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D. A. Watt Consulting

STADIUM SHOPPING CENTRE

Transportation Impact Assessment

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Engineering Your Future Since 1983

Stadium Shopping Centre

Transportation Impact Assessment

PROFESSIONAL ENGINEER ALBERTA
BRUCE NELLIGAN

April 25, 2013

PERMIT TO PRACTICE
D. A. WATT CONSULTING GROUP LTD.
Signature _____
Date April 25, 2013
PERMIT NUMBER: P 3818
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

Prepared for:	**Western Securities Ltd.**
Prepared by:	**D.A. Watt Consulting**
File:	**2818.T02**
Date:	**April 25, 2013**

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1.0 Introduction

1.1 Background

Western Securities Ltd. is in the process of redeveloping the Stadium Shopping Centre site located on the northwest corner of 16 Avenue and Uxbridge Drive (29 Street) NW. The landowner's aspiration for the site is to transform the underutilized shopping centre into a medium density mixed-use local centre that incorporates many of the planning principles from the Municipal Development Plan and Calgary Transportation Plan. The location of the site is shown in **Figure 1.**

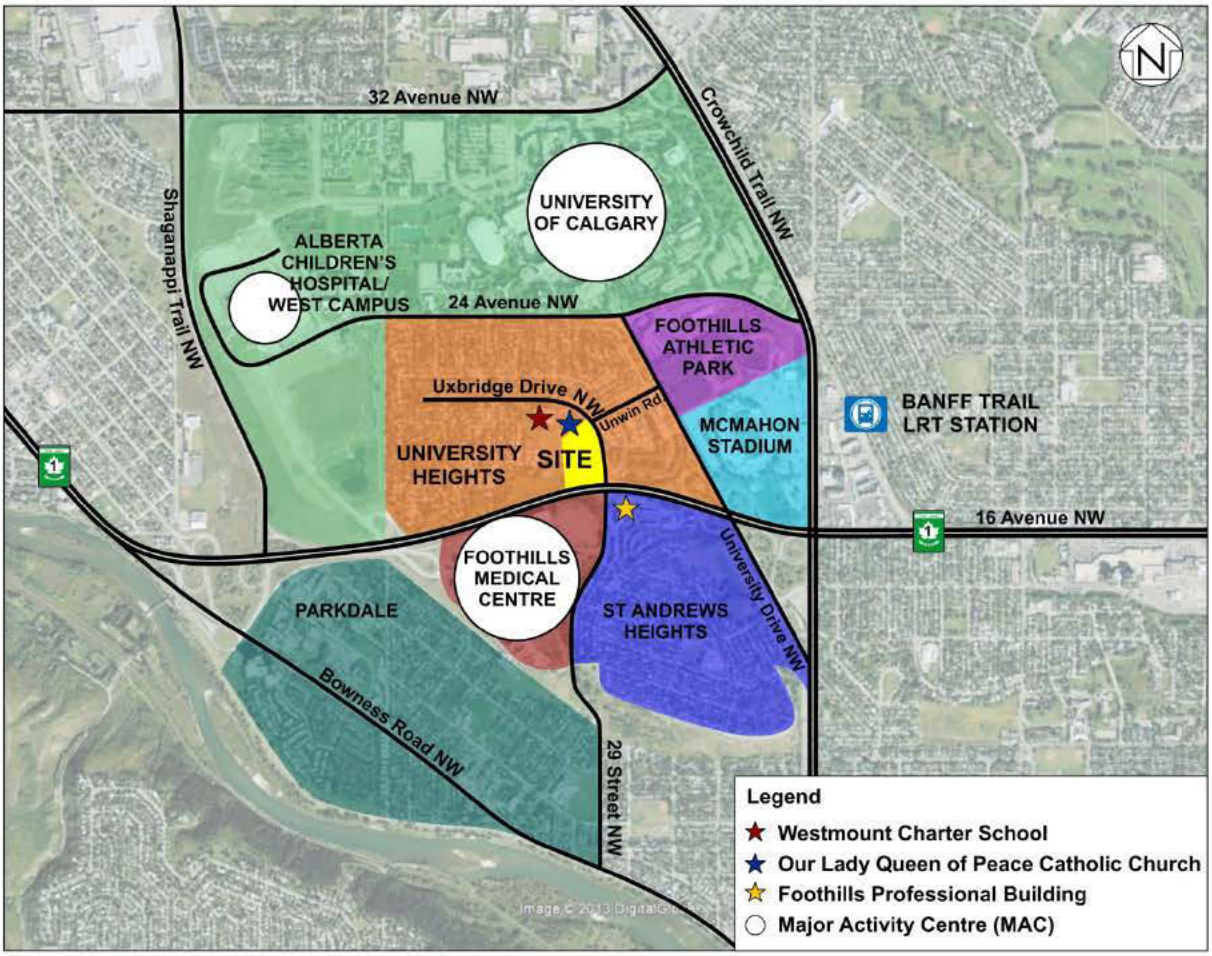

FIGURE 1: SITE CONTEXT

D.A. Watt Consulting (DAW) was retained by Western Securities to review the transportation impact of the proposed development in support of the Area Redevelopment Plan.

1.2 Redevelopment Context

Currently several major institutions and major activity centres (MACs) are linked by both 29 Street (Uxbridge Drive) and 16 Avenue. City planning policy has identified this area as one of the strategic areas that is appropriate for further intensification following the established principles of creating more compact and complete communities. Future development of both the Foothills Medical Centre (FMC) and Stadium Shopping Centre sites will contribute to transforming this area into a more complete mixed-use area.

The Stadium Shopping Centre site is identified as a Neighbourhood Activity Centre within the South Shaganappi Communities Area Plan. According to the Municipal Development Plan (MDP), a NAC is defined as:

> *The Neighbourhood Activity Centre (NAC) is a neighbourhood-scale centre providing opportunities for residential intensification and local jobs, retail, services and civic activities.*

From a transportation perspective, the emphasis around NAC's is on more sustainable modes of transportation, primarily walking, cycling and transit.

The MACs in the vicinity of the intersection, as identified within the MDP, include the University of Calgary, the West Campus, McMahon Stadium and FMC. According to the MDP, a MAC is defined as:

> *Major Activity Centres (MACs) provide for the highest concentration of jobs and population outside of the Centre City area. In addition to achieving higher concentrations of jobs and population, the design and character of the MACs must also create a high-quality environment that features amenities for a comfortable street environment.*

Again from a transportation perspective, the emphasis around MACs is on more sustainable modes of transportation, primarily walking, cycling and transit.

The area where the Stadium Shopping Centre resides is part of the South Shaganappi Communities Area Plan (SSCAP). The SSCAP provides a framework and level of planning between the city of Calgary's Municpal Development Pans and Local Area Plans for the South Shaganappi area over a 30 year time line.

1.3 Study Area and Scope of Work

The study area and the intersections included in the transportation study are shown in **Figure 2.** A detailed scope of work for this study was determined in consultation with the City of Calgary's Transportation Development Services Division and is provided below and also included in **Appendix A.**

1) PREAMBLE

A. Western Securities is proposing to redevelop the Stadium Shopping Centre into a mixed use site with office, retail and residential land uses. It is our understanding that the City is leading an Area Redevelopment Plan (ARP) for the site and will require transportation analysis to support the plan.
B. DA Watt has been retained by Western Securities to provide this information in support of the ARP and proposes the following scope of work for the Transportation Impact Assessment (TIA).

2) HORIZON YEARS

A. Existing Conditions (Baseline)
B. Future Conditions (2039)
C. Counts shall include vehicular, bicycle, and pedestrian traffic. DA Watt shall provide balanced traffic volumes between intersections that are going to be analysed for both existing and future time horizons.

3) TIME PERIODS

A. Weekday AM/PM Peak Hours reflective of the timing of Foothills Medical Centre shift changes and Westmount Charter School start/end times.
B. DA Watt shall show 24-hour data for the roadways in the area to confirm that peak periods are being picked up.
C. DA Watt shall count Uxbridge and the City will update 16 Avenue volumes if necessary.

4) INTERSECTION CAPACITY ANALYSIS

A. 16 Avenue & Uxbridge Drive
B. Site Access (South)
C. Site Access (North) – existing horizon only
D. Site Access (North – Unwin Road (Lane) / Uxbridge Drive)
E. Uxbridge Drive and Lane (on the west side of the Queen of Peace Church)
F. Unwin Road & University Drive
G. Volume shifts from Tim Horton's/Shell resulting from project and potential modifications to Uxbridge Drive shall be included in analysis of study area intersections.
H. In addition to Synchro analysis, SIDRA roundabout analysis shall be done for intersections of Uxbridge Dr & Unwin Rd NW / lane north of site and Uxbridge Dr & Ulster Rd NW in comparing and recommending ultimate intersection control and configuration at these locations.

5) WEAVING ANALYSIS

A. DA Watt shall review existing and future conditions of weaving area westbound on 16 Avenue between University Drive and Uxbridge Drive during AM and PM peak hours.

6) SENSITIVITY ANALYSIS

DA Watt shall conduct sensitivity analysis for all of the study intersections based on a more conservative mode split data (assuming more people driving). The recommended numbers to be used will be verified with the City prior to the analysis.

7) REVIEW OF MODEL DATA

A. DA Watt shall review City's Regional Transportation Model (RTM) data to check population and growth forecasts for Foothills Medical Centre, West Campus, the University of Calgary, McMahon Stadium and the Foothills Athletic Park.
B. As per the City's TIA guidelines, DA Watt shall include information about new developments in the area surrounding the proposed site (West campus, Foothills Medical Centre future expansion, Foothills Athletic centre expansion, McMahon redevelopment etc.) and projected traffic volumes in the background traffic. DA Watt shall provide comments on the relocation of Westmount Charter School (citywide catchment) to University Heights and the impacts of University Elementary School having a 30% non-community enrolment.

8) DAILY VOLUME ANALYSIS

A. Uxbridge Drive
B. Unwin Road and the lane to the north of the site
C. 16 Avenue
D. Significant internal roads

9) MODE SPLIT DATA

A. Current mode split data for site (based on survey to be conducted by DA Watt)
B. Discussion on mode split for future (full-build scenario)
C. DA Watt to obtain RTM mode split and discuss implications

10) PROPOSED TRIP GENERATION RATES

A. 16 Avenue west of Uxbridge Drive is part of the future primary transit network, therefore DA Watt shall use the following mix of TOD and standard rates for the proposed land uses as follows:
B. TOD Office: 1.39 (AM) / 1.57 (PM) – City of Calgary Standard Rate
C. Medical Office: 3.00 (AM) / 4.0 (PM) – Local Example (Ashton Professional Centre)
D. Retail: 2.00 (AM) / 6.00 (PM) – City of Calgary
E. Hotel: 0.56 (AM) / 0.59 (PM) - ITE
F. TOD Residential: 0.35 (AM) / 0.45 (PM) – City of Calgary Standard Rate

11) TRIP ASSIGNMENT AND DISTRIBUTION

A. DA Watt shall estimate the vehicular, bicycle, and pedestrian trip generation for the proposed site for the AM and PM peak periods, and assign all trips to the adjacent roadways.
B. The City's RTM select zone analysis shall be used for the trip distribution patterns. If some minor adjustments need to be done this has to be approved by the City.

12) SITE ACCESS REVIEW

A. DA Watt shall assess the operation of the site access locations, and provide commentary related to on-site circulation.
B. South site access proximity to the signalized intersection of 16 Avenue & Uxbridge Drive NW shall be included in this review.

13) INTERNAL TRIP CAPTURE, PASS-BY, AND DIVERTED LINKED TRIPS

A. DA Watt shall use Transportation Research Board methodology for calculating internal trip rates.
B. The City estimates that 20% of the external trips to/from the site will be either diverted linked trips (drivers already travelling along 16 Avenue that divert to the site and then continue on 16 Avenue) or pass-by trips (drivers already travelling along Uxbridge Drive that turn into the site and then continue along Uxbridge Drive). DA Watt shall document the split between pass-by and diverted linked trips in the TIA report.

14) PARKING REVIEW

A. DA Watt shall review on- and off-site parking requirements and management issues, including: bylaw requirements and justification for any reduction, hospital traffic currently using the parking lot and where they will be relocated to, and recommendations for neighbourhood spillover parking mitigation.

15) TRANSIT

A. Existing Transit Service & Conditions
B. Current Pedestrian Facilities
C. Current Pedestrian Volumes
D. Future Transit Service Planned for the Immediate Area (assessment of what's needed to meet the anticipated demand)
E. Forecast of transit trips generated to/from the site using the forecast mode split
F. Proposed transit facilities for site and surrounding area (bus shelters, benches, bus bays connections etc.

16) ACTIVE MODES

A. DA Watt shall review the HCM 2010 methodology for assessing bikes/peds and will provide the City with an assessment of whether this analysis will add value to the process and at what cost.
B. DA Watt shall provide an assessment of available infrastructure in the area surrounding the site for pedestrians and cyclists (with photos)
C. DA Watt shall map out destinations, routes, and barriers within 1km and 3km of the site, including the identification of potential improvements
D. DA Watt shall estimate future peak hour pedestrian volumes generated by the site

17) SHORT-CUTTING TRAFFIC REVIEW

A. DA Watt shall review the potential impacts of the site on short-cutting traffic by:
    a. Identifying potential routes
    b. Estimating the potential increase in volumes
    c. Develop potential mitigation measures including closures, turn restrictions, and both horizontal and vertical calming installations

18) TDM

A. DA Watt shall comment on the high level characteristics of a TDM plan that is appropriate for the site and things that can be included in conditions of development (i.e. carpool parking, bike lockers, shower facilities, car share program etc.).
B. Include recommendations for design/improvements as required for all report sections (e.g. access, parking, proposed road cross-sections, and TDM measures)

19) PROJECT MANAGEMENT

A. The City and DA Watt shall meet at least every two weeks to discuss the progress and results. Some additional work might be required after these consultations.

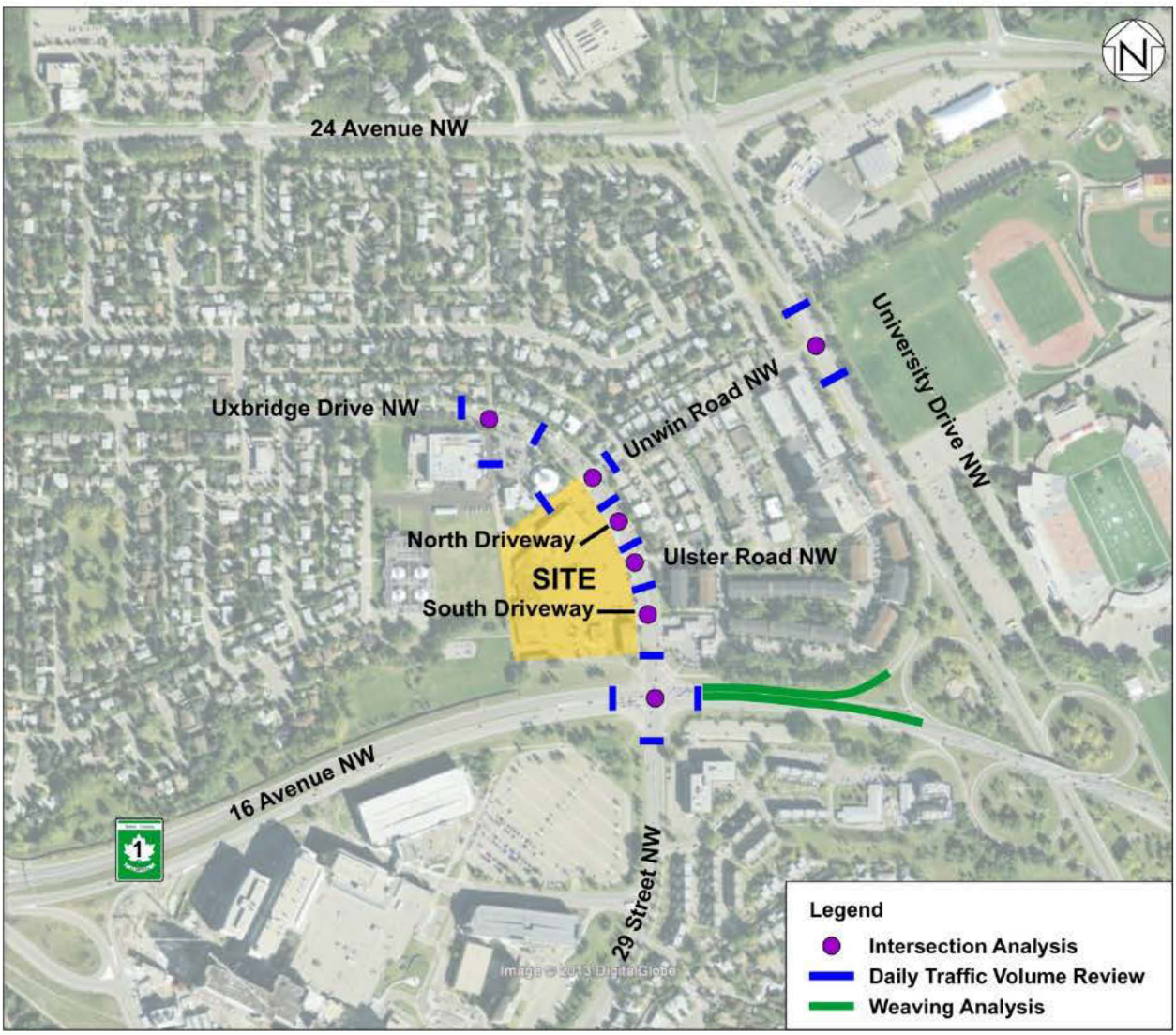

FIGURE 2: STUDY AREA AND INTERSECTIONS

2.0 Existing Conditions

2.1 Existing Road Network

The proposed development is located in the northwest corner of the intersection of 16 Avenue / Uxbridge Drive. The north edge of the site is bounded by a lane, and the western edge is bounded by a park. The vehicular transportation network in the vicinity of the proposed site consists of the following roads:

16 Avenue

- Classified as a Skeletal Roadway (from west City limits to 49 Street, Bowness Road to Crowchild Trail and Deerfoot to east City limits)
- Classified as an Urban Boulevard in the vicinity of the proposed development (from 49 Street to Bowness Road and Crowchild Trail to Deerfoot)
- Part of the primary transit network (west of 29 Street)
- Part of the primary goods movement network
- Part of the primary HOV network
- Links three major activity centres together (FMC, West Campus and University of Calgary)
- High concentration of pedestrian and cyclist volumes at 16 Avenue/29 Street intersection

29 Street (Uxbridge Drive)

- Classified as a collector roadway
- Part of the primary transit network (south of 16 Avenue)
- Links two major activity centres together (FMC and University of Calgary)

The existing lane configuration and traffic controls, as confirmed during a site visit, are shown in **Figure 3**.

