



**Broadmoor Shopping Centre Master Plan
Richmond, BC**

**Transportation Study
Final Report**

Prepared For: First Capital Realty Inc.

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1.0 INTRODUCTION

1.1 Background

First Capital Realty Inc. is planning to redevelop the Broadmoor Mall located at the south-west corner of the intersection of No. 3 Road and Williams Road in the City of Richmond, BC. This neighbourhood shopping centre has been serving the community for many years, but revitalization is much needed in order to maintain its competitiveness and to better serve the community. The site is categorized as one of the *Neighbourhood Service Centres* in Richmond's Official Community Plan (OCP) and in the *Priority Area* where improvements are encouraged to provide distinctive design features in the road network to complement neighbourhood character and to emphasize landmark locations. The redevelopment proposals will provide an excellent opportunity and fully supports the OCP's planning and policy objectives.

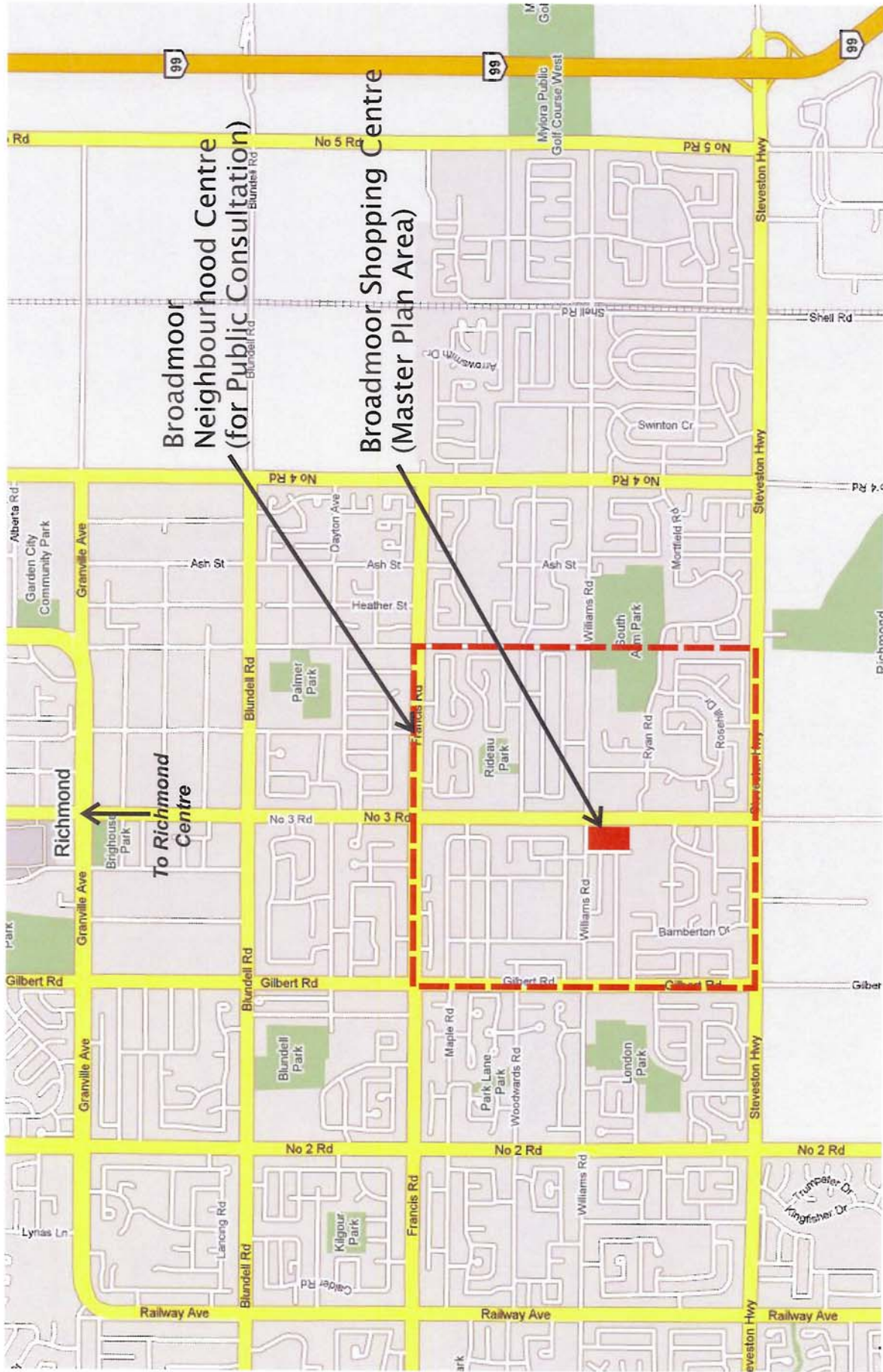
Extensive planning studies for the Broadmoor Mall have been conducted including submission of development permit applications, liaisons with city staff, and public consultation/open houses. Detailed traffic impact studies were first undertaken by Bunt & Associates in 2007.

In early 2009, Richmond's Planning staff advised that a Master Plan is required for the proposed redevelopment in order to provide an overall planning framework which reflects community preferences and guides the implementation process during the various phases. The Terms of Reference for the Master Plan (called *Broadmoor Shopping Centre Master Plan*) was subsequently established. The required Master Plan area includes the Broadmoor Mall site owned by First Capital Realty Inc. as well as the adjoining properties owned by others such as Richlea Square and the Petro Canada gas station, see **Exhibit 1.1**. A larger area called *Broadmoor Neighbourhood Centre* was defined to reflect largely for public consultation.

1.2 Study Objectives

To support the master planning process, Bunt & Associates conducted a Transportation Study and reviewed the transportation aspects related to the proposed Master Plan. The findings and recommendations from the Transportation Study are presented in this report.

The development proposals in the Master Plan are anticipated to be developed in phases over the next 20-30 years, or longer. Phase 1 of the redevelopment is to renovate part of the existing Broadmoor Mall (eastern half) where a Development Permit has been issued. This phase will include improvement to both interior and exterior, but generally no change to the building footprint. Works will commence shortly. First Capital also proposes to redevelop the remaining half of the Broadmoor Mall (western half near Williams Road and Dunoon Drive as Phase 2) into a mixed-use development to be completed by 2011. Concurrently with the Rezoning Application for the entire Master Plan, a separate Development Permit Application was submitted to the City for the initial Phase 2 development and a separate Traffic Impact Study Report has been prepared by Bunt & Associates.



Broadmoor Neighbourhood Centre (for Public Consultation)

Broadmoor Shopping Centre (Master Plan Area)

To Richmond Centre

Dec 2009 N.T.S. 4493-14

Exhibit

1.1

Site Location

Broadmoor MP Transportation Study, Richmond, BC



1.3 Structure of Report

Following this introductory section, **Sections 2 to 6** cover the transportation analysis and evaluation of the Master Plan, including

- A description of the proposed Master Plan and land uses;
- An assessment of the existing condition in the surrounding area;
- Development traffic impact assessment of the Master Plan during the various phases and final build-out, and identification of the required off-site improvements;
- Review of on-site circulation and provisions for pedestrians, bicycles, loading and parking for various phases and final build-out;
- Assessment of the transportation demand management (TDM) principles and measures to support the overall planning and sustainability objectives envisaged in the Official Community Plan.

Finally, conclusions of the Transportation Study are provided in **Section 7**.

2.0 MASTER PLAN AREA AND DEVELOPMENT PROPOSALS

2.1 Existing Land Uses

The Master Plan site area is approximately 33,600m² (140m x 240m) and is currently comprised of 6 land parcels with four property owners, as illustrated in **Exhibit 2.1** and **Table 2.1** below.

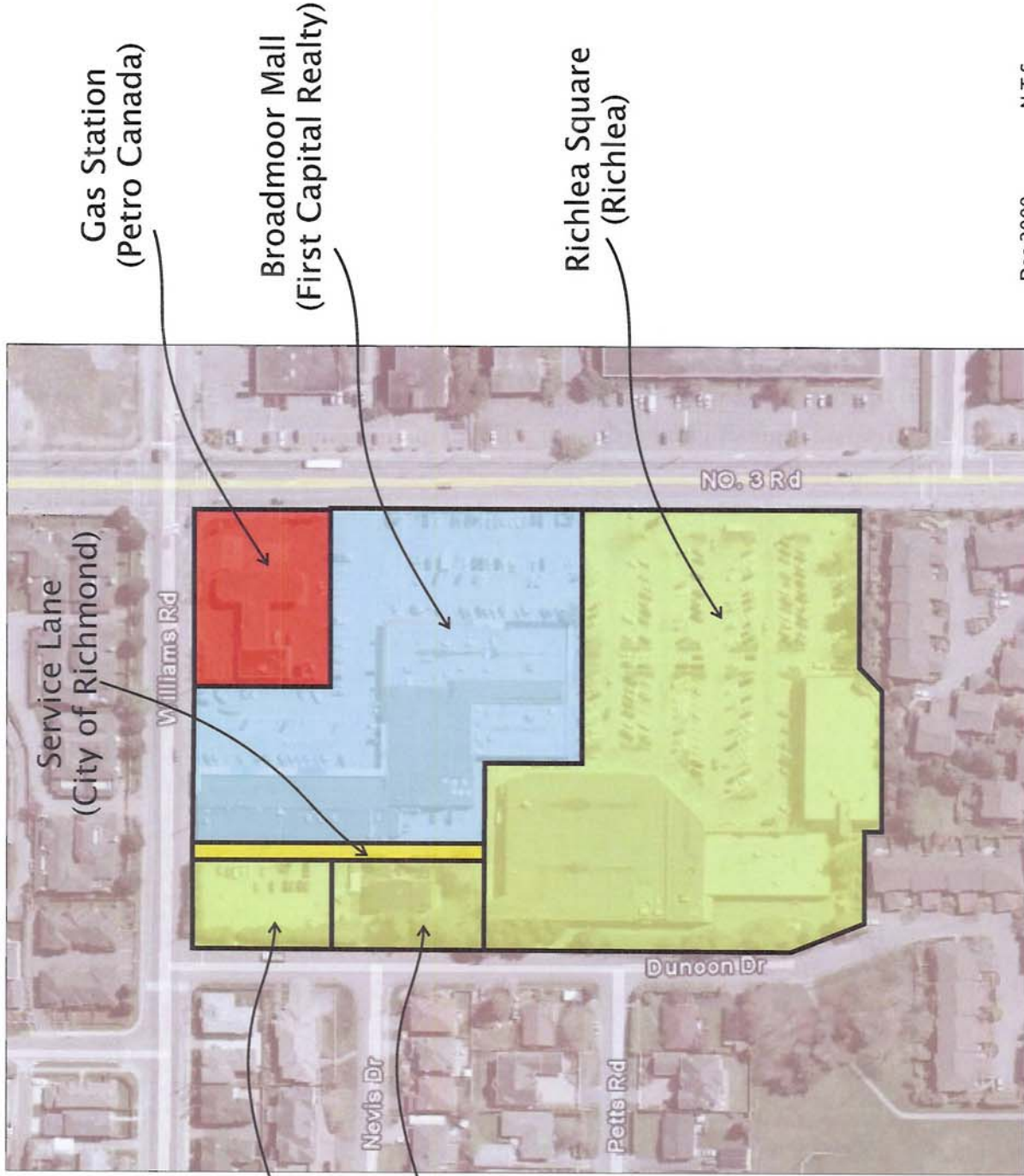
Table 2.1: Summary of Existing Land Uses

Parcel	Property Owner	Site Area (m ²)	Uses
Broadmoor Mall	First Capital Realty	11,269	2 Banks Pub and Liquor Retail 4 Restaurants/Fast Food Dry Cleaner Tailor Barber Grocery (Bakery, Fruits/Veg) Pet Retail Mobility Retailer
Richlea Square	Richlea	16,929	Safeway 4 Restaurants/Cafes Bank Insurance Broker 3 Dental Clinics 2 Medical Clinics Pharmacy Dry Cleaner 2 Estheticians Travel Agent Animal Clinic Other retail (House of Cards, Blockbuster)
Petro Canada	Petro Canada	2,490	Gas Station Convenience Store
Residential Lot	First Capital Realty	1,202	Vacant Residential Building
Parking Lot	First Capital Realty	1,113	Parking Lot
Lane	City of Richmond	541.5	Service Lane

The splits of property ownership by site area are as follows:

- First Capital Realty 40.5%
- Richlea 50.5%
- Petro Canada 7.4%
- City of Richmond 1.6%

First Capital Realty currently owns approximately 40% of the Master Plan area. In preparing the Master Plan, Brook + Associates, planning consultants for the project, liaises with all 4 property owners to ensure that the plan reflects a coordinated effort.



Gas Station
(Petro Canada)

Broadmoor Mall
(First Capital Realty)

Richlea Square
(Richlea)

Service Lane
(City of Richmond)

Williams Rd

NO. 3 Rd

Dunoon Dr

Nevils Dr

Petts Rd

Parking Lot
(First Capital Realty)

Vacant Residential
Building
(First Capital Realty)

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Land Parcels and Ownership

Broadmoor MP Transportation Study, Richmond, BC

2.2 Proposed Master Plan and Phasing

The proposed Master was developed in consultation with city staff as illustrated in **Exhibit 2.2**. The Master Plan reflects a thorough analysis of land uses, built form, density, urban design guidance, amenities and infrastructure. It promotes a mixed-use environment with residential use well integrated within the neighbourhood shopping centre. The primary objectives of the Master Plan are (i) to demonstrate that a satisfactory long-term plan can be developed and (ii) to provide a framework for implementation of the initial phase (Phase 2) scheduled for completion by 2011.

As in other similar large scale of redevelopment and in light of the leasing agreements with the existing tenants on the site, the implementation of the Master Plan is anticipated to occur in phases as illustrated in **Exhibit 2.3** and summarized below.

- Phase 1 (2010): Commercial renovation of part of the existing Broadmoor Mall; Development Permit has been issued
- Phase 2 (2011): Commercial-residential redevelopment - northwest corner of site; a Development Permit application has been submitted concurrently with the Rezoning Application for the overall Master Plan area
- Phase 3 (2024): Demolish Phase 1 and build mixed-use development along No. 3 Road between Petro Canada and Richlea site
- Phase 4 (2027): Demolish Safeway building and move to No. 3 Road
- Phase 5 (2031+): Petro Canada site redevelops

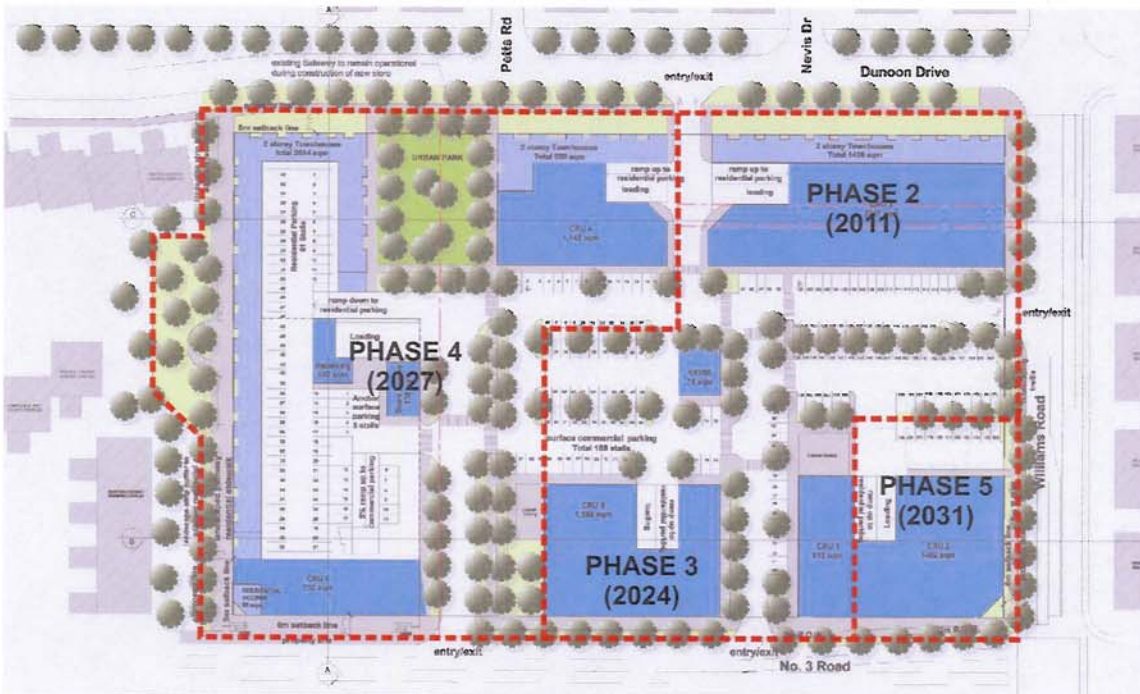
It can be seen that Phases 1 and 2 are expected to be completed within the next two years, while the subsequent phases (3 to 5) will occur over a longer time frame (approximately 15-20 years). The actual implementation dates may vary and are subject to the market condition and other factors which may influence the implementation considerations. As such, it should be noted that the labeling and timing of the future phases (3 to 5) above are primarily for the purpose of the transportation analysis presented in this report.



