TRANSPORTATION PLANNERS AND ENGINEERS

UBC Okanagan Master Plan
Transportation Summary

Draft Report

Prepared for
University of British Columbia

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1. INTRODUCTION

Bunt & Associates has been retained by the University of British Columbia (UBC) Campus + Community Planning department to assist with transportation planning at the Okanagan Campus in Kelowna, BC. A master plan for the campus was developed initially in 2005 and updated in 2009 with a view towards 2020; however, no detailed consideration was made on how future transportation demands would be managed or how the internal street and parking systems would function as student numbers increase.

This report serves as a reference document to assist with understanding existing transportation patterns at the campus along with current and future transportation infrastructure changes that are expected to influence demands and allow for the university to grow over time in a sustainable way.

To understand the implications of population growth, a campus build-out scenario was tested whereby the campus almost doubles to 15,000 FTE students to see its impact on parking and transit demand along with understanding what walking, cycling, transit, and road connections would be required to meet future demands.

This report will provide a valuable reference point for ongoing workshops and the design development of the campus throughout this master planning process.

1.1 Site Context

The University of British Columbia Okanagan Campus is located on the northern edge of Kelowna and close to Kelowna International Airport (YLW), as highlighted at **Figure 1.1**. It is positioned adjacent to Highway 97, which is the Provincial Highway connecting Kelowna to Vernon and beyond to Highway 1.

Travel distance to the downtown is around 8.5 kilometres and is accessed from Highway 97 where grade-separated ramps (accommodating vehicle movements to/from the south) are located at the southeast corner of the campus, while vehicle movements to/from the north are accommodated primarily at the traffic signal connection at University Way and Highway 97.

Surrounding uses to the site are currently limited but there are development plans near the campus that will change this situation. Presently, open space along with several single-family homes are located to the west; a new business area and Quail Ridge (residential community) are north of the campus; Highway 97, Kelowna Airport, and farmland are to the east; and farmland and a new residential development (with some commercial) are located to the south.

In the coming years the immediate environs will be in transition with new street connections expected to better integrate the campus with the surrounding urban areas. The University also owns land to the west (currently open space) that could accommodate future growth.

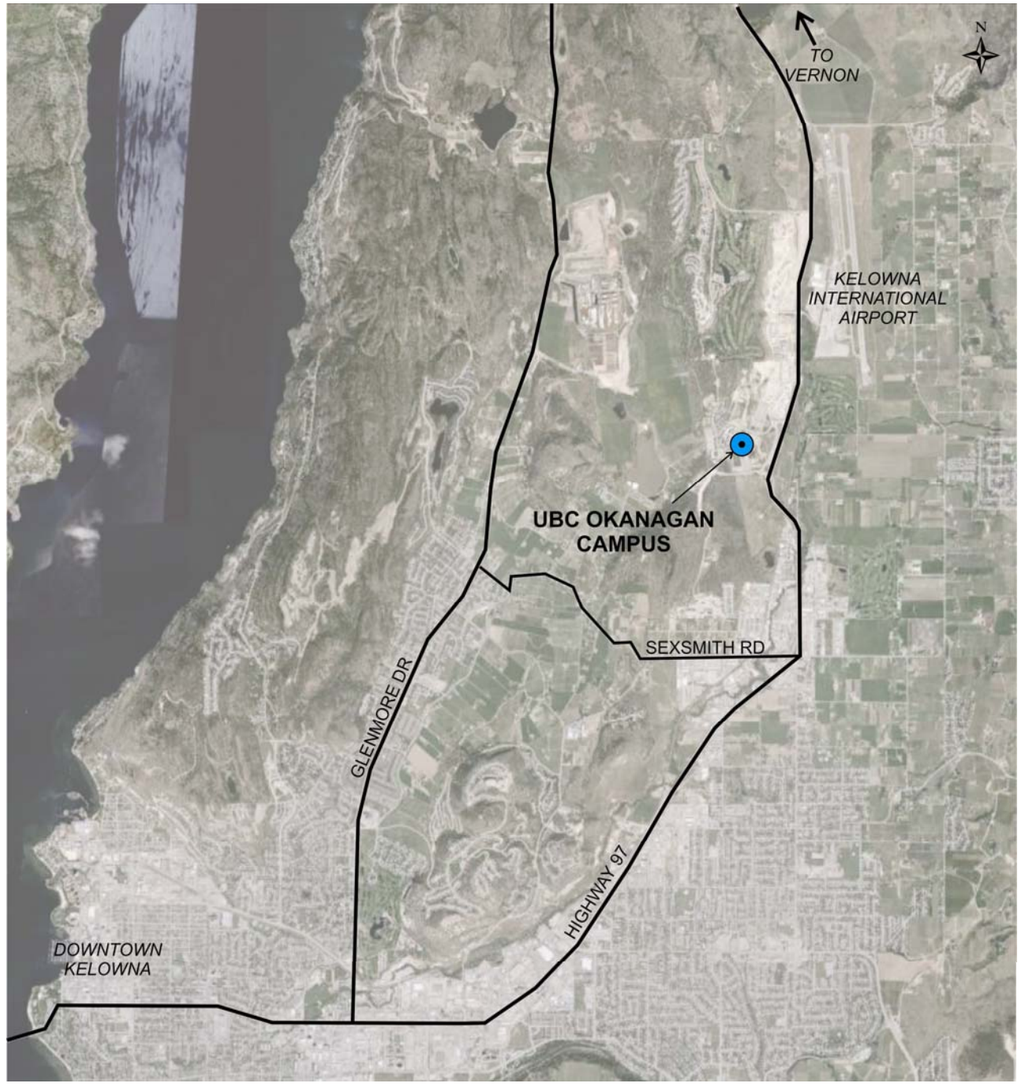


Figure 1.1: Site Context

Figure 1.2: Campus Map

1.2 Campus Layout

The campus map is highlighted at **Figure 1.2**, highlighting the main buildings, transit, streets, and parking lots, with the main concentration of buildings and activity located south of University Way, between Discovery Way and Alumni Avenue. Student residences are located in the northwest part of the campus.

Internal circulating streets are primarily made up of University Way, Discovery Avenue, Alumni Avenue, John Hindle Drive, and Hollywood Road North. All are two-way roads with one travel lane per direction. North Hollywood Road's connections with John Hindle Drive and University Way are roundabout controlled while all other internal connections are minor stop controlled. Raised crosswalks are located on the higher volumes routes of University Way and Alumni Avenue.

The main parking areas are located to the north (Lots H and F) and west (Lots C, G and S) parts of the campus, while the student residences has its own separate parking, located in the northwest corner.

The transit exchange is located on the west side of Alumni Avenue, south of University Way, and adjacent to the Library and Administration buildings.

1.3 General Statistics

In the Fall 2013 semester there were 8,400 students; comprising 88 percent of the campus population, with staff and faculty making up the balance (see **Figure 1.3**). The student number of 8,400 covers both full-time and part-time students and is equivalent to 7,400 FTE students which is the measure used throughout this report.

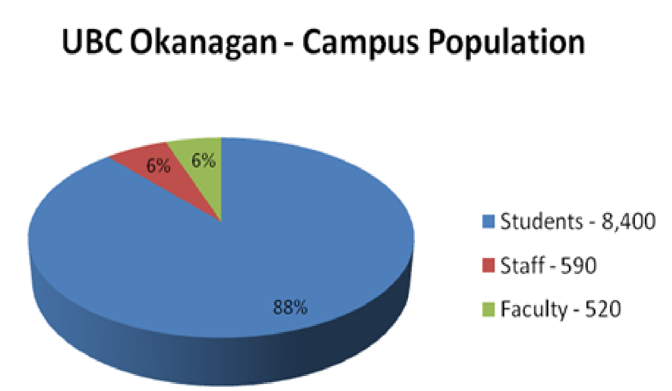


Figure 1.3: Campus Population

Since the Fall of 2008, the university has experienced significant growth in student numbers, rising from approximately 4,500 to 8,400 - an almost doubling in number (see **Figure 1.4**). This magnitude of increase has placed particular challenges on the transportation network at the campus during peak travel times, and especially in the morning peak period (7:30am to 8:30am) on the road network, and more generally throughout the day with transit demand.

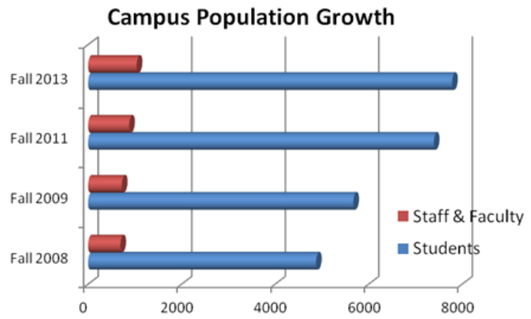


Figure 1.4: Campus Population Growth

UBC Okanagan has a healthy proportion of residential beds to students at around 22 percent compared to other British Columbia Universities reviewed (see **Figure 1.5**). This position is likely influenced by the limited opportunity to walk to the campus from surrounding residential neighbourhoods. Quail Ridge currently connects to the campus via an informal trail used by students, while Academy Way to the south is starting to develop and a connection would be beneficial.

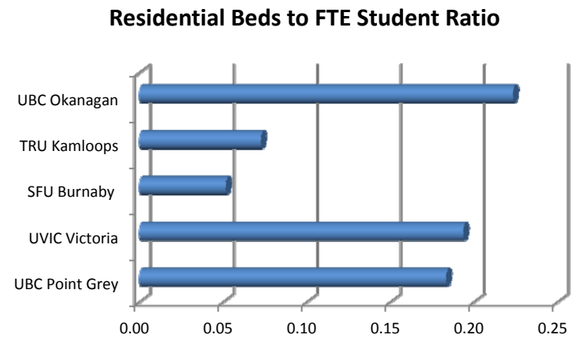
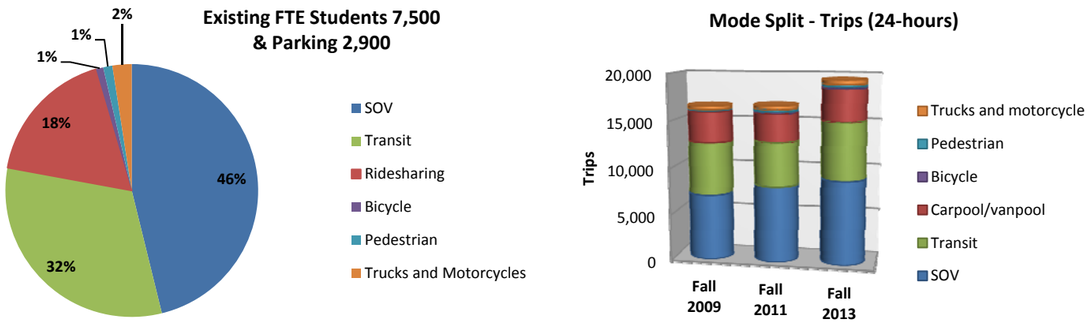


Figure 1.5: Residential Beds per Student

1.4 Travel Patterns

In the Fall 2013 semester, single-occupant vehicles (SOV) made up 46 percent of the daily demands at the campus, while transit at 32 percent was the next biggest contributor (see **Figure 1.6**). At the time there were 7,400 full-time equivalent (FTE) students on the campus along with approximately 2,900 parking spaces.



Figures 1.6 & 1.7: Travel Mode Split

Walking and cycling play only a minor travel role, which can be attributed to the limited walking opportunities from adjacent neighbourhoods and the lack of cycling route connections that are direct or safe to use. These will be important considerations moving forward.

Over the past 4 years (between Fall 2009 and Fall 2013), travel proportions for each mode have remained similar (see **Figure 1.7**), but in Fall 2011, transit use dropped in part due to changes in bus services.

2. STREET CONNECTIONS

Existing and future street network connections are presented in this section to inform the shape of how the campus can grow in a safe, sustainable, and integrated manner (See **Figure 2.1**). It will also highlight vehicle arrival patterns with a particular focus on the weekday morning and afternoon peak-hour periods to understand pressure points on the road network.

2.1 Street Network

Highway 97 runs along the east side of the campus, providing vehicle access at the following three locations:

- Grade-separated interchange located at John Hindle Drive and Hollywood Road North at the southeast corner of the campus with ramps for vehicles entering and exiting to/from the south.
- Traffic light at University Way, restricted only to vehicle movements to and from the north on Highway 97.
- Traffic light at Airport Way (full movements) with access to the campus via Innovation Drive and with future development plans could be upgraded to grade-separated interchange (developer funded).

A number of new road connections are expected to improve permeability and spread demands in the future as described below.

John Hindle Drive is a new road connection running east-west between Glenmore Drive and Highway 97. It is expected to have 2 travel lanes (one per direction) along with left-turn travel lanes at key points. The City of Kelowna is progressing with the design and consulting with the university. Completion is expected in 2017.

At the south interface with the campus, the City plan highlights two new roadways that will connect between Sexsmith Road and John Hindle Drive, providing alternatives to using Highway 97 to the south, including for walking, cycling, and transit.

Bulman Road, located to the east of Highway 97, will provide a connection from Sexsmith Road to the Airport without the need to use the highway, and again provides more travel options, especially for cycling and transit.

Innovation Drive to the north of the campus (towards the Airport) provides an alternative connection to the north. This will be realigned to the west of the industrial buildings to avoid driveways of the units and provide a stronger connection to the traffic light at Highway 97 and the Airport.

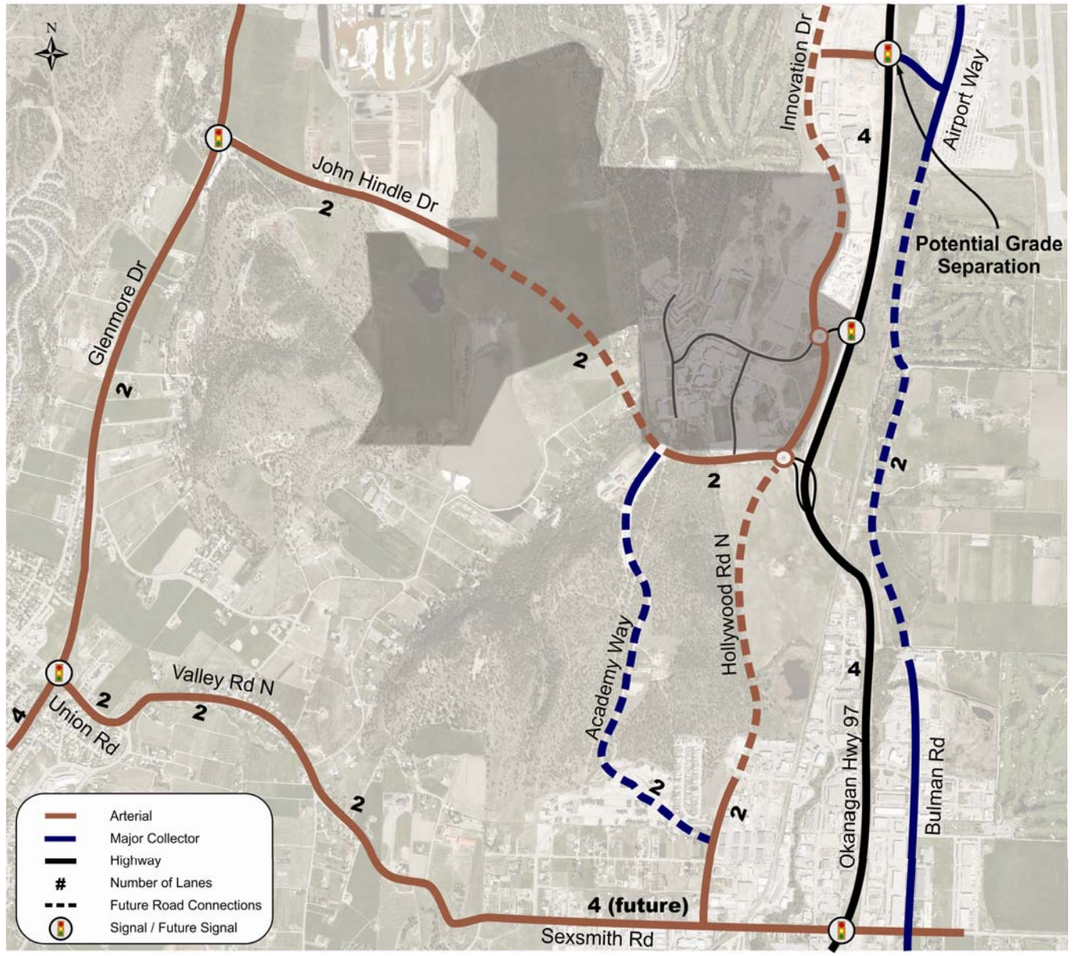


Figure 2.1: Street Connections Existing and Planned (External)

2.2 Vehicle Flows

Based on data provided by the UBC Okanagan from their biennial transportation reports, the weekday peak-hours for vehicle movements associated with the campus were confirmed as:

- Morning – 7:30am to 8:30am
- Afternoon – 4:30pm to 5:30pm

Peak-hour vehicle flows increased from 2009 to 2011, while 2013 was similar to the levels of 2011 (see **Figure 2.2**) campus population grew over this time period by around 30 percent but this has not been reflected in the peak-hour vehicle demands and shows that there are influences dampening peak demand such as more transit use, students staying on campus, or lower attendance rates at classes.

