reduces gaps for left turning traffic from the driveway. As a signalized intersection this will operate at a LOS B or better. At Catherine Street / Esquimalt Road in the PM peak hour, the northbound left turn drops from a LOS E to LOS F (with significant delays) as well the southbound movement drops to a LOS F. These poor movements are mitigated

with the addition of a northbound left turn lane on Catherine Street and adjusted signal timing. The addition of the signal at Sitkum Road / Esquimalt Road may also draw some of the northbound left turning traffic from Catherine Street which will improve the operations at Catherine Street / Esquimalt Road.

The other site accesses on Catherine Street / Kimta Road will operate at good LOS in the long term. A review of the southbound left turn queues at the DA-4/DA-5/DA-6 access (closest to the Catherine Street crossing) found that the 95th queues are less than 10m in length and won't impact the railway crossing (located 50m away) or the crosswalk (approximately 12m away).

A right in / right out access for DA-9, that aligns with the 222 Esquimalt Road driveway will operate at a LOS B or better. The grades from Sitkum Road to the site are prohibitive to accommodating a driveway under DA-9 as well the parcel frontage is limited to less than 15m due to the Backshop (heritage building) which would make exiting towards Esquimalt Road difficult. The location of a driveway on Sitkum Road is not recommended due to the spacing from the intersection and the challenge motorists will have making a left turn out of the site. A parking facility under the heritage buildings is not planned which makes utilizing a Saghalie Road access for DA-9 not possible.

The northbound queue from Esquimalt Road / Main Site Access will extend to 20m in the peak periods which is approximately half a car length more than the spacing between the two intersections (on site) based on the conceptual design for the on-site road layout. One vehicle may queue on the east-west legs of the internal intersection. However, vehicles may utilize the Sitkum Road / Esquimalt Road intersection with the proposed change in traffic control to a traffic signal that will provide an easy alternative to access to Esquimalt Road.

The site is well situated for pedestrian facilities, bicycle facilities, and transit service. The transit stop along the Esquimalt Road frontage will be relocated to the far side of the main access and be provided with a queue jumper lane / right turn into the site and a receiving bus bay. New crosswalks at the Main Access intersection will provide

additional crossing opportunities between Victoria West Park and the Roundhouse site. Internal pedestrian connections are planned to allow for movement of pedestrians through all frontages / portions of the site. A key corridor will connect the Roundhouse building to Lime Bay. A new raised crosswalk is proposed to extend this corridor across Kimta Road. Cycling facilities are provided on Esquimalt Road (bicycle lanes) and Kimta (protected facility) and ultimately a multi-use facility will parallel the E&N railway line through the middle of the site.

6.0 RECOMMENDATIONS

The developer is recommended to implement the following as part of the development of the Roundhouse at Bayview Place:

- Signalize the intersection of Esquimalt Road / Main Site Access (between Stores Building and Carshop) including crosswalks on all approaches.
- Provide a right in / right out access for DA-9 on Esquimalt Road. Extend the centre median to restrict the turn movements at this access.
- Add an eastbound right turn at Esquimalt Road / Main Site Access that could be a shared right turn into the site and a queue jumper lane for transit accessing the new far side stop.
- Relocate that bus bay on Esquimalt Road, eastbound, to a far side bus bay at the Main Site Access.
- Add a northbound left turn lane on Catherine Street at Esquimalt Road and optimize the signal timing.
- Adjust the signal timing at Wilson Street / Bay Street.
- Install a raised crosswalk across Kimta Road to connect Lime Bay Park with the internal Roundhouse pedestrian/bicycle corridor.
- Signalize the intersection Esquimalt Road / Sitkum Road and provide a northbound left turn lane and through / right on Sitkum Road. Add crosswalks on all approaches.

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