Existing Layout



Proposed Master Plan



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2.3 Development Scale and Mix

The existing uses in the Master Plan area consist of a total of 11,208 m² of commercial floor space. **Table 2.2** below provides a summary of the anticipated changes in development uses and the corresponding sizes. It can be seen that the total commercial floor area will remain more or less the same as the existing level. In the final phase (Phase 5), the total commercial floor area will be 11,215 m² together with a total of 187 residential dwelling units. The existing gas station will be removed from the site. The tenant mix in the commercial use is not finalized at this stage but will remain largely the same as existing and function collectively as a neighbourhood shopping centre. Therefore, the major change in land uses is the addition of residential use and removal of the gas station.

Table 2.2: Development Gross Floor Areas

Parcel	Use	Unit	Existing	Phase 2	Phase 3	Phase 4	Phase 5
Broadmoor Mall	Commercial	m ² GFA	4,333	4,882	3,907	3,907	3,907
	Residential	# units	-	64	84	84	84
Richlea Square	Commercial	m ² GFA	6,875	6,875	6,875	5,906	5,906
	Residential	# units	-	-	-	75	75
Petro Canada	Commercial	m ² GFA	-	-	-	-	1,402
	Residential	# units	-	-	-	-	28
	Gas Station	# fuelling stations	12	12	12	12	-
Total	Commercial	m ² GFA	11,208	11,757	10,782	9,813	11,215
	Residential	# units	-	64	84	159	187
	Gas Station	# fuelling stations	12	12	12	12	-

Note that 'gas station' use is typically a high traffic generator on a per-unit basis, drawing traffic from the fronting streets. The new traffic from the residential use will be somewhat offset by the reduction in gas station traffic to/from the site. Also, the mixed-use nature of the proposed development will eliminate some of the shopping trips supported by the on-site population in the new residential development.

In recently years, alternative modes of transportation, such as transit and bicycles, are actively developed in Richmond and Metro Vancouver. Overall, it can be expected that the net change in site traffic volumes will be insignificant when comparing to the existing conditions.

3.0 EXISTING CONDITION

3.1 Existing Road Network

The Master Plan area is located at the south-west quadrant of the signalized intersection of No. 3 Road and Williams Road, see **Exhibit 3.1**. It has 3 road frontages; No. 3 Road to the east, Williams Road to the north and Dunoon Drive to the west. The site abuts with Maple Village, a multi-family residential development, to the south.

No. 3 Road is a north-south major arterial road and generally provides a 4-lane cross-section. It is also a major transit corridor in the City of Richmond. The Canada Line rapid transit system terminates at the Richmond-Brighouse Station located between Saba Road and Cook Road on No. 3 Road, approximately 3km north of Broadmoor. There are several feeder bus routes passing by the site and connect to the Canada Line. No. 3 Road extends to River Road to the north and Dyke Road to the south. It intersects major east-west arterial roads, i.e. Bridgeport Road, Westminster Highway, and Steveston Highway which links with Highway 99. The posted speed on this road is 50 km/hr.

Williams Road is an east-west arterial road which accommodates one through lane in each direction. Given the number of residential driveways along this road, a two-way left-turn lane is currently provided between the No.1 Road and No.5 Road corridors. Bike lane is also provided on both sides of the roadway. At signalized or marked intersections, left-turning bays are provided at the east and west approaches. This generally '3-traffic lanes+bike lanes' cross section of roadway is also posted at a 50km/hr speed limit.

Dunoon Drive is a collector street that provides access to the nearby residential developments as well as servicing access to the Richlea Square loading dock at the end of Dunoon Drive. The Maple Lane Elementary School is located to the south-west of the southern end of Dunoon Drive. Nevis Drive and Petts Road, intersecting with Dunoon Drive, are local residential streets primarily used by local traffic due to their configuration.

3.2 Existing Traffic Volumes

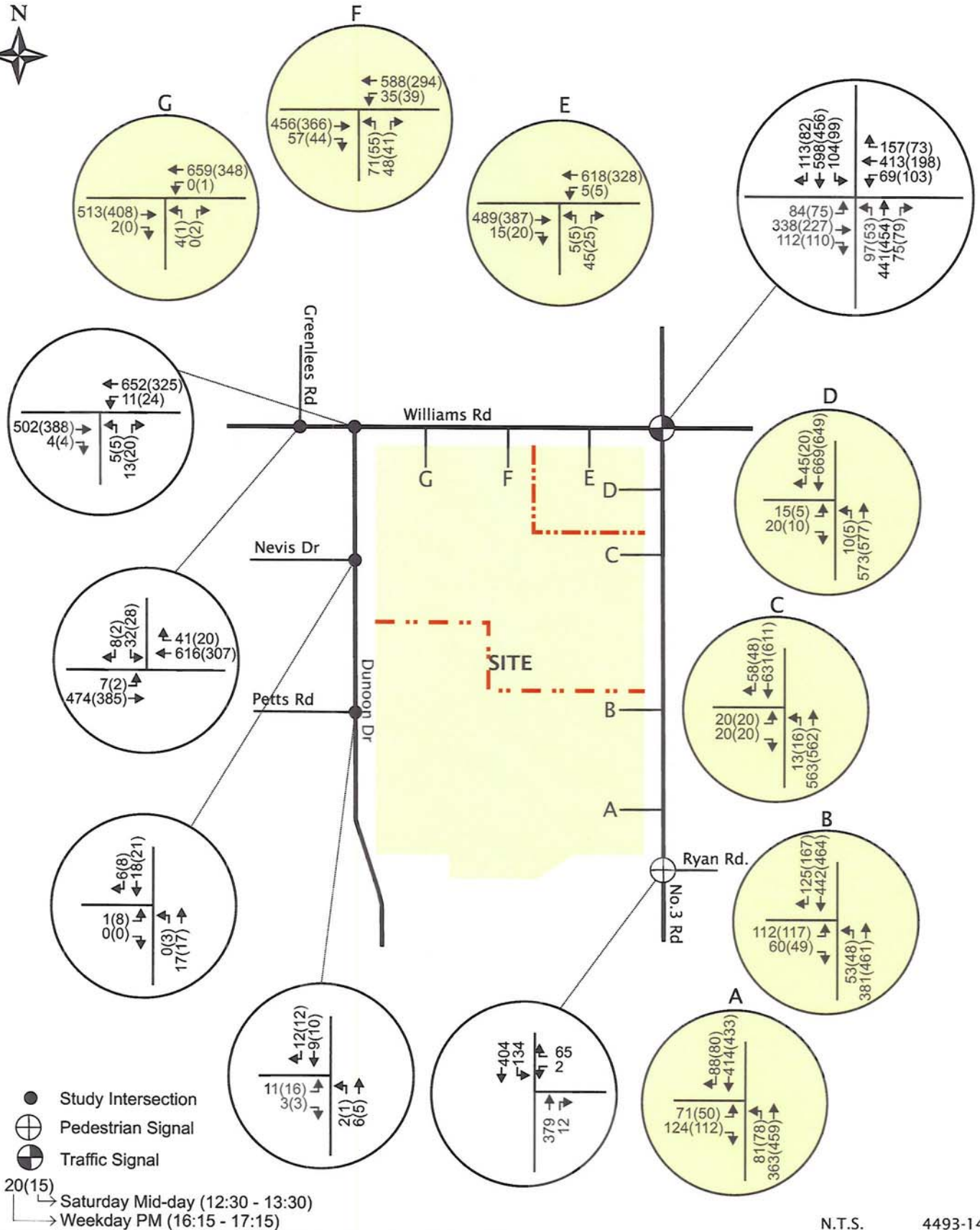
To document the existing traffic characteristics in the vicinity of the Master Plan area, existing traffic volumes on the surrounding streets and at all the site access driveways were counted during the typical weekday PM peak and Saturday mid-day peak periods. A summary of the observed peak hour volumes is provided in **Exhibit 3.2**.

Traffic volumes on No. 3 Road and Williams Road are generally higher during the weekday peak periods due to the commuter traffic volumes associated with work and school trips. However, weekend street traffic volumes are lower. The existing commercial use on the site exhibits that its peak hour site traffic generation in the weekday morning period generally occurs after the typical commuter peak. As such, the worst case condition for the site when the site and street traffic volumes combined is highest during the weekday PM peak period.



Area Road Network

Broadmoor MP Transportation Study, Richmond, BC



N.T.S. 4493-14



Existing 2009 Peak Hour Traffic Volumes

Broadmoor MP Transportation Study, Richmond BC

Exhibit
3.2

During the Friday survey period, the observed two-way traffic volumes along No.3 Road and Williams Road are approximately 1,400 and 1,150 vehicles per hour, respectively. It is calculated that the Friday peak hour two-way traffic volume is approximately 15% higher on No.3 Road and over 50% higher on Williams Road when compared to the corresponding Saturday peak traffic volumes.

3.3 Existing Intersection Operating Performance

Intersection capacity performance was assessed using Synchro 6 traffic analysis software package, developed by Trafficware (2004). The traffic operational performance was evaluated by calculating the volume-to-capacity (V/C) ratio and the Level of Service (LOS) for each traffic movement. The V/C ratio is a measure of the traffic congestion for a particular traffic lane or lane group or an entire intersection. Generally, values up to 0.85 are considered appropriate for intersections and up to 0.90 for individual lanes or lane groups. A V/C ratio of 1.0 or greater indicates that the traffic operation is over-capacity. The LOS indicator ranges from ideal LOS A conditions with minimum or no delay through to LOS F conditions with extensive delay. At an unsignalized intersection, the LOS is based on the estimated average control delay per vehicle for each crucial movement. A control delay less than 10 seconds indicates sufficient capacity and good traffic conditions. A calculated control delay value that is greater than 50 seconds is given a LOS F.

Table 3.1 summarizes the results of the capacity analysis for the existing conditions at the key intersections around the site.

Table 3.1: Existing Intersection Performance

Intersection	Control	Friday PM Peak		Saturday Mid-day Peak	
		V/C Ratio	LOS	V/C Ratio	LOS
No.3 Road / Williams Road	Signalized	0.64	B	0.37	A
No. 3 Road / Ryan Road	Pedestrian Signal	0.25	A	nc	nc
Williams Road / Dunoon Drive	Unsignalized	-	B	-	B
Williams Road / Greenlees Road	Unsignalized	-	C	-	B
Dunoon Drive / Nevis Drive	Unsignalized	-	A	-	A
Dunoon Drive / Pettis Road	Unsignalized	-	A	-	A

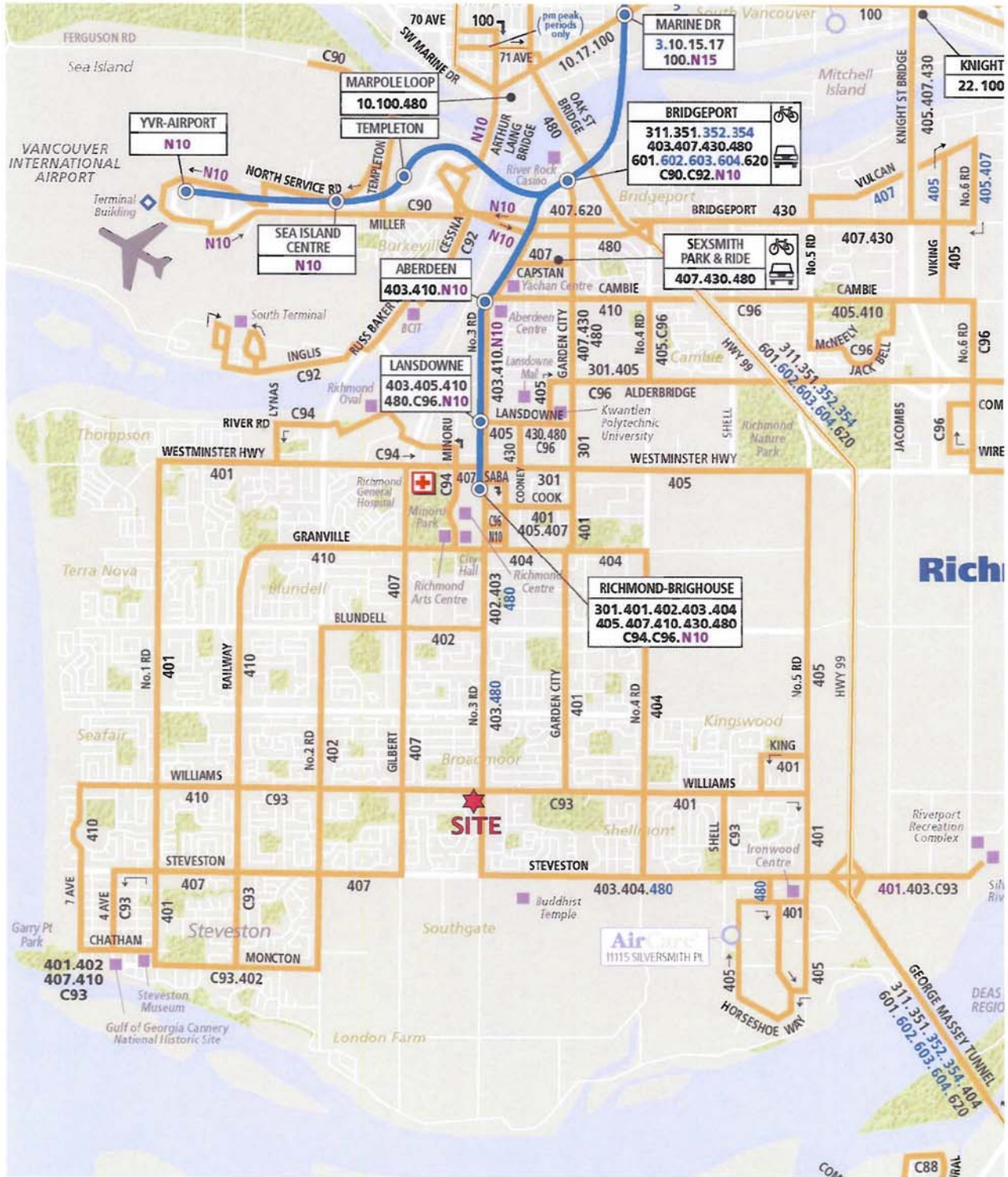
Note: nc – not calculated, no data available, performance expected to be better than Friday PM peak

With higher traffic volumes recorded during the Friday PM peak, the V/C ratios and delays are correspondingly higher than the Saturday peak period. The operational performance of the signalized intersection, however, remains within the typical design threshold, at a V/C ratio of 0.64 with a LOS B for the Friday PM peak hour and 0.37 with a LOS A for the Saturday mid-day peak hour. The unsignalized intersections analyzed currently operate satisfactorily with LOS C or better.