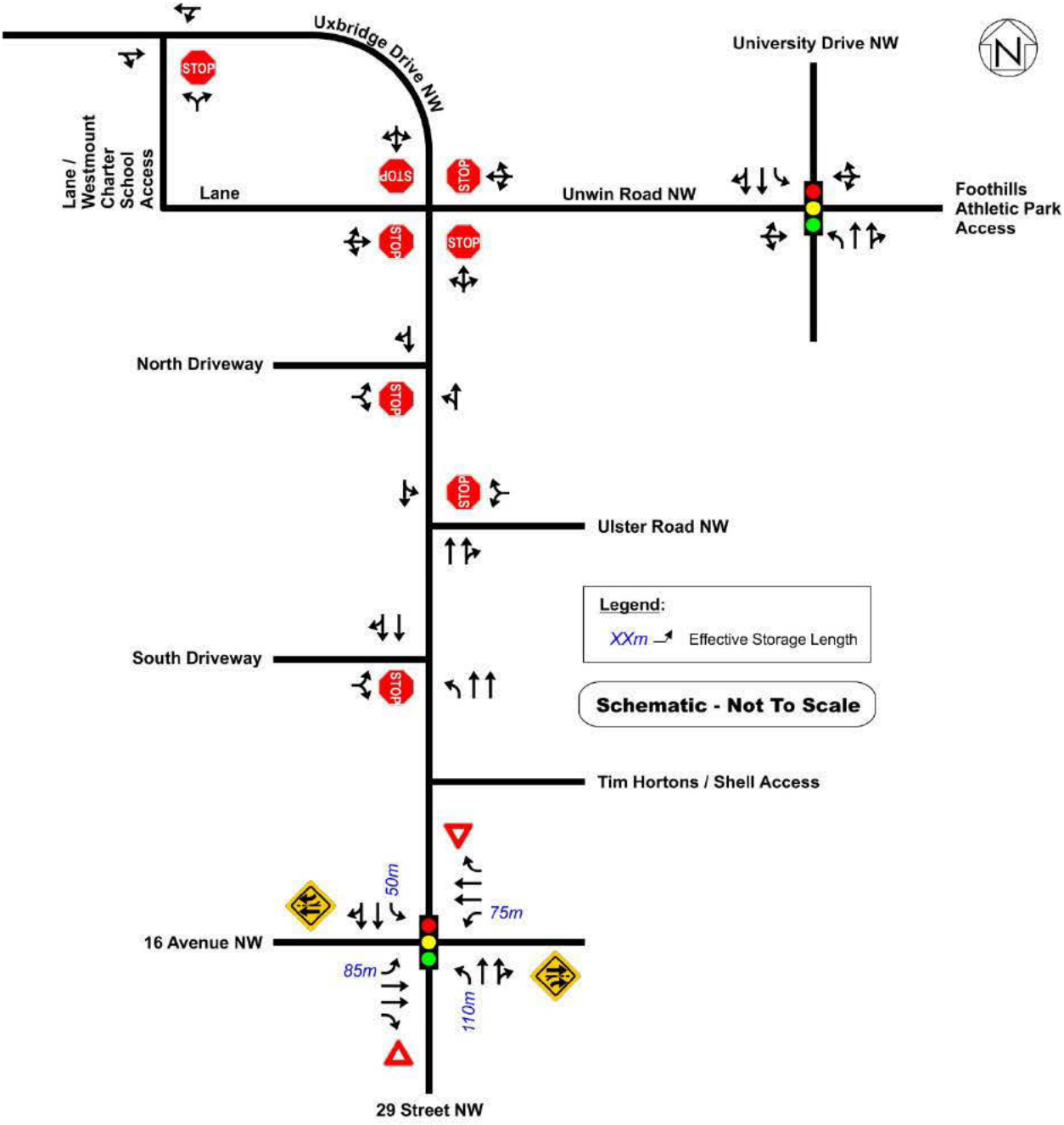

FIGURE 3: EXISTING LANE CONFIGURATION AND TRAFFIC CONTROL

2.2 Existing Traffic, Pedestrian and Bicycle Volumes

Existing traffic, pedestrian and bicycle volumes were collected at the study intersections on weekdays throughout February 2013. Intersection turning movement counts were conducted from 7:00 a.m. to 9:00 a.m. and 3:00 p.m. to 6:00 p.m. and recorded vehicle, bicycle, and pedestrian activities at each intersection. A summary of the traffic count schedule is included in **Table 1.** The raw traffic count data is included in **Appendix B**.

It is noted that teacher's convention occurred on February 14 and 15, 2013 and the University of Calgary had its reading week from February 17 – February 24. No intersection traffic counts were conducted during this time period. The traffic count hoses that were in place along Uxbridge Drive south of Unwin Road were in place for two days before the convention (February 12 and 13) as well as the first day of the convention. The impact of the teacher's convention is discussed in Section 2.3.

TABLE 1: INTERSECTION TURNING MOVEMENT COUNT SCHEDULE

Survey Type	Location	Data Collector	Date	Hours
Weaving count	Westbound 16 Avenue Weave	DAW	Wednesday February 20, 2013	7-9 a.m. and 3-6 p.m.
Turning Movement Count	Unwin Road / University Drive	DAW	Wednesday February 13, 2013	7-9 a.m. and 3-6 p.m.
	Uxbridge Drive / North Lane (access to Westmount Charter School)	DAW	Wednesday February 13, 2013	7-9 a.m. and 3-6 p.m.
	Uxbridge Drive / Unwin Road (lane)	DAW	Wednesday February 13, 2013	7-9 a.m. and 3-6 p.m.
	Uxbridge Drive / Ulster Road	DAW	Tuesday February 12, 2013	7-9 a.m. and 3-6 p.m.
	16 Avenue / Uxbridge Drive (29 Street)	DAW	Tuesday February 12, 2013	7-9 a.m. and 3-6 p.m.

Existing intersection turning movement traffic volumes were then balanced between intersections. The balanced existing traffic volumes are shown in **Figure 4**. Note that the traffic volumes shown at the Tim Hortons driveways were estimated by balancing adjacent intersection turning movement counts. The pedestrian, bicycle and transit passenger intersection counts are summarized in **Figure 5**.

According to the City of Calgary's Transportation department, the seasonal adjustment conversion factor needed for data collected on a Tuesday and Wednesday in February is 1.06 corresponding with the nearest 24 hour count station to the city (Shaganappi Trail NW south of 32 Avenue NW). The intersections counts conducted for this study were not seasonal adjusted.

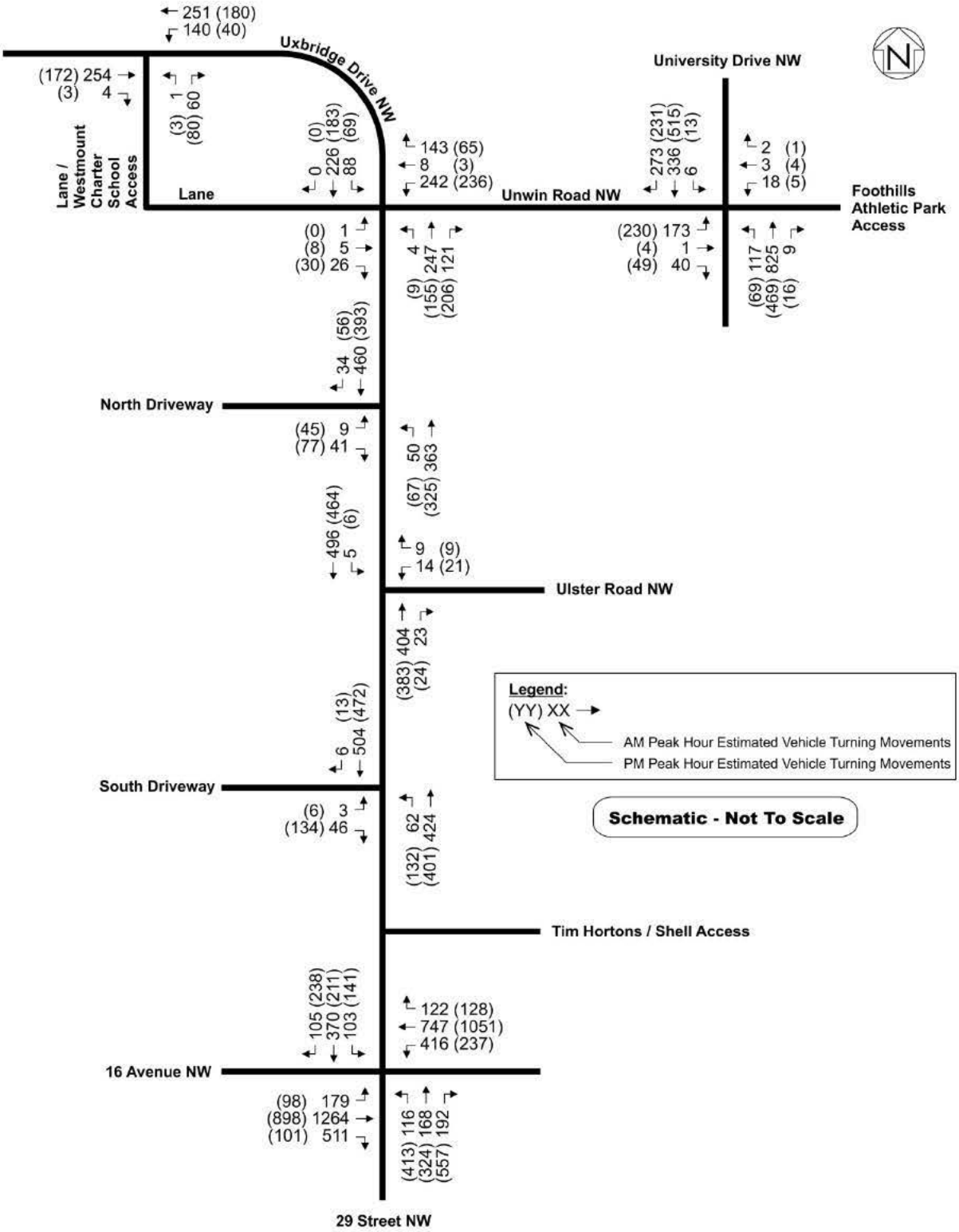

FIGURE 4: BALANCED EXISTING TRAFFIC VOLUMES

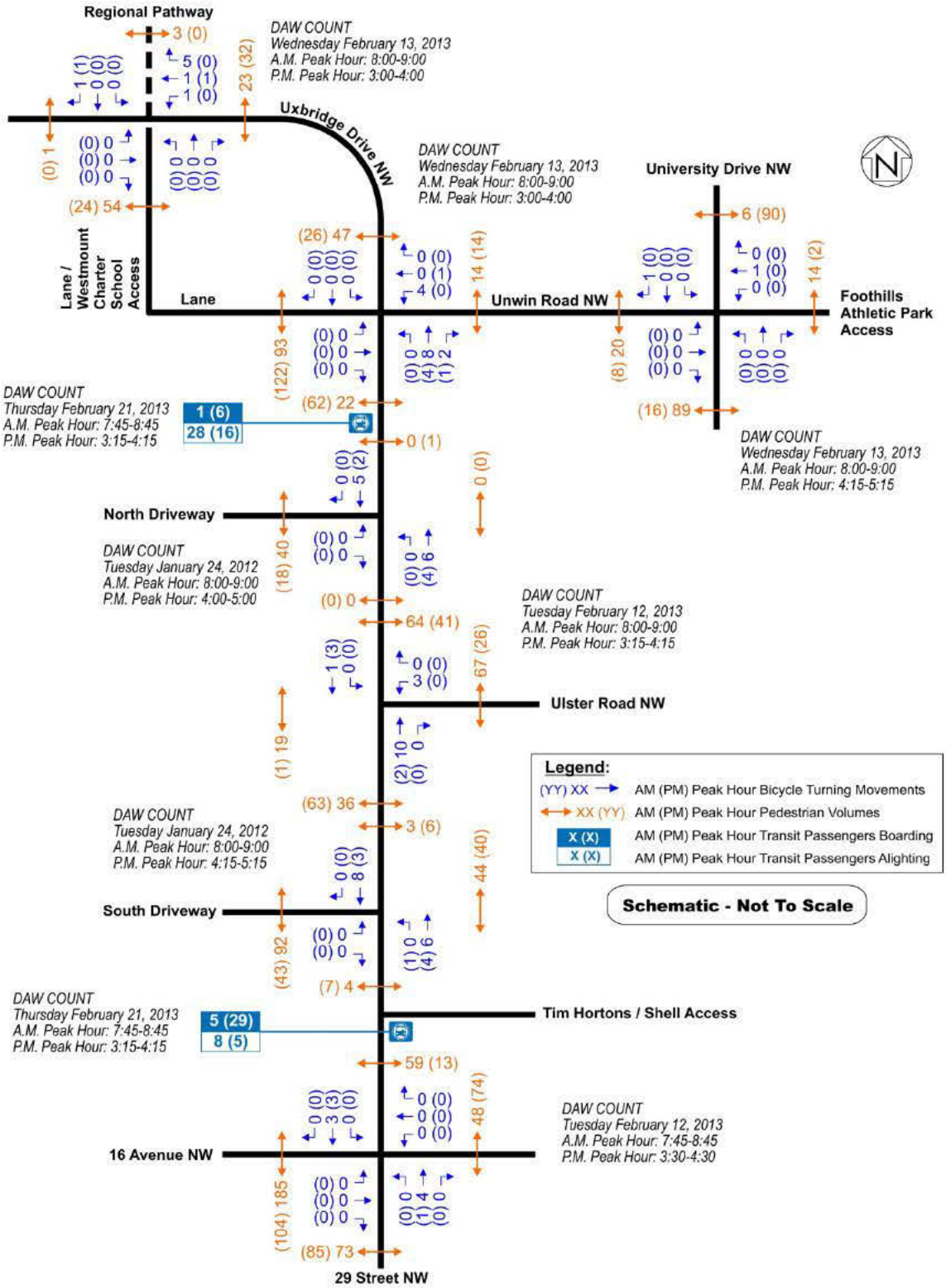

FIGURE 5: EXISTING PEDESTRIAN, BICYCLE AND TRANSIT PASSENGER VOLUMES

2.3 Existing Daily Traffic Volumes

Daily traffic volumes were collected on Uxbridge Drive south of Unwin Road from February 12-15, 2013 by the City of Calgary data collection staff. Previous 24-hour traffic counts were also gathered and reviewed as outlined in **Table 2**.

TABLE 2: DAILY TRAFFIC COUNT DATA

Survey Type	Location	Source	Date	Hours
Daily Counts	Uxbridge Drive South of Unwin Road	City of Calgary	Feb.12-15, 2013 (Tue-Fri)	24 hours
	Unwin Road East of Uxbridge Drive	DAW	Thursday July 7, 2011	24 hours
	16 Avenue East of 29 Street	City of Calgary	Tuesday August 26, 2008	24 hours

Daily traffic volume profiles were summarized for both Unwin Road and Uxbridge Drive. The 24-hour profiles are provided in **Figure 6** and **Figure 7**. The traffic along Unwin is more balanced over the course of a day building to a peak in the afternoon. The Uxbridge Drive traffic profile is more typical of commuter patterns with a spike in the morning and a spike in the afternoon. The afternoon peak hour is from 3:00 p.m. until 4:00 p.m. which is consistent with the peak periods for the schools in the neighbourhood.

As previously mentioned, the 24-hour volumes along Uxbridge Drive (south of Unwin) were collected for the few days before the Teacher's Convention and one full day after. On February 14, the first day of the convention, the total 24-hour volumes were reduced by 9.5 percent, while the peak hour volumes were reduced 43% for the AM Peak Hour and 22% in the PM Peak Hour. The data that was collected on Uxbridge Drive for the two day period before the convention was similar to historical counts that were collected at the same location in 2008 and 2002.

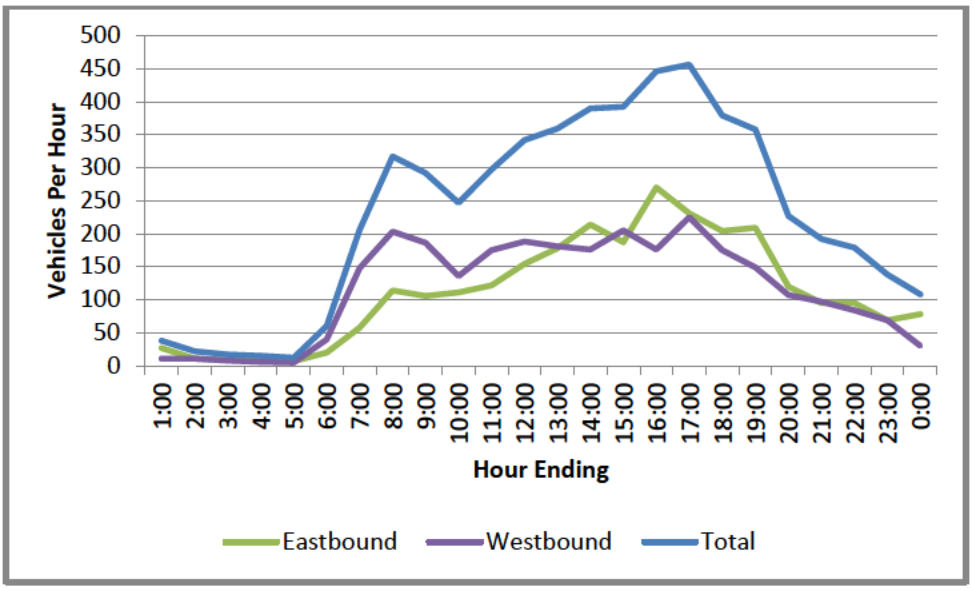

FIGURE 6: WEEKDAY 24-HOUR VOLUME PROFILE ON UNWIN ROAD

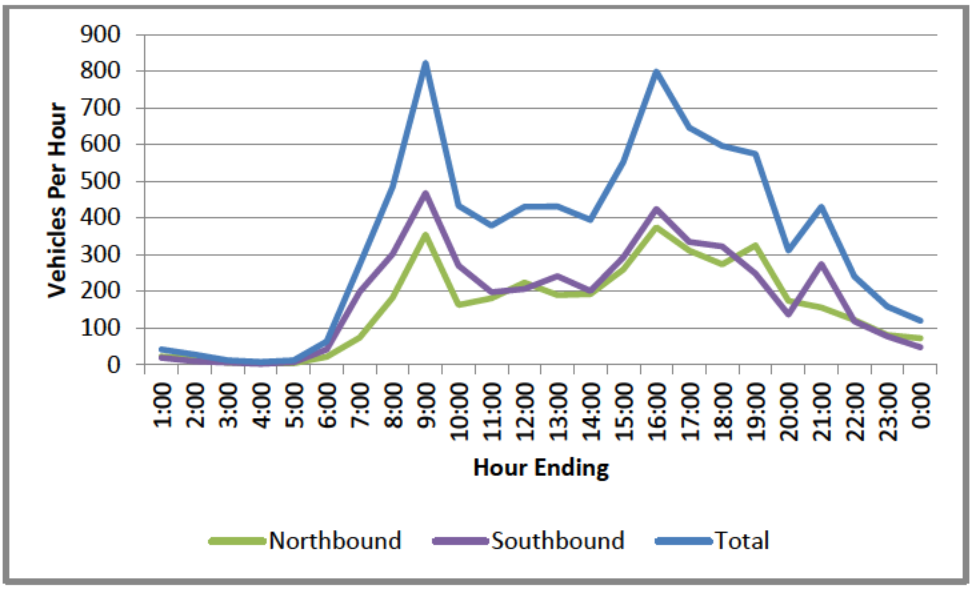

FIGURE 7: WEEKDAY 24-HOUR VOLUME PROFILE ON UXBRIDGE DRIVE SOUTH OF UNWIN ROAD

2.4 Existing Mode Split

2.4.1 Stadium Shopping Centre

In addition to the intersection turning movement counts, a mode split survey was conducted at Stadium Shopping Centre. This count identified the total number of vehicles, passengers, transit users, pedestrians and cyclists entering and exiting the site. The mode split count was conducted on Thursday February 21, 2013 between 7-9 a.m. and 3-6 p.m. The raw mode split count data is included in **Appendix C.** The resulting mode split is summarized in **Table 3**.

