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UNIVERSITY OF VICTORIA

1996 TRAFFIC SURVEY REPORT

COPY

Prepared For:	The University of Victoria
Prepared By:	Bunt & Associates Engineering Ltd.
File:	4070.02
Date:	May 6, 1996

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25 June, 1996 File No. 4070.02

University of Victoria Facilities Management
Saunders Building
P.O. Box 1700, MS 7591
Victoria, B.C.
V8W 2Y2

Attention: R.A. (Dick) Chappell, P.Eng., Manager Support Services

RE: University of Victoria: 1996 Traffic Survey Final Report

Dear Mr. Chappell,

Bunt & Associates Engineering Ltd. has now completed our work tasks associated with the University of Victoria's 1996 traffic survey/study. I am pleased to provide you with three (3) copies of our final report as per your request.

We thank you for the opportunity to be of assistance and trust that you are fully satisfied with our services. Naturally we would be delighted to work with you again in the future, be it either as another update to the traffic survey or possibly on some other more specific transportation issue at the University (e.g., cycling facility design, parking/traffic operations, transit access, etc.).

Yours truly,
Bunt & Associates

Peter G. Joyce, P.Eng.,
Associate

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Table of Contents

List of Exhibits

List of Tables

1.0 INTRODUCTION

1.1 BACKGROUND

In February, 1996, Bunt & Associates Engineering Ltd. was retained by the University of Victoria, Facilities Management Office, to conduct a comprehensive survey of current traffic access patterns to/from the University for a typical weekday condition. The data requirements of the 1996 survey were to be closely modelled upon the reporting structure of a similar traffic survey conducted for the University back in the fall of 1992, by Bunt & Associates (at the time the Vancouver office of BA Consulting Group Ltd.).

The primary purpose of the 1996 survey is to provide an update to the 1992 survey results so as to monitor changes in transportation activity patterns at the University over the past 3½ years. Similar to the 1992 survey, the 1996 update survey considers each of the principal modes of traffic access to the University including:

- automobile drivers;
- automobile passengers;
- transit passengers;
- cyclists;
- pedestrians.

The 1996 survey also included for the first time a "license plate trace" survey of inbound and outbound automobile traffic using the University Drive and Finnerty Road access driveways to the campus, to identify how much "through traffic", i.e., non-University traffic, may be using the University driveway/ring-road system during peak traffic periods.

In addition, the 1996 traffic survey includes a more specific consideration of bicycle access conditions at the University Drive access on the south side of the campus, including recommended design improvements to this major access driveway to better accommodate cyclists.

As with the 1992 survey, Bunt & Associates were greatly assisted by Transtech Data Services (Ms. Carol Smith) and BC Transit (Mr. Steve Harvey) for the traffic and transit data collection respectively.

1.2 UNIVERSITY OF VICTORIA: 1996 UPDATE

The University of Victoria presently has a total enrollment of approximately 15,185 students, a faculty of approximately 1,870 members, and a total staffing of 1,385 persons. These numbers are not significantly different from 1992 conditions.

Since 1992 there have been a number of facility improvements to the campus including new building construction and additional student residences (e.g., Commonwealth Village and the David and Dorothy Lam Family Student Housing Complex). The basic configuration and operation of the driveway access and internal ring road system has not, however, changed appreciably since 1992.

At present, parking charges range from $12 per month for general parking ($96 per year), $21 per month for reserved staff parking, and $48 per month for premium parking in the parkade. These rates reflect increases of approximately 25% per year over the past few years. A carpool program (minimum 3 persons per vehicle) was initiated in September, 1992, with incentives including a 50% reduction in parking fee ($6 per month) and a guaranteed parking stall. However, interest has been low and presently there are just 8 registered carpools, including 7 by students and 1 by staff.

Regular BC Transit student bus passes are presently $37 per month as compared to the $45 per month standard adult bus pass. The University offers a further $5 per month subsidy (obtained from parking revenues) to UVic students to bring the cost down to $32 per month, which is unchanged from the 1992 student transit fare. However, with the parking rate increases as described above, transit has in fact become a relatively less expensive transportation mode for trips to/from the University.

There have been no substantial changes to bicycle pathways/storage facilities on the campus since 1992 though there has been some bicycle lane development on McKenzie Avenue at the McGill Road access.

2.0 SURVEY METHOD

2.1 TRAVEL MODE SURVEY

To simplify the study process and ensure consistency between the 1992 and 1996 traffic survey results, the traffic survey methodology applied for the 1992 survey was replicated for the 1996 survey. As with the 1992 survey, the basic design of the travel mode survey was to position a number of traffic count stations around the periphery of the campus so as to establish a "cordon" across which all trips entering and exiting the University could be systematically recorded.

Three different forms of traffic count survey were once again used for the 1996 update, including:

- Driveway Counts - 24 Hour Automatic Tube Counts
- Driveway Counts - Peak Period Manual Observations
- BC Transit - Arriving/Departing Passenger Counts

The traffic survey locations used for the 1996 survey are summarized in Exhibit 1, and are identical to the 1992 locations. Additional survey details are described below:

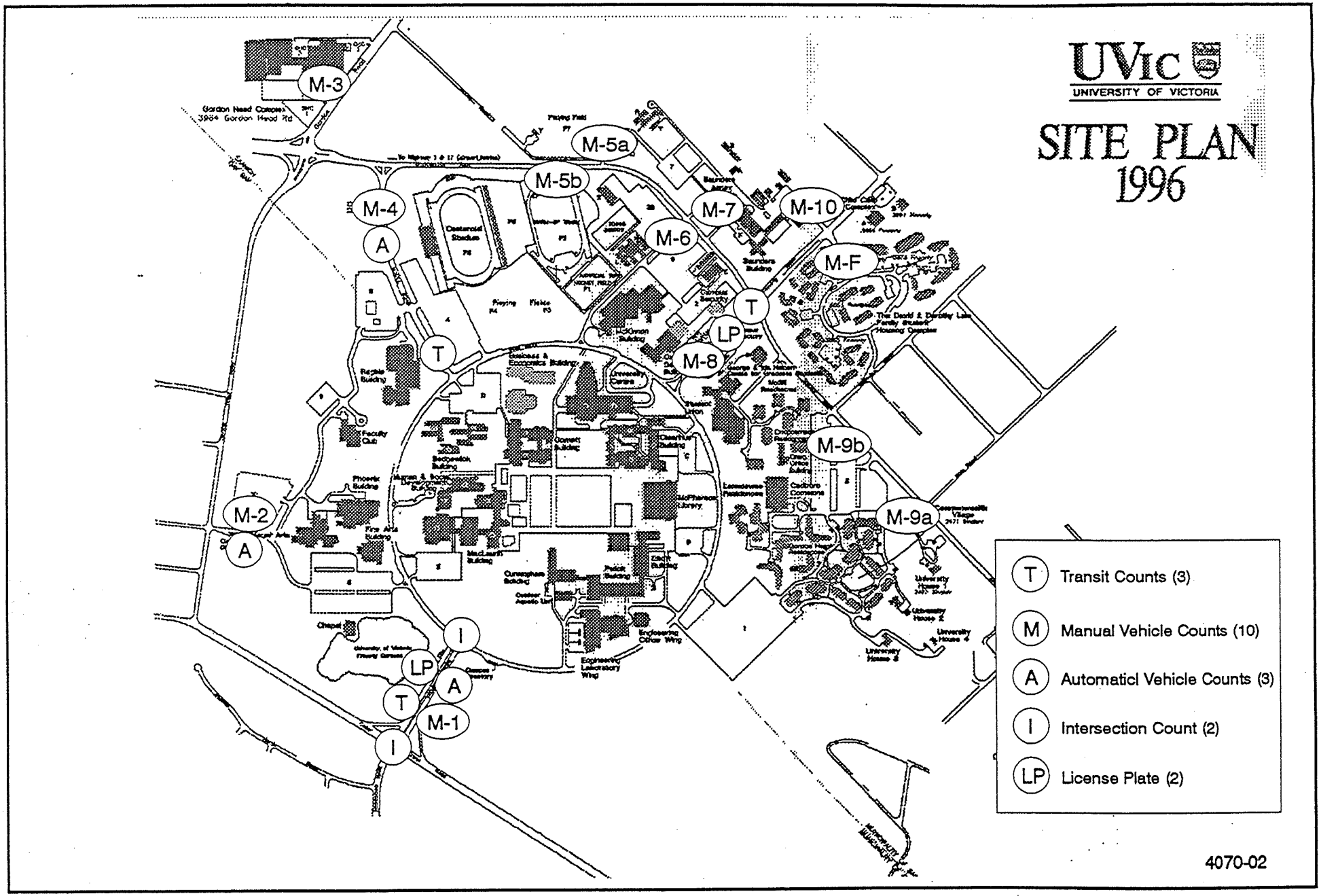
Driveway Counts - 24 Hour Automatic Tube Counts