3.4 Existing Transit, Pedestrian and Bicycle Facilities

As illustrated in **Exhibit 3.3** showing the existing transit network in Richmond, the Master Plan site is located strategically where the local bus routes on Williams Road and No. 3 Road intersect and well connected to the regional services, such as the Canada Line, bus routes to Vancouver to the north and other bus services to the east via Westminster Highway, and Highway 99 through the Massey tunnel. Bus stops are located directly on the site frontages on Williams Road and No. 3 Road.

Dedicated bike lanes are provided on Williams Road which provide an excellent alternative for access to the shopping centre by bike. On-site provisions for bicycles and pedestrians, however, are in need for improvements due to the dated building form and site layout. The proposed Master Plan addresses this deficiency and was developed to provide an environmentally and community-friendly interconnected circulation network.



Source: www.translink.ca

N.T.S. 4493-14

4.0 DEVELOPMENT IMPACT ANALYSIS

4.1 Horizon Years

As mentioned earlier, the implementation of the Master Plan will be in phases. Phases 1 and 2 are to be completed in the short-term, by 2011. However, all other subsequent phases (3 to 5) will likely be developed in the longer term partly due to the current lease agreements with some of the tenants. The anticipated implementation dates for these later phases are 2024 and beyond. As such, two horizon years are proposed for assessing the potential development traffic impact on the area road network. These include a short-term horizon at 2011 for completion up to Phase 2 and a long-term horizon at 2031 for up to Phase 5, i.e. at the ultimate phase of the Master Plan. It should be noted that the long-term horizon (2031) is primarily an assumption for the purpose of this study. The actual completion year of the ultimate redevelopment may vary.

To ensure that the traffic plans will adequately support throughout the implementation process, traffic forecasts at the site access driveways are prepared for each phase, including

Phase 2	2011
Phase 3	2024
Phase 4	2027
Phase 5	2031

Again, the actual date for each phase and its sequence/development form are subject to change.

4.2 Site Traffic Analysis

At present, Broadmoor Mall, Richlea Square and the Petro Canada gas station are in operation. Bunt & Associates conducted a Trip Generation Survey to document the existing site traffic volumes from the existing development uses. The surveys were conducted at all the site driveways during a typical Friday PM peak period and a Saturday mid-day peak period in late October 2009. A summary of the observed volumes are provided in **Table 4.1** below together with the calculated trip generation rates.

Table 4.1: Existing Peak Hour Site Traffic

Time Period		GLA m ²	# Trips (veh/hr)			Trip Rates ⁽¹⁾		
			IN	OUT	2-WAY	IN	OUT	2-WAY
Friday PM	Broadmoor Mall	3,795	175	195	370	4.61	5.09	9.70
	Richlea Square	6,251	350	365	715	5.55	5.87	11.42
	Gas Station	12 fuelling stations	75	85	160	6.25	7.08	13.33
	Total		600	645	1,245			
Saturday Mid-day	Broadmoor Mall	3,795	145	155	300	3.90	4.03	7.93
	Richlea Square	6,251	375	325	700	5.97	5.25	11.22
	Gas Station	12 fuelling stations	50	45	95	4.17	3.75	7.92
	Total		570	525	1,095			

Note:

(1) Trip rates for Broadmoor and Richlea commercial uses are in veh/hr per 100 m² GLA

Trip rates for gas station use is veh/hr per fuelling station

The total site traffic generation during the peak hour from the entire Master Plan area, including the Broadmoor Mall, Richlea Square and Petro Canada gas station, is about 14% higher during the Friday PM peak than the Saturday mid-day peak, at approximately 1,245 vehicles/hour (two-way) and 1,095 vehicles/hour (two-way), respectively. It should be noted that the calculated trip rates are slightly higher than the typical rates for Shopping Centre use documented in the Institute of Transportation Engineers' (ITE) Trip Generation Manual, 7th Edition. Traffic volumes generated from the Richlea Square are observed to be at a higher rate than those from the Broadmoor Mall.

Table 4.2 shows a summary of the existing and planned development uses (at ultimate phase). The proposed commercial use will retain the existing function as a Neighbourhood Service Centre serving the Broadmoor area, consistent with the OCP policy for this location.

Table 4.2: Comparison of Gross Floor Areas

Existing			Proposed GFA
Property	Uses	GFA ⁽¹⁾	
Broadmoor Mall	Commercial	4,333 m ²	3,907 m ² 84 dwelling units
Richlea Square	Commercial	6,875 m ²	5,906 m ² 75 dwelling units
Gas Station	Gas Station	12 fuelling positions	1,402 m ² 28 dwelling units
TOTAL		11,208 m² 12 fuelling positions	11,215 m² 187 dwelling units

⁽¹⁾ Estimated from existing Gross Leasable Area

The proposed commercial floor area in the ultimate phase of the Master Plan is basically the same as the existing floor area. Since commercial and residential traffic generally do not peak in the same time period, the addition of residential use onto a commercial development will provide many advantages including more efficient use of the available transportation infrastructure and eliminating some of the vehicular trips which would otherwise travel on the surrounding road network, due to internalization of trip movements between the residential and commercial components on the site.

For conservative analysis, the observed trip rates were used to estimate the future traffic generation from the commercial component while the residential trip rates were based on the ITE trip rate No. 230 for Residential Condominium/Townhouses. Applying these trip rates for both the commercial and residential uses, **Table 4.3** presents the estimated site traffic generated by the development uses in Phases 2 to 5. Note that the commercial trip rates could be lower in practice due to the on-site population support.

Since the Background traffic condition and the anticipated site traffic volumes are more critical during the Friday PM peak, all subsequent traffic analysis documented in this report focus only on the Friday PM peak hour condition.

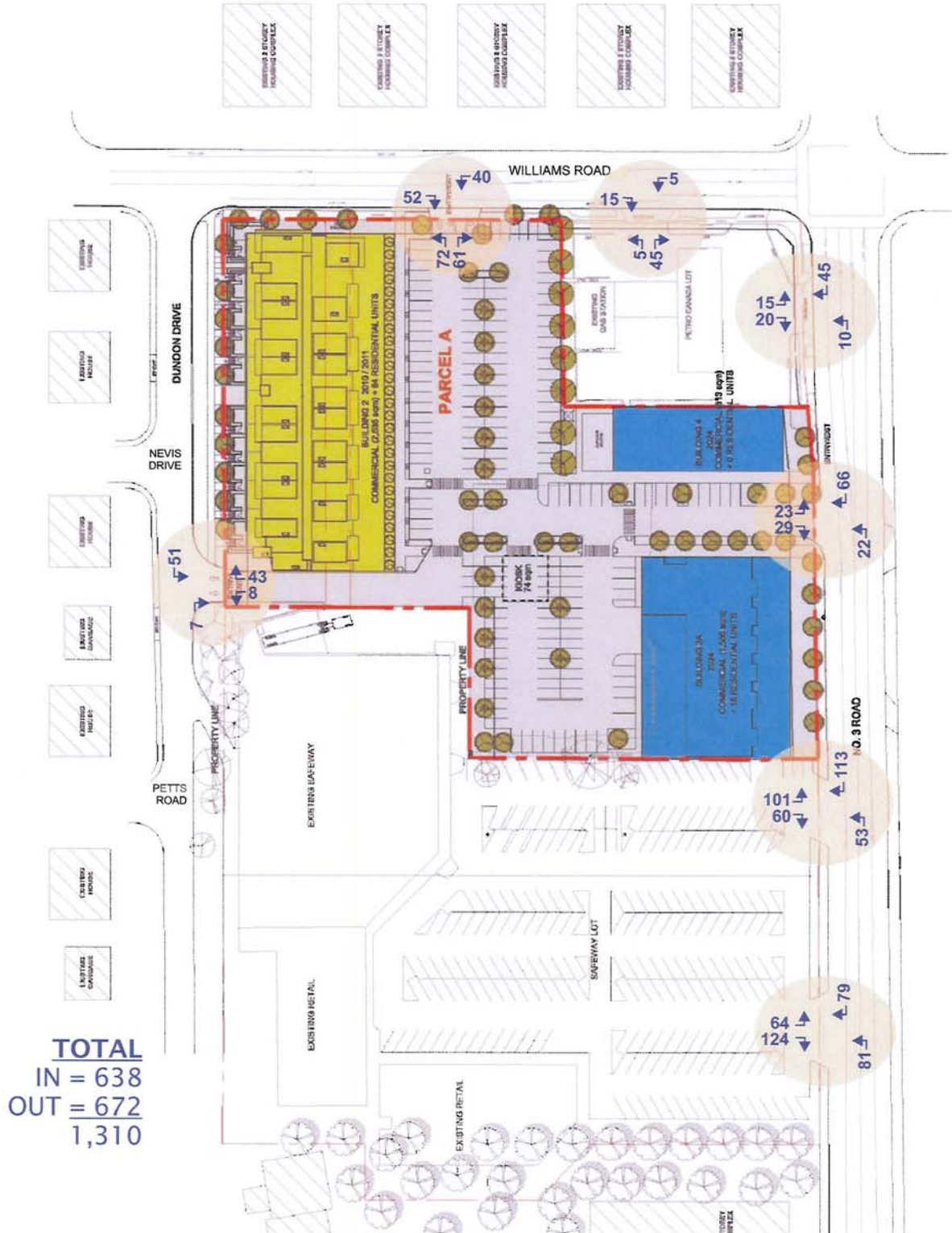
Table 4.3: Estimated Peak Hour Site Traffic Volume (Friday PM Peak)

		GLA m ²	Trip Rates			# Trips (veh/hr)		
			IN	Out	2-Way	IN	Out	2-Way
Phase 2								
Broadmoor Mall	Commercial	4,576	4.61	5.09	9.70	211	233	444
	Residential	64	0.35	0.17	0.52	22	11	33
Richlea Square	Commercial	6,251	5.55	5.87	11.42	347	367	714
Gas Station Site	# fuelling station	12	6.25	7.08	13.33	75	85	160
Total						655	696	1,351
Phase 3								
Broadmoor Mall	Commercial	4,050	4.61	5.09	9.70	187	206	393
	Residential	84	0.35	0.17	0.52	29	14	44
Richlea Square	Commercial	6,251	5.55	5.87	11.42	347	367	714
Gas Station Site	# fuelling station	12	6.25	7.08	13.33	75	85	160
Total						638	672	1,310
Phase 4								
Broadmoor Mall	Commercial	4,124	4.61	5.09	9.70	190	210	400
	Residential	84	0.35	0.17	0.52	29	14	44
Richlea Square	Commercial	5,514	5.55	5.87	11.42	306	324	630
	Residential	75	0.35	0.17	0.52	26	13	39
Gas Station Site	# fuelling station	12	6.25	7.08	13.33	75	85	160
Total						627	646	1,272
Phase 5								
Broadmoor Mall	Commercial	4,124	4.61	5.09	9.70	190	210	400
	Residential	84	0.35	0.17	0.52	29	14	44
Richlea Square	Commercial	5,514	5.55	5.87	11.42	306	324	630
	Residential	75	0.35	0.17	0.52	26	13	39
Gas Station Site	Commercial	1,262	4.61	5.09	9.70	58	64	122
	Residential	28	0.35	0.17	0.52	10	5	15
Total						620	630	1,249

Comparing with the observed 2009 traffic volumes shown in Table 4.1, the future total site traffic is estimated to be approximately the same as the existing volume largely due to the fact that the traffic generation from the existing gas station is eliminated and the addition of the multi-family residential use generates moderate traffic volume at a level similar to the existing gas station traffic.

As a result, it can be confirmed that the proposed uses and density assumed in the Master Plan would not cause any significant change in site traffic loads onto the surrounding road network. In fact, it will encourage more trips to be made by non-auto modes through the redevelopment process and the inherited planning principles in the Master Plan, for example *Interconnected circulation network* and *Alternative modes of transportation*. Existing road widths on No. 3 Road and Williams Road can be maintained.

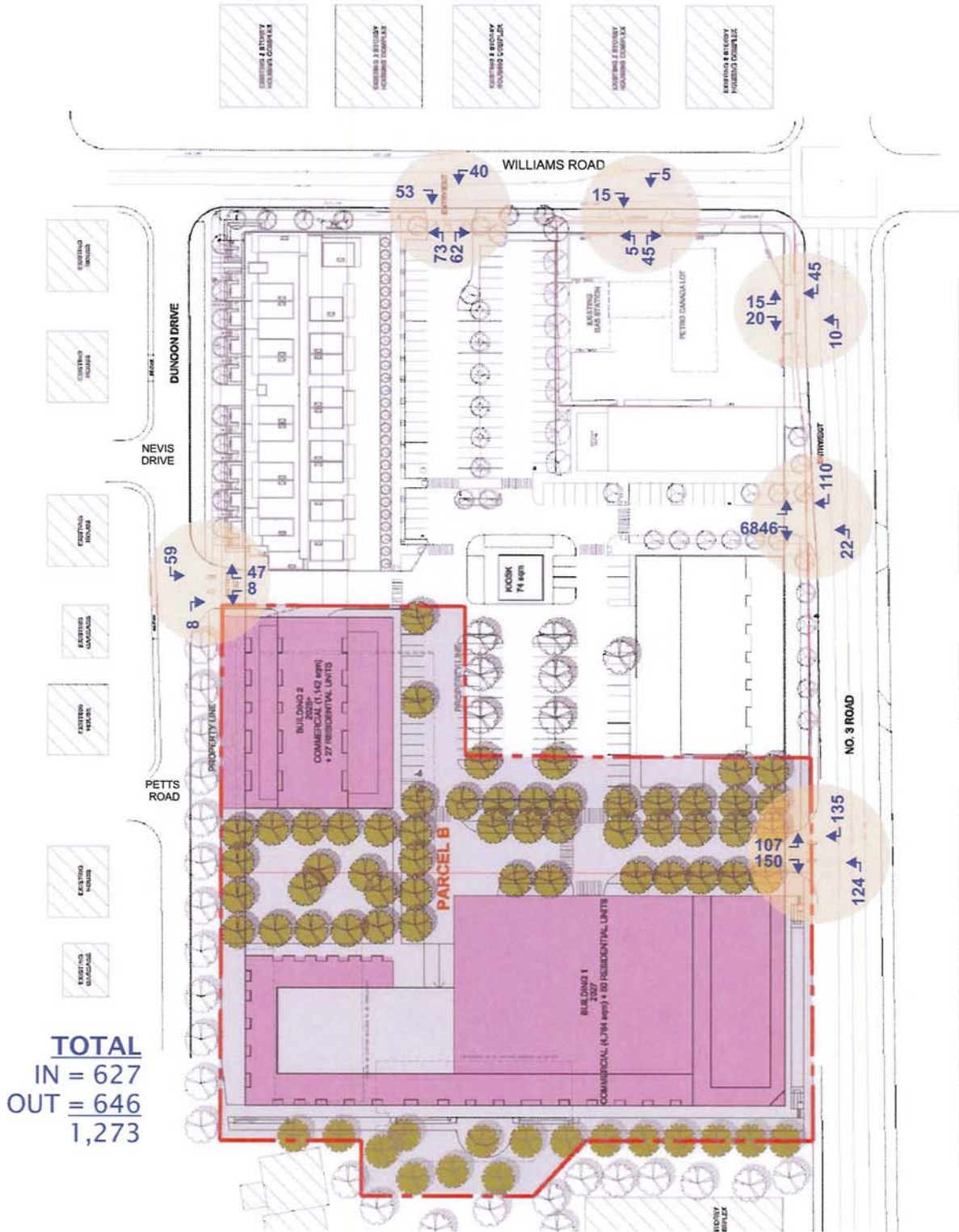
The assignment of the site traffic during each phase (2 to 5) is shown in **Exhibits 4.1 to 4.4** respectively.



112 Friday PM Peak Hour Traffic (veh/hr)

N.T.S.

