



## Delbrook Lands Transportation Study

June 2016

In March of 2016, the District of North Vancouver commissioned a transportation study for the Delbrook Community Recreation Centre site at 600 West Queens Road. As part of a public dialogue about the future of the site, the study examined the transportation implications of possible land uses. This study was completed in anticipation of a deliberative dialogue session with the public on June 18, 2016.

The study acknowledges that there will be traffic generated by the new Delbrook Community Recreation Centre, located further down the street at 851 West Queens Road. The study also acknowledges that different land uses, especially if combined on site, may have differing peak traffic hours.

The range of land uses examined as part of this study are:

- Parkland
- Housing
- Community service and cultural uses
- Housing and parkland combination

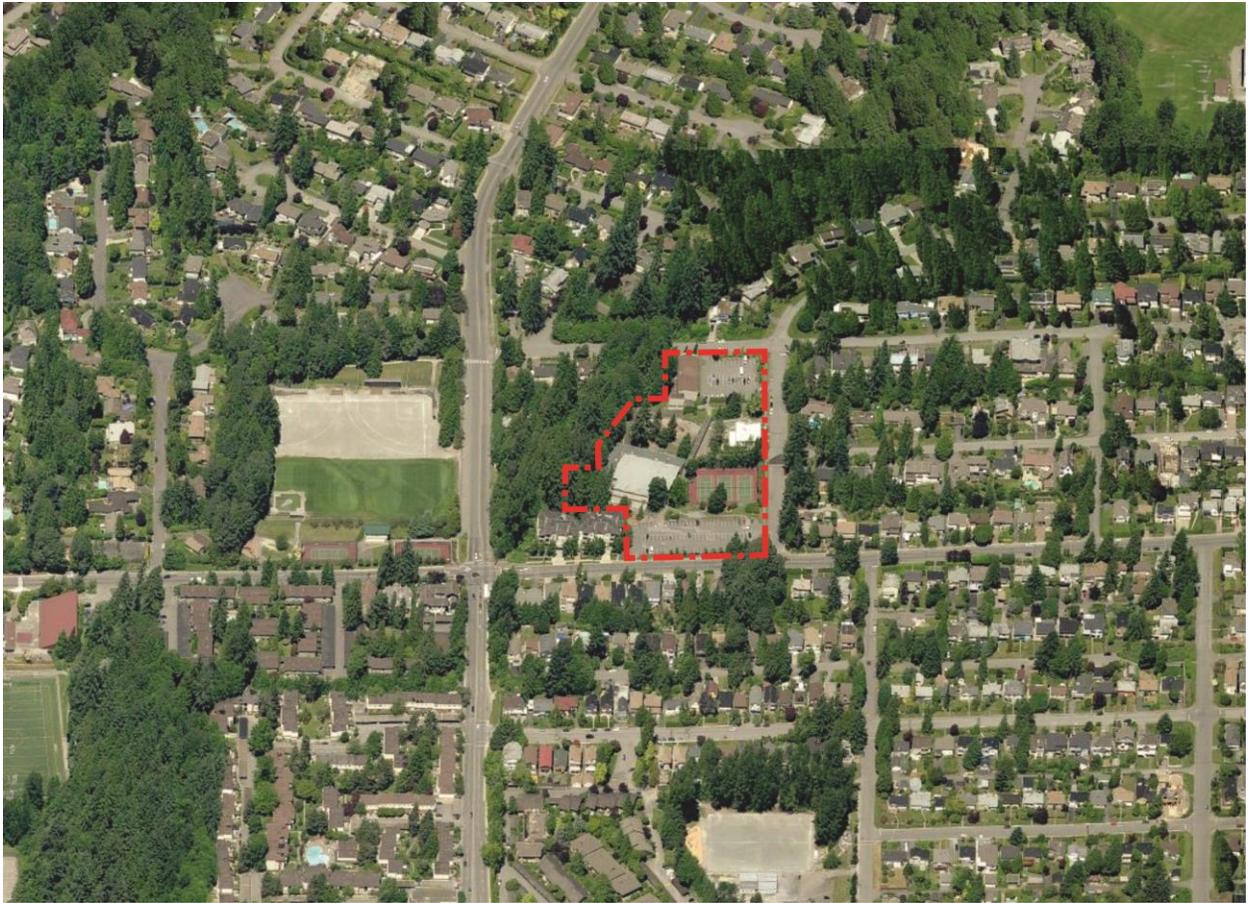
Note: The traffic impacts for a commercial use were not analyzed as part of this study.

### Key Findings:

- Currently, the site generates a total of 192 vehicle trips in the morning peak hour and 193 in the afternoon peak hour.
- The full-site housing use, which is the highest traffic generator proposed, is not expected to exceed the amount of traffic generated by the current use on the site: 154 vehicles in the morning peak hour and 177 vehicles in the afternoon peak hour.
- The intersection at West Queens Road and Delbrook Avenue, which currently operates at a 'Level of Service' (LOS) of 'C', will not exceed its current level of operation, even with the highest traffic-generating use on site. By comparison, LOS 'A' represents free flowing traffic while LOS 'F' represents high delays and volumes. An LOS 'C' is characterized by some level of volume and some level of delay, but operates reasonably well as an intersection.
- The study identifies opportunities for shared parking on the site, since various uses peak at different times. It is also assumed the majority of residential parking would likely be located underground, if housing is selected as the preferred land use.
- The study identifies numerous opportunities and challenges for active travel to and from the site. The study details opportunities for improved pedestrian infrastructure, bridging gaps in cycling routes, and improved transit infrastructure which would all support people using active modes of travel to access the site.

A full copy of the study follows.

# DELBROOK LANDS TRANSPORTATION STUDY



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# 1. INTRODUCTION

## 1.1 Background

The District of North Vancouver (District) is currently exploring opportunities for the Delbrook Lands site located on the west side of Stanley Avenue between West Windsor Road and West Queens Road in the Delbrook area of North Vancouver. The Delbrook Lands site is shown in the context of the surrounding area in **Exhibit 1.1**.

There are four (4) potential land use scenarios under review for the purposes of the transportation study. The District commissioned the Delbrook Lands Transportation Study (DLTS) to provide insight to the potential implications of the site options specifically related to site-generated vehicle trips on the nearby street network, site parking requirements, and also to identify possible safety and accessibility enhancements for non-auto modes on facilities that connect to the site. The primary purpose of the DLTS was to provide the District and the public with information on the potential implications of different land use options from a transportation perspective, in anticipation of upcoming project workshops.

## 1.2 Understanding of Assignment

### **Walking, Cycling, & Transit**

The District's Official Community Plan (OCP) has set a target of increasing the proportion of trips made by walking, cycling and transit from 21 percent in 2011 to 35 percent by 2030. In an effort to meet these targets, this study has highlighted opportunities to encourage active travel to and from the site.

The study has identified potential pedestrian crossing improvements near the site, at the intersection of West Windsor Road/Delbrook Avenue and West Queens Road/Stanley Avenue that could provide improved access to the site. Additionally, different land use options could create different sets of opportunities and challenges for pedestrians, cyclists and transit users and would need to be reviewed in the context of traffic and parking when assessing the potential land uses for the site.

Consequently, the DLTS assesses existing site accessibility for pedestrians, cyclists, and transit users. This study further identifies gaps in/quality of facilities as well as potential measures to improve alternative modes.

### **Vehicle Traffic**

Traffic is often a key concern of local residents living near sites in transition. As such, it is important to understand the impacts that a new site use would have on existing traffic conditions in the study area. In particular, for the DLTS, the District was most concerned about the impacts on the intersections of Delbrook Avenue / West Queens Road, West Windsor Road / Delbrook Avenue, and Stanley Avenue / West Queens Road, given their proximity to the site.

### **On-Site Parking**

Today the District is faced with the challenge of achieving sustainable growth goals while serving the needs of its existing residents. A key goal is ensuring that parking needs are met for users to minimize added pressure on local street parking while still encouraging active travel to the site. To meet these needs, parking provision and access to parking may influence the site plan layout.

The study explores the potential on-site parking requirements for the four different land use scenarios for the Delbrook Lands, and implications they may have on on-street parking demand.

**Exhibit 1.1 – Existing Site Context**



## 2. EXISTING CONDITIONS

The following section highlights the existing context of the area surrounding the site with respect to walking, cycling, transit, the adjacent street network as well as vehicle volumes and traffic operations at study intersections.

### 2.1 Walking, Cycling & Transit

The Delbrook Lands site is situated within a mature residential neighbourhood with an established street grid pattern to the east and south. A more segmented street pattern lies to the north and west given the presence of Mission Creek to the west of the site, (and Mosquito Creek farther west) which bisect the east-west street grid. There are existing connections to the site for pedestrians, cyclists, and transit users; however given the age of the neighbourhood, challenging geography, and relatively low density, there are some challenges that exist with these facilities.

Given that, there are also opportunities in the immediate area adjacent to the site to help improve ongoing challenges for these users and are detailed further in Section 6 of this report. **Exhibit 2.1** highlights the site accessibility for existing walking, cycling, and transit connections along with key amenities nearby.

#### Walking

Sidewalks are not present on all local streets in the surrounding area however, these streets are still conducive to walking. Although sidewalks are present on all three of the existing site street frontages, they are generally narrow (i.e. 1.3m – 1.5m) when considered against today's standards and may not provide an ideal level of comfort for pedestrians. Key issues for pedestrians today are that:

- With a 1.5m or narrower sidewalk, a pedestrian cannot pass someone in a wheelchair or pushing a cart/stroller without some level of difficulty;
- West Windsor Road and Stanley Avenue have sidewalks on just one side; and
- Boulevards adjacent to sidewalks that provide a buffer for pedestrians only exist along Stanley Avenue, West Windsor Road, and portions of West Queens Road.

Marked crosswalks are provided at key locations including at the intersection of Stanley Avenue and West Queens Road, as well as Delbrook Avenue and West Windsor Road. **Figure 1** below shows the Delbrook Avenue at West Windsor Road marked crossing (left) and another at West Queens Road and Stanley Avenue (right). These two locations have street crossing distances of approximately 18.5m at Delbrook Avenue / West Windsor Road and 12m at West Queens Road / Stanley Avenue.

**Figure 1: Southbound on Delbrook Avenue & W Windsor Road (left), and Eastbound on W Queens Road & Stanley Avenue (right)**



At the signed and marked crossing at Delbrook Avenue and West Windsor Road, the geometry of the curved road may result in reduced motorist visibility of pedestrians already engaged in the marked crossing. Additionally, this crossing has a bus stop immediately to the south which leads to buses stopping on top of the marked crossing and reduces northbound drivers' visibility of crossing pedestrians.

Pedestrian crossing volumes at the Delbrook Avenue and West Windsor Road crosswalk were observed during the count program to be approximately 30-35 equivalent adult units (EAU), as defined by the MoTI Pedestrian Crossing Control Manual for B.C.) during the PM peak hour. There are nearly 700 vehicles per hour (vph) on Delbrook Avenue during the same time period, resulting in approximately 70 gaps per hour of sufficient length for pedestrians to cross safely without any conflicts with vehicle traffic. Under these conditions, the MoTI Pedestrian Crossing Control Manual for B.C. warrants a signed and marked crosswalk, one of which already exists.

At West Queens Road and Stanley Avenue, pedestrian crossing volumes observed at the crosswalk were around 40 EAU's during the mid-day peak hour. With around 800 vph on West Queens Road this would result in approximately 65 crossing opportunities for pedestrians (i.e. gaps in traffic), and according to the MoTI Pedestrian Crossing Control Manual for B.C. would warrant a "Special Crosswalk" (i.e. signed and marked crosswalk with side or overhead flashing beacons).

It is noted that the exposure of pedestrians to vehicle traffic can be improved by reducing the crossing distance for pedestrians through provision of curb bulges or a centre median. A reduced crossing distance using curb bulges would further benefit pedestrians as it would increase their visibility to approaching motorists; a reduced crossing distance using a centre median would create a two-stage crossing resulting in pedestrians finding more gaps in traffic and being more visible to vehicles.

Section 6 further outlines opportunities for improved crossing treatments near the site.

### **Cycling**

Existing or planned on-street cycling routes surround the site on West Windsor Road to the north, Stanley Avenue to the east, West Queens Road to the south, and Delbrook Avenue to the west. Existing routes are generally informal in that they do not delineate space specifically for cyclists, but provide cycling links in all directions from the site and extend to connect with key amenities nearby, and the wider cycling network.

At present however, there are no formal cycling facilities such as painted bike lanes, shared/marked curb lanes, or cycle tracks which would help to encourage cycling as a travel mode for a wider range of users in the broader community. As highlighted in **Exhibit 2.1** there are also key gaps in the existing cycling network near the site with no connection on West Queens Road between Stanley Avenue and Delbrook Avenue, nor on Westview Drive south of West Queens Road.

Cycling challenges and opportunities for the Delbrook Lands are described in **Section 6**.