Transtech Data Services established automatic tube count stations on the same three (3) driveways surveyed in the 1992 survey, i.e: University Drive, McGill Road, and the driveway leading in from Gordon Head Road. The automatic tube counts provided a continuous, hourly record of all inbound and outbound vehicle traffic on these three driveways from Saturday, February 24/96 through to Friday, March 1/96. Weather conditions through this period were generally clear and dry, and not considered to be a major influencing factor on travel mode patterns.

The primary purpose of the automatic tube counts was to provide some indication of the daily variation in total vehicle traffic activity at the University, as well as profiles of vehicle traffic activity through the course of an entire 24 hour day, including both peak and off-peak traffic periods.

Anomalous traffic count recordings on the McGill Road southbound (entering) lane during the February 24th to March 1st count period prompted the need for a second count on this driveway from Thursday, March 7/96 to Sunday, March 10/96, and again from Saturday, March 16/96 to Friday, March 22/96.

A complete record of the automatic traffic count data is provided in Appendix 1.



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Traffic Count Stations

University of Victoria - 1996 Traffic Survey

Exhibit 1

Driveway Counts - Peak Period Manual Counts

As shown in Exhibit 1, a total of 10 manual traffic count locations, i.e., M-1 through to M-10, were established on key driveway and parking lot entrances to the University. In addition, a new count location (M-F) was established at the Finnerty Road access to the new David and Dorothy Lamb Family Student Housing Complex, and a partial count (one afternoon only) at the Clarndon Road access to this same facility.

As with the 1992 survey, the manual counts were conducted over two consecutive weekdays, in this case (Tuesday, February 27/96 and Wednesday, February 28/96), during both the morning (7am-10am) and afternoon (2pm-6pm) peak traffic periods at the University. The data collected from the manual traffic counts included:

- peak period inbound and outbound vehicle traffic in 15 minute intervals;
- number of occupants in inbound vehicles;
- peak period inbound and outbound pedestrian and cycling activity;

A complete record of the peak period manual traffic count data is provided in Appendix 2.

BC Transit Passenger Counts

As in 1992, BC Transit conducted inbound and outbound transit passenger counts for all eight (8) routes servicing the University of Victoria, including:

- #4 - Mount Tolmie
- #7 - Foul Bay
- #11 - Uplands
- #14 - University
- #26 - Crosstown
- #29 - UVic
- #39 - UVic
- #51 - UVic

As shown in Exhibit 1, a total of three transit count stations were again used for the 1996 traffic survey, including: (i) University Drive at Cedar Hill Cross Road, (ii) Finnerty Road at McKenzie Avenue/Sinclair Road, and (iii) McGill Road at the UVic ring road. The transit counts were conducted on a weekday from 7am to after midnight during the week of February 26th to March 1st, 1996.

A complete record of the BC Transit passenger data is provided in Appendix 3.

2.2 LICENSE PLATE SURVEY

New for the 1996 traffic survey update, Transtech Data Services conducted a license plate matching survey to determine approximately the amount of external traffic, i.e., non-university traffic, short-cutting through the campus ring road system.

In consultation with University of Victoria officials, it was reasoned that the most likely short-cut route would involve trips between the University Drive access and the Finnerty Road access. The McGill Road access was ruled out because of its proximity to Gordon Head Road adjacent the campus which provides a more direct route to Cedar Hill Cross Road.

Transtech Data Services therefore established two license plate observations stations, including one on University Drive (inbound and outbound plates), and one on Finnerty Road just in from McKenzie Avenue/Sinclair Road (inbound and outbound plates). The license plate survey was conducted on Thursday, February 29/96, during the peak "commuter traffic" periods of 7 to 9am, and from 3:30 to 5:30pm. Specifically designed license plate matching software was applied by Transtech to identify matches between inbound and outbound trips between these two driveways, with the added criterion that to be a match the inbound to outbound trip time across the campus needed to be under 10 minutes.

To account for trips seemingly passing through the campus but in fact generated from peripheral parking lots #5 and #11 off Sinclair Road and Finnerty Road respectively, license plate numbers were also recorded in these lots. Any driveway traffic match involving a license plate generated in one of these lots was rejected, i.e., not to be considered as an external (non-university) trip. In addition to the license plate observations, the number of vehicle occupants was recorded for both inbound and outbound trips on the University Drive and Finnerty Road driveways. Any driveway traffic match that involved a change in the number of inbound to outbound occupants was also rejected, i.e., not an external trip, since likely this trip was a legitimate university-related trip involving either a passenger(s) pick-up or drop-off.

A summary of the Transtech's license plate match survey data is provided in Appendix 4.

2.3 UNIVERSITY DRIVE - INTERSECTION TRAFFIC/CYCLIST COUNTS

To address a specific road design issue involving the interaction between vehicle and cyclist traffic on the University Drive driveway, manual intersection counts were conducted at the University Drive/Cedar Hill Cross Road and University Drive/ring road intersections. Information collected included a full account of all vehicle and cyclist turning movements at both intersections plus a summary of pedestrian activity on the intersection crosswalks. The counts were conducted during the 7-10am and 2-6pm peak traffic periods on Tuesday, February 27/96 and again on Wednesday, February 28/96.