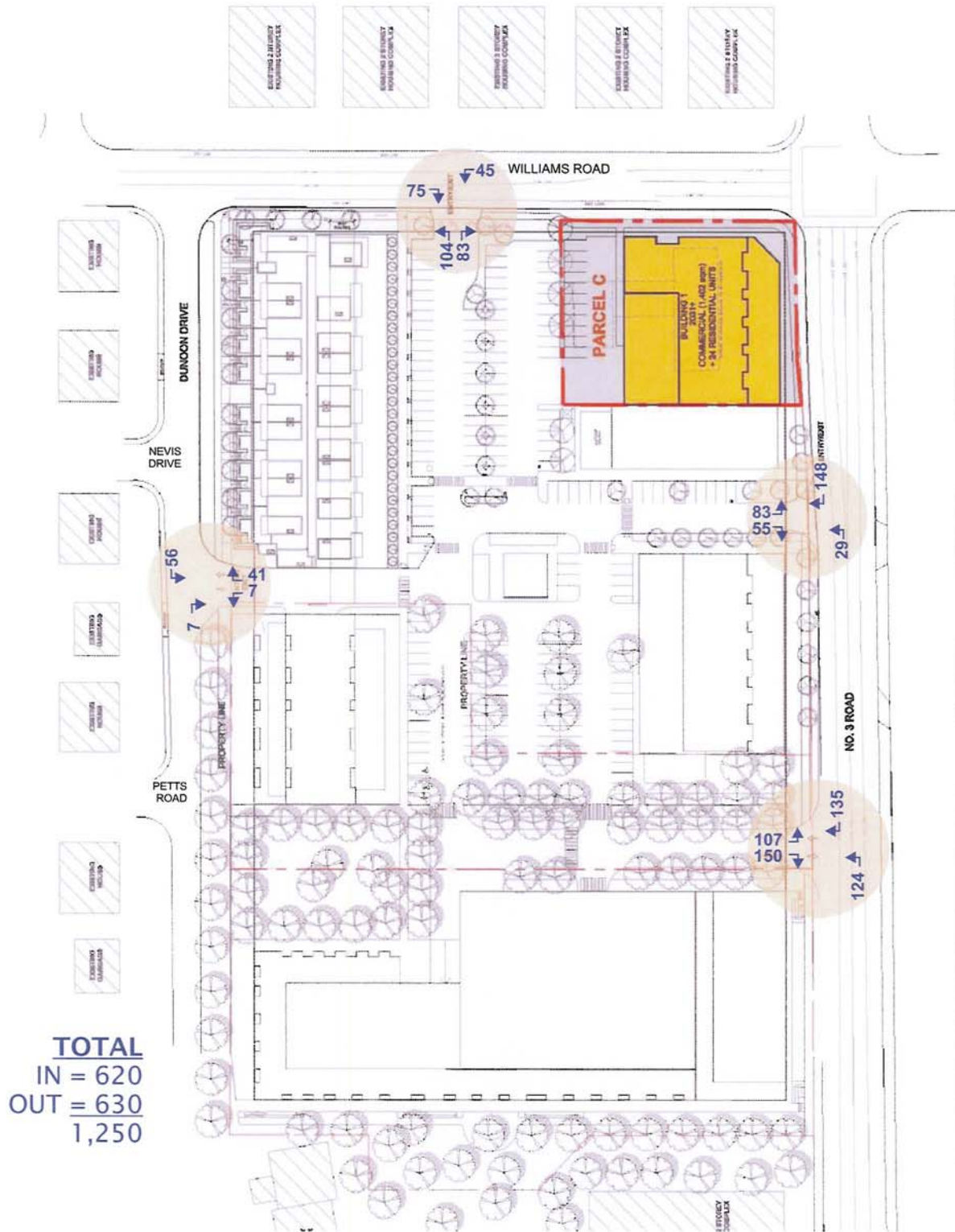
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112 Friday PM Peak Hour Traffic (veh/hr)

N.T.S.

4493-14



112 Friday PM Peak Hour Traffic (veh/hr)

N.T.S.

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4.3 Background Traffic Volumes

In examining the historical traffic count data and as discussed with city staff, projection of the Background traffic growth is proposed to be at a rate of +1.5% per annum from existing up to 2021 and at a lower rate at +0.5% per annum beyond 2021. This is considered conservative especially in light of the recent opening of the Canada Line rapid transit system on No. 3 Road connecting to the YVR airport and Vancouver Downtown.

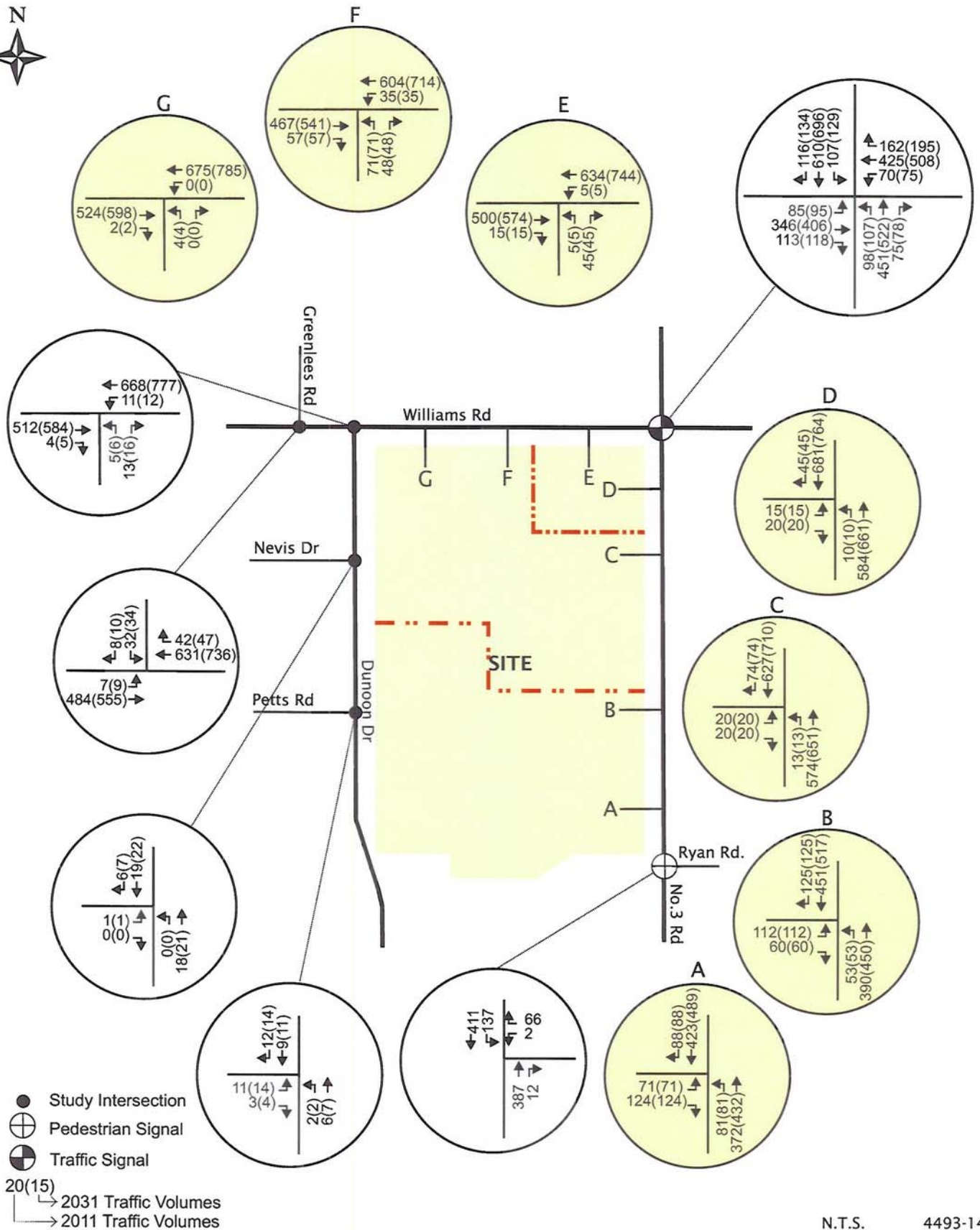
Longer term traffic forecasts are not readily available at the present moment. With ongoing growth in population and employment in the region and alternative transportation mode choices are becoming more developed and acceptable, it is anticipated that the year-to-year traffic growth in the longer term would be at a lower rate.

The projected 2011 and 2031 Background traffic volumes are shown in **Exhibit 4.5**, which assume 'do nothing' scenario, i.e. assuming that the existing development within the Master Plan area remains unchanged.

Again, the traffic operating performance at the study intersections in the 2011 and 2031 Background traffic condition is analyzed using the Synchro 6 traffic analysis package. The results of these analyses are summarized in **Table 4.4**. No capacity shortfall is anticipated.

Table 4.4: Projected Weekday PM Peak “Do Nothing” Traffic Conditions

Intersection	Control	2011		2031	
		V/C Ratio	LOS	V/C Ratio	LOS
No.3 Road / Williams Road	Signalized	0.65	B	0.81	B
No. 3 Road / Ryan Road	Pedestrian Signal	0.25	A	0.28	A
Williams Road / Dunoon Drive	Unsignalized	-	B	-	B
Williams Road / Greenlees Road	Unsignalized	-	C	-	C
Dunoon Drive / Nevis Drive	Unsignalized	-	A	-	A
Dunoon Drive / Petts Road	Unsignalized	-	A	-	A



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4.4 Traffic Impact Analysis

Short Term - 2011 Traffic Conditions

The projected 2011 weekday PM peak hour Total traffic volumes were derived by adding the estimated site traffic volumes (Phases 1 and 2) onto the 2011 Background traffic volumes. These 2011 Total traffic volumes are shown in **Exhibit 4.6**. The operating performance of the study intersections was analyzed again and the results are summarized in **Table 4.5** below.

Table 4.5: Projected 2011 Total Traffic Conditions

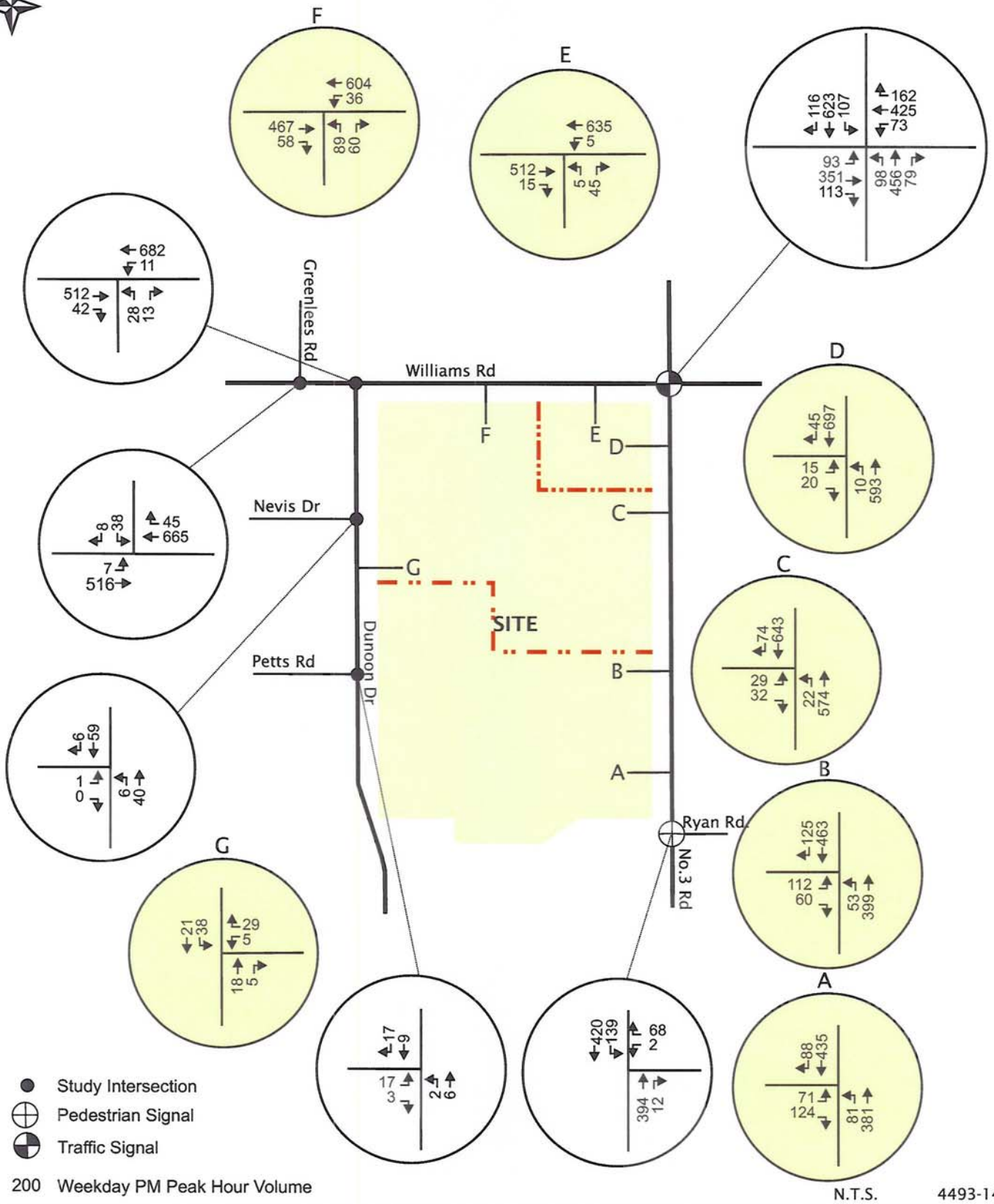
Intersection	Control	Weekday PM Peak	
		V/C Ratio	LOS
No.3 Road / Williams Road	Signalized	0.66	B
No. 3 Road / Ryan Road	Pedestrian Signal	0.25	A
Williams Road / Dunoon Drive	Unsignalized	-	C
Williams Road / Greenlees Road	Unsignalized	-	C
Dunoon Drive / Nevis Drive	Unsignalized	-	A
Dunoon Drive / Petts Road	Unsignalized	-	A

Overall, the traffic analysis of the study intersections confirms that the signalized intersection at No. 3 Road and Williams Road is expected to perform satisfactorily at a V/C ratio of 0.66 with a LOS B during the Friday PM peak hour. The pedestrian signal at Ryan Road will also operate satisfactorily. Other unsignalized intersections will operate with a LOS C or better. No additional off-site road improvements are required at this stage.

Long Term - 2031 Traffic Conditions

Analysis for the 2031 horizon was conducted to verify the traffic conditions in the long-term when the final phase of the development in the Master Plan is completed. **Exhibit 4.7** shows the projected 2031 Total traffic volumes during the Friday PM peak hour. These are the sum of the projected 2031 Background traffic volumes and the net change in site traffic volumes from the Master Plan area.

Table 4.6 shows the results of the capacity analysis. The signalized intersection at No.3 Road and Williams Road will continue to perform satisfactorily in this long-term scenario at a V/C ratio of 0.78 with a LOS B. In fact, the operating condition is slightly better than the Background condition as reported in Table 4.4 due to the redistribution of site traffic caused by the new developments. Again, all other intersections will have any significant traffic impact.



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Projected 2011 Total Traffic Volumes

Broadmoor MP Transportation Study, Richmond BC

Exhibit
 4.6

Table 4.6: Projected 2031 Total Traffic Conditions

Intersection	Control	Weekday PM Peak	
		V/C Ratio	LOS
No.3 Road / Williams Road	Signalized	0.78	B
No. 3 Road / Ryan Road	Pedestrian Signal	0.28	A
Williams Road / Dunoon Drive	Unsignalized	-	C
Williams Road / Greenlees Road	Unsignalized	-	C
Dunoon Drive / Nevis Drive	Unsignalized	-	A
Dunoon Drive / Pettis Road	Unsignalized	-	A

Site Access Considerations

The operating conditions at the site accesses were also examined for the 2011 and 2031 horizons. This includes the accesses located on No. 3 Road, Williams Road and Dunoon Drive, all assumed to be unsignalized with all movements permitted. The results of this analysis are shown in **Table 4.7** below. In the 2031 horizon, the south access on No. 3 Road is expected to operate with a LOS E on the eastbound left-turn movement, exiting the site. This is largely due to the assumed increase in the No. 3 Road Background traffic volume.

