



# 900 ESQUIMALT ROAD & 900 CARLTON TERRACE

Traffic Impact Assessment

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## 1.0 INTRODUCTION

WATT Consulting Group is retained by Carlton Living Inc. to prepare a Traffic Impact Assessment (TIA) for a proposed mixed-use development at 900 Esquimalt Road and 900 Carlton Terrace in the Township of Esquimalt. The site location is illustrated in **Figure 1**.

### 1.1 The Site Today

The site is bound by Esquimalt Road to the south, Head Street to the east, Carlton Terrace to the west, and low to mid-rise commercial and apartment buildings to the north.

The site today is occupied by two and three storey commercial buildings and associated surface parking lots.

The site is currently zoned C-2 (Neighbourhood Commercial) and is within the Commercial / Commercial Mixed-Use land use designation area on the Esquimalt Official Community Plan map.

### 1.2 Proposed Development

The proposed development consists of a 26-storey mixed-use building, consisting of 176 multi-family condominium units, 96 multifamily market rental units, and six commercial retail units with a combined gross floor area (GFA) of 730 m<sup>2</sup>.

### 1.3 This Report

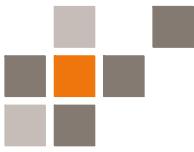
This report is provided as part of the Development Permit and Development Variance Permit application being submitted to the Township of Esquimalt.

This report provides the following:

- An overview of the existing and evolving transportation context, including vehicular, pedestrian, cycling, and transit facilities, and area travel characteristics
- An overview of the proposed development and the transportation-related features of the proposed site plan
- An overview of the transportation demand management (TDM) measures proposed for the site



- A projection of the site's trip generation, distribution, and assignment potential
- An assessment of existing traffic patterns and volumes in the study area during the weekday morning and afternoon peak periods
- A review of the vehicular traffic volume changes that may occur in the area in the future due to growth in the surrounding area
- An operational assessment of vehicular traffic operations in the study area under existing, background, and post-development conditions



900 Esquimalt Rd  
Traffic Impact Assessment

Figure 1  
Site Location



## 2.0 TRANSPORTATION CONTEXT

### 2.1 Road Network

#### 2.1.1 Existing Road Network

The existing road network, lane configuration, and intersection control within the study area are illustrated in **Figure 2**.

**Esquimalt Road** is a major road under the jurisdiction of the Township of Esquimalt. It extends between Canadian Forces Base Esquimalt in the west and the Johnson Street Bridge in the east, where it continues as Pandora Avenue / Johnson Street in the City of Victoria. In the vicinity of the site, Esquimalt Road has a three-lane cross section (one lane in each direction and a two-way centre left turn lane). On-street parking is generally not permitted on Esquimalt Road, however there are small pockets on the north and south sides of the road in the immediate vicinity of the site that permit on-street parking outside of peak hours. The posted speed limit in the vicinity of the site is 40 km/h.

**Head Street** is a residential collector road under the jurisdiction of the Township of Esquimalt. It extends between Malvern Street in the south and Lampson Street in the north. Head street has a two-lane cross section (one lane in each direction). In the immediate vicinity of the site, on-street parking is permitted on the west side of the road only, north of the existing site driveway. The speed limit is 50 km/h, except for in the vicinity of École Victor-Brodeur, where there is a 30 km/h school zone.

**Carlton Terrace** is a local road under the jurisdiction of the Township of Esquimalt. It extends between Esquimalt Road in the south, and a cul-de-sac approximately 100 metres to the north. Carlton Terrace has a two-lane cross section (one lane in each direction). On-street parking is permitted at the very north end of the road past the bend, and adjacent to the island mid-block. The speed limit is 50 km/h.



Two intersections are included within the study area:

**Esquimalt Road / Head Road** is a signalized intersection. Auxiliary left turn lanes are provided in all directions except northbound. A dedicated right turn lane is provided in the westbound direction. Two through lanes (one through lane and one through / right turn lane) are provided in the eastbound direction, however one of the eastbound receiving lanes ends shortly downstream of the intersection.

**Esquimalt Road / Carlton Terrace** is a three-leg, stop-controlled intersection. The eastbound and westbound directions are free flow, and the southbound direction is stop-controlled. A two-way left turn lane is provided in the eastbound and westbound direction.

**Esquimalt Road / Carlton Terrace** is a stop-controlled intersection on the minor (Carlton Terrace) leg only. A two-way centre left turn lane is provided on Esquimalt Road. No lane separation exists on the Carlton Terrace leg. Carlton Terrace meets Esquimalt Road at a sharp angle (approximately 40°).

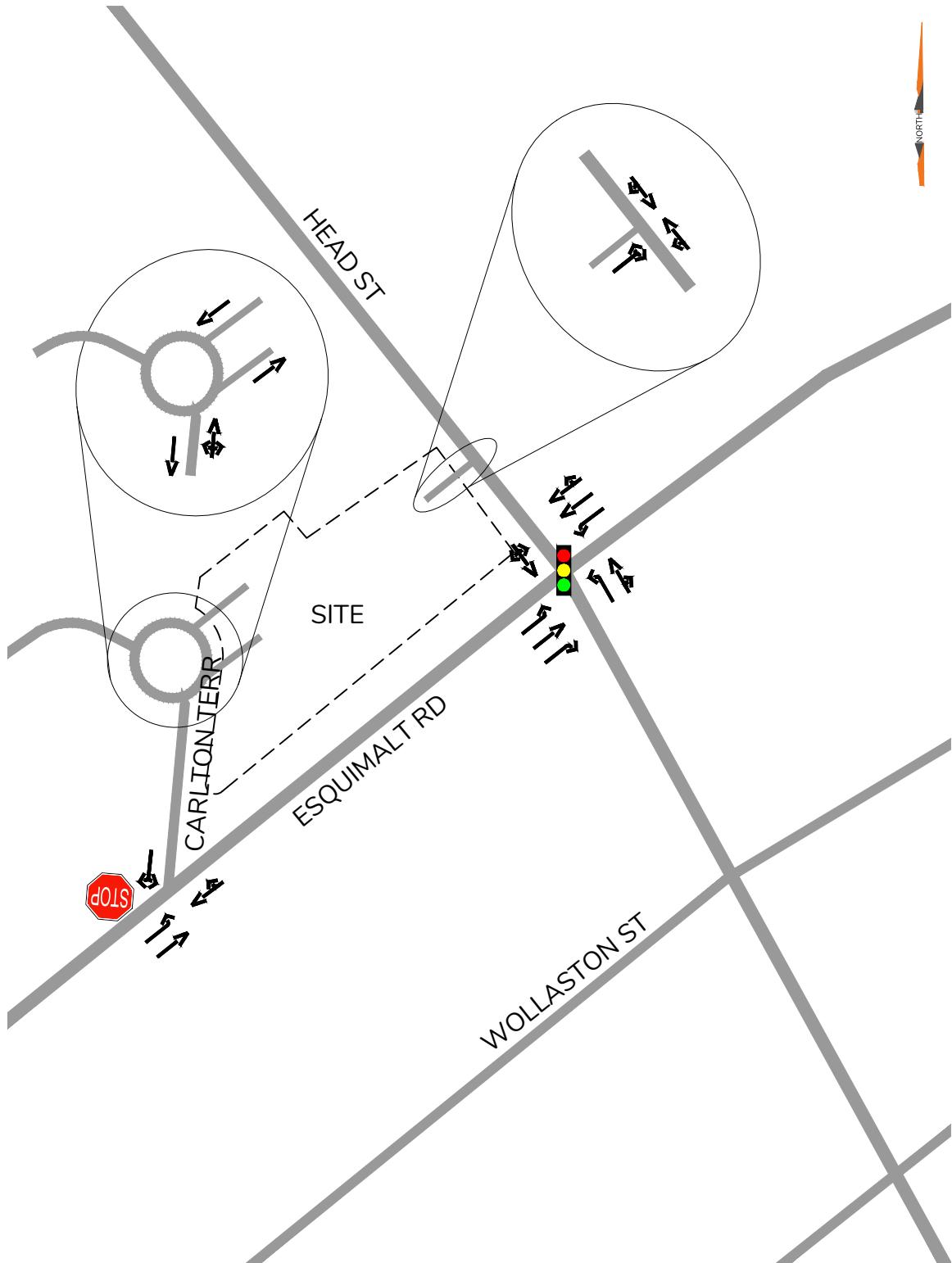
### 2.1.2 Evolving Road Network

#### Reduced Speed Limits

The Township of Esquimalt is exploring a reduction of the posted speed limit on major roads to 40 km/h, and on all other roads to 30 km/h. Esquimalt is currently gathering public feedback on the proposed plan, with the intent to implement the speed reduction over the next 3 years, starting with gateways and major roads.

#### Esquimalt Road and Carlton Terrace Improvements

As part of the implementation of the Esquimalt quick build cycling network (discussed in further detail in **Section 2.3.2**) and in preparation for BC Transit RapidBus service (discussed further in **Section 2.2.2**), the Township of Esquimalt intends to work together with the developer of the site to reconstruct the site frontage and the intersection of Esquimalt Road / Carlton Terrace to accommodate protected bike lanes, an improved bus bay, and narrow the pavement width at Carlton Terrace to provide improved visibility at the intersection, and shorten the crossing distance for pedestrians. The planned frontage improvements are illustrated in the architectural site plan, shown in **Appendix A**.



900 Esquimalt Rd  
Traffic Impact Assessment

Figure 2  
Existing Road Network



## 2.2 Transit Network

### 2.2.1 Existing Transit Network

The existing transit network in the vicinity of the site is illustrated in **Figure 3**.

**Route 15 - Esquimalt / UVic** operates between the HMC dockyard in the west and the University of Victoria in the east, generally travelling along Esquimalt Road, Fort Street / Yates Street, and Foul Bay Road. The closest stop is located along the site frontage, at Esquimalt Road / Head Street. Route 15 is a regional transit route, with buses operating at 15-to-30-minute headways on weekdays, and 20-to-30-minute headways on weekends.

**Route 24 – Cedar Hill / Tillicum Centre** operates between the McKenzie Avenue / Cedar Hill Road intersection and Tillicum Mall, generally travelling along Cedar Hill Road, Cook Street, Old Esquimalt Road, and Admirals Road. The closest stop is approximately 400 metres from the site (a 5-minute walk) at Lampson Street / Old Esquimalt Road. Route 24 is a local route, with buses operating at 30-to-80-minute headways on weekdays and 50-to-80-minute headways on weekends.

**Route 25 – Maplewood / Tillicum Centre** operates in between Reynolds Secondary School and Tillicum Mall, generally travelling along Maplewood Road, Cook Street, Esquimalt Road, and Admirals Road. The closest stop is approximately 250 metres from the site (a 3-minute walk) at Dunsmuir Road / Head Street. Route 25 is a local route, with buses operating at 30-to-80-minute headways on weekdays and 50-to-80-minute headways on weekends.

**Route 26 - Dockyard / UVic** operates between the HMC Dockyard in the west and the University of Victoria in the east, generally travelling along Esquimalt Road, Lampson Street, Tillicum Road, Saanich Road, and McKenzie Avenue. The closest stop is approximately 400 metres from the site (a 5-minute walk) at Lampson Street / Old Esquimalt Road. Route 26 is a frequent route, with buses operating at 15-to-30-minute headways on weekdays, and 20-to-30-minute headways on weekends.

The bus stops servicing the site all have benches and shelters except for the eastbound stop at Old Esquimalt Road / Head Street. A contiguous sidewalk network is provided from the site to each of the above-mentioned bus stops.



## 2.2.2 Evolving Transit Network

The evolving transit network is illustrated in **Figure 4**.