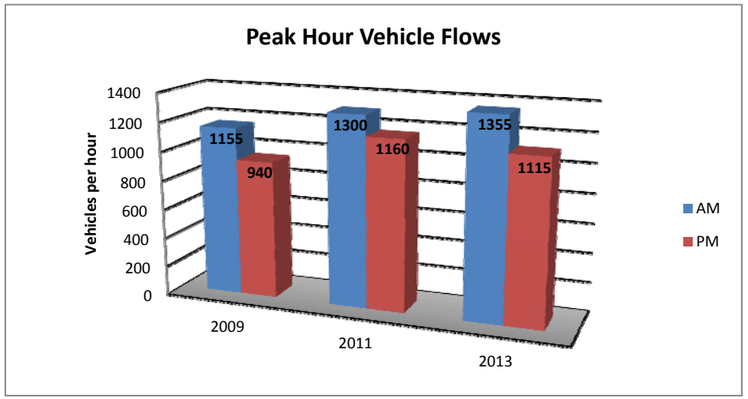


Figure 2.2: Peak Hour Vehicle Flow Trends

Figure 2.3 demonstrates the daily vehicle flow profile for the campus which highlights the AM peak period being more accentuated than the PM one. The increase shown at the AM peak in Fall 2013 over Fall 2011 is due to changes in class times and scheduling, while the overall number of vehicles during the morning period (i.e. 7:30am to 9:30am) remained relatively flat.

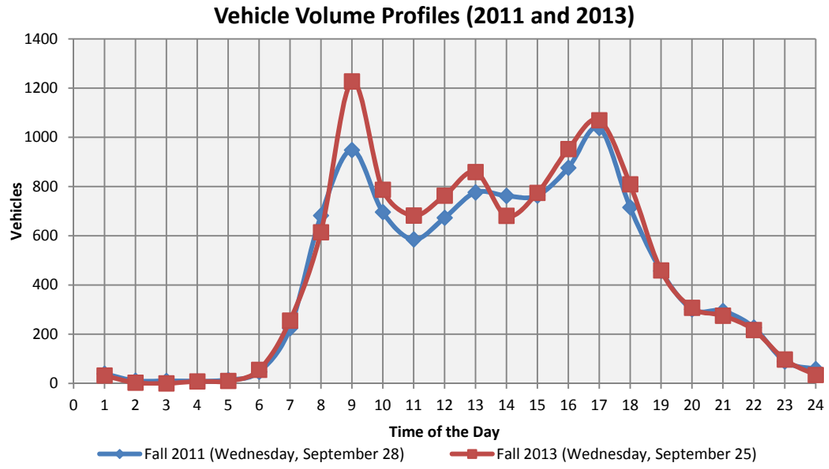


Figure 2.3: Vehicle Volume Profile

Vehicle patterns at the campus for the Fall 2013 semester (see **Figures 2.4** and **2.5**) highlight the dominant flow to/from the south, i.e. toward Rutland and Downtown Kelowna, with around 85 percent of all vehicle movements arriving/departing in the peak-hour periods. The remaining balance of 15 percent is to/from the north, i.e. toward Lake Country and Vernon.

With this high vehicle flow from the south, the Highway 97 northbound off-ramp is placed under particular pressure at its roundabout with John Hindle Drive and Hollywood Road North during the weekday morning peak period. The roundabout has a single-lane entry from the Highway 97 ramp and this constraint manifests in a slow moving vehicle queue that backs toward Highway 97 (northbound), and especially with the concentrated demand generated at class start times.

Aberdeen Hall Preparatory School has added to the queuing demand at the Highway 97 off-ramp in the morning period, contributing to approximately nine percent of all vehicle movements at peak times.

The City of Kelowna is reviewing options to improve throughput at this roundabout, which will be discussed with the university over the summer. Looking further ahead, this roundabout will need to be reconfigured with the completion of John Hindle Drive to Glenmore Drive along with Hollywood Road North extending south to Sexsmith Road.

Equally important will be that the extensions of John Hindle Drive (westward), Hollywood Road (southward), and Academy Way (southward) will provide more options for arriving and leaving the campus from the south and west, therefore relieving some of the concentrated pressure placed at the roundabout today during peak times.

Vehicle movements entering the campus from the south predominantly use Hollywood Road North to access the main parking lots, located in the north and west sectors. Alumni Avenue has significantly less use in vehicles accessing the main parking lots to the west and north, where the volume is only around 80 vehicle movements in the peak hours, or under 1.5 vehicles per minute. However, it still provides an important connection within the campus for vehicles and truck servicing.

More generally, the orientation of parking on the west and north sectors of the campus mean that the majority of people need to drive the length of the campus to park. The John Hindle Drive extension will assist in providing a more direct connection to the west parking lots without the need to use either University Way or Alumni Avenue, while new parking opportunities at the south of the campus could be explored.

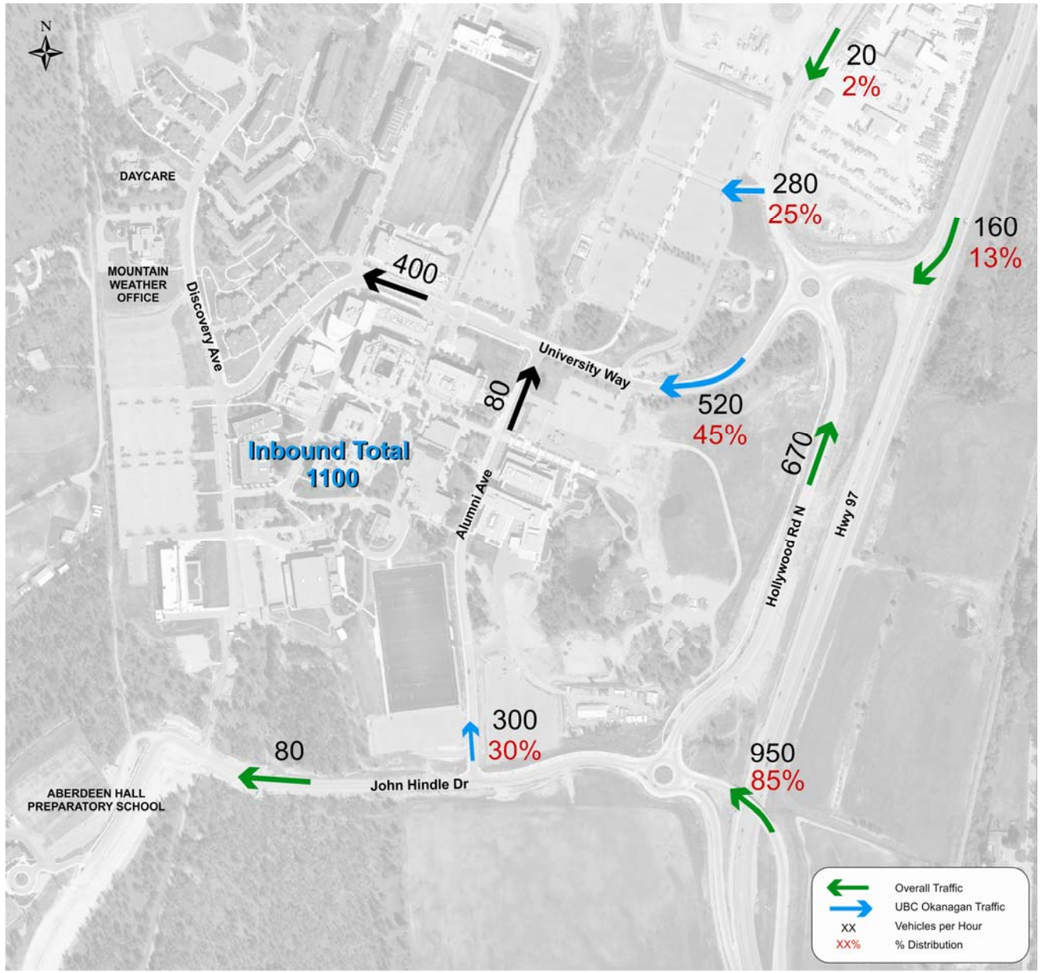


Figure 2.4: AM Peak Hour Vehicle Volumes (Inbound Flows)

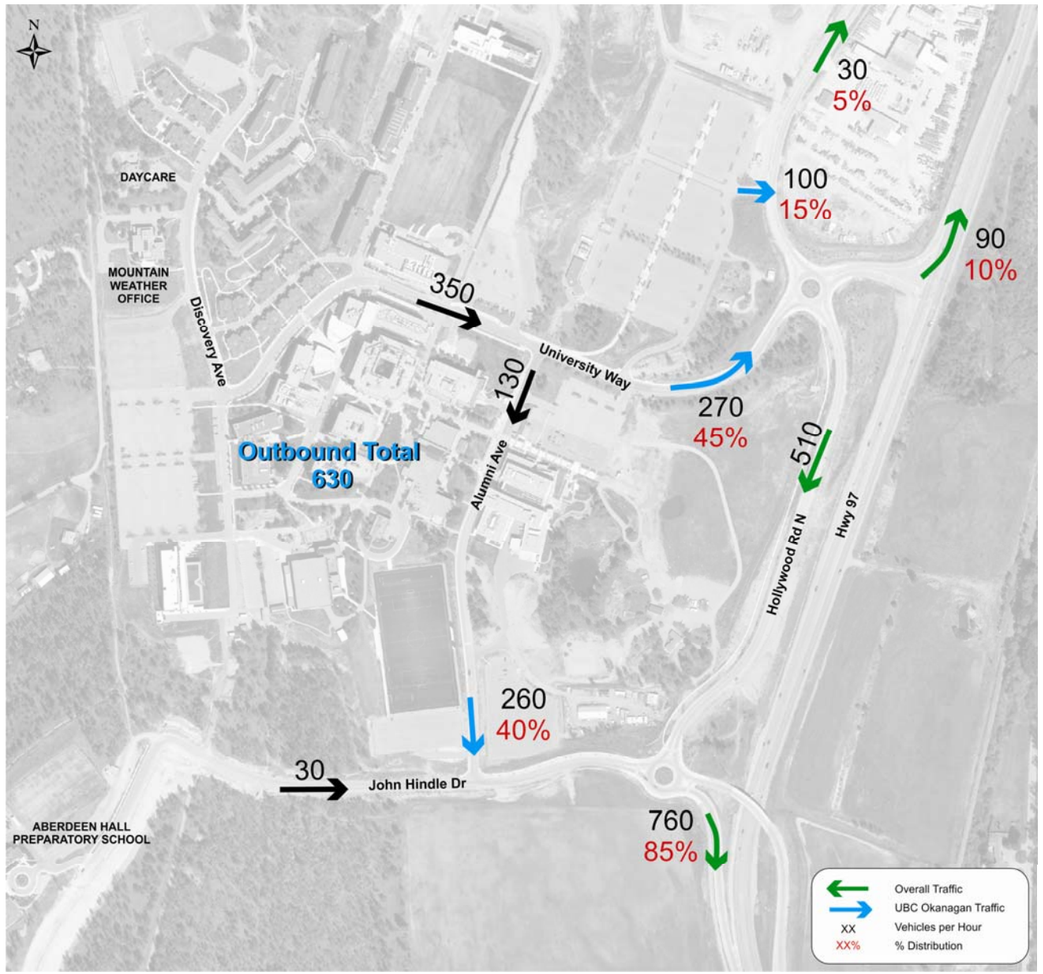


Figure 2.5: PM Peak Hour Vehicle Volumes (Outbound Flows)

3. PARKING AND TRUCK SERVICING

3.1 Introduction

Parking and truck servicing are critical functions for the everyday operations at the campus, and therefore understanding current arrangements will greatly contribute to the future planning.

3.2 Parking Supply and Demand

All campus parking is presently located in surface lots, and some on future building sites as indicated at **Figure 3.1**. Supply is estimated at approximately 2,900 stalls and the plan opposite differentiates sector locations as west, south, and northeast of campus, while student residence parking in the northwest is identified separately. A breakdown summary is provided below:

- Northeast – 1,460 (50%)
- West – 745 (26%)
- South – 350 (12%)
- Student residences – 338 (12%)

Parking in the northeast and west sectors accounts for around 75 percent of the total. The northeast parking was originally directly accessible from Highway 97 when the intersection connection from University Way operated as the main point of entry from both the south and north. It is now restricted to only vehicle movements to/from the north, while vehicle access to/from the south is from two ramps at the southeast corner of the campus (85% of demand). Parking in the south sector represents only 12 percent of the supply.

Lot H in the northeast sector accounts for one-third of the total supply with approximately 950 spaces. It is also likely to be the only functioning car park in the northeast sector once buildings are developed at Lots E and F.

A sample survey was undertaken in March 2014 to get an appreciation of the current parking use at the campus, but it is acknowledged that demand would likely be higher during the Fall semester. Campus demand varied by sector with the highest usage in the northeast sector and student residences at around 80 percent to 90 percent occupancy, while the south and west sectors were slightly lower at 75 percent.