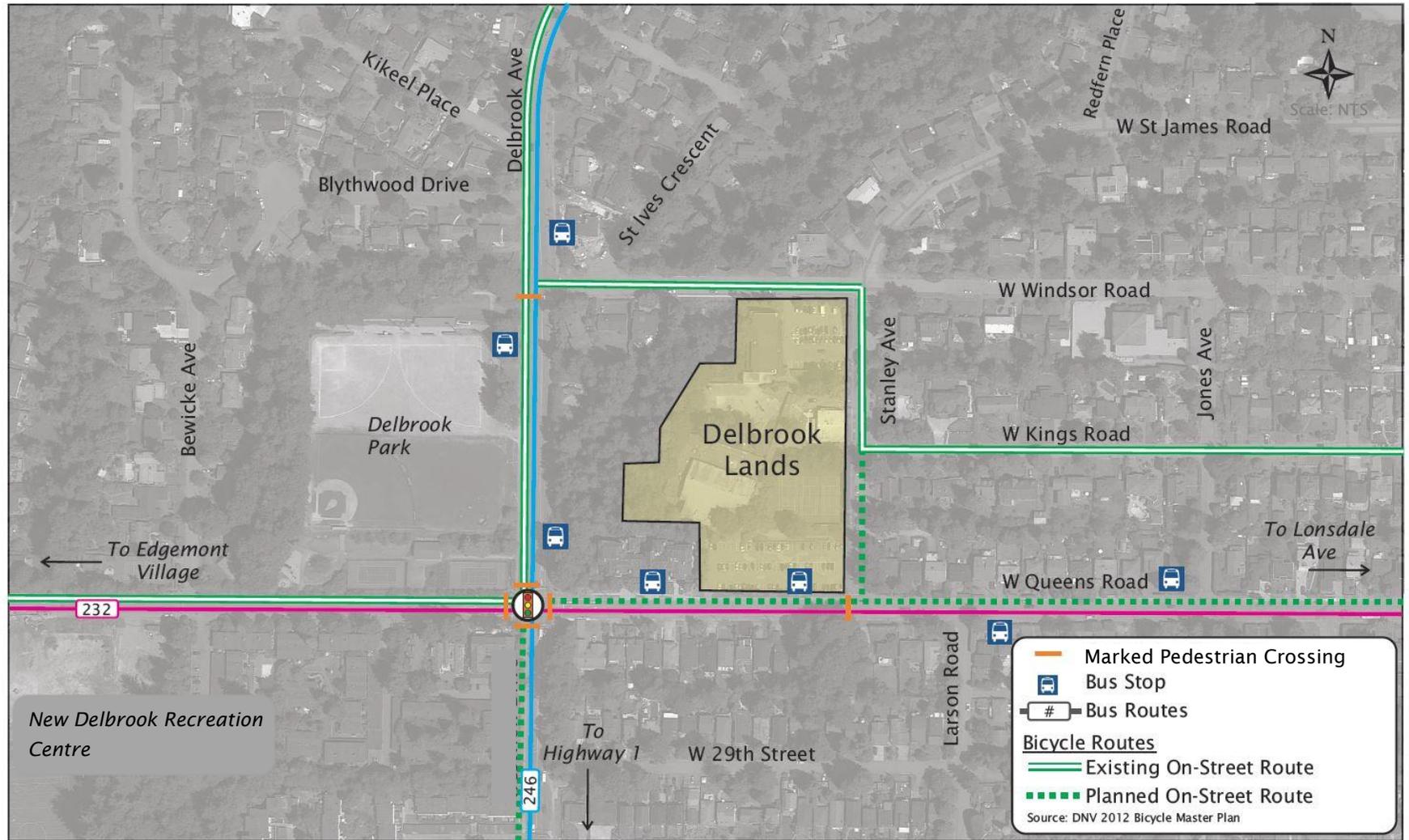
### **Transit**

The Delbrook Lands site can be accessed by two bus routes that provide service directly to and from the site, including the #246 (Lonsdale Quay / Highland / Vancouver) on Delbrook Avenue, and #232 (Grouse Mountain / Phibbs Exchange) on West Queens Road. These routes provide medium (i.e. 10 minute headways at peak times) to low (i.e. 30 minute headways) frequency service to the local area and connect users to other key local and regional destinations.

Nearby bus stops for the #232 route are located on the south site frontage on West Queens Road, while bus stops for the #246 route are located on Delbrook Avenue, just west of the site. The majority of existing bus stop facilities are marked using a 'bus stop' sign, while other stops provide improved amenities such as benches or shelters.

Bus routes and stop locations are highlighted on **Exhibit 2.1**. Transit challenges and opportunities are described in Section 6.

**Exhibit 2.1: Existing Walking, Cycling & Transit Connections**



## 2.2 Local Amenities

There are a number of key amenities located within an approximately 5 minute walking distance of the site as highlighted in **Exhibit 2.1** including:

- The new Delbrook Community Recreation Centre located at 853 Queens Road (previously called the William Griffin Community Recreation Centre, currently under construction. Final concept facility illustrated in top photo below);
- Delbrook Park (left photo below);
- Westview Shopping Centre (right photo below); and
- Schools (Larson Elementary, Highlands Elementary, Braemar Elementary, École André-Piolat, and Mountainside Secondary)



## 2.3 Study Street Network

The key streets within the study area include West Windsor Road, Stanley Avenue, West Queens Road, and Delbrook Avenue.

### West Windsor Road

West Windsor Road is a two-lane collector road that runs east-west along the north frontage of the subject site. Sidewalks are provided along the south side and parking is allowed along both sides of the roadway with no restrictions.

### Stanley Avenue

Stanley Avenue is a two-lane collector road running north-south along the east frontage of the subject site. North of West Windsor Road, it transitions into West St. James Road, which is classified as a road. Sidewalks are provided along the west side only and parking is allowed along both sides of the roadway.

### West Queens Road

West Queens Road is an east-west major arterial road that borders the south side of the proposed site. Sidewalks are provided on both sides of the street, and along the site frontage, the two-lane roadway allows parking along the south side. Additionally, two bus stops are provided along the north side between Stanley Avenue and Delbrook Avenue that serve the #232 bus route.

### Delbrook Avenue

Delbrook Avenue is a two-lane minor arterial road within the study area and transitions into a four-lane major arterial road (Westview Drive) south of West Queens Road. It serves as an important connection between the surrounding residential areas to the Trans-Canada Highway and further to the south. Angled parking is provided along the west side of the road to serve the playing fields west of the subject site. Sidewalks and transit stops for the #246 bus route are provided on both sides of Delbrook Avenue.

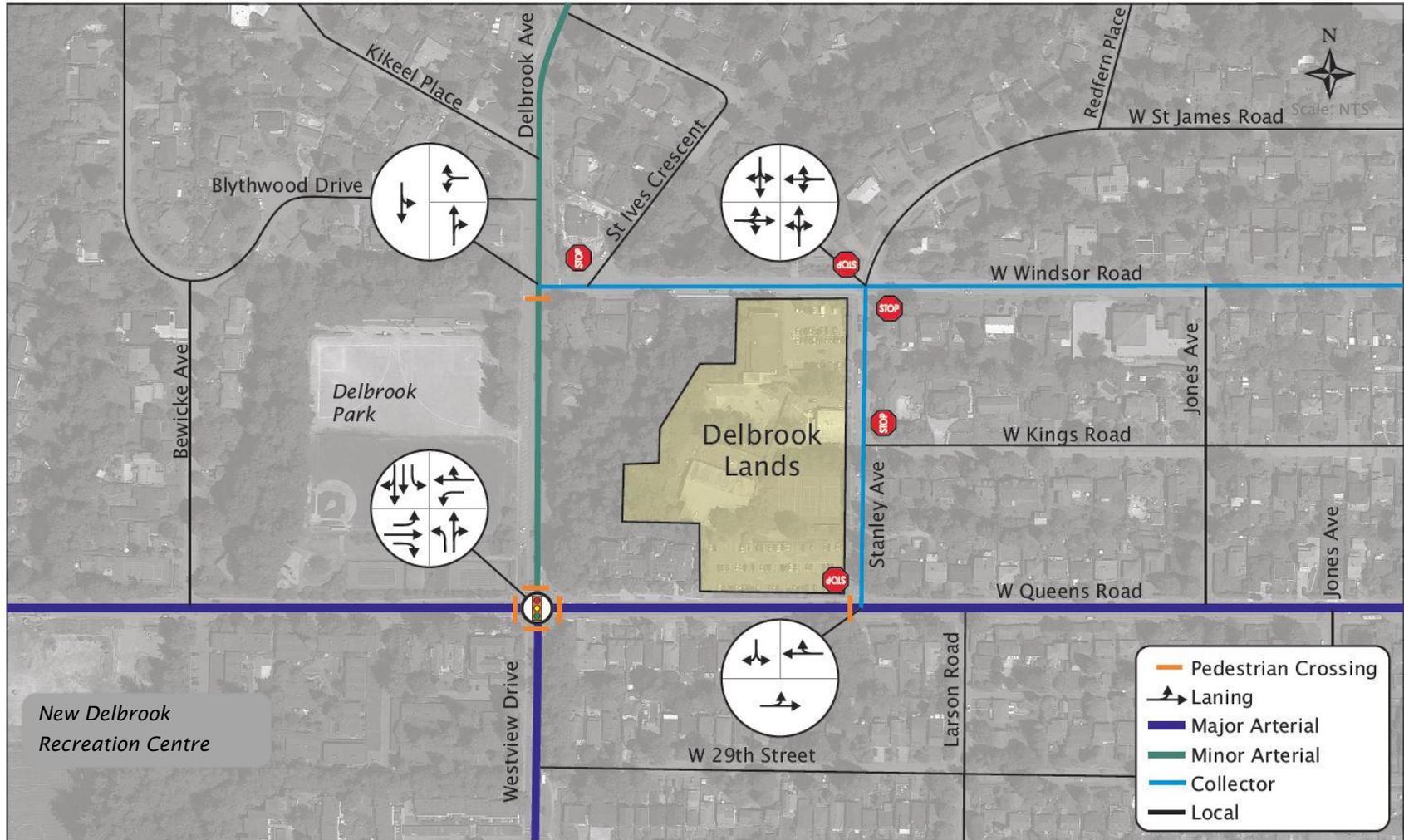
## 2.4 Study Intersections

Intersections included in the study network are categorized by traffic control types and are summarized in **Table 2.1** below. The existing laning and intersection controls are illustrated on **Exhibit 2.2**.

**Table 2.1: Study Intersections & Controls**

Intersection	Traffic Control
Delbrook Avenue / W Queens Road	Signalized
W Queens Road / Stanley Avenue	Stop Control – Minor Approach with signed & marked crosswalk on west approach
Stanley Avenue / W St James Road / W Windsor Road	Stop Control – Minor Approaches
Delbrook Avenue / W Windsor Road	Stop Control – Minor Approach with signed and marked crosswalk on south approach

**Exhibit 2.2: Existing Intersection Laning and Controls**



## 2.5 Traffic Surveys

### Peak Hour Traffic Volumes

Weekday morning and afternoon commuter periods are typically studied by transportation planners when assessing impacts on adjacent streets. It is these periods that generally govern a community's choices for planning improvements and expansions to the roadway network. Individual land uses may experience peak site activity and traffic outside of these days and hours, but collectively, when adjacent street demands are taken into account, weekday morning and afternoon peak hours are generally the critical time periods. It must be noted however, that uses with potential all-day programming may cause consistent traffic generation throughout the day.

With this in mind, vehicle traffic, pedestrian, and bicycle counts were conducted on Tuesday March 22<sup>nd</sup>, 2016 covering the weekday morning (7:00 am to 9:00 am) and afternoon (3:00 pm to 6:00 pm) peak traffic periods at two of the four intersections on the surround street network. Data was collected prior to this date for the remaining two intersections, as explained below. Existing weekday peak hour traffic volumes are summarized in **Exhibit 2.3**.

Note that data used to depict existing and background traffic for the West Queens Road and Delbrook Avenue intersection were collected as part of the new William Griffin Community Recreation Centre Transportation Study in 2013. This data was collected under normal weekday and weekend conditions, and was deemed to be an accurate representation of existing conditions due to a marginal net traffic volume growth of 0.2% per year. This rate remains low due to limited development in this existing and mature single-family neighbourhood. Once a land use is selected for the site, additional counts may be conducted to accurately reflect 2016 traffic volumes. Traffic counts for West Queens Road at Stanley Avenue were collected on the 1<sup>st</sup> of March, 2016 under 'normal' traffic conditions. Due to schedule constraints for this study, the traffic counts for the two remaining intersections, West Windsor Road at Delbrook Avenue and West Windsor Road at Stanley Avenue were conducted during the second week of spring break. This time period does not reflect typical normal peak commuter conditions on the adjacent street networks. It is believed that there is marginal change in traffic volumes during the AM and PM peak periods around the site during spring break, although special spring break programming was in effect at the Delbrook Recreation Community Centre.

