



MILLSTONE RIVER FRONT DEVELOPMENT (TERMINAL 1)

Traffic Impact Assessment

PERMIT TO PRACTICE
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1.0 INTRODUCTION

Watt Consulting Group was retained by Oakwood Park Estates to conduct a traffic impact assessment for the proposed Millstone River Front development, which includes a mixture of multi-family residential buildings, commercial, hotel, restaurant, and conference facilities. There is an adjacent Ironclad development, that was originally part of this site. The adjacent development has a separate traffic impact assessment; however, the road network for the two projects is interconnected and therefore traffic from this adjacent development is included in this report. The development is located at the northwest corner of Highway 1 / Comox Road in the City of Nanaimo. The study will review the existing traffic operations along with the post development and long-term conditions for all modes of transportation for the proposed development (see **Figure 1**).

1.1 STUDY AREA

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

- Highway 1 / Comox Road
- Comox Road / Wallace Street
- Comox Road / Prideaux Street
- Mill Street / Prideaux Street and Barsby Avenue



Figure 1: Study Area and Site Location

2.0 EXISTING CONDITIONS

2.1 LAND USE

The site was previously utilized by a hotel, nightclub, and regional bus depot. It currently has a fitness centre and church utilizing the site. The surrounding land use is a mixture of multi-family residential buildings, and commercial / retail units.

2.2 ROAD NETWORK

Comox Road is an east-west urban arterial road with a four-lane cross section. Comox Road becomes Bowen Road and provides a parallel route to Terminal Avenue/Island Highway to the north. To the east of Highway 1 Comox Road leads to downtown Nanaimo. There are sidewalks on both sides of Comox Road, but no bicycle facilities.



Highway 1 is a four lane urban arterial road under the jurisdiction of the Ministry of Transportation and Infrastructure. Immediately north of Comox Road (across the Millstone River) Highway 1 turns east (to Stewart) to the Departure Bay Ferry Terminal. The northbound continuation of Highway 1 is Terminal Avenue, which is under the City of Nanaimo jurisdiction. Highway 1 has sidewalks on both sides of the roadway.

Wallace Street is a two lane urban major collector street running north-south. Wallace Street ends at Comox Road and becomes an access road into the site.

Prideaux Street is a two lane urban local road until Comox Road then becomes Mill Street. North of Comox Road there is a sidewalk on the east side of the street along the first property and then a 100m gap to the next section of sidewalk which then continues onto Mill Street. There is on-street parking on both sides of the road until Barsby Avenue.

Mill Street is an extension of Prideaux Street. Mill Road has a two lane cross section, no centreline, and no parking on the east side of the road. There are sections of sidewalk along the west side of the road. The City is planning to add parking on both sides of the street creating a 'queuing' street where traffic will have to single lane alternate where vehicles are on both sides of the road.

The Comox Road / Highway 1 intersection is signalized with split phasing on Comox Road due to the shared left and left/through lanes. At the westbound approach the right turn is a free right turn with an acceleration lane. The southbound and eastbound approaches have channelized right turns with yield signs. The northbound and southbound approaches have separate left turn lanes and protected phasing.

The Comox Road / Wallace Street intersection is signalized with a northbound left/through and separate right turn lane. On Comox Road there are no separate left turn lanes, but in the westbound direction there is an advance (protected/permitted) left turn. Eastbound there is a separate channelized right turn.



The Comox Rd / Prideaux Street intersection is signalized with no separate turn lanes on any approach. The Prideaux Street / Mill Street / Barsby Avenue intersection is unsignalized with stop control on Barsby Avenue.

2.3 TRAFFIC VOLUMES

Traffic counts were collected on March 11, 2021 for the AM and PM peak hour at Comox Road / Prideaux Street, Highway 1 / Comox Road, and Prideaux Street / Mill Street / Barsby Avenue. The data for Comox Road / Wallace Street was collected in September 2020. Further, April 2017 and September 2020 traffic counts were provided by the City of Nanaimo for the Comox Road / Wallace Street and Comox Road / Prideaux Street intersections to identify if the WATT counts were impacted by COVID. A review of the three count periods found that all the movements had similar volumes except for the westbound left and northbound right movements at the Comox Road / Wallace Street intersection. For these movements, the volume was adjusted to the higher September 2020 volumes to represent the worst case scenario. The April 2017 and September 2020 volumes were similar to each other.

During the traffic counts BC was within the end of the second wave of the COVID-19 pandemic. Due to the pandemic, traffic volumes may have been lower than historically and what they could be post-pandemic. Based on information from MoTI during the fall of 2020 traffic volumes in the Nanaimo area, on Highway 1 were within 5% of typical levels and expect to continue back to pre-pandemic levels. To account for the reduction in traffic, due to COVID, the 2021 traffic volumes were increased by 5%. The traffic volumes at Comox Road / Wallace Street taken in 2020 were adjusted with a 2% annual growth rate as well to bring the volumes from 2020 to 2021. It is also unknown if traffic volumes will fully return to pre-pandemic levels or if the work from home / hybrid work environment may reduce peak hour (commuting) traffic to a new pattern / level.

See **Figure 2 and 3** for 2021 peak hour background volumes.

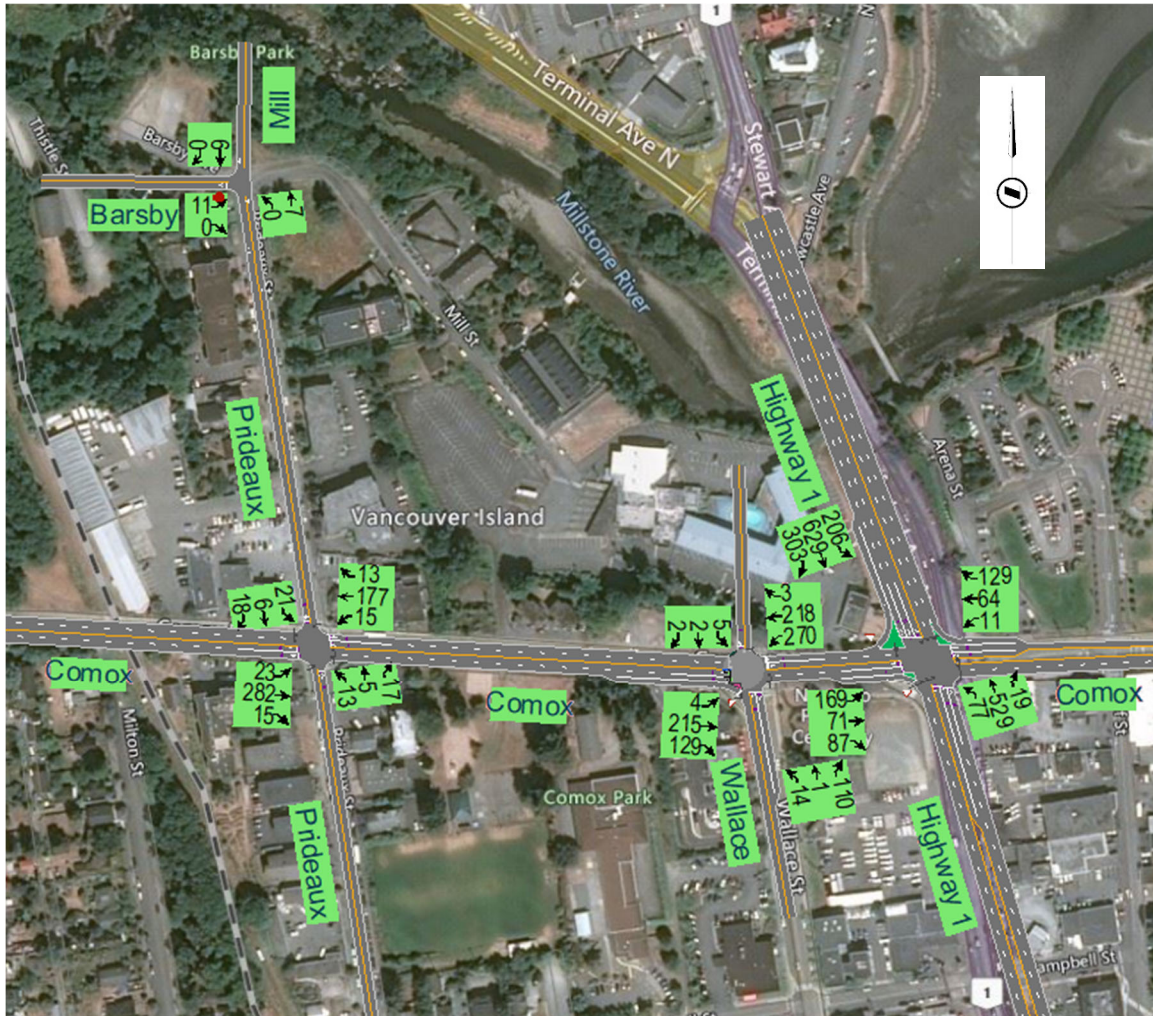


Figure 2: 2021 AM Peak Hour Background Volumes



Figure 3: 2021 PM 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 11) is used because of its ability to provide analysis using the Highway Capacity Manual (2010) methodology, while SimTraffic integrates established driver behaviors 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**.

For each movement within the traffic modelling 2% of the total volume was modelled as heavy vehicles, as this was the average for all movements at each intersection based on the traffic counts. Signal timing sheets were provided from the City of Nanaimo and Ministry of Transportation and Infrastructure (MoTI) and utilized for all modelled scenarios without modification unless otherwise noted.

2.5 2021 BACKGROUND TRAFFIC CONDITIONS

The 2021 background traffic conditions were analyzed for the AM and PM peak hours. At the intersection of Highway 1 / Comox Road, in the AM and PM peak hour there are several movements at a LOS E including the eastbound left, eastbound through-left, westbound through-left, northbound left and southbound left.

At Wallace Road /Comox Road the northbound left/through movement (from Wallace onto Comox) operates at a LOS D in the AM and PM peak hour. All other movements at this intersection operate at a LOS C or better.

At Prideaux Street / Comox Road all movements operate at a LOS C or better. The unsignalized intersection of Prideaux Street / Mill Street / Barsby Avenue operates at a LOS A.