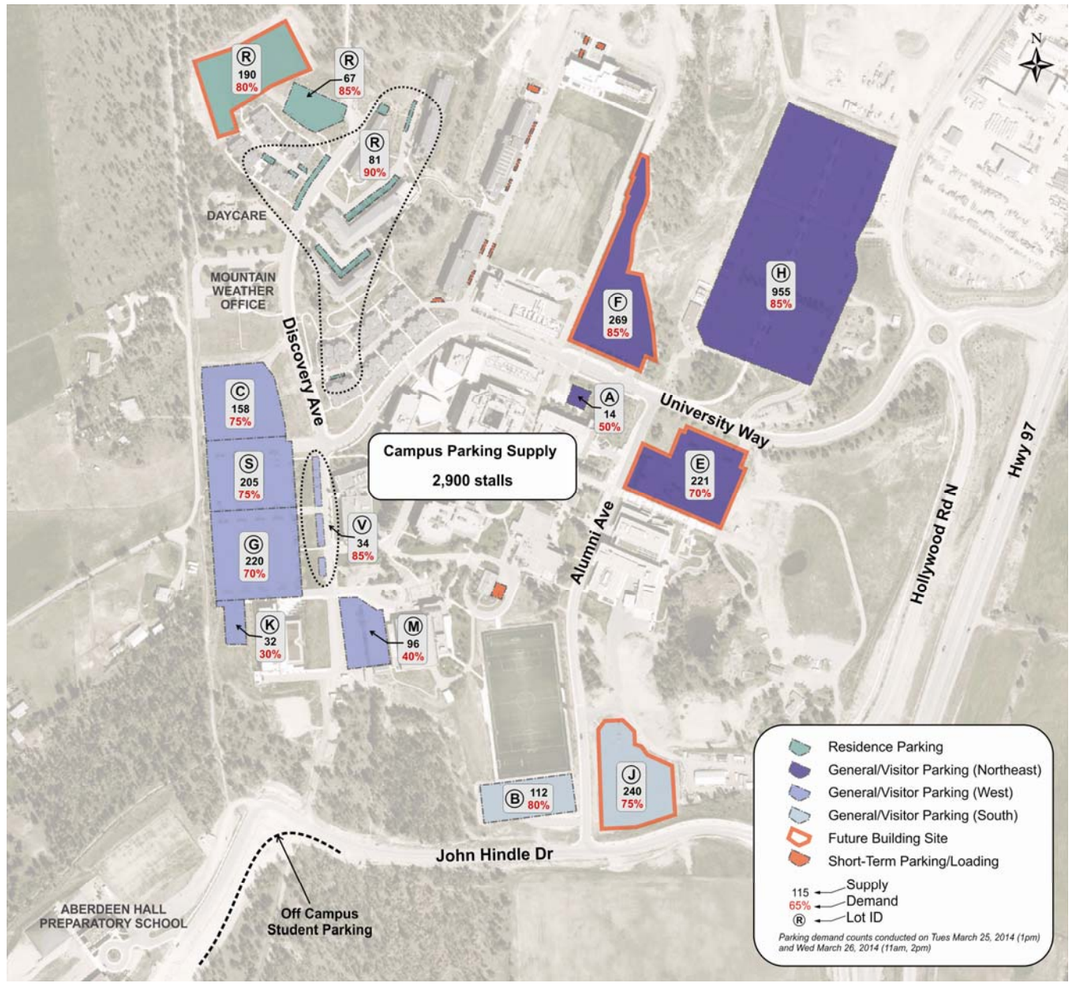


Figure 3.1: Campus Parking Supply & Demand

3.3 Supply Review and Parking Charges

Parking supply at the campus is currently guided by the City bylaw rate at 10 spaces per classroom. However, this metric covers all types of educational institutions and is not typically reflective of the unique demands of a university. Application of this rate for the current 239 classrooms would indicate a supply of around 2,390 spaces, whereas the current supply excluding student residences is around 2,660 spaces. Student residence parking requirements are not covered in the bylaw, but looking at the existing supply indicates a rate of 0.20 parking spaces per bed based on 1,675 beds currently on campus.

One of the ways to better understand supply needs is to make a comparison with what other Universities are employing as a benchmark. Parking supply relative to FTE students is presented at **Figure 3.2** for different Universities (excludes student residence parking), and it highlights that Thompson Rivers University has a comparable rate but is above the next highest -the University of Victoria.

Parking demand could lower over time with more development of residential accommodation within a 20 to 30-minute walk of the campus, with Quail Ridge and Academy Way (early stage) providing the only two external options. More student residences on site would also assist, but UBC Okanagan is already at one of the highest ratios at 22 percent of FTE students to beds (see Figure 1.5).

Parking's role in future planning at the campus will be explored further in Section 7 with the future projections of FTE students.

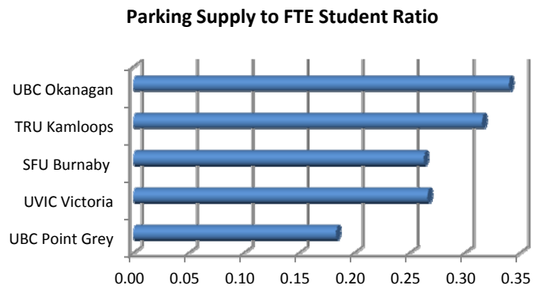
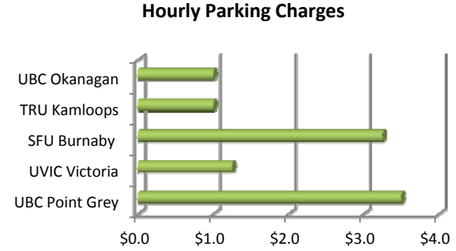


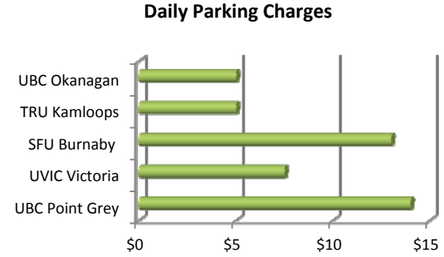
Figure 3.2: Parking Supply to FTE Student Comparison

Application of parking charges at the campus present a dichotomy of interests. On one hand, they are an important revenue stream to fund operations at the campus, including maintenance and landscaping, while they are also an important tool in discouraging people from driving to the campus.

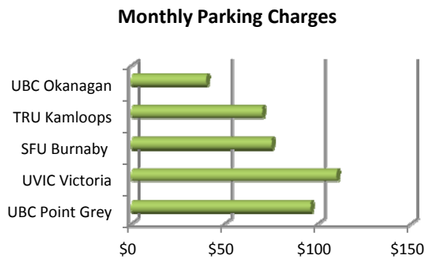
UBC Okanagan has one of the lowest parking charge structures compared to the other university locations reviewed and this would suggest there are opportunities to gradually increase charges over time (see **Figures 3.3 to 3.6**). One of the guiding factors of the parking charges is consistency with Downtown Kelowna, which has influenced the approach up to now.

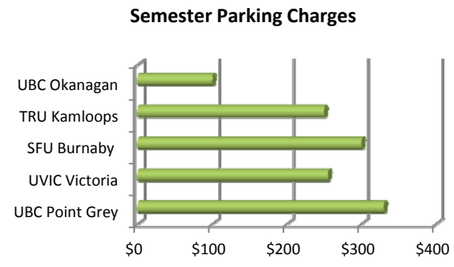
Initial review work shows the payment structure encourages monthly and semester parking pass purchases, whereby the equivalent cost per day decreases significantly. This structure is particularly challenging if people wish to use transit or cycle occasionally, but feel compelled to drive having already paid for parking. Perhaps a rebate arrangement could be introduced through an honor system. Section 5.2 discusses the cost of parking charges in the context of transit cost.





Figures 3.3 & 3.4: Hourly and Daily Parking Charge Comparison





Figures 3.5 & 3.6: Monthly and Semester Parking Charges

3.4 Campus Truck Servicing

Loading truck routing and loading facilities are highlighted for the campus on the plan opposite (**Figure 3.7**).

A central loading facility (and security point) is located on Alumni Avenue in the lower level of the library building with its driveway access positioned between the layover and pick-up areas for the transit exchange.

The main block of campus buildings are serviced from Discovery Avenue on the west side of the campus, where a network of shared streets provides access to each building. This results in trucks currently having to use University Way. John Hindle Drive is expected to provide this connection in the future.

The loading space for the 'University Centre' building is probably too small for the type of activity it serves. This was evident from the Coca Cola truck parked on-street loading in front of the building (see photograph at Figure 3.7).

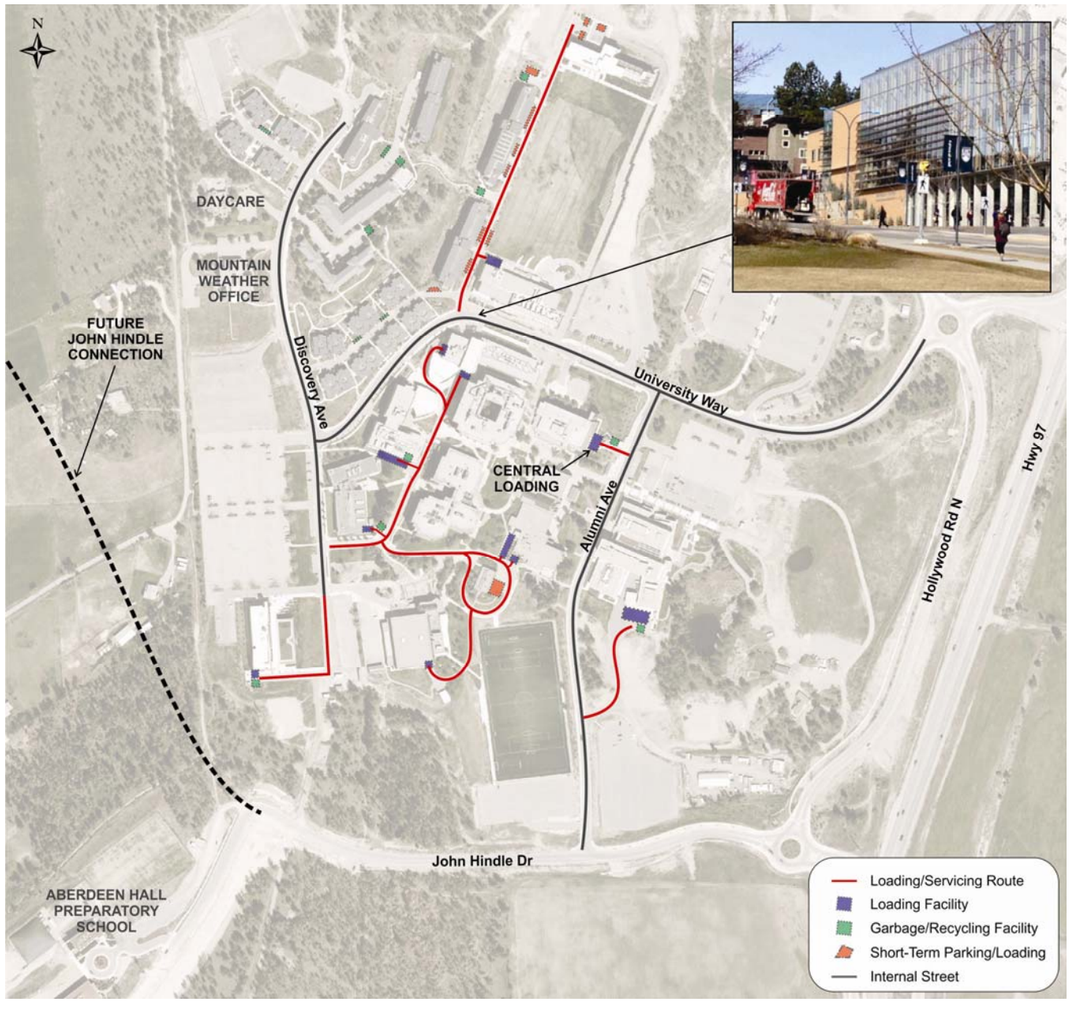


Figure 3.7: Campus Servicing

4. ACTIVE MODES - WALKING AND CYCLING

4.1 Introduction

Walking within the campus is the single most important travel mode activity, whether it is moving between buildings, entering the campus after arriving by bus or car, or coming from the student residences. It encapsulates what most people's experience is at the campus and is paramount in future planning.

Cycling is related more to how people arrive at the campus from neighbouring areas and therefore it will be important to understand how future connections evolve adjacent to the campus as it starts to connect with the surrounding urban areas.

Existing on-campus pedestrian connections are highlighted in **Figure 4.1** while existing and planned cycling connections external to the campus are covered in **Figure 4.2**.

4.2 Pedestrians

Walkway connections within the campus come in a number of different forms, providing particular functions on how people move around the campus. The following types were established:

- **Streets** (highlighted black) – University Way, Discovery Avenue, and Alumni Avenue are the main street arteries running through the campus and have sidewalks and crosswalk facilities.
- **Main Routes** (highlighted dark blue) – these provide important pedestrian spines through the campus as well as important visual and way-finding corridors.
- **Shared Services Routes** (highlighted green) – these are essentially shared-streets, providing a low-volume and comfortable walking environment.
- **Local Connections** (highlighted light blue) – in combination with the shared services routes, the local connections provide a fine-grained network that improves pedestrian permeability through the campus between buildings and to/from car parks.

These pedestrian connections provide a variety of walking experiences through the campus, adding to interest and stimulus, while contributing to the general permeability of movement through the campus. The connections are generally good with the one exception at the block where the Library building is located, given its size and lack of permeability.

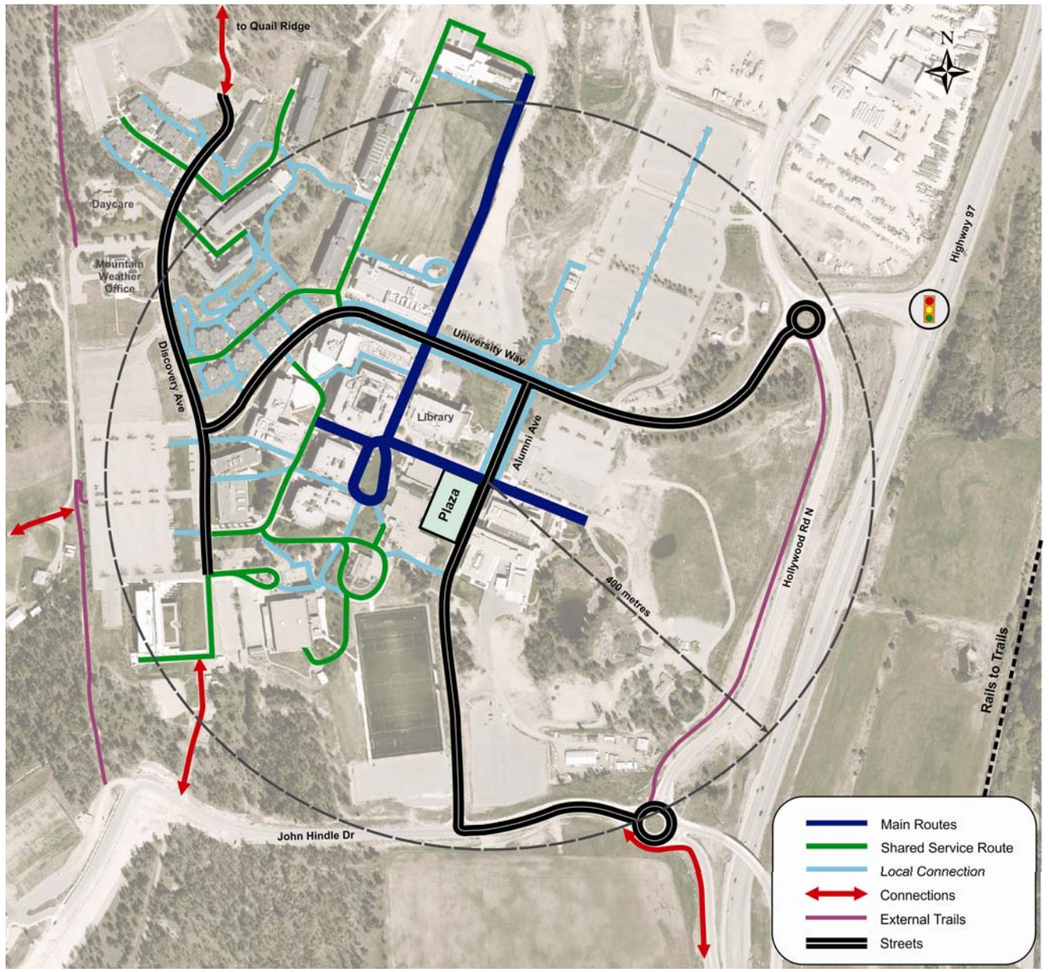


Figure 4.1: Pedestrian Connections

Central to the campus's pedestrian activity is the bus exchange at Alumni Avenue. It is located in front of the Library and Administration Buildings, which are set back by a landscaped area that is starting to become an informal plaza with new bisecting pathways connecting more directly between buildings and the transit stops. The future treatment of the bus exchange will be an important consideration, whether it remains in this location or it moves elsewhere.