**Table 2.2: Sources for Traffic Count Data**

Count Location	Source	Data Type	Date	Time Period
W Queens Road and Stanley Ave	DNV	Turning Movement Count/Ped & Cycle Count	March 1, 2016	Weekday: 7:30am – 9:15 am, 11:00am – 12:45pm 2:30pm – 6:15pm
W Queens Road at Delbrook Ave	DNV	Turning Movement Count	March 7, 2013	Weekday 7:30am – 9:15am 3:30pm – 5:15pm
Delbrook Ave at W Windsor Road	Bunt	Turning Movement Count	March 22, 2016	Weekday 7:00am – 9:00 am 3:00pm – 6:00pm
W Windsor Road at Stanley Ave	Bunt	Turning Movement Count	March 22, 2016	7:00am – 9:00am 3:00pm – 6:00pm

In total, during the spring break counts, the current Delbrook site generates the following peak traffic volumes:

- AM Peak Hour: 120 vph entering, 72 vph exiting
- PM Peak Hour: 81 vph entering, 112 vph exiting

### Exhibit 2.3: Existing Weekday Peak Hour Traffic Volumes

\*Data for the West Queens Road and Delbrook Avenue Intersection was collected in 2013 as part of the new William Griffin Community Recreation Centre Transportation Study. Data for the West Windsor Road at Stanley Avenue and Delbrook Avenue at West Windsor Road intersections were collected during spring break in March, 2016.



### Traffic Effect of New Delbrook Community Centre

As part of the District’s planning work in 2013 for the currently under construction new Delbrook Community Centre<sup>1</sup>, peak hour traffic generation at both the new and existing Delbrook sites were undertaken and trip generation of the two facilities was estimated, as summarized in **Table 2.2** below.

**Table 2.3: Anticipated Traffic Generation from New Delbrook Recreation Centre**

Location	Time Period	Distribution		Trips		
		% In	% Out	In	Out	Total
New Delbrook Community Recreation Centre	Weekday AM	70	30	73	32	105
	Weekday PM	45	55	89	109	198
Existing Delbrook Community Recreation Centre	Weekday AM	29	71	27	67	94
	Weekday PM	65	35	59	32	90
Combined	Weekday AM	50	50	100	99	199
	Weekday PM	51	49	148	141	288

Source: “New WGCRC Transportation Study”, Opus International Consultants Ltd. (2013).

It can be seen that combined, the two facilities in 2013 accounted for approximately 200 vph in the AM peak hour and about 290 vph in the PM peak hour. According to the District’s study, the new Delbrook Community Recreation Centre is expected to generate essentially the same number of combined trips from the two facilities as were observed in 2013.

Therefore, once the new site opens, it is expected that there will be approximately 5 vph more in the AM peak hour and 95 vph more in the PM peak hour on the nearby road network compared to today. However, not all of these additional trips would be added to the roadway network adjacent to the Delbrook Lands. Based on the District’s previous planning work, approximately 40% of this additional traffic will be on Queens west of Westview, approximately 12% will be on Delbrook north of Queens and approximately 20% will be on Westview south of Queens. The remaining 26% of traffic will access the new community centre site from Queens west of the new Delbrook site and therefore would not pass by the existing Delbrook Lands.

### Existing Daily Traffic Volumes

In terms of typical daily traffic volumes on the surrounding streets, **Table 2.3** provides a summary of estimated Average Annual Daily Traffic (AADT) volumes assuming Weekday PM Peak Hour volumes are approximately 8% of daily volumes, as it typical in urban areas. Weekday PM Peak Hour volumes for the Queens Rd at Delbrook Ave intersection were calculated using 2013 data gathered for the New William Griffin Community Recreation Centre Transportation Study.

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<sup>1</sup> New WGCRC Transportation Study, OPUS International Consultants, December 2013, page 20. The findings from this Study shall be used for any data collected for the ‘New Delbrook Community Recreation Centre’.

**Table 2.4: Existing Daily Traffic Volumes**

Road Link	Average Weekday PM Peak Hour Two-Way Vehicle Volume on Road Link	Estimated AADT Volumes (1)
W Queens, between Delbrook and Stanley (2)	992	12,400
Delbrook, between W Windsor and W Queens (3)	678	8,500
W Windsor, between Delbrook and Stanley	81	1,000
Stanley, between W Windsor and W Queens	93	1,200

- (1) Assuming AADT volumes are approximately 8% of weekday PM peak hour volumes (as per Table 4-2 in Traffic Engineering Handbook, page 96, for Suburban facilities).
- (2) Data used to calculate the peak hour vehicle volume on the road link between Westview and Stanley on West Queens Road was collected in 2013 as part of the William Griffins Community Recreation Centre Transportation Study.
- (3) Data for the intersection used to calculate the average weekday PM peaks for Delbrook, between West Windsor and West Queens was collected in 2013 as part of the William Griffins Community Recreation Centre Transportation Study.

## 2.6 Existing Traffic Operations

Traffic operations of these intersections were evaluated using Trafficware’s Synchro / SimTraffic 9.0 traffic analysis software. The operational performance analysis was based on the unsignalized intersection analysis procedures outlined in the Highway Capacity Manual (HCM 2000) to assess traffic “volume to capacity” (v/c) ratios and average delays per vehicle, or how long a vehicle will have to wait to pass through an intersection. Volume to capacity ratios compare roadway demand (vehicle volumes) with roadway supply (carrying capacity) to measure mobility and quality of travel on a road.

Based on average delays, a “Level of Service” or LOS score from ‘A’ to ‘F’ is assigned when applying the HCM methodology. An average control delay of less than 10 seconds per vehicle represents LOS ‘A’ and indicates excellent vehicle traffic operations with minimal delays to drivers. A calculated control delay value greater than 50 seconds per vehicle is assigned LOS ‘F’, representing relatively poor operations with high delays to drivers.

In urban areas, at an unsignalized intersection, LOS at the threshold of LOS D/E (35 seconds per vehicle) is considered acceptable for ‘critical movements’ at the intersection. Critical movements at unsignalized intersections are typically the left or right turn movements from the minor street onto the major street. As the major street movements do not stop, they are not critical movements and tend to operate at LOS ‘A’.

**Table 2.4** summarizes the existing weekday morning and afternoon peak-hour traffic operations at the study intersections. Traffic laning, signal timing and phasing assumptions were based on observed existing conditions. The overall and critical movement v/c ratios and LOS are reported below.

**Table 2.5 Existing Traffic Operations**

Intersection	Weekday AM				Weekday PM			
	Overall/ Critical Movement	v/c	LOS	95th Percentile Queue (m)	Overall/ Critical Movement t	v/c	LOS	95th Percentile Queue (m)
W Windsor Rd & Stanley Ave	Overall	-	A	-	Overall	-	A	-
	EB LTR	0.00	A	0	EB LTR	0.01	A	0
	WB LTR	0.01	A	0	WB LTR	0.00	A	0
	NB LTR	0.02	A	1	NB LTR	0.02	A	0
	SB LTR	0.02	A	0	SB LTR	0.01	A	0
W Queens Rd & Stanley Ave	Overall	-	A	-	Overall	-	A	-
	EB LT	0.05	A	1	EB LT	0.04	A	1
	WB TR	0.38	A	0	WB TR	0.21	A	0
	SB LR	0.24	C	7	SB LR	0.22	C	6
W Queens Rd & Delbrook Ave	Overall	0.76	B	-	Overall	0.81	C	-
	EB T	0.51	C	36	EB T	0.81	C	87
	WB L	0.62	B	35	WB L	0.65	C	24
	NB L	0.69	B	56	NB L	0.75	B	68
	SB TR	0.40	B	36	SB TR	0.27	B	23
W Windsor Rd & Delbrook Ave	Overall	-	A	-	Overall	-	A	-
	WB LR	0.13	B	3	WB LR	0.11	B	3
	NB TR	0.15	A	0	NB TR	0.25	A	0
	SB LTR	0.02	A	1	SB LTR	0.00	A	0

Based on the above, the critical movements at the study area intersections all perform within acceptable levels of service, generally ranging from LOS 'A' to 'C'. Traffic volumes and queues are also well within capacity. However, it should be noted that queues along the westbound left turn movement at West Queens Road and Delbrook Avenue are shown to occasionally extend beyond the available left turn storage bay. No road network changes are indicated at the adjacent study intersections.

With the opening of the new community centre at the new Delbrook site, traffic volumes are expected to increase at the intersections of West Queens Road and Delbrook Avenue, but not to the extent that traffic operations would be substantively different than noted above.

### 3. POTENTIAL LAND USE OPTIONS

A variety of land use options are being contemplated for the Delbrook Lands site as potential future uses for the area ranging from expanded park space, to a combination of the existing community amenity uses and park space, to housing. For the purposes of traffic impact assessment, four (4) distinct land use options were assessed as described in **Table 3.1**.

**Table 3.1: Potential Land Use Option Breakdown**

Land Use Option	Land Uses	Size/Area	Description
Option 1 - Parkland	- parkland	4.3 acres	Includes multi-purpose courts; children's playground; picnic area; trail networks, natural areas, and no playing fields
Option 2 - Housing	- multi-family residential	300 apartment units	Multi-family dwelling units in multiple 6-storey buildings
Option 3 - Community Service/Cultural	- community services - arts & culture - parkland	~18,700 sq ft day care facilities ~18,700 sq ft arts & culture facility ~3.45 acres parkland	10% of site for community service uses including existing Little Rascals child day care of 85 spaces, plus additional child day care and adult day care of 67 spaces; 10% of site for arts and culture facility (i.e. art gallery or museum); and 80% of site for parkland
Option 4 - Housing/Parkland	- multi-family residential - parkland	28 units (townhouses) ~3.45 acres parkland	20% of site for housing, all townhouses; and 80% of site for parkland

### 4. TRAFFIC IMPACT ASSESSMENT

To assess the traffic impact of each of the four options, peak hour traffic operations performance under existing conditions was compared to anticipated performance with the site redeveloped under the four land use scenarios tested.

#### 4.1 Forecast Traffic Volumes

Firstly, forecasts of future site traffic were required. The following steps were employed to develop future forecasts:

1. Existing site traffic generation was estimated by reviewing site driveway traffic volumes and on-street parking activity on the site's fronting roadways. **Table 4.1** below summarizes the existing site trip generation during the spring break week of the traffic data collection program.

**Table 4.1: Existing Site Vehicle Trip Generation**

Land Use Scenario	Land Use	Site Generated Vehicle Trips					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Existing	Recreation/Community Services	120	72	192	81	112	193

- Existing site traffic was “stripped off” the road network to create base level “background” volumes. Base level (background weekday peak hour) traffic volumes and are summarized in **Exhibit 4.1**. Note that the values for the intersections of West Windsor Road at Stanley Avenue and West Windsor Road at Delbrook Avenue were collected during the spring break period.
- Future site traffic during the AM and PM peak hours was estimated based on the four future land use scenarios. **Table 4.2** below summarizes the trip generation rates employed to estimate vehicle trips associated with the four land use scenarios, while **Table 4.3** summarizes the estimated site generated trips.

**Table 4.2: Trip Generation Rates**

Land Use	Sub Category	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Parkland <sup>(1)</sup>	General Park	2.52	1.98	4.5	2.00	1.51	3.50
MF Residential <sup>(2)</sup>	Townhouse/Apartment	0.16	0.35	0.51	0.38	0.21	0.59
Arts & Culture <sup>(3)</sup>	Art Gallery/Museum	1.35	0.70	2.05	1.34	1.40	2.74
Community Services	Day Care (Adult or Child) <sup>(4)</sup>	0.39	0.38	0.77	0.41	0.40	0.81

Notes:

1 - Based on ITE 411 (City Park) trip rate.

2 - Based on trip rates developed from Bunt studies at North Vancouver townhouse sites. Note, the ITE rates for Apartments were not used in this case given that some ITE rates for multi-family uses were higher than the local observed data for townhouse projects in the District. However, the townhouse rate was higher than the condominium/townhouse rate for “high-rise” (i.e. over 3 storeys). Therefore, this analysis is considered conservative for that reason.

3 - Based on ITE 495 (Recreational Community Centre) trip rate.

4 - Based on trip rates established from existing Delbrook site driveway counts. The rates in the table are generic rates and do not apply specifically to Little Rascals or the adult day care.