This information, together with existing driveway design information supplied by the University, was used as the basis for our recommendations regarding driveway design improvement options (discussed later in Section 5.0).

A summary of the intersection traffic count survey data is provided in Appendix 5.

3.0 TRAVEL MODE SURVEY: RESULTS

3.1 AUTOMOBILE DRIVERS

The volume of automobile traffic (automobile drivers) was recorded using both automatic loop counts on the three busiest driveways and manual observations during the morning and afternoon peak periods on all key driveways and parking entrances. A summary of the combined daily traffic (24hr inbound + outbound total) for the three automatic count stations is provided in Table 1 and in Exhibit 2. Included in Table 1, for comparison purposes, are the results from the 1992 survey.

Overall, the average total weekday traffic (24 hour) recorded on the three driveways in 1996 was 20,434 vehicles, or approximately 2% less than the 1992 average of 20,819 vehicles. However, the results of the automatic tube counts do not necessarily mean that vehicle traffic overall to the University is down from 1992 levels, only that vehicle traffic using these three particular driveways is lower. A more valid comparison between 1992 and 1996 levels of vehicle traffic considers the manual count data recorded on the various driveways over the combined periods 7-9am and 2-6pm.

Table 2: OBSERVED DRIVEWAY TRAFFIC VOLUMES

1992 Survey		1996 Survey	
inbound	8,642	inbound	8,811
outbound	7,683	outbound	7,788
total	16,325 vehicles	total	16,599 vehicles

Note: 1992 and 1996 volumes are averaged over the two days counted for each year

From Table 2, in fact the driveway traffic volumes during the daytime peak periods have increased marginally by 1.7% from October 1992 conditions.

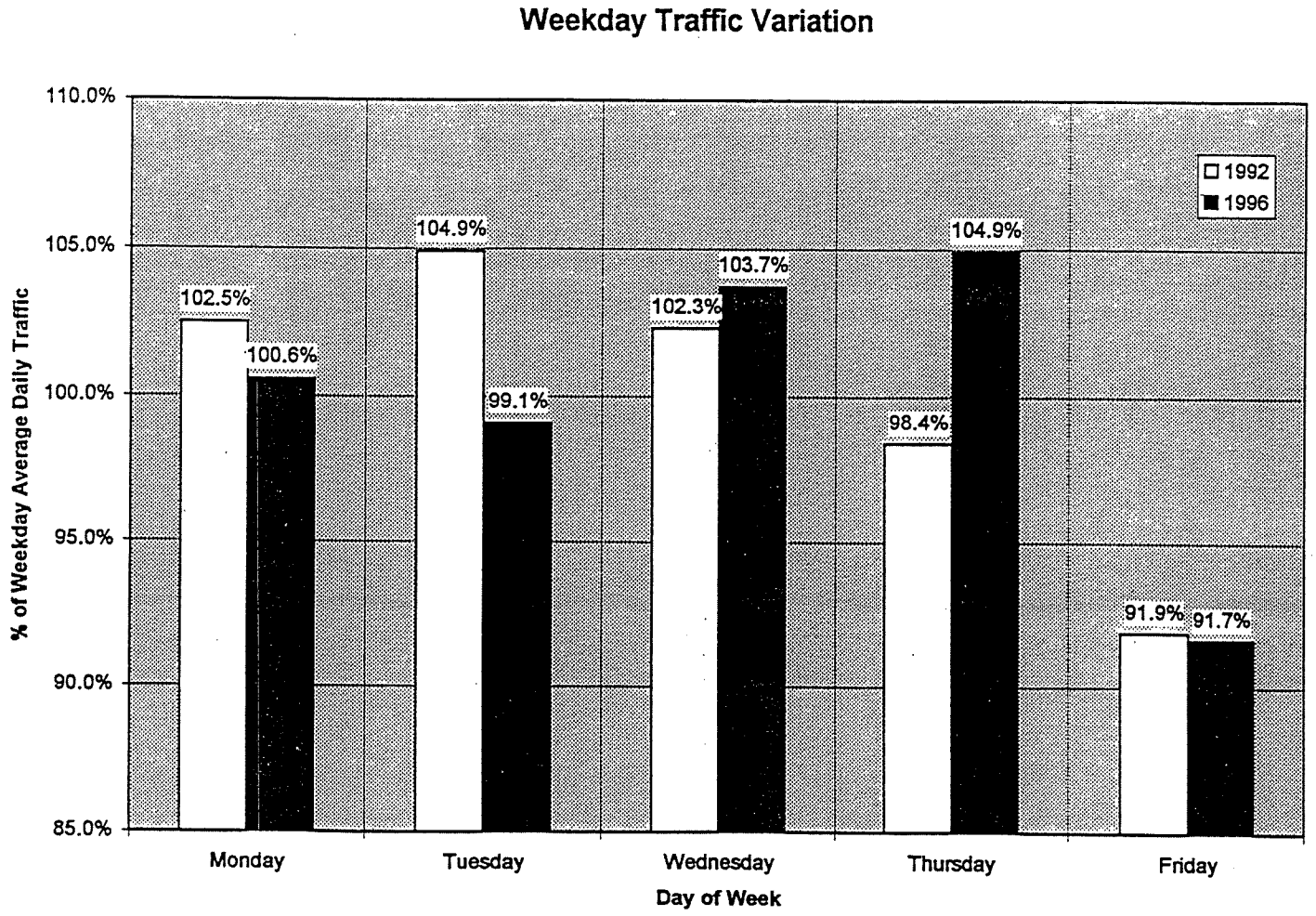
While driveway traffic volumes overall have not changed considerably from 1992 levels, evidently there has been some change in the distribution of traffic using the different driveways. Most notable is the reduced amount of exiting traffic using University Drive over the course of a day, down as much as 1,000 vehicles per day (6,364 veh/day in 1992 to 5,322 veh/day in 1996). The inbound traffic on University Drive has remained steady though at roughly 4,900-5,000 veh/day. Analysis of the manual count data for each of the various driveways suggests that the reduction in traffic exiting at University Drive is accounted for by additional exiting traffic at the McGill Road and at Finnerty Road driveways.