TABLE 3: EXISTING MODE SPLIT COUNT – STADIUM SHOPPING CENTRE

MODE	AM		PM	
	IN	OUT	IN	OUT
Auto Driver	72%	53%	69%	74%
Auto Passenger	7%	10%	8%	8%
Pedestrians	19%	36%	23%	17%
Bicycles	1%	1%	0%	0%
Transit	1%	0%	0%	1%
TOTAL	100%	100%	100%	100%

During the mode split survey, observers were asked to identify pedestrians who were either:

1) Destined to/from the school and using the parking lot as a short-cut route to the pathway west of the site. These pedestrians were easily identifiable as adults travelling with small children destined to Westmount Charter School during the peak pick-up/drop-off times. These adults then returned via the same route without children.
2) Walking from the site to other nearby uses including but not limited to Foothills Hospital, Westmount Charter School and Foothills Professional Centre. These users were identifiable as pedestrians who parked a vehicle and then immediately left the site or vice versa.
3) Walking through the site without stopping.

The mode split survey results were adjusted to remove the above data points from the survey data. It is noted that approximately 40% of the total trips in the a.m. and p.m. peak hour were associated with uses other than Stadium Shopping Centre. The resulting adjusted mode split is shown in **Table 4**.

TABLE 4: EXISTING MODE SPLIT COUNT FOR STADIUM SHOPPING CENTRE (ADJUSTED)

MODE	AM		PM	
	IN	OUT	IN	OUT
Auto Driver	83%	78%	87%	86%
Auto Passenger	14%	19%	12%	13%
Walk & Cycle	3%	3%	1%	1%
Transit	0%	0%	0%	0%
TOTAL	100%	100%	100%	100%

As shown, more than 95 percent of the trips to/from the site are currently by vehicle. This indicates that the site is primarily auto-oriented and that there is significant opportunity to reduce vehicle trips to the Stadium Shopping Centre by providing enhanced transit, pedestrian and bicycle facilities to promote the use of other modes.

2.4.2 University Heights

Existing mode split data for University Heights residents was collected as part of the 2006 Federal Census. The census data provided information related to which mode of travel University Heights residents used to commute to work. The results of the census data are provided below in **Table 5**. For comparison purposes, two typical suburban neighborhoods (Coventry Hills and Glamorgan) along with city wide data are also included in the table.

TABLE 5: EXISTING MODE SPLIT UNIVERSITY HEIGHTS RESIDENTS COMMUTE TO WORK*

MODE	UNIVERSITY HEIGHTS	COVENTRY HILLS	GLAMORGAN	CITY OF CALGARY
Auto Driver	47%	79%	66%	68%
Auto Passenger	4%	7%	6%	8%
Walk and Cycle	26%	1%	7%	7%
Transit	22%	12%	20%	17%
Other	1%	1%	1%	1%
TOTAL	100%	100%	100%	100%

* Based on 2006 Federal Census Data – Numbers may add up to more than 100% because of rounding

This data is relevant to this study since the future residents of the site are expected to exhibit a similar mode split for peak hour travel (or even less auto travel with enhanced transit service and better infrastructure to support walking and cycling).

2.5 Lane Observations

During the mode split count, observations of vehicular activities were conducted in the lane north of the shopping centre. The following observations were made:

- Many parents were observed walking their kids to the elementary school by cutting through the site and the gap in the fence on the west side;
- Parents were also observed using the Stadium Shopping Centre parking lot as a vehicle pick-up/drop-off area;
- Minor amounts of traffic use lane as access to the shopping centre (approx. 10 vehicles during each peak hour);
- No traffic was observed accessing the church parkade during the surveys;
- Several vehicles were observed parking in lane despite no parking signs (concentrated around p.m. school pick up times); and,
- Several vehicles were observed travelling along the entire length of the lane without stopping. We suspect this is school traffic using the lane as a turnaround route as it primarily occurred during peak school times.

Site visits were made to determine the quality of the lane. **Figure 8**, from Google streetview shows what the lane looks like during non-winter period (August 2012), while **Figure 9** shows the quality of the lane during a site visit on March 20, 2013.

FIGURE 8: VIEW OF LANE DURING SUMMERTIME

FIGURE 9: VIEW OF LANE DURING SITE VISIT

2.6 Existing Operating Conditions

2.6.1 Intersection Operations

The existing operating conditions for the intersections within the study area were evaluated using the Synchro 7.0 software package (which is based on the methodology outlined in the Highway Capacity Manual[1]). For unsignalized (stop-controlled) intersections, the level-of-service (LOS) is based on the computed delays on each of the critical movements. LOS 'A' represents minimal delays for minor street traffic movements, and LOS 'F' represents a scenario with an insufficient number of gaps on the major street for minor street motorists to complete their movements without significant delays.

For signalized intersections, the methodology considers the intersection geometry, traffic volumes, the traffic signal phasing/timing plan, and also pedestrian volumes. The average delay for each lane group is calculated, as well as the delay for the overall intersection. The operating conditions can also be expressed in terms of volume-to-capacity (v/c) ratio. The LOS criteria for signalized and unsignalized intersections, as summarized in the Highway Capacity Manual, in presented in **Table 6**.

[1] Transportation Research Board, National Research Council. Highway Capacity Manual 2000. Washington, D.C. 2000.

TABLE 6: LEVEL OF SERVICE CRITERIA

Level of Service (LOS)	Average Delay for Unsignalized Intersection Movements	Average Delay for Signalized Intersection Movements
A	0 – 10 seconds per vehicle	0 – 10 seconds per vehicle
B	> 10 – 15 seconds per vehicle	> 10 – 20 seconds per vehicle
C	> 15 – 25 seconds per vehicle	> 20 – 35 seconds per vehicle
D	> 25 – 35 seconds per vehicle	> 35 – 55 seconds per vehicle
E	> 35 – 50 seconds per vehicle	> 55 – 80 seconds per vehicle
F	> 50 seconds per vehicle	> 80 seconds per vehicle

Applying the existing traffic volumes summarized in Figures 4 and 5 and the existing intersection geometry from Figure 3, the results of the Synchro analysis for each of the study intersections are summarized in **Table 7.** The existing signal timing plan is included in **Appendix D**. Detailed capacity analysis Synchro reports for the signalized and stop-controlled intersections are included in **Appendix E**, while detailed capacity analysis SIDRA reports for the roundabouts are included in **Appendix L.**

TABLE 7: EXISTING OPERATING CONDITIONS

INTERSECTION / MOVEMENT			AM PEAK HOUR				PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)	v/c Ratio	LOS	Delay (s)	Queue (m)
Uxbridge Dr / Lane (Stop-Controlled)	EB	Through / Right	0.16	A	0	0	0.11	A	0	0
	WB	Left / Through	0.13	A	4	4	0.04	A	2	1
	NB	Left / Right	0.10	B	11	3	0.12	B	11	3
Unwin Rd / Uxbridge Dr (Stop-Controlled)	EB	Left / Through / Right	0.06	B	10	-	0.07	A	9	-
	WB	Left / Through / Right	0.71	C	23	-	0.52	C	15	-
	NB	Left / Through / Right	0.65	C	20	-	0.56	B	15	-
	SB	Left / Through / Right	0.59	C	18	-	0.43	B	13	-
North Driveway / Uxbridge Dr (Stop-Controlled)	EB	Left / Right	0.11	B	14	3	0.30	C	17	10
	NB	Left / Through	0.05	A	2	1	0.06	A	2	2
	SB	Through / Right	0.31	A	0	0	0.28	A	0	0
Ulster Rd / Uxbridge Dr (Stop-Controlled)	WB	Left / Right	0.09	C	20	3	0.11	C	20	3
	NB	Through / Right	0.17	A	0	0	0.16	A	0	0
	SB	Left /Through	0.01	A	0	0	0.01	A	0	0
South Driveway / Uxbridge Dr (Stop-Controlled)	EB	Left / Right	0.08	B	11	2	0.22	B	12	7
	NB	Left	0.06	A	9	2	0.13	A	9	4
		Through	0.13	A	0	0	0.12	A	0	0
	SB	Through / Right	0.21	A	0	0	0.19	A	0	0
16 Avenue/ Uxbridge Dr / 29 Steet (Signalized)	EB	Left	0.78	E	70	71	0.80	F	102	#68
		Through	0.95	D	49	#215	0.90	E	56	168
		Right	0.86	D	43	#177	0.22	B	11	18
	WB	Left	1.04	F	97	#184	0.84	E	77	#110
		Through	0.46	B	19	83	0.77	D	36	161
		Right	0.15	A	3	10	0.18	A	5	14
	NB	Left	1.62	F	367	#84	1.13	F	119	#211
		Through / Right	0.52	C	23	37	0.74	C	28	120
	SB	Left	0.86	F	97	#62	1.61	F	353	#114
		Through / Right	0.84	E	58	#89	0.80	D	48	#80
	Intersection Summary		-	**E**	**56**	-	-	**E**	**60**	-
Unwin Rd / University Dr (Signalized)	EB	Left / Through / Right	0.56	B	19	37	0.68	C	22	44
	WB	Left / Through / Right	0.07	B	13	6	0.02	B	11	3
	NB	Left	0.39	B	14	23	0.29	B	14	15
		Through / Right	0.55	B	11	57	0.34	B	10	30
	SB	Left	0.03	A	9	2	0.04	A	10	4
		Through / Right	0.14	A	6	24	0.52	A	10	43
	Intersection Summary		-	**B**	**11**	-	-	**B**	**12**	-

The existing capacity analysis results are summarized below:

16 Avenue / Uxbridge Drive (29 Street)

The intersection of 16 Avenue / Uxbridge Drive (29 Street) is currently operating at an overall LOS E in both the a.m. and p.m. peak hour. Several movements are currently operating at LOS F and E in both peak hours. This indicates that this intersection is approaching capacity with the current geometric configuration. It is noted that several volume-to-capacity (v/c) ratios currently exceed 1.0 during the peak periods. In particular, the northbound left-turn movement in the a.m. peak hour and the southbound left-turn movement in the p.m. peak hour both operate with v/c ratios in excess of 1.6.

The 95th percentile westbound left-turn queue length was estimated at 180m in the a.m. peak hour. This queue length exceeds the left turn bay storage length of approximately 100m. Field visits confirmed that the westbound left-turn queue sometimes backs up into the through lane during the peak periods.

Other Intersections

The capacity analysis results indicate that all remaining study intersections are operating at acceptable levels of service during the a.m. and p.m. peak hours. No operational issues were observed at the other intersections and all individual movements are operating at LOS C or better with v/c ratios less than 0.90.

2.6.2 Improved Intersection Operations

The intersection of 16 Avenue / Uxbridge Drive (29 Street) is currently operating at an overall LOS E in both the a.m. and p.m. peak hour. The City of Calgary is aware of the operational issues at this intersection and is planning to widen the westbound approach to include a dual westbound left-turn lane. It is also noted that there are no left-turn phases for the northbound and southbound movements during the morning peak period. The lack of a left-turn phase for the northbound traffic in the a.m. peak period is contributing to the long delays for this movement.

Capacity analysis was conducted with the westbound dual left-turn lane in place as well as a northbound left-turn phase during the a.m. peak period and a southbound left turn phase in the P.M. The results of the analysis are shown in **Table 8**. The results indicate that the overall intersection is expected to improve from an overall LOS E to an overall LOS D during both peak periods. Furthermore, the westbound left-turn movement is expected to improve to LOS E during both peak periods and the improvement is expected to reduce the occurrence of the westbound left-turn lane spilling back and blocking the through lane. The addition of the protected/permissive left-turn phase for the northbound movement in the a.m. peak period significantly reduces the delays and queue lengths for this movement.

TABLE 8: EXISTING OPERATING CONDITIONS – IMPROVED*

INTERSECTION / MOVEMENT			AM PEAK HOUR				PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)	v/c Ratio	LOS	Delay (s)	Queue (m)
16 Avenue/ Uxbridge Dr / 29 Steet (Signalized)	EB	Left	0.74	E	67	71	0.70	E	73	#50
		Through	0.95	D	50	#225	0.86	D	43	#144
		Right	0.75	C	26	124	0.20	A	6	13
	WB	Left	0.87	E	69	#86	0.88	E	79	#54
		Through	0.58	C	30	109	0.97	E	56	#182
		Right	0.18	A	5	13	0.21	A	7	16
	NB	Left	0.57	D	43	40	0.96	E	58	#133
		Through / Right	0.38	B	17	33	0.99	D	39	106
	SB	Left	0.67	E	67	#26	0.62	C	31	32
		Through / Right	0.88	E	64	#93	0.68	C	27	46
	Intersection Summary		-	**D**	**44**	-	-	**D**	**46**	-

* Dual westbound left-turn lane plus a northbound left-turn phase in the a.m. and a southbound left turn phase added in the p.m.

2.6.3 Weaving Analysis

The City of Calgary requested that the westbound weaving section along 16 Avenue between University Drive and Uxbridge Drive be analyzed as part of this study. The concern was that the increased traffic generated by the site may generate operational and safety issues along this weaving section. It is noted that weaving analysis is typically conducted using the methods prescribed in the Highway Capacity Manual (HCM). The methodology however is based on uninterrupted traffic flow characteristics and is primarily meant to analyze weaving movements on freeway segments. Therefore, the HCM methodology for analyzing weaving area could not be applied to this section since it is considered “interrupted flow” with the signal at Uxbridge Drive.

Therefore, general traffic operational and safety observations were made during the p.m. peak period on April 3, 2013. Based on these observations, there were no existing operational or safety issues associated with the weaving movement. Most of the weaving movements took place at low operating speeds and sufficient gaps were generally available in the adjacent traffic stream. Under lower operating speeds, drivers in the westbound through lane were generally observed to let merging vehicles into the through traffic stream by creating gaps (courtesy gaps). During the observed study periods the queue length on 16 Avenue NW ranged from 40 m to 240 m. **Figure 10**, a still frame from the video, shows that currently during peak hour traffic, the queue on 16 Avenue NW already extends past the merge point of the ramp entering from University Drive NW. Therefore, since the westbound queue currently extends beyond the University Drive southbound to westbound ramp, the additional traffic generated by the proposed redevelopment of Stadium Shopping Centre is not expected to have an impact on the safety and operations of this movement.

FIGURE 10: QUEUE LENGTH ON 16 AVENUE NW PAST WEAVING SECTION

3.0 Future Background

3.1 Future Road Network

The future road network in the area of the proposed development is expected to change between 2013 and the 2039 horizon year. The City's Regional Transportation Model (RTM) which is used to estimate future traffic volumes assumes a number of improvements to the network. The projects that are assumed to be complete by 2039 that are relevant to this study include:

- 16 Avenue widened to 6 lanes through 29 Street intersection
- NW LRT Extended to Tuscany Rocky Ridge
- Interchange at 16 Avenue / Bowfort Road
- Introduction of the South Shaganappi BRT (exact route to be determined)

In addition to the above network improvements, it was assumed that a northbound dual left-turn would be provided by the year 2039 since it is close to being warranted under existing conditions.

The City has been protecting land around the 16 Avenue / 29 Street intersection for a potential future interchange. Through discussions with City Administration, it was concluded that the proposed interchange at this location is not consistent with the policies included in the Municipal Development Plan and the Calgary Transportation Plan and would not support pedestrian and transit oriented development in the area. Based on this input, it was assumed that the intersection would remain at-grade in the future.