**Table 4.3: Land Use Option Site Trip Generation Comparison**

Land Use Scenario	Land Use	Size	Site Generated Vehicle Trips					
			AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
<i>Existing</i>	<i>Recreation/Community Services</i>	51,830 sq ft	120	72	192	81	112	193
Option 1 - Parkland	Parkland	4.3 acres	11	9	19	9	6	15
Option 2 - Housing	Housing	300 units (331,000 sq ft)	47	106	154	114	63	177
Option 3 - Community Service/Cultural	Day Cares*	18,731 sq ft	48	46	94	50	49	99
	Arts & Culture	18,731 sq ft	25	13	38	25	26	51
	Parkland	3.44 acres	9	7	15	7	5	12
	Total	-	82	66	148	82	80	162
Option 4 - Housing/Parkland	Housing	28 units	4	10	14	11	6	17
	Parkland	3.48 acres	9	7	16	7	5	12
	Total	-	13	17	30	18	11	29

\*Day cares include existing Little Rascals existing day care 7,675 sq ft (85 children), plus additional child and adult day cares of total combined 67 spaces.

It is noted that each of the four future site land use scenarios is expected to generate lower AM and PM peak hour traffic volumes compared to the spring break activity levels recorded at the existing site. They will however, have different peak traffic hours due to the nature of each use

and possible activity programming. Options 1 and 4 are expected to generate the lowest number of vehicle trips (15-30 vph) while options 2 and 3 are expected to generate the highest number of vehicle trips (160-180 vph).

4. Future site traffic was distributed to the adjacent roadway network and superimposed on the road network. Future site generated traffic volumes are summarized for each land use option at the study intersections on **Exhibits 4.2** and **4.3** for the morning and afternoon peak hours, respectively. **Exhibits 4.4** and **4.5** summarize the total traffic volumes, once the new site trips were superimposed on the base volumes. **Exhibits 4.6** and **4.7** provide a visual comparison of the site generated traffic for each land use option on each road link fronting the site, to give a sense of the order of magnitude for potential impacts adjacent to the site.

### Exhibit 4.1: Background Weekday Peak Hour Traffic Volumes

\*Data for the West Queens Road and Delbrook Avenue Intersection were collected in 2013 as part of the new William Griffin Community Recreation Centre Transportation Study. Data for the West Windsor Road at Stanley Avenue and Delbrook Avenue at West Windsor Road intersections were collected during spring break in March, 2016.