Table 1: AUTOMATIC TUBE COUNT SUMMARY

Count Location		Monday		Tuesday		Wednesday		Thursday		Friday		Average Weekday	
		1992	1996	1992	1996	1992	1996	1992	1996	1992	1996	1992	1996
University Drive (1)	in	5,033	4,756	5,088	4,822	5,081	5,039	5,016	5,311	4,616	4,691	4,967	4,924
	out	6,348	5,285	6,635	5,128	6,578	5,495	6,227	5,620	6,031	4,993	6,364	5,322
Gordon Head Access (1)	in	1,922	1,896	1,907	1,718	1,995	1,856	1,699	1,758	1,561	1,590	1,817	1,764
	out	1,609	1,794	1,707	1,644	1,656	1,810	1,581	1,692	1,483	1,499	1,607	1,688
McGill Road (2)	in	3,867	4,190	3,930	4,158	3,633	4,275	3,573	4,307	3,279	3,558	3,656	4,098
	out	2,567	2,633	2,563	2,779	2,364	2,721	2,384	2,751	2,160	2,399	2,408	2,657
Totals	in	10,822	10,842	10,925	10,698	10,709	11,170	10,288	11,376	9,456	9,839	10,440	10,785
	out	10,524	9,712	10,905	9,551	10,598	10,026	10,192	10,063	9,674	8,891	10,379	9,649
	total	21,346	20,554	21,830	20,249	21,307	21,196	20,480	21,439	19,130	18,730	20,819	20,434
Percentage (%) of Average Weekday		102.5%	100.6%	104.9%	99.1%	102.3%	103.7%	98.4%	104.9%	91.9%	91.7%	-	-

Note: (1) University Drive and Gordon Head Tube Count Data from Monday, February 26/96 to Friday, March 1/96

(2) McGill Road Tube Count Data from Monday, March 18/96 to Friday, March 22/96



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Weekday Traffic Variation
University of Victoria - 1996 Traffic Survey

Exhibit
2

A summary of the morning peak hour (8-9am) and afternoon peak hour (4-5pm) vehicle traffic, averaged between the February 27th and 28th count days, is shown in Exhibits 3 and 4 respectively. As shown, the overall busiest driveway continues to be University Drive with 30% of the morning traffic and 32% of the afternoon traffic. McGill Road is the next busiest access with 23% of the morning peak hour traffic, and 18% of the afternoon peak hour traffic.

Using the daily traffic profile information derived from the 24 hour, automatic tube count stations, estimates of the inbound and outbound vehicle trip profiles were developed for the 7am to 10pm period. Over this period, which accounts for most of the total daily traffic activity at the University, the total inbound vehicle traffic estimate is 16,140 vehicles while the outbound traffic is 15,870 vehicles (note: inbound/outbound imbalance attributed to some vehicles still not departed from the University at 10pm), for an overall weekday daily vehicle trip generation of approximately 33,000 trips.

3.2 AUTOMOBILE PASSENGERS

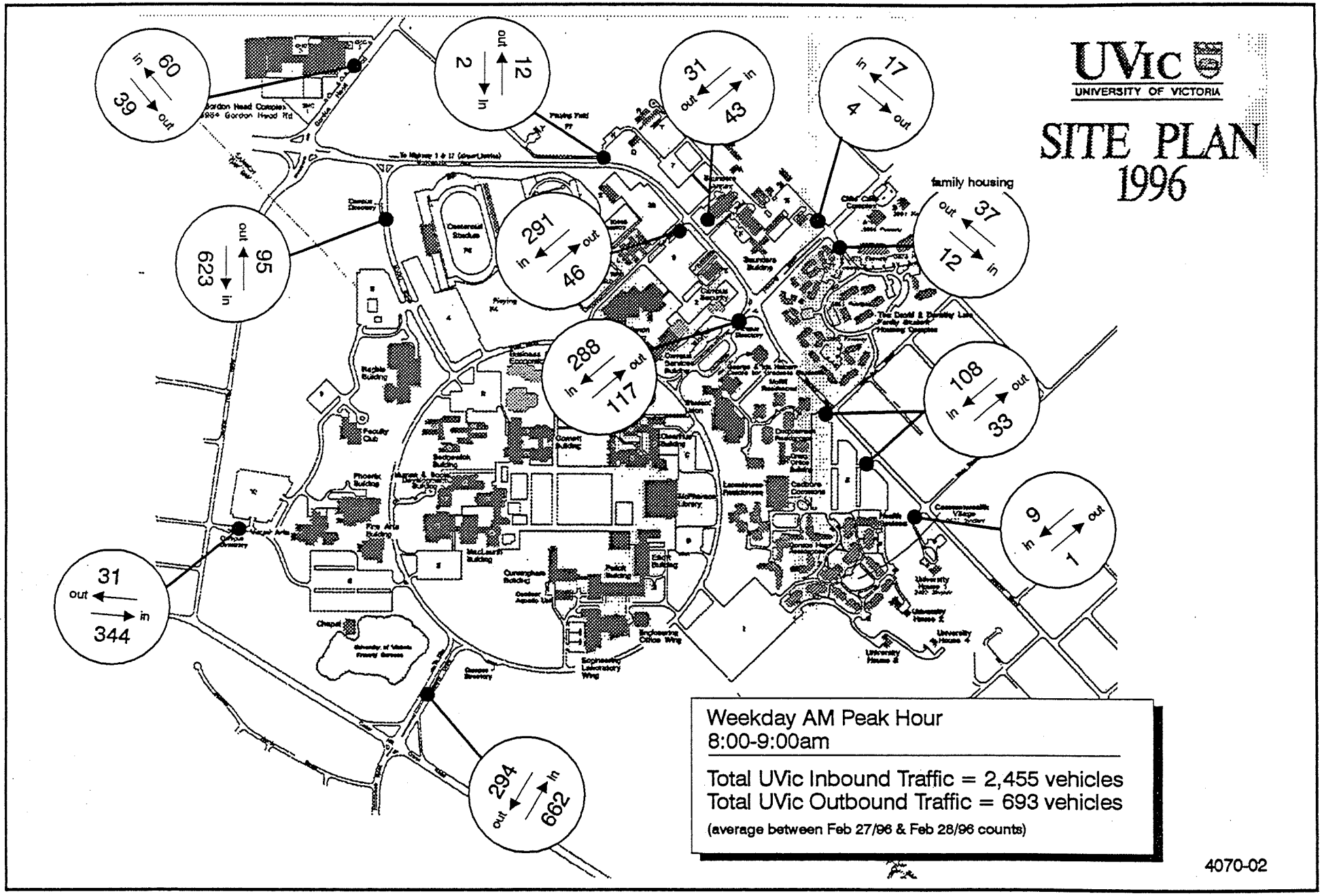
As described previously, the manual driveway counts included observations of the number of total occupants (i.e., driver plus passengers) in vehicles arriving to the University during the morning and afternoon peak periods. An hourly summary of the vehicle occupancy at each count station is provided in Table 3.

As with the 1992 survey, the vehicle occupancy varies considerably at the different count stations. For the morning and afternoon periods combined, the highest average occupancy of 1.49 persons per vehicle occurs at Count Station 3 at the entrances to the Gordon Head Complex at Gordon Head Road and McKenzie Avenue. The lowest average occupancy of 1.09 persons per vehicle occurs at the (North) Gabriola/Discovery Road parking entrance. The overall average occupancy for vehicles arriving to the University is 1.28 persons per vehicle, up from an average of 1.25 persons per vehicle in 1992.