There are no queues extending beyond the provide storage lengths at Comox Road / Prideaux Street or Prideaux Street / Mill Street, however, due high existing traffic volumes, signal timing which prioritizes Highway 1, and a 70m westbound / eastbound spacing between Highway 1 and Wallace Road, eastbound traffic at Highway 1 / Comox Road and westbound traffic at Wallace Road / Comox Road have been known to spillback between the two intersections. The lack of a separate left turn lane on Comox Road at the Comox Road / Wallace Road intersection further exasperates the queue spillback for those travelling westbound. There are several options to mitigate the existing queuing issues; however, none are feasible and do not support active transportation initiatives outlined in the Nanaimo City Plan which prioritizes walking, rolling, and cycling and providing safe and comfortable streets. These potential options include:

- Adding an additional westbound lane on Comox Road at Comox Road / Wallace Road to separate westbound left turns from through movements. Similarly separate the left / through movements (east-west) at Highway 1 / Comox Road to provide separate left turns. The addition of lanes on Comox Road would widen the roadway and make crossing distances longer for cyclists and pedestrians at both intersections which results in a less safe environment for vulnerable users. This would also promote vehicles and car centric behavior, as well as take right-of-way (being provided by this developer) that could be otherwise used for active transportation infrastructure such as bicycle lanes. This is counter to the City Plan objectives and does not fit with the City's Downtown Mobility Hub concept. There is also a lack of right-of-way from more than five property owners surrounding the two intersection and would impact Maffeo Park and potential the Graveyard park and Comox Park. The addition of the lane at Highway 1 / Comox Road would also not eliminate the split phasing due to potential truck overlap during left turns. This split phasing is contributing to the queue lengths Comox Road
- Adjusting the green time to provide more green time on Comox Road would reduce the queues on Comox Road, but would adversely effect Highway 1 as it would take green time away from the north / south movements. Further, MoTI has



- indicated that they are not supportive of adjustments in signal timing at this location to improve side street operations or reduce queueing.
- Adding additional lanes on Highway 1 could alleviate traffic backup however there is no right-of-way to the south of Comox Road and adding lanes north of Comox Road would require the bridge to be expanded. This option also does not align with the City of Nanaimo's desire for Highway 1 (Terminal Avenue) to be two lanes in the core area and prioritize active transportation infrastructure. Creating an intersection, at the entry to a downtown core, with more than five lanes per approach is counter to the City Plan to prioritize active transportation and creating inviting streets, particularly in the core area.

See **Table 1 and 2** for opening day background LOS, delays, v/c ratios, and queues.



TABLE 1: 2021 AM BACKGROUND CONDITIONS

INTERSECTION	MOVEMENT	AM PEAK HOUR			
		LOS	Delay (s)	Queue (m)	V/C Ratio
HWY 1 / COMOX RD	EBL	E	65.3	37.1	0.68
	EBL/T**	E	64.3	50.8	0.67
	EBR	A	6.6	29.0 (30)	0.35
	WBL/T & WBT**	D	54.5	25.0 (30) / 14.1	0.29
	WBR	B	17.0	0.0 (30)	0.60
	NBL	E	64.5	33.7 (70)	0.58
	NBT & NBT/R**	C	27.0	53.9 / 55.8	0.38
	SBL	E	62.5	74.0	0.77
	SBT	C	20.8	60.9	0.41
WALLACE RD / COMOX RD	SBR	A	3.6	0.0 (65)	0.39
	EBL/T & EBT**	A	3.3	15.5 / 10.8	0.11
	EBR	A	0.9	8.0 (60)	0.15
	WBL/T & WBT/R**	A	5.6	39.4 / 26.3	0.35
	NBL/T	D	39.3	9.1	0.15
	NBR	B	12.1	17.0 (55)	0.49
PRIDEAUX ST / COMOX RD	SB	C	32.0	10.8	0.11
	EBL/T & EBT/R**	A	3.6	13.9 / 21.0	0.16
	WBL/T & EBT/R**	A	1.8	10.0 / 10.3	0.09
	NB	C	26.3	15.9	0.25
PRIDEAUX ST / MILL ST / BARSBY AVE	SB	C	29.1	21.4	0.31
	EB	A	0.0	0.0	0.00
	NB	A	0.0	0.0	0.00
	SB	A	0.0	0.0	0.01

*Note: 95th percentile queues based on SimTraffic results (averaged from five simulation runs); (##) = Existing Storage Length including PL on Highway 1. Where two through lanes higher queue is listed.

**For roads with two through lanes that may be shared Synchro groups left-throughs and through-rights with the adjacent through lanes in the reporting.



TABLE 2: 2021 PM BACKGROUND CONDITIONS

INTERSECTION	MOVEMENT	PM PEAK HOUR			
		LOS	Delay (s)	Queue (m)	V/C Ratio
HWY 1 / COMOX RD	EBL	E	77.8	58.8	0.83
	EBL/T**	E	79.6	73.6	0.83
	EBR	A	9.1	44.8 (30)	0.36
	WBL/T & WBT**	E	55.5	20.5 (30) / 22.6	0.43
	WBR	B	16.6	0.0	0.77
	NBL	E	66.8	53.4 (70)	0.76
	NBT & NBT/R**	D	37.3	78.2 / 69.1	0.60
	SBL	E	63.6	78.0	0.82
	SBT	C	33.6	86.9	0.66
	SBR	A	7.5	34.7 (65)	0.38
WALLACE RD / COMOX RD	EBL/T & EBT**	A	4.3	20.8 / 21.2	0.17
	EBR	A	0.9	0.0 (60)	0.14
	WBL/T & WBT/R**	A	6.7	33.5 / 31.3	0.34
	NBL/T	D	50.0	33.5	0.58
	NBR	A	10.0	26.1 (55)	0.59
	SB	C	29.8	5.6	0.05
PRIDEAUX ST / COMOX RD	EBL/T & EBT/R**	A	4.3	17.3 / 14.3	0.22
	WBL/T & EBT/R**	A	3.5	16.1 / 14.1	0.19
	NB	C	29.5	19.8	0.12
	SB	C	32.1	26.2	0.12
PRIDEAUX ST / MILL ST / BARSBY AVE	EB	A	8.4	0.0	0.01
	NB	A	1.4	0.0	0.01
	SB	A	0.0	0.0	0.01

*Note: 95th percentile queues based on SimTraffic results (averaged from five simulation runs); (##) = Existing Storage Length including PL on Highway 1. Where two through lanes higher queue is listed.

**For roads with two through lanes that may be shared Synchro groups left-throughs and through-rights with the adjacent through lanes in the reporting.



3.0 POST DEVELOPMENT

3.1 PROPOSED LAND USE

The Millstone River Front development at Terminal 1 is proposed to include 415 multi-family units (mid-rise), 340 multi-family units (high-rise), five townhouse units (low-rise), a 120-room hotel, and 12,000 sq. ft. of commercial space. The adjacent Ironclad development includes three multi-family buildings with 230 units. For the purposes of this study both developments are estimated to be completed by 2025.

3.2 SITE ACCESS

The road network for this development and the adjacent Ironclad development will be interconnected. The adjacent development will create a new access point to Comox Road between Wallace Street and Prideaux Street (known as the West Access). With the current design on Comox Road (four lanes with no separate turn lanes) this access will be restricted to right in / right out. Mills Street will be extended into the site and provide full movement access to Comox Road at Prideaux Street for both this development and the Ironclad development.

Another internal road will connect at the Comox Road and Wallace Street intersection (known as the East Access). The Comox Road and Wallace Street intersection is already signalized, and this fourth leg is existing; therefore, full movement access to Comox Road and Wallace Street will continue to be provided. A separate southbound left turn lane at this access should be constructed and the existing lane converted to a through-right lane. This will be designed during detailed design phases of the project. Both the West Access, East Access, and the Mill Street extension will connect internally on the site providing multiple access options for the site. See **Figure 1** for the site plan and accesses.



3.3 TRIP GENERATION

Trip generation rates were estimated using the 11th Edition of the ITE Trip Generation Manual. The 11th Edition Trip Generation Manual is the latest edition and includes enhanced data sets and modernized content such as the option to differentiate suburban / urban, dense multi-family and dense core areas. The urban/suburban setting was used for the below trip generation to account for a worst-case scenario, however, as the surrounding area densifies as per the City Plan this development could be considered as “dense core” which would have a lower trip generation than is being analyzed in this report. Further, the trip generation for this development have not been modified or adjusted for pass-by / internal trips or for multi-modal shift (to active modes), as a worst-case scenario; however, as this site is located within the Downtown Mobility Hub with its access to existing and future active transportation and transit options. Overall, it is expected that this site will generate less vehicle traffic than modelled.

Trip generation rates for the weekday AM and PM peak hours are shown in **Table 3**. **Table 4** shows the estimated trips generated by the proposed development. The development is expected to generate 317 new weekday AM peak hour trips and 390 new weekday PM peak hour trips to the surrounding road network.

TABLE 3: PEAK HOUR TRIP GENERATION RATES

ITE Land Use		Weekday AM			Weekday PM		
Code	Description	Rate	In	Out	Rate	In	Out
220	Multi-Family Housing (Low-Rise)	0.40	24%	76%	0.51	63%	37%
221	Multi-Family Housing (Mid-Rise)	0.37	23%	77%	0.39	61%	39%
222	Multi-Family Housing (High-Rise)	0.27	34%	66%	0.32	56%	44%
310	Lodging (Hotel)	0.46	56%	44%	0.59	51%	49%
820	Commercial	0.84	62%	38%	3.40	48%	52%



TABLE 4: DEVELOPMENT GENERATED TRIPS

Description	Units	Weekday AM			Weekday PM		
		In	Out	Total	In	Out	Total
Building A	175	15	50	65	42	27	69
Building B	55	5	16	21	13	9	22
Building C	192	18	34	52	35	27	62
Building D	88	8	25	33	21	14	35
Building E	97	8	28	36	23	15	38
Building F	148	14	26	40	27	21	48
Townhouse 1	2	0	1	1	1	1	2
Townhouse 2	3	0	2	2	1	1	2
Hotel/Restaurant/Conference – Lodging (Hotel)	120	31	25	56	36	35	71
Commercial	12 (1000 sq. ft.)	7	4	11	20	21	41
Total	892	106	211	317	219	171	390

3.4 TRIP ASSIGNMENT

The site trip assignment is based on the existing trip distributions at the study intersections in the area. The trip assignment includes the Millstone Riverfront development as well as the sub-area Ironclad development within the Millstone Riverfront development. **Table 5, Figure 4 and Figure 5** illustrate the site trip distributions for AM and PM peak hours per movement.