Exhibit 4.2: Future Site Generated Traffic Volumes - AM Peak Hour

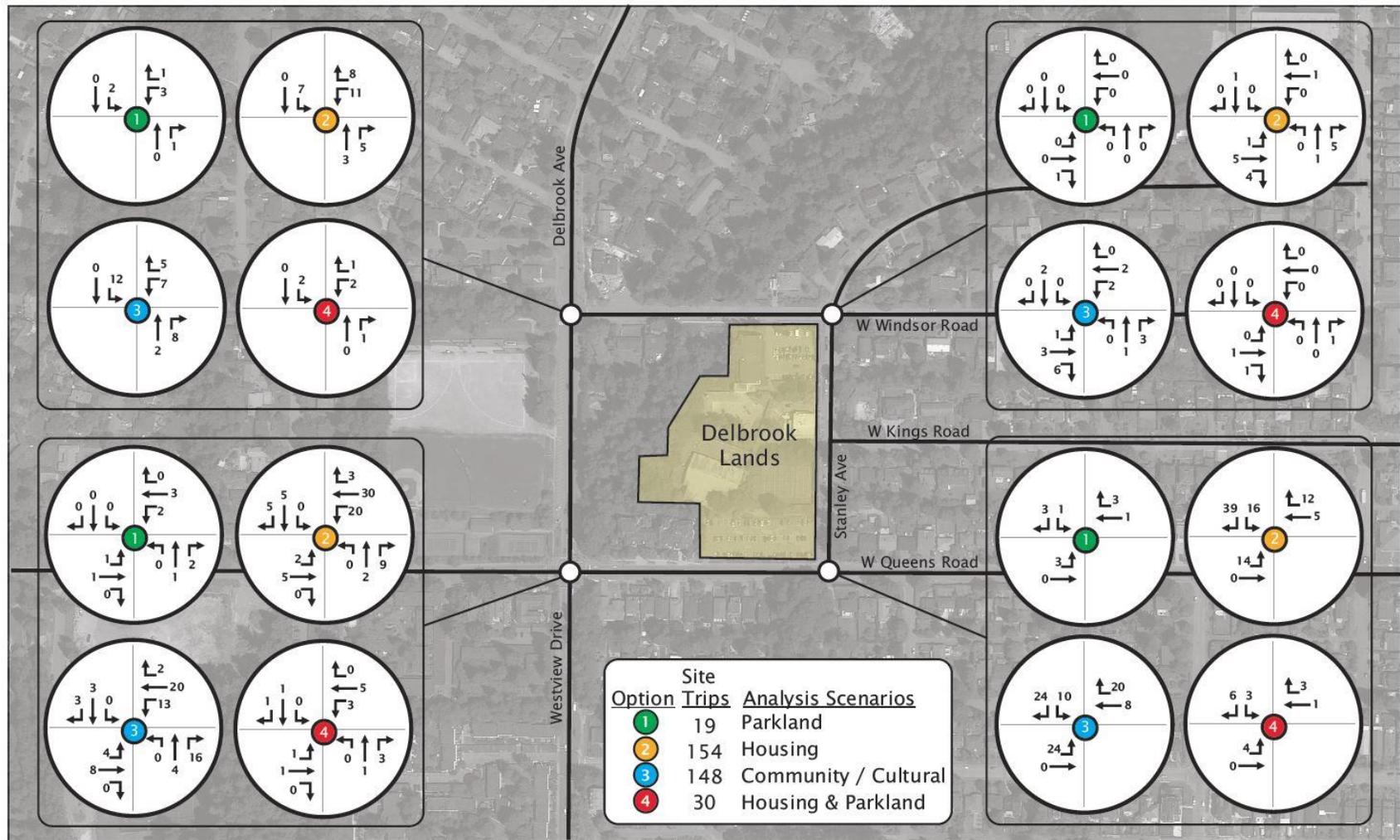


Exhibit 4.3: Future Site Generated Traffic Volumes – PM Peak Hour

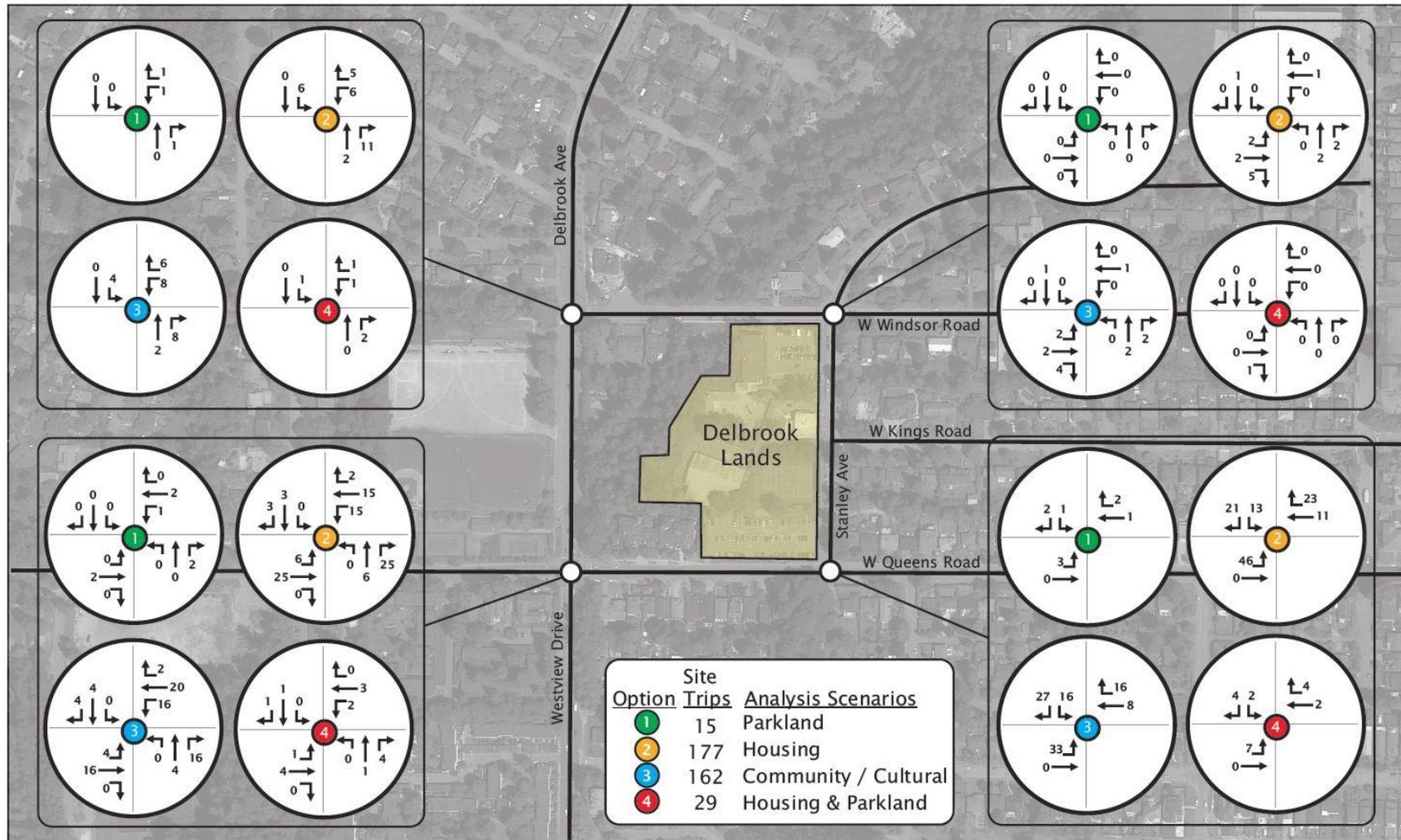


Exhibit 4.4: Total Future Traffic Volumes - AM Peak Hour

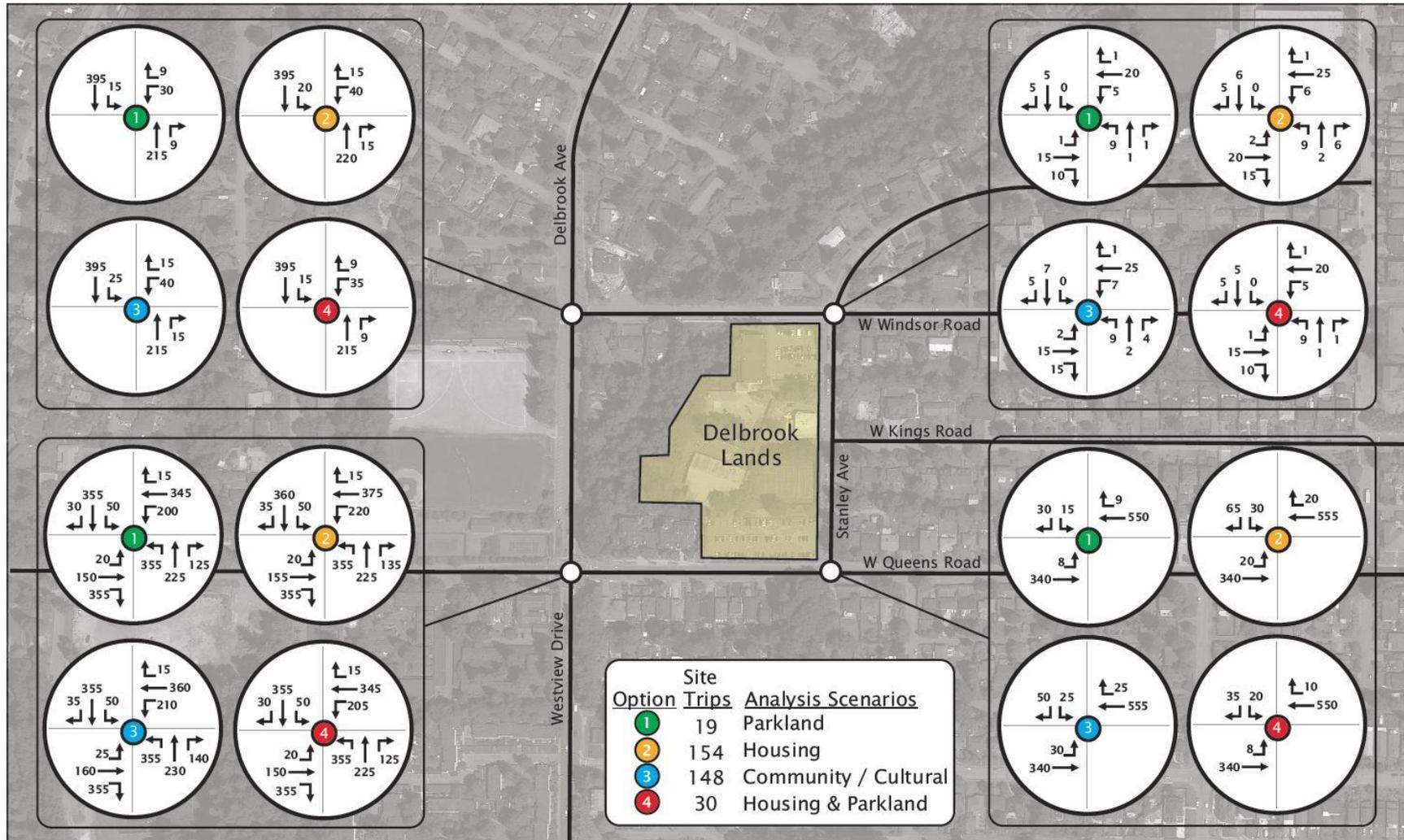
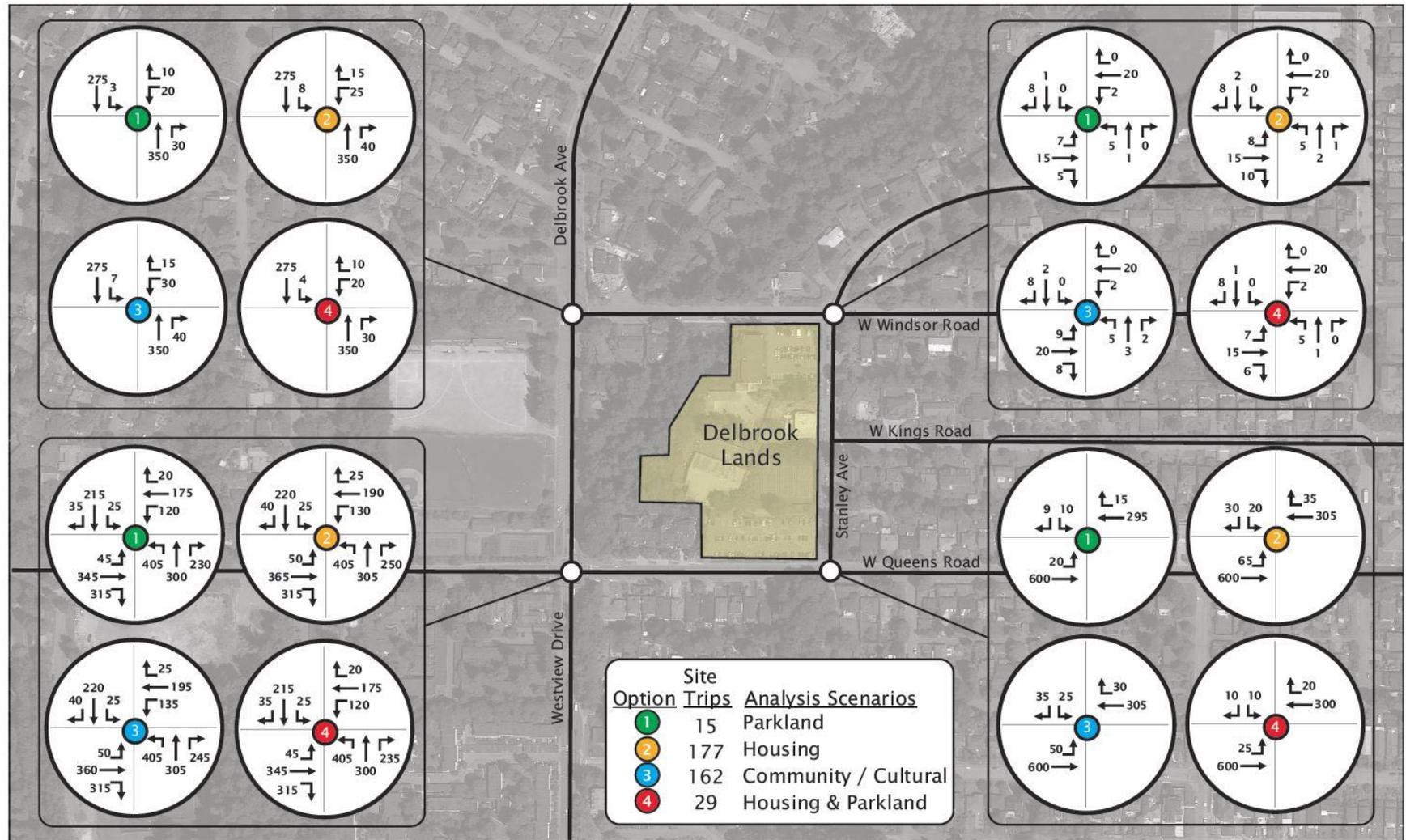


Exhibit 4.5: Total Future Traffic Volumes - PM Peak Hour



**Exhibit 4.6: Future Site Traffic Volume Comparison on Links - AM Peak Hour**

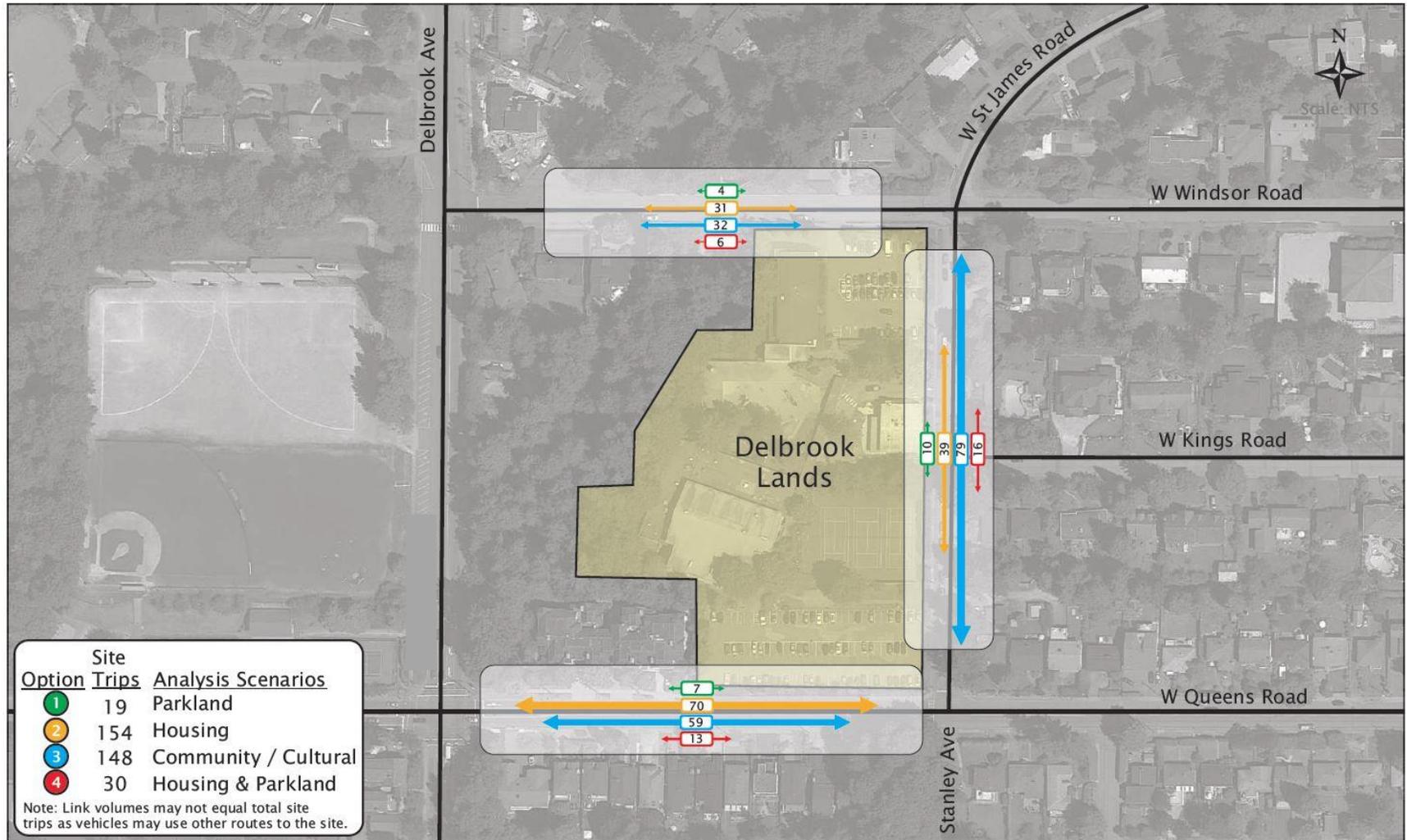
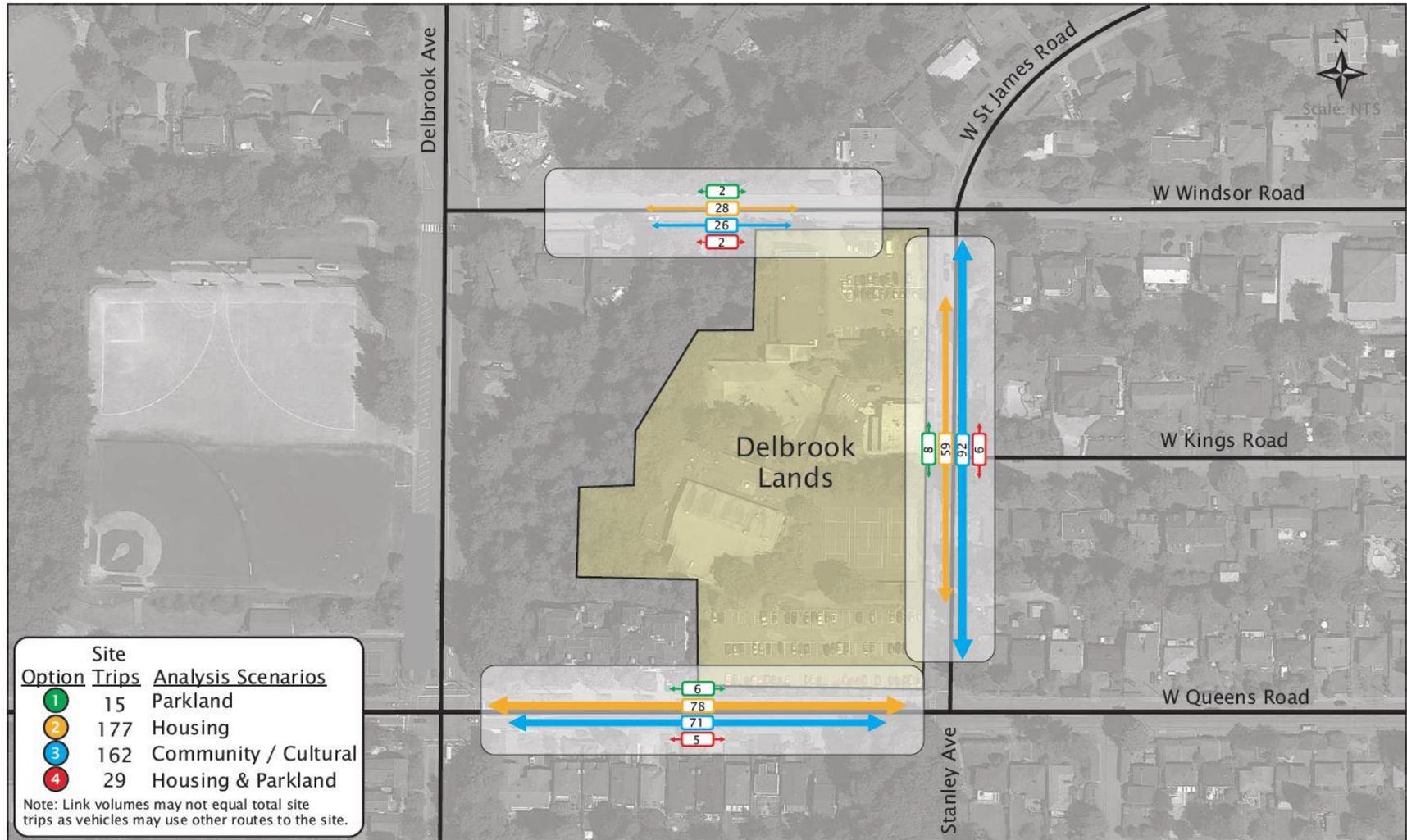


Exhibit 4.7: Future Site Traffic Volume Comparison on Links - PM Peak Hour



## 4.2 Future Traffic Operations

Tables 4.4 to 4.7 below summarize the traffic operations for the four land use options. As shown, queues and delays at the study area intersections are expected to be reduced compared to existing conditions as the four land use scenarios generate less peak hour traffic compared to the existing site. The study acknowledges that the intersections of West Windsor Road and Stanley Avenue as well as West Windsor Road and Delbrook Avenue reflect spring break conditions. All intersections and critical movements are expected to operate well, and no off-site roadway or traffic control improvements would be required to support any new proposed land uses.