All of the campus is generally within a five minute or 400-metre walk from the current heart of activity, located in the vicinity of the Library Building. Grades are; however, challenging where the student residences are located in the northwest of the campus. Concern has been expressed about carrying groceries home from the bus exchange.

Academy Way to the southeast of the campus is under development and there could be an opportunity to provide a bridge link over John Hindle Drive, taking advantage of the grades, along with providing a formal connection to Discovery Way.

The Quail Ridge neighbourhood to the north is currently accessed from an informal pathway that connects to Discovery Avenue. It has no lighting and the surface is generally uneven with steep grades in some places.

Sidewalks on Innovation Drive to the north currently do not extend to the campus edge, but this would be expected to change as the business park develops out.

At the west interface of the campus there is a private road that runs along the south side of Robert Lake and connects with Curtis Road, which is a municipal street, and further south to Valley Road North. The status of this private road connection is unknown as to whether it can be used by pedestrians (or cyclists) and as such cannot be relied upon in the future planning of the campus, unless the legal position changes.

A connection to Glenmore Drive will be achieved with the completion of John Hindle Drive (2017), while there is the potential to develop a connection to Curtis Road along the north side of Robert Lake.

Finally there is the pedestrian connection that runs north-south along the west side of Highway 97 and the east side of the campus, but currently stops at the railway corridor to the south. It is expected over time this connection will integrate with future rails to trails routes and also link through to Bulman Road.

4.3 Cycling

Presented at Figure 4.2 are the existing and future bicycle connections for the Okanagan Campus. Clearly there are a number of future bicycle connections that will improve access for the campus, but currently there a number of challenges.

On the southeast corner of the campus, cyclists currently need to use Highway 97 (a high-speed road) and there are no painted shoulders at the railway crossing and therefore cyclists are forced onto the travel lane. Cyclists can access the new rails to trails route at the Airport using the cycling facilities on Innovation Drive but there are no facilities on the east-west connection to Airport Way or across Highway 97.

Access on the west of the campus for cyclists is not legally permitted along the south side of Robert Lake to Curtis Road (municipal street) although observations show that it is used by some people.

To the north, cyclists can currently access the campus via marked bicycle facilities along Innovation Drive through the industrial park, however there are limited destinations to the north.

This limited infrastructure significantly challenges the development of cycling, which represents one percent of the current travel demand, and even though the Downtown is potentially only a 40-minute ride to the campus if there were more direct connections and could be a viable cycling trip if it was supported by infrastructure.

The following looks at potential route options that can be developed over time with new roads and greenway connections taking shape around the campus.

A multi-use pathway could be developed with the new John Hindle Drive connection, providing a direct link to Glenmore Drive to the west. A connection could also feed from John Hindle Drive along the north side of Robert Lake to link with Curtis Road and continuing on to Valley Road North and Glenmore Drive. The latter connection would potentially allow a cycling time to the downtown at around 40-minutes, and much less for intervening local neighbourhoods.

Cycling facilities are present along much of Glenmore Drive, providing an important north-south route within the City.

New road connections running south at Academy Way and Hollywood Road North from John Hindle Drive to Sexsmith Road will provide important urban routes for cyclists to use and a safer and more attractive option than Highway 97, which is currently the only access (from the south). Hollywood Road North will be especially attractive to use as the grade changes. It will be a more moderate grade compared to Academy Way.

A greenway connection is being developed from John Hindle Drive, at Hollywood Road North, south to the railway corridor on the west side of Highway 97. This route currently stops close to the railway, where a short-term option is being explored to connect through toward Bulman Road. The provincial bike route overlaps this routing, and will continue northwards along the east edge of the campus and on the west side of Hollywood Road North.

Ultimately the greenway connection will integrate with the 'rails to trails' corridor, which will continue all the way to the north side of Downtown Kelowna, where it will connect with local street-based routes.

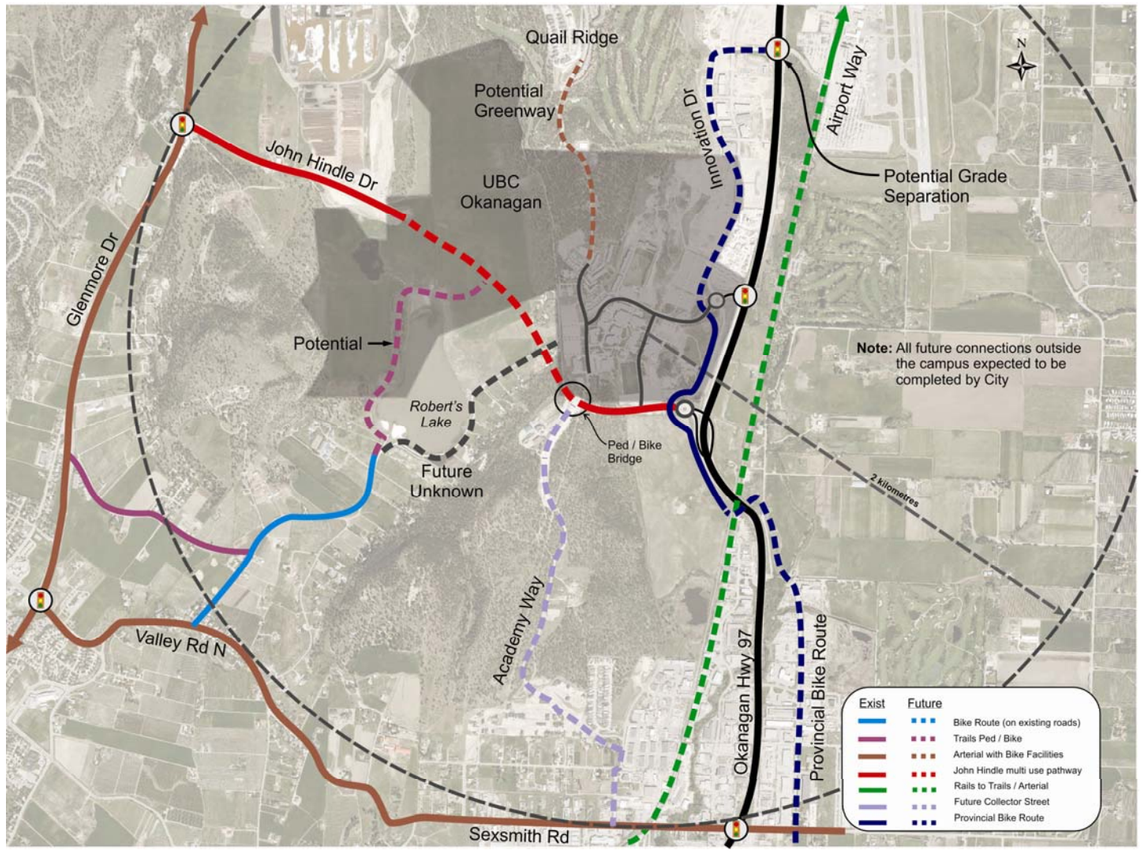


Figure 4.2: Cyclist Corridors Existing and Planned

5. TRANSIT

5.1 Transit Network

UBC Okanagan forms a major bus exchange within the Kelowna transit system, where currently seven routes converge at the campus. Three of the routes, #13, #23 and #90 connect to destinations to the north consisting of Quail Ridge, Lake Country, and Vernon, while four routes connect to the south, #4, #6, #8, and #97 to destinations including Downtown Kelowna, West Kelowna, Rutland, and South Pandosy Town Centre.

UBC Okanagan bus routes are presented in the context of the wider Kelowna area in **Figure 5.1**. **Table 5.1** summarizes the typical frequencies for morning, daytime, afternoon, and evening periods during the peak Fall and Spring semesters.

Table 5.1: UBC Okanagan Bus Routes and Frequencies

Route	Frequency by Direction					
	AM Peak	Daytime	PM Peak	Evening	Weekends (y/n)	Start/Finish
Buses to/from South						
#4	30	n/a	25-30	n/a	n	6:18am/5:56pm
#6 *	~45	n/a	50-70	n/a	n	6:20am/7:04pm
#8	15	~20-35	15	variable	y	6:12am/12:56am
#97	~15	30	~15	60	y	6:06am/12:58am
Buses to/from North						
#13*	30	n/a	30	n/a	n	7:00am/6:22pm
#23	~30	30	15	variable	y	5:25am/1:45am
#90*	60	60	60	60	n	7:00am/5:55pm

* Limited service (#90) or no service (#6, #13) end of April to beginning of September.

Bus routing to the campus exchange at Alumni Avenue is presented in **Figure 5.2**, where all bus routes follow a counter-clockwise circulatory pattern via University Way, Alumni Avenue, and John Hindle Drive and terminate at the bus exchange. The length of routing is considered inefficient by the bus operator. All bus routes terminate at the bus exchange; therefore, there is a need to have some form of circulatory system with a new design and that also meets the layover requirements of certain routes.

Road capacity challenges in the morning peak period at the south roundabout of Hollywood Road North/Highway 97/John Hindle Drive exist, but would be addressed by interim changes planned by the City.

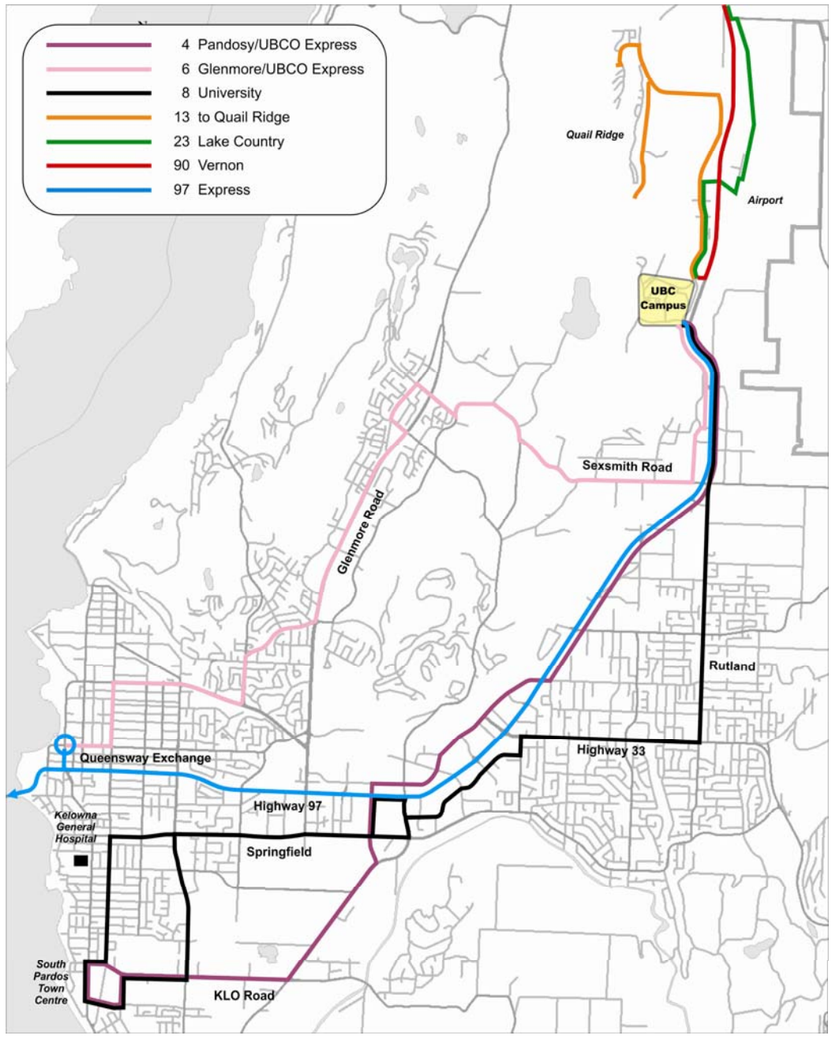


Figure 5.1: UBCO Transit Routes

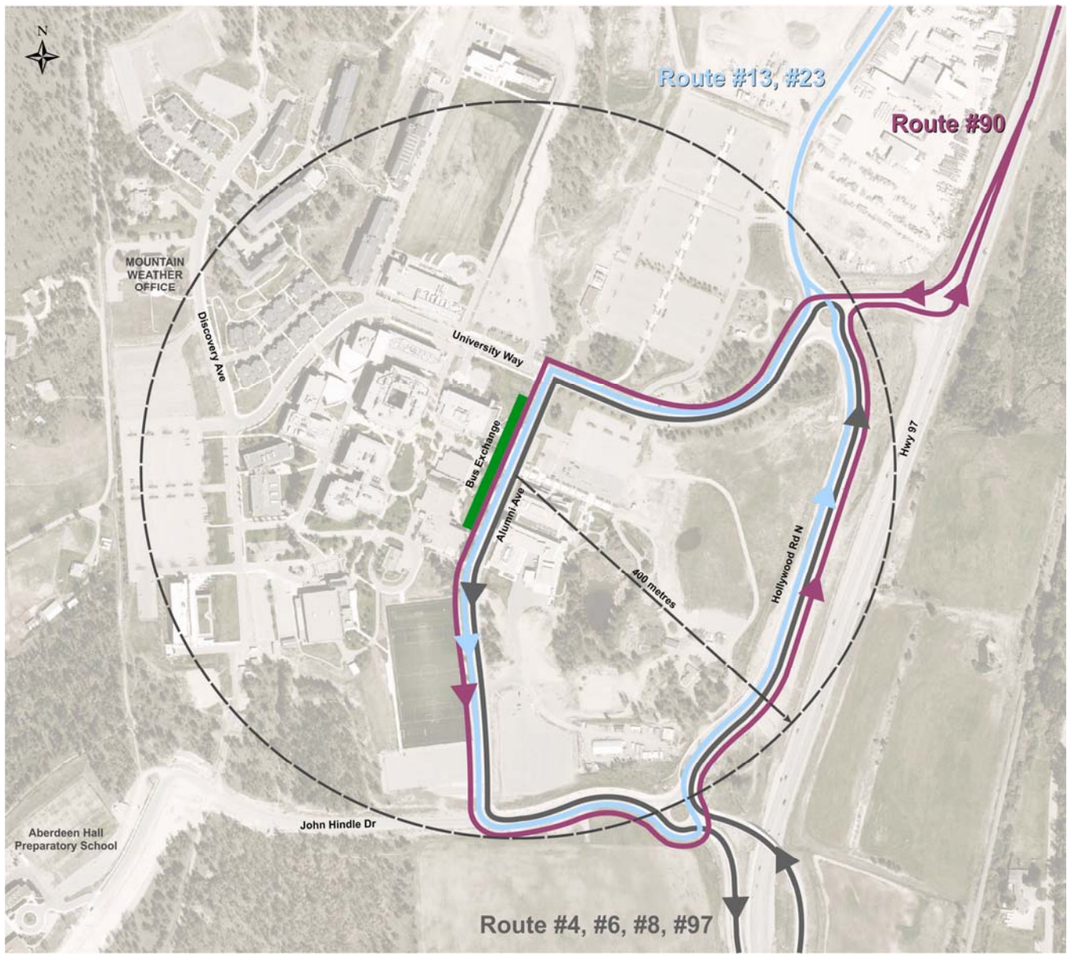
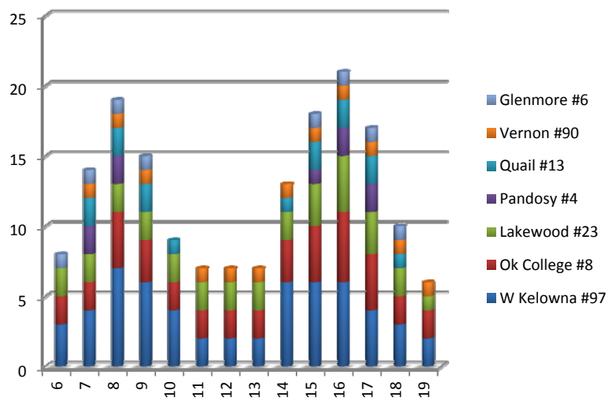


Figure 5.2: UBCO Transit Routing on Campus

Bus numbers passing through the exchange are aggregated in **Figure 5.3** and this highlights that the maximum is around 19 buses per hour in the morning period (8:00-9:00) and 21 buses per hour in the afternoon period (16:00 – 17:00). This confirms that the intensity of use peaks at certain times of the day, but also that there are periods with appreciably lower demand at ten or less buses per hour or one bus every six minutes.