Similar to the 1992 survey, vehicles were grouped into one of six classes depending on the number of occupants per entering vehicle. The categories ranged from one person (driver only) on up to six or more persons. A summary of the 1996 survey results is provided in Table 4, and in Exhibit 5. As indicated in Table 4, some highlights between the 1996 and 1992 survey results:

- In 1996, single-occupant vehicles, i.e., driver only, accounted for 77.3% of all inbound trips during the 7-10am and 2-6pm peak periods, down from 79.1% in 1992;

- In 1996, two (2) person per vehicle trips accounted for 19.9% of all inbound trips, up from 18.3% in 1992;



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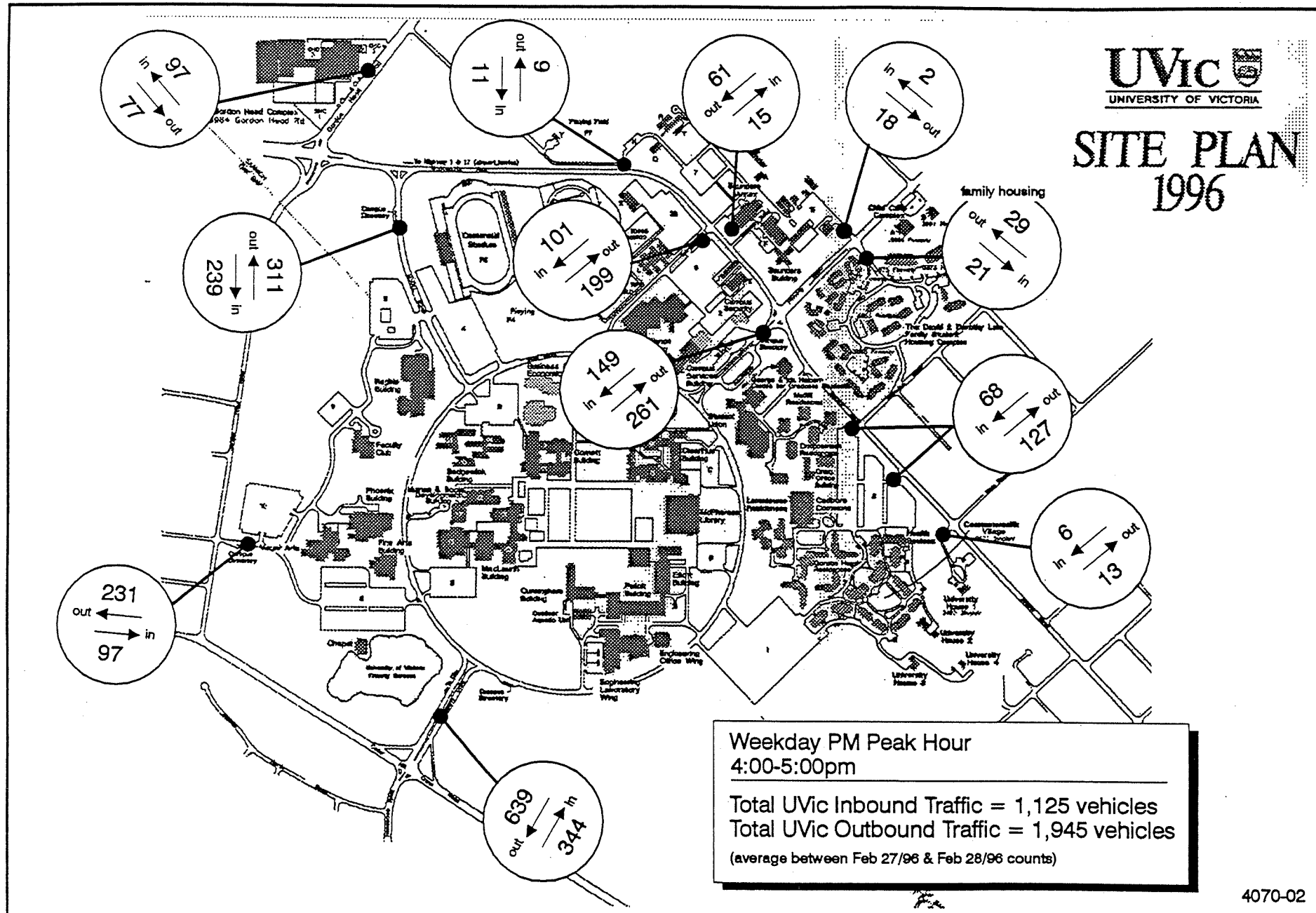
Weekday AM Peak Hour Vehicle Traffic

University of Victoria - 1996 Traffic Survey

Exhibit 3



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Weekday PM Peak Hour Vehicle Traffic

University of Victoria - 1996 Traffic Survey

Exhibit 4

Table 3: VEHICLE OCCUPANCY

Count Station	7-8am	8-9am	9-10am	Average (Morning)	2-3pm	3-4pm	4-5pm	5-6pm	Average (Afternoon)	Average (Day)
1 - University Drive Access	1.19	1.28	1.28	1.27	1.24	1.26	1.23	1.24	1.24	1.26
2 - Gordon Head Rd Access	1.20	1.20	1.17	1.19	1.16	1.14	1.14	1.21	1.16	1.18
3 - Gordon Head Complex	1.29*	1.46*	1.98*	1.60*	1.31*	1.84*	1.37*	1.34*	1.44*	1.49*
4 - McGill Road Access	1.16	1.26	1.20	1.23	1.26	1.33	1.25	1.20	1.26	1.24
5 - McCoy Road Access	1.00*	1.17*	1.14*	1.14*	1.25*	1.20*	1.00*	1.00*	1.11*	1.13*
6 - (South) Gabriola Road Access	1.18	1.20	1.10	1.17	1.17	1.23	1.22	1.37	1.23	1.19
7 - (North) Gabriola/Discovery Road Access	1.03*	1.15*	1.15*	1.10*	1.05*	1.04*	1.07*	1.50*	1.07*	1.09*
8 - (South) Finnerty Road Access	1.32	1.61	1.30	1.47	1.37	1.40	1.49	1.48	1.44	1.45
9 - Craigdarroch Parking	1.31	1.15	1.28	1.22	1.23	1.39	1.49	1.42	1.37	1.30
10 - (North) Finnerty Road Access	1.20*	1.39*	1.12*	1.25*	1.38*	1.23*	1.00*	1.00*	1.27*	1.26*
F - Family Housing (Finnerty Access)	1.22*	1.26*	2.80*	1.97*	1.53*	2.88*	1.46*	1.47*	1.75*	1.80*
Overall Average (not including family housing)	1.20	1.29	1.25	1.26	1.25	1.32	1.28	1.29	1.28	1.27
Overall Average (including family housing)	1.20	1.29	1.27	1.27	1.26	1.35	1.29	1.30	1.30	1.28