An alternative access arrangement was tested assuming that the north access on No. 3 Road is restricted to right-in/right-in and the control method at the south access is upgraded with new traffic signals. This analysis indicates that the alternative arrangement will result in a better operating condition.

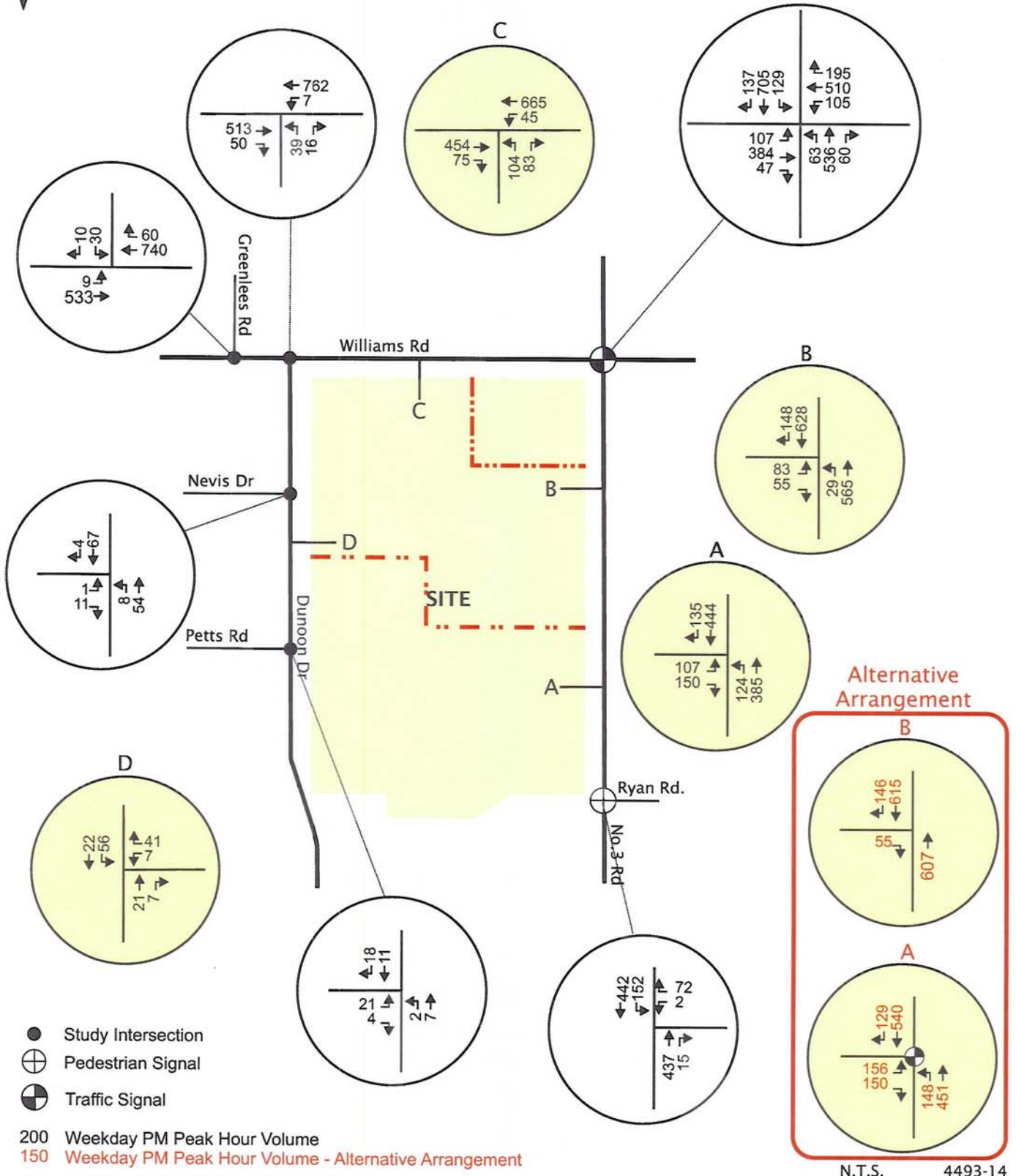
Table 4.7: Site Access Operating Conditions

Site Access	Control	Movements Permitted	Level of Service (Friday PM Peak Hour)	
			2011	2031
No.3 Road - North Access	Unsignalized	All	C	D (EB)
No. 3 Road – South Access	Unsignalized	All	D (EB)	E (EBL)
Williams Road Access	Unsignalized	All	C	C
Dunoon Drive Access	Unsignalized	All	A	A
Alternative Arrangement				
No.3 Road - North Access	Unsignalized	Right-in/Right-out		A
No. 3 Road – South Access	Signalized	All		0.45 - A

As this involves the long-term horizon (2031), the alternative access arrangement should be reviewed again at the later phases when the design of the future developments proceeds.

As requested by city staff, a Traffic Signal Warrant Analysis was conducted for the No. 3 Road/Ryan Road intersection based on the existing traffic and pedestrian demand. A summary of the warrant analysis is included in **Appendix A**. Following the standard procedures as per the "Ministry of Transportation and Infrastructure" method, there are a total of 9 warrant criteria. Only 1 out of the 9 warrants would satisfy the criteria for traffic signals when considering the projected 5-year traffic volumes. It is considered that traffic signal is not warranted at the intersection for the Phase 2 (2011) condition. However, the warrant analysis should be reviewed later for the long-term 2031 horizon when reviewing the site access design on No. 3 Road. Note that the Ryan Road intersection is about 100m south of the development's south access on No. 3 Road. As such, the selection of intersection control methods should also consider the requirement of traffic progression along No. 3 Road and traffic interaction between intersections.

A warrant analysis was also conducted for the existing pedestrian crosswalk on Williams Road near Dunoon Drive. The analysis confirms that an upgrade to a Special Crosswalk is warranted based on the observed traffic and pedestrian volumes. However, upgrade to Pedestrian Signal is not warranted.



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5.0 ON-SITE CIRCULATION, PARKING AND LOADING

5.1 On-Site Circulation

The proposed Master Plan will specifically address the following areas, improve the transportation mode choices to/from the site, and achieve a better balance in the long term.

Pedestrian and Bicycle Connections

At present, pedestrian connections between the shopping centre and the residential neighbourhood to the west are not strong - a lack of permeability combined with incomplete sidewalks around the shopping centre contributes to an inconvenient pedestrian environment. Bicycle facilities are virtually non-existent, with the exception of compressed air available at the Petro Canada gas station. The Master Plan will re-define the connections, nodes and gateways through the site and form an integral part of the entire development concept. The redevelopment of the site also allows significant improvements in the provision of on-site bicycle facilities to meet or exceed the bylaw requirement.

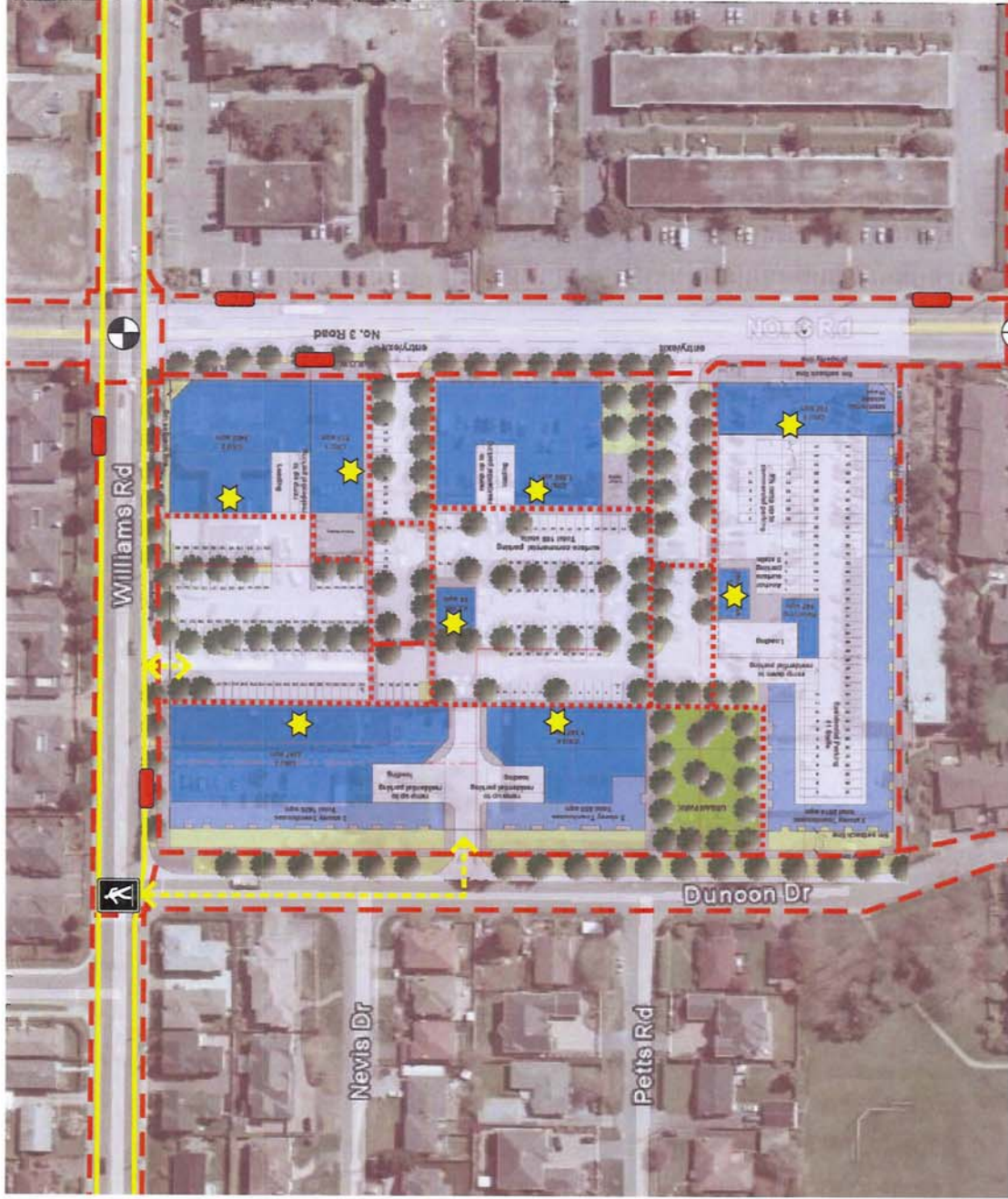
The design of the pedestrian and bicycle paths within and to/from the development site should be as direct as possible and generally meets the desire lines of travel. The development of the Master Plan includes these considerations. **Exhibit 5.1** illustrates the pedestrian and bicycle network and connections for the ultimate condition.

Transit Facilities










The Site is well served by public transit with 3 bus stops near the corner of No.3 Road (northbound and southbound) and Williams Road (westbound), and 1 stop at Williams Road (eastbound) close to Dunoon Drive. Currently, there are 3 bus routes serving the location:

- Route 403 & 480 with 10-15 minutes frequency that go along No.3 Road connecting Steveston and Richmond City Centre (onward connection to Canada Line stations to Downtown Vancouver and YVR);
- Route C93 connecting Steveston and Riverport with 30 minutes frequency.

Based on the observed bus stop activities conducted by Bunt & Associates during the peak periods, there is a significant number of people alighting from Route 403 southbound and boarding on Route 403 northbound during the peak hours. The occupancy on Route C93 is rather low, with only 1-2 people boarding or alighting during the field observations. The survey also suggests that currently spare capacity is available on the all bus routes on No. 3 Road and Williams Road during the peak periods which can adequately accommodate the future transit demand from the population in the Master Plan area.



Legend:

-  Commercial Frontage
-  Bus Stops
-  Traffic Signal
-  Pedestrian Signal
-  Special Crosswalk
-  On-site Sidewalk
-  On-street Sidewalk
-  On-street Bike Lane
-  Bike Access to/from Site

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Exhibit 5.1

Pedestrian & Bike Routes

Broadmoor MP Transportation Study, Richmond, BC





Additional transit service along Williams has been identified as an opportunity to link the community with the South Arm Community Centre. It is recommended that the existing transit services in the adjacent area be further reviewed as and when necessary to reflect the changes in travel patterns after opening of the Canada Line.

The site is well connected to regional transit systems. The connecting bus routes to the Canada Line stations will be benefited from the new on-site population resulting increase in ridership and hence revenue. Opportunities also exist for bus shelters to be integrated with the building design.

Vehicular Access

Site accesses on No. 3 Road, Williams Road and Dunoon Drive will be consolidated through the implementation of the Master Plan. A comparison of the access arrangements is illustrated in the diagrams below. Three driveways associated with the gas station on No. 3 Road and Williams Road will be removed which eliminate the potential vehicular conflicts near the intersection of No. 3 Road and Williams Road. It can marginally increase intersection capacity of No. 3 Road/Williams Road.



Legend: ↔ External movements allowed ↔ Internal movements



Legend: ↔ External movements allowed

Commercial traffic should all ultimately access via the arterial streets (No. 3 Road and Williams Road) where, as illustrated in the Master Plan, 2 all-movements accesses will be located on No. 3 Road and 1 all-movement access on Williams Road. These accesses will accommodate all traffic including servicing trucks to/from the site. An alternative arrangement was evaluated to install traffic signals at the south access on No. 3 Road and have the north access restricted to right-in/right-out only. This alternative arrangement should be considered when required.

The existing loading area at Dunoon Drive associated with the Richlea Square will be eliminated. To facilitate the implementation of the Master Plan and before the relocation of the Safeway store, an interim inbound truck route to the existing Safeway loading dock via Dunoon Drive was proposed. This inbound truck route should be re-routed to No. 3 Road and Williams Road in later phase upon redevelopment of the Safeway store. The demand for the largest truck size to the Safeway dock is WB20 semi-trailer, one per day which typically arrives at 7:00am. At present, traffic surveys on Dunoon Drive by Bunt & Associates indicate that semi-trailer vehicles were also found using Dunoon Drive for accessing the Richlea Square. All other truck movements to/from the Master Plan area should be via the accesses on No. 3 Road or Williams Road.

On-site circulation involves consideration of efficient and safe access to/from the site by all modes, including bicycles, pedestrians, transit and vehicular traffic to on-site parking and loading facilities. The forecasts of site traffic assignment discussed in Section 4 reflect that the site generated traffic will be well distributed so that there will be no concentration of traffic movements at critical locations. The internal traffic layouts also include well defined pedestrian network so as to minimize potential conflicts with vehicular traffic.

5.2 Parking and Bicycle Requirements

Parking issues have arisen in the past at Broadmoor and Richlea shopping centres with customers not recognizing the different ownership between sites leading to conflicts between customers and shop owners. It also creates inefficient use of on-site parking supply, i.e. parking spaces not being able to be shared by all customers.

It is recommended that arrangement for shared parking between Broadmoor, Richlea and Petro Canada properties be reached as the implementation of the Master Plan progresses. This will allow developing a common pool of shared on-site parking for all commercial uses within the Master Plan area. The concept of 'shared' parking also allows flexibility in meeting the parking requirement particularly during the various construction phases, though parking supply for each building phase should preferably be self-sufficient so that it would maintain appropriate parking supply/demand balance in each parking area. Parking for residential use should be provided separately in secured parking areas, but residential visitor parking spaces can be shared with the commercial parking supply in mixed-use development. This is a common approach as in other mixed-use projects.

It is anticipated that parking demand for residential and commercial uses will decrease over time as alternative transportation modes are developed further and become more acceptable for day-to-day commutes.