Figure 5.3: UBC Okanagan Buses Per Hour



Ridership per bus route is summarized in **Figure 5.4** for the morning, daytime, and afternoon periods. This confirms that three routes, #8, #23, and #97, altogether accommodate about 85 percent of the transit demand at the campus exchange.

The #8 and #97 would be expected to be well-used given their penetration to the main population centres in Kelowna, while the #23 (Lake Country) connects to a relatively small community. Bus services to the north including #23 represents around 30 percent of the overall transit demand to the campus, whereas in contrast, the driving proportion is only 15 percent from the north direction (also includes Vernon). Lake Country therefore appears to be a strong draw for students and staff wishing to locate within reasonable travelling distance of the University the #23 route caters to much of this demand.

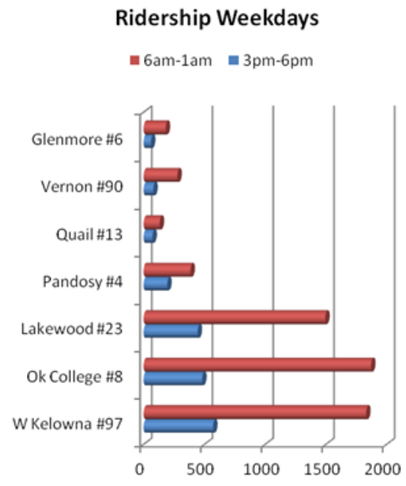


Figure 5.4: UBC Okanagan Transit Ridership

5.2 Transit Context

Transit use and cost compared to other BC Universities provides a picture of where UBC Okanagan currently stands with its peers and will assist with understanding the opportunities moving forward. The transit use proportions are presented in **Figure 5.5** to show that transit use at UBC Okanagan is comparable with University of Victoria and is higher than Thompson Rivers University. It also demonstrates that for the size of institution, use of transit has been a success for the Okanagan Campus even though it does not have the same critical mass of numbers as UBC Point Grey or Simon Fraser University.

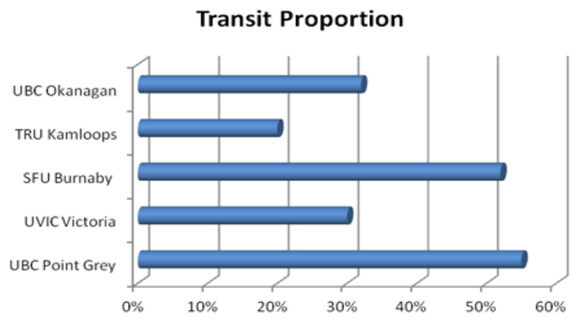


Figure 5.5: Transit Mode Share Comparison

UBC Okanagan operates a U-Pass system, like most other Universities in British Columbia, and the cost per month is one of the lowest reviewed at $50 per month (see **Figure 5.6**). In comparison, the cost of parking is actually lower at $40 per month, which is not the case at other Universities. Removing the cost gap, lowering the cost of transit relative to a monthly parking pass will be important to encourage greater use and indeed should be a guiding parameter in the annual review of parking charges.

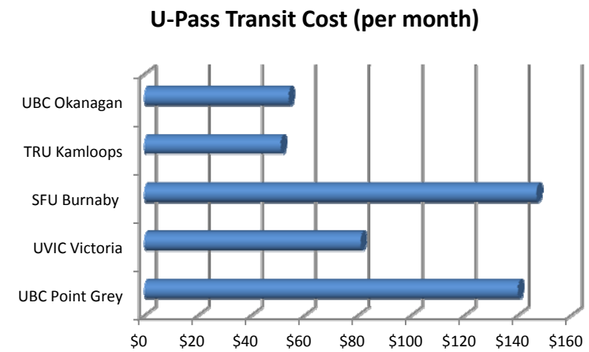


Figure 5.6: U-Pass Cost Comparison

6. CHALLENGES & OPPORTUNITIES

This section summarizes some of the key issues that were identified by local university staff as well as through general observations across the campus for access and parking, pedestrians and cyclists, as well as transit. These will help form a base for understanding future considerations for these elements moving forward with the master plan.

6.1 Access & Parking

Table 6.1 and **Figure 6.1** highlight some of the key challenges and opportunities for vehicle access, parking and loading at the campus.

Notably, queuing on the Highway 97 off-ramp from the roundabout at John Hindle Drive during the morning peak period will need to be addressed with potential upgrading of the roundabout to a traffic signal or creating a right-turn slip lane. Furthermore, vehicle speed and delay on University Way, and the level of pedestrian volume crossing are issues that warrant the consideration of partial closure in the future.

The location of the campus' main parking facility (Lot H) at the north end of the site combined with the majority of traffic going to/coming from the south results in inefficient access for vehicles to the site and further pressures the John Hindle/Hollywood Road North roundabout.

A decision will need to be made whether or not to retain access at University Way and Highway 97, and perhaps to also reinstate the right-turn in/out movements at this intersection to both help reduce pressure at the south roundabout and increase accessibility to the campus.

Table 6.1: Challenges and Opportunities for Access and Parking

Challenge	Opportunity
Loss of parking with new buildings	• Increase parking at the south end of the campus
Construction costs of new structured parking facilities	• Encourage alternative modes (i.e. transit)
Much of the parking located in the north and west of the campus, but majority arrive from the south (85%)	• Potential for new vehicle access connection to John Hindle Drive in the west
Potential for restricted movements at Alumni Avenue/ John Hindle Drive intersection	• Potential for new vehicle access connection to John Hindle Drive in the west
Vehicle speeds/ delays and pedestrian challenges on University Way	• Potential for partial closure or traffic calming
Queuing at off-ramp from Highway 97	• Possible upgrade of roundabout to traffic signal • New connection to south with Hollywood Road North and extending Academy Way further south

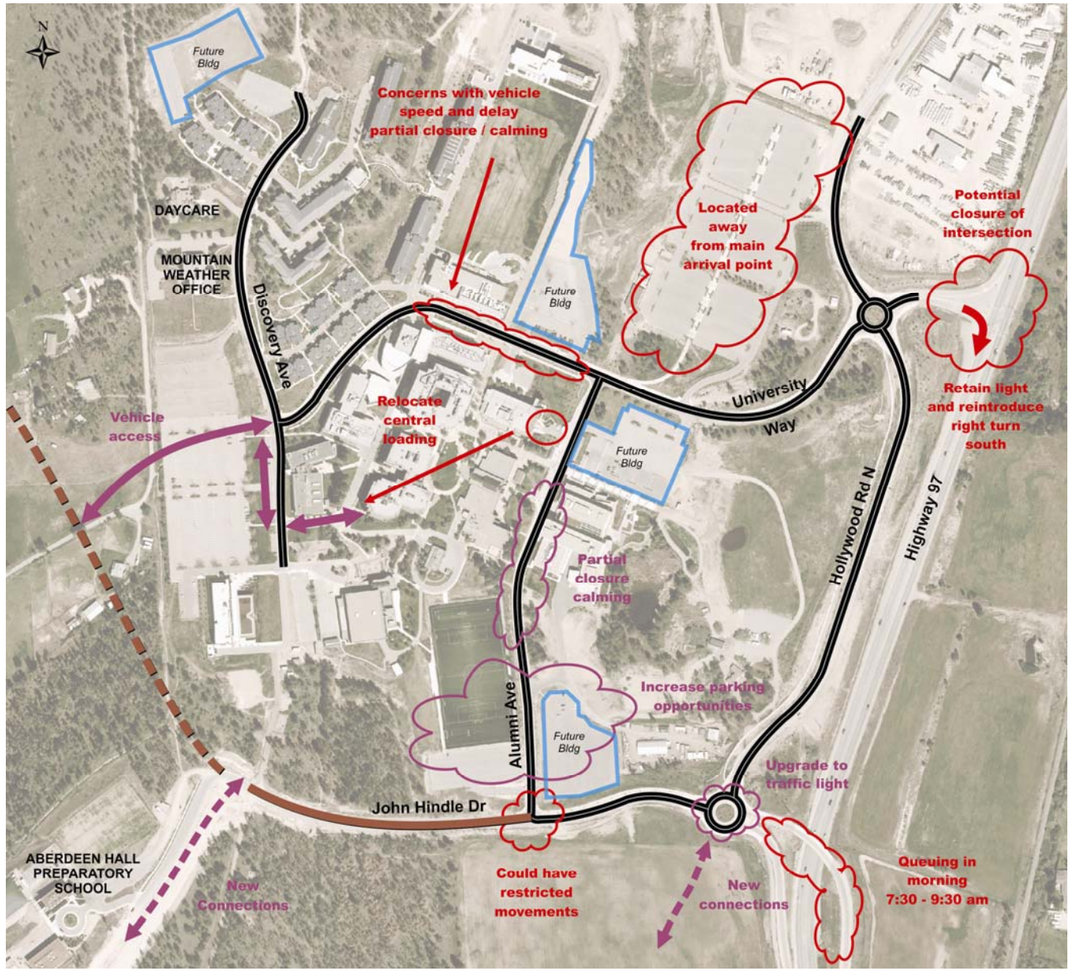


Figure 6.1: Challenges and Opportunities (Access and Parking)

6.2 Pedestrians & Cyclists

Walking and cycling represent a minor share of the overall travel to/from the UBC Okanagan Campus at around 2 percent combined. There are a number of challenges and opportunities that exist and which need to be addressed in order to help move towards increasing pedestrian and cyclist mode shares in the future as presented below (**Table 6.2**). These challenges and opportunities are illustrated in **Figure 6.2**.

Table 6.2: Challenges and Opportunities for Pedestrians and Cyclists

Challenge	Opportunity
No direct connection to Glenmore Drive	• Multi-use path parallel to John Hindle Drive • Explore options to Valley Road North
No street connection to the south of campus	• Academy Way and Hollywood Road will be developed by City
Cycling provision/storage on campus	• Develop a bike station integrated with the transit exchange • Assess opportunity with a local bicycle operator to develop a bicycle sales/repurchase program for students
Vehicle volume and speeds on University Way	• Review opportunities for full or partial closure and weigh against activity levels at different times of day
No direct connection to Rails to Trails/ provisioned bike route	• Develop connection from the south roundabout at Highway 97 to provisioned bike route • Consider long term over-bridge to the rails to trails
Informal Quail Ridge trail connection	• Look to develop a more formal connection that could be shared by cyclists

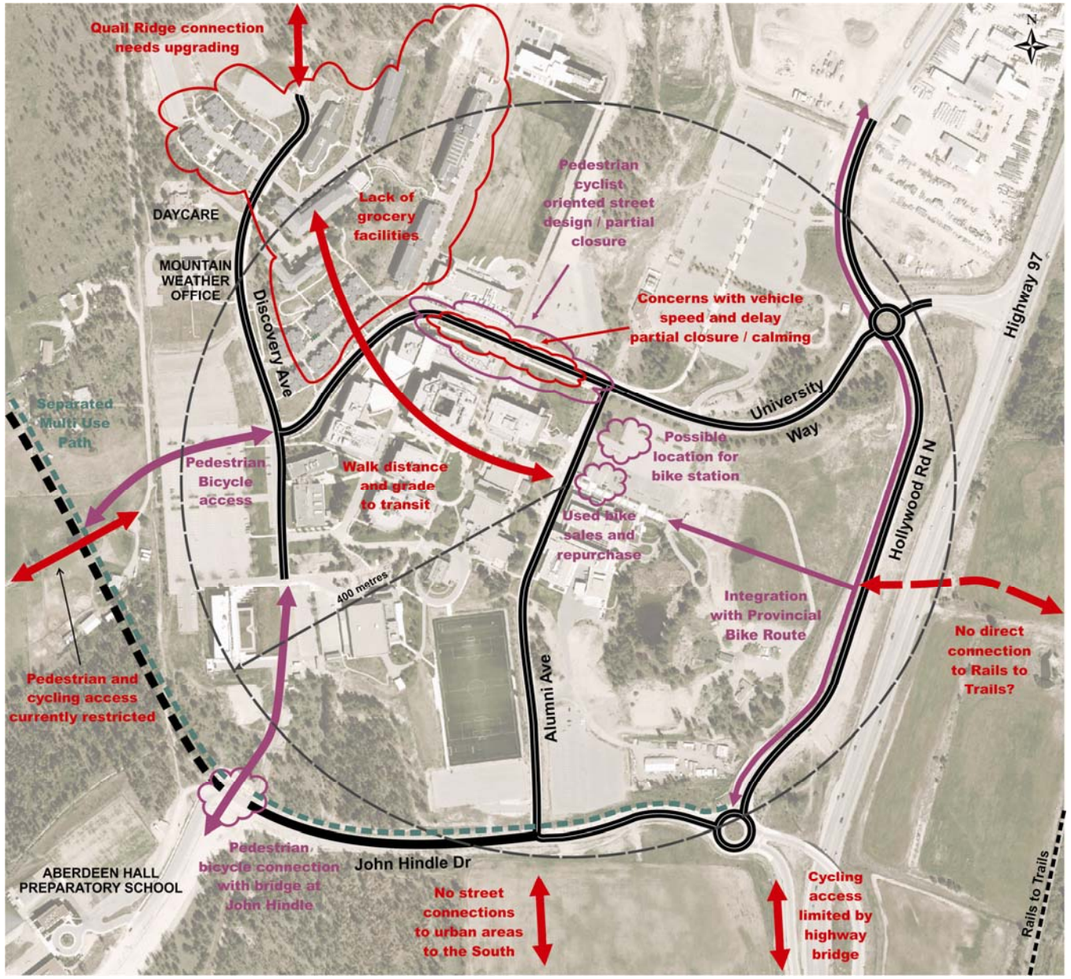


Figure 6.2: Challenges & Opportunities (Pedestrians and Cyclists)

6.3 Transit

Key challenges for transit are summarized in **Table 6.**3, and highlighted in **Figure 6.3**. One of the key standouts is the limited capacity for layover at the exchange on Alumni Way and how this impacts the drop-off and pick-up activity. Heavy pedestrian flows crossing Alumni Way to the Engineering Building at class change times are also highlighted as an issue for the operator, whereby pedestrians currently have priority.