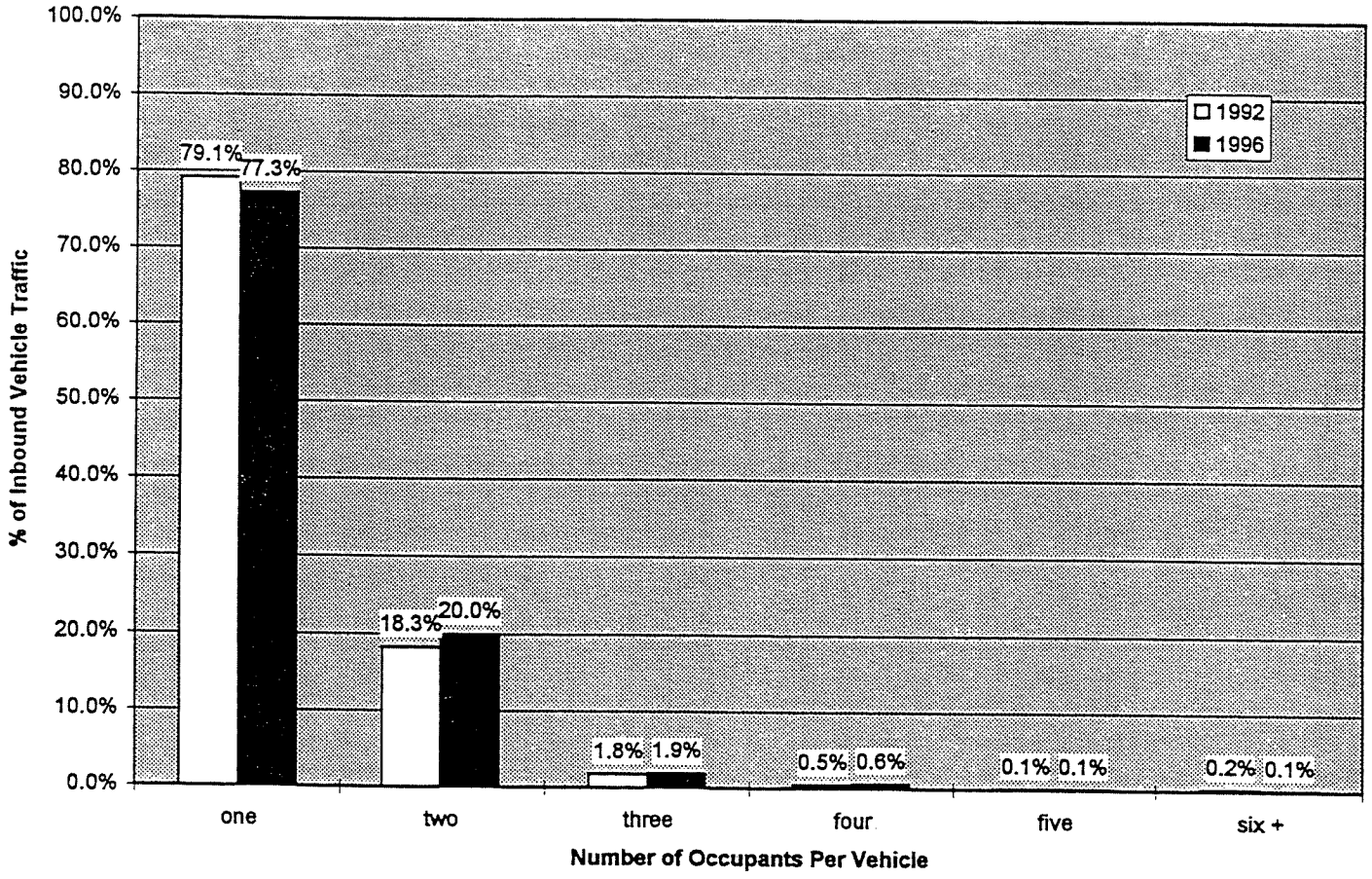
Note: * use with caution (small volumes)

Table 4: OCCUPANTS PER VEHICLE - COMBINED MORNING & AFTERNOON PEAK PERIODS

	1 Person (Driver Only)	2 Persons	3 Persons	4 Persons	5 Persons	6 or more Persons	Totals
1996 Survey	6,782 vehicles (77.3%)	1,746 vehicles (20.0%)	169 vehicles (1.9%)	55 vehicles (0.6%)	12 vehicles (0.1%)	12 vehicles (0.1%)	8,774 vehicles
1992 Survey *	6,837 vehicles (79.1%)	1,578 vehicles (18.3%)	159 vehicles (1.8%)	46 vehicles (0.5%)	7 vehicles (0.1%)	15 vehicles (0.2%)	8,642 vehicles

Note: * occupants per vehicle values reported in Table 3 and Exhibit 9 of the 1992 Traffic Survey Report vary slightly from the 1992 values reported in Table 5 as the above values are based on total peak period observations, rather than peak hour only.

Occupants Per Vehicle



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Vehicle Occupancy

University of Victoria - 1996 Traffic Survey

Exhibit 5

- In 1996, three (3) person per vehicle trips accounted for 1.9% of all inbound trips, up marginally from 1.8% in 1992;

- Little change between 1992 and 1996 in trips with four (4) or more persons per vehicle, accounting collectively for less than 1% of all vehicle trips to the University.

3.3 TRANSIT PASSENGERS

BC Transit's complete summary of the transit passenger survey conducted in February 1996 is presented in Appendix 3. Highlights include:

- For a typical weekday condition in 1996, a total of 3,264 transit passengers arrive to the University and 3,142 depart from the University. For inbound trips the busiest one hour period is from 9-10am, while for outbound trips the peak hour occurs from 4-5pm;

- Of the eight (8) bus routes servicing the University, the most heavily used route is the #14 University route, accounting for nearly 40% of all rides to/from the University, followed by the #26 Crosstown route at 24%, and the #4 Mount Tolmie route at 18%.