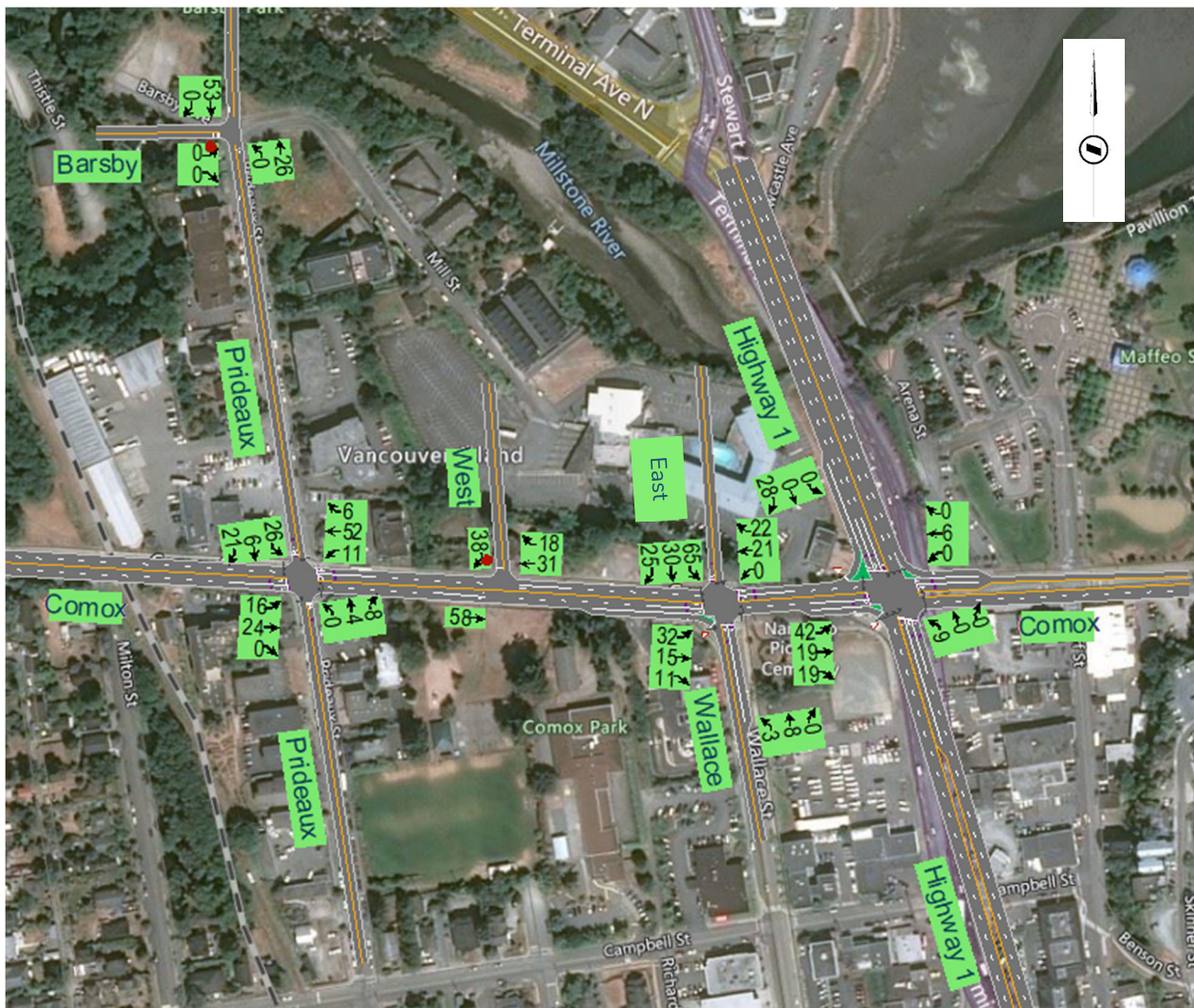


Figure 4: AM Trip Assignment



Figure 5: PM Trip Assignment



TABLE 5: DISTRIBUTION PERCENTAGES OF SITE TRIPS

INTERSECTION	MOVEMENT	AM PEAK HOUR		PM PEAK HOUR	
		% IN	% OUT	% IN	% OUT
HWY 1 / COMOX RD	EBL	-	20%	-	24%
	EBT	-	9%	-	8%
	EBR	-	9%	-	9%
	WBT	6%	-	11%	-
	NBL	8%	-	17%	-
	SBR	26%	-	25%	-
WALLACE RD / SITE ACCESS / COMOX RD	EBL	30%	-	17%	-
	EBT	-	7%	-	8%
	EBR	-	5%	-	3%
	WBT	20%	-	24%	-
	WBR	19%	-	28%	-
	NBL	3%	-	8%	-
	NBT	8%	-	10%	-
	SBL	-	31%	-	34%
	SBT	-	14%	-	13%
SITE ACCESS / COMOX RD	SBR	-	12%	-	11%
	EBT	-	12%	-	12%
	WBT	6%	12%	8%	-
	WBR	17%	-	24%	-
PRIDEAUX ST / COMOX RD	SBR	-	18%	-	17%
	EBL	15%	-	9%	-
	EBT	23%	-	13%	-
	WBL	-	5%	-	5%
	WBT	-	25%	-	24%
	WBR	7%	-	8%	-
	NBT	4%	-	3%	-
	NBR	8%	-	4%	-
	SBL	-	12%	-	10%
PRIDEAUX ST / MILL ST / BARSBY AVE	SBT	-	3%	-	4%
	SBR	-	10%	-	10%
	NB	-	-	-	-
	NB	26%	-	20%	-
	SB	-	25%	-	25%



3.5 OPENING DAY BACKGROUND TRAFFIC CONDITIONS

Background traffic conditions for opening day in 2025 are the result of 2021 background data with an applied 2% annual growth rate. See **Figures 6 and 7** and **Table 6 and 7** for the 2025 background traffic.



Figure 6: Opening Day AM Background Volumes

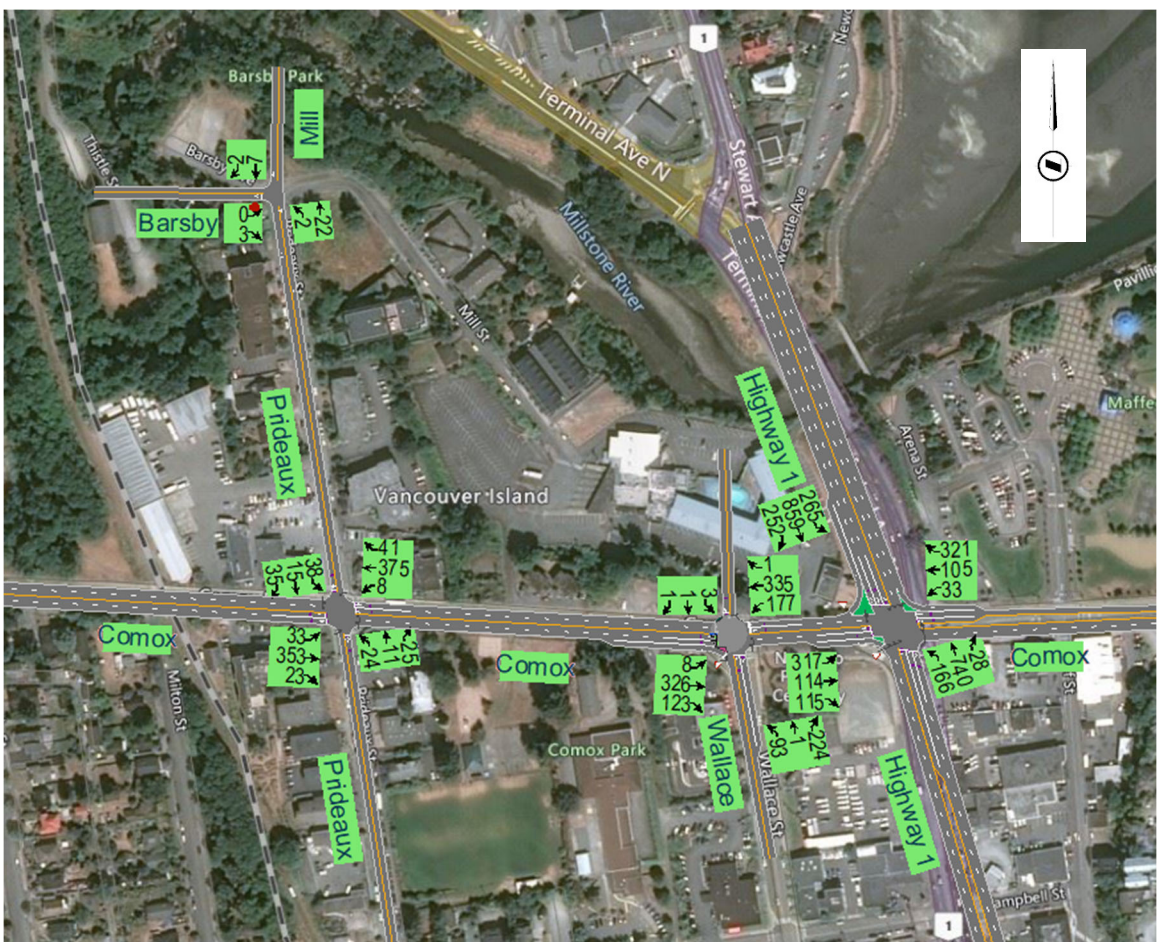


Figure 7: Opening Day PM Background Volumes



TABLE 6: OPENING DAY AM BACKGROUND CONDITIONS

INTERSECTION	MOVEMENT	AM PEAK HOUR			
		LOS	Delay (s)	Queue (m)	V/C Ratio
HWY 1 / COMOX RD	EBL	E	64.7	43.0	0.69
	EBL/T**	E	63.4	54.8	0.68
	EBR	A	7.9	39.4 (30)	0.37
	WBL/T & WBT**	D	54.7	20.5 (30) / 21.1	0.30
	WBR	B	17.0	0.0 (30)	0.61
	NBL	E	64.8	38.8 (70)	0.60
	NBT & NBT/R**	C	29.7	64.3 / 57.7	0.43
	SBL	E	62.1	70.4	0.79
	SBT	C	22.7	63.8	0.45
	SBR	A	4.3	0.0	0.43
WALLACE RD / COMOX RD	EBL/T & EBT**	A	3.3	14.1 / 12.6	0.12
	EBR	A	0.9	8.9 (65)	0.16
	WBL/T & WBT/R**	A	6.0	40.5 / 18.6	0.38
	NBL/T	D	39.6	14.8	0.16
	NBR	B	12.1	19.2 (55)	0.52
	SB	C	32.9	8.8	0.12
PRIDEAUX ST / COMOX RD	EBL/T & EBT/R**	A	3.6	12.2 / 26.3	0.18
	WBL/T & EBT/R**	A	1.7	6.5 / 10.3	0.10
	NB	C	26.6	16.6	0.29
	SB	C	29.3	18.3	0.34
PRIDEAUX ST / MILL ST / BARSBY ST	EB	A	0.0	0.0	0.00
	NB	A	0.0	0.0	0.00
	SB	A	0.0	0.0	0.01

*Note: 95th percentile queues based on SimTraffic results (averaged from five simulation runs); (##) = Existing Storage Length including PL on Highway 1. Where two through lanes higher queue is listed.