**Table 4.4: Option 1 (Parkland) Traffic Operations**

Intersection	Weekday AM				Weekday PM			
	Overall/ Critical Movement	v/c	LOS	95th Percentile Queue (m)	Overall/ Critical Movement	v/c	LOS	95th Percentile Queue (m)
W Windsor Rd & Stanley Ave	Overall	-	A	-	Overall	-	A	-
	EB LTR	0.00	A	0	EB LTR	0.01	A	0
	WB LTR	0.00	A	0	WB LTR	0.00	A	0
	NB LTR	0.01	A	0	NB LTR	0.01	A	0
	SB LTR	0.01	A	0	SB LTR	0.01	A	0
W Queens Rd & Stanley Ave	Overall	-	A	-	Overall	-	A	-
	EB LT	0.01	A	0	EB LT	0.02	A	0
	WB TR	0.36	A	0	WB TR	0.20	A	0
	SB LR	0.14	C	4	SB LR	0.06	C	1
W Queens Rd & Delbrook Ave	Overall	0.81	B	-	Overall	0.78	B	-
	EB T	0.44	C	30	EB T	0.81	C	84
	WB TR	0.58	B	54	WB L	0.56	B	21
	NB L	0.79	B	71	NB L	0.73	B	63
	SB TR	0.37	B	32	SB TR	0.26	B	23
W Windsor Rd & Delbrook Ave	Overall	-	A	-	Overall	-	A	-
	WB LR	0.10	B	3	WB LR	0.08	B	2
	NB TR	0.14	A	0	NB TR	0.24	A	0
	SB LTR	0.01	A	0	SB LTR	0.00	A	0

**Table 4.5: Option 2 (Housing) Traffic Operations**

Intersection	Weekday AM				Weekday PM			
	Overall/ Critical Movement	v/c	LOS	95th Percentile Queue (m)	Overall/ Critical Movement	v/c	LOS	95th Percentile Queue (m)
W Windsor Rd & Stanley Ave	Overall	-	A	-	Overall	-	A	-
	EB LTR	0.00	A	0	EB LTR	0.01	A	0
	WB LTR	0.00	A	0	WB LTR	0.00	A	0
	NB LTR	0.02	A	1	NB LTR	0.01	A	0
	SB LTR	0.01	A	0	SB LTR	0.01	A	0
W Queens Rd & Stanley Ave	Overall	-	A	-	Overall	-	A	-
	EB LT	0.02	A	1	EB LT	0.06	A	1
	WB TR	0.37	A	0	WB TR	0.22	A	0
	SB LR	0.29	C	9	SB LR	0.17	C	5
W Queens Rd & Delbrook Ave	Overall	0.77	B	-	Overall	0.81	C	-
	EB T	0.48	C	33	EB T	0.83	D	89
	WB TR	0.67	C	67	WB L	0.62	C	22
	NB L	0.69	B	56	NB L	0.75	B	68
	SB TR	0.40	B	36	SB TR	0.26	B	23
W Windsor Rd & Delbrook Ave	Overall	-	A	-	Overall	-	A	-
	WB LR	0.14	B	4	WB LR	0.10	B	3
	NB TR	0.15	A	0	NB TR	0.25	A	0
	SB LTR	0.02	A	0	SB LTR	0.01	A	0

**Table 4.6: Option 3 (Community Service/Cultural) Traffic Operations**

Intersection	Weekday AM				Weekday PM			
	Overall/ Critical Movement	v/c	LOS	95th Percentile Queue (m)	Overall/ Critical Movement	v/c	LOS	95th Percentile Queue (m)
W Windsor Rd & Stanley Ave	Overall	-	A	-	Overall	-	A	-
	EB LTR	0.00	A	0	EB LTR	0.01	A	0
	WB LTR	0.01	A	0	WB LTR	0.00	A	0
	NB LTR	0.02	A	0	NB LTR	0.01	A	0
	SB LTR	0.01	A	0	SB LTR	0.01	A	0
W Queens Rd & Stanley Ave	Overall	-	A	-	Overall	-	A	-
	EB LT	0.03	A	1	EB T	0.05	A	1
	WB TR	0.37	A	0	WB L	0.21	A	0
	SB LR	0.23	C	7	NB L	0.18	C	5
W Queens Rd & Delbrook Ave	Overall	0.76	B	-	Overall	0.81	C	-
	EB T	0.49	C	34	EB T	0.82	D	87
	WB TR	0.65	C	65	WB L	0.63	C	35
	NB L	0.69	B	56	NB L	0.75	B	68
	SB TR	0.40	B	36	SB TR	0.26	B	23
W Windsor Rd & Delbrook Ave	Overall	-	A	-	Overall	-	A	-
	WB LR	0.13	B	3	WB LR	0.11	B	3
	NB TR	0.15	A	0	NB TR	0.25	A	0
	SB LTR	0.02	A	1	SB LTR	0.01	A	0

**Table 4.7: Option 4 (Housing/Parkland) Traffic Operations**

Intersection	Weekday AM				Weekday PM			
	Overall/ Critical Movement	v/c	LOS	95th Percentile Queue (m)	Overall/ Critical Movement	v/c	LOS	95th Percentile Queue (m)
W Windsor Rd & Stanley Ave	Overall	-	A	-	Overall	-	A	-
	EB LTR	0.00	A	0	EB LTR	0.01	A	0
	WB LTR	0.00	A	0	WB LTR	0.00	A	0
	NB LTR	0.01	A	0	NB LTR	0.01	A	0
	SB LTR	0.01	A	0	SB LTR	0.01	A	0
W Queens Rd & Stanley Ave	Overall	-	A	-	Overall	-	A	-
	EB LT	0.01	A	0	EB LT	0.02	A	1
	WB TR	0.36	A	0	WB TR	0.20	A	0
	SB LR	0.15	C	4	SB LR	0.07	C	2
W Queens Rd & Delbrook Ave	Overall	0.75	B	-	Overall	0.79	C	-
	EB T	0.47	C	33	EB T	0.82	C	85
	WB L	0.58	B	33	WB L	0.57	B	21
	NB L	0.68	B	55	NB L	0.73	B	63
	SB TR	0.39	B	35	SB TR	0.26	B	23
W Windsor Rd & Delbrook Ave	Overall	-	A	-	Overall	-	A	-
	WB LR	0.11	B	3	WB LR	0.08	B	2
	NB TR	0.14	A	0	NB TR	0.24	A	0
	SB LTR	0.01	A	0	SB LTR	0.00	A	0

As shown, traffic volumes at this intersection are expected to decline slightly compared existing conditions and the average vehicle delay (LOS) and capacity is expected to remain unchanged in comparison to option 2.

## 5. PARKING REVIEW

### 5.1 Parking Bylaw Requirements

Off-street parking requirements vary for different land uses by intensity and type of use. The District’s off-street parking requirements are outlined in its Zoning Bylaw (Bylaw 3210). Off-street parking requirements for the four land use options for Delbrook Lands have been calculated based on the Zoning Bylaw (or other sources, where required); **Table 5.1** summarizes the total off-street parking supply required for each of the land use options for comparison.

**Table 5.1: Off-Street Parking Bylaw Supply Requirements**

Land Use	Source	Parking Rate
Park	ITE Manual, Land Use 411 City Park	5.1 spaces per acre
Apartment / Townhouse	DISTRICT Zoning Bylaw	1 space per unit plus 1 space per 100m <sup>2</sup> residential floor area
Community Services	DISTRICT Zoning Bylaw	1 space per 35m <sup>2</sup> gross floor area for public assembly purposes
Day Care	Bunt Database	0.12 spaces per student for parent pick-up/drop-off plus approximately 0.75 spaces/staff member
Arts and Culture Facility	DISTRICT Zoning Bylaw	1 space per 12 m <sup>2</sup> for public assembly, plus 1 space per 45 m <sup>2</sup> for all other purposes

**Table 5.2: Off-Street Parking Requirements**

Land Use Option	Size	Required Parking Spaces
Existing Site	-	136
Option 1 – Parkland	4.3 acres	22 (1)
Option 2 – Housing	300 apartment units (24,600 sq m)	546 (2)
Option 3 – Community Service/Cultural	~18,700 sq ft community services ~18,700 sq ft arts & culture facility ~3.45 acres parkland	81-85 (3)
Option 4 – Housing/Parkland	28 units (townhouses) ~3.45 acres parkland	74 (1)

Notes:

(1) Many municipalities do not provide parking on-site for non-programmed park space if sufficient on-street parking supply along the site frontages is present to support anticipated demand. At the Delbrook site, approximately 30-35 on-street parking stalls would be available on West Windsor Road and Stanley Avenue combined (on the site frontage) to support a park use and therefore the Option 1 supply on-site could be reduced by 22 stalls and the Option 4 on-site supply could be reduced by 18 stalls.

(2) The District’s current bylaw rate for multi-family development results in a supply rate of 1.8 to 1.9 stalls per unit depending on the residential floor area. While considered suitable for townhouses, this is not considered suitable for apartment units where 1.1 to 1.5 stalls per unit, depending on unit size, would be more appropriate for this site. Based on these rates, approximately 390 parking stalls could be sufficient for the site assuming 50% 1 bedroom and 50% 2-3 bedrooms.

(3) Dependent on the number of staff members at the day care (assume 10).

In summary, there is quite a range in parking requirements for the different land use options for Delbrook Lands with option 2 (housing) having the highest requirement at 390 - 546 parking spaces, while option 1 (parkland) would have the lowest requirement at only 22 parking spaces. In the case of option 2, it would be likely that all parking stalls would be provided underground; in option 4, it may be possible and appropriate to provide resident parking in surface garages and visitor parking in surface stalls. In options 1 and 4, if parking stalls on-site are to be provided for parkland, it would likely be at surface level. Option 3 would likely provide parking at surface, as combined surface/underground or all underground.

## 5.2 Shared Parking Opportunities

On sites with mixed uses, there are often opportunities to reduce overall parking supply requirements by sharing a common pool of parking, if appropriate. In the case of the four future land use scenarios, there are limited sharing opportunities, except for option 3. Day care facilities tend to have intense peak parking demands during the weekday morning drop off and peak afternoon pick up periods. Outside of these periods, these drop-off and pick-up spaces could be used to support demands of other community facility uses; certainly after operating hours of the day care (evenings and weekends), these stalls could be made available for other site users.

## 6. ALTERNATIVE MODES OPPORTUNITIES

As noted in Section 2 there are a number of existing conditions for pedestrians, cyclists and transit users around the Delbrook Lands site which could be improved with the redevelopment of the site. **Table 6.1** identifies existing conditions adjacent to the site for walking, cycling, and transit along with some potential opportunities. These opportunities are discussed in more detail below in the following sections.

**Table 6.1: Walking, Cycling & Transit Existing Conditions & Opportunities Matrix**

Walking		Cycling		Transit	
Existing Conditions	Opportunities	Existing Conditions	Opportunities	Existing Conditions	Opportunities
<ul style="list-style-type: none"> <li>- Narrow sidewalks on site frontages;</li> <li>- Missing sidewalks;</li> <li>- Long pedestrian crossings of busy streets at key locations; and</li> <li>- Multiple vehicle oriented driveway crossings on site frontages.</li> </ul>	<ul style="list-style-type: none"> <li>- Provide wider sidewalks on site frontages (i.e. 2.0m minimum);</li> <li>- Add sidewalks to address gaps in pedestrian network where possible near the site;</li> <li>- Shorten pedestrian crossings with curb bulges or pedestrian refuges in centre medians; and</li> <li>- Reduce number of driveways, ensure good sightlines to pedestrians at crossings, carry sidewalk across driveway to give priority to pedestrians</li> </ul>	<ul style="list-style-type: none"> <li>- Lack of formal on-street cycling facilities;</li> <li>- Incomplete cycling network; and</li> <li>- Steep cycling grades in the area may prevent cycling by a wider group.</li> </ul>	<ul style="list-style-type: none"> <li>- Develop formal on-street cycling facilities adjacent to site where possible (i.e. painted bike lanes/sharrows; cycle tracks/buffered bike lanes; or multi-use paths;</li> <li>- Follow North Vancouver Bicycle Master Plan planned cycle routing to complete cycling network in the area; and</li> <li>- Provide widened cycling facilities where challenging uphill grades exist.</li> </ul>	<ul style="list-style-type: none"> <li>- Lack of consistency between transit stop facilities (i.e. not all with benches, shelter or passenger info);</li> <li>- Reduced visibility of pedestrian connections near transit site(i.e. Delbrook/West Windsor crossing);</li> <li>- Lack of visibility to transit facilities near site.</li> </ul>	<ul style="list-style-type: none"> <li>- Upgrade nearby transit stop facilities to include consistent and coherent elements (i.e. shelter/weather protection; seating; passenger travel information etc.);</li> <li>- Improve pedestrian visibility at crossings near site (i.e. shorten crossing distance; increase visibility, trim vegetation etc.);</li> <li>- Provide way-finding signage on-site to direct transit users to nearby facilities; and</li> <li>- Provide minimum 3.0m wheelchair pad space at stops.</li> </ul>

### 6.1 Walking

In general, the Delbrook Lands site is surrounded by lower volume collector streets to the north (West Windsor Road) and east (Stanley Avenue) which characterize a safe walking and cycling environment. However, there is an opportunity to improve the pedestrian environment and encourage active transportation for all users as new land uses are considered for this site.