Future bus movements may also be restricted at Alumni Way's connection at John Hindle Drive, which will have increased demands once John Hindle Drive links through to Glemore Drive and its close proximity to the intersection of Hollywood Road North and Highway 97 are considered.

April 2014 transportation workshop tested three alternate locations for a potential future transit exchange on campus with a design exercise. UBC Campus + Community Planning staff summarized the outcomes of the workshop exercise and this is included in **Appendix A**.

Table 6.3: Challenges and Opportunities for Transit

Challenge	Opportunity
Bus routing length	• New/expanded transit exchange could allow for more flexible routing options • New John Hindle Drive connection/possible service to west
Bus layover storage	• New transit exchange could create space for layovers
Potential for restricted movements at Alumni Avenue / John Hindle Drive intersection	• Potential to allow bus only movements
Queuing at off-ramp from Highway 97	• Possible upgrade of roundabout to traffic signal with possible transit priority • New connection to south with Hollywood Road North extension
Plaza/landscaping on Alumni Avenue	• Creation of a formal public plaza acting as a multi-modal hub if existing transit exchange is expanded
Pedestrians crossing Alumni Avenue from Engineering building	• Potential for new location for transit exchange
Restricted movements at University Way and Highway 97	• Retain traffic signal and reinforce right-turn to south

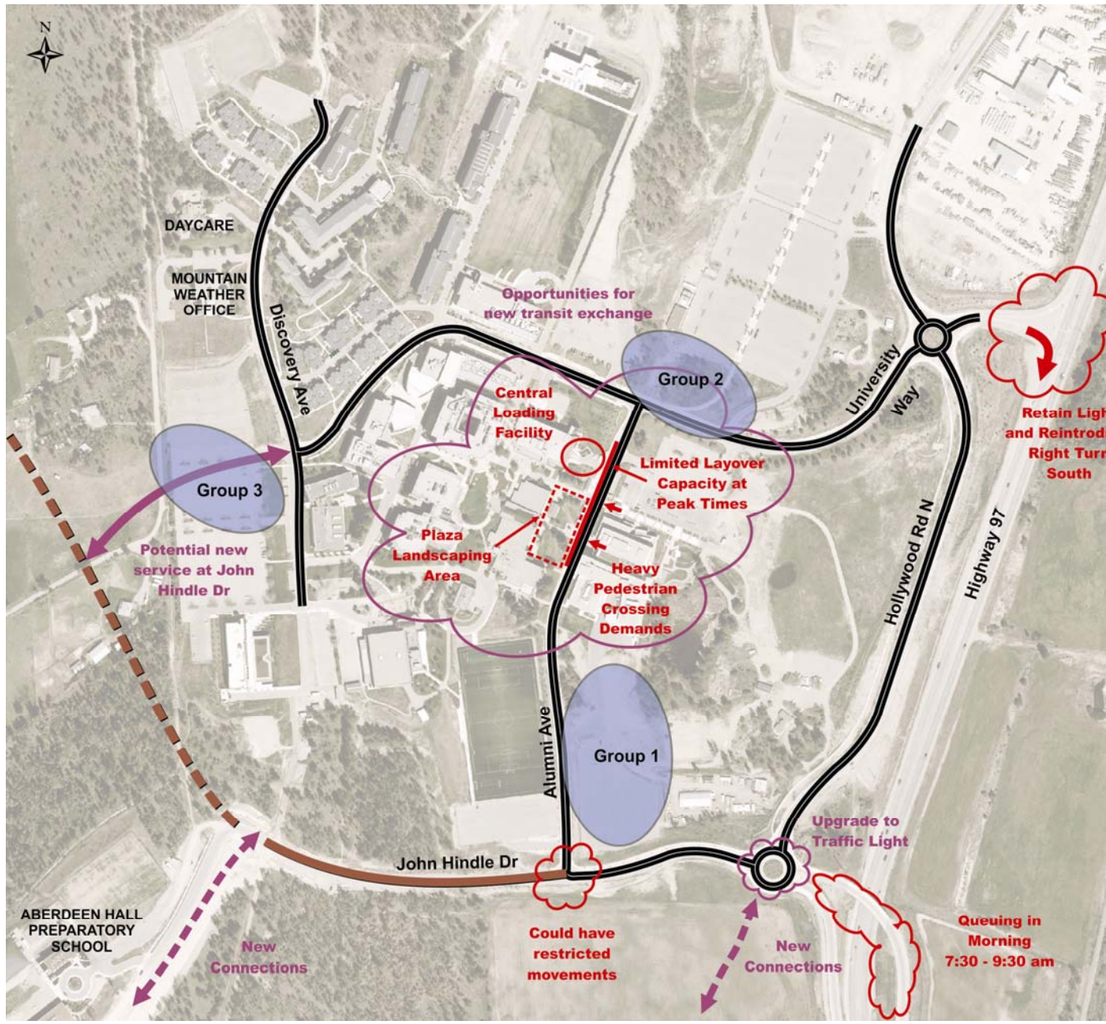


Figure 6.3: Challenges & Opportunities (Transit)

7. CAMPUS BUILD-OUT TESTS

To consider potential future growth at the UBC Okanagan Campus, it was essential to develop a simplified mechanism to assess what infrastructure would be needed to accommodate 15,000 FTE student numbers, with the understanding that this is the maximum of what the campus is expected to accommodate.

Key levers for the campus transportation demands would be to lower the proportion of single-occupant vehicle movements and offset this with increased transit use. Walking and cycling modes to the campus are expected to remain limited in the future given the lack of connections and limited access to accommodation and amenities nearby. Transit use is therefore the most plausible option to increase use given its current high-level of demand and potential for expansion.

Parking restraint is expected to be the 'driving' determinant in achieving the transportation lever of lowering single occupant vehicle (SOV) trips while increasing transit use. Two future campus build-out scenarios were developed based on capping parking at a 'low' level (i.e. 2,000 stalls), and a 'moderate' level (i.e. 4,000 stalls) to determine what level of change in transit use would be needed.

These projections were estimated by considering the current profile for transit demands and using the parking number to cap the SOV proportion with the balance of new demand taken up by transit. Walking, cycling and ride-share proportions were held constant for this high-level exercise given the current limited opportunities.

7.1 Scenario 1 (Low Level) – FTE 15,000 & Parking 2,000

Figure 7.1 highlights the anticipated travel mode split that would result with capping parking at 2,000 stalls (a reduction of nearly 1,000 stalls from today) and accommodating 15,000 FTE students. Clearly, transit use would need to increase to well over 50 percent (observed at the larger UBC Point Grey and Simon Fraser University) to accommodate this parking cap.

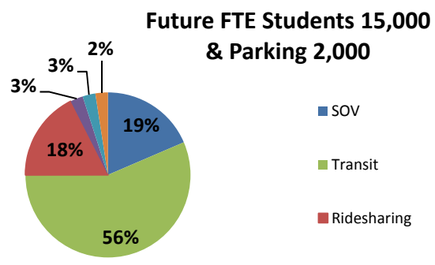


Figure 7.1: Travel Mode Split - Campus Build-Out Scenario 1

7.2 Scenario 2 – FTE 15,000 & 4,000 Parking

Figure 7.2 shows the anticipated travel mode split that would result in capping the parking supply at the campus to 4,000 stalls (an increase in supply of slightly over 1,000 stalls from today) and with 15,000 FTE students.

In this scenario, transit use would need to increase to 38 percent, which is only six percent above the current proportion. This is more likely to be attainable from a transit perspective, but will be significantly challenging in providing the additional parking, especially as some of the existing lots will be future building sites and structured parking may not be financially viable or desirable.

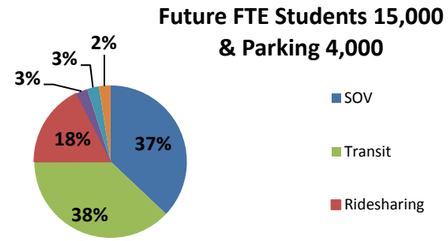


Figure 7.2: Travel Mode Split - Campus Build-Out Scenario 2

This demonstrates a more equitable distribution of mode share between transit use and single occupancy vehicles.

Even though transit use would only increase by around six percent, the higher campus population would significantly add to the number of transit trips to/from the campus which could potentially double from today's numbers (i.e. from 6,170 to 12,700 transit passengers). This level of growth would need to be managed over time by increased service from BC Transit.

7.3 Summary

These two campus build-out scenarios will form a base for understanding potential future transportation needs moving forward with the development of the UBC Okanagan Master Plan.

8. TRANSIT DESIGN BEST PRACTICE

Planning the transit exchange at the campus is central to achieving its future success as it grows, with a potential doubling in size. The transit exchange will continue to be the focal point of activity for campus arrivals and departures. This cannot be achieved with people arriving by vehicles given that parking is spread across the peripheral areas of the campus.

A well-designed and used transit exchange can also be a catalyst for commercial activities along with other supporting travel options such as car-share vehicles, bicycle storage, bike rental, taxi waiting area, and which could be complemented with communication boards, real-time information, and an office for a travel coordinator (which could be part-time or temporarily employed at the start of each semester). Altogether, it could form a multi-modal hub within the campus to establish the importance of sustainable transportation options for students, faculty, and staff.

This section reviews various transit exchange typologies along with existing examples, and is supported with the planning work at Simon Fraser University in Burnaby, BC, as a Case Study. This leads to informing the expected key planning principles and objectives needed to guide the design process and to keep it focused on balancing the vibrancy needs of the university with that of the functional needs of the operator.

8.1 Transit Exchange Typologies

Typical transit exchange typologies found in North America and Europe are presented in **Figure 8.1**. Island, concourse, perimeter, and hybrid exchange typologies are most typical in a suburban context where space is less of a premium. The reverse exchange typology is not expected to be appropriate for the Okanagan Campus. These types of facilities offer various benefits and drawbacks for both the operator and transit users, and the application depends on the context in which they are situated.

The street exchange typology is more typical of an urban context where space is at a premium and the street grid offers the opportunity to position different bus routes on the street block frontages depending on the direction of flow. Equally important, it allows the exchange to fully integrate with the surrounding urban fabric, making use of adjacent amenities for transit users (i.e. coffee shops, grocery stores etc.) as well as providing flexibility for bus routing options to offer a better overall transit experience for the rider.

This urban design type is now becoming more prevalent, even in the suburban context, particularly in Metro Vancouver, where suburban areas become more compact and land uses are more diverse. A case study of the proposed future design of the SFU Burnaby campus is presented in Section 8.3.

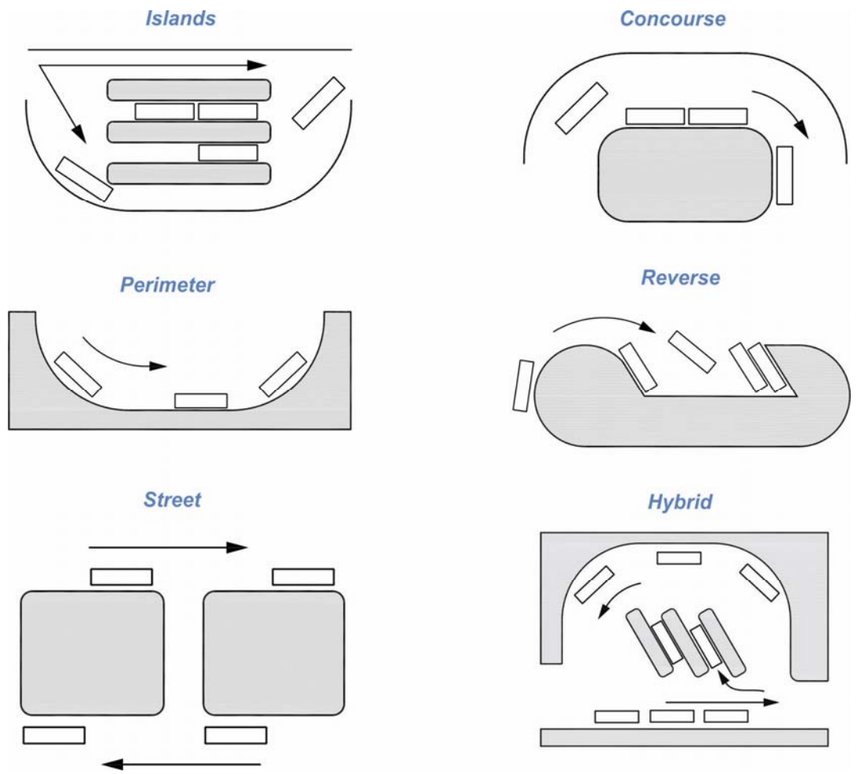


Figure 8.1: Transit Exchange Typologies

8.2 Transit Exchange Functional Requirements

For a transit exchange facility positioned at the terminus of one or more bus routes, there are three basic operational components to consider (listed in functional order) need to be provided for:

- Passenger unloading area(s);
- Bus layover area to accommodate route recovery time and driver breaks/substitutions;
- Passenger loading area(s)

The operational efficiency of a transit exchange will depend on the interaction of these three elements including the physical space allocated to each, transit vehicle circulation and travel time requirements moving from one operation to the next, and minimizing as much as possible the crossing of transit vehicle movements with other vehicle and pedestrian/cyclist traffic. Pedestrian safety is paramount and perhaps the most challenging design condition given the highly concentrated pedestrian flow profiles in the vicinity of transit exchanges.

The space required for each component will vary depending on the type of transit exchange, the number of routes, and the schedule frequency throughout the day.

Transit exchanges should also, at the very least, provide adequate passenger waiting areas together with shelter and seating for comfort and weather protection. Furthermore, routing information and schedules should be posted in a central location and kept current with travel information to passenger destinations.

In addition to these basic operational requirements, the design of the transit exchange including notably the land uses and public realm space within and bordering the exchange, has the potential to significantly enhance the experience for the transit user which serves to positively reinforce the decision to use transit. Retail shops and cafes' open into the evening hours add to user interest and safety/security, particularly during off peak transit use periods. Wide sidewalk areas for pedestrian/passenger movement without interfering with people waiting for buses and marked crosswalks (either with or without signal control), further contribute to the success of the transit exchange.

Transit exchanges can also serve as a hub for other forms of sustainable transportation including bike storage facilities and bike repair shops, electric car charging stations, and parking zones for car share and car pool vehicles.

8.3 Transit Exchange Examples

A good starting point for transit exchange planning is to understand some of the pros and cons of facilities at other locations. UBC Point Grey, Thompson Rivers University in Kamloops, Downtown Kelowna, and the University of Victoria were selected to provide context for urban, suburban, and campus style transit exchanges (See **Figure 8.2**).

UBC Point Grey – transit facilities are separated into the diesel exchange located off of Wesbrook Mall, which accommodates the majority of routes, while the central on-street exchange located on University Boulevard accommodates electric trolley bus routes.

Typically the diesel exchange accommodates around 75 buses per hour at peak times and represents around 70 percent of total transit service to the campus. The layout is an island facility but is challenged with the number of students crossing the facility and it is also located away from the university's main commercial activities, however it is planned to be relocated more centrally towards the new Student Union Building and other amenities. Design options are being considered to create a better urban context and to create a separate layover facility.

Thompson Rivers University Kamloops - this perimeter design exchange, located on the west side of campus was developed around 2010 with accommodation of up to eight bus bays; however, only five are currently in use. It has no surrounding commercial activities and is located on the west side of the campus.

Queensway (downtown Kelowna) – this exchange occupies the street block between Pandosy Street and Ellis Street and is framed between a Government of Canada building to the south and a museum to the north. Street commercial activities are located on the adjacent streets of Ellis Street and Pandosy Street, but none are located at the main passenger waiting areas.