**For larger laning schemes Synchro groups through-lefts and through-rights with other through lanes in the reporting.



TABLE 7: OPENING DAY PM BACKGROUND CONDITIONS

INTERSECTION	MOVEMENT	PM PEAK HOUR			
		LOS	Delay (s)	Queue (m)	V/C Ratio
HWY 1 / COMOX RD	EBL	F	89.0	67.1	0.87
	EBL/T**	F	95.1	80.0	0.87
	EBR	B	11.0	54.3 (30)	0.38
	WBL/T & WBT**	E	55.7	28.6 (30) / 37.0	0.46
	WBR	B	16.5	20.9 (30)	0.78
	NBL	E	64.2	61.9 (70)	0.75
	NBT & NBT/R**	D	40.9	98.2 / 87.8	0.69
	SBL	E	64.9	75.0	0.85
	SBT	D	38.1	94.8	0.75
WALLACE RD / COMOX RD	SBR	A	9.4	34.5 (65)	0.43
	EBL/T & EBT**	A	4.4	24.4 / 17.5	0.18
	EBR	A	0.9	2.9	0.15
	WBL/T & WBT/R**	A	7.3	48.4 / 43.2	0.38
	NBL/T	D	50.9	37.8	0.61
	NBR	A	9.9	35.7 (55)	0.61
PRIDEAUX ST / COMOX RD	SB	C	29.4	8.9	0.04
	EBL/T & EBT/R**	A	4.5	16.4 / 17.0	0.24
	WBL/T & EBT/R**	A	3.5	16.2 / 18.0	0.20
	NB	C	29.4	23.6	0.42
PRIDEAUX ST / MILL ST / BARSBY ST	SB	C	33.6	30.0	0.52
	EB	A	8.4	4.2	0.01
	NB	A	1.3	0.0	0.01
	SB	A	0.0	0.0	0.01

*Note: 95th percentile queues based on SimTraffic results (averaged from five simulation runs); (##) = Existing Storage Length including PL on Highway 1. Where two through lanes higher queue is listed.

**For larger laning schemes Synchro groups through-lefts and through-rights with other through lanes in the reporting.

In 2025 with the growth, the eastbound left and through, westbound left-through and through, northbound left, and southbound left turn movements will operate at a LOS E / F in both the AM and PM peak hours at Comox Road / Highway 1. All other movements at the study area intersections operates at a LOS D or better. The eastbound right turn



at Comox Road / Highway 1 will exceed the provided left turn storage (including PL distance) in the AM and PM peak hour by approximately one to three vehicles (10-25m). Queues will continue to increase and spillback occur more frequently along Comox Road between Highway 1 and Wallace Road (see **Section 2.5** for mitigation options).

In the PM peak hour, at Comox Road / Highway 1 the v/c ratios are between 0.80 and 0.86 for all movements except the eastbound right, westbound left/through, and the southbound movements.

3.6 OPENING DAY POST DEVELOPMENT TRAFFIC CONDITIONS

The 2025 opening day post development conditions were analyzed for the AM and PM peak hours. Development traffic was added to the 2025 background conditions. See **Figure 8 and 9** for AM and PM post development traffic volumes.