## Sidewalk & Boulevards

When a new land use is implemented at the site, it is recommended that all new sidewalks along the site frontage be at least 2.0m wide and preferably wider, up to 3.0m on frontages next to buildings with community, cultural and day care facilities. It is also recommended that sidewalks be set back from the curb to provide a landscaped buffer between pedestrians and parked vehicles and moving vehicles in travel lanes along Delbrook Avenue and the remaining portions of West Queens Road. In order to provide a pleasant walking environment, shade trees should be considered, which would require widening existing and new boulevards to 2.5m to 3.0m in width. Additional roadway dedication on some frontages may be required for this, however the additional boulevard would assist in ensuring sufficient space is available for street furniture, transit shelters, and other amenities.

## Pedestrian Crossings

On the south frontage, West Queens Road is a busy major arterial street with high traffic volumes moving at higher speeds, as compared to the adjacent collector streets. Similarly, Delbrook Avenue to the west of the site is a minor arterial street with higher volumes and speeds, as compared to the adjacent collector streets. Presently, and upon implementation of new land uses at the site, the primary barrier to walking will be crossing these busier streets.

Potential crossing improvements for pedestrians, cyclists and transit users near the site can therefore be considered where the adjacent collector streets meet with the major and minor arterial streets. In particular, uncontrolled pedestrian crossings on Delbrook Avenue at West Windsor Road and on West Queens Road at Stanley Avenue are two candidate locations for further study to better understand how pedestrians will continue to access the site. **Exhibits 6.1** and **6.2** highlight conceptual design alternatives for consideration.

Alternative pedestrian crossing design options to consider for both candidate locations include:

- Option 1 – curb bulges
- Option 2 – centre median with pedestrian refuge

Benefits and drawbacks for implementation at Delbrook Avenue/West Windsor Road option are summarized in **Table 6.2**.

**Table 6.2: Pedestrian Crossing Alternative Comparison (Delbrook Avenue/West Windsor Road)**

Option	Benefits	Drawbacks
<b>Option 1 – Curb Bulge</b>	<ul style="list-style-type: none"> <li>- Significant reduction of pedestrian crossing distance;</li> <li>- Increases visibility of pedestrians at crossing;</li> <li>- Provides horizontal deflection of vehicles to help reduce speeds approaching crossing; and</li> <li>- Provides space for landscaping/pedestrian refuge area.</li> <li>- This option would benefit from the addition of a centre median north of the crosswalk to assist with the centre line realignment south of the crosswalk.</li> </ul>	<ul style="list-style-type: none"> <li>- Impacts parking on west side of Delbrook Avenue south of the crossing for Delbrook Park (would result in a loss of around 6-7 parking stalls); and</li> <li>- Moves bus stop farther south away from the crossing</li> </ul>

Option	Benefits	Drawbacks
<b>Option 2 – Centre Median</b>	<ul style="list-style-type: none"> <li>- Reduces pedestrian crossing distance;</li> <li>- Reduces waiting time;</li> <li>- Encourages slower vehicle speeds with narrowed travel lanes;</li> <li>- Maintains current bus stop location; and</li> <li>- Does not impact parking on West side of Delbrook.</li> </ul>	<ul style="list-style-type: none"> <li>- Some pedestrians may feel vulnerable in centre median refuge;</li> <li>- Only moderate reduction in pedestrian crossing distance; and</li> <li>- Does not significantly improve visibility.</li> </ul>

Benefits and drawbacks for implementation at West Queens Road/Stanley Avenue are summarized in **Table 6.3**.

**Table 6.3: Pedestrian Crossing Alternative Comparison (West Queens Road/Stanley Avenue)**

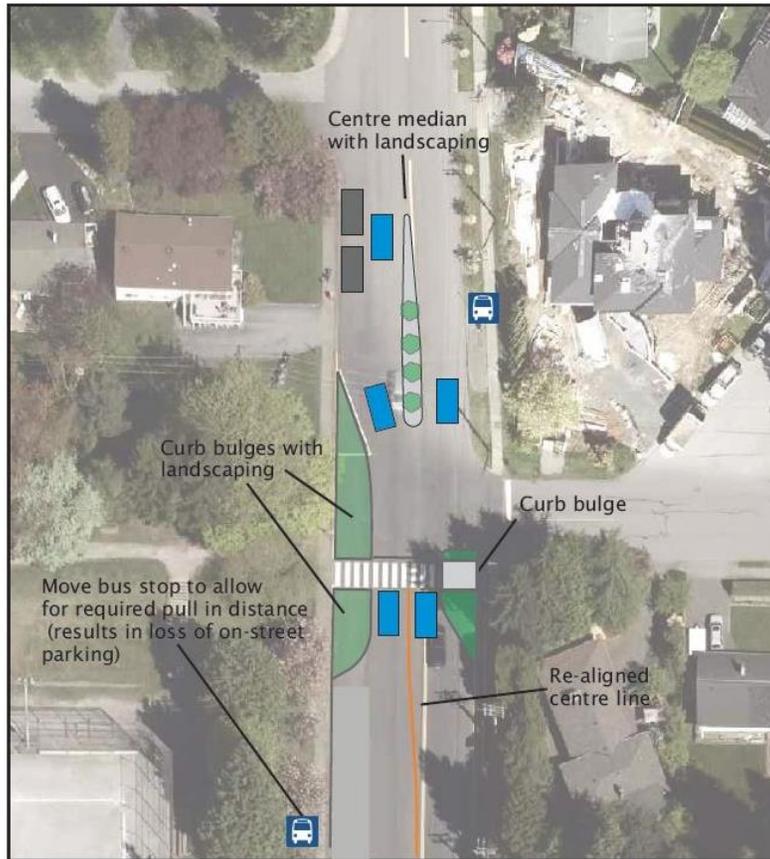
Option	Benefits	Drawbacks
<b>Option 1 – Curb Bulges</b>	<ul style="list-style-type: none"> <li>- Significant reduction of pedestrian crossing distance;</li> <li>- Increases visibility of pedestrians at crossing; and</li> <li>- Provides space for landscaping/pedestrian refuge area.</li> </ul>	<ul style="list-style-type: none"> <li>- May impact bus stop location and result in shift farther west, away from the crossing</li> </ul>
<b>Option 2 – Centre Median</b>	<ul style="list-style-type: none"> <li>- Reduces pedestrian crossing distance and waiting time;</li> <li>- Increases visibility of pedestrians at crossing;</li> <li>- Encourages slower vehicle speeds with narrowed travel lanes; and</li> <li>- Maintains current bus stop location.</li> </ul>	<ul style="list-style-type: none"> <li>- Some pedestrians may feel vulnerable in centre median refuge;</li> <li>- Only moderate reduction in pedestrian crossing distance;</li> <li>- Does not significantly improve visibility.</li> </ul>

With each of the above options, either it would be possible to upgrade the pedestrian control crossing signage/markings by providing a “Special Crosswalk” installation which has side mounted or overhead flashers to provide active warning to oncoming drivers that a pedestrian will be entering the cross walk. It is recommended that formal pedestrian crossing warrant studies be conducted at both locations to establish the most appropriate control for each location, ensuring consideration of pedestrian demands during events at the adjacent field to the west and during weather conditions that encourage active travel.

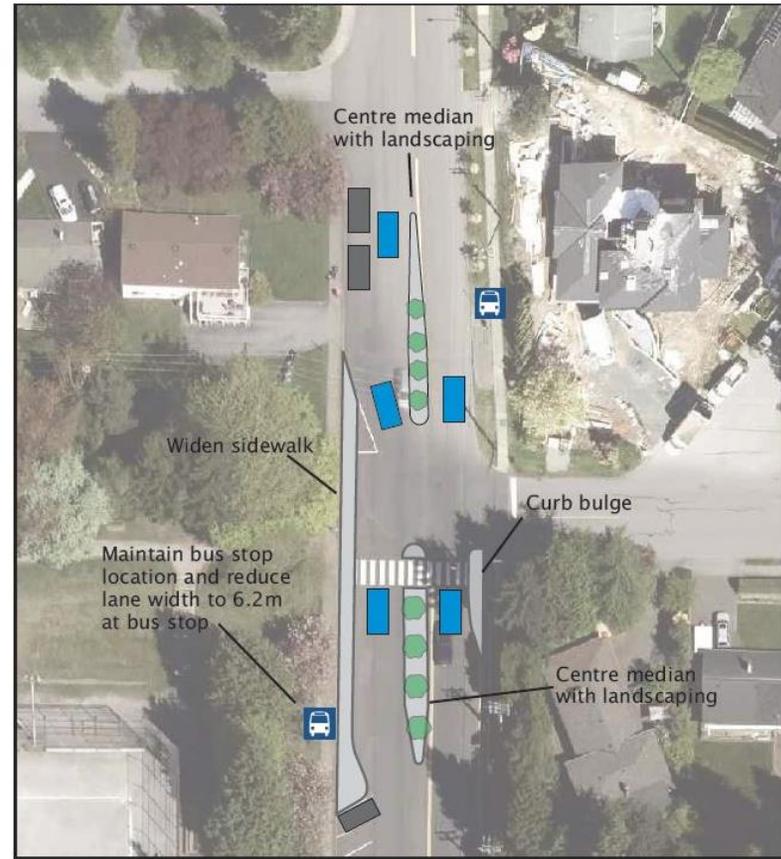
# Exhibit 6.1: Delbrook Avenue and West Windsor Road Pedestrian Crossing Design Options



### Option 1: Curb Bulge w/ Centre Median



### Option 2: Centre Median

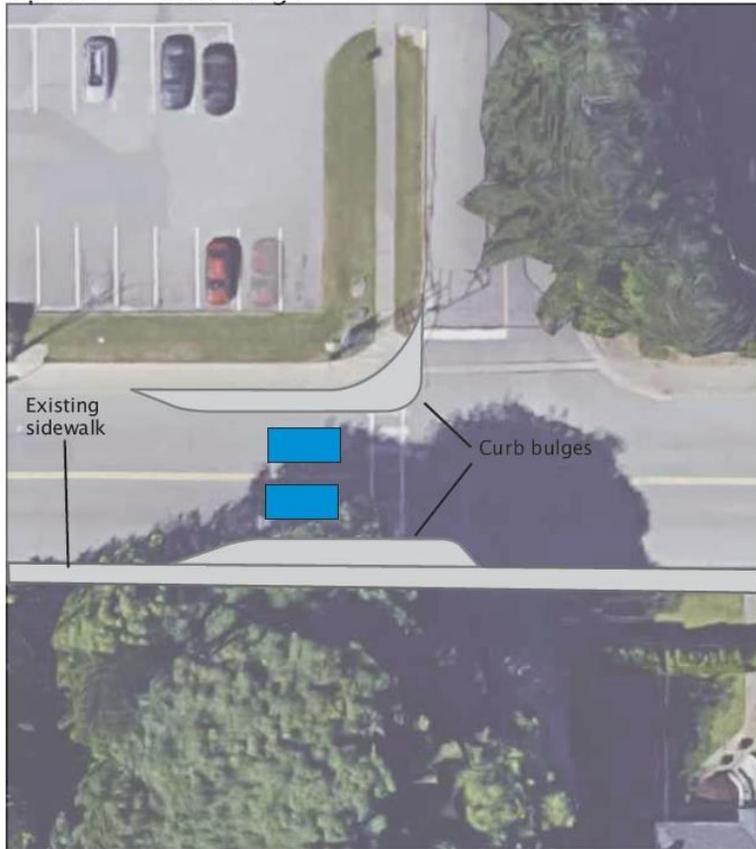


Note: A raised pedestrian crossing could be utilized with either scenario.