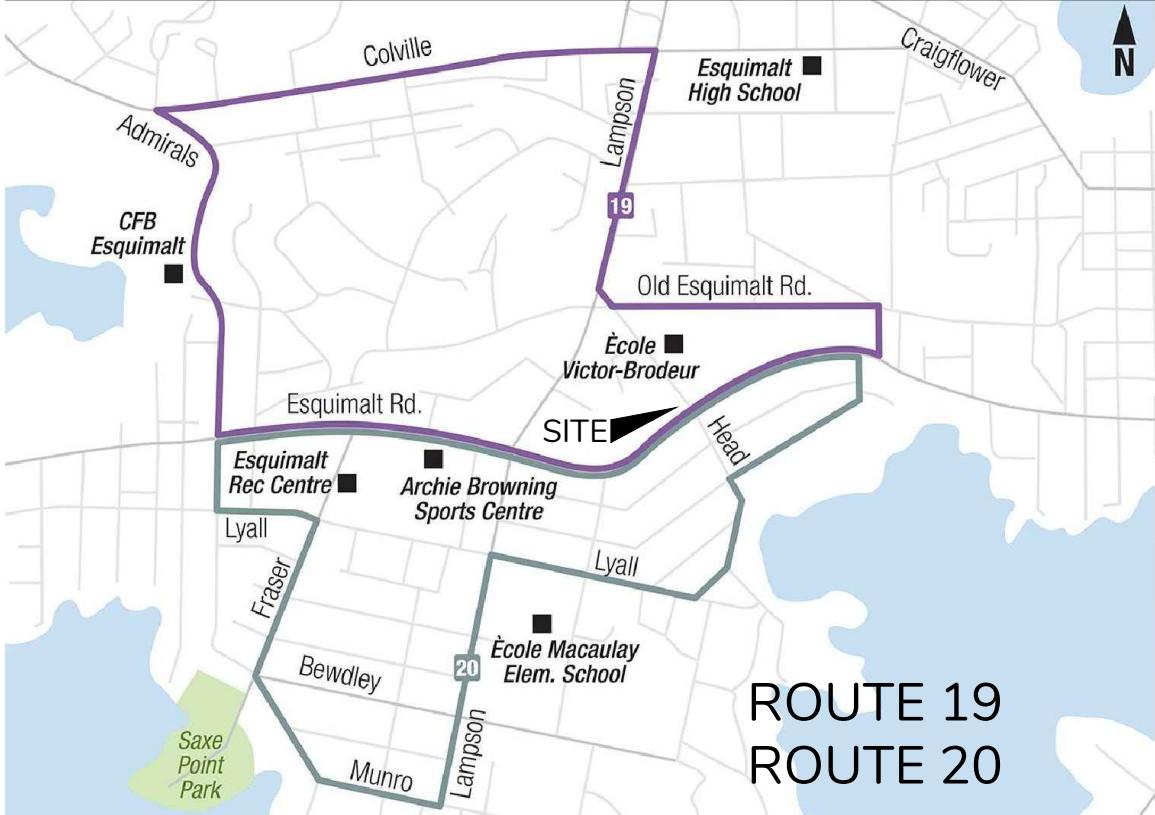
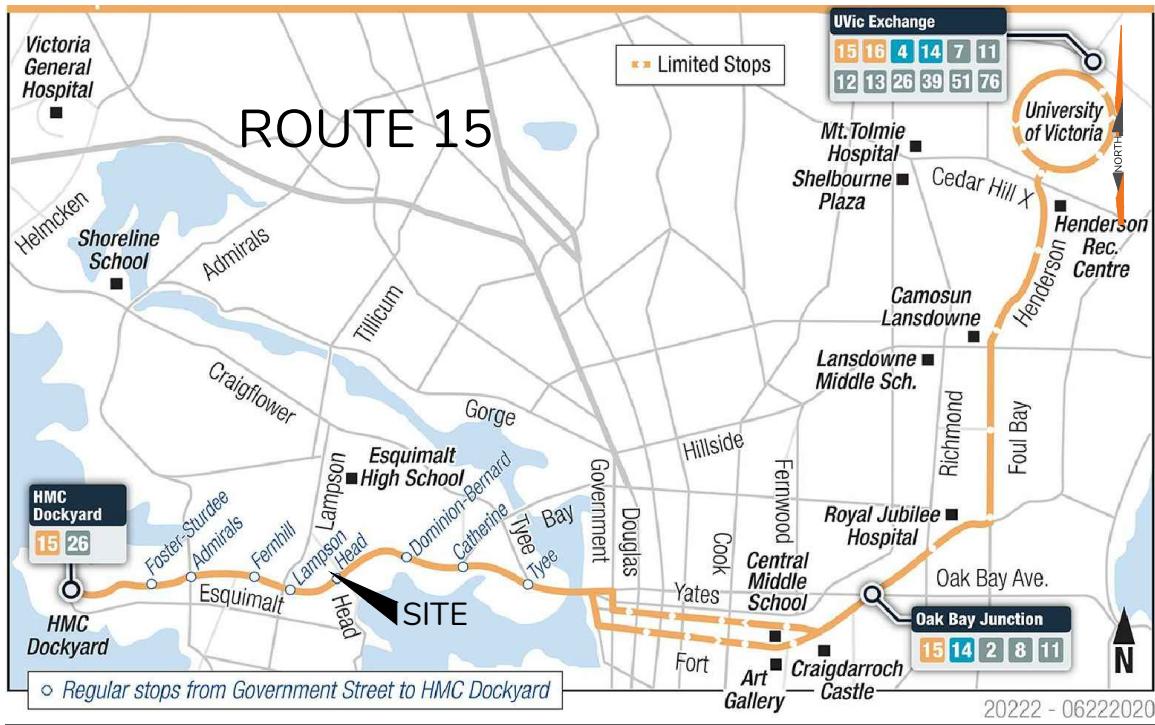
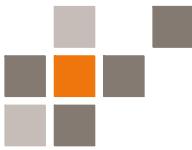
### Route 15

The conversion of Route 15 (Esquimalt / UVic) to a potential RapidBus corridor has been identified as a long-term priority in BC Transit's 2021 Esquimalt-View Royal Local Area Transit Plan. Frequent service (15 minutes or better; 7:00 AM – 10:00 PM, 7 days a week) would be provided, with a stop at Esquimalt Road / Head Street (directly in front of the site) being maintained.

### Routes 19 / 20

The addition of two new local transit routes servicing the Esquimalt Core has also been identified as long-term priorities in BC Transit's 2021 Esquimalt-View Royal Local Area Transit Plan. Both routes would operate along Esquimalt Road, passing by Head Street. Route 19 would loop to the north, via Admirals Road, Colville Street, Lampson Street, and Old Esquimalt Road. Route 20 would loop to the south, via Dunsbuir Road, Lyall Street, Lampson Street, Munro Street, and Fraser Street. These routes would operate at 60-minute headways on weekdays and Saturdays, and 90 minute headways on Sundays. Streamlining of the existing routes 24 and 25 would also be possible with the implementation of these two new routes.







## 2.3 Cycling Network

### 2.3.1 Existing Cycling network

The existing cycling network in the vicinity of the site is illustrated in **Figure 5**.

Esquimalt Road is the primary bike route in the vicinity of the site. On-street painted bicycle lanes are provided east of Park Place all the way into the City of Victoria, however in the vicinity of the site, the bike lanes are dropped at major intersections (such as Head Street and Lampson Street) due to space constraints, requiring bicycles to travel in mixed traffic through major intersections.

Head Street, Lampson Street, Dunsmuir Street, Lyall Street, and Paradise Street are all designated as shared street cycling routes.

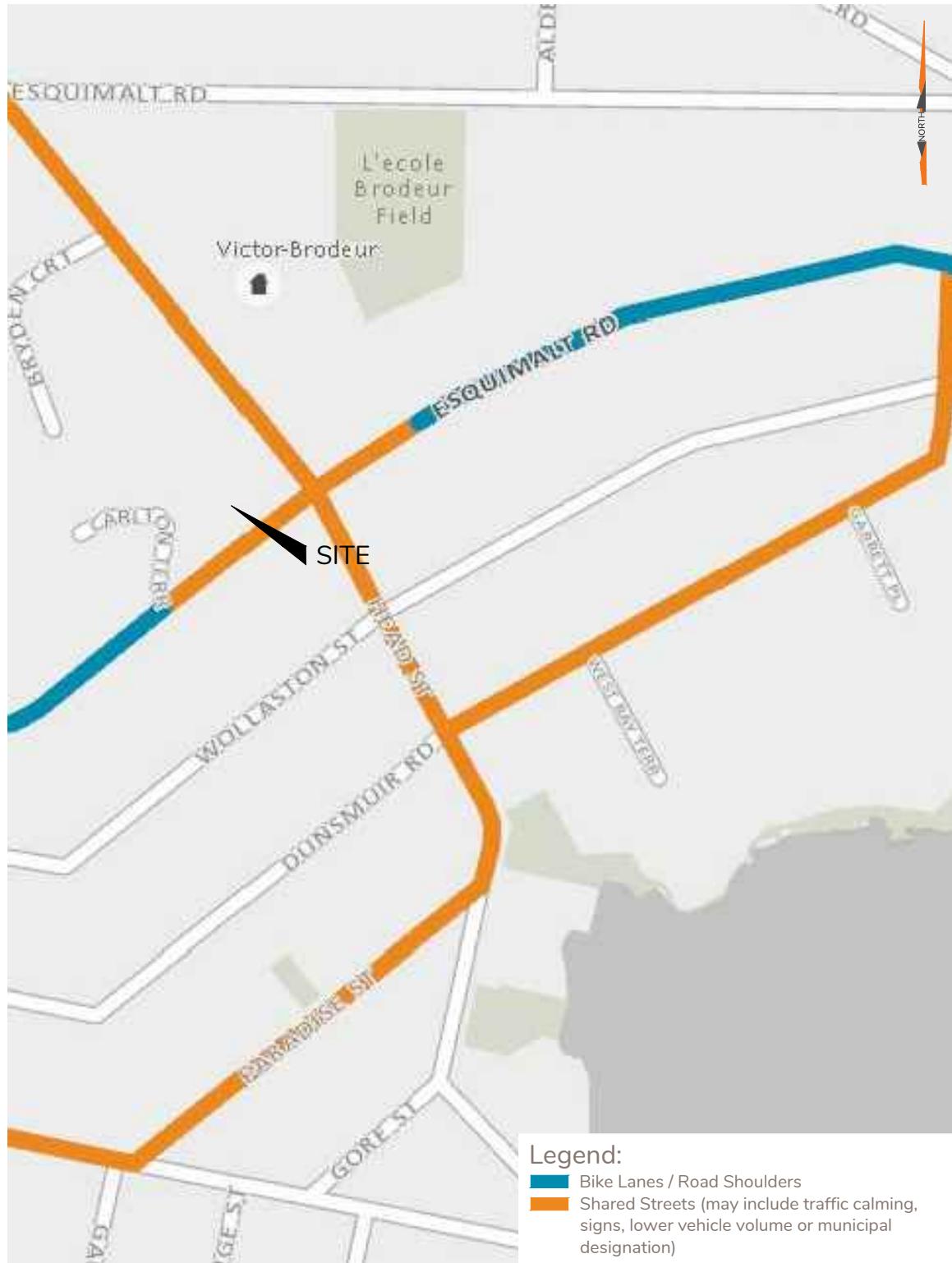
### 2.3.2 Evolving Cycling Network

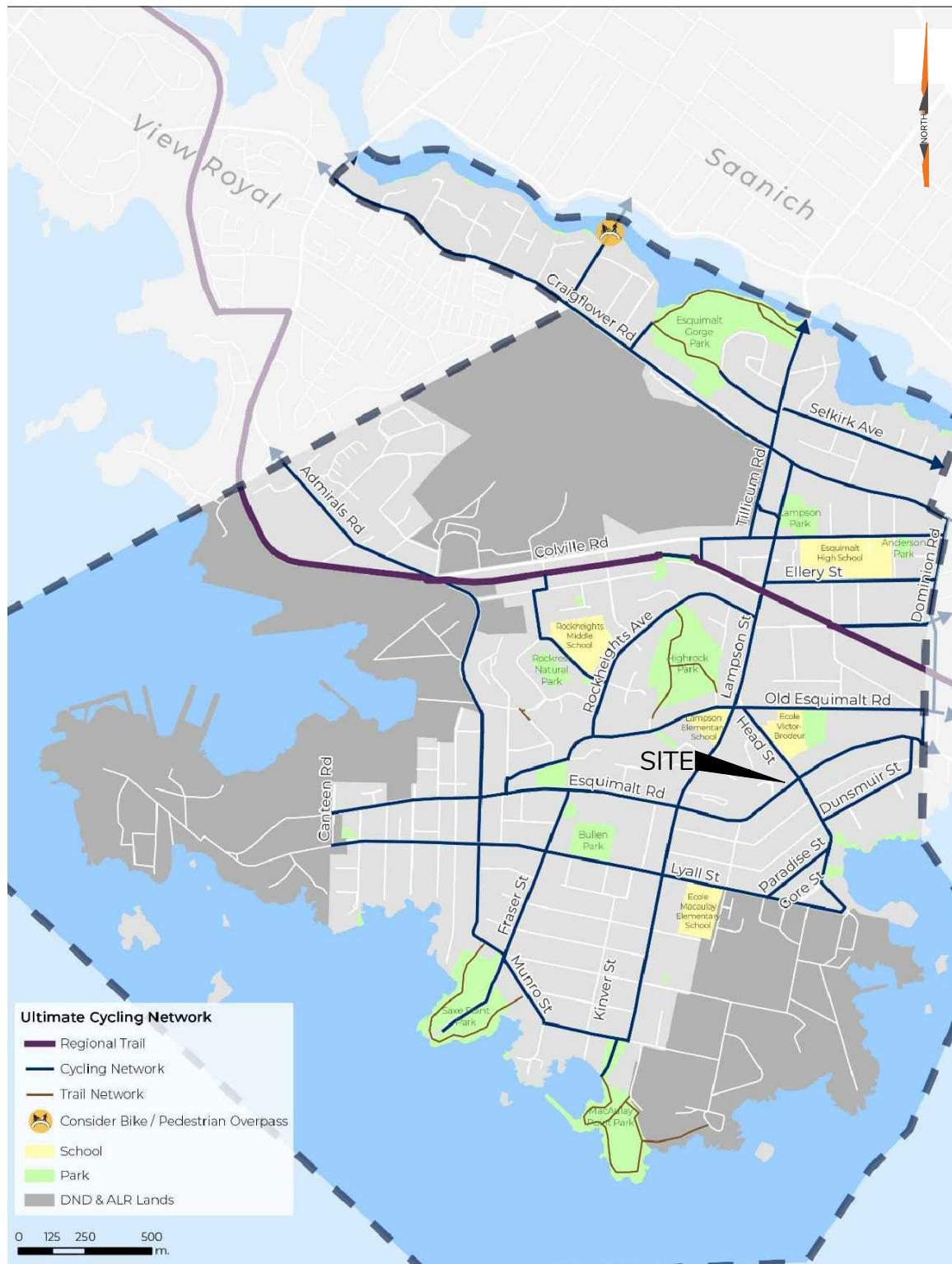
The evolving cycling network in the vicinity of the site is illustrated in **Figure 6**.