3.2 Review of Land Use Model Data

Future traffic volumes were based on traffic forecasts from the City's RTM. The City's RTM contains assumptions for future jobs and population in each transportation zone (TZ) based on projected land uses and their associated densities. To verify the assumptions in the RTM, the RTM job and population forecasts were compared to the current understanding of development plans in the vicinity of Stadium Shopping Centre. The 2006 and 2039 forecasts are shown in **Figure 11** and further discussed in **Table 9.**

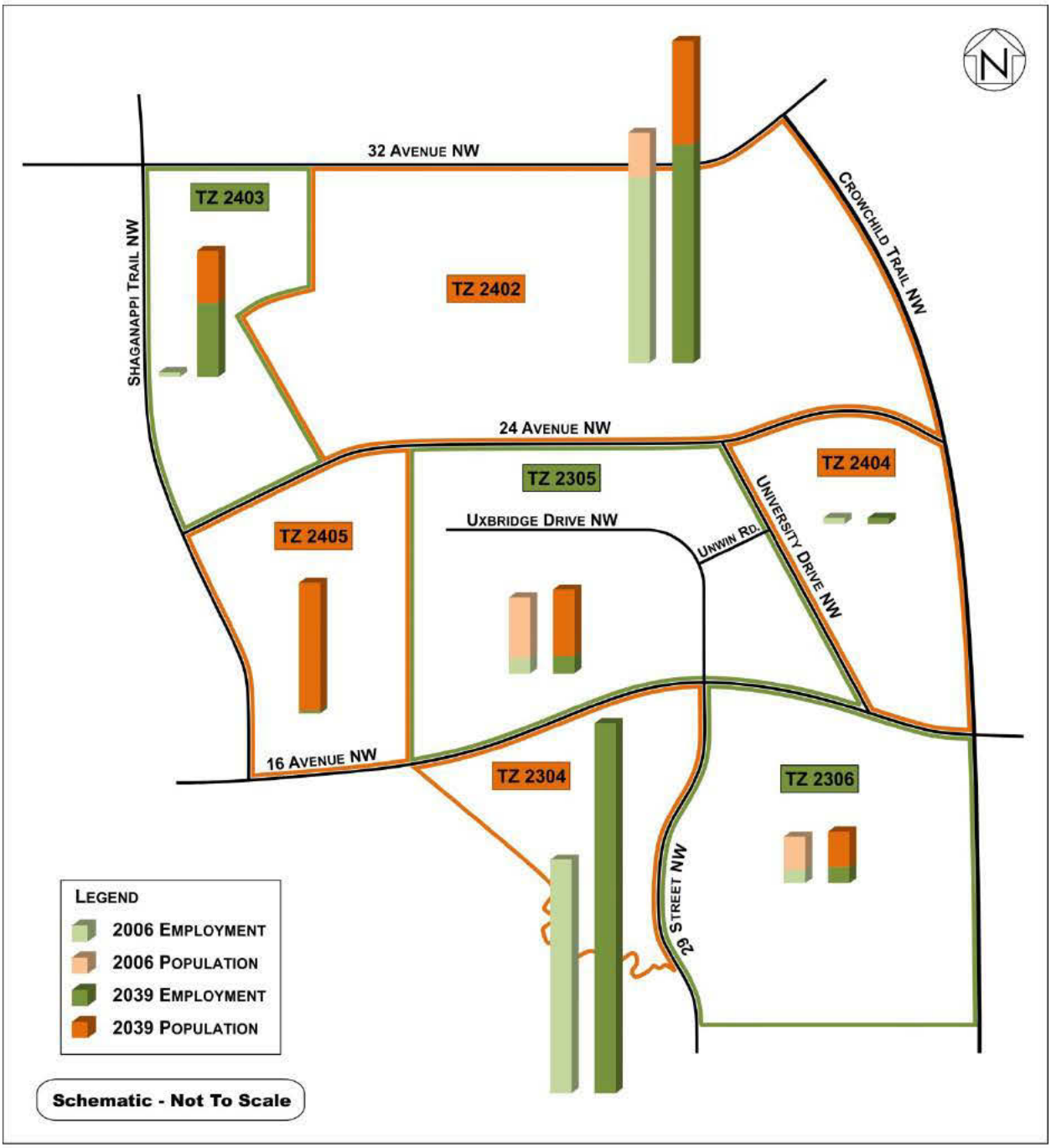

FIGURE 11: RTM EMPLOYMENT AND POPULATIONS FORECASTS

TABLE 9: RTM EMPLOYMENT AND POPULATIONS FORECASTS

Employment / Population Forecast	2006	2039	% Change	Comments
TZ 2035 – Stadium Shopping Centre and University Heights				
Employment	748	853	+ 14%	Assumes some minor growth, does not include Stadium Shopping Centre redevelopment. No changes to background growth but will add traffic generated by the redeveloped site.
Population	2919	3193	+ 9%	
TZ 2304 – Foothills Medical Centre				
Employment	11,246	17,816	58%	Assumes significant growth of site including Cancer Care Centre. Growth included in the model is higher than what is assumed in the 2006 FMC master plan. No changes recommended.
Population	0	0	0%	
TZ 2402 – University of Calgary				
Employment	8957	10,519	17%	Assumes significant growth in population and employment. No changes recommended.
Population	2137	5,000	134%	
TZ 2403 – West Campus and Children's Hospital				
Employment	219	3533	1,513%	Assumes significant growth and development of West Campus. Recommended changes discussed below.
Population	0	2525	n/a	
TZ 2405 – West Campus				
Employment	0	145	n/a	Assumes significant growth and development of West Campus. Recommended changes discussed below.
Population	0	6150	n/a	
TZ 2306 – St. Andrews Heights				
Employment	664	785	18%	Minor growth assumed. No changes recommended.
Population	1588	1711	8%	
TZ 2404 - McMahon Stadium and Foothills Athletic Centre				
Employment	291	291	0%	No growth assumed. No changes recommended as discussed below.
Population	0	0	0%	

With the exception of the zones that include parts of West Campus (TZ 2403 and TZ 2405) and the McMahon Stadium/Foothills Athletic Centre zone (TZ 2404) all TZ's show growth that is consistent with current development plans.

West Campus

For comparison, the future estimate of employment and population at West Campus (TZ 2403 and TZ 2405) was obtained from the West Campus Development Trust (WCDT). Development plans currently estimate 9,700 employment and 13,000 population for a total of 22,700 people. Summing both West campus TZs together the 2039 forecast estimate is 12,400 people. This indicated the RTM model was underestimating the traffic generation from West Campus. To account for this discrepancy, the traffic volumes associated with West Campus were increased by 83 percent to reflect current estimates.

Foothills Athletic Centre

The RTM assumed no growth at McMahon Stadium and Foothills Athletic Centre. Based on conversations with City of Calgary TDS staff, it is understood that redevelopment is planned at Foothills Athletic Centre. This redevelopment is expected to have a minor impact on the a.m. and p.m. peak hour in the area of the proposed redevelopment. The adjustments that were made to account for redevelopment of the Foothills Athletic Centre are discussed in the following section.

McMahon Stadium

Although some future redevelopment is anticipated at McMahon Stadium, no further information was available at the time of this study. TDS staff indicated that the impact of any future development at McMahon stadium will be evaluated under a separate study.

3.3 Future Mode Split

The RTM also included a forecast of future mode splits for the University Heights TZ. The future mode split from the RTM is shown in **Table 10** together with the mode split data from 2006 for comparison purposes. The raw data is included in **Appendix F**.

TABLE 10: 2039 MODE SPLIT FOR UNIVERSITY HEIGHTS (TZ 2305)

MODE	2006 RESIDENTIAL	2039 ALL LAND USES
Auto Driver	44%	48%
Auto Passenger	4%	18%
Pedestrians & Bicycles	28%	27%
Transit	24%	14%
TOTAL	100%	100%

3.4 Future Background Traffic, Pedestrian and Bicycle Volumes

Future background traffic volumes were developed based on the City of Calgary's RTM 2039 horizon forecasts. The detailed methodology of the development of background traffic, pedestrian and bicycle volumes is shown in **Appendix G**. The 2039 background peak hour traffic volumes are shown in **Figure 12.**

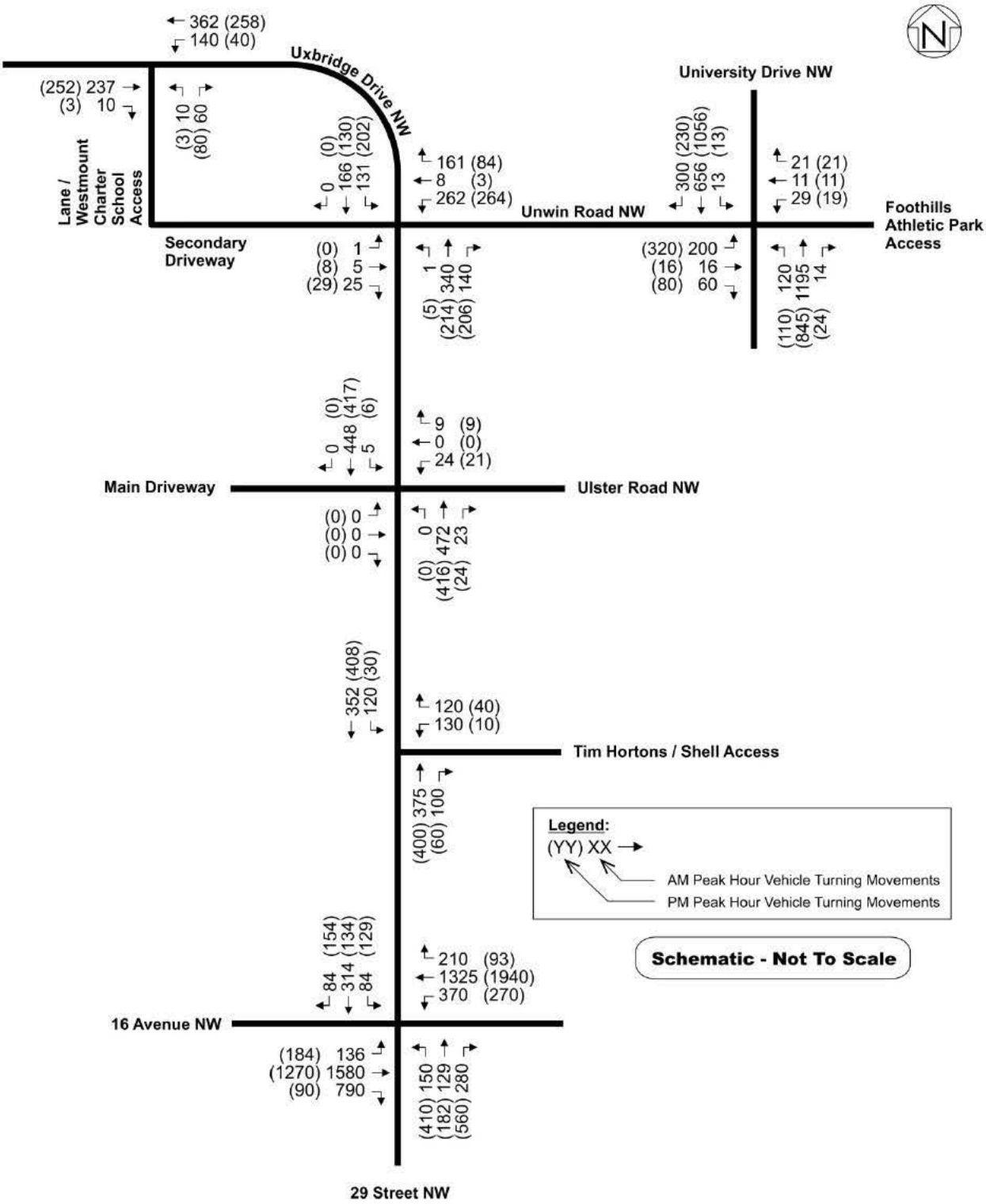

FIGURE 12: FUTURE BACKGROUND PEAK HOUR TRAFFIC VOLUMES

3.5 Future Background Intersection Operating Conditions

Using the volumes in **Figure 12**, capacity analysis was conducted for all of the study intersections. The results of this analysis are provided in **Table 11**.

TABLE 11: FUTURE BACKGROUND OPERATING CONDITIONS

INTERSECTION / MOVEMENT			AM PEAK HOUR				PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)	v/c Ratio	LOS	Delay (s)	Queue (m)
Uxbridge Dr / Lane (Stop-Controlled)	EB	Through / Right	0.15	A	0	0	0.16	A	0	0
	WB	Left / Through	0.13	A	3	4	0.04	A	2	1
	NB	Left / Right	0.15	B	13	4	0.13	B	11	4
Unwin Rd / Uxbridge Dr (Stop-Controlled)	EB	Left / Through / Right	0.07	B	11	-	0.07	B	11	-
	WB	Left / Through / Right	0.83	D	34	-	0.66	C	21	-
	NB	Left / Through / Right	0.89	E	41	-	0.72	C	22	-
	SB	Left / Through / Right	0.61	C	20	-	0.61	C	19	-
Ulster Rd / Uxbridge Dr (Stop-Controlled)	WB	Left / Through / Right	0.21	D	33	6	0.14	C	24	4
	NB	Left / Through / Right	0.16	A	0	0	0.14	A	0	0
	SB	Left / Through / Right	0.01	A	0	0	0.01	A	0	0
Tim Hortons / Uxbridge Dr (Stop-Controlled)	WB	Left / Right	0.73	E	38	45	0.09	B	12	2
	NB	Through / Right	0.16	A	0	0	0.17	A	0	0
	SB	Left / Through	0.15	A	2	3	0.17	A	1	1
16 Avenue/ Uxbridge Dr / 29 Steet (Signalized)	EB	Left	0.71	E	79	65	1.05	F	139	#110
		Through	0.73	C	33	169	0.71	D	37	141
		Right	1.09	F	87	#331	0.16	A	7	13
	WB	Left	0.83	E	74	79	0.70	E	66	54
		Through / Right	0.71	C	30	167	1.06	E	76	#272
	NB*	Left	0.66	E	78	38	0.90	E	79	#91
		Through	-	-	-	-	0.44	D	47	71
		Right	-	-	-	-	0.95	D	45	#156
		Through / Right	0.60	C	21	39	-	-	-	-
	SB	Left	0.43	D	45	35	0.48	D	35	49
		Through / Right	0.88	E	75	#91	0.48	C	28	33
	Intersection Summary			**D**	**47**	-	-	**E**	**60**	-
Unwin Rd / University Dr (Signalized)	EB	Left / Through / Right	0.72	C	32	#76	0.96	E	62	#123
	WB	Left / Through / Right	0.16	B	15	16	0.12	B	13	11
	NB	Left	0.62	C	27	36	0.42	B	12	14
		Through / Right	0.71	B	13	97	0.50	B	12	54
	SB	Left	0.11	B	10	4	0.06	B	14	5
		Through / Right	0.59	A	10	62	0.95	D	36	#149
	Intersection Summary		-	**B**	**15**	-	-	**C**	**31**	-

* defacto right in p.m. peak hour

The analysis suggests that even with the widening of 16 Avenue by one lane in each direction, the intersection of 16 Avenue and Uxbridge Drive will continue to operate at close to capacity during the peak periods. The analysis also indicates that most of the other study intersections are expected to operate satisfactorily with minimal delays. The exception is the intersection of Unwin Road and Uxbridge Drive where the northbound movement is expected to approach capacity during the a.m. peak period.

4.0 Proposed Development

4.1 Land Use Concept

The proposed mixed-use development is expected to incorporate retail, multi-family, office, medical office, seniors housing and a hotel. The proposed intensity as provided by Western Securities is shown in **Table 12.** Some street parking will be provided within the development with the majority of the parking demand accommodated through underground/structured parking.

TABLE 12: LAND USE CONCEPT

Land Use	Intensity
Retail	73,000 ft^2
Restaurant	24,000 ft^2
Residential	310 units
Office	255,000 ft^2
Medical Office	100,000 ft^2
Hotel	200 rooms

4.2 Site Access and Internal Road Network

As part of the redevelopment, the two existing site accesses will be relocated. The existing south access with be relocated to align with Ulster Road. The north site access will be moved to the north and will be combined with the lane on the north edge of the site across from Unwin Road.

A potential right-in / right-out access onto 16 Avenue from the site is currently being explored by the applicant's design team. There are a number of design issues associated with the potential access and these would need to be discussed and resolved to the satisfaction of City's Transportation Department before this access could be approved. These discussions are expected to take place at later stages of the redevelopment process when the site plan has been better defined. Notwithstanding the design issues associated with the new access, a high-level assessment was completed for the right-in/right-out access onto 16 Avenue to estimate the potential impacts on traffic operations. Based on this assessment, the additional access on 16 Avenue will improve operations slightly at the south access on Uxbridge Drive but the impact is not expected to be significant.

With regards to the internal road network, this is still being developed by the applicant's design team. Therefore, we are not able to assess the daily volumes and traffic operations on the internal streets at this time.

4.3 Trip Generation

The trip generation for the proposed redevelopment was estimated based on methods prescribed by the Institute of Transportation Engineers (ITE). Typically, the trip generation for a single-use site is estimated by multiplying a trip rate (e.g. trips / 1,000ft^2 of gross floor area of development) by the proposed area of development. The same methodology is used for mixed-use site however, an additional step is added to account for the internal trips that are inherent with these types of development. One of the advantages of mixed-use site is that they can generate a significant amount of internal trips between complimentary land uses. For example, someone living on the site may stop to pick up a coffee on the way to the transit stop. The trip from the residence to the coffee shop is known as an internally captured trip since the trip did not leave the site. The technical definition of an internal trip as provided by the Institute of Transportation Engineers (ITE) is provided below:

> *An internal trip, as defined by ITE, is one that is made without utilizing the major road system. For the purposes of this project, the definition is expanded to include travel within a highly interactive area containing complementary land uses and convenient internal on- or off-street connections that may use short segments of major streets. An example might be a one block development consisting of residential, office, and retail buildings with convenient sidewalk connections between them and a single parking facility serving all three land uses.*

A method for estimating the trip generation potential for mixed-use sites was recently developed and the methodology is described in the *NCHRP Report 684*[2] published by the Transportation Research Board (TRB). Using this methodology, the trip generation of a mixed-use site is determined by first estimating the total trip generation for the site assuming that each land use is a single-use development. Then, a series of reductions are applied to account for the anticipated internal capture rates between each pair of origin and destination land uses. The methodology also allows reductions to be applied based on an anticipated future mode split and vehicle occupancy data.

Using the TRB methodology, the total number of vehicular, transit, walking and cycling trips that are expected to be generated by the redeveloped site were estimated and are summarized in **Figure 13** together with the current trip generation. The detailed trip rate tables are provided in **Appendix I**.

[2] NCHRP Report 684 - Transportation Research Board, Enhancing Internal Trip Capture Estimation for Mixed-Use Developments, 2011.

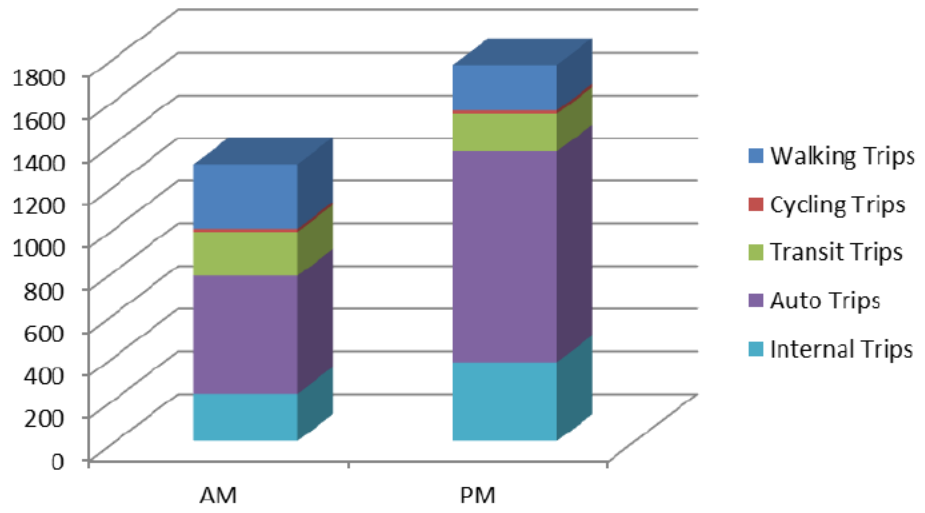

FIGURE 13: ESTIMATED TRIP GENERATION FOR STADIUM SHOPPING CENTRE

4.4 Trip Distribution

The City's transportation model provides estimates for the traffic distribution patterns to/from all of the Transportation Zones. The RTM data for the TZ containing Stadium Shopping Centre is included in **Appendix J.** This data, in addition to general population distribution, and current site traffic patterns were used to estimate the traffic distribution pattern for each land use proposed with the SSC.