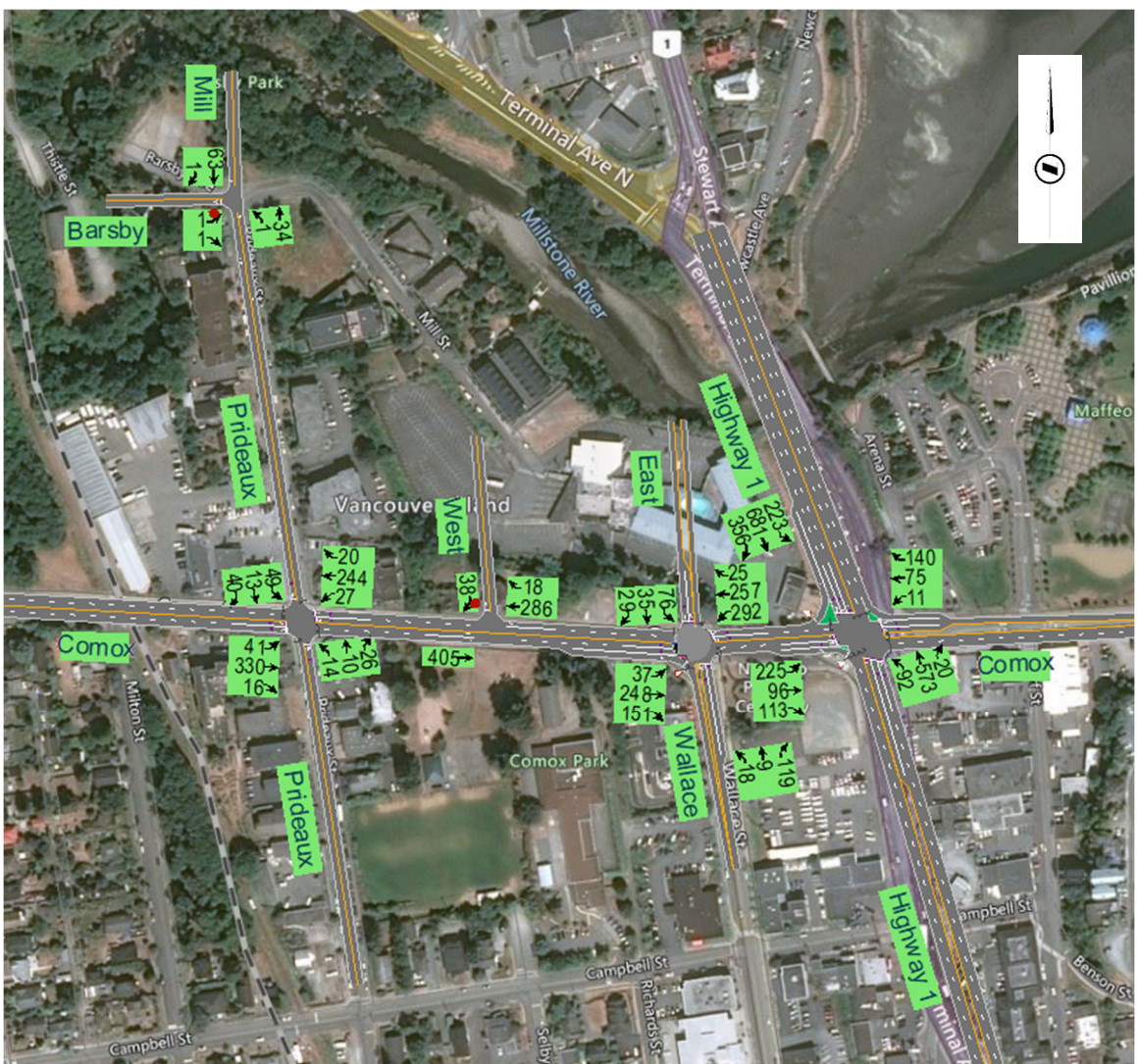


Figure 8: Opening Day 2025 AM Post Development Volumes

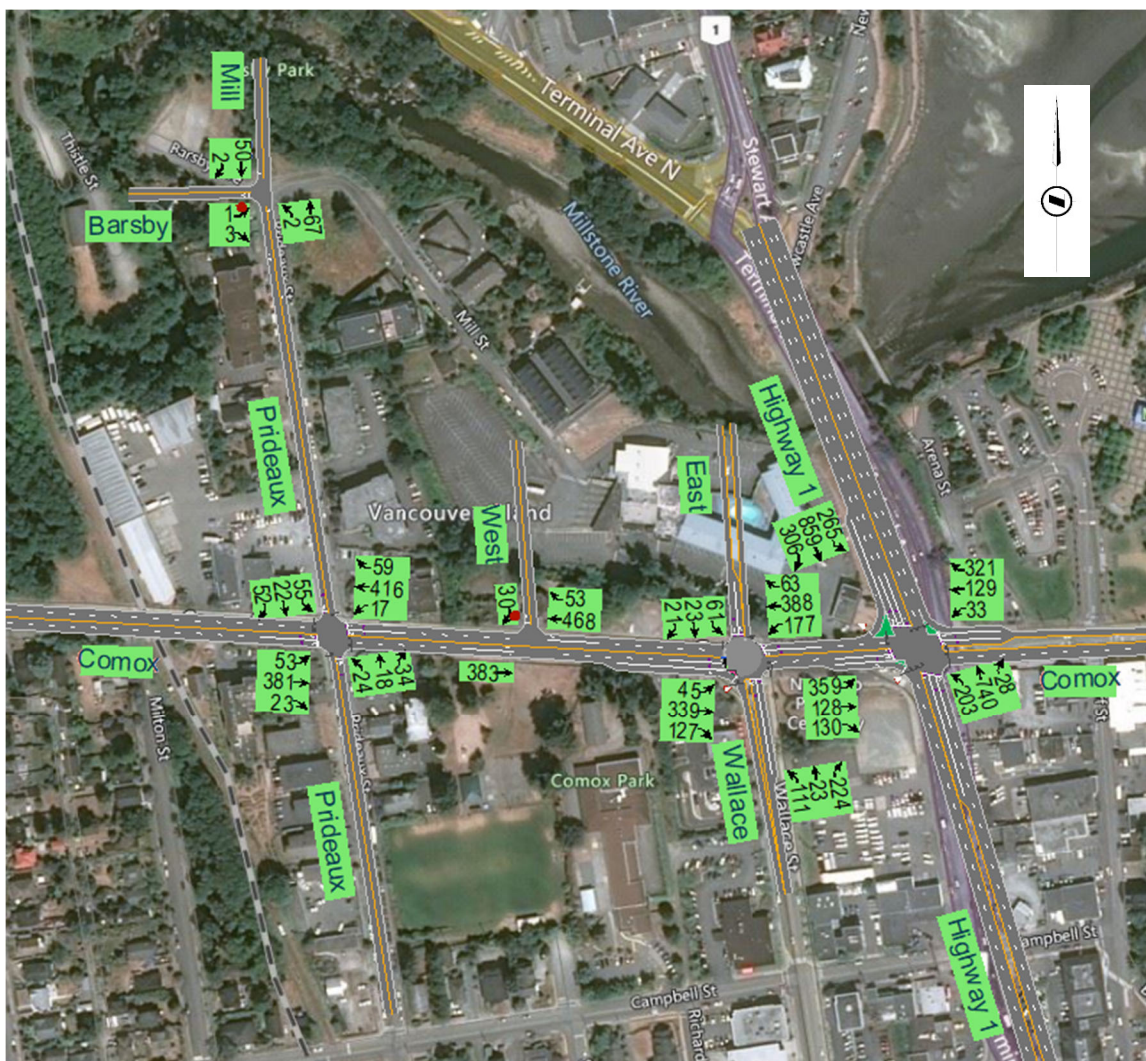


Figure 9: Opening Day 2025 PM Post Development Volumes

The addition of the development traffic at Highway 1 / Comox Road minimally impacts / changes the levels of service in comparison to 2025 background conditions. The eastbound right movement will drop from a LOS A to B with an added delay of 3.5 seconds in the AM peak hour. The southbound right movement will drop from a LOS A to B with an added delay of 1 second. Queue lengths exceed storage lengths in the PM peak hour for eastbound right, westbound left and through, northbound left, and southbound right movements. In the AM peak hour, only the eastbound right queue



exceeds the storage length. For the eastbound and westbound movements between Highway 1 and Wallace Road, along Comox Road where the existing queues are spilling back to the adjacent intersection the development adds less than three vehicles to the existing queues (in the PM) and this is an existing issue which MoTI and the City of Nanaimo should collaborate on to either mitigate (see mitigation options in **Section 2.5**) or agree to prioritize pedestrian and cycling infrastructure over additional vehicle infrastructure that encourages vehicle use and utilize space that could be utilized for providing space for active transportation modes. Active transportation modes on Comox Road, along the frontage, are limited to bicycles sharing a lane on a four lane roadway and pedestrians using a 1.5m sidewalk without any separation from the four lane roadway. The v/c ratios increase, in the PM peak hour by less than 0.06; however, the eastbound left and through-left will increase to 0.93 which is the worst v/c at the intersection. No vehicle mitigation is recommended at this location as the v/c ratios are less than 1.0 and there is no right-of-way available to add laning, vehicle improvements would negatively impact active transportation or eliminate the ability to add facilities for active transportation. The existing spillback between Wallace Road and Highway 1 is not created by this development nor substantially increased by this development.

At Wallace Road / East Access / Comox Road several movements drop one level of service; however, they all remain at a LOS D or better. The v/c ratio at this intersection are below 0.76.

At Prideaux Street / Comox Road the southbound movement will drop from a LOS C to LOS D in the AM and PM peak hour; however, there are no queuing issues and the v/c ratios in both periods are less than 0.69.

The Mill Street / Prideaux Street / Barsby Avenue intersection will remain at the same LOS A with the addition of the development.

The new right in / right out West Access on Comox Road will operate at a LOS B or better in the AM and PM peak hours. See **Table 8 and 9** for opening day post development LOS, delays, and queues.



TABLE 8: OPENING DAY 2025 AM POST DEVELOPMENT CONDITIONS

INTERSECTION	MOVEMENT	AM PEAK HOUR			
		LOS	Delay (s)	Queue (m)	V/C Ratio
HWY 1 / COMOX RD	EBL	E	67.8	45.7	0.76
	EBL/T**	E	67.5	74.0	0.76
	EBR	B	11.4	43.3 (30)	0.42
	WBL/T & WBT**	D	54.9	28.9 (30) / 24.3	0.32
	WBR	B	16.9	0.0	0.61
	NBL	E	66.0	27.7 (70)	0.64
	NBT & NBT/R**	C	31.2	69.8 / 57.5	0.45
	SBL	E	62.1	88.5	0.79
	SBT	C	24.4	62.7	0.47
WALLACE RD / EAST AVE / COMOX RD	SBR	A	4.5	5.2	0.47
	EBL/T & EBT**	A	5.0	15.0 / 19.3	0.22
	EBR	A	0.9	6.4 (60)	0.18
	WBL/T & WBT/R**	A	8.0	56.5 / 30.9	0.47
	NBL/T	D	35.7	13.8	0.22
	NBR	A	8.6	20.0 (55)	0.40
	SBL	D	53.5	32.1	0.68
PRIDEAUX ST / COMOX RD	SBT/R	C	26.6	25.8	0.40
	EBL/T & EBT/R**	A	4.7	15.9 / 14.6	0.23
	WBL/T & EBT/R**	A	3.0	13.2 / 5.6	0.16
	NB	C	23.2	29.2	0.31
PRIDEAUX ST / MILL ST / BARSBY ST	SB	D	36.2	28.0	0.57
	EB	A	9.0	5.2	0.01
	NB	A	0.5	0.0	0.00
WEST AVE / COMOX RD	SB	A	0.0	0.0	0.05
	EBT	A	0.0	0.0	0.15
	WBT	A	0.0	0.0	0.19
	WBR	A	0.0	0.0	0.01
	SBR	B	10.5	14.7	0.07

*Note: 95th percentile queues based on SimTraffic results (averaged from five simulation runs); (##) = Existing Storage Length including PL on Highway 1. Where two through lanes higher queue is listed.

**For roads with two through lanes that may be shared Synchro groups left-throughs and through-rights with the adjacent through lanes in the reporting.



TABLE 9: OPENING DAY 2025 PM POST DEVELOPMENT CONDITIONS

INTERSECTION	MOVEMENT	PM PEAK HOUR			
		LOS	Delay (s)	Queue (m)	V/C Ratio
HWY 1 / COMOX RD	EBL	F	124.0	72.1	0.93
	EBL/T**	F	132.0	81.6	0.93
	EBR	B	13.9	53.4 (30)	0.42
	WBL/T & WBT**	E	55.8	38.4 (30) / 59.0	0.49
	WBR	B	15.7	17.4	0.77
	NBL	E	70.5	85.9 (70)	0.83
	NBT & NBT/R**	D	43.0	105.7 / 95.9	0.72
	SBL	E	64.9	87.0	0.85
	SBT	D	42.9	96.3	0.82
	SBR	B	10.4	10.8 (65)	0.53
WALLACE RD / EAST AVE / COMOX RD	EBL/T & EBT**	A	7.5	26.6 / 27.3	0.32
	EBR	A	1.2	5.3 (60)	0.17
	WBL/T & WBT/R**	B	11.0	77.7 / 81.8	0.54
	NBL/T	D	51.6	46.1	0.76
	NBR	A	6.9	45.1 (55)	0.52
	SBL	D	52.4	25.9 (30)	0.67
	SBT/R	B	17.9	20.1	0.22
PRIDEAUX ST / COMOX RD	EBL/T & EBT/R**	A	5.6	28.5 / 23.0	0.30
	WBL/T & EBT/R**	A	4.2	18.8 / 24.3	0.25
	NB	C	27.9	26.9	0.45
	SB	D	43.3	40.9	0.69
PRIDEAUX ST / MILL ST / BARSBY ST	NB	A	9.0	2.9	0.02
	SBR	A	0.5	0.0	0.01
	SB	A	0.0	0.0	0.04
WEST AVE / COMOX RD	EBT	A	0.0	0.0	0.14
	WBT	A	0.0	0.0	0.31
	WBR	A	0.0	0.0	0.04
	SBR	B	12.3	13.7	0.07

*Note: 95th percentile queues based on SimTraffic results (averaged from five simulation runs); (##) = Existing Storage Length including PL on Highway 1. Where two through lanes higher queue is listed.

**For roads with two through lanes that may be shared Synchro groups left-throughs and through-rights with the adjacent through lanes in the reporting.



4.0 2035 10-YEAR HORIZON TRAFFIC CONDITIONS

For the ten-year horizon analysis, 2035 background volumes were obtained by utilizing an annual growth rate of 2%. The Ironclad trips were not added to obtain the 2035 background volumes as they form part of the development traffic. See **Figure 10** and **11** for 2035 peak hour background volumes.