The following roads in the vicinity of the site have been identified as priority cycling projects in Esquimalt's 2022 Active Transportation Network Plan:

- Lampson Street (Craigflower Road – Colville Road) – Protected bike lanes
- Lampson Street (Esquimalt Road – Craigflower Road) – Protected bike lanes
- Head Street (Esquimalt Road – Lampson Street) – Protected bike lanes
- Esquimalt Road (Canteen Road – Dominion Road) – Protected bike lanes

Buildout of the quick-build cycling network as contemplated in Esquimalt's 2022 Active Transportation Network Plan will enhance connectivity both north-south and east-west, as well as provide cycling facilities suitable for all ages and abilities.







## 2.4 Pedestrian Network

### 2.4.1 Existing Pedestrian Network

The pedestrian environment in the vicinity of the site generally allows pedestrians to travel in a safe and efficient manner to destinations in the area.

Sidewalks are provided on both sides of Esquimalt Road and Head Street, and on the west side of Carlton Terrace. All bus stops in the area are accessible via public sidewalks. Crosswalks are provided on all legs of the Esquimalt Road / Head Street intersection.

Sidewalks in the area are occasionally obstructed by above ground utilities such as utility poles or fire hydrants.

### 2.4.2 Evolving Pedestrian Network

As part of the redevelopment of the site, it is planned to install sidewalks along the eastern frontage of Carlton Terrace and improve the existing sidewalks along the northern frontage of Esquimalt Road and Head Street.

Installation of a sidewalk on the north side of Wollaston Street (between Lampson Street and Macaulay Street) has been identified as a short-term priority improvement Esquimalt's 2022 Active Transportation Network Plan.



## 2.5 Area Travel Characteristics

### 2.5.1 Existing Area Travel Characteristics

**Table 1** outlines the current mode share for the Township of Esquimalt.

**Table 1 – Existing Mode Share**

Mode	Mode Share
Auto Driver	60%
Auto Passenger	5%
Transit	12%
Bicycle	11%
Walk	8%
Other	4%

Notes:

1. Based on Statistics Canada 2021 Census, main mode of commuting

While automobile travel is the predominant mode of travel in Esquimalt, the Township has the second highest active travel mode share in all of Greater Victoria (after the City of Victoria).

Most commuting trips by Esquimalt residents leave the Township; only 26% of people commuting for work remain within Esquimalt.



### 3.0 PROPOSED DEVELOPMENT

The proposed development consists of a 26-storey mixed-use building, consisting of 176 multi-family condominium units, 96 multifamily market rental units, and six commercial retail units with a combined gross floor area (GFA) of 730 m<sup>2</sup>. The key land uses, and transportation-related elements of the proposed site plan are summarized in **Table 2**. The current site plan is provided in **Appendix A**.

#### 3.1 Site Access

Two vehicular accesses to the site are proposed:

##### **Head Street Access**

This driveway is located approximately 25 metres north of the Esquimalt Road / Head Street signalized intersection (measured from stop bar to centreline of driveway). The location is consistent with the existing 900 Esquimalt Road driveway. The TAC Geometric Design Guide for Canadian Roads (2017) recommends a minimum clearance of 55 metres from a driveway to a downstream signalized intersection on a collector road. As the current access spacing does not meet the minimum recommended separation distance, it is proposed to restrict this driveway to a right-in / right-out configuration to limit potential for blockages at the intersection.

This driveway provides access to the L1-P2 levels of the parking garage (i.e., ground floor to underground), servicing all commercial and visitor parking and most residential parking, as well as the site's loading space.

##### **Carlton Terrace Access**

This driveway is located approximately 50 metres north of the Esquimalt Road / Carlton Terrace intersection. The existing one-way driveway loop for the 900 Carlton Terrace site is planned to be consolidated to a single two-way access point.

This driveway provides access to the L1 Mezzanine-L2 levels of the parking garage (i.e., ground floor to second floor), servicing residential rental parking.

Given the straight, flat nature of the roads in the surrounding area, and the proximity to nearby intersections, sightlines are not anticipated to be an issue for either of these driveways.



**Table 2 – Development Proposal**

Site Element	Details	
<b>Residential Units</b>	Condominium	176 units
	Rental	96 units
	Total	272 units
<b>Commercial GFA</b>	730 m <sup>2</sup> (7858 ft <sup>2</sup> )	
<b>Vehicular Access</b>	2 driveways; right-in / right-out from Head Street, full movement driveway from Carlton Terrace	
<b>Cyclist Access</b>	Short term bike parking is directly accessible from the public street network. Access to long term bike parking on the ground floor is provided from dedicated entrances off Esquimalt Road and Carlton Terrace. Access to long term bike parking in the parking garage is provided from the driveway via Head Street.	
<b>Pedestrian Access</b>	Pedestrian access to the residential lobbies is provided from dedicated entrances off Head Street and Carlton Terrace. Pedestrian access to each of the commercial retail units is provided from Esquimalt Road.	
<b>Pick-up / Drop-off Facility</b>	On-street spaces for curbside uses are accommodated along the Carlton Terrace frontage.	
<b>Vehicular Parking Supply</b>	231 parking spaces (204 residential, 27 commercial)	
<b>Loading Space Supply</b>	1 space, accessed from the Head Street driveway	
<b>Bicycle Parking Supply</b>	Condominium + Residential	272 spaces
	Commercial (6-space bike racks)	18 spaces
	Total	290 spaces

Notes:

1. Based on architectural plans prepared by dHKarchitects, dated October 13, 2023.



### **3.2 Pick-up / Drop-off Facility**

Six (6) spaces are proposed to be provided on-street along the Carlton Terrace frontage to accommodate curbside uses such as passenger pick up and drop off, food and parcel delivery, mail delivery, and short-term parking required for trades. This space will also function as a loading area for larger vehicles during the day.

### **3.3 Vehicular Parking**

A total of 231 parking spaces (including 204 residential and 27 commercial spaces) are proposed to be provided. A parking study justifying the reduced parking supply from the Parking Bylaw requirements has been provided under a separate cover.

Circulation through the parking garage is straightforward; vehicles enter from either the Head Street or Carlton Terrace driveways and circulate in a simple loop up or down to their parking space. Convex mirrors will be provided at all 90 degree turns in the garage.

### **3.4 Loading**

One loading space is proposed to be provided on-site on the ground floor, accessed from Head Street, that can accommodate smaller trucks (for parcel deliveries and service vehicles). Large trucks (for move-in / move-out and commercial deliveries) can be accommodated within the lay-by along Carlton Terrace.

### **3.5 Bicycle Parking**

Short term bicycle parking is accommodated with bicycle racks near the rental lobby entrance on Head Street and at the southwest corner of the site off Esquimalt Road.

Long-term bike parking is provided on the ground floor within three separate bike rooms (188 stalls), and on the second level below grade within the underground parking garage (84 stalls). Long-term bicycle parking on the ground floor is accessible from the residential lobbies, and from dedicated entrances off Carlton Terrace / Esquimalt Road. Long term bicycle parking in the underground parking garage is accessible from the parking garage ramp via the Head Street driveway.



## 4.0 TRANSPORTATION DEMAND MANAGEMENT

Transportation Demand Management (TDM) is the application of strategies and policies to influence the travel choice of an individual, most commonly to reduce single-occupant vehicle travel. TDM measures typically aim to encourage sustainable travel, enhance travel options, and decrease parking demand. The following TDM measures are recommended for the proposed development:

- Carshare vehicle + membership for all units
- Non-Standard bicycle parking spaces to accommodate electric cargo bikes and bikes with trailers and a bicycle maintenance facility.

Further details on transportation demand management measures being pursued for the proposed development are outlined in WATT's parking study.



## 5.0 TRAFFIC VOLUMES

### 5.1 Traffic Analysis Scenarios and Time Periods

Traffic operations analysis has been undertaken during the weekday AM and PM peak periods under the following scenarios:

- Existing Conditions
- Opening Day (2025) Background Conditions
- Opening Day (2025) Post-Development Conditions
- 10 Year Post-Buildout (2035) Background Conditions
- 10 Year Post-Buildout (2035) Post-Development Conditions

### 5.2 Existing Traffic Volumes

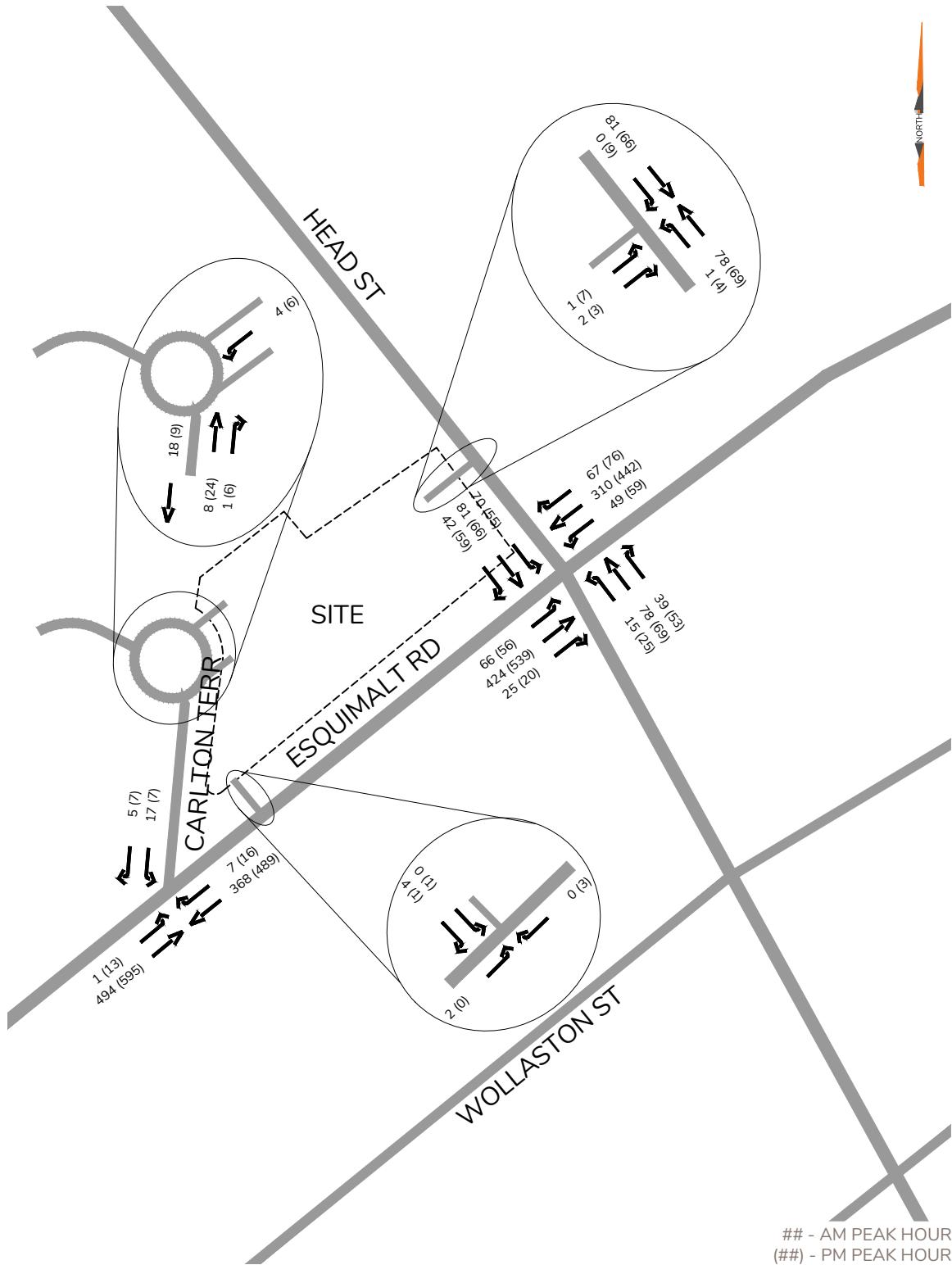
Turning movement counts were established for intersections in the study area for the weekday AM and PM peak periods. Traffic counts adopted as the basis for this study are summarized in **Table 3**.