Office: The distribution for the office and medical office use was based on general population distribution in the city of Calgary.

Hotel: The trip distribution patterns for hotel were estimated based on the assumption that most hotel patrons would either come directly from the airport or downtown. The distribution for hotel accordingly distributes traffic primarily toward the major roadways of Crowchild Trail and 16 Avenue.

Residential: Vehicular trip distribution for the residential and seniors uses was based on the City of Calgary model information. Some minor adjustments were made to account for the specific road network in the vicinity of the Stadium Shopping Centre.

Retail: Vehicular trip distribution for the retail and restaurant uses was based on existing traffic counts conducted at the site driveways. These turning movement counts were used to estimate

the proportion of traffic turning left, travelling straight through and turning right when entering and exiting the site.

4.5 Trip Assignment

Based on the peak hour vehicular traffic generation and the trip distribution pattern, the vehicular traffic was manually assigned to the adjacent street network. The resulting overall assignment of site generated trips is illustrated in **Figure 14**. Individual trip assignment layers for vehicles are included in **Appendix K.**

Retail pass-by trips were assigned to the network based on the assumption that 70 percent of the pass-by trips were to/from 16 Avenue (drivers already travelling along 16 Avenue that divert to the site and then continue on 16 Avenue) with 40% of those trips eastbound and 60 percent westbound. The remaining 30 percent of pass-by trips were assumed to come from Uxbridge Drive (drivers already travelling along Uxbridge Drive that turn into the site and then continue along Uxbridge Drive) and were assumed to be 40 percent southbound and 60 percent northbound. The detailed pass-by trip assignment is also shown in **Appendix K.**

Based on the peak hour pedestrian and transit trip generation and the trip distribution pattern, the pedestrian and transit trips were manually assigned to the area street network. The resulting overall assignment of site generated trips is illustrated in **Figure 15**.

The trip generation for bicycles was very low, as a result bicycle trips were not manually assigned to the network. Instead, a conservative minimum of 5 conflicting bicycles was assumed at every intersection approach, unless observed to be higher in the current traffic counts.

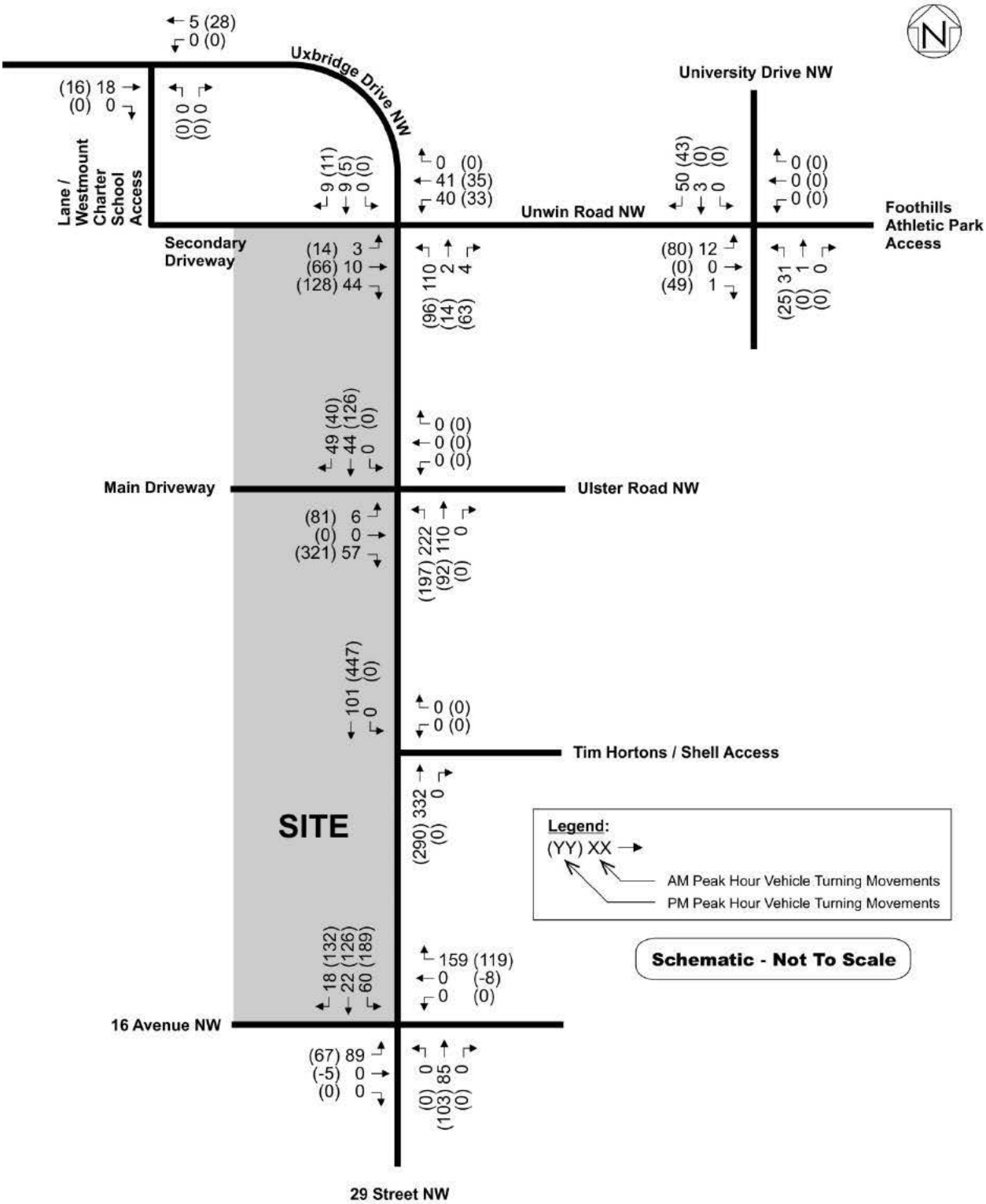

FIGURE 14: SITE GENERATED TRAFFIC VOLUMES

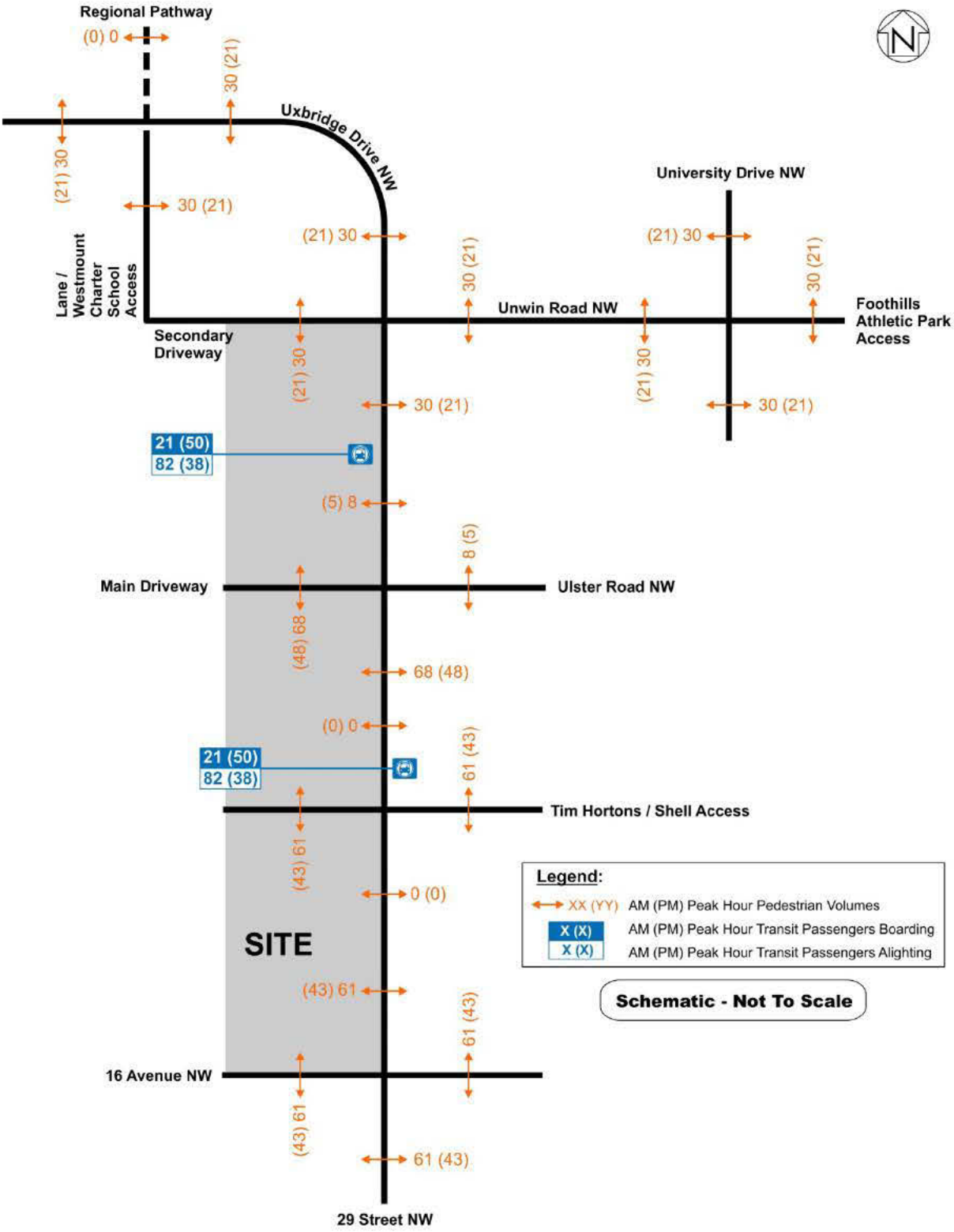

FIGURE 15: SITE GENERATED PEDESTRIAN AND TRANSIT VOLUMES

5.0 Post-Development Conditions

5.1 Post Development Traffic Volumes

The trips generated by the proposed redevelopment were added to the 2039 background traffic volumes to determine the future post-development traffic volumes at the study intersection. The post-development traffic, walk and transit volumes for the study intersections are summarized in **Figure 16** and **Figure 17**.

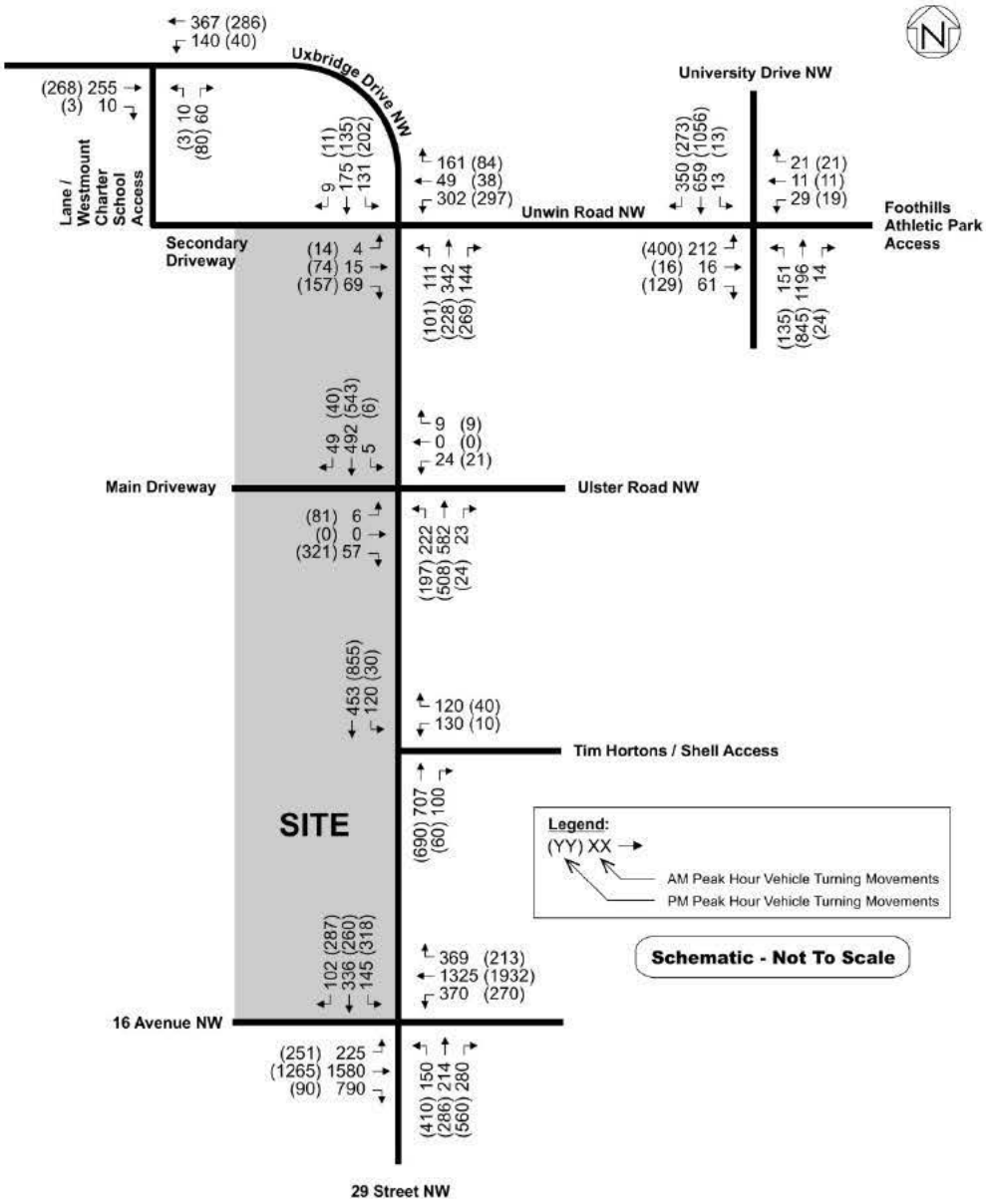

FIGURE 16: POST-DEVELOPMENT TRAFFIC VOLUMES

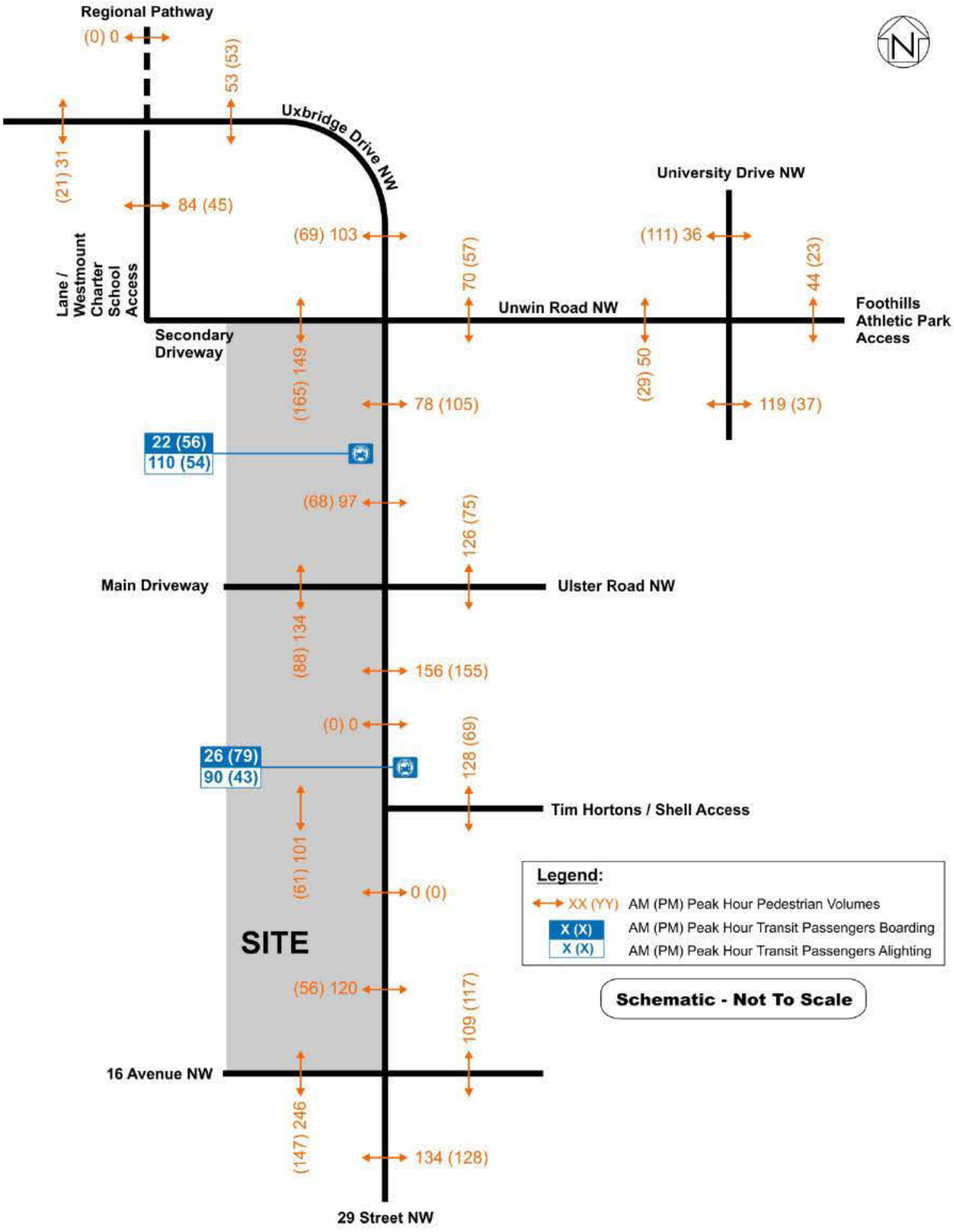

FIGURE 17: POST-DEVELOPMENT PEDESTRIAN AND TRANSIT VOLUMES

If roundabouts are introduced along Uxbridge Drive at the two entrances to the site, the traffic volumes will change. This is primarily based on the assumption that a median would be constructed from the south roundabout to 16 Avenue which would force traffic exiting the Shell Station to turn right from the site. The portion of traffic exiting the site that is destined to 16 Avenue would then need to do a u-turn through the roundabout. The estimated intersection volumes with roundabouts in place is provided in **Figure 18.**

Detailed capacity analysis Synchro reports for the signalized and stop-controlled intersections are included in **Appendix E**, while detailed capacity analysis SIDRA reports for the roundabouts are included in **Appendix L.**