In mixed-use development, residential visitor parking can practically be shared with commercial parking due to temporal variations in their demand patterns, i.e. residential visitor parking demand typically peaks in the evenings while commercial parking demand peaks in the daytime. Shared off-street parking supply is permitted under the current Parking Bylaw where maximum parking demand from individual uses occurs at different times. It is considered that the residential visitor parking demand can be adequately accommodated within the commercial parking areas and no separate parking is needed in practice for residential visitors.

Commercial Parking

Calculations of parking requirement for the commercial use was first based on the current park bylaw rates for Retail Trade & Services and the specific uses in the Phase 1 Renovation Portion. A summary of the bylaw requirements and the supply shown in the Master Plan are compared in **Table 5.1**. Details of the calculations are documented in **Appendix B**.

Table 5.1: Commercial Parking Requirements and Supply

	2011 (Phase 2)		2024 (Phase 3)		2027 (Phase 4)		2031+ (Phase 5)	
	Required	Provided	Required	Provided	Required	Provided	Required	Provided
Broadmoor Mall	199	192	158	177	158	153	158	149
Richlea Square	219	219	219	219	217	163	217	163
Gas Station	7	7	7	7	7	7	47	11
Combined	425	418	384	403	382	323	422	323
<i>% of Bylaw Req'd</i>		98.4%		104.9%		84.6%		76.5%

Notes:

Numbers in shaded areas are existing conditions

At Phase 2, the total commercial parking supply in the Master Plan area is 418 stalls whereas the requirement based on current bylaw is 425 stalls. In the longer terms when Phase 3 is developed, the total parking supply is, in fact, 5% more than the current bylaw requirement. It can be anticipated that the required commercial parking rates should be lowered over time as the Broadmoor neighbourhood area continues to develop. Therefore, the parking requirements for the long-term phases (3, 4 and 5) should be less than those calculated in Table 5.1 above. As such, the parking supply will be more closely match with the parking requirement at that time. It should be noted that lower parking supply at the Richlea development parcel is due to the proposed open space providing improved pedestrian connection between No. 3 Road and Dunoon Drive and to the park west of Dunoon.

At Phase 5, the anticipated parking shortfall is anticipated larger due to the redevelopment of the gas station site where limited number of commercial parking stalls is provided. It is

recommended that the proposed parking supply/requirement balance should be reviewed again when development of this phase proceeds.

Residential Parking

The current parking bylaw requirement is 1.5 stalls per dwelling unit plus 0.2 stall per unit for visitor parking. The actual peak parking demand is anticipated to be lower than the bylaw requirement due to (1) the mixed-use effect of the project which generally reduces travel demand, (2) the proposed transportation demand management (TDM) measures to be implemented with the Master Plan, and (3) parking requirement can be anticipated to be lower overtime as the area continues to develop and regional and local transit services improve. As noted earlier, residential visitor parking can be mixed with commercial parking, as in other mixed-use projects, due to their temporal variations in parking demand.

A summary of the residential parking supply and requirement based on the current bylaw is calculated in **Table 5.2** below. Again, detailed residential parking analysis is documented in **Appendix B**.

Table 5.2: Residential Parking Requirements and Supply

	2011 (Phase 2)		2024 (Phase 3)		2027 (Phase 4)		2031+ (Phase 5)	
	Required	Provided	Required	Provided	Required	Provided	Required	Provided
Broadmoor Mall	109	84	143	125	143	125	143	125
Richlea Square	-	-	-	-	128	93	128	93
Gas Station	-	-	-	-	-	-	48	44
Combined	109	84	143	125	271	218	318	262
<i>Total # dwelling units</i>	<i>64 units</i>		<i>84 units</i>		<i>159 units</i>		<i>187 units</i>	
<i>Average Parking Supply Rate</i>	<i>1.31 stalls per unit</i>		<i>1.49 stalls per unit</i>		<i>1.37 stalls per unit</i>		<i>1.40 stalls per unit</i>	

The average parking supply rate is approximately 1.31 stalls per unit in Phase 2 and 1.40 stalls per unit in the ultimate phase. The critical supply condition is in Phase 2. However, as in the detailed parking analysis conducted in the Traffic Impact Study for the Phase 2 development, the average unit size of the proposed 64 dwelling units is approximately 810 sf, including 44 one-bedroom units with floor area of 750 sf or less. As such, the bylaw rate at 1.5 stalls per units plus 0.2 stalls per unit for visitor parking are considered excessive. In the later phases (3 to 5), the proposed parking supply rates are higher.

Understanding the parking standard approaches adopted in other cities and municipalities for compact pedestrian-/ transit-orientated communities provides the basis for assessing the

requirement for Broadmoor. Parking standards for multi-family units are presented for a selected number of municipalities and cities within Metro Vancouver in **Table 5.3**.

Table 5.3: Parking Standards for Urban Centres

City	Bylaw Parking Rate (absolute minimums)
Burnaby P11e (UniverCity at SFU)	1 stall per unit for 1-bedroom unit + 0.1 stall for each additional bedroom; visitor parking 0.1 stall per unit
City of Vancouver (Non-downtown)	0.5 stall per unit up to 50 m ² ; and after that 0.6 stall per unit + A / 200 m ² GFA up to a maximum of 1.5 stalls per unit; inclusive of visitor parking
City of New Westminster (under review)	1.0 – 2.0 stalls per unit; including visitors (relaxations allowed)
City of North Vancouver	1.2 stalls per unit; inclusive of 0.2 for visitors

Evidently, parking rates in these municipalities are starting to approach the 1 stall per unit level. Also, New Westminster is currently reviewing their parking by-law and in the interim they are accepting relaxations at around 1.2 stalls per unit in certain locations (inclusive of visitor parking).

Car-Sharing Schemes are also becoming more popular and put in use more often. The following examines the planning context in North America for incorporating car-sharing schemes within bylaws for new developments. **Table 5.4** summarizes the cities where car-sharing schemes are established or where the city has or is planning to amend their planning code to encourage participation in such schemes.

Table 5.4: Parking Status for Developments with Car-Sharing Schemes

Location	Planning Status
Arlington County, VA	Parking reductions are negotiated as part of the overall TDM package. Arlington prefers credits for tenants instead of dedicating car-sharing vehicles, and this allows vehicles to be located on-street or in other 'communal' off-street parking locations.
Austin, TX	The proposed code amendment recommends that 1 car-sharing vehicle be allowed to replace 20 parking spaces for projects with at least 100 residential units.
Vancouver, BC	The City allows a reduction of three parking spaces per car-sharing vehicle (net reduction of 2) for every 60 units. The vehicle must be provided by the developer and is subject to the filing of a satisfactory agreement between the developer and the car-sharing operator.
San Francisco, CA	Permits 1 car-sharing vehicle to be provided for every 200 units with parking reductions determined on a case-by-case basis.
Seattle, WA	The City has no specific standards for parking space reduction through the introduction of car-sharing vehicles. This is due, in part, to the City having low parking standards.
Portland, OR	As Seattle

Evidently from this table there is no consistency between the cities' approaches to car-sharing. On one hand, some cities offer incentives to developers to reduce parking levels through either subsidizing or providing car-sharing vehicles and/or spaces, while others (Seattle, Portland) have low minimum parking standards (or are removing their standards for accessible locations) and hence have no reduction measures.

More and more municipalities have updated their residential parking requirement to reflect the size of the dwelling units or the numbers of bedrooms, as these parameters are found to be more closely correlated to the actual parking demand and affordability. The following minimum parking rates are proposed and to be reviewed in conjunction with the development applications:

Studio	0.5 stall per unit
One Bedroom	1 stall per unit
Two Bedrooms	1.5 stalls per unit
Three Bedrooms or more	2 stalls per unit

(Rates inclusive of 0.1 stall per unit for visitor parking)

Combined the analysis for commercial and residential parking to reflect the mixed use effect of the Master Plan area, **Table 5.5** provides a summary of the parking supply/requirement balance to highlight the anticipated conditions. It should be noted that the required residential supply excludes the 0.2 visitor stall per unit for mixed-use conditions.

Table 5.5: Combined Parking Requirement/Supply Balance

	2011 (Phase 2)		2024 (Phase 3)		2027 (Phase 4)		2031+ (Phase 5)	
	Required	Provided	Required	Provided	Required	Provided	Required	Provided
Commercial	425	418	384	403	382	323	422	323
Residential	96 ⁽¹⁾	84	126 ⁽¹⁾	125	239 ⁽¹⁾	218	281 ⁽¹⁾	262
Total	521	502	510	528	621	541	703	585
% Bylaw Requirement		96%		104%		87%		83%

Note: (1) Exclude the 0.2 stall per unit for visitor parking for shared parking

Again, the analysis indicates that the parking supply/requirement balance should be reviewed again at the later phases, especially for Phases 4 and 5 when redevelopment occurs at the Richlea and Petro Canada parcels.

Bicycle Parking

To encourage the use of alternative modes of transportation and to support the proposed residential parking rates, adequate supply of bicycle parking spaces on-site should be provided. These should be in combination with ease of access and direct connectivity through the site and to/from the external areas. To guide the design of the building plans, **Table 5.6** shows the calculations of the bicycle parking requirements based on the current bylaw. This should be reviewed, as and when necessary, in light of the overall planning objectives.

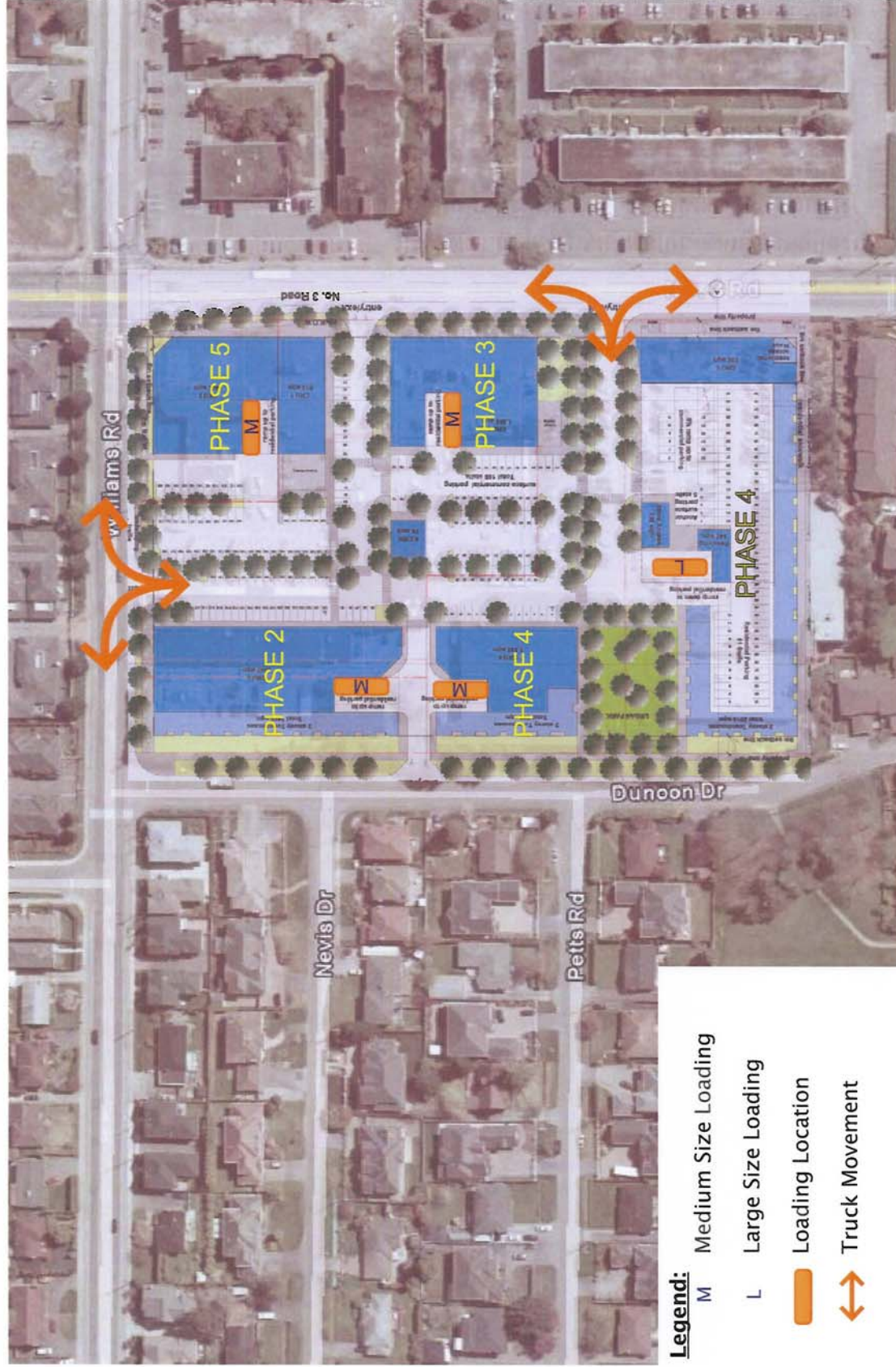
Table 5.6: Bicycle Parking Spaces Required

Use	Size		Bylaw Rates	
			Class 1	Class 2
Retail Trade & Services; Food Catering Establishment			0.27 spaces per each 100 m ² (1,076 ft ²) of gross leasable floor area greater than 100 m ² (1,076 ft ²)	0.4 spaces per each 100 m ² (1,076 ft ²) of gross leasable floor area greater than 100 m ² (1,076 ft ²)
Residential			1.25 spaces per dwelling unit	0.2 spaces per dwelling unit

		Use	# Bicycle Spaces	
Requirement at each phase	Phase 2	Commercial	6	8
		Residential	80	13
	Phase 3	Commercial	6	8
		Residential	25	4
	Phase 4	Commercial	15	22
		Residential	94	15
	Phase 5	Commercial	4	5
		Residential	35	6

5.3 Loading Plan

Exhibit 5.2 illustrates the locations of the loading docks shown in the Master Plan. Access to/from these loading docks should be via the accesses on No. 3 Road or Williams Road. To support the early phase of the redevelopment, an interim inbound truck route via Dunoon Drive to the existing Safeway loading dock was studied and is considered feasible from a transportation perspective. This interim inbound route should be eliminated upon redevelopment of the Safeway store.



- Legend:**
- M Medium Size Loading
 - L Large Size Loading
 - Orange rectangle Loading Location
 - Orange double-headed arrow Truck Movement

Loading Plan

Broadmoor MP Transportation Study, Richmond, BC

The Parking Bylaw outlines the requirements for the provision of off-street loading facilities. These requirements include medium-size (9.1m x 3.0m) and large-size (18.4m x 3.5m) loading spaces. The proposed residential component in the Master Plan (Phases 2 to 5) accommodates about 20 to 75 dwelling units in each building. As such, so specific loading spaces is required. **Table 5.7** shows the calculated loading requirement for the commercial uses from Phase 2 to 5.

Table 5.7: Commercial Loading Requirements

Phase	Floor Area m ² GLA	Bylaw Requirements			# Spaces Shown in Master Plan
		Medium Size Spaces	Large Size Spaces	Minimum # Spaces	
2	2,071	On-site designated: 1 space, plus 1 space for each additional 5,000m ² over 1,860m ²	On-site designated: 1 space for each 5,000m ² over 1,860m ²	1 medium size	1 medium size
3	2,053			1 medium size	1 medium size
4	1,028	On-site designated: 1 space	N/A	1 medium size	1 medium size
	4,486	On-site designated: 1 space, plus 1 space for each additional 5,000m ² over 1,860m ²	On-site designated: 1 space for each 5,000m ² over 1,860m ²	1 medium size	1 medium size; 1 large size
5	1,262	On-site designated: 1 space	N/A	1 medium size	1 medium size

As illustrated in **Exhibit 5.3**, the design for these loading spaces has been assumed to be medium size spaces with the Phase 3 building accessible for large size vehicle if needed. As verified in Exhibit 5.3, adequate vehicle turning area is available in accessing these loading spaces. However, the specific design should be checked again during the subsequent design development stage for each phase.