**Table 3 – Existing Turning Movement Counts**

Intersection	Count Date	Time Period	Source
Esquimalt Road / Head Street	Wednesday May 10, 2023	4:00 – 5:00 PM	WATT
	Thursday May 11, 2023	8:00 – 9:00 AM	
Esquimalt Road / Carlton Terrace	Wednesday May 10, 2023	4:00 – 5:00 PM	
	Thursday May 11, 2023	8:00 – 9:00 AM	
Carlton Terrace / Site Access	Wednesday May 10, 2023	4:00 – 5:00 PM	
	Thursday May 11, 2023	8:00 – 9:00 AM	
Head Street / Site Access	Wednesday May 10, 2023	4:00 – 5:00 PM	
	Thursday May 11, 2023	8:00 – 9:00 AM	
Esquimalt Road / Site access / Street Parking	Wednesday August 30, 2023	4:00 – 5:00 PM	
	Thursday August 31, 2023	8:00 – 9:00 AM	

The existing turning movement counts were reviewed in detail to ensure general consistency in traffic volumes between intersections. The existing traffic volumes for the weekday AM and PM peak periods are illustrated in **Figure 7**.





## 5.3 Background Traffic Volumes

### 5.3.1 Corridor Growth

Corridor growth on all streets in the study area was forecast using a 2.0% annual linear growth rate applied to the observed volumes from 2023 to the 2025 and 2035 horizon years.

### 5.3.2 Concurrent Developments

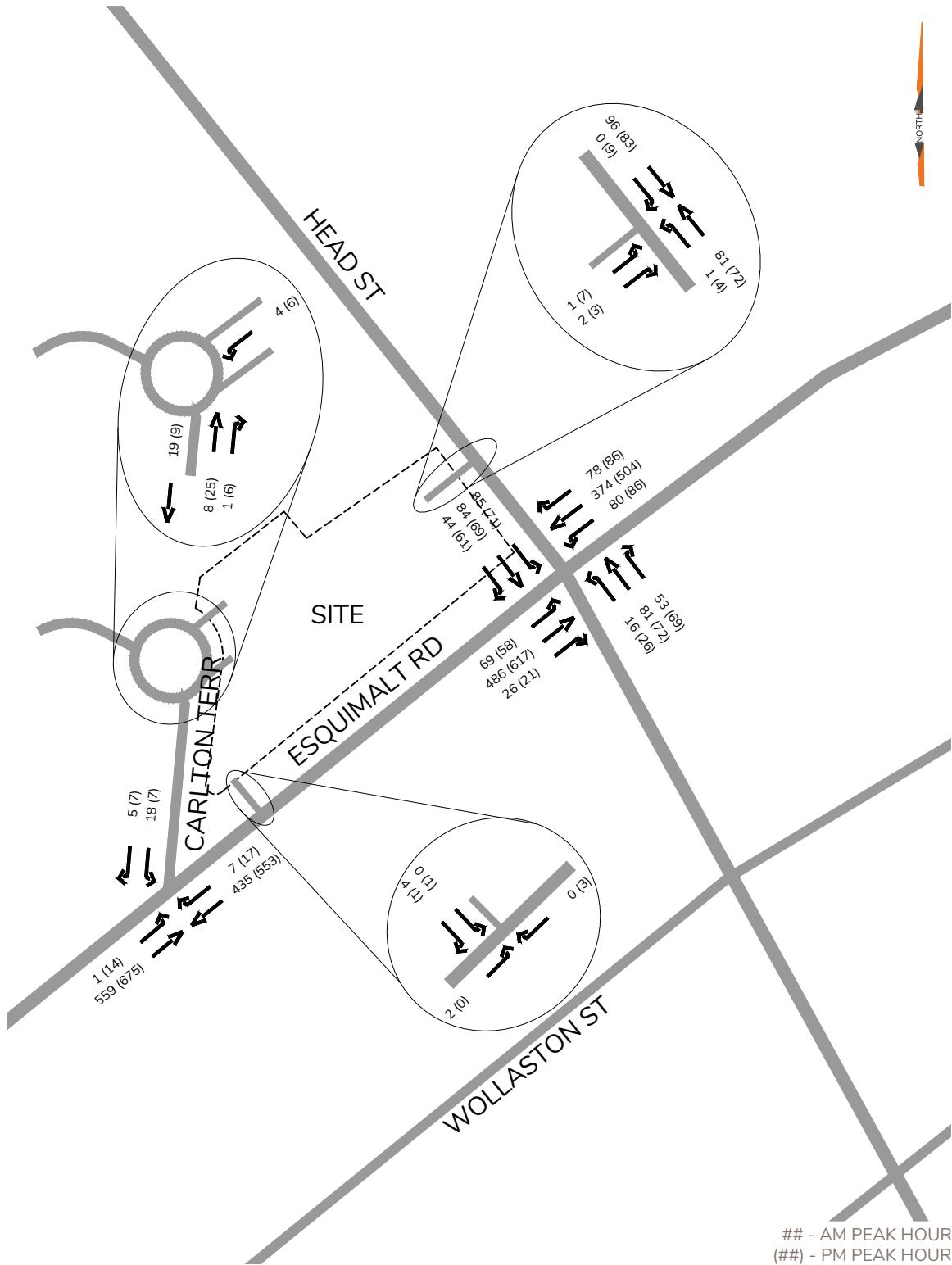
Allowances were made to account for new traffic generated by other development proposals near the site that are either under construction, approved, being reviewed, or in which an application is expected to be submitted to the Township of Esquimalt in the near future. One background development has been considered for the purposes of this study. A summary of the concurrent development considered is provided in **Table 4**.

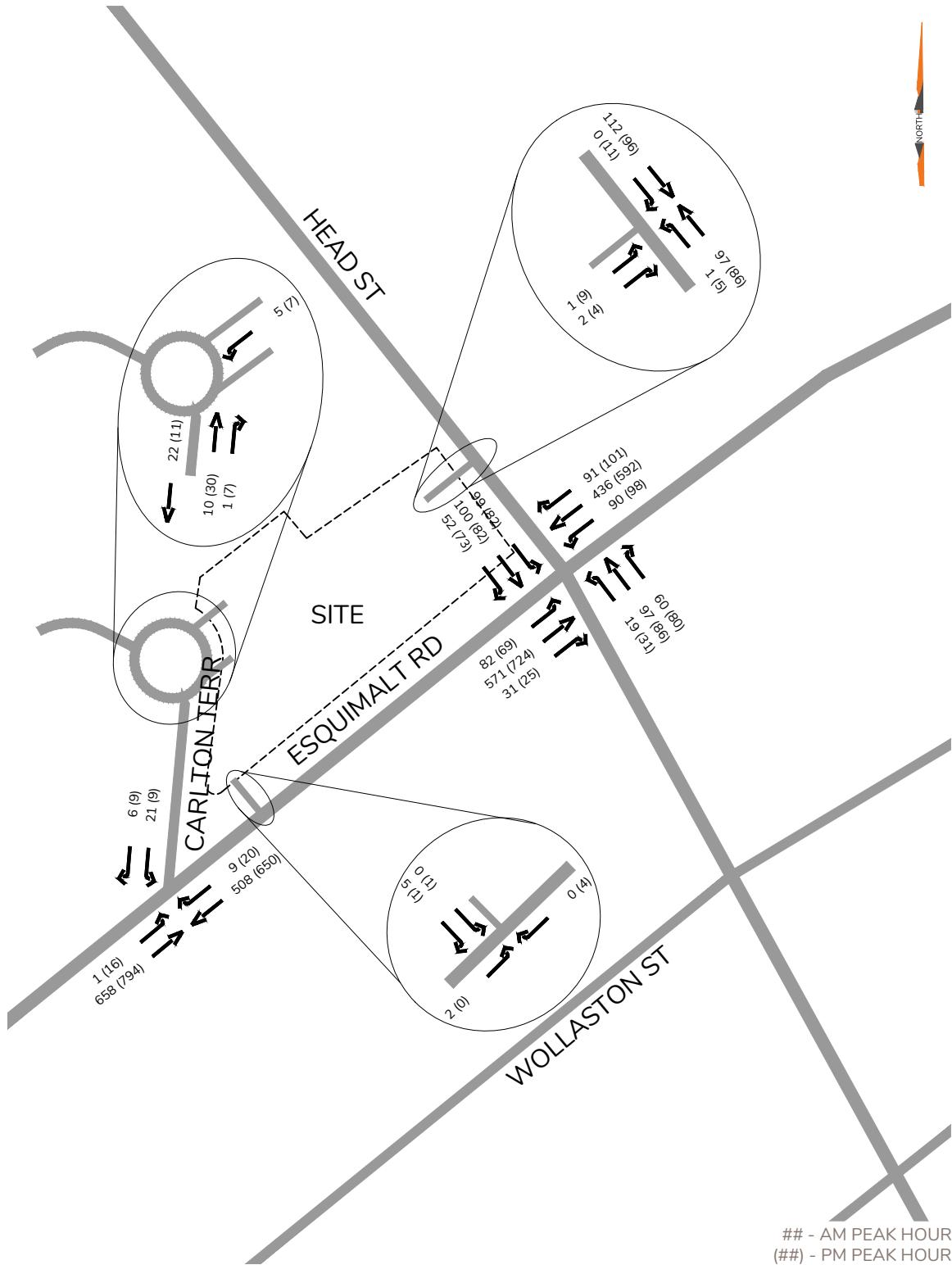
**Table 4 – Concurrent Developments**

Development Address	Development Statistics	Trip Generation / Distribution Source
852 Esquimalt Road	198 units, 6633 ft <sup>2</sup> liquor store, 2000 ft <sup>2</sup> coffee shop	Generated based on this study's methodology

### 5.3.3 Background Traffic Volumes

Background traffic volumes are the sum of existing traffic volumes, corridor growth, and concurrent development traffic. Background traffic volumes for the opening day (2025) and 10-year post-development (2035) horizon years are illustrated in **Figure 8** and **Figure 9**, respectively.







## 5.4 Site Traffic Volumes

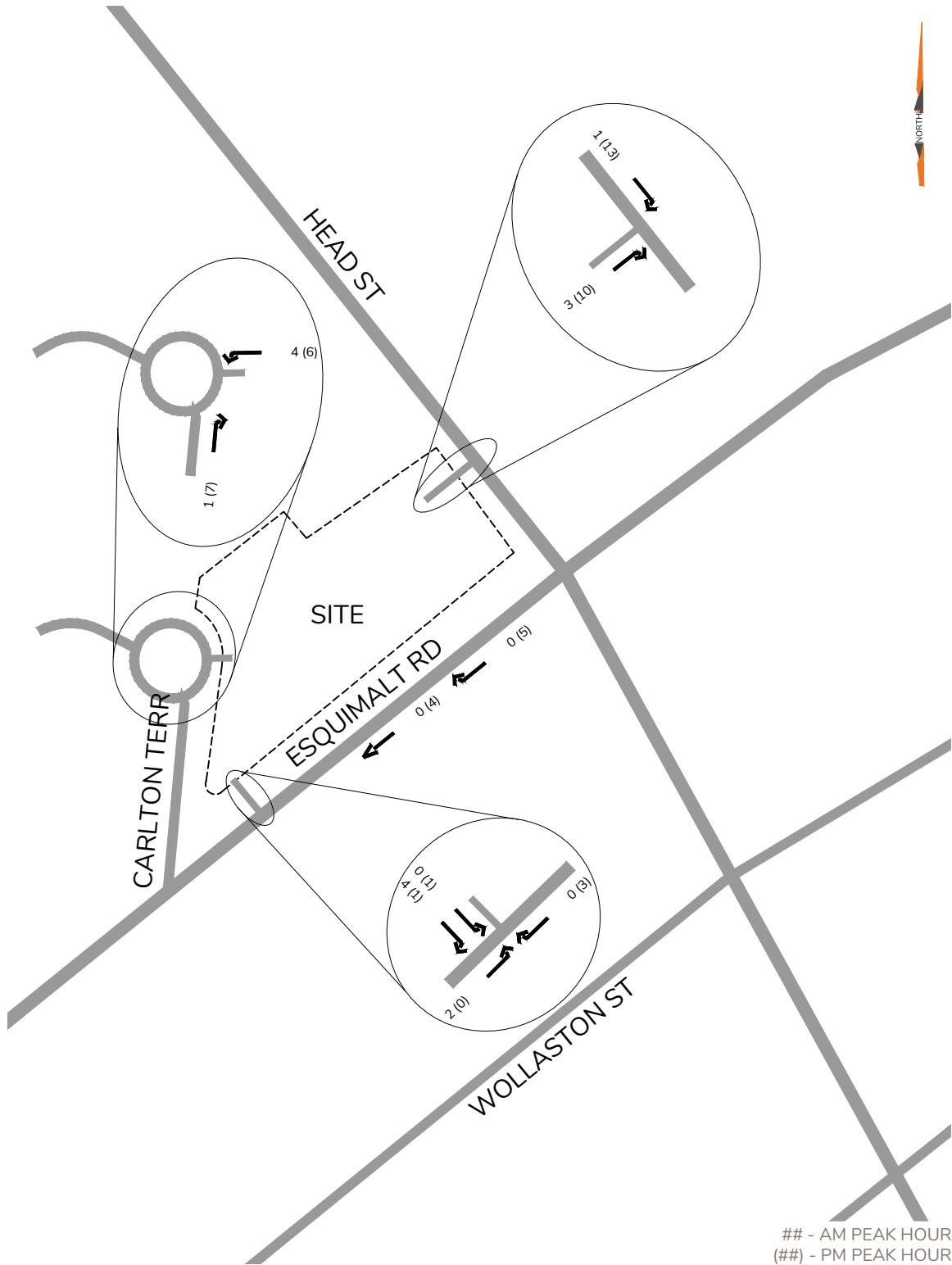
### 5.4.1 Existing Site Trip Generation

Currently, the site is occupied by a multifamily low-rise residential building, several restaurants, and commercial services. Existing site trips were based on counts performed by WATT at the site access points (as listed above in **Table 3**) and have been removed from the post-development site trip generation forecast. The existing site trip rates and trips to be removed are summarized in **Table 5**.