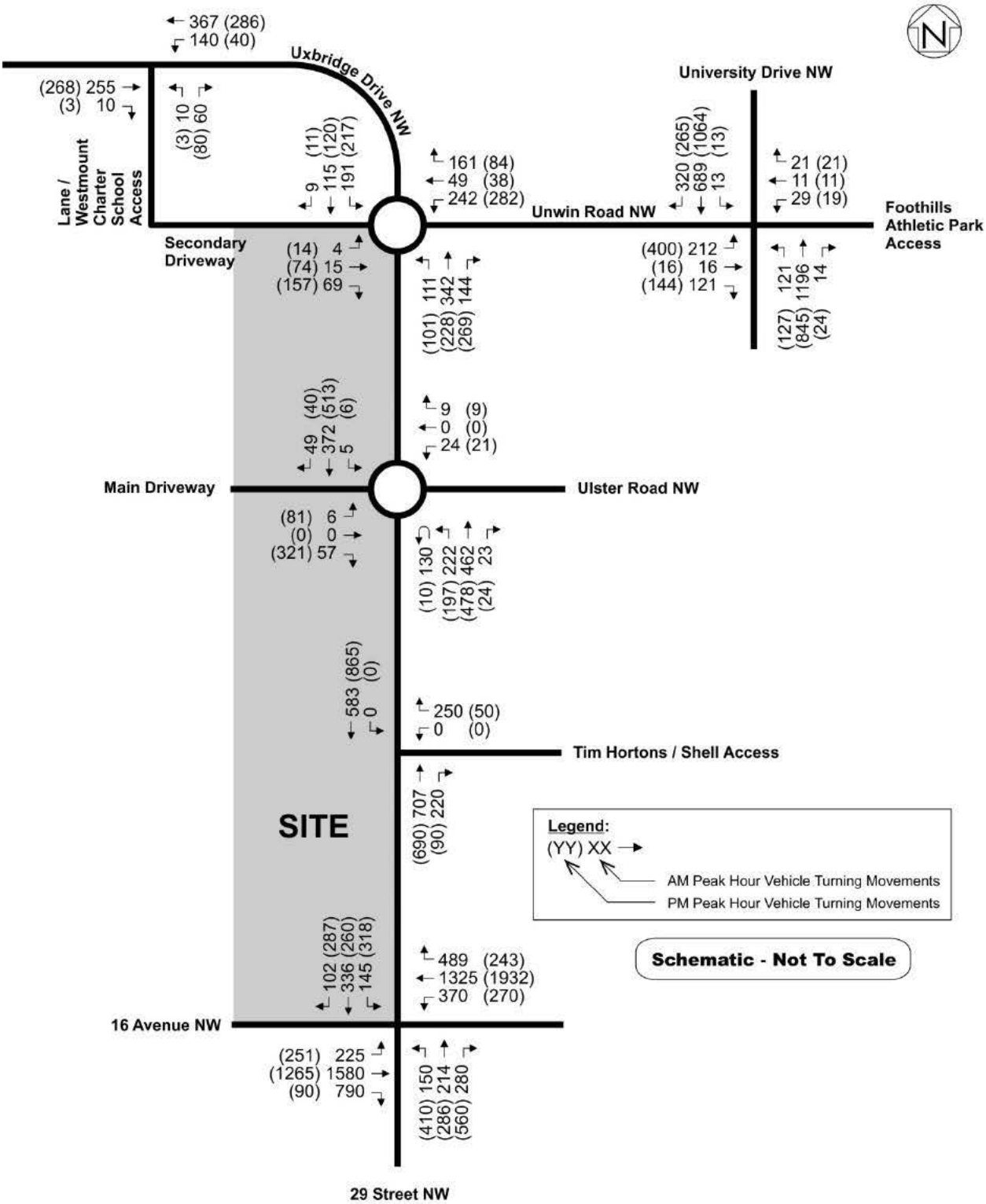

FIGURE 18: POST-DEVELOPMENT TRAFFIC VOLUMES (WITH ROUNDABOUTS)

5.2 Post-Development Operating Conditions

Capacity analysis was conducted for the study intersections under the two traffic control scenarios for the accesses including traffic signals and roundabouts. Four-way stops were also tested for each access but were deemed to be infeasible due to anticipated long delays and queues. The results of the analysis for each traffic control option are presented in **Table 13** and **Table 14**.

TABLE 13: 2039 POST DEVELOPMENT OPERATIONS – SITE ACCESS AS SIGNALS

INTERSECTION / MOVEMENT			AM PEAK HOUR				PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)	v/c Ratio	LOS	Delay (s)	Queue (m)
Uxbridge Dr / Lane (Stop-Controlled)	EB	Through / Right	0.16	A	0	0	0.17	A	0	0
	WB	Left / Through	0.15	A	4	4	0.04	A	1	1
	NB	Left / Right	0.17	B	15	5	0.15	B	12	4
Unwin Rd / Secondary Driveway / Uxbridge Dr (Signalized)	EB	Left / Through / Right	0.14	A	6	9	0.37	A	7	20
	WB	Left / Through / Right	0.91	D	41	#121	0.90	D	42	#100
	NB	Left / Through / Right	0.84	C	24	86	0.82	C	23	#106
	SB	Left / Through / Right	0.64	B	18	46	0.92	D	47	#85
	Intersection Summary		-	**C**	**27**	-	-	**C**	**30**	-
Ulster Rd / Main Driveway / Uxbridge Dr (Signalized)	EB	Left / Through / Right	0.21	A	8	8	0.77	C	20	#68
	WB	Left / Through / Right	0.14	B	14	7	0.07	B	10	6
	NB	Left	0.37	A	7	36	0.67	C	22	#46
		Through / Right	0.46	A	6	82	0.66	B	13	69
	SB	Left / Through / Right	0.38	A	5	64	0.65	B	13	73
	Intersection Summary		-	**A**	**6**	-	-	**B**	**16**	-
Tim Hortons / Uxbridge Dr (Stop-Controlled)	WB	Left / Right	1.27	F	200	112	0.19	C	21	6
	NB	Through / Right	0.29	A	0	0	0.28	A	0	0
	SB	Left / Through	0.19	A	5	5	0.35	A	1	1
16 Avenue/ Uxbridge Dr / 29 Street (Signalized)	EB	Left	0.81	E	76	97	1.27	F	200	#150
		Through	0.82	D	40	188	0.72	D	39	142
		Right	1.18	F	116	#321	0.18	A	7	13
	WB	Left	0.82	E	71	#79	0.70	E	66	54
		Through	0.97	D	54	#251	1.20	F	132	#311
	NB*	Left	0.56	E	68	35	0.90	E	79	#91
		Through	-	-	-	-	0.88	E	79	#135
		Right	-	-	-	-	1.25	F	154	#219
		Through / Right	0.82	D	45	#80	-	-	-	-
	SB	Left	0.62	D	46	52	1.01	F	87	#138
		Through / Right	0.86	E	68	#93.6	0.93	E	60	#98
	Intersection Summary		-	**E**	**61**	-	-	**F**	**98**	-
Unwin Rd / University Dr (Signalized)	EB	Left / Through / Right	0.77	D	37	76	1.13	F	106	#163
	WB	Left / Through / Right	0.17	B	16	15	0.11	B	12	10
	NB	Left	0.50	B	15	25	0.55	B	18	21
		Through / Right	0.65	B	13	100	0.54	B	14	60
	SB	Left	0.09	B	16	6	0.07	B	16	5
		Through / Right	0.80	C	22	98	1.08	E	75	#168
	Intersection Summary		-	**B**	**19**	-	-	**E**	**59**	-

* defacto right in p.m. peak hour

TABLE 14: 2039 POST DEVELOPMENT OPERATIONS – SITE ACCESS AS ROUNDABOUTS

INTERSECTION / MOVEMENT			AM PEAK HOUR				PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)	v/c Ratio	LOS	Delay (s)	Queue (m)
Uxbridge Dr / Lane (Stop-Controlled)	EB	Through / Right	0.16	A	0	0	0.17	A	0	0
	WB	Left / Through	0.15	A	4	4	0.04	A	1	1
	NB	Left / Right	0.17	B	15	5	0.15	B	12	4
Unwin Rd / Secondary Driveway / Uxbridge Dr (Roundabout)	EB	Left / Through / Right	0.14	A	4	6	0.41	A	7	21
	WB	Left / Through / Right	0.67	A	10	46	0.53	A	6	29
	NB	Left / Through / Right	0.65	A	4	50	0.73	A	8	71
	SB	Left / Through / Right	0.44	A	6	23	0.49	A	7	29
	Intersection Summary		-	**A**	**6**	-	-	**A**	**7**	-
Ulster Rd / Main Driveway / Uxbridge Dr (Roundabout)	EB	Left / Through / Right	0.11	A	6	5	0.73	B	16	66
	WB	Left / Through / Right	0.06	B	14	4	0.06	B	11	3
	NB	Left / Through / Right	0.61	A	2	44	0.67	A	3	55
	SB	Left / Through / Right	0.58	A	7	43	0.65	A	4	58
	Intersection Summary		-	**A**	**4**	-	-	**A**	**6**	-
Tim Hortons / Uxbridge Dr (Stop-Controlled)	WB	Left / Right	0.68	D	32	39	0.10	B	13	3
	NB	Through / Right	0.29	A	0	0	0.28	A	0	0
	SB	Left / Through	-	-	-	-	-	-	-	-
16 Avenue/ Uxbridge Dr / 29 Street (Signalized)	EB	Left	0.81	E	76	97	1.27	F	200	#150
		Through	0.82	D	40	188	0.71	D	38	140
		Right	1.18	F	116	#321	0.17	A	7	13
	WB	Left	0.82	E	71	#79	0.70	E	66	54
		Through	1.06	E	76	#281	1.20	F	131	#314
	NB*	Left	0.56	E	68	35	0.88	E	77	#89
		Through	-	-	-	-	0.88	E	79	#135
		Right	-	-	-	-	1.18	F	123	#202
		Through / Right	0.82	D	45	#80	-	-	-	-
	SB	Left	0.62	D	46	52	1.05	F	99	#142
		Through / Right	0.86	E	68	#93.6	0.96	E	66	#101
	Intersection Summary		-	**E**	**67**	-	-	**F**	**96**	-
Unwin Rd / University Dr (Signalized)	EB	Left / Through / Right	0.80	D	38	#102	1.09	F	100	#235
	WB	Left / Through / Right	0.15	B	16	15	0.10	B	15	13
	NB	Left	0.42	B	12	17	0.83	E	60	#53
		Through / Right	0.70	B	15	100	0.53	C	22	97
	SB	Left	0.11	B	18	6	0.07	C	22	7
		Through / Right	0.79	C	22	100	1.02	E	64	#237
	Intersection Summary		-	**C**	**20**	-	-	**E**	**57**	-

* defacto right in p.m. peak hour

The results of the analysis indicate that traffic signals or roundabouts would work at the site accesses on Uxbridge Drive. The roundabouts would function better during the peak periods and significantly better during the off-peak periods when traffic flow is reduced. Roundabouts are also expected to provide a better level of safety for all modes of transportation.

The analysis also indicates that the intersection of 16 Avenue and Uxbridge Drive will operate at LOS F during the p.m. peak period. To address this operational issues, a dual eastbound left-turn lane was tested as the next logical improvement to the at-grade intersection. Using the projected volumes in the signalized scenario in **Figure 16**, the impacts of adding a dual left-turn

lane in the eastbound direction are summarized in **Table 15**. The results indicate that if a dual left turn lane is added on the eastbound approach of 16 Avenue, the LOS of the intersection of 16 Avenue & 29 Street/Uxbridge improves to E in both the a.m. and p.m. peak periods.

TABLE 15: 2039 POST DEVELOPMENT OPERATIONS – DUAL EASTBOUND LEFT TURN LANES

INTERSECTION / MOVEMENT			AM PEAK HOUR				PM PEAK HOUR			
			v/c Ratio	LOS	Delay (s)	Queue (m)	v/c Ratio	LOS	Delay (s)	Queue (m)
16 Avenue/ Uxbridge Dr / 29 Street (Signalized)	EB	Left	0.64	E	63	48	1.03	F	123	#70
		Through	0.89	D	45	#213	0.66	C	34	129
		Right	1.19	F	118	#306	0.16	A	5	11
	WB	Left	0.76	E	62	72	0.76	E	71	56
		Through	0.89	D	40	#214	1.03	E	62	#276
	NB*	Left	0.54	E	64	35	0.98	F	96	#98
		Through	-	-	-	-	0.79	E	66	#124
		Right	-	-	-	-	1.33	F	193	#246
		Through / Right	0.78	D	40	#77	-	-	-	-
	SB	Left	0.58	D	40	50	1.18	F	147	#142
		Through / Right	0.81	E	60	#90	1.03	F	87	#112
	Intersection Summary		-	**E**	**56**	-	-	**E**	**79**	-

* defacto right in p.m. peak hour

5.3 Sensitivity Analysis

Sensitivity analysis was conducted for all of the study intersections to determine the potential impacts of increasing the site traffic by 20 percent. The analysis indicates that the intersection of 16 Avenue and Uxbridge Drive would operate at a more congested level, especially during the p.m. peak period when the site traffic is highest. To maintain a LOS E or better at the 16 Avenue / Uxbridge intersection, a dual southbound left-turn lane would be required. In addition, some queuing issues were identified at the south roundabout. More specifically, the eastbound queue (queuing back into the site) was estimated to be 180m which would create internal operational issues since internal driveways and intersections would potentially be blocked by the queue. In reality, the queue for this scenario would likely be less since some of the drivers would shift to the north access. Capacity analysis details of the sensitivity analysis are provided in **Appendix M.**

5.4 Short-Cutting Review

The issue of short-cutting through University Heights has been a community issue for a long time. In response to community concerns, the City of Calgary installed a number of turn restrictions along the south side of 24 Avenue NW along the north edge of the community. The purpose of the turn restrictions was to prevent traffic using Uxbridge Drive and other local streets within University Heights as a short-cut route between 24 Avenue and 16 Avenue.

Based on discussions with community residents and City Transportation Staff, the turn restrictions have generally been successful in reducing through traffic in University Heights.

Although no formal short-cutting surveys were conducted as part of this study, anecdotal discussions with community residents suggest that there is a perceived short-cutting issue along Unwin Road / Uxbridge Drive. The existing daily volume of 5,500 vehicles per day on Unwin Road is at the upper end of the City's environmental design guide threshold for collector roads. This traffic count includes traffic from significant generators within University Heights including the two schools.

The redevelopment of Stadium Shopping Centre is expected to generate more traffic along Unwin Road and the southern portion of Uxbridge Drive (south of Unwin). The estimated daily volume along Unwin road is expected to increase by approximately 200 vehicles in the AM Peak Hour and 200 vehicles in the PM Peak Hour). To address resident concerns, a traffic calming plan is recommended to identify potential mitigation measures that could be implemented along Unwin Road. Given that Unwin Road is a transit route, the following traffic calming measures could be considered:

- Curb Extensions at one or more of the cross-streets to improve visibility and safety for pedestrians crossing Unwin Road
- Speed tables to along Unwin Road (these would not impact transit vehicles)
- Special (e.g. "ladder") crosswalk markings and/or lighting

6.0 Parking Review

6.1 Existing Conditions – Stadium Shopping Centre

Parking accumulation surveys were undertaken at the site on Thursday February 21, 2013 during the peak periods from 7-9a.m. and from 3-6p.m. The purpose of the parking accumulation survey is to determine the peak parking demand for the site during these time periods. Based on the survey data, the peak parking demand on the survey day occurred at 5:45p.m. and the demand was 287 parked cars. This represents 65 percent of the current supply of 444. The parking accumulation survey data can be found in **Appendix N.**

In addition to the accumulation surveys, parking data was collected from the parking operator for Stadium Shopping Centre during a one week period in March 2013. The parking operator provided total ticket purchases during 1-hour increments for the entire week. There are three types of tickets that users can purchase including 2-hour (free), 12-hour ($8.50) and 16-hour ($11.50). A summary of the data is provided in **Table 16** and the key findings are provided below.

TABLE 16: SUMMARY OF PARKING DATA

Day	Date	2-hour	12-hour	16-hour	Total
Sat	Mar-02	383	1	2	386
Sun	Mar-10	184	1	0	185
Mon	Mar-04	350	37	1	388
Tue	Mar-05	543	39	1	583
Wed	Mar-06	386	34	1	421
Thu	Mar-07	480	28	1	509
Fri	Mar-01	720	32	0	752

- *94% of the people that obtain parking tickets are purchasing 2-hour parking tickets*
- *The average number of people purchasing a ticket on a weekday is 530*
- *The average number of people purchasing a ticket on a weekend is 285*
- *Approximately 30-40 people purchase a 12-hour ticket on weekdays and the majority of these occur between 6:00 a.m. and 9:00 a.m. and are likely related to people parking on-site and walking to a place of employment*
- *The peak time for purchasing tickets generally occurred between 11:00 a.m. and 1:00 p.m. walking to a place of employment.*
- *The number of purchases during the peak period generally ranged between 50-80 per hour which is consistent with the inbound trip generation surveys conducted for the site.*

6.2 Existing Conditions – University Heights Parking Restrictions

Current parking restrictions within University Heights were reviewed as part of this study. A summary of the current restrictions is provided in **Figure 19.** The majority of the on-street parking is managed through time restrictions and through residential permit parking. This is necessary to prevent people from adjacent major activity centre from parking in the community all day.