University of Victoria – this exchange is a hybrid system with a perimeter layout but also utilizes the adjacent street to reduce the footprint of the exchange and as such can also be described as a hybrid layout.

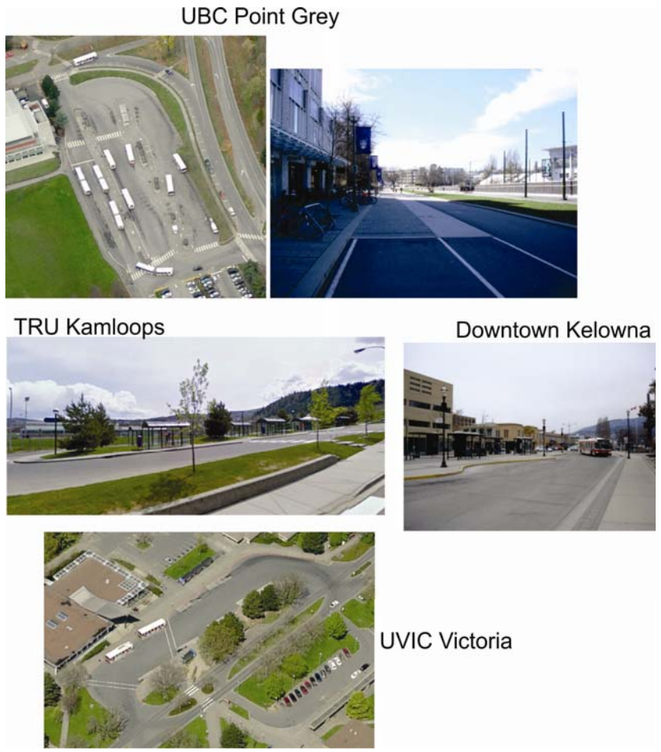


Figure 8.2: Transit Exchange Options

8.4 Case Study – Simon Fraser University Transit Exchange

The existing transit exchange examples presented are either off-street or partial off-street facilities, focused on the functionality needs of the operator and less so for the transit user's experience. Waiting areas should be more integrated with the urban street environment, where the majority of transit activity occurs on the route, and this should also be applicable to the future exchange at UBC Okanagan.

Recognizing the importance of the transit user's experience and maintaining functionality, SFU is developing a street-based system for drop-off and pick-up activity while locating layover activity close-by but without impacting or sterilizing the quality of the public realm.

This more balanced approach to transit exchange planning is aimed at improving the rider's experience both in terms of accessibility and safety to encourage greater use of transit. **Figures 8.3** and **8.4** show the renderings for the design concepts together with a plan view of the proposed design, key features of the design are also described.

Figure 8.3: Transit Exchange Options (SFU)

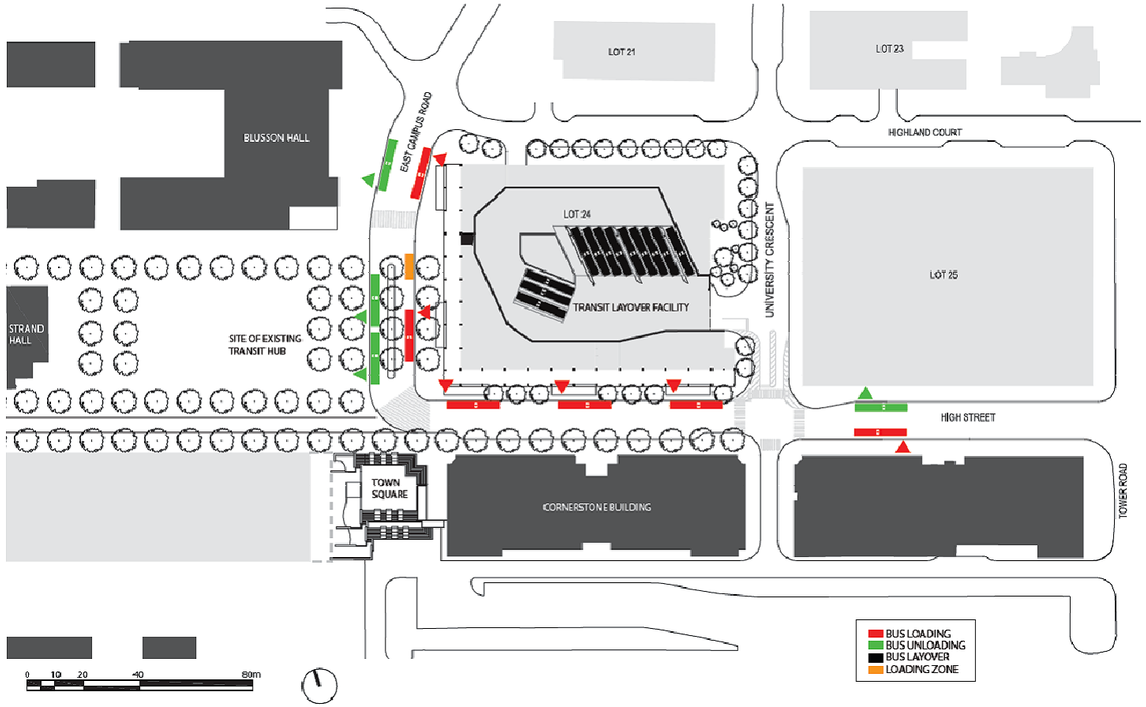


Figure 8.4: SFU Proposed Future Transit Exchange

The recommended design concept included many urban design features as follows:

- A new university plaza and future quadrangle where bus users will arrive on campus; trees and other landscape elements will strengthen and support the edges of the new quadrangle leaving the central area open to be programmed and used for a wide variety of activities.
- A colonnade that provides a weather-protected walking route that extends from the corridor within Blusson Hall to connect to the north side of High Street that creates a generously scaled public space that accommodates both movement and waiting space for bus users as well as retail frontage. ·
- Weather protection for bus stops with glass canopies that extend outside the colonnade at bus stops.
- Removal of buses from the street during layover times so that buses do not stop any longer than needed to load and unload and incorporating a bus layover facility within a building that can be developed by UniverCity with built edges that will enhance and animate the adjacent streets and fit with the urban design plans for UniverCity (neighbouring residential and commercial community) and its High Street.
- Massing of new buildings to define and animate the public realm.
- A design concept for East Campus Road that uses rows of trees and planters to create a strong sense of entry and place and to control pedestrian movement and enhance safety by directing pedestrians to two marked and signalized locations preventing jaywalking.
- Pedestrians are encouraged to move along the two major east-west spines where pedestrian crossings of East Campus Road will be located with pedestrian-activated signals. Movement through Town and Gown Square is also integrated into the movement pattern.

The transit and transportation features of the recommended concept include:

- Six loading, three unloading stops, and 12 layover spaces with potential for adapting loading and unloading locations to changed bus routing and new road use patterns
- Flexibility to adapt to lower levels of bus use in the future if an alternative new mode of transit is introduced.
- Cars and buses share East Campus Road and the High Street and add to the energy and activity of the commercial heart.
- 9.0 metre commercial loading zone on the east side of East Campus Road for Lot 24 commercial tenant use.

9. TRANSIT EXCHANGE DESIGN METHODOLOGY

A step-by-step approach is needed to evaluate the transit exchange design options and to provide context for discussion moving forward. This process will help ensure that the main areas of consideration are covered and that the design remains focused.

9.1 Introduction

Consideration for a new transit exchange is a key component of the transportation plan to meet future demands at the campus as it expands and matures. It needs to provide:

- a comfortable and safe environment for transit users;
- integrate with the campus's urban design and main activity areas;
- be adaptable to future demands; and,
- support the functional needs of the operator.

Each of these considerations are important determinants that will contribute to its future success, or failure.

In April 2014, UBC Okanagan began a discussion about how a new transit exchange facility might work for the campus as well as to identify the priorities that will shape its location and form. Three potential new locations were explored as "test locations" for the workshop exercise to flush out some of the challenges and opportunities.

Moving forward, these test locations will be considered in addition to the potential reconfiguration and expansion of the existing exchange facility at Alumni Avenue. The following provides a starting point for continuing this assessment. Each of the potential location descriptions was covered before presenting guiding principles for the workshop design process.

9.2 Location Descriptions

The four potential transit exchange locations identified are highlighted on the next page. **Table 9.1** provides a summary description for each.

Table 9.1: Transit Exchange Location Options

Location	Description
West (Discovery Ave)	• Positioned on existing surface parking (current Lot S) • The shape could be generally square (depends on design needs) and could also support an on-street facility with building sites already at-grade
North (University Way)	• Positioned on the slope between University Way and parking Lot H, and would require grading work or structure to support • The shape would need to elongated given the limited depth available
South (John Hindle Drive)	• Positioned at current parking Lot J • The shape options are flexible given the footprint available, but would require some re-grading
Existing expanded (Alumni Way)	• Utilizes the street system occupied by existing transit exchange and extended also into Lot E around the new building • The shape would be rectangular, utilizing the frontage of future building on Lot E for passenger loading/unloading

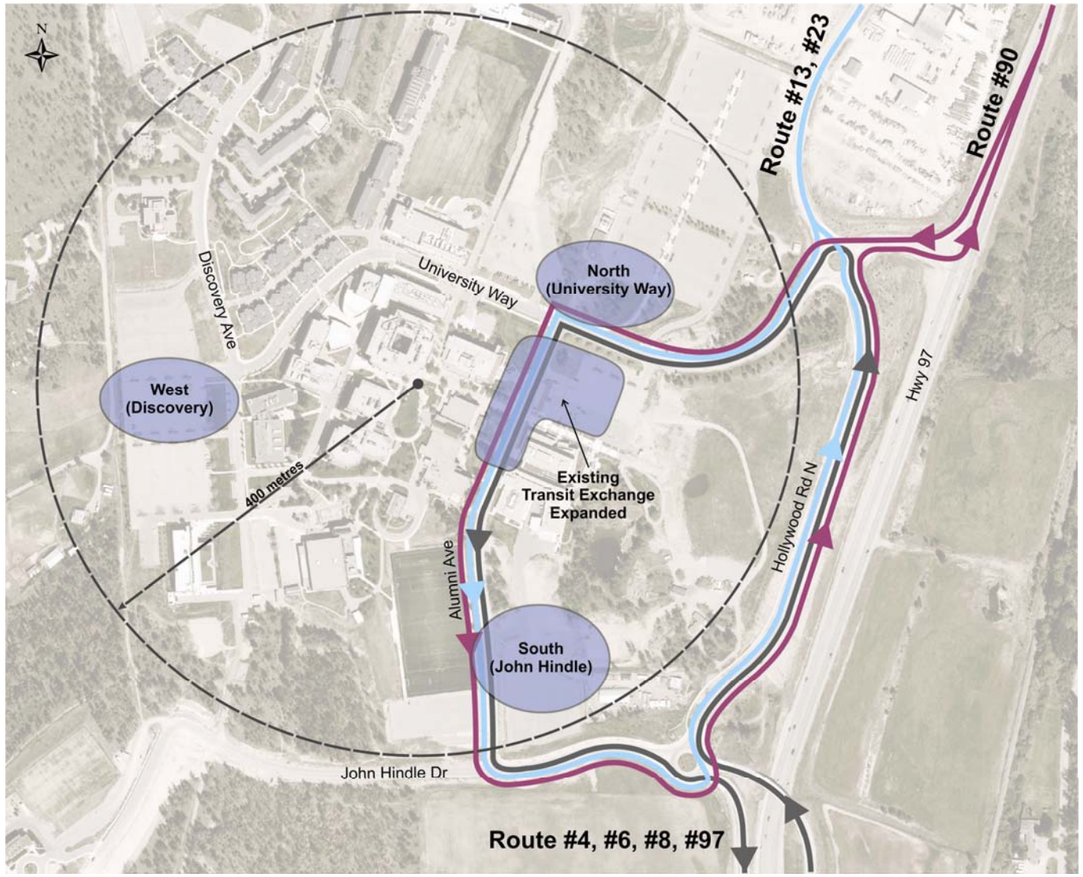


Figure 9.1: Potential Transit Exchange Locations

9.3 Guiding Principles and Criteria

The following 'guiding principles and criteria' were developed as part of the workshop to ensure that the design process remains focused and balanced on the needs of the university and the operator in order to decide the optimal exchange location. They will provide objectivity and transparency in the assessment process in order to decide on the optimal exchange location and what form and features it will embrace.

9.3.1 Location

- Central if possible
- Some level of connectivity to the residences
- Proximity to the existing routing system
- Mid-level location along campus slope

9.3.2 User Experience

- Feel secure (active, well lit, animated) for use at all times of the day
- Readily accessible from all part of the campus
- Locate transit hub to extend or compliment an existing pedestrian corridor
- Adjacent uses that are active through the hours of the transit exchange
- Weather protection

9.3.3 Quality Public Realm

- Frame and integrate with buildings to optimize user experience
- Develop a well landscaped plaza area to connect with waiting areas and accommodate pedestrian demands
- Provide flexibility to introduce amenities on campus (i.e. groceries, entertainment, wine and beer)
- Design for a strong pedestrian/bicycle network between the transit hub and surrounding neighbourhoods

9.3.4 Operational Efficiency

- Minimize pedestrian / bus movement interactions
- Minimize bus routing through campus
- Fully utilize the benefit of new road corridors (e.g. John Hindle Drive)
- Continue dynamic loading / unloading facilities to reduce footprint
- Provide strong circulation routes for users along with ample queuing areas
- Sequence unloading, layover, and loading with minimal bus movements between steps

9.3.5 Adaptability

- Flexibility of design to allow contraction/expansion of the facility as demand decreases/increases
- Transit hub need not to be at the campus core but should be close enough to contribute to vitality and safety of the core
- Central and relevant to the future expansion of the campus
- Design future intersections with transit operations as a priority

9.3.6 Multi-modal Capability

- Develop a bike station or other form of central storage facility
- Provide location for accessing taxis

- Consider bicycle rental system
- Provision of car-share vehicles
- Communication boards, real-time arrival info, travel option information, travel coordinator

Each of the criteria will assist in the decision making process, for a more robust and focused evaluation. It can be developed into a matrix with each location listed in columns to see how they measure up using ticks or stars.

10. DISCUSSION – NEXT STEPS

This document provides an important point of reference to assist in the process of moving to the next steps of the transportation planning of the UBC Okanagan Master Plan.

Much of the information included has already been presented to a workshop group for developing options for a transit exchange taking into consideration the future build-out options for the campus as presented in Section 6.

A two-day Growth and Campus Experience charrette is planned for June 2014 at the campus, and this document will assist in informing that process.

Key decisions will need to be made regarding:

- What level should parking supply be capped at to manage demands by non-vehicle modes?
- Where the optimal location for the transit exchange hub is to meet the university's objective for a vibrant heart, while retaining the functional needs of the operator?
- Maximizing access opportunities to the campus with the new street connections at John Hindle Drive, Academy Way, and Hollywood Road for the benefit of pedestrians, cyclists, transit, and vehicles, including servicing.
- The focus to be given to greenway connections in the future, i.e. 'rails to trails', provincial bike route, Quail Ridge, Curtis Road, etc.?