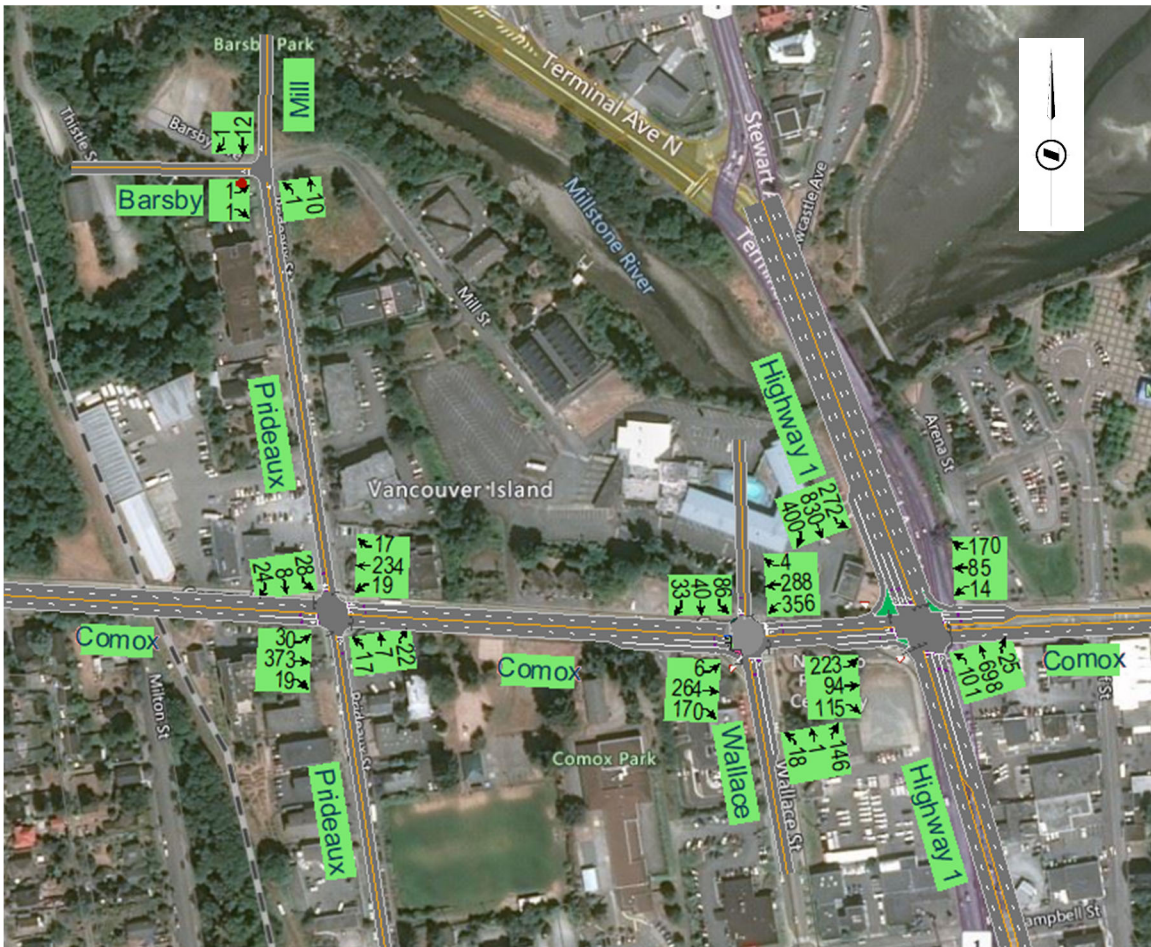


Figure 10: 2035 AM Background Volumes



Figure 11: 2035 PM Background Volumes

4.1 2035 BACKGROUND CONDITIONS ANALYSIS RESULTS

The 2035 background conditions were analyzed for the AM and PM peak hours.

In 2035, with expected traffic growth in the AM peak hour, the traffic operations at Highway 1 / Comox Road will have five movements operating at a LOS E in the AM peak hour (eastbound left and through, westbound left/through, northbound left and southbound left). In the AM peak hour, the eastbound right movement queue length exceeds the existing storage length by 17.8m or two vehicles. In the PM peak hour, there are four movements operating at a LOS F (northbound left and through/right, and



southbound left and through) and two movements at LOS E (eastbound left and through) and four movements with queue lengths exceeding the existing storage length (eastbound right, westbound left/through, northbound left, and southbound right) by 3m to 33m (or one to four vehicles). See **Section 2.5** for possible mitigations. In the PM peak hour two movements (northbound through and southbound through) will have v/c ratios above 1.0 with the existing laning and signal timing.

At Wallace Road / Comox Road the northbound left/through in the PM peak hour and southbound movements in the AM peak hour will be at a LOS D. All other movements in the Wallace Road / Comox Rd intersection operate at a LOS C or better. At Prideaux Street / Comox Road all movements are at a LOS C or better in the AM; however, in the PM peak hour the southbound movements will be at a LOS D. Prideaux Street / Mill Street / Barsby Avenue will continue to operate at a LOS A or better during the peak hours. See **Table 10 and 11** for LOS, delays, v/c ratios, and queues.



TABLE 10: 2035 AM BACKGROUND CONDITIONS

INTERSECTION	MOVEMENT	AM PEAK HOUR			
		LOS	Delay (s)	Queue (m)	V/C Ratio
HWY 1 / COMOX RD	EBL	E	67.6	49.6	0.75
	EBL/T**	E	66.7	69.1	0.75
	EBR	B	11.9	47.8 (30)	0.42
	WBL/T & WBT**	E	55.4	18.1 (30) / 23.9	0.36
	WBR	B	16.8	16.9 (30)	0.66
	NBL	E	67.0	54.7 (70)	0.67
	NBT & NBT/R**	D	36.3	75.5 / 72.7	0.59
	SBL	E	63.1	81.9	0.84
	SBT	C	27.1	85.1	0.58
	SBR	A	8.1	22.6 (65)	0.54
WALLACE RD / COMOX RD	EBL/T & EBT**	A	7.5	17.7 / 20.2	0.17
	EBR	A	1.3	9.7 (60)	0.23
	WBL/T & WBT/R**	B	13.7	57.2 / 68.4	0.58
	NBL/T	C	26.9	10.5	0.08
	NBR	A	6.0	17.9 (55)	0.36
	SB	D	53.5	48.8	0.84
PRIDEAUX ST / COMOX RD	EBL/T & EBT/R**	A	3.9	15.1 / 17.9	0.22
	WBL/T & EBT/R**	A	2.1	7.1 / 9.2	0.13
	NB	C	26.8	18.5	0.33
	SB	C	29.1	26.3	0.39
PRIDEAUX ST / MILL ST / BARSBY AVE	EB	A	8.6	7.1	0.01
	NB	A	1.4	0.0	0.00
	SBR	A	0.0	0.0	0.01

*Note: 95th percentile queues based on SimTraffic results (averaged from five simulation runs); (##) = Existing Storage Length including PL on Highway 1. Where two through lanes higher queue is listed.

**For roads with two through lanes that may be shared Synchro groups left-throughs and through-rights with the adjacent through lanes in the reporting.



TABLE 11: 2035 PM BACKGROUND CONDITIONS

INTERSECTION	MOVEMENT	PM PEAK HOUR			
		LOS	Delay (s)	Queue (m)	V/C Ratio
HWY 1 / COMOX RD	EBL	F	132.2	76.9	0.98
	EBL/T**	F	131.8	79.6	0.98
	EBR	B	15.9	54.4 (30)	0.45
	WBL/T & WBT**	D	52.1	33.4 (30) / 50.5	0.43
	WBR	C	32.7	28.1 (30)	0.91
	NBL	F	93.7	92.6 (70)	0.95
	NBT & NBT/R**	F	90.1	171.5 / 158.8	1.06
	SBL	E	70.0	87.5	0.91
	SBT	E	65.9	156.4	1.00
	SBR	B	14.6	97.9 (65)	0.56
WALLACE RD / COMOX RD	EBL/T & EBT**	A	4.9	28.7 / 37.7	0.23
	EBR	A	0.9	24.4 (60)	0.18
	WBL/T & WBT/R**	A	8.3	59.9 / 57.5	0.49
	NBL/T	D	53.2	36.5	0.68
	NBR	A	9.6	44.5 (55)	0.65
	SB	C	28.8	6.0	0.05
PRIDEAUX ST / COMOX RD	EBL/T & EBT/R**	A	5.2	22.2 / 30.2	0.30
	WBL/T & EBT/R**	A	3.8	15.4 / 19.7	0.25
	NB	C	31.6	27.4	0.49
	SB	D	38.1	30.7	0.61
PRIDEAUX ST / MILL ST / BARSBY AVE	EB	A	8.6	6.0	0.02
	NB	A	1.6	0.0	0.01
	SBR	A	0.0	0.0	0.01

*Note: 95th percentile queues based on SimTraffic results (averaged from five simulation runs); (##) = Existing Storage Length including PL on Highway 1. Where two through lanes higher queue is listed.

**For roads with two through lanes that may be shared Synchro groups left-throughs and through-rights with the adjacent through lanes in the reporting.



4.2 2035 POST DEVELOPMENT ANALYSIS RESULTS

The 2035 post development conditions were analyzed by adding the development trips of the Millstone Riverfront development and Ironclad development to 2035 background traffic volumes. See **Figure 12 and 13** for 2035 post development volumes.