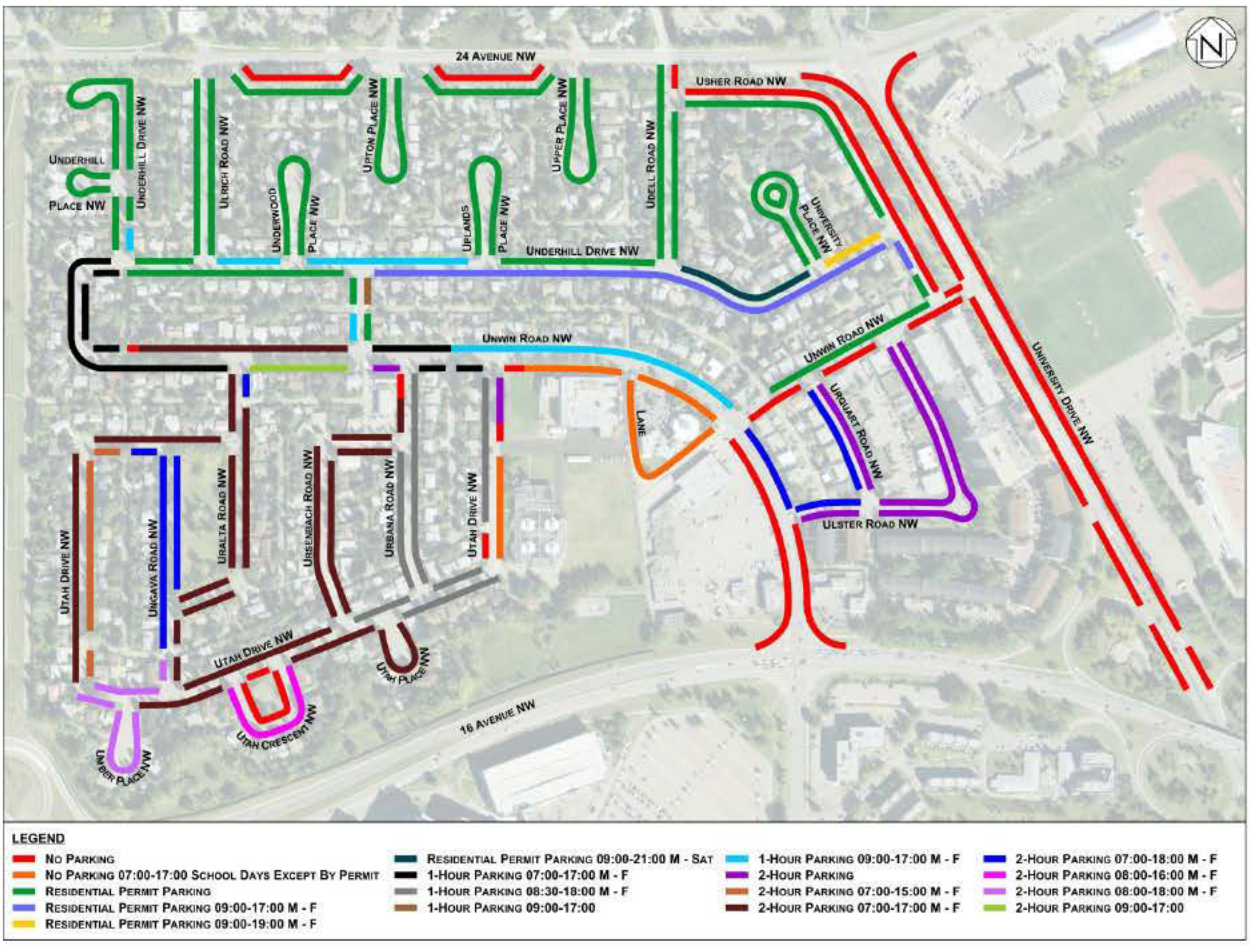

FIGURE 19: PARKING RESTRICTIONS IN THE VICINITY OF STADIUM SHOPPING CENTRE

6.3 Bylaw Parking Review - Vehicles

The land use approved for the subject site is C-C2 (Commercial Community 2 District). Based on the parking requirement referenced in the Land Use Bylaw for the C-C2 land use and the development intensity, the bylaw motor vehicle parking requirements for each component of the proposed development were calculated and are summarized in **Table 17**.

TABLE 17: BYLAW MOTOR VEHICLE PARKING REQUIREMENTS

Land Use	Bylaw Section	Intensity	Bylaw Parking Requirement	
			Rate	Stalls
Retail and Consumer Service	Part 4 Section 286.1 1P2007	6781.9 m^2	4.0 motor vehicle parking stalls per 100 m^2 of gross usable floor area	271.3
Restaurant: Licensed - Medium	Part 4 Section 282 1P2007	1114.8 m^2 (Public Area)	2.85 motor vehicle parking stalls per 10.0 m^2 of public area	317.7
Dwelling Unit	Part 7 Division 5 Section 770 1P2007	200 units	0.75 stalls per unit for resident parking	150.0
			0.1 visitor parking stalls per unit	20.0
Dwelling Unit (Seniors Housing)	Part 7 Division 5 Section 770 1P2007	110 Units	0.75 stalls per unit for resident parking	82.5
			0.1 visitor parking stalls per unit	11.0
Office	Part 4 Section 246 1P2007	23,690.3 m^2	2.0 motor vehicle parking stalls per 100 m^2 of gross usable floor area	473.8
Medical Clinic	Part 4 Section 233 32P2009	9290.3 m^2	6.0 motor vehicle parking stalls per 100 m^2 of gross usable floor area	557.4
Hotel	Part 4 Section 209 67P2008	200 Rooms	1.0 stalls per guest room when the parcel on which the building containing the use is located adjacent to or separated by a lane or street from a low density residential district.	200
Total Stalls Required				**2084**
Spaces Eligible for Reduction (Office Only)		473.8	5% Frequent Transit Service Reduction	-23.7
Total Stalls Required (After Reduction)				**2060**

Site plans for the redeveloped site have not been finalized and therefore the proposed parking supply is unknown at this time. The City has indicated shared parking analysis to support a total parking supply that is less than the bylaw requirements will be considered at the development permit (DP) stage.

6.4 Bylaw Parking Review – Bicycles

The City of Calgary requires developers to provide bicycle parking stalls for new developments based on the size and proposed land use. Based on the current densities and land use mixes, the bylaw bicycle parking requirement for the site is estimated to be 40 Class 1 bike parking stalls (secure) and 100 Class 2 bike parking stalls (unsecured bike racks).

7.0 Active Modes Review

7.1 Active Modes Destinations

The site is situated in the northwest corner of the intersection of Uxbridge Drive and 16 Avenue NW. A broad range of land uses exist within walking distance of the site, which include offices, commercial and institutional destinations, medical facilities, sports and recreation facilities, cultural amenities, open spaces, as well as transit stops, and other active mode travel destinations.

The site is also located within walking distance of the Banff Trail LRT station and is close to the extensive Bow River pathway system. The sidewalks and pathways in the vicinity of the site provide good connectivity to several local amenities, transit stops and the extensive Bow River pathway system. Major pedestrian and cyclist destinations located close to the site are illustrated in **Figure 20**.

7.2 Pedestrian and Cyclist Facilities

The existing pedestrian and bicycle pathway system within a 1 km radius and a 3 km radius from the site is illustrated in **Figure 21**.

The on-street bicycle routes along Uxbridge Drive and 29 Street NW lead south to the regional pathway system. The regional pathway along the Bow River provides a direct and well-maintained connection to major beltline and downtown destinations, which are located approximately 5 km from the site. The on-street bike routes along Uxbridge Drive and 29 Street also connect to other bike routes and regional pathways within the community of University Heights to the north, and St. Andrews Heights, West Hillhurst, and Parkdale to the south.

The sidewalk system also provides direct connections into the communities of University Heights, St. Andrews Heights and Parkdale, as well as to several bus stops located in the vicinity of the site. The pedestrian bridge over Crowchild Trail provides access from the site to the Banff Trail LRT Station, and also to the communities of Briar Hill and Capitol Hill to the east.

The pedestrian and bicycle infrastructure along the streets adjacent to the site are summarized in **Figure 22**, which shows a larger area network, and also in **Figure 23**, which illustrates a closer view of the facilities in the immediate vicinity of the site.

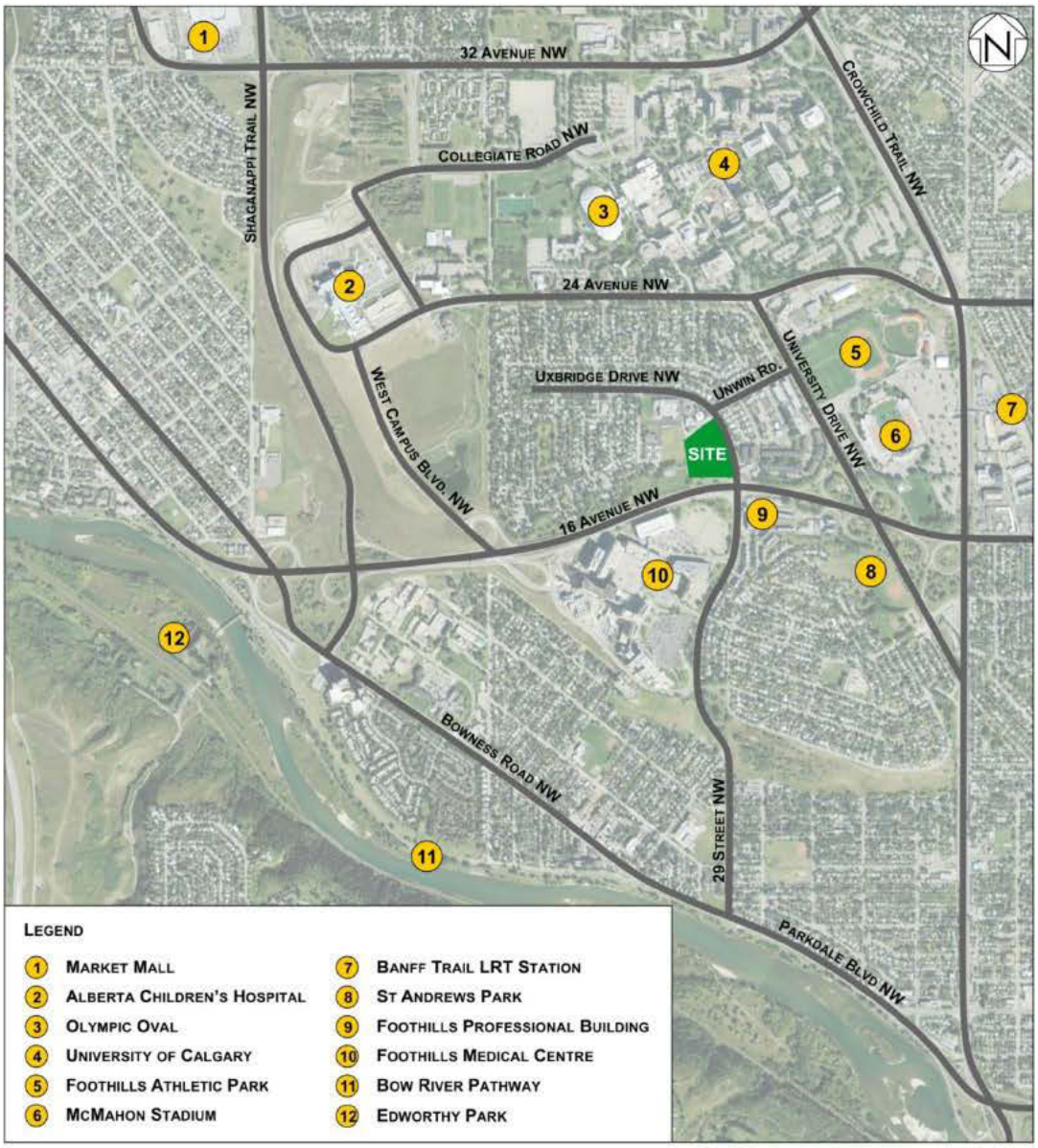

FIGURE 20: LOCAL AMENITIES AND TRAVEL DESTINATIONS

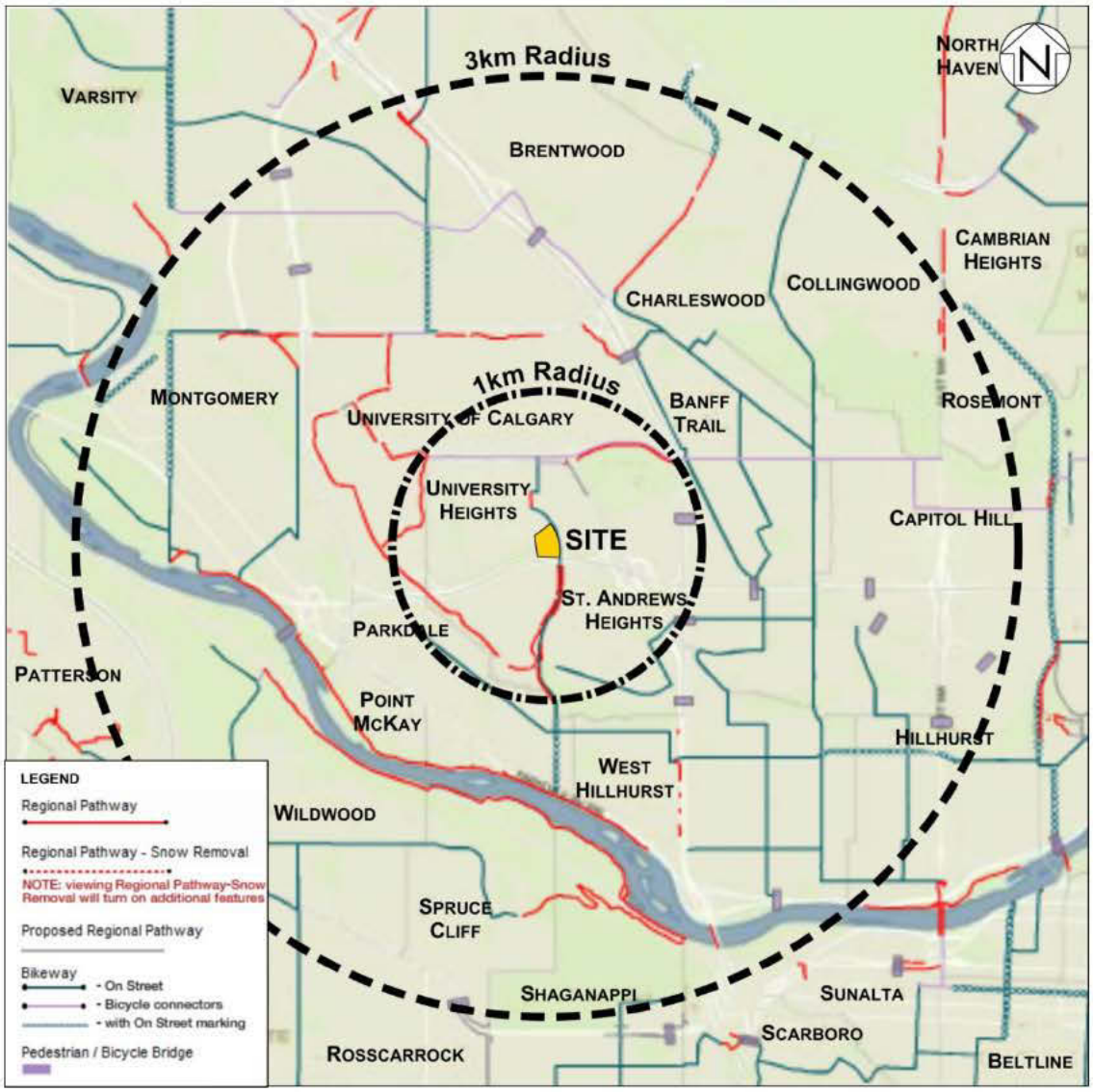

FIGURE 21: PEDESTRIAN AND CYCLIST FACILITIES (1 KM & 3 KM)