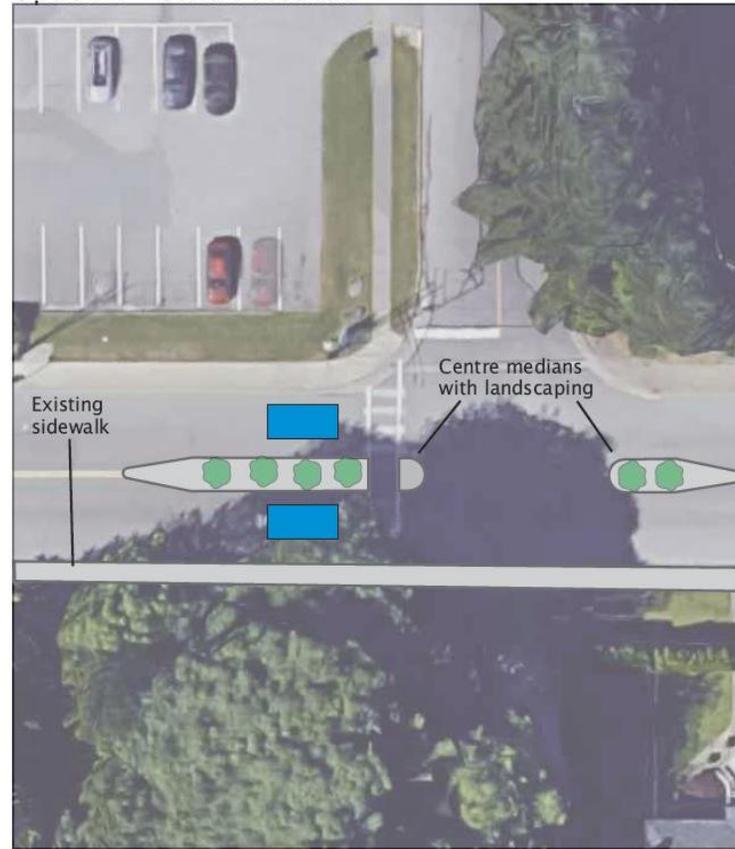
# Exhibit 6.2: West Queens Road and Stanley Avenue Pedestrian Crossing Design Option



### Option 1: Curb Bulges



### Option 2: Centre Median



### Site Access Points

In addition to pedestrian crossings along busy arterial and collector streets, other locations such as site access points may prove to be future candidates for crosswalk treatments. The number of site accesses would vary between the potential land use options and would be based on differing parking needs. Options with fewer driveways would have fewer sidewalk obstructions. For instance, the parkland use, which will have the lowest site trip generation and the lowest parking requirements, would have the fewest driveway connections (if any), and fewer potential points of conflict for pedestrians/cyclists/transit users. Parking for this option would likely rely primarily on on-street parking located on each of the site frontages.

The high-density housing use would have the highest trip generation (excluding existing site uses) and highest parking requirement. However, as the parking for apartment units will likely be provided underground, there will likely be one or two access points if the site is developed in one phase. If developed in multiple phases, there could be additional site access points. The site access points for this option would need to be carefully designed to encourage a safe and comfortable pedestrian environment (i.e. level crossing, high visibility, and additional considerations).

It is noted that each of the four land use scenarios under consideration would generate lower traffic volumes at their site driveways than the existing site currently does. While pedestrian trip generation was not part of this study, it is expected that compared to the proposed land uses, the existing site uses likely generate higher pedestrian volumes than any of the future site options (except possibly, the housing option). Finally, each site option would likely have fewer site access driveways than today.

## 6.2 Cycling

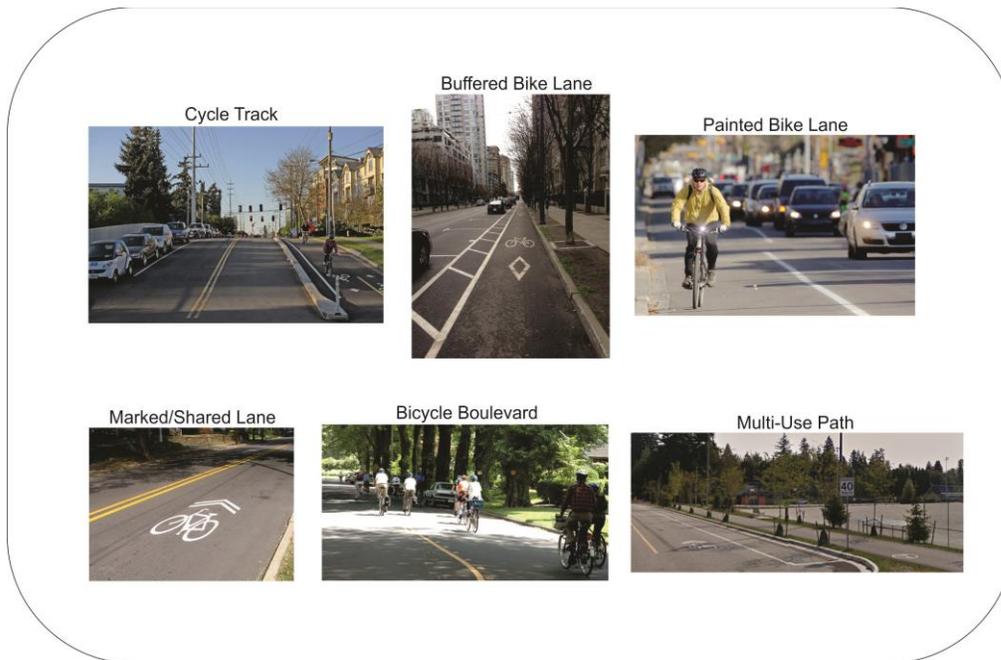
### On-Street Cycling Facilities

As noted in Section 2.1, there is a lack of formal on-street cycling facilities near the site which likely results in a lower cycling mode share than if visible, protected, and functional cycling facilities were present. Cycling facilities that may be appropriate near the Delbrook Lands site and along the site frontages given the context and space available could include:

- Cycle tracks or buffered bike lanes (Delbrook Avenue);
- Painted bike lanes (West Queens Road);
- Marked/shared lanes (West Windsor Road; Stanley Avenue; West Kings Road); and,
- Multi-use path (West Windsor Road site frontage; Stanley Avenue site frontage)

**Figure 2** provides examples of the types of facilities that could be implemented near the Delbrook Lands site.

**Figure 2: Bicycle Facility Types**



### **Incomplete Cycling Network and Planned Routes**

The combination of a lack of formal cycling facilities on-street near the site and an incomplete network of signed routes makes it challenging for cyclists to navigate to/from the site by bicycle.

As shown on Exhibit 2.1, there are gaps in the cycling network near the site on Westview Drive south of West Queens Road, on West Queens Road east of Delbrook Avenue including along the site frontage, and on Stanley Avenue south of West Kings Road. The District has plans to expand the cycling network to provide coverage along these existing gaps however, the timing of these projects remains unclear.

In terms of off-street bicycle routes, the development of the majority of the site as parkland in Option 1 would provide an opportunity to develop a 4.0m wide multi-use pathway through the site.

### **Bicycle Parking for Development Options**

As with vehicle parking, different land uses for the development options will command different levels of bicycle parking demand. Similarly where a new use might generate more vehicle traffic, it likely also generates higher bicycle traffic. Sufficient infrastructure for bicycle parking would then be required to meet this demand. **Table 6.4** summarizes the bicycle parking requirements for the different development options.

**Table 6.4: DNV Bicycle Parking Requirements**

Development Option	Size	Bicycle Parking Rate		Required Bicycle Parking Spaces	
		Class 1	Class 2	Class 1	Class 2
Option 1 – Parkland	4.3 acres	n/a	n/a	n/a	n/a (1)
Option 2 – Housing	300 apartment units (24,600 sq m)	1 space per unit (minimum)	0.2 spaces per unit	300	60
Option 3 – Community Service/Cultural	~18,700 sq ft (1,737 sq m) community services ~18,700 sq ft (1,737 sq m) arts & culture facility ~3.45 acres parkland Day care	n/a	- 6 spaces per 1,500 sq m gfa (comm. serv.) - 6 spaces per 1,000 sq m gfa (arts and culture)	n/a (2)	12
Option 4 – Housing/Parkland	28 units (townhouses) ~3.45 acres parkland	1 space per unit (minimum)	0.2 spaces per unit	28	6 (1)

(1) While there is no bicycle parking rate for parkland uses in the District, a neighbourhood park with playgrounds and other communal uses would generally have bicycle racks available for park users. A park of this size would ideally have 2-3 bicycle racks spread across the site at strategic locations.

(2) Class 1 bicycle parking rates are not specified in the District’s Zoning Bylaw 3210 as this is generally determined on a case by case basis; however District’s new Multi-family development parking policy identifies a minimum Class 1 bicycle parking rate for multi-family residential uses which is 1 space per unit. It may be possible that there would be Class 1 bicycle parking requirements for the proposed community service, arts and culture, and day care facilities given their employment based uses however a rate is not known for these uses.

As shown, option 2 would therefore have the highest bicycle bylaw parking requirement at 300 Class 1 spaces (secured long-term parking for residents), and 60 Class 2 spaces (convenient short-term parking for visitors).

End-of-trip facilities could be considered for the other uses on the site, although these are not addressed in the District bylaw. For land use options with employment, the following should be considered:

- Showers;
- Wash basins;
- Clothes Lockers;
- Bike lockers; and
- Bicycle repair/maintenance equipment.

For land use options with parkland, the following should be considered:

- Short term bicycle parking in racks (6 spaces are noted in table above);
- Benches/rest areas; and
- Way-finding signage.

## 6.3 Transit

Existing transit service to the site was summarized in **Exhibit 2.1** with bus routes #232, and #246 providing medium-frequency local and regional connections to/from the site with stops on West Queens Road and Delbrook Avenue. In terms of future services planned, TransLink's North Shore Area Transit Plan identifies West Queens Road as a potential Frequent Transit Network service route. This would further improve transit connectivity to/from the site for key destinations.

The main opportunities for improving the safety, comfort and efficiency of use for transit users to/from the site as outlined in Table 6.1 include:

- Upgrading nearby transit stop facilities to ensure consistent services and infrastructure (i.e. shelter/weather protection; seating; passenger travel information etc.);
- Improving pedestrian crossing conditions near the site (i.e. shortened crossing distance; increased visibility etc.) as outlined in Section 6.1; and
- Providing way-finding signage on-site to direct transit users to nearby facilities.

## 7. SUMMARY

### 7.1 Existing Traffic Conditions

- Local intersections on Stanley Avenue and West Windsor Road operate very well and are within acceptable thresholds for delay and capacity. The intersection of West Queens Road and Delbrook Avenue, while experiencing much higher levels of traffic, also function within acceptable levels of delay and capacity with the aid of a traffic signal.

### 7.2 Land Use Option Trip Generation & Future Traffic

- Land use option vehicle trip generation ranges from the lower end for option 1 (parkland) at 15-20 vehicle trips per hour, to the higher end for option 2 (high-density housing) at around 150 - 175 vehicle trips per hour during the morning and afternoon peak hours.
- Trip generation for option 2 would be less than the existing Delbrook Lands site's trip generation of around 190 vehicle trips per hour in the morning and afternoon peak hours, and would result in slightly lower traffic flow on the adjacent streets and intersections.
- Adjacent intersections would experience nominal changes in operations with slightly less average vehicle delay and slightly greater capacity with the development options compared to existing site traffic volume.

### 7.3 Parking

- On-site parking requirements for the different land use options would, similarly to vehicle trip generation, range from the lower end for option 1 (parkland) at 22 parking spaces, to the higher end for option 2 (housing) at 390 to 546 parking spaces.

- There are limited shared parking opportunities, except for option 3. Outside of day care peak morning drop-off and afternoon pick-up, this parking could be used to support demands of other community facility uses.

#### 7.4 Pedestrians

- There are narrow sidewalks along the north and east site frontages with no sidewalks on the opposite sides of some streets. Sidewalks are lacking on surrounding local streets but their low volume, low speed characteristics make them conducive to walking. Sidewalks should be widened on site frontages where possible to further encourage walking to/from the site.
- Existing crossing conditions at Delbrook Avenue and West Windsor Road crosswalk are characterized by limited sightlines on Delbrook Avenue to the north and higher vehicle speeds approaching the crosswalk, and should be addressed with a redesign of this crosswalk. A special crosswalk with flashing beacons may be warranted and the crossing distance should be narrowed and combined with traffic calming measures (i.e. curb bulges, or centre median islands with pedestrian refuge) to improve pedestrian comfort and safety at this existing marked crossing. A pedestrian crossing warrant analysis should be conducted to confirm pedestrian demands during normal conditions and on event days.
- Similar improvements should be made at the West Queens Road and Stanley Avenue pedestrian crossing to help facilitate improved pedestrian connections to/from the site. A pedestrian crossing warrant analysis should also be considered for this location.
- Site access points should be designed to reinforce pedestrian priority with narrow, leveled pedestrian crossings at driveways with adequate sightlines between vehicles and pedestrians.

#### 7.5 Cyclists

- Lack of formal on-street cycling facilities combined with gaps in the cycling network and steep uphill grades near the site may make it challenging for people of all ages and abilities to cycle to/from the site. The North Vancouver Bicycle Master Plan identifies planned routes to help fill in gaps in the cycling network near the site.
- Enhanced on-street facilities like cycle tracks/buffered bike lanes or painted bike lanes should be considered on higher volume streets like Delbrook Avenue and West Queens Road, while multi-use paths (site frontage), or shared use lanes could be considered on West Windsor Road and Stanley Avenue where lower vehicle volumes exist.
- Bicycle parking and end-of-trip facilities should be provided to meet the needs of the land use options being considered to help encourage more active travel to the site.

#### 7.6 Transit Users

- Improvements in the pedestrian network and at key connections will enhance connectivity to/from the site for transit users.
- Upgrading bus stop facilities near the site with consistent amenities including shelters; seating; passenger information etc. will improve transit user experience for visitors to the site.