Figure 12: 2035 AM Post Development Volumes

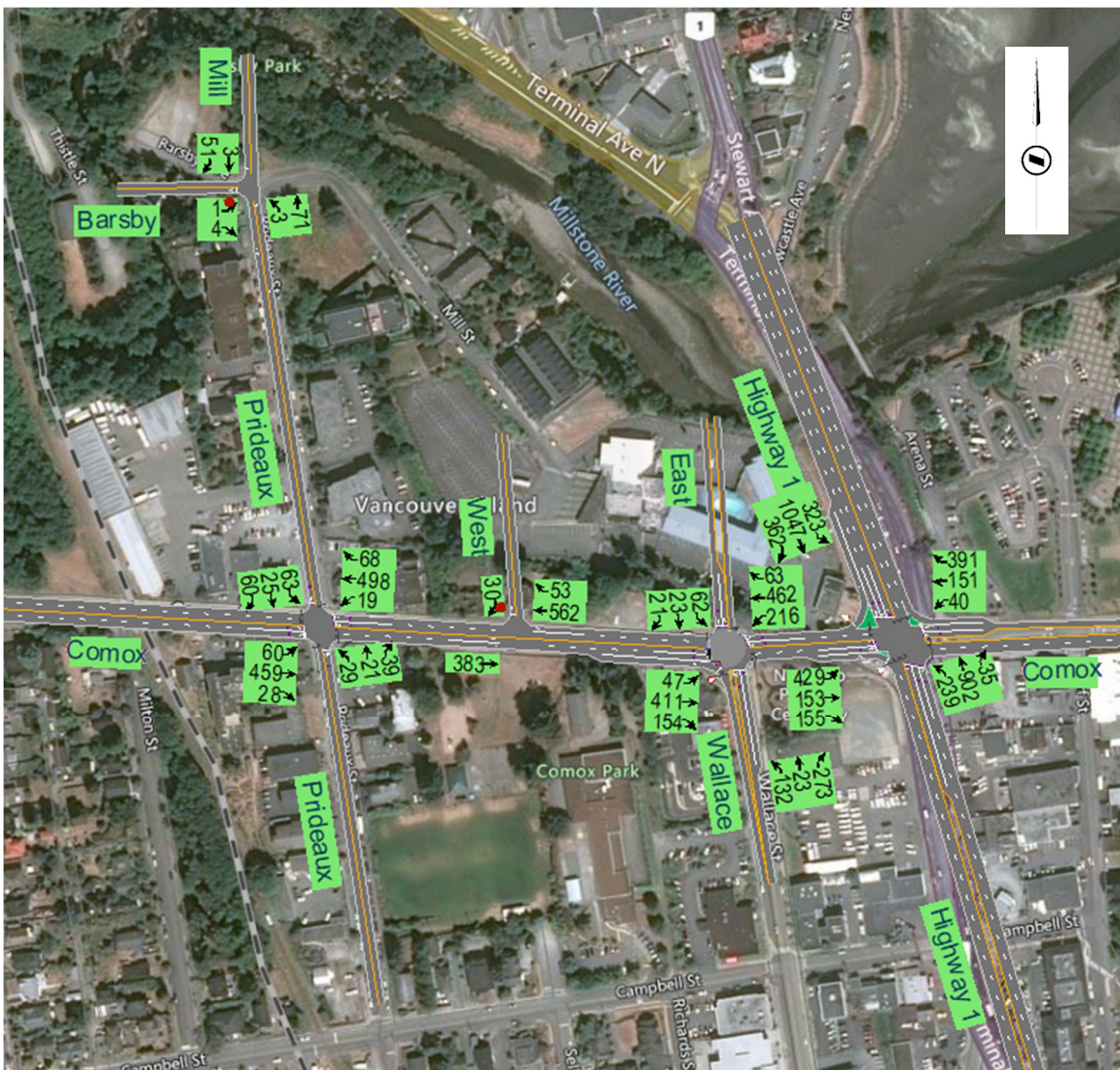


Figure 13: 2035 PM Post Development Volumes

The addition of the development traffic in the long term at Highway 1 / Comox Road does not change the LOS for any movement when compared to 2035 background conditions. Turn lane and eastbound queue lengths are exceeding the storage lengths by similar amounts to the long-term background conditions. All mitigations for this intersection are outlined in **Section 2.5** and are not needed as a result of the development.



In the AM, at Wallace Road / East Avenue / Comox Road all movements will remain at a similar LOS as without the development. At Wallace Road / Comox Road, in the PM peak hour the southbound movement will drop to a LOS D due to the development traffic. However, since all movements are at a LOS D or better no mitigation is required.

At Prideaux Road / Comox Road, in the AM peak hour the southbound movement will drop to a LOS D due to the development traffic. In the PM, at Prideaux Street / Comox Road all movements will remain at the same LOS as without the development. No mitigation is required due to the development in the long term.

At Barsby Avenue / Mill Street / Prideaux Street there is no change in the operations with the addition of the development. At the right in/right out access on Comox Road the southbound right turn will operate at a LOS B in the AM and PM peak hour. See **Table 12 and 13** for the results of the 2035 post development analysis.



TABLE 12: 2035 AM POST DEVELOPMENT CONDITIONS

INTERSECTION	MOVEMENT	AM PEAK HOUR			
		LOS	Delay (s)	Queue (m)	V/C Ratio
HWY 1 / COMOX RD	EBL	E	73.9	62.1	0.81
	EBL/T**	E	74.2	78.2	0.81
	EBR	B	15.5	50.8 (30)	0.47
	WBL/T & WBT**	E	55.6	26.6 (30) / 19.3	0.38
	WBR	B	16.6	11.7 (30)	0.66
	NBL	E	68.0	38.0 (70)	0.70
	NBT & NBT/R**	D	38.1	78.8 / 73.6	0.62
	SBL	E	63.1	82.2	0.84
	SBT	C	29.2	84.1	0.61
	SBR	A	8.8	51.3 (65)	0.58
WALLACE RD / EAST AVE / COMOX RD	EBL/T & EBT**	A	6.0	22.3 / 27.8	0.27
	EBR	A	1.0	10.5 (60)	0.22
	WBL/T & WBT/R**	B	11.1	74.6 / 96.2	0.60
	NBL/T	C	33.7	21.2	0.22
	NBR	A	7.7	21.9 (55)	0.43
	SBL	D	53.4	29.7 (30)	0.72
	SBT/R	C	27.8	23.3	0.43
PRIDEAUX ST / COMOX RD	EBL/T & EBT/R**	A	5.2	21.1 / 22.5	0.28
	WBL/T & EBT/R**	A	3.6	14.9 / 12.0	0.19
	NB	C	23.3	22.4	0.35
	SB	D	38.8	36.5	0.62
PRIDEAUX ST / MILL ST / BARSBY AVE	NB	A	9.1	5.0	0.01
	SBR	A	0.5	0.0	0.00
	SB	A	0.0	0.0	0.05
WEST ACCESS / COMOX RD	EBT	A	0.0	0.0	0.18
	WBT	A	0.0	0.0	0.23
	WBR	A	0.0	0.0	0.01
	SB	B	11.1	13.5	0.07

*Note: 95th percentile queues based on SimTraffic results (averaged from five simulation runs); (##) = Existing Storage Length including PL on Highway 1. Where two through lanes higher queue is listed.

**For roads with two through lanes that may be shared Synchro groups left-throughs and through-rights with the adjacent through lanes in the reporting.



TABLE 13: 2035 PM POST DEVELOPMENT CONDITIONS

INTERSECTION	MOVEMENT	PM PEAK HOUR			
		LOS	Delay (s)	Queue (m)	V/C Ratio
HWY 1 / COMOX RD	EBL	F	127.7	77.0	1.09
	EBL/T**	F	127.6	73.2	1.08
	EBR	B	19.2	53.9 (30)	0.49
	WBL/T & WBT**	D	52.8	40.1 (30) / 65.1	0.48
	WBR	C	33.0	17.9 (30)	0.91
	NBL	F	145.4	79.0 (70)	1.15
	NBT & NBT/R**	F	93.4	420.7 / 421.8	1.07
	SBL	E	70.6	108.2	0.91
	SBT	E	65.9	168.6	1.00
	SBR	B	15.8	103.5 (65)	0.63
WALLACE RD / EAST AVE / COMOX RD	EBL/T & EBT**	B	10.3	52.5 / 61.7	0.44
	EBR	A	1.4	15.2 (60)	0.21
	WBL/T & WBT/R**	C	24.5	80.6 / 101.7	0.72
	NBL/T	D	43.6	129.1	0.70
	NBR	A	6.2	72.6 (55)	0.53
	SBL	D	41.1	40.7 (30)	0.56
	SBT/R	B	16.1	75.3	0.18
PRIDEAUX ST / COMOX RD	EBL/T & EBT/R**	A	6.6	37.5 / 31.2	0.38
	WBL/T & EBT/R**	A	4.4	21.4 / 24.2	0.31
	NB	C	30.7	35.9	0.50
	SB	D	47.7	41.0	0.75
PRIDEAUX ST / MILL ST / BARSBY AVE	NB	A	9.1	8.0	0.02
	SBR	A	0.8	0.0	0.01
	SB	A	0.0	0.0	0.12
WEST ACCESS / COMOX RD	EBT	A	0.0	0.0	0.14
	WBT	A	0.0	0.0	0.37
	WBR	A	0.0	0.0	0.04
	SB	B	13.6	12.6	0.08

*Note: 95th percentile queues based on SimTraffic results (averaged from five simulation runs); (##) = Existing Storage Length including PL on Highway 1. Where two through lanes higher queue is listed. **For roads with two through lanes that may be shared Synchro groups left-throughs and through-rights with the adjacent through lanes in the reporting.



5.0 SENSITIVITY ANALYSIS

A sensitivity analysis was completed to determine how much additional density could be built before mitigations to the road (vehicle) network due to the development would be warranted. The sensitivity analysis was completed with Synchro / SimTraffic and only looked at the PM peak hour in the long-term, due to the PM peak hour having worse operations than the AM peak hour in the above analysis. It was found that an additional the equivalent of additional 400 residential units or up to 58,000 sq. ft. of commercial could be added before the City network starts to fail. Failure was defined as when the southbound left movement dropping from a LOS D to E at Comox Road / Wallace Road and the westbound right, southbound left, and southbound through at Highway 1 / Comox Road drop from a LOS C to E for the westbound movement and E to F for the southbound movements. Therefore, if densities change more than 400 residential units or 58,000 sq. ft. commercial this TIA will require revision to identify mitigation for the vehicle network.

6.0 ROAD CROSS SECTIONS

Comox Road is a mobility arterial (30m right-of-way) between Highway 1 and Prideaux Street. The mobility arterial cross section has a wider right-of-way requirement than is currently available on Comox Road along the development frontage. The current right-of-way ranges from 22m to 25m (approximately). The City may request additional right-of-way along the Comox Road frontage to accommodate future bicycle facilities and turn lanes. This request could be expected to be 4m to meet the right-of-way width for mobility arterial. See **Figure 14** for potential property request.