**Table 5 – Existing Site Trips To Be Removed**

Use	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
<b>Counted Vehicle Trips</b>						
Esquimalt Road Access & Street Parking	2	4	6	8	6	14
Head Street Access	1	3	4	13	10	23
Carlton Terrace Access	1	4	5	7	6	13
<b>Total</b>	<b>4</b>	<b>11</b>	<b>15</b>	<b>28</b>	<b>22</b>	<b>50</b>

A total of 15 two-way trips have been removed during the AM peak hour, and 50 two-way trips have been removed during the PM peak hour. Existing trips to be removed are illustrated in **Figure 10**.





#### 5.4.2 New Site Trip Generation

Trip generation for the proposed development was based off a 26-storey mixed use building with 176 multifamily condominium units, 96 multi-family market rental units, and 6 commercial-retail units (730m<sup>2</sup>).

Vehicular trip generation rates for the proposed residential uses are based on the ITE Trip Generation Manual (11th Edition).

A site-specific commercial trip generation rate was developed based on the GFA of the existing commercial uses, and the number of trips observed accessing the site via Carlton Terrace and Esquimalt Road during the weekday AM and PM peak hours (dates of counts noted in **Table 3**, trips generated noted in **Table 5**). The site-specific commercial trip generation rate calculation is summarized in **Table 6**.

**Table 6 – Site-Specific Commercial Trip Generation Rate Calculation**

	AM Peak Hour	PM Peak Hour
Trips In	3	15
Trips Out	8	12
Existing Commercial GFA (Occupied)	7,323 ft <sup>2</sup>	
Trip Rate (Inbound) <sup>[1]</sup>	0.41	2.05
Trip Rate (Outbound) <sup>[1]</sup>	1.09	1.64
<b>Trip Rate (Two-way)<sup>[1]</sup></b>	<b>1.50</b>	<b>3.69</b>

Notes:

1. Trip rates are per 1,000 ft<sup>2</sup> GFA

The existing commercial trip rate observed on site is lower than the applicable rates in the ITE Trip Generation Manual (11th Edition) by a factor of approximately 50 to 75%, depending on the specific land use. This is indicative of the walkable, bikeable, and transit-accessible nature of the site lending towards lower vehicular trip rates.



The future tenancy of the commercial uses proposed for the site are currently unknown; however, it is anticipated that it will be generally consistent with the existing uses of restaurants and personal services. All commercial trips are assumed to be primary trips. Internal or pass-by trips were not used for the purposes of this study to provide a more conservative estimate of travel demand in the area. The trip generation forecast for the site is provided in **Table 7**.

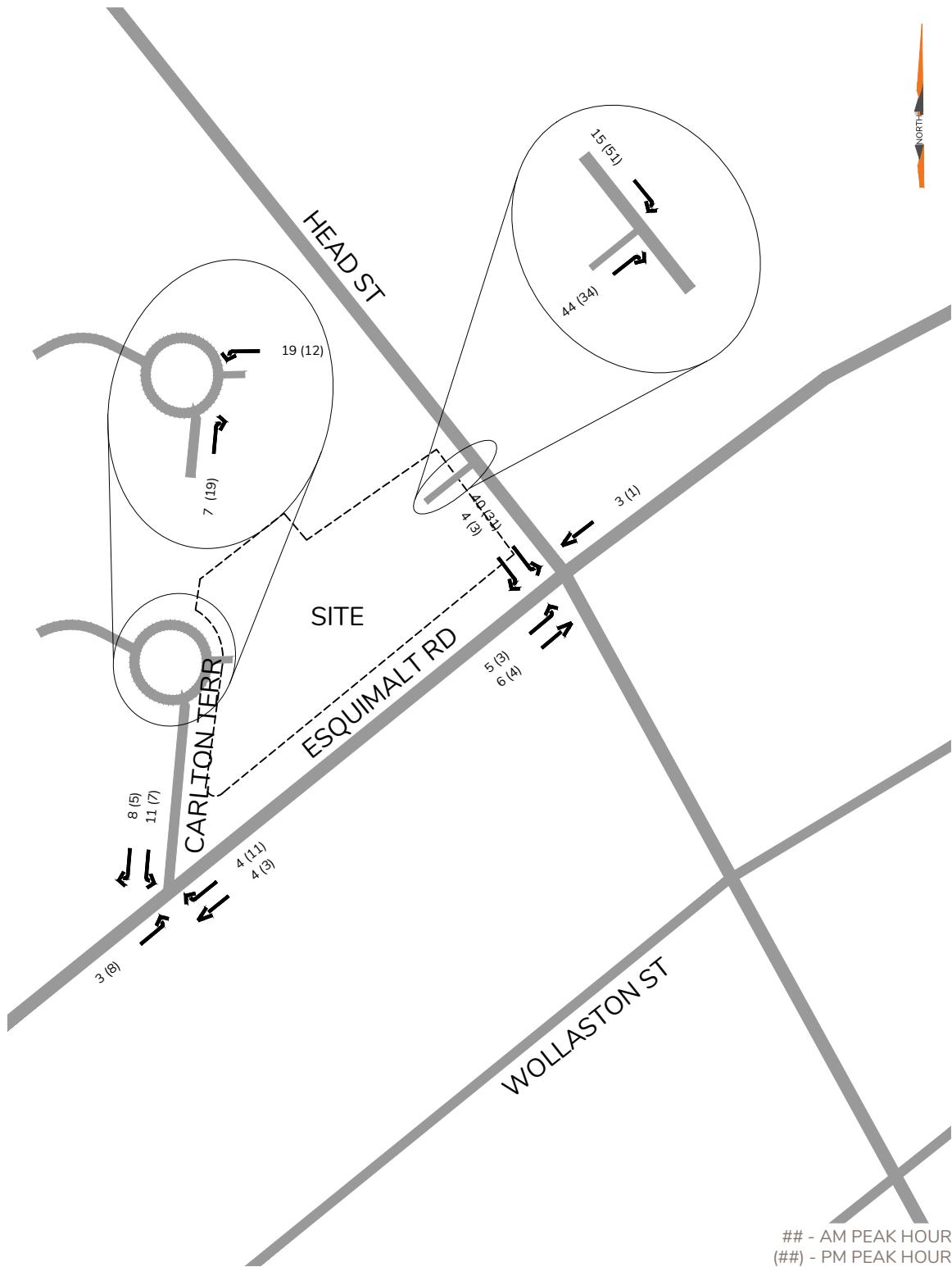
**Table 7 – New Site Trip Generation**

Use	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
<b>ITE Trip Generation Manual 11th Edition Rates</b>						
Multifamily Housing (High-Rise) (Not Close to Rail Transit) (General Urban / Suburban) (LU 222) <sup>(1)</sup>	0.07	0.20	0.27	0.20	0.12	0.32
<b>Calculated Commercial Trip Rates</b>						
Commercial <sup>(2)</sup>	0.41	1.09	1.50	2.05	1.64	3.69
<b>Vehicular Trip Generation</b>						
Condo - 176 units	12	35	47	35	21	56
Rental - 96 units	7	19	26	19	12	31
Commercial - 7858 ft <sup>2</sup>	3	9	12	16	13	29
<b>Total</b>	<b>22</b>	<b>63</b>	<b>85</b>	<b>70</b>	<b>46</b>	<b>116</b>

Notes:

1. Trip rates are per dwelling unit
2. Trip rates are per 1,000 ft<sup>2</sup> GFA

The proposed development is forecast to generate 85 new two-way trips in the AM peak hour and 116 new two-way trips in the PM peak hour before removing existing site trips. New site traffic volumes are illustrated in **Figure 11**.





#### 5.4.3 Net New Site Trip Generation

The net new trips for the site after the existing trips are removed, and new site trips are added is summarized in **Table 8**.

**Table 8 – New New Site Trips**

Use	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
New Site Trips	22	63	85	70	46	116
Existing Trips To Be Removed	-4	-11	-15	-28	-22	-50
<b>Net New Total</b>	<b>18</b>	<b>52</b>	<b>70</b>	<b>42</b>	<b>24</b>	<b>66</b>

The proposed development is forecast to generate 70 net new two-way trips in the AM peak hour and 66 net new two-way trips in the PM peak hour.

#### 5.4.4 Trip Distribution and Assignment

The trip distribution pattern for new site traffic was established based on existing traffic patterns and key origin/destinations in the region. Based on the parking distribution in the site plan, all rental parking spaces are provided via the Carlton Terrace site access and all commercial and condominium parking spaces are provided via the Head Street site access. The distribution of inbound and outbound traffic adopted for the proposed development is outlined in **Table 9**.