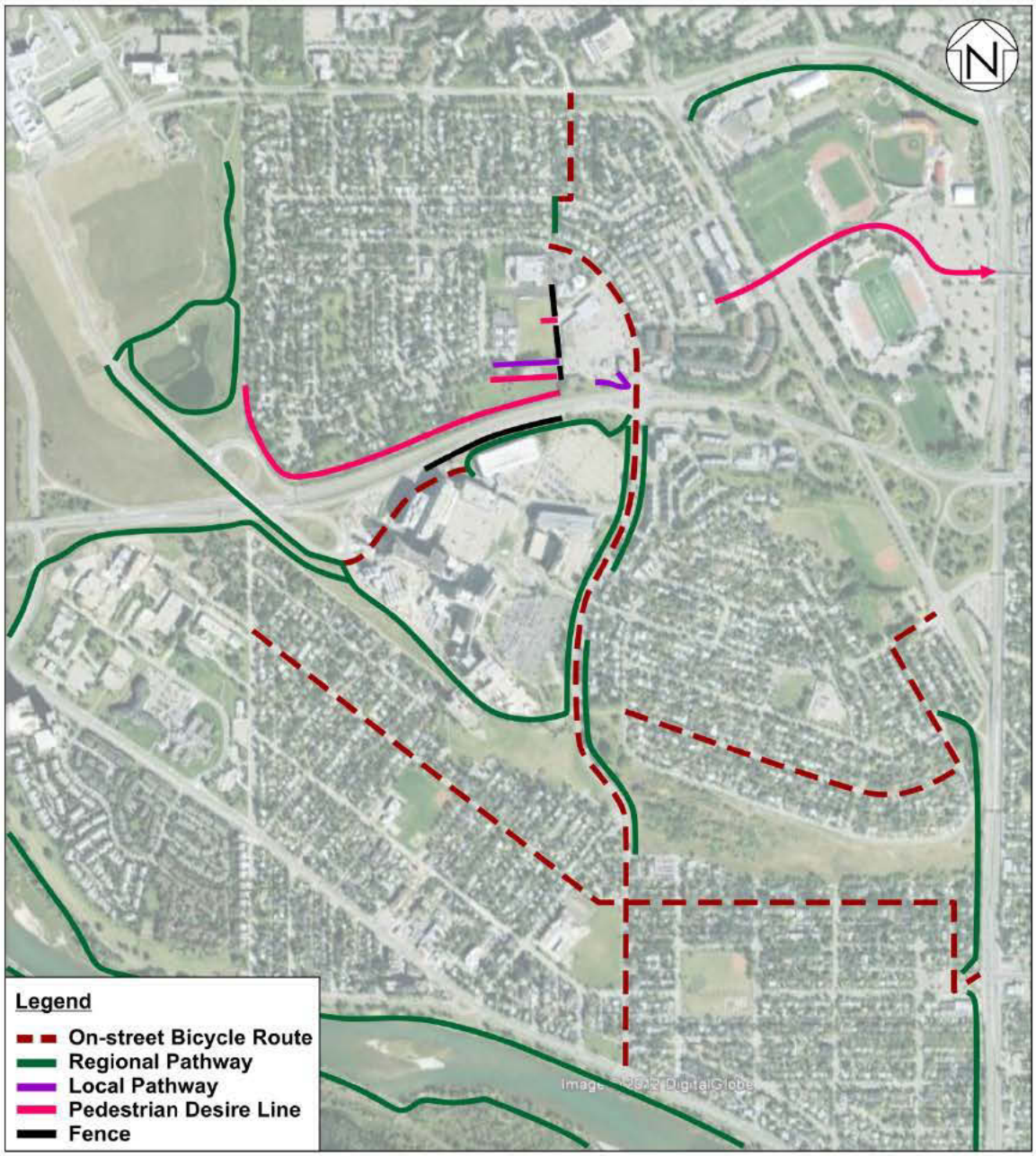

FIGURE 22: LARGER AREA ACTIVE MODES NETWORK

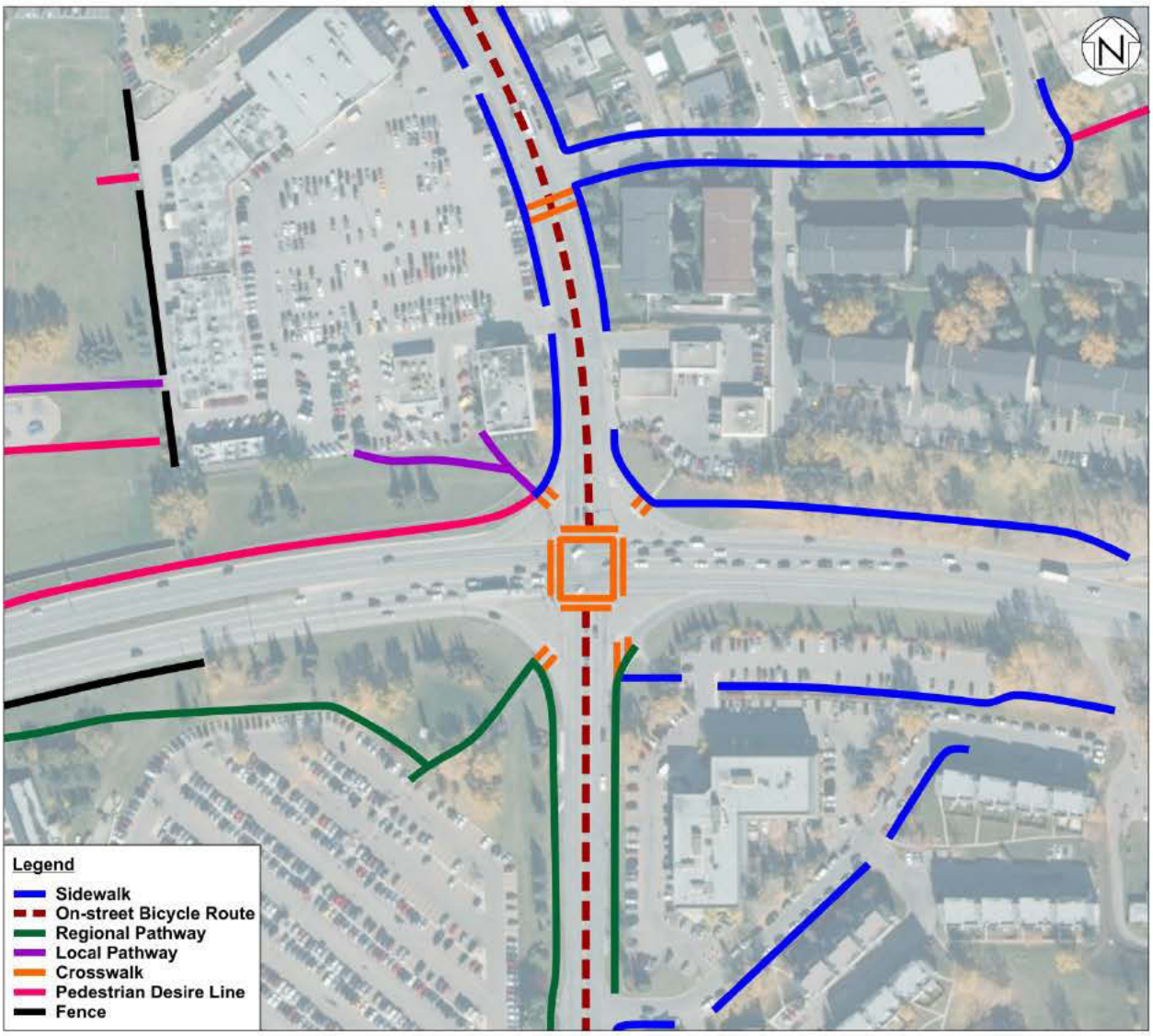

FIGURE 23: ACTIVE MODES FACILITIES ADJACENT TO THE SITE

The review of the active modes facilities in the vicinity of the site has identified the following connectivity concerns:

1. The pavement markings at the intersection of 16 Avenue and Uxbridge Drive / 29 Street are faded and are difficult to see.
2. A common route for pedestrians to the Banff Trail LRT Station travels through the community of University Heights along Unwin Road or Ulster Road. From Ulster Road, pedestrians often shortcut through the Boardwalk Heights residential property lane before cutting across the McMahon Stadium parking lot to the pedestrian bridge over Crowchild Trail. This route is indirect, not always maintained, and causes pedestrians to

traverse private property; however it is significantly shorter and more attractive than the alternative option of travelling east from the site along 16 Avenue to Banff Trail.

3. The alternative route to the LRT station along 16 Avenue provides pedestrian access eastbound across the University Drive and Crowchild Trail overpasses, but the sidewalk ends at 24 Street NW. From here, pedestrians can continue travelling east on a paved, sloped median separation between 16 Avenue and the service road along the north side. The sidewalk resumes 50m to the east. This sidewalk continues eastbound until Banff Trail, where pedestrians can head north to the Banff Trail LRT Station.
4. A potential barrier to active modes mobility in the area surrounding the site exists just west of the proposed development. As demonstrated by worn trails in the area, pedestrian desire lines extend through the site to the west, leading to adjacent residential development and an elementary school and playground. The current site is not well integrated with development to the west.

In general, adequate facilities and travel options are available to support a variety of transportation modes in the area. The existing active modes infrastructure provides suitable connectivity and accessibility for pedestrians and cyclists in the vicinity of the proposed development. However, some potential improvement measures that could further enhance pedestrian and cyclist mobility in the area include:

1) Re-painting of the faded and worn pavement markings at the intersection of 16 Avenue and Uxbridge Drive / 29 Street, and along Uxbridge Drive in the vicinity of the site.

2) Construction of a more direct and public route to improve pedestrian connections through the community of University Heights and around McMahon Stadium to the Banff Trail LRT Station from the site.

3) Addressing the pedestrian desire for connections through the site to the adjacent school and playground areas as part of the site plans.

8.0 Transit Service

8.1 Existing Transit Service

There are eight bus stops located within walking distance of the site, along with the Banff Trail LRT Station. The sidewalk network in the area provides a direct route to these transit stops. The areas around the site are currently serviced by bus routes 9, 19, 20, 40, 72, 73, 91, and 119. The approximate service headways and possible connections for each route are summarized in **Table 18**.

TABLE 18: EXISTING TRANSIT SCHEDULE AND CONNECTIONS

Route	Connections	Frequency						
		AM Peak	Mid Peak	PM Peak	Eve	Sat		Sun
						Day	Eve	Day
9 – Varsity Acres / Bridgeland	Brentwood terminal, University of Calgary, Children's Hospital	20	30	20	30	30	30	30
19 – 16 Avenue North	University LRT, Lions Park LRT, Peter Lougheed Hospital	40	40	40	45	30	30	45
20 – Heritage / Northmount	Brentwood terminal, University LRT, Foothills, MRU, Rockyview	10	20	10	30	30	30	30
40 – Crowfoot / North Hill	Crowfoot LRT, Foothills, Lions Park LRT	35	35	35	35/*	35	*	35
72 – Circle Route	Brentwood terminal, University LRT, Shaganappi Point LRT, Children's Hospital, Westbrook terminal	10	30	15	30	30	30	30
73 – Circle Route	Brentwood terminal, University LRT, Shaganappi Point LRT, Children's Hospital, Westbrook terminal	10	30	15	30	30	30	30
91 – Lions Park / Brentwood	Brentwood LRT, Children's Hospital, Foothills, Lions Park LRT	16	25	16	25	25	25	25
119 – 16 Avenue North	University LRT, Lions Park LRT, Peter Lougheed Hospital	40	40	40	*	*	*	*

** No service provided*

The existing transit facilities and route numbers in close proximity to the site are shown in **Figure 24.** There are some connectivity issues between the site and the nearest LRT station, as noted in Section 7.2 of this report.

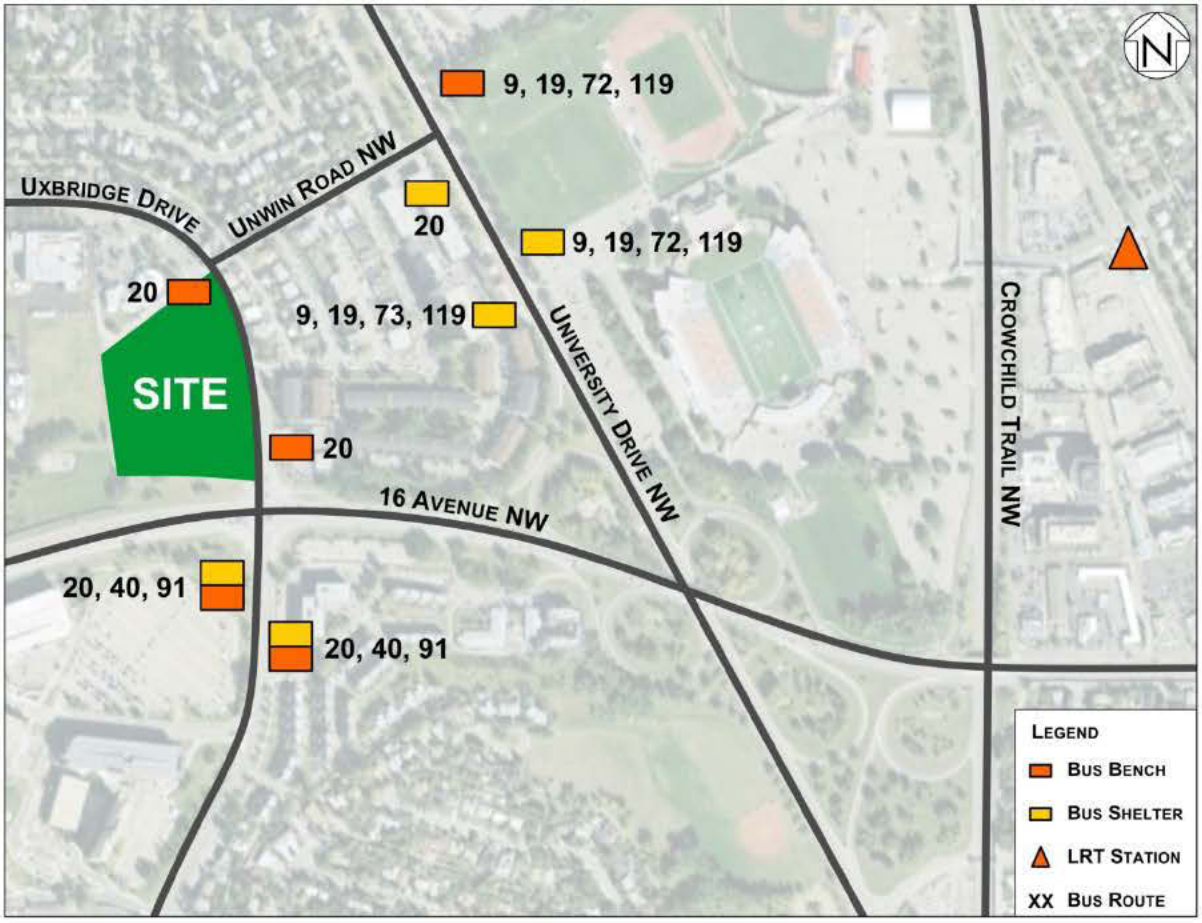

FIGURE 24: EXISTING TRANSIT FACILITIES

Data was collected at the two bus stops located adjacent to the site along Uxbridge Drive. The number of people getting on and off the #20 route bus were observed during the a.m. and p.m. peak hours. During the a.m. peak period, the majority of the transit activity occurred on the west side of Uxbridge Drive where approximately 30 passengers got off at the bus stop next to the site. In the p.m. peak period, the majority of the transit activity occurred on the east side with approximately 30 people boarding northbound busses.

West of Uxbridge Drive / 29 Street, 16 Avenue is identified as part of the primary transit network in the CTP. South of 16 Avenue, 29 Street is identified as part of the primary transit network. These areas are currently served by local transit routes. **Figure 25**, provided by Calgary Transit, illustrates the current bus routes servicing the area.

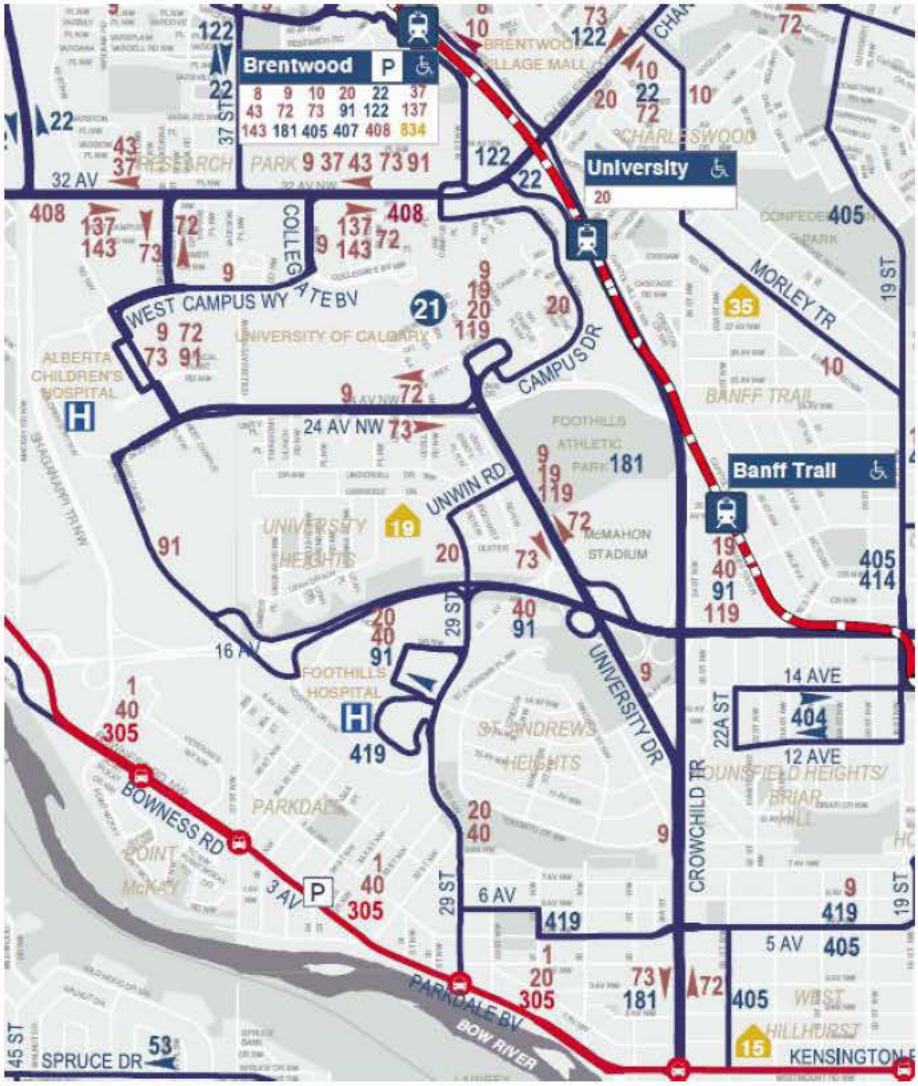

FIGURE 25: EXISTING TRANSIT SERVICES

8.2 Future Transit Service and Stops

The City of Calgary is currently undertaking a study to determine how to enhance transit service within the City Northwest Major Activity Centre. The key destinations included in the study include the Foothills Medical Centre, Alberta Children's Hospital, the University of Calgary, Market Mall, Stadium Shopping Centre and areas along the NW LRT line. The study will not be completed until 2014 and therefore the details of the enhanced transit service are unknown at this time.

In response to the City's desire to enhance transit service to the area, Western Securities is interested in developing a site that accommodates transit service and integrates the bus stops into the overall design of the site. More specifically, consideration was given to the potential addition of transit stops along 16 Avenue, which would serve both the Stadium Shopping Centre as well as FMC. The master plan concept for Stadium Shopping Centre proposes the creation of a high quality transit stop where transit users have an activated, safe and comfortable area to use while waiting for service. Convenient and accessible transit will be essential at both these locations to promote the use of transit and work towards the CTP mode split targets. Western Securities proposed to work with the City of Calgary to explore opportunities to integrate transit stops into the development along Uxbridge Drive as well as 16 Avenue (east of Uxbridge Drive).

8.3 Transit Passenger Volume Estimates

The additional number of people getting on and off the bus at the two bus stops located on the northeast and southeast sides of the site along Uxbridge Drive was estimated based on the anticipated mode split for the site and the future estimates of site generated transit pedestrians. **Table 19** summarizes the results of the analysis.

TABLE 19: ESTIMATED FUTURE USE OF TRANSIT ADJACENT TO THE SITE

Southbound Bus Stop (West Side of Uxbridge Drive)				
Scenario	People Boarding #20 Route Bus		People Getting Off #20 Route Bus	
	a.m. peak hour	p.m. peak hour	a.m. peak hour	p.m. peak hour
Existing Volumes	1	6	28	16
Site Generated Volumes	21	50	82	38
Post Development Volumes	22	56	110	54
Northbound Bus Stop (East Side of Uxbridge Drive)				

Scenario	People Boarding #20 Route Bus		People Getting Off #20 Route Bus	
	a.m. peak hour	p.m. peak hour	a.m. peak hour	p.m. peak hour
Existing Volumes	5	29	8	5
Site Generated Volumes	21	50	82	38
Post Development Volumes	26	79	90	43

The anticipated significant increase in transit use at these locations indicates that transit service frequency should be increased in the vicinity of the proposed development to accommodate the estimated future demand of transit users. While working toward the primary transit network outlined in the CTP, it is desirable to ensure that in the future, both the Stadium Shopping Centre and FMC are directly connected to the primary transit network with high frequency routes.

9.0 TDM Program

A transportation demand management (TDM) program is a series of measures and strategies to promote the use of alternative modes of transportation and reduce the reliance on private passenger vehicles. TDM measures should be considered for this site to minimize the impact of this development on the adjacent street network. The following TDM measures are appropriate for a development of this size and type:

- Provide Class 1 secure bicycle parking facilities for all components of the development. This provides an incentive for people to bike to/from the site.
- Provide access to showers, lockers and change facilities for the retail, restaurant, office, medical office and hotel components of the development. These facilities can be located at a central location such as a fitness facility or could be incorporated within each individual development. These facilities primarily accommodate employees that wish to cycle to/from the site.
- Designate carpool only stalls for the retail, office and medical office components of the development. Carpool stalls should be located as close as possible to the main entrances.
- Provide Class 2 unsecured bicycle parking near the main entrances to the buildings. This is primarily meant to accommodate visitors to the site that are expected to be there for the short-term.
- Provide comfortable transit shelters and waiting areas to encourage the use of the transit mode. Shelters should be highly visible from the development to promote a feeling of safety and security.
- Consider implementing a carpool program for the entire development to encourage ride sharing and reduce the number of vehicle trips. Alternatively, the www.carpool.ca carpool program could be promoted.
- Consider providing a transit pass incentive or subsidy to restaurant, retail, office, medical office and hotel employees.
- Limit the number of visitor parking spaces available to residential and seniors uses to the minimum required to discourages auto use.
- Improve sidewalks in the area and provide high quality direct pedestrian facilities throughout the development. Enhance connections between the site and nearby developments such as Foothills Medical Centre and the U of C to encourage walking between adjacent destinations.
- Maintain a pay for parking policy on-site and discourage long-term parking by visitors by increase the daily fee.
- Consider providing shuttle service from the airport and/or downtown Calgary for the Hotel use to reduce the reliance on the vehicle.