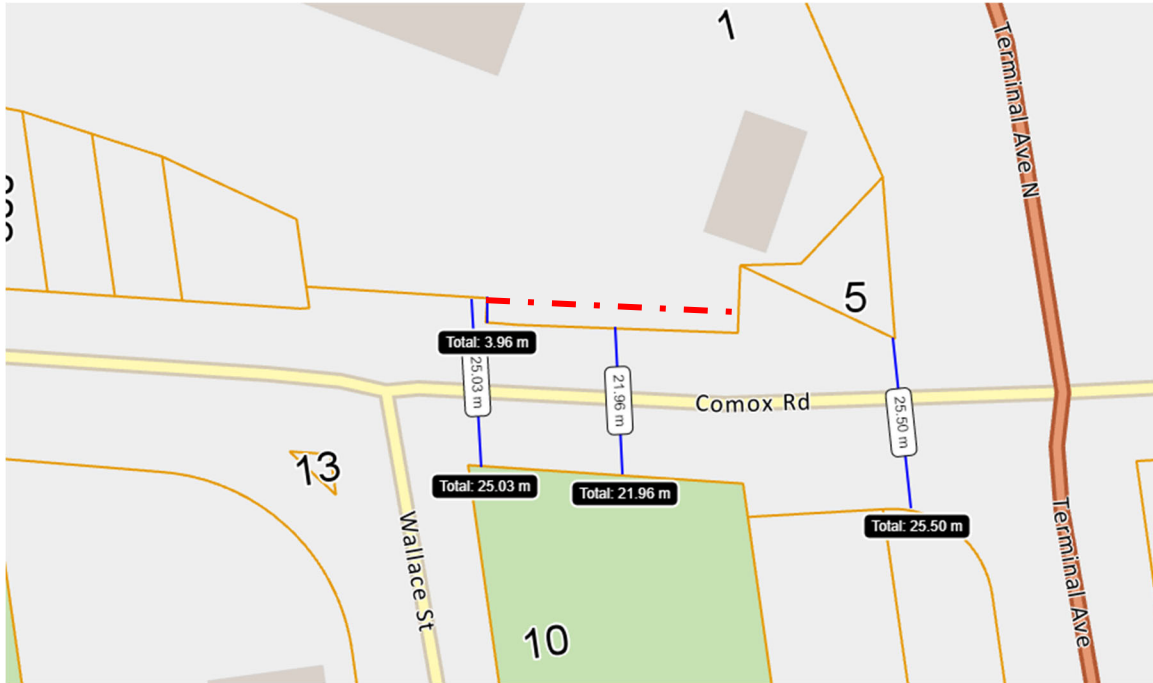


Figure 14: Potential Property Request

7.0 DOWNTOWN MOBILITY HUB

This site is located in the City’s Downtown Mobility Hub which is where the mixture of residential, commercial, office space, and amenities are located within walking, cycling and transit. The development supports the goals of the City Plan to shift new trips to/from sites to active transportation and transit. The density of housing and the right of way to support implementation of the mobility arterial on Comox Road (in the future by the City) and improved Harbourfront Walkway connection under the George Pearson Bridge (by developer) are benefits the transportation network and support the ability to shift trips from vehicles. At this stage of the development (rezoning) details on Transportation Demand Management (TDM) per building / business has not been developed as the type of measures (ie. transit passes, e-bike plug ins, larger bicycle parking area for cargo bikes, car share, etc) will be determined once more detailed design of the buildings is complete. However, the developer will ensure that at least



10% of the bicycle stalls are oversized for cargo bikes and that 50% of the stalls have their own plug e-bike charging.

The very location and nature of the surrounding area of this development provides build-in TDM as residents & hotel users can cycle, walk, or take transit easily from the site which promote use of modes other than a passenger vehicle. The City has plans to continue to expand the AT facilities in the core area that will further encourage use of non-vehicle modes and support modal shift as identified in the City Plan. Further, by this development adding more density, this generally supports a more walkable, bikeable community.

There is a modo car located at Barsby Avenue / Prideaux Street that is less than 500m from the development that can be utilized by the development residents. Adding more density generally supports a more walkable, bicycle community.

8.0 ACTIVE TRANSPORTATION

8.1 PEDESTRIAN FACILITIES

There are existing sidewalks along Comox Road; however, they are not separated from the travelled roadway. Changes to the Comox Road sidewalk alignment, along this property, could occur; however, the relocated sidewalk would have to connect to the existing crosswalks at Wallace Street as there is no additional right-of-way on the north side west of Wallace Road. This short length of new sidewalk, bicycle facility, and flex space may not be desirable for the short distance (70m) as the rest of the corridor (west of Wallace Street) does not have the right-of-way to implement the mobility or urban cross sections at this time. The City should plan for a future improvement on this corridor as they collect sufficient right-of-way to implement the mobility arterial cross section.

Crosswalks are provided at the two signalized intersections on Comox Road for pedestrians to safely cross the arterial road. There is a pedestrian bridge across the Millstone River at the end of Barsby Avenue to connect to Thistle Street. This pedestrian



bridge connects to Mill Street through Barsby Park where there is a hard surface trail. Pedestrians will also benefit from a significantly improved walkway along the river connecting with the existing Harbour Walkway east of Highway 1 (under the George Pearson bridge).

8.2 BICYCLE FACILITIES

Based on the City Plan Comox Road is to be a secondary active mobility route and have bicycle facilities. This will aid in the connection of neighborhoods and urban centres such as the downtown core. The newer Complete Streets Standards for the City have a protected bicycle facility. However, in order to implement bicycle facilities on Comox Road a 30m right-of-way has to be attained or at least several metres on the north side beyond Wallace Road. Otherwise there will be a protected bicycle lane for only 70m before they must share the four lane road with vehicles.

This site owner only owns frontage on Comox Road for 70m (from Highway 1 to Wallace). The frontage between Wallace (East Driveway) and the West Driveway is owned by MoTI. The City should work with MoTI to determine if additional ROW can be obtained from them to implement the City's Mobility Arterial. Additionally, west of the West Access to Prideaux Street there is a lack of right-of-way that is privately owned and the City would have to obtain ROW from them to continue the mobility arterial west of the West Driveway. The value of providing only 70m (or 200m if ROW from MOTI obtained) of cycling facility is limited and may create a further unsafe situation for cyclists as they would transition from a AAA facility to a shared lane (non-AAA). The City should obtain a contribution for the construction of the cycling facility along the site frontage and when the City has obtained the ROW west of the site implement the ultimate cross section to a logical transition. Changes to the cycling infrastructure on Comox Road will require a City approach, rather than an individual lot by lot construction approach as more right-of-way or changes to the laning would be required to accommodate bicycle facilities. Therefore, no bicycle facilities along this site frontage should be constructed as part of this development.



8.3 TRANSIT FACILITIES

On the section of Comox Road, west of Wallace Street, Route 30 is the only transit route; however, east of Comox Road and on Wallace Road service is provided on Routes 1, 20, 20A, and 50. East of Highway 1 is also Route 25. The closest westbound stop is located on Comox Road less than 100m west of the new access road to the site. The eastbound stop is across the street from the new access and transit users can utilize the crosswalks at Prideaux Road to safely cross between the site and eastbound stop. The closest stop for Routes 1, 20, and 50 is located on Wallace Road 75m south of Comox Road or 200m from the site access road. These bus stops have shelters, benches and garbage cans which provide comfort for transit users. These stops are fully accessible. When the City implements the ultimate cross section and has the ROW to move the transit waiting area further from the roadway this should be implemented by the City.

9.0 CONCLUSIONS

The City of Nanaimo intersections: Comox Road / Prideaux Street, Comox Road / Wallace Road, and Barsby Avenue / Mill Street / Prideaux Street currently operate at a LOS D or better. These intersections are expected to remain at LOS D or better in the long term, with the development. The right in / right out (West) access on Comox Road will operate at a LOS B or better in the long term with the development. Therefore, the addition of the development traffic does not require mitigation measures at the City's intersections even with the increase in vehicle trips generated by this development.

At Highway 1 / Comox Road there are currently multiple movements at a LOS E during the AM and PM peak hour periods including eastbound movements and the left turns on Highway 1. The addition of the development traffic at opening day changes several movements from a LOS A to B but overall does not impact the operations at the highway intersection. In the long term, the AM and PM peak hour LOS declines without the development traffic with several movements operating at a LOS E and F in the AM and PM peak hours. Queue lengths for multiple turn movements also exceed the turn storage in the AM and PM peak hours in the long term without the development traffic. The addition of development traffic does not change the long-term conditions.



There is an existing queuing issue that occurs between Wallace Road and Highway 1 due to the limited spacing between the two intersections and the lack of separate left turn lanes at each intersection. This is an existing issue that the City and MoTI should review together; however, changes in signal timing may improve east-west queues but create worst queues on Highway 1. Similarly adding additional laning may help the Wallace Road queue issue, but requires more ROW, may impact existing park space on Comox Road, and prioritizes vehicle operations over bicycle and pedestrian safety and providing them actual facilities. The development has minimal impact (less than one additional vehicle to the queue lengths) on this issue and improving the vehicle network would promote a car centric environment, which does not align with the vision of the downtown core as per the Nanaimo City Plan. Continuing to add development density, such as this site and add active transportation facilities (new bicycle facilities and improved pedestrian environment), to the downtown mobility hub supports the ability for shifting more trips from vehicles to active transportation to mitigation the future traffic conditions due to 'status quo' vehicle usage. This development, in this location, supports the goals of the City Plan, to shift new trips to active transportation and transit.

The right-of-way on Comox Road currently ranges from 22 to 25m, while the new standard cross section for arterial roads requires 30 to 34.5m of right-of-way to accommodate left turn lanes, bicycle facilities, and wider pedestrian facilities. The development will be required to provide right-of-way for future changes to Comox Road; however, implementation of bicycle and relocated sidewalk facilities provides little benefit without additional right-of-way west of the site since this site only has a 70m frontage on Comox Road. The developer should provide a contribution for the cost of the frontage improvements to the City for their use once additional right-of-way is obtained west of Wallace Road.

On Mill Street the local road standard is to be built including extending sidewalks along the site frontage to Comox Road. The sidewalk should be extended across 55 Mill Street (non-development frontage) to provide connection to the existing Mill Street sidewalk. The site is well provided for in terms of trail connection (and bridge) across the Millstone River, the improved walkway along the riverfront of this site, and crosswalks across



Comox Road. The site is well serviced by transit routes with stops along the Comox Road frontage and additional stops on Wallace Road all within 200m.

The developer should provide at least 10% of the bicycle stalls for cargo bicycles (larger stalls) and ensure that 50% of the bicycle stalls have a plug for e-bicycles. The developer should continue to explore additional TDM measures that could be implemented as the development design is progressed.

A sensitivity analysis found that up to an additional 400 residential units or up to 58,000 sq. ft. of commercial could be added to the site without dropping the LOS and requiring vehicle mitigations on the City network. If changes to this magnitude in density are made to the development, this study should be reevaluated to determine potential mitigations as a result of the development.

10.0 RECOMMENDATIONS

The following recommendations are made for the proposed development:

- Provide right-of-way along the Comox Road frontage for future improvements.
- Contribution for frontage improvements (sidewalk and bicycle lane to mobility arterial standard).
- Provide 10% of the bicycle stalls for larger cargo bicycles and 50% of the bicycle stalls will have plugs for charging e-bikes.



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