APPENDIX A

UBC Okanagan Master Plan Transportation Workshop Outcomes

campus + community planning
planning + design

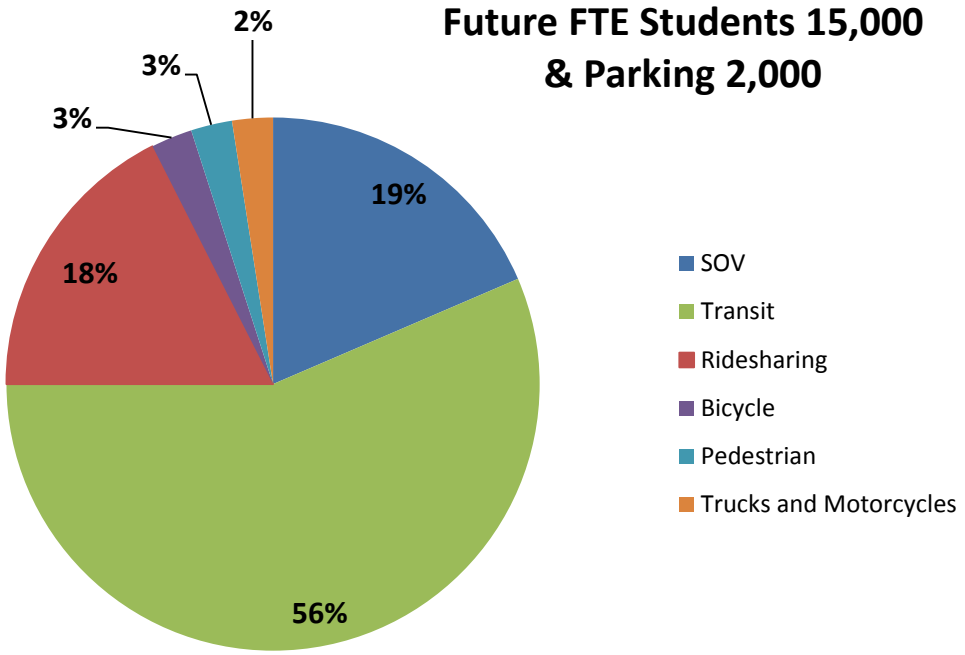
UBC Okanagan Master Plan Transportation Workshop Outcomes

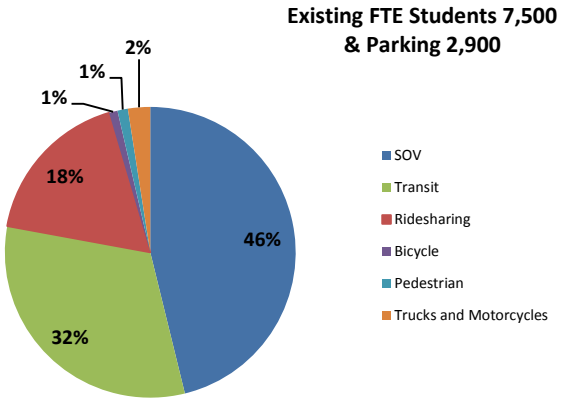
April 24, 2014

Lisa Moffatt

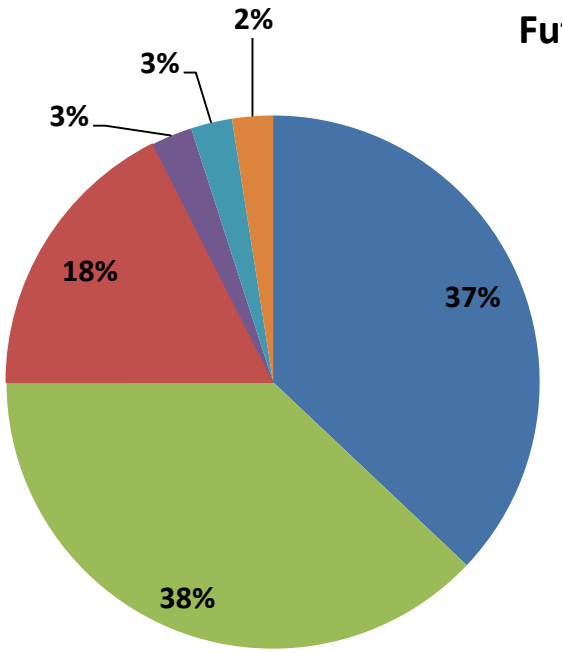
Community Planner, Campus + Community Planning

Mode Share Projections (Scenario 1)





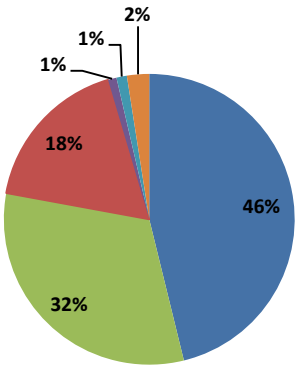
Mode Share Projections (Scenario 2)



Future FTE Students 15,000 & Parking 4,000

- SOV
- Transit
- Ridesharing
- Bicycle
- Pedestrian
- Trucks and Motorcycles

Existing FTE Students 7,500 & Parking 2,900



- SOV
- Transit
- Ridesharing
- Bicycle
- Pedestrian
- Trucks and Motorcycles

Principles

Transit User Experience

- Maximize amenities on campus (e.g. groceries, entertainment, wine and beer)
- Plan and design transit facility to optimize user experience
- Locate transit hub to extend or complement an existing pedestrian corridor

Principles

Public Realm

- Provide dynamic adjacent use to transit hub for safety and vitality
- Ideally locate development on both sides of transit hub
- Design for a strong pedestrian/bicycle network between transit hub and surrounding neighbourhoods

Principles

Integration and Expansion

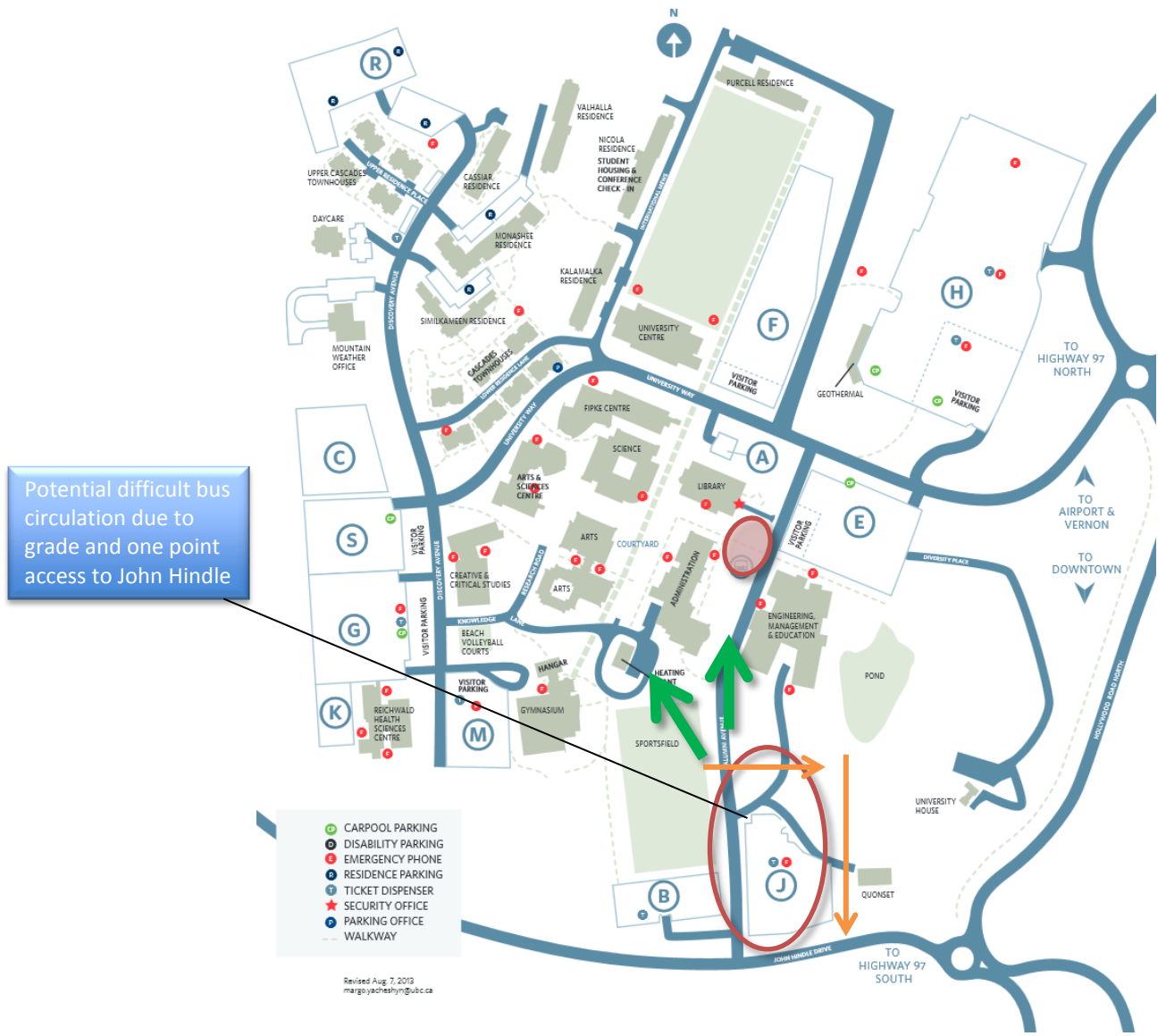
- Design future traffic intersections with transit operations as a priority
- Design with the ability to expand the transit facility
- Hub need not be at the campus core but should be close enough to contribute to vitality and safety of the core

Principles

Safety

- Minimize pedestrian-bus movement conflicts
- Minimize bus routing through campus
- Provide transit support to student residence to address night safety and groceries loads

Group 1


Potential difficult bus circulation due to grade and one point access to John Hindle
Legend
New transit hub location
Potential road closure
Existing transit hub site
Potential lay-over location
Anticipated pedestrian movement
N
PURCELL RESIDENCE
VALHALLA RESIDENCE
NICOLA RESIDENCE
STUDENT HOUSING & CONFERENCE CHECK - IN
UPPER CASCADES TOWNHOUSES
CASSIAR RESIDENCE
DAYCARE
MONASHEE RESIDENCE
KALAMALKA RESIDENCE
SIMILKAMEEN RESIDENCE
MOUNTAIN WEATHER OFFICE
UNIVERSITY CENTRE
FIPKE CENTRE
SCIENCE
ARTS & SCIENCES CENTRE
LIBRARY
ARTS
COURTYARD
CREATIVE & CRITICAL STUDIES
ADMINISTRATION
ENGINEERING, MANAGEMENT & EDUCATION
BEACH VOLLEYBALL COURTS
HANGAR
GYMNASIUM
REICHWALD HEALTH SCIENCES CENTRE
HEATING PLANT
POND
SPORTSFIELD
UNIVERSITY HOUSE
QUONSET
GEOTHERMAL
VISITOR PARKING
TO HIGHWAY 97 NORTH
TO AIRPORT & VERNON
TO DOWNTOWN
TO HIGHWAY 97 SOUTH
CARPOOL PARKING
DISABILITY PARKING
EMERGENCY PHONE
RESIDENCE PARKING
TICKET DISPENSER
SECURITY OFFICE
PARKING OFFICE
WALKWAY
Revised Aug. 7, 2013
margo.yacheshyn@ubc.ca

Group 2

Envisioned as a long u-shaped facility.
Potential multi-level facility for: layover, drop-off/pick-up to use topography

Stops located throughout campus

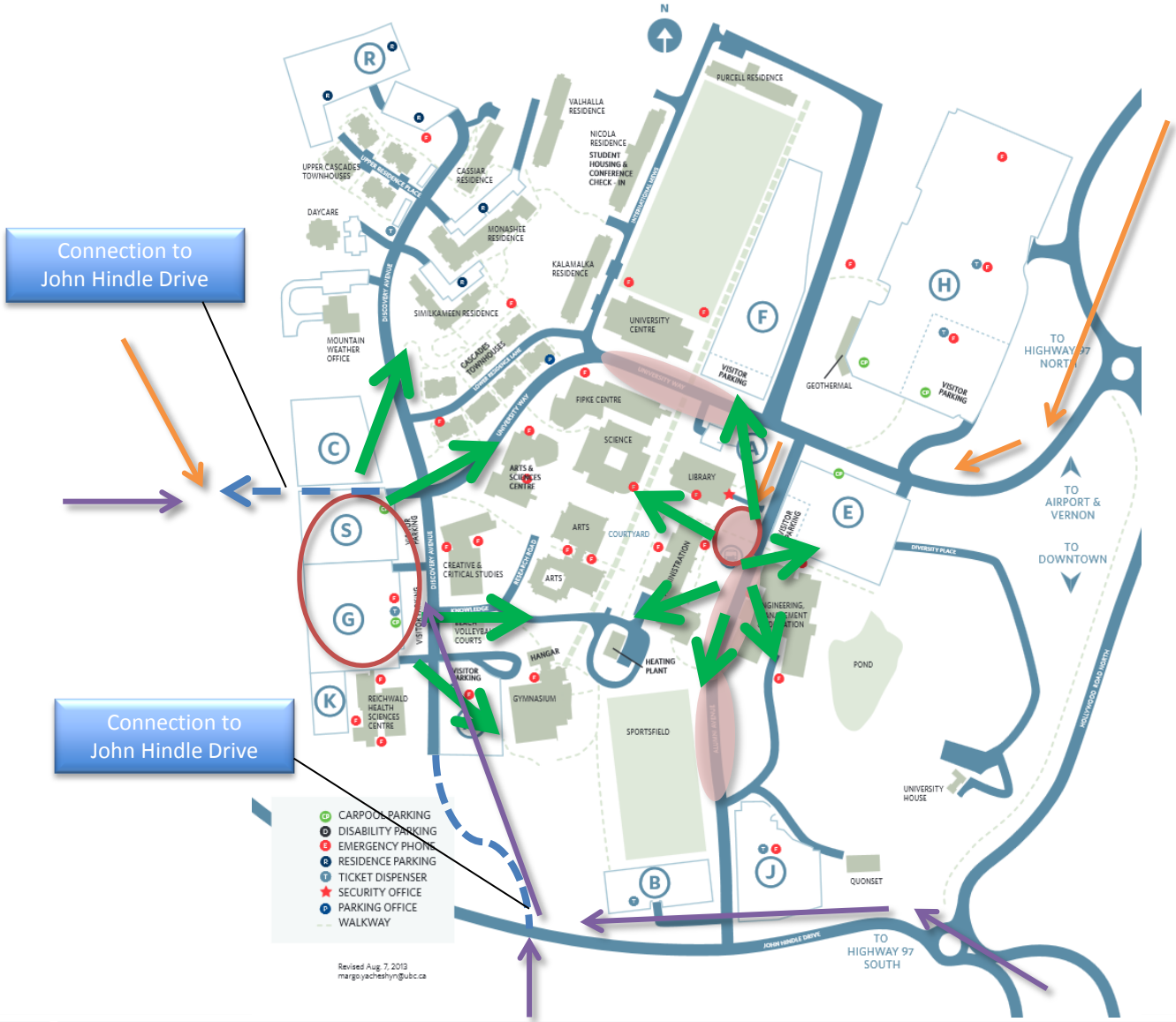
Traffic calming at U-way and Alumni Ave to minimize interactions between pedestrians and vehicles

Potential layover facility

Legend

- New transit hub location
- Potential road closure
- Existing transit hub site
- Potential lay-over location
- Anticipated pedestrian movement

Group 3


Connection to John Hindle Drive
Connection to John Hindle Drive
Legend
New transit hub location
Potential road closure
Potential to retain existing site for SB transit
SB transit travel route
NB transit travel route
Potential new road connection
Anticipated pedestrian movement
CARPOOL PARKING
DISABILITY PARKING
EMERGENCY PHONE
RESIDENCE PARKING
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HOLLYWOOD ROAD NORTH


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