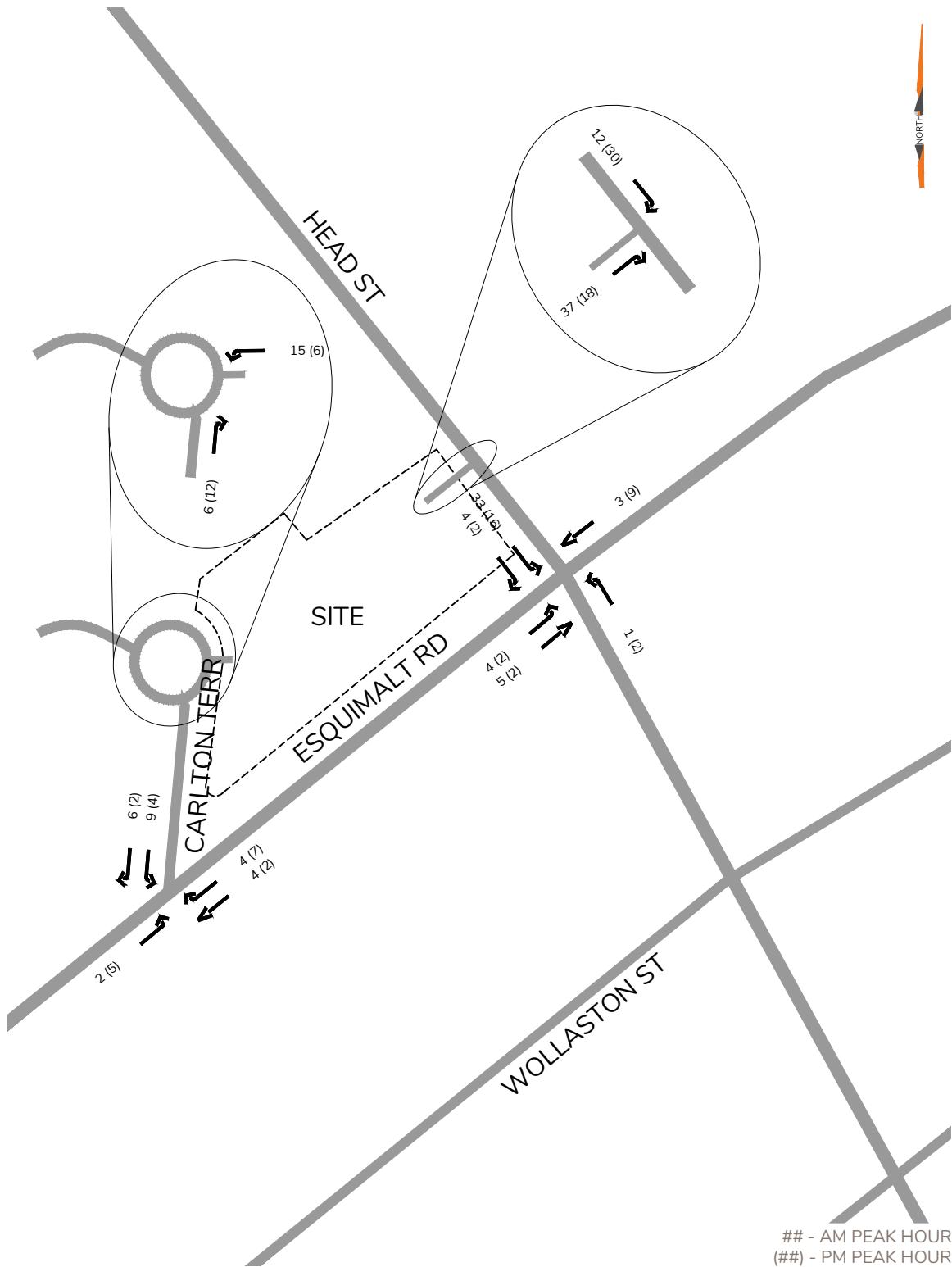
**Table 9 – Site Traffic Distribution**

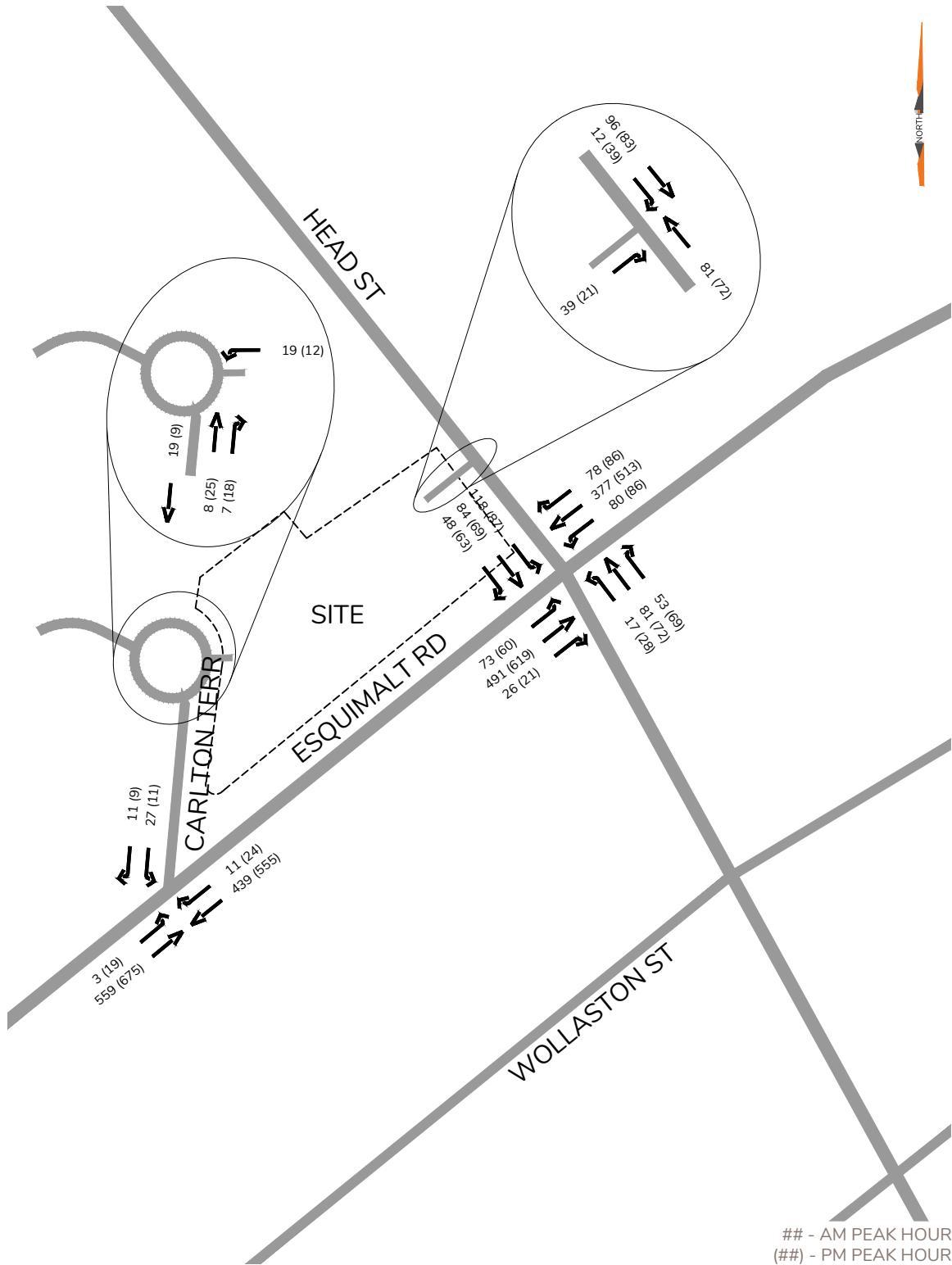
Street	Direction	AM & PM
<b>Commercial &amp; Condominium</b>		
Esquimalt Road	East	0% In / 90% Out
	West	0% In / 10% Out
Head Street	North	100% In / 0% Out
<b>Rental</b>		
Esquimalt Road	East	50% In / 30% Out
	West	40% In / 40% Out
Head Street	North	0% In / 25% Out
	South	10% In / 5% Out

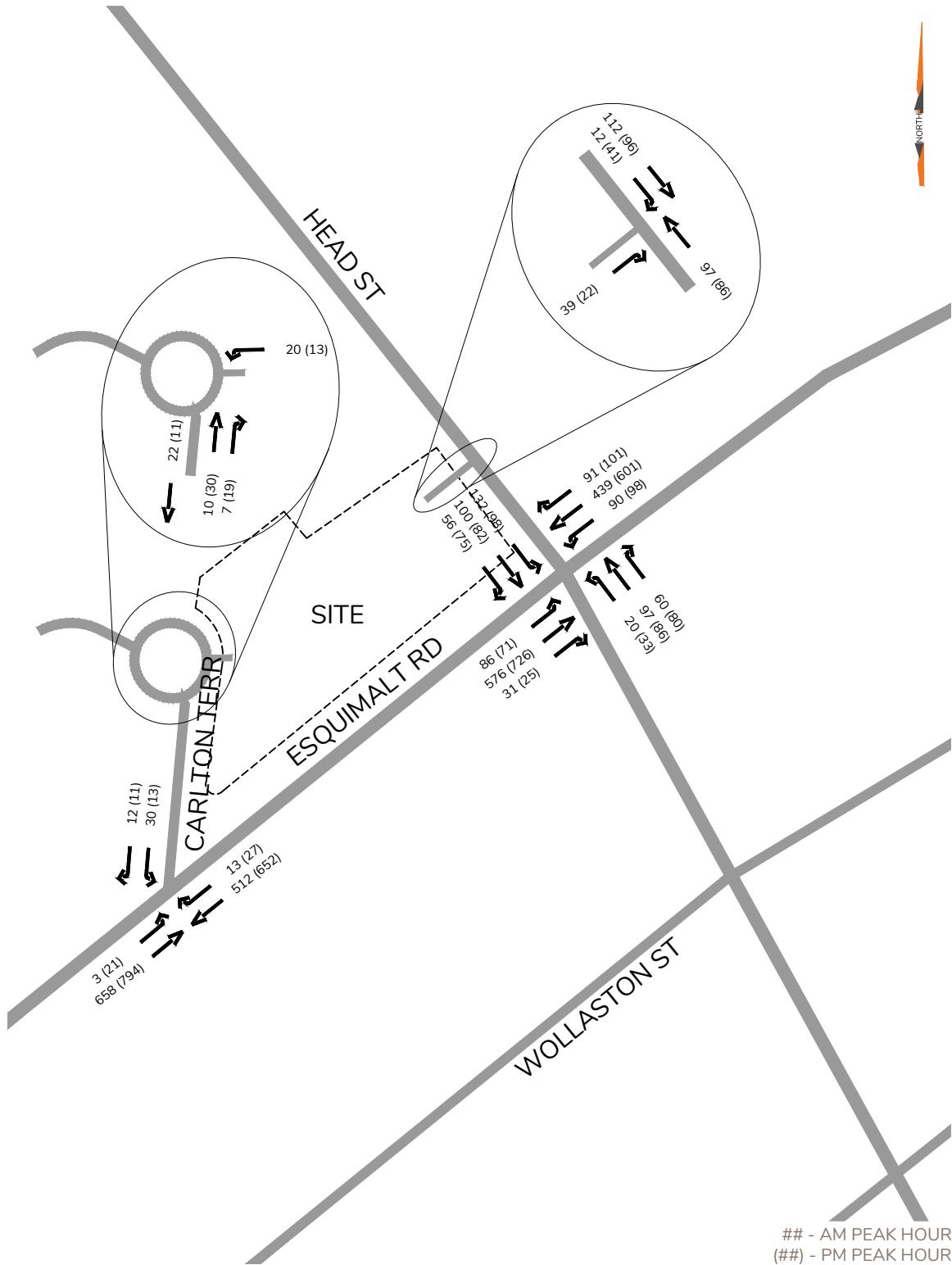
The net new site traffic volumes assigned to the area road network are illustrated in **Figure 12**.

## 5.5 Post-Development Traffic Volumes

Post-development traffic volumes are the sum of background traffic volumes and net new site traffic volumes. Post-development traffic volumes for the opening day (2025) and 10-year post-development (2035) horizon years are illustrated in **Figure 13** and **Figure 14**, respectively.









## 6.0 TRAFFIC OPERATIONS ANALYSIS

### 6.1 Methodology

Analysis of the traffic conditions at the study area intersections was undertaken using Synchro Version 11. Synchro / SimTraffic is a two-part traffic modelling software that provides analysis of traffic conditions based on the Highway Capacity Manual (HCM) 6<sup>th</sup> Edition evaluation methodology.

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

The volume-to-capacity ratio (v/c) is also an indicator of the capacity utilization for the key movements in the intersection. A v/c of 1.0 indicates that certain governing traffic movements through the intersection are operating at maximum capacity.

### 6.2 Input and Calibration Parameters

#### Heavy Vehicle Percentage

The percentage of heavy vehicles for each movement was based on the information provided as part of the turning movement counts. Where not available, a default value of 2 percent heavy vehicles was assumed.

#### Peak Hour Factor

The Peak Hour Factor (PHF) was based on the information provided as part of the turning movement counts. PHFs were calculated for each intersection using the overall intersection volumes. Where not available, a default PHF of 0.90 was used.

#### Signal Timings

Existing signal timings were used for all scenarios.



### Esquimalt Road / Head Street Queue Storage Capacity

Maximum thresholds for 95<sup>th</sup> percentile storage capacities are the maximum number of metres that can hold cars in the lane (queue storage) and/or the point that the queue backs up so far that it is now blocking other intersections and/or roads. The intersection of Esquimalt Road / Head Street has several movements with storage queues. The Esquimalt Road / Head Street maximum queue storages are listed in **Table 10**.

**Table 10 – Esquimalt Road / Head Street Maximum Queue Storage Thresholds**

Esquimalt Road /Head Street				
SBL	EBL	EBTR	WBL	WBR
20m	35m	35m	75m	65m



## 6.3 Intersection Analysis

### 6.3.1 Esquimalt Road / Head Street

Intersection analysis results for the Esquimalt Road / Head Street intersection are summarized in **Table 11** and **Table 12**.

**Table 11 – Esquimalt Road / Head Street Analysis – Opening Day**

Movement	Existing				Background				Post Development			
	v/c	LOS	Delay (s)	95% Queue (m)	v/c	LOS	Delay (s)	95% Queue (m)	v/c	LOS	Delay (s)	95% Queue (m)
<b>Opening Day (2025)</b>												
<b>NB</b>	0.37 (0.40)	B (B)	16.1 (17.2)	22 (27)	0.38 (0.45)	B (B)	15.7 (17.7)	26 (28)	0.35 (0.45)	B (B)	15.3 (19.0)	28 (31)
<b>SBL</b>	0.26 (0.21)	B (B)	15.6 (16.3)	19 (17)	0.31 (0.31)	B (B)	15.5 (16.3)	21 (20)	0.40 (0.38)	B (B)	15.6 (18.7)	23 (22)
<b>SBTR</b>	0.32 (0.28)	B (B)	15.8 (16.6)	23 (23)	0.30 (0.29)	B (B)	15.4 (17.2)	22 (23)	0.28 (0.29)	B (B)	14.9 (18.2)	28 (25)
<b>EBL</b>	0.14 (0.15)	A (A)	6.0 (7.2)	15 (17)	0.18 (0.17)	A (A)	7.4 (8.0)	20 (22)	0.20 (0.18)	A (A)	8.1 (8.4)	22 (21)
<b>EBT</b>	0.34 (0.42)	A (B)	9.3 (10.8)	30 (34)	0.43 (0.49)	B (B)	11.1 (11.8)	37 (41)	0.44 (0.49)	B (B)	11.9 (12.4)	37 (51)
<b>EBTR</b>	0.34 (0.42)	A (B)	9.3 (10.8)	27 (32)	0.43 (0.49)	B (B)	11.1 (11.8)	33 (37)	0.44 (0.49)	B (B)	11.9 (12.4)	33 (40)
<b>WBL</b>	0.12 (0.15)	A (A)	7.5 (6.8)	16 (21)	0.20 (0.21)	A (A)	7.3 (6.8)	17 (22)	0.21 (0.21)	A (A)	7.9 (6.3)	19 (21)
<b>WBT</b>	0.48 (0.64)	B (B)	11.3 (13.6)	40 (52)	0.59 (0.67)	B (B)	13.1 (13.3)	47 (69)	0.61 (0.68)	B (B)	14.2 (14.6)	52 (57)
<b>WBR</b>	0.05 (0.05)	A (A)	9.0 (9.0)	20 (22)	0.05 (0.06)	B (A)	9.4 (8.9)	21 (31)	0.05 (0.06)	A (A)	10.0 (8.9)	23 (17)

Notes:

1. ## (##) = AM (PM)
2. ## = Value exceeding threshold



Table 12 - Esquimalt Road / Head Street Analysis – 10-Year Horizon

Movement	Background				Post Development			
	v/c	LOS	Delay (s)	95% Queue (m)	v/c	LOS	Delay (s)	95% Queue (m)
Horizon (2035)								
NB	0.45 (0.55)	B (C)	17.5 (22.8)	30 (40)	0.41 (0.56)	B (C)	17.5 (23.4)	32 (38)
SBL	0.41 (0.42)	B (C)	17.4 (21.7)	23 (23)	0.50 (0.51)	B (C)	18.2 (22.9)	25 (23)
SBTR	0.36 (0.36)	B (C)	17.0 (21.2)	26 (27)	0.33 (0.37)	B (C)	17.1 (21.5)	30 (29)
EBL	0.22 (0.22)	A (A)	7.9 (8.6)	25 (29)	0.24 (0.23)	A (A)	8.7 (8.7)	24 (24)
EBT	0.51 (0.51)	B (B)	12.9 (12.3)	52 (72)	0.51 (0.50)	B (B)	13.9 (12.2)	45 (57)
EBTR	0.51 (0.51)	B (B)	12.9 (12.3)	40 (44)	0.51 (0.50)	B (B)	13.9 (12.2)	40 (43)
WBL	0.23 (0.27)	A (A)	7.5 (7.2)	20 (33)	0.24 (0.27)	A (A)	8.2 (7.2)	19 (29)
WBT	0.70 (0.76)	B (B)	16.9 (18.2)	55 (88)	0.70 (0.76)	B (B)	17.9 (18.2)	62 (80)
WBR	0.06 (0.08)	B (A)	10.5 (9.7)	20 (32)	0.06 (0.08)	B (A)	11.2 (9.6)	23 (40)

Notes:

1. ## (##) = AM (PM)
2. ## = Value exceeding threshold

The intersection of Esquimalt Road / Head Street for both the AM and PM peak hours is currently operating at an acceptable LOS B or better on all movements with a delay of 17 seconds or less. The v/c ratio is 0.64 or less and the 95<sup>th</sup> percentile queues are all within their available storage.



The addition of background traffic volumes on opening day has minor impacts on the operation of the intersection with the LOS, delay, and v/c ratio remaining within acceptable limits on all movements. Delay increases by 2 seconds or less and the 95<sup>th</sup> percentile queues increase by 17 metres or less. The 95<sup>th</sup> percentile queue on the southbound left movement starts to exceed its 20-metre capacity by 1 metre in the AM peak hour and is at capacity in the PM peak hour, while the eastbound through-right movement is over capacity in the AM and PM peak hours by 6 metres or less (i.e., one car length).

The introduction of post development traffic on opening day has negligible impacts on the intersection as LOS experiences no change in service levels, maximum change in delay on any movement is less than 3 seconds, the v/c ratios change 0.09 or less, and the 95<sup>th</sup> percentile queues increase by 6 metres or less (i.e., one car length). The 95<sup>th</sup> percentile queues are largely within their storage capacity except where it had previously failed.

There is limited change to the LOS, delay, and v/c ratios in the background phase 10 years post-development. Compared to the background scenario for opening day, the LOS is C or better on all movements, the delay increases by 6 seconds or less on any approach, the v/c increases by 0.11 or less, and the 95<sup>th</sup> percentile queues increase by 31 metres or less (i.e., five car lengths) and remain stable except where they were already exceeded. All movements that exceed their capacity exceed by only one car length.

Adding post development traffic to the horizon year background volumes has minimal impact. The LOS remains at C or better with an increase in delay of 2 seconds or less, v/c ratios increase by 0.1 or less, and the 95<sup>th</sup> percentile queues increase by 8 metres (i.e., 1 car length) or less. The only 95<sup>th</sup> percentile queues that are exceeding their storage are the previously failed movements which continue to exceed by only one car length.

The potential for extension of the southbound left turn lane is limited by the proposed (and existing) 900 Esquimalt Road driveway, and the opposing 890 Esquimalt Road driveway. While space exists in the roadway to extend this left turn lane as needed, it will restrict the ability of drivers exiting these two lots to turn left onto Esquimalt Road. The exceeded storage length is still very small (1 car length or less), so no mitigation measures are recommended for the southbound left turn lane at this time.



There is limited space in the roadway or the Esquimalt Road right-of-way to extend the eastbound through / right turn lane, as it would impact both the bike lane, and the opposing two-way centre left turn lane. Despite queues exceeding storage by 1 to 2 car lengths, performance for this lane is still within acceptable parameters. No mitigation measures are recommended for the eastbound through / right turn lane at this time.

WATT recommends that the Township of Esquimalt monitor this intersection and adjust the traffic signal timings as necessary to mitigate long queues in the southbound left turn and eastbound through / right turn lanes.

### 6.3.2 Esquimalt Road / Carlton Terrace

Intersection analysis results for the Esquimalt Road / Carlton Terrace intersection are summarized in **Table 13** and **Table 14**.

**Table 13 - Esquimalt Road / Carlton Terrace Analysis – Opening Day**

Movement	Existing				Background				Post Development			
	v/c	LOS	Delay (s)	95% Queue (m)	v/c	LOS	Delay (s)	95% Queue (m)	v/c	LOS	Delay (s)	95% Queue (m)
<b>Opening Day (2025)</b>												
SBL R	0.05 (0.04)	B (B)	13.1 (13.9)	6 (5)	0.06 (0.04)	B (C)	14.1 (15)	12 (5)	0.09 (0.06)	B (C)	14.3 (15.6)	10 (5)
EBL	0.00 (0.01)	A (A)	8.1 (8.6)	0 (6)	0.00 (0.02)	A (A)	8.3 (8.8)	4 (7)	0.00 (0.02)	A (A)	8.3 (8.8)	2 (9)
EBT	0 (0)	A (A)	0 (0)	0 (0)	0 (0)	A (A)	0 (0)	0 (0)	0 (0)	A (A)	0 (0)	0 (0)
WBT R	0 (0)	A (A)	0 (0)	0 (1)	0 (0)	A (A)	0 (0)	0 (0)	0 (0)	A (A)	0 (0)	0 (0)

Notes:

1. ## (##) = AM (PM)
2. ## = Value exceeding threshold



**Table 14 – Esquimalt Road / Carlton Terrace Analysis – 10-Year Horizon**

Movement	Background				Post Development			
	v/c	LOS	Delay (s)	95% Queue (m)	v/c	LOS	Delay (s)	95% Queue (m)
<b>Horizon (2035)</b>								
<b>SBLR</b>	0.08 (0.06)	C (C)	15.6 (17.1)	8 (7)	0.12 (0.08)	C (C)	15.9 (17.8)	10 (9)
<b>EBL</b>	0.00 (0.02)	A (A)	8.5 (9.2)	1 (8)	0.00 (0.03)	A (A)	8.5 (9.2)	4 (9)
<b>EBT</b>	0 (0)	A (A)	0 (0)	3 (7)	0 (0)	A (A)	0 (0)	0 (3)
<b>WBTR</b>	0 (0)	A (A)	0 (0)	0 (0)	0 (0)	A (A)	0 (0)	1 (2)

Notes:

1. ## (##) = AM (PM)
2. ## = Value exceeding threshold

In both the AM and PM peak hours the intersection of Esquimalt Road / Carlton Terrace is within acceptable standards in all scenarios (existing, background, post-development). For all movements the LOS is C or better, the delay is 18 seconds or less, the v/c ratio is less than 0.12, and the 95<sup>th</sup> percentile queues are within their storage capacity.



### 6.3.3 Site Driveways

Intersection analysis results for the two site driveways are summarized in **Table 15**.

**Table 15 – Site Driveways – Intersection Analysis Results**

Movement	Opening Day (2025)				10-Year Post-Development			
	v/c	LOS	Delay (s)	95% Queue (m)	v/c	LOS	Delay (s)	95% Queue (m)
<b>Head Street Driveway</b>								
SBTR	0 (0)	A (A)	0 (0)	4 (0)	0 (0)	A (A)	0 (0)	4 (3)
EBR	0.05 (0.03)	A (A)	9.0 (8.9)	2 (0)	0.05 (0.03)	A (A)	9.1 (9.0)	2 (3)
<b>Carlton Terrace Driveway</b>								
NBTR	0 (0)	A (A)	0 (0)	0 (0)	0 (0)	A (A)	0 (0)	0 (0)
WBLR	0.02 (0.01)	A (A)	8.8 (8.8)	10 (8)	0.02 (0.02)	A (A)	8.8 (8.8)	10 (9)

Notes:

1. ## (##) = AM (PM)
2. ## = Value exceeding threshold

Post-development, both driveways will function at LOS A, with delays of no more than 10 seconds, v/c ratios of 0.05 or less, and will be within their 95<sup>th</sup> percentile queues.



## 7.0 CONCLUSIONS

Traffic from the proposed development can be accommodated on the existing road network on both opening day and 10 years post-development.

Due to the proximity of the Head Street driveway to the Esquimalt Road / Head Street intersection, it is recommended that the driveway be restricted to right-in / right-out only movements. A full moves driveway is still provided from Carlton Terrace.

Loading for parcel deliveries and service vehicles can be accommodated in the loading space internal to the building. Loading for larger vehicles (such as move-in / move-out and deliveries for the commercial uses) can be accommodated in the proposed lay-by along the Carlton Terrace frontage.

## 8.0 RECOMMENDATIONS

WATT makes the following recommendations to the developer of the site:

1. Build out frontage of Esquimalt Road to provide protected bike lanes.
2. Provide sidewalks along the frontage of the development.

WATT makes the following recommendations to the Township of Esquimalt:

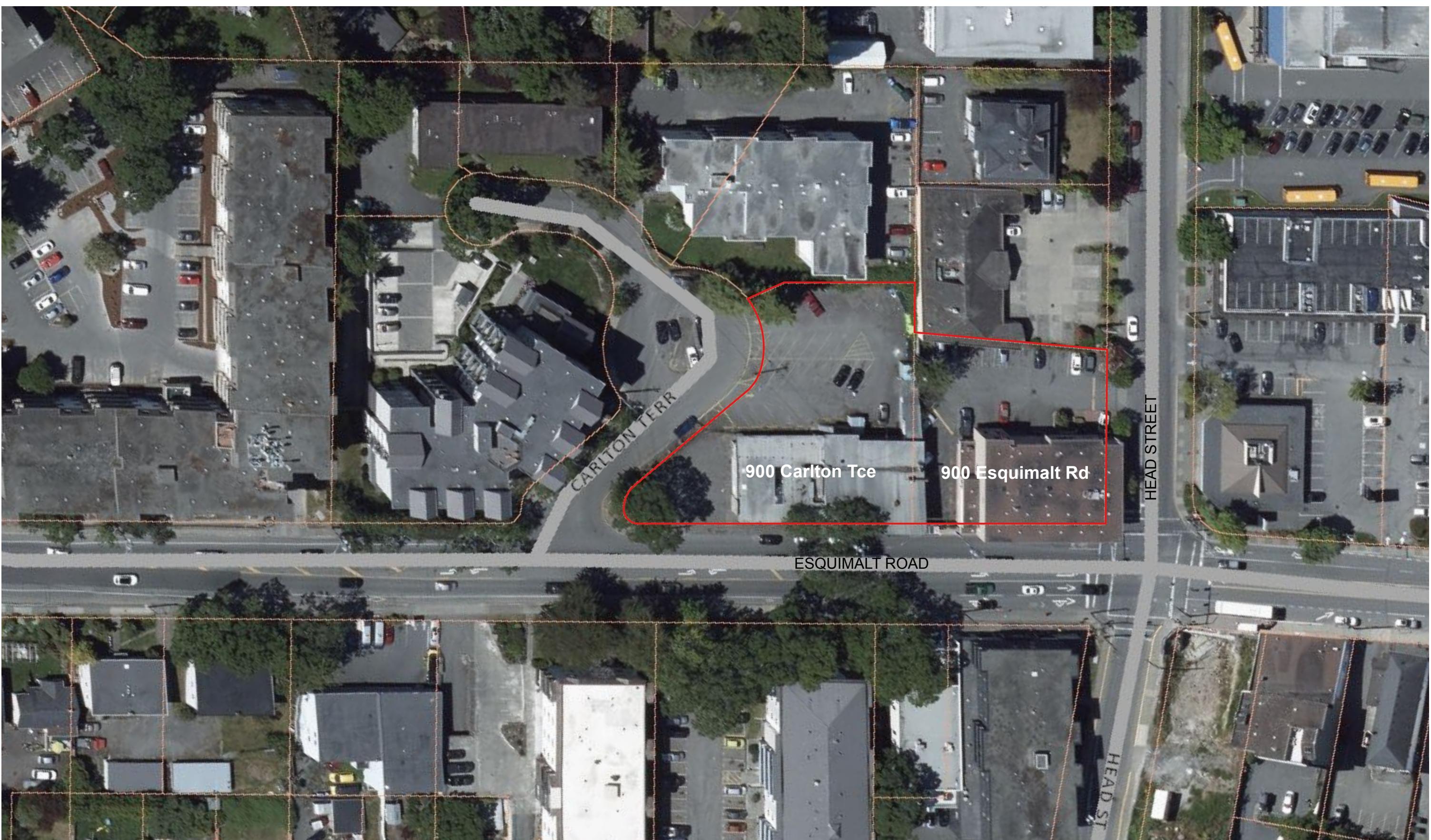
1. Monitor the Esquimalt Road / Head Street intersection and adjust the traffic signal timings as necessary to mitigate long queues in the southbound left turn and eastbound through / right turn lanes.
2. Prioritize the implementation of the Esquimalt Active Transportation Network Plan.
3. Work with BC Transit to support the routing and service changes identified in their 2021 Esquimalt-View Royal Local Area Transit Plan.