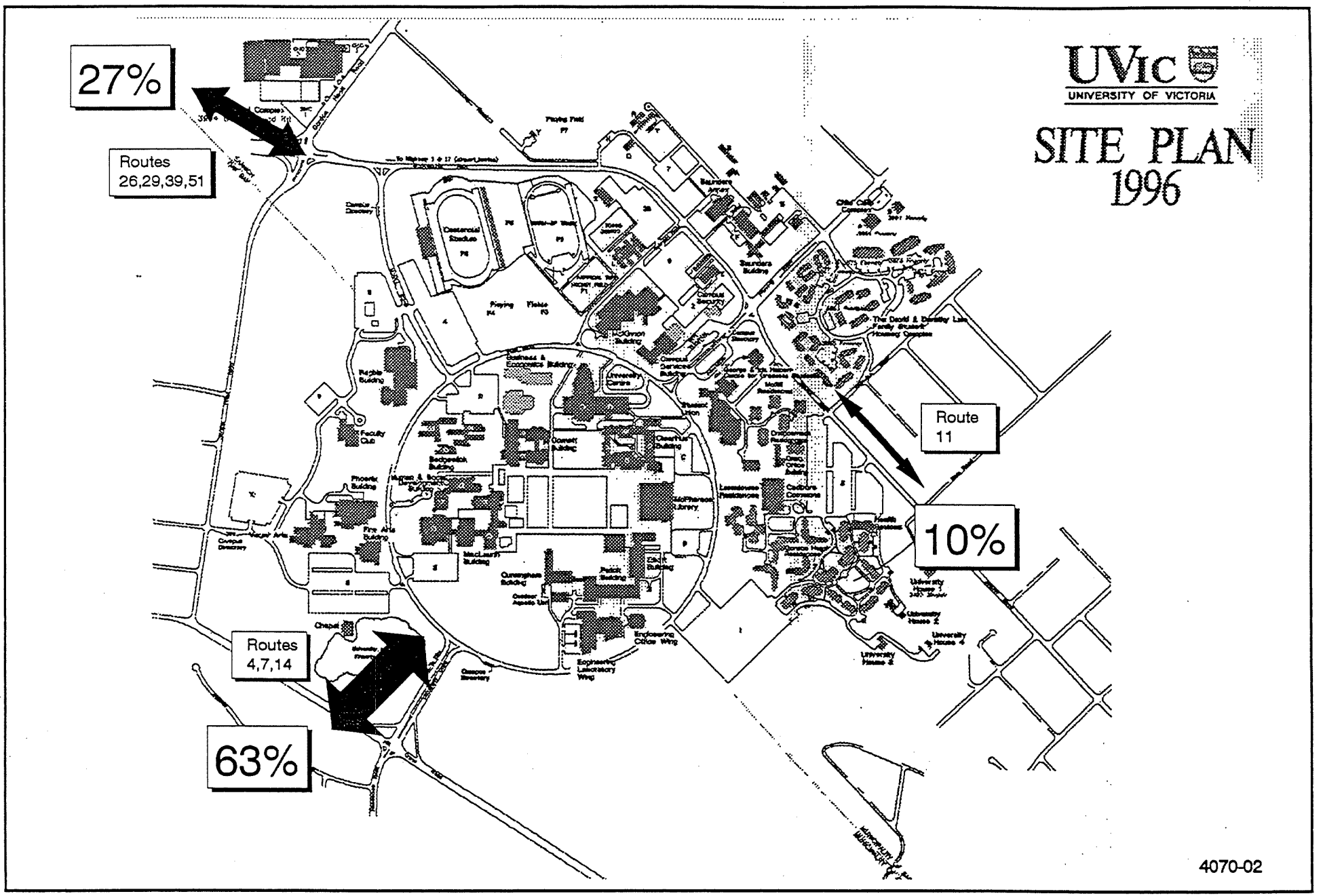
The approximate distribution of transit trips at UVic is shown in Exhibit 6. As in 1992, the predominate transit trip orientation is to the south/southwest involving the #4,#7, and #14 routes and accounting for 63% of all trips.

3.4 CYCLISTS

A summary of the total observed inbound and outbound cyclist trips at the University for the 7-10am and 2-6pm peak periods combined is summarized in Exhibit 7.

From Exhibit 7 the most heavily used driveway for cyclist trips is University Drive accounting for approximately 38%, followed by McGill Road at 16%, followed by the Gordon Head Road access driveway and nearby cycle/pathway at 11%. Directionally it would appear that the most popular access route for UVic cyclists is Henderson Road to/from the south, followed by McKenzie Avenue to/from the west.

Using the same procedure as described in Section 3.1, the observed peak period cyclists trips were expanded into daily inbound and outbound trip profiles. The resulting estimate of total cyclist trips generated by the University over an average weekday, from 7am to 10pm, is approximately 3,820 trips, including 2,155 inbound trips and 1,665 outbound trips. As described previously for automobile trips, the inbound/outbound imbalance reflects the fact that at 10pm there remain cyclists on the campus who have not yet departed.



Transit Passenger Directional Distribution

University of Victoria - 1996 Traffic Survey

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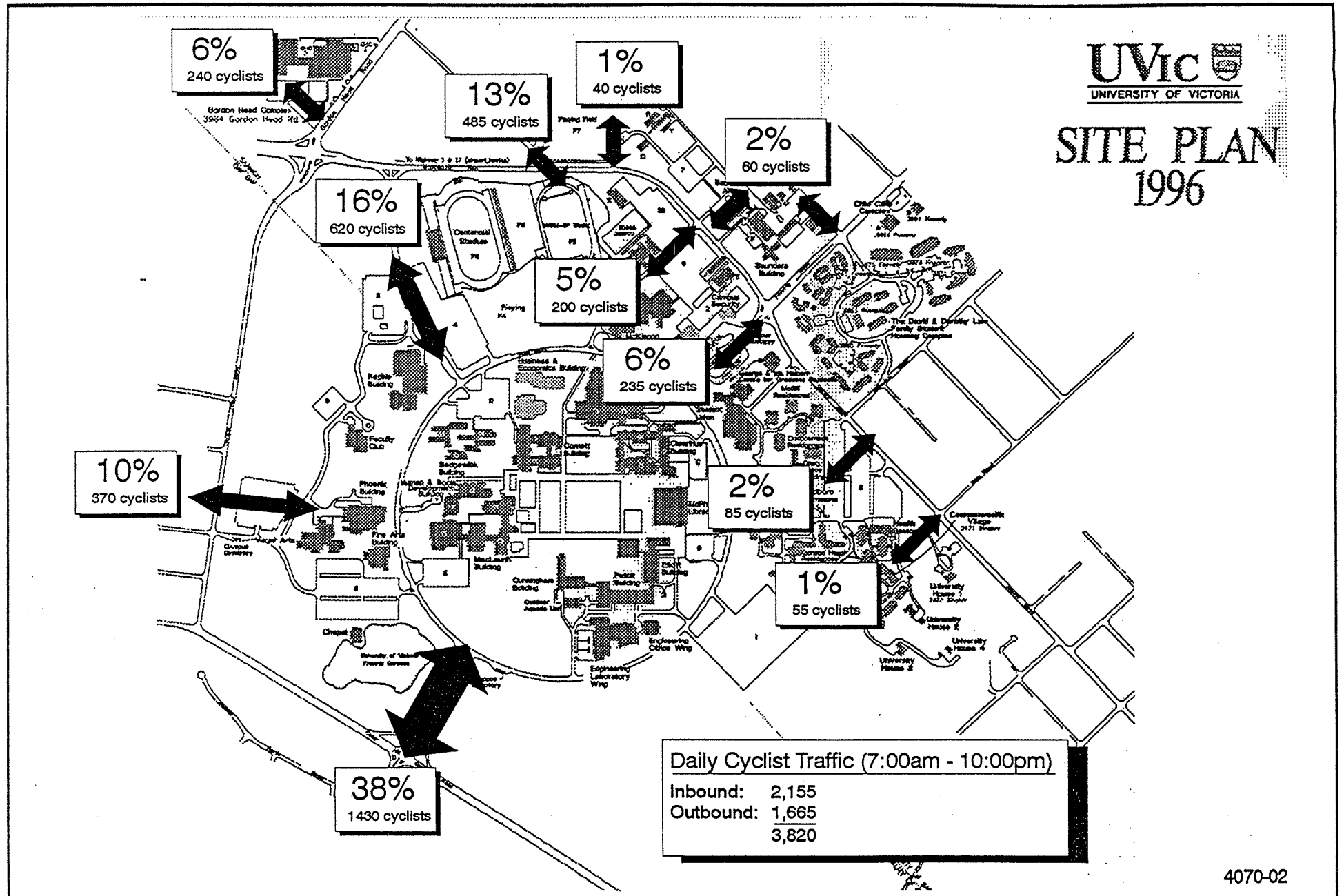
Exhibit
6



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Cyclist Access Patterns

University of Victoria - 1996 Traffic Survey

Exhibit
7

From the cumulative inbound and outbound cycle trip estimates, a further estimate of the on-site bicycle accumulation was developed, as summarized in Table 5. As indicated, the apparent peak accumulation of bicycles parked at the University, based on the inbound/outbound traffic observations, is approximately 1,100 bicycles between 1-2pm. Based on information supplied by Transtech Data Services there are an estimated 2,000 parking spaces for bicycles at the University.