6.0 TRANSPORTATION DEMAND MANAGEMENT

6.1 Proposed TDM Plan

A Transportation Demand Management (TDM) plan was developed for the initial Phase 2 development to reduce automobile dependency, and thus parking demand number. Details of the Phase 2 TDM plan are outlined in the Traffic Impact Study report prepared separately by Bunt & Associates. This plan should be monitored as a continuously effort throughout the implementation of the Master Plan so that the transportation planning objectives of the overall Master Plan can be maintained at all times. The following discussion covers the general principles for the TDM plan to support the proposed mixed-use developments:

1. *Shared Parking*

- Shared parking effects exist virtually in all mixed-use environments where the overall parking demand is 'dampened' due to the fact that the peak parking demands from individual uses do not occur at the same time. As such, provision for lowering than the required parking bylaw requirement would not cause any undesirable impact;
- An example of shared parking is residential visitor parking to be mixed with commercial parking. Since these uses peak at different times and hence no separate residential visitor parking spaces are required in practice;
- Where feasible, develop an easement agreement among the owners of the properties within the Master Plan area, i.e. Broadmoor, Richlea and Petro Canada, to allow commercial parking spaces to be shared among all individual commercial tenants and customers.

2. *Car-Sharing*

- Car sharing has become more popular in Metro Vancouver, for example those operated by Zipcar and Co-operative Auto Network;
- Provide spaces for car-sharing parking located in the ground level commercial parking area; this allows 24/7 access;
- Where appropriate, contribute to the purchase of car-sharing vehicle(s) and located on the site. These may be used by residents on the site, commercial employees and the general public.

3. *Bicycles and Pedestrians*

- Provide enhanced end-of-trip bicycle facilities on-site including Class 1 bike storage within the mixed-use buildings and Class 2 bike racks installed near building entrances;
- Provide clear and safe pedestrian paths to/from and within the Site;
- Provide signed bicycle/pedestrian network to/from the site.

4. *Transit*

- Fund to build integrated shelters for bus stops fronting the Site, included with transit system maps and related travel information and other facilities which can help promoting the use of transit services;
- Where appropriate, consider providing subsidized transit passes, e.g. commercial employees and residents.

6.2 Neighbourhood Traffic Calming

The proposed Broadmoor Shopping Centre Master Plan takes on the advantage of its frontages on two arterial streets; No. 3 Road in the north-south direction and Williams Road in the east-west direction. The primarily vehicular accesses for the site should be located at these arterial streets.

As in other neighbourhood shopping centres, unnecessary traffic penetration into the nearby residential areas is one of the prime considerations in the design process. There have been some concerns from the neighbourhood regarding potential traffic short-cutting in the area and also noise disruption due to truck access to Safeway through Dunoon Drive in the initial phase.

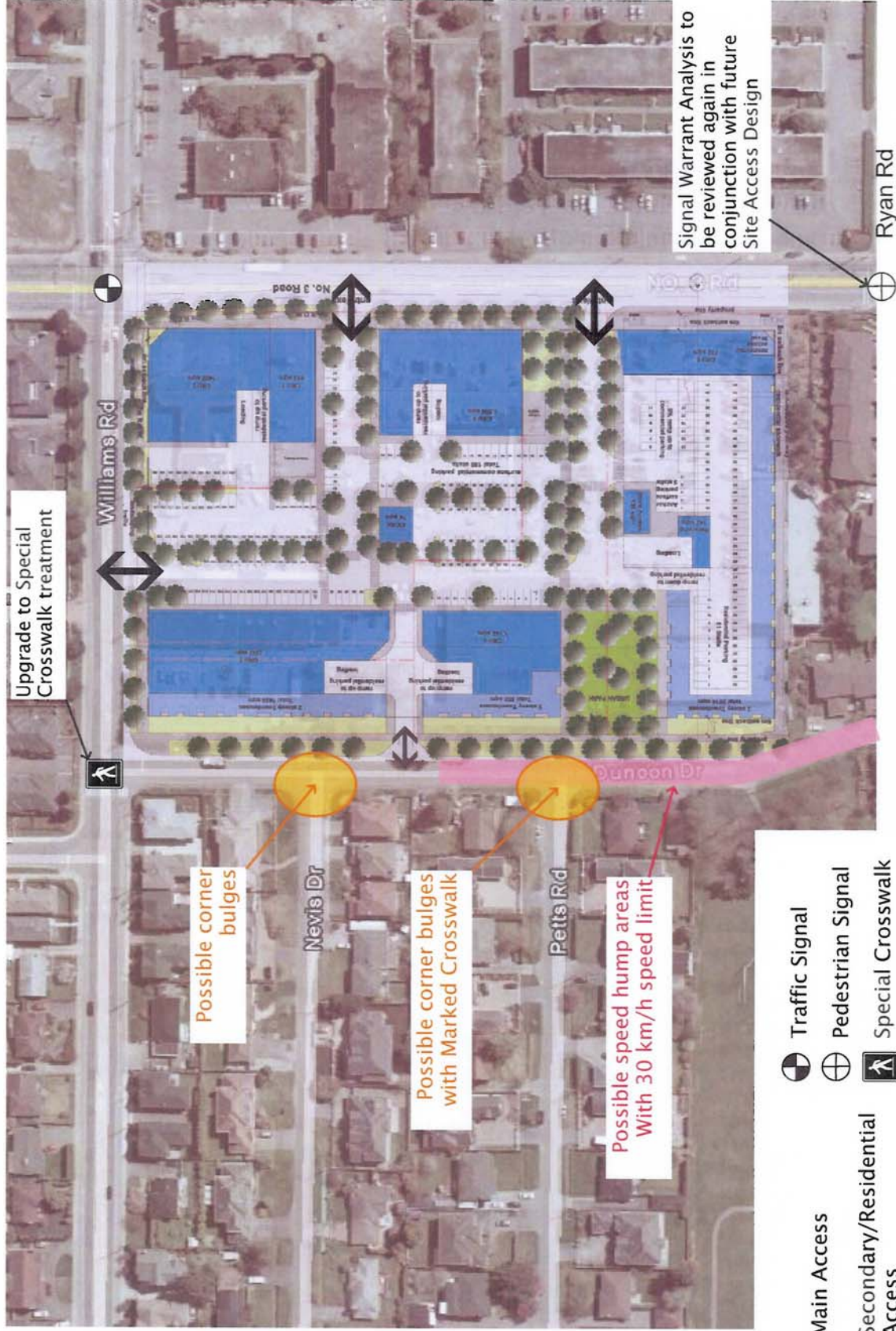
The proposed on-site traffic circulation and site access arrangement directs commercial traffic via the arterial streets (No. 3 Road and Williams Road). The Dunoon access in the long term will primarily be used by residential traffic. The connection between No. 3 Road and Dunoon Drive through the site has been made indirect and unattractive.

To further mitigate any undesirable impact, traffic calming measures should be considered and implemented, as required, in consultation with the stakeholders including nearby residents, schools, etc. These traffic calming measures may include:

- Corner bulges on Dunoon Drive to narrow traffic lane width, shorter crosswalk distance and reduce vehicle speed; this would be desirable at later phase when the interim Dunoon inbound truck access is not required
- Provide marked crosswalk at Dunoon Drive south of Petts Road with a 30 km/h sign approaching the park/playground
- Consider speed humps on Nevis Drive and Petts Road.

See examples in **Exhibit 6.1**.

At present, an existing marked pedestrian crosswalk is located west of Dunoon Drive on Williams Road. A warrant analysis has been conducted using the existing traffic and pedestrian volumes. The analysis confirms that an upgrade of this crosswalk to "Special Crosswalk" is warranted (but not to "Pedestrian Signal").



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Possible Neighbourhood Traffic Calming Measures

Broadmoor MP Transportation Study, Richmond, BC

Exhibit 6.1



7.0 CONCLUSIONS

A master planning exercise was conducted which develops a planning framework and guiding principles for the redevelopment of the Broadmoor Mall, Richlea Square and Petro Canada gas station located at the south-west quadrant of the intersection of No. 3 Road and Williams Road in the City of Richmond. This is called "*the Broadmoor Shopping Centre Master Plan*". The implementation of the Master Plan will transform the Site into one of the Neighbourhood Service Centres as envisaged in Richmond's Official Community Plan.

Bunt & Associates was commissioned by First Capital Realty Inc. to conduct a Transportation Study for the proposed Broadmoor Shopping Centre Master Plan. The study examined the transportation component of the Master Plan and recommended measures to ensure that the overall transportation objectives can be maintained throughout the implementation process.

The redevelopment of the Master Plan will be in phases over the next 20-30 years. Concurrent to the Rezoning Application for the Master Plan, First Capital Realty Inc. proposes to proceed with the initial phase of redevelopment within the existing Broadmoor Mall parcel. A separate Traffic Impact Study was prepared by Bunt & Associates to support the Development Permit Application already submitted to the City. One of the objectives of the Transportation Study for the Master Plan is to ensure that the planning and design of this early phase will be consistent with the ultimate Master Plan requirements.

It is concluded that (1) the transportation analysis and review conducted in this study has established transportation inputs to the required planning parameters for the overall Master Plan, and (2) the development of the Phase 2 in the Broadmoor Mall parcel can be supported from a transportation perspective and within the context of the overall Master Plan.

Appendix A:

Traffic Signal Warrant Analysis for the Intersection of No. 3 Road / Ryan Road

WARRANT NO.1 MINIMUM VEHICULAR VOLUME

Number of Incoming Lanes on Approach		Large Urban Areas (> 10000 population)				Small Urban Areas (<10000 population)	
		Posted or 85th Percentile Speed				Peak 7 Hour Volume (vph)	
		=< 70 km/hr		> 70 km/hr			
Major	Minor	Major	Minor	Major	Minor	Major	Minor
1	1	500	150	350	105	350	105
2 or more	1	600	150	420	105	420	105
2 or more	2 or more	600	200	420	140	420	140
1	2 or more	500	200	350	140	350	140

Existing Scenario to be Considered			
Number of Incoming Lanes on Approach		Minimum Volumes	
Major	Minor	Major	Minor
2 or more	1	600	150

Existing Traffic Volumes (by Approach)

8 hours traffic volume on an average day

Time Period	Total of Both Major Approaches	Higher than Minimum?
6am to 7am	231	No
7am to 8am	488	No
8am to 9am	824	Yes
2pm to 3pm	863	Yes
3pm to 4pm	937	Yes
4pm to 5pm	956	Yes
5pm to 6pm	903	Yes
6pm to 7pm	748	Yes
Average 8-hr	744	

Existing Traffic Volumes (by Approach)

8 hours traffic volume on an average day

Time Period	Higher of Each Minor Approaches	Higher than Minimum?
6am to 7am	70	No
7am to 8am	81	No
8am to 9am	167	Yes
2pm to 3pm	74	No
3pm to 4pm	91	No
4pm to 5pm	90	No
5pm to 6pm	72	No
6pm to 7pm	75	No
Average 8-hr	90	

Warrant Satisfied? Yes No

Explanation: The warrant is not satisfied. Only 1 of the 8 hours traffic volume meet the minimum volumes

WARRANT NO.2 Interruption of Continuous Traffic

Number of Incoming Lanes on Approach		Large Urban Areas (> 10000 population)				Small Urban Areas (<10000 population)	
		Posted or 85th Percentile Speed					
		=< 70 km/hr		> 70 km/hr			
		Peak 7 Hour Volume (vph)		Peak 7 Hour Volume (vph)		Peak 7 Hour Volume (vph)	
Major	Minor	Major	Minor	Major	Minor	Major	Minor
1	1	750	75	525	50	525	50
2 or more	1	900	75	630	50	630	50
2 or more	2 or more	900	100	630	70	630	70
1	2 or more	750	100	525	70	525	70

Existing Scenario to be Considered			
Number of Incoming Lanes on Approach		Minimum Volumes	
Major	Minor	Major	Minor
2 or more	1	900	75

Existing Traffic Volumes (by Approach)
8 hours traffic volume on an average day

Time Period	Total of Both Major Approaches	Higher than Minimum?
6am to 7am	231	No
7am to 8am	488	No
8am to 9am	824	No
2pm to 3pm	863	No
3pm to 4pm	937	Yes
4pm to 5pm	956	Yes
5pm to 6pm	903	Yes
6pm to 7pm	748	No
Average 8-hr	744	

Existing Traffic Volumes (by Approach)
8 hours traffic volume on an average day

Time Period	Higher of Each Minor Approaches	Higher than Minimum?
6am to 7am	70	No
7am to 8am	81	Yes
8am to 9am	167	Yes
2pm to 3pm	74	No
3pm to 4pm	91	Yes
4pm to 5pm	90	Yes
5pm to 6pm	72	No
6pm to 7pm	75	No
Average 8-hr	90	

Warrant Satisfied? Yes No

Explanation: The warrant is not satisfied. Only 2 hours of traffic volume exceed the minimum vehicular volume criteria.

WARRANT NO.3 Progressive Movement

1) Is the distance to the nearest signal greater than or equal to 300m? Yes No

One Way

Are the adjacent signals so far apart that they do not provide a necessary degree of vehicle platooning and speed control? ~~Yes~~ ~~No~~

Two Way

Do the adjacent signals constitute a progressive system? Yes No

Are the adjacent signals so far apart that they do not provide a necessary degree of vehicle platooning and speed control? Yes No

Warrant Satisfied? Yes No

Explanation: The adjacent signals do not constitute a progressive system, and the installation of a signal at this location will not provide a necessary degree of vehicle platooning and speed control.

WARRANT NO.4 Accident Experience (based on ICBC Claims Data)

1) Have five or more reported accidents of types susceptible to correction by traffic signals occurred within a 12 month period, with each accident involving personal injury or damage exceeding \$1000? Yes No

2) Have adequate trials of less restrictive remedies with satisfactory observance and enforcement failed to reduce the accident frequency? Yes No

3) Will the installation of a signal allow progressive traffic flow? Yes No

Warrant Satisfied? Yes No

Explanation: - Previous 5 years (2003 to 2008): 11 accident
 '- Highest 12 months: 2 accident
 '- Highest 12 months: 0 accident that may be correctable with a traffic

WARRANT NO.5 System Warrant

1) Are both the major and minor streets "Major Routes"? Yes No

2) Does the total Peak Hour Volume over all approaches equal or exceed 1000 vph? Yes No

3) Are one or more of Warrants 1,2,6,7 and 9 satisfied using Projected 5 Year Volumes? Yes No

4) Does the Peak 5 Hour Weekend Volume equal or exceed 1000 vph? ~~Yes~~ ~~No~~

Warrant Satisfied? Yes No

Explanation: Only Warrant 2 is satisfied for the Projected 5 Year Volumes

WARRANT NO.6 Combination Warrant

1) Have other measures been tried which cause less delay and inconvenience to traffic than traffic signals?