## APPENDIX A – SITE PLAN



1 Location Plan  
A001 N.T.S.



2 Local Context  
A001 N.T.S.

## ZONING SUMMARY

**BUILDING DESCRIPTION:**  
26 Storey mixed-use commercial/residential building, with mechanical penthouse & 2 levels underground parking

**ZONE:** C-2 Neighborhood Commercial

**USE:** Mixed Commercial/Residential

### DEVELOPMENT PERMIT AREA:

DPA-1 Natural Environment  
DPA-4 Commercial  
DPA-7 Energy Conservation & Greenhouse Gas  
DPA-8 Water Conservation  
DPA-11 West Bay

**SITE AREA:** 3650 sq.m.

**SITE COVERAGE:** 2361 sq.m. = 65%

**FLOOR AREA RATIO:** 4.7 : 1

See A221 Floor Area Determination

**OPEN SPACE:** 3761 sq.m.

See A222 Open Space Determination

**GRADE OF BUILDING:** 26.5 m (GEODETIC)

See A101 Site Plan for grade calculation

### HEIGHT OF BUILDING:

PERMITTED: 13 m MAXIMUM

PROPOSED: 83 m\*

### NUMBER OF STOREYS:

26 storeys + mechanical penthouse

### RESIDENTIAL PARKING:

Condominium Tower: 141 stalls (+18 visitor, shared with Commercial)  
Rental Mid-rise: 63 stalls (+9 visitor, shared with Commercial)  
TOTAL PROVIDED: 204 stalls

### COMMERCIAL PARKING:

Restaurant: 10 stalls = 1 stall per 25 sq.m. x 250 sq.m.  
Retail: 17 stalls = 1 stall per 28 sq.m. x 480 sq.m.  
TOTAL PROVIDED: 27 stalls + 1 Loading

**TOTAL PARKING:** 231 stalls\* (including 7 HC) + 1 Loading

### BICYCLE PARKING:

Condominium Tower: 176 stalls (including 18 oversize)  
Rental Mid-rise: 96 stalls (including 10 oversize)  
6-space bike racks: 18 stalls  
TOTAL PROVIDED: 290 stalls

### SETBACKS:

	required:	proposed:
Front Head St. (East PL)	0.0 m	2.0 m
Exterior Side, Esquimalt Rd.	0.0 m	3.5 m
Rear, Carlton Tce. (West PL)	3.0 m	0.5 m
Interior Side (North) - adj. Res.	3.0 m	10.0 m
Interior Side (North) - adj. Com.	0.0 m	0.0 m

### SUITE SUMMARY:

#### Rental Mid-rise:

Junior 1 Bed	36 suites @ 42 sq.m.
1 Bed	12 suites @ 46 sq.m.
1 Bed + Den	18 suites @ 53 sq.m.
Junior 2 Bed	18 suites @ 62 sq.m.
2 Bed / 2 Bath	12 suites @ 76 sq.m. (avg.)
<b>TOTAL:</b>	<b>96 Rental Suites</b>

#### Condominium Tower:

Junior 1 Bed	22 suites @ 42 sq.m.
1 Bed	36 suites @ 54 sq.m. (avg.)
1 Bed + Den	22 suites @ 59 sq.m.
Junior 2 Bed	22 suites @ 64 sq.m.
2 Bed / 2 Bath	22 suites @ 74 sq.m.
2 Bed + Den / 2 Bath	38 suites @ 85 sq.m.
3 Bed / 2 Bath	6 suites @ 93 sq.m.
2 Bed PH / 2 Bath	4 suites @ 91 sq.m.
3 Bed PH / 2 Bath	4 suites @ 118 sq.m.
<b>TOTAL:</b>	<b>176 Condominium Suites</b>

**TOTAL SUITES:** 272 Rental + Condominium

\* variance required

## BUILDING CODE SUMMARY

**REFERENCED DOCUMENT :**  
BRITISH COLUMBIA BUILDING CODE 2018 - PART 3

### MAJOR OCCUPANCY CLASSIFICATION:

- GROUP C - RESIDENTIAL

### BUILDING AREA:

- 2456 sq.m. (26 436 s.f.)

### BUILDING HEIGHT:

- 26 STOREYS

### NUMBER OF STREETS FACING:

- 3

### ACCESSIBLE FACILITIES

- ACCESSIBLE ENTRANCES

- ACCESSIBLE PARKING STALLS

### CONSTRUCTION REQUIREMENTS:

- 3.2.2.47 GROUP C, ANY HEIGHT, ANY AREA, SPRINKLERED
- NON-COMBUSTIBLE CONSTRUCTION WITH 2HR MIN FIRE RESISTANCE RATING TO FLOORS AND LOADBEARING WALLS
- ADDITIONAL REQUIREMENTS FOR HIGH BUILDINGS Ref. 3.2.6.1 (1)(d)

## PROJECT DIRECTORY

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## LIST OF DRAWINGS

### Architectural

- A001 Project Data
- A100 Survey Plan
- A101 Site Plan
- A201 P2 Parking Plan
- A202 P1 Parking Plan
- A203 L1 Plan
- A204 L1 Mezzanine Plan
- A205 L2 Plan
- A206 L3 Plan
- A207 L4-L7 Plan
- A208 L8 Plan
- A209 L9 Plan
- A210 L10 Plan
- A211 L11-L24 Plan
- A212 L25 Plan
- A213 L26 Plan
- A214 Mechanical Penthouse
- A215 Roof Plan
- A221 Floor Area Determination
- A222 Open Space Determination
- A301 South & East Elevations
- A302 North & West Elevations
- A303 Colours & Materials
- A401 Building Sections
- A402 Building Sections
- A403 Building Sections
- A404 Building Sections
- A501 Perspective Renderings
- A502 Perspective Renderings
- A503 Perspective Renderings
- A504 Perspective Renderings
- A505 Perspective Renderings
- A506 Perspective Renderings
- A507 Perspective Renderings
- A510 Shadow Study

### Landscape

- L1 Existing Tree Plan
- L2 Landscape Ground Plane Site Plan
- L3 Ground Plane Tree Planting Plan
- L4 Ground Plane Planting Plan
- L5 Landscape Rooftop Plan
- L6 Rooftop Tree Planting Plan
- L7 Rooftop Planting Plan

Carlton Terrace

900 Carlton Terrace  
Esquimalt BC

Project Data

A001

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1 23-10-13 DP REVISIONS

23-06-19 ISSUED FOR DP/DVP

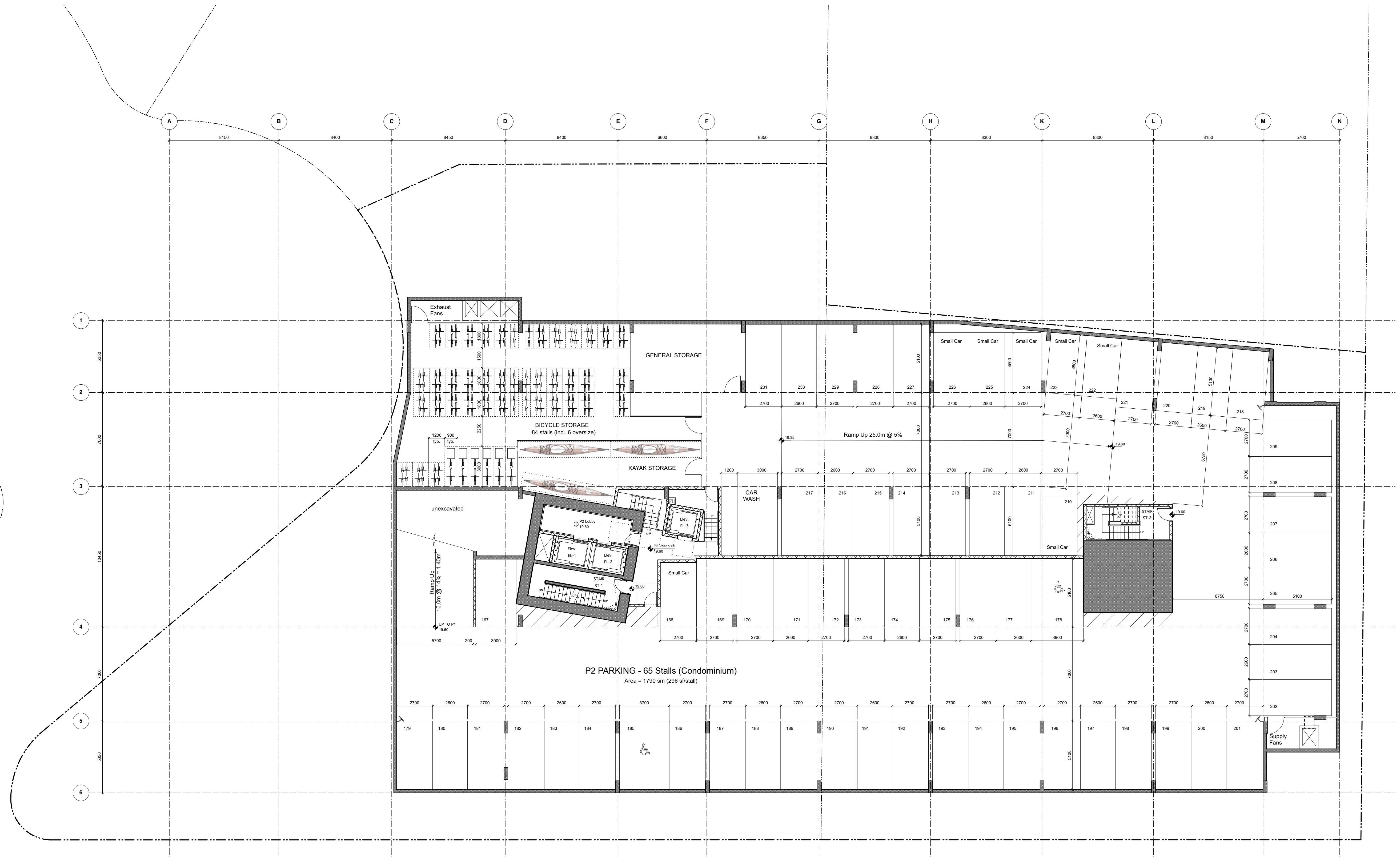
Rev Date Description

plot date 23-06-19 drawing file 2139 Project Data

drawn by LGF checked by PDH

scale 1:200 project number 2139

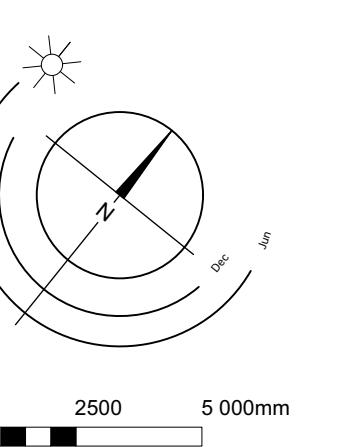
NOTE: All dimensions are shown in millimeters U.N.O.



# Carlton Terrace

900 Carlton Terrace  
Esquimalt BC

## P2 Parking Plan



HKa A201

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## APPENDIX B – SYNCHRO BACKGROUND



## SYNCHRO MODELLING SOFTWARE DESCRIPTION

The traffic analysis was completed using Synchro and SimTraffic traffic modelling software. Results were measured in delay, level of service (LOS), 95th percentile queue length and volume to capacity ratio. 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 ten times (ten 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. A LOS C or better is considered acceptable operations, while D is on the threshold between acceptable and unacceptable operations. Highway operations will typically need to operate at LOS C or better for through movements and LOS E or better for other traffic movements with lower order roads.

The hierarchy of criteria for grading an intersection or movement not only includes delay times, but also considers 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 (LOS)	Unsignalized Intersection Average Vehicle Delay (sec / veh)	Signalized Intersection Average Vehicle Delay (sec / veh)
A	0 – 10	0 – 10
B	> 10 – 15	> 10 – 20
C	> 15 – 25	> 20 – 35
D	> 25 – 35	> 35 – 55
E	> 35 – 50	> 55 – 80
F	> 50	> 80