3.5 PEDESTRIANS

A summary of the total observed inbound and outbound pedestrian trips at the University for the 7-10am and 2-6pm peak periods combined is summarized in Exhibit 8.

From Exhibit 8, pedestrian activity arriving and departing the University is dispersed among the main driveways. Directionally it would appear that the most popular access route for UVic cyclists is Henderson Road to/from the south, followed by McKenzie Avenue to/from the west.

Based on the estimated daily inbound/outbound trip profiles developed for the 7am to 10pm period, the number of daily pedestrian trips to/from the University is estimated at approximately 4,830 trips, including 2,570 inbound trips and 2,260 outbound trips.

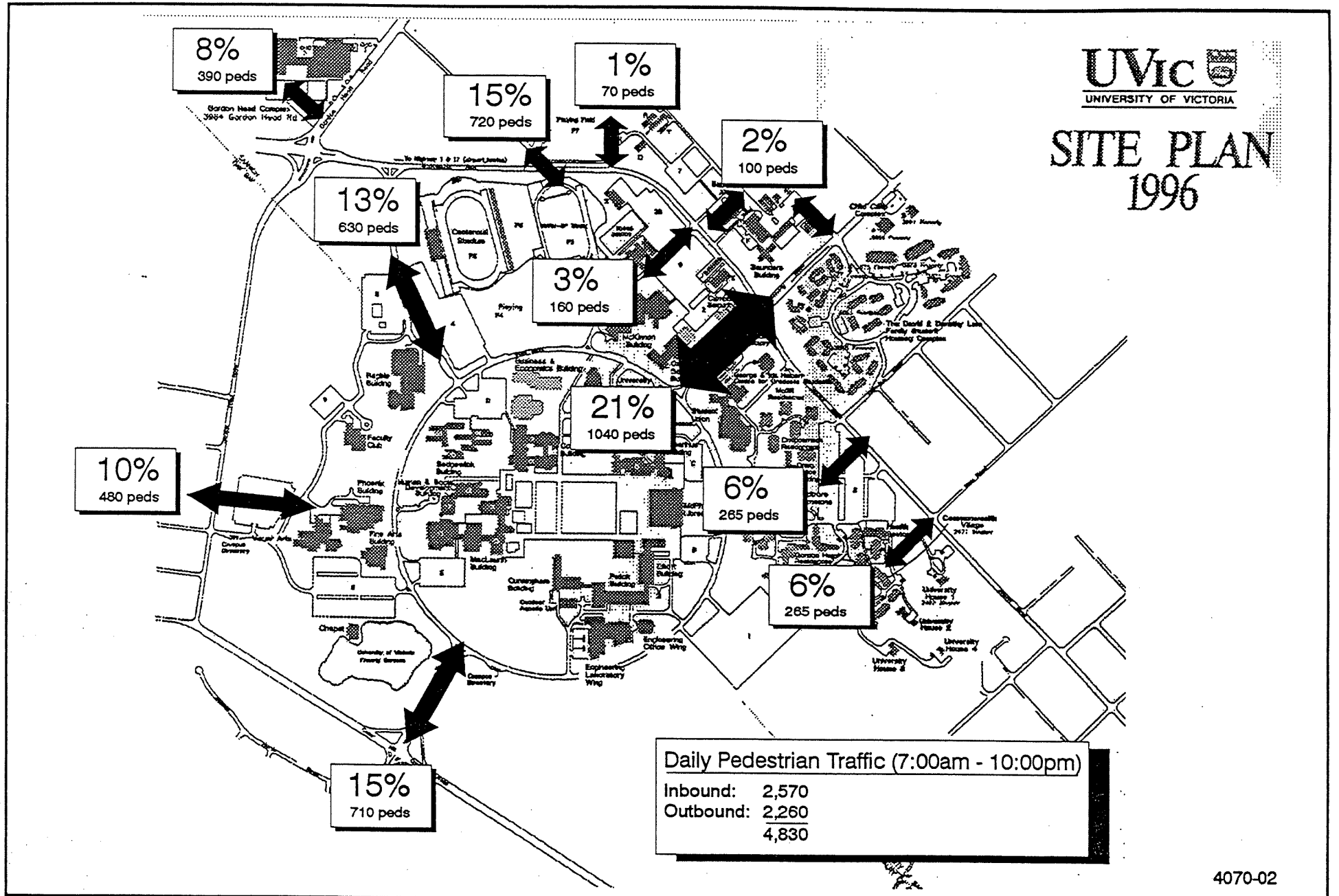
3.6 MODE SPLIT SUMMARY

For a typical weekday condition, the estimated daily profiles of inbound and outbound trips to/from the University are summarized in Table 6 for all the major modes considered, i.e., vehicles (auto drivers), automobile passengers, transit passengers, cyclists, and pedestrians. The corresponding profiles for inbound and outbound trips, by all modes, are presented in Exhibits 9 and 10 respectively.

The resulting overall modal split estimates for the University of Victoria, over the course of a typical weekday, are summarized below in Table 7, and graphically in Exhibit 11:

Table 5: ON-SITE BICYCLE PARKING ESTIMATE

Hour Beginning	Cumulative Bicycle Arrivals	Cumulative Bicycle Departs	On-Site Bicycle Accumulation
7:00 AM	74	26	48
8:00 AM	475	56	419
9:00 AM	772	114	658
10:00 AM	964	177	787
11:00 AM	1,160	264	896
12:00 PM	1,356	359	997
1:00 PM	1,547	457	1,090
2:00 PM	1,654	625	1,029
3:00 PM	1,741	790	951
4:00 PM	1,841	1,034	807
5:00 PM	1,921	1,258	663
6:00 PM	2,021	1,382	639
7:00 PM	2,088	1,462	626
8:00 PM	2,125	1,544	581
9:00 PM	2,157	1,664	493



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Pedestrian Access Patterns

University of Victoria - 1996 Traffic Survey

Exhibit 8

Table 6: INBOUND/OUTBOUND TRIP SUMMARY

(i) Inbound Trips