Yes No

Number of Incoming Lanes on Approach		Large Urban Areas (> 10000 population)				Small Urban Areas (<10000 population)	
		Posted or 85th Percentile Speed				Peak 7 Hour Volume (vph)	
		=< 70 km/hr		> 70 km/hr			
Major	Minor	Peak 7 Hour Volume (vph)		Peak 7 Hour Volume (vph)		Major	Minor
1	1	600	120	420	85	420	85
2 or more	1	720	120	500	85	500	85
2 or more	2 or more	720	160	500	110	500	110
1	2 or more	600	160	420	110	420	110

Existing Scenario to be Considered			
Number of Incoming Lanes on Approach		Minimum Volumes	
Major	Minor	Major	Minor
2 or more	1	720	120

Existing Traffic Volumes (by Approach)
8 hours traffic volume on an average day

Time Period	Total of Both Major Approaches	Higher than Minimum?
6am to 7am	231	No
7am to 8am	488	No
8am to 9am	824	Yes
11am to 12am	863	Yes
12am to 1pm	937	Yes
3pm to 4pm	956	Yes
4pm to 5pm	903	Yes
5pm to 6pm	748	Yes

Existing Traffic Volumes (by Approach)
8 hours traffic volume on an average day

Time Period	Higher of Each Minor Approaches	Higher than Minimum?
6am to 7am	70	No
7am to 8am	81	No
8am to 9am	167	Yes
11am to 12am	74	No
12am to 1pm	91	No
3pm to 4pm	90	No
4pm to 5pm	72	No
5pm to 6pm	75	No

Warrant Satisfied? Yes No

Explanation: The warrant is not satisfied. Only 1 of the 8 hours traffic volume meet the minimum volumes

WARRANT NO.7 Four Hour Volumes

	Large Urban Areas (> 10000 population)	
	Posted or 85th Percentile Speed	
Location Type	=< 70 km/hr	> 70 km/hr
Rural	Figure 1	Figure 2
Large Urban (>10000 pop.)	Figure 1	Figure 2
Small Urban (<10000 pop.)	Figure 2	Figure 2

Existing Scenario to be Considered	
Location Type	Figure
Small Urban (<10000 pop.)	Figure 2

Highest of 4 consecutive hours on an average day

Time Period	Southbound	Northbound	Total of Both
2pm to 3pm	470	393	863
3pm to 4pm	492	445	937
4pm to 5pm	599	357	956
5pm to 6pm	497	406	903

Highest of 4 consecutive hours on an average day

Time Period	Eastbound	Westbound	Higher of Each
2pm to 3pm	0	74	74
3pm to 4pm	0	91	91
4pm to 5pm	0	90	90
5pm to 6pm	0	72	72

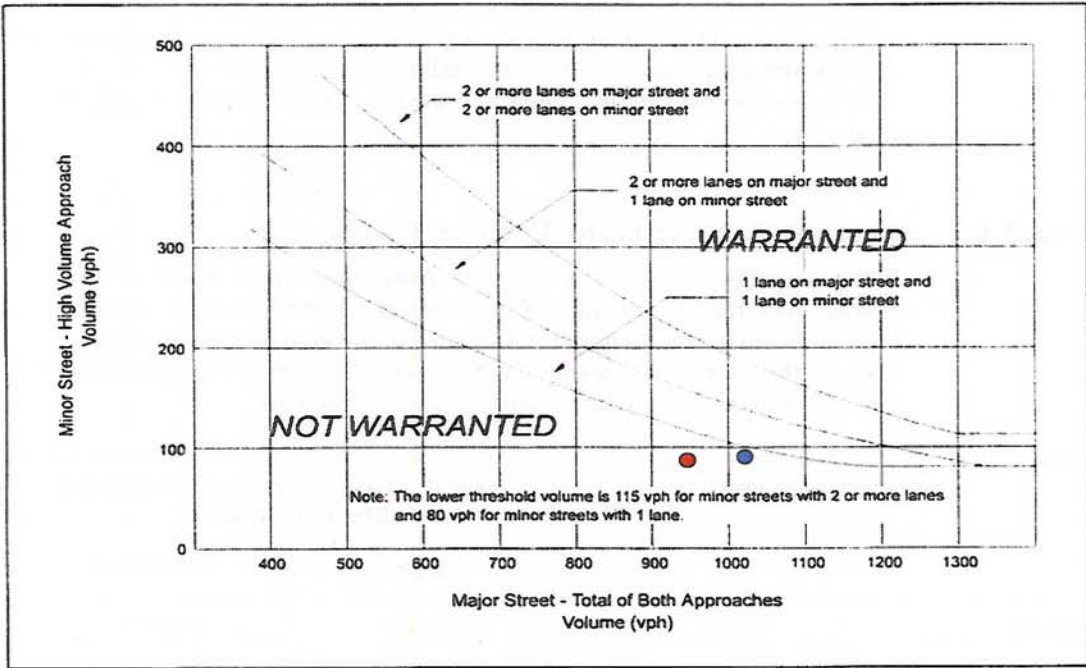


Figure 1. Warrant 7: four hour volumes 1

Warrant Satisfied? Yes No

Explanation: The red dot is for 2009 traffic volumes; the blue dot is for the projected 5 Year volumes

WARRANT NO.8 Peak Hour Delay

	Number of Minor Street Incoming Lanes on Approach with Highest Peak Hour Delay	
	1	2 or more
Minimum Peak Hour Delay (veh-hr)	4	5
Minimum Peak Hour Traffic (vph)	100	150

Number of Intersection Approaches	Minimum total Peak Hour Traffic for All Approaches Combined (vph)
3	650
4	800

Existing Scenario to be Considered	
Minimum Peak Hour Delay (veh-hr)	4
Minimum Peak Hour Traffic (vph)	100
Minimum total Peak Hour Traffic for All Approaches Combined (vph)	800

Peak hour traffic volumes on an average day

Time Period	Southbound	Northbound	Total of Both
4pm to 5pm	599	357	956

Peak hour traffic volumes on an average day

Time Period	Eastbound	Westbound	Higher of Each
4pm to 5pm	0	90	90

Existing Peak Hour Delay (veh-hr):

Eastbound:	0.00
Westbound:	0.00

Warrant Satisfied? Yes No

Explanation: The warrant is not satisfied because the minor approach does not exceed the minimum volume criteria, and existing peak hour delay for the minor approach does not exceed 4 veh-hr.

WARRANT NO.9 Peak Hour Volumes

Location Type	Large Urban Areas (> 10000 population)	
	Posted or 85th Percentile Speed	
	=< 70 km/hr	> 70 km/hr
Rural	Figure 3	Figure 4
Large Urban (>10000 pop.)	Figure 3	Figure 4
Small Urban (<10000 pop.)	Figure 4	Figure 4

Existing Scenario to be Considered	
Location Type	Figure
Small Urban (<10000 pop.)	Figure 4

Peak hour traffic volumes on an average day

Time Period	Southbound	Northbound	Total of Both
4pm to 5pm	599	357	956

Peak hour traffic volumes on an average day

Time Period	Eastbound	Westbound	Higher of Each
4pm to 5pm	0	90	90

TRAFFIC SIGNALS

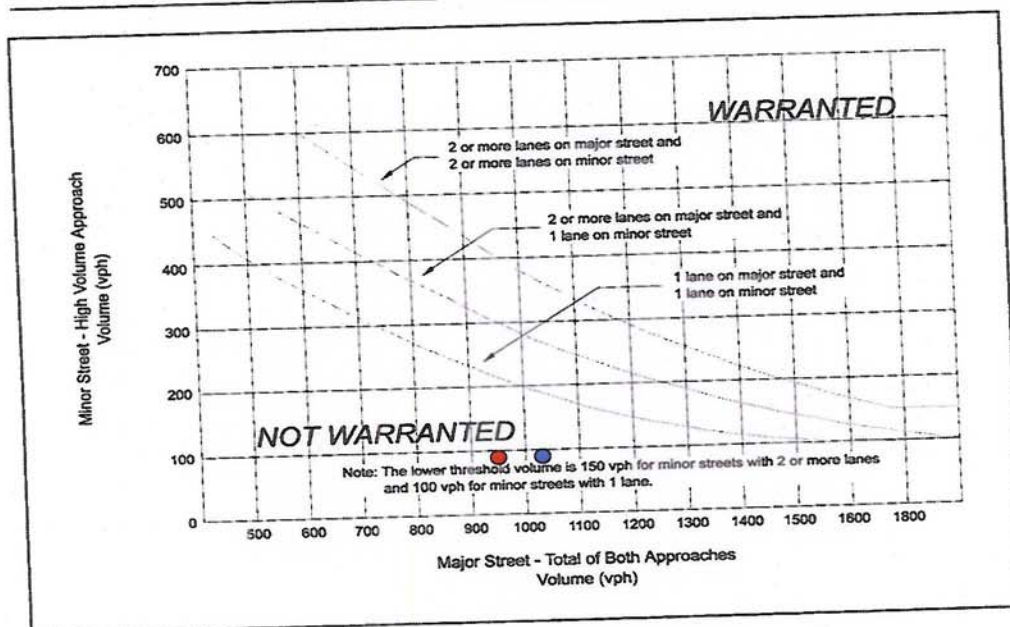


Figure 3 Warrant 9: peak hour volumes 1

Warrant Satisfied? Yes No

Explanation: The warrant is not satisfied because the peak hour volume does not exceed or equal to the required threshold.

Summary

Warrant		
1) Minimum Vehicular Volume	<input type="checkbox"/> Satisfied	<input checked="" type="checkbox"/> Not Satisfied
2) Interruption of Continuous Traffic	<input type="checkbox"/> Satisfied	<input checked="" type="checkbox"/> Not Satisfied
3) Progressive Movement	<input type="checkbox"/> Satisfied	<input checked="" type="checkbox"/> Not Satisfied
4) Accident Experience	<input type="checkbox"/> Satisfied	<input checked="" type="checkbox"/> Not Satisfied
5) System Warrant	<input checked="" type="checkbox"/> Satisfied	<input type="checkbox"/> Not Satisfied
6) Combination Warrant	<input type="checkbox"/> Satisfied	<input checked="" type="checkbox"/> Not Satisfied
7) Four Hour Volume	<input type="checkbox"/> Satisfied	<input checked="" type="checkbox"/> Not Satisfied
8) Peak Hour Delay	<input type="checkbox"/> Satisfied	<input checked="" type="checkbox"/> Not Satisfied
9) Peak Hour Volume	<input type="checkbox"/> Satisfied	<input checked="" type="checkbox"/> Not Satisfied

Comments:

- This intersection does not warrant the installation of a traffic signal.
- It should be noted that the only accident data available for this site was the ICBC Claims Data provided by the City of Richmond Traffic Operation Department

Appendix B:

Parking Calculations for Commercial and Residential Uses

Commercial Parking Requirement and Supply - Up to Phase 2

		Commercial Floor Area		Parking Bylaw Requirements		Parking Supply
Broadmoor Mall	Restaurant (Phase 1)	2,635	204	Food establishment: 8 spaces per 100m ² GLA up to 350m ²	16.3	192
	Pub (Phase 1)		274	Food establishment: 8 spaces per 100m ² GLA up to 350m ²	21.9	
	Liquor Store (Phase 1)		178	Licensee Retail Store: 4 spaces per 100m ² GLA	7.1	
	Retail (Phase 1)		1,850	Retail trade & services: 3 spaces per 100m ² GLA up to 350m ² plus 4 spaces for each additional 100m ²	153.4	
	New (Phase 2)	2,247	2,071			
	<i>Sub-Total</i>	<i>4,882</i>	<i>4,576</i>		<i>198.7</i>	
Richlea Square	Existing	6,875	6,251	<i>As existing supply</i>	219	219
Petro Canada	Existing	12 fuelling stations		<i>As existing supply</i>	7	7
Total					425	418

Commercial Parking Requirement and Supply - Up to Phase 3

		Commercial Floor Area		Parking Bylaw Requirements		Parking Supply
		m ² GFA	m ² GLA	Rates	# spaces	# spaces
Broadmoor Mall	New (Phase 3)	2,273	2,053	Retail trade & services: 3 spaces per 100m ² GLA up to 350m ² plus 4 spaces for each additional 100m ²	78.6	177
	Phase 2	2,247	2,071		79.3	
	<i>Sub-Total</i>	<i>4,520</i>	<i>4,124</i>		<i>158.0</i>	
Richlea Square	Existing	6,875	6,251	<i>As existing supply</i>	219	219
Petro Canada	Existing	12 fuelling stations		<i>As existing supply</i>	7	7
Total					384.0	403

Commercial Parking Requirement and Supply - Up to Phase 4

		Commercial Floor Area		Parking Bylaw Requirements		Parking Supply
		m ² GFA	m ² GLA	Rates	# spaces	# spaces
Broadmoor Mall	Phase 3	2,273	2,053	Retail trade & services: 3 spaces per 100m ² GLA up to 350m ² plus 4 spaces for each additional 100m ²	78.6	153
	Phase 2	2,247	2,071		79.3	
	<i>Sub-Total</i>	<i>4,520</i>	<i>4,124</i>		<i>158.0</i>	
Richlea Square	New (Phase 4)	4,764	4,486	Retail trade & services: 3 spaces per 100m ² GLA up to 350m ² plus 4 spaces for each additional 100m ²	217.1	163
	New (Phase 4)	1,142	1,028			
	<i>Sub-Total</i>	<i>5,906</i>	<i>5,514</i>			
Petro Canada	Existing	12 fuelling stations		<i>As existing supply</i>	7	7
Total					382.0	323

Commercial Parking Requirement and Supply - Up to Phase 5, FINAL

		Commercial Floor Area		Parking Bylaw Requirements		Parking Supply
		m ² GFA	m ² GLA	Rates	# spaces	# spaces
Broadmoor Mall	Phase 3	2,273	2,053	Retail trade & services: 3 spaces per 100m ² GLA up to 350m ² plus 4 spaces for each additional 100m ²	78.6	149
	Phase 2	2,247	2,071		79.3	
	<i>Sub-Total</i>	<i>4,520</i>	<i>4,124</i>		<i>158.0</i>	
Richlea Square	Phase 4	4,764	4,486	Retail trade & services: 3 spaces per 100m ² GLA up to 350m ² plus 4 spaces for each additional 100m ²	217.1	163
	Phase 4	1,142	1,028			
	<i>Sub-Total</i>	<i>5,906</i>	<i>5,514</i>			
Petro Canada	New (Phase 5)	1,402	1,262	Retail trade & services: 3 spaces per 100m ² GLA up to 350m ² plus 4 spaces for each additional 100m ²	47.0	11
Total		19,981	18,484		422.0	323

Residential Parking Requirement and Supply - Up to Phase 2

		Residential	Parking Bylaw Requirements		Proposed Parking Supply	
		# units	Rates	# spaces	Rates	# spaces
Broadmoor Mall	Phase 2	64	1.5 spaces per unit + 0.2 stalls per unit for visitor parking	108.8	1.31 spaces per unit (combined)	84
Richlea Square	-	-	-		-	
Petro Canada	-	-	-		-	
Total		64		108.8		84

Residential Parking Requirement and Supply - Phase 3

		Residential	Parking Bylaw Requirements		Proposed Parking Supply	
		# units	Rates	# spaces	Rates	# spaces
Broadmoor Mall	Phase 2	64	1.5 spaces per unit + 0.2 stalls per unit for visitor parking	108.8	1.31 spaces per unit (combined)	84
	New (Phase 3)	20	1.5 spaces per unit + 0.2 stalls per unit for visitor parking	34.0	2.78 spaces per unit (combined)	50
Richlea Square	-	-	-		-	
Petro Canada	-	-	-		-	
Total		84		142.8		134

Residential Parking Requirement and Supply - Phase 4

		Residential	Parking Bylaw Requirements		Proposed Parking Supply	
		# units	Rates	# spaces	Rates	# spaces
Broadmoor Mall	Phase 2	64	1.5 spaces per unit + 0.2 stalls per unit for visitor parking	108.8	1.31 spaces per unit (combined)	84
	Phase 3	20	1.5 spaces per unit + 0.2 stalls per unit for visitor parking	34.0	2.78 spaces per unit (combined)	50
Richlea Square	New (Phase 4)	75	1.5 spaces per unit + 0.2 stalls per unit for visitor parking	127.5	1.21 spaces per unit (combined)	93
Petro Canada	-	-	-		-	
Total		159		270.3		227

Residential Parking Requirement and Supply - Phase 5, FINAL

		Residential	Parking Bylaw Requirements		Proposed Parking Supply	
		# units	Rates	# spaces	Rates	# spaces
Broadmoor Mall	Phase 2	64	1.5 spaces per unit + 0.2 stalls per unit for visitor parking	108.8	1.31 spaces per unit (combined)	84
	Phase 3	20	1.5 spaces per unit + 0.2 stalls per unit for visitor parking	34.0	2.78 spaces per unit (combined)	50
Richlea Square	Phase 4	75	1.5 spaces per unit + 0.2 stalls per unit for visitor parking	127.5	1.21 spaces per unit (combined)	93
Petro Canada	New (Phase 5)	28	1.5 spaces per unit + 0.2 stalls per unit for visitor parking	47.6	1.57 spaces per unit (combined)	44
Total		187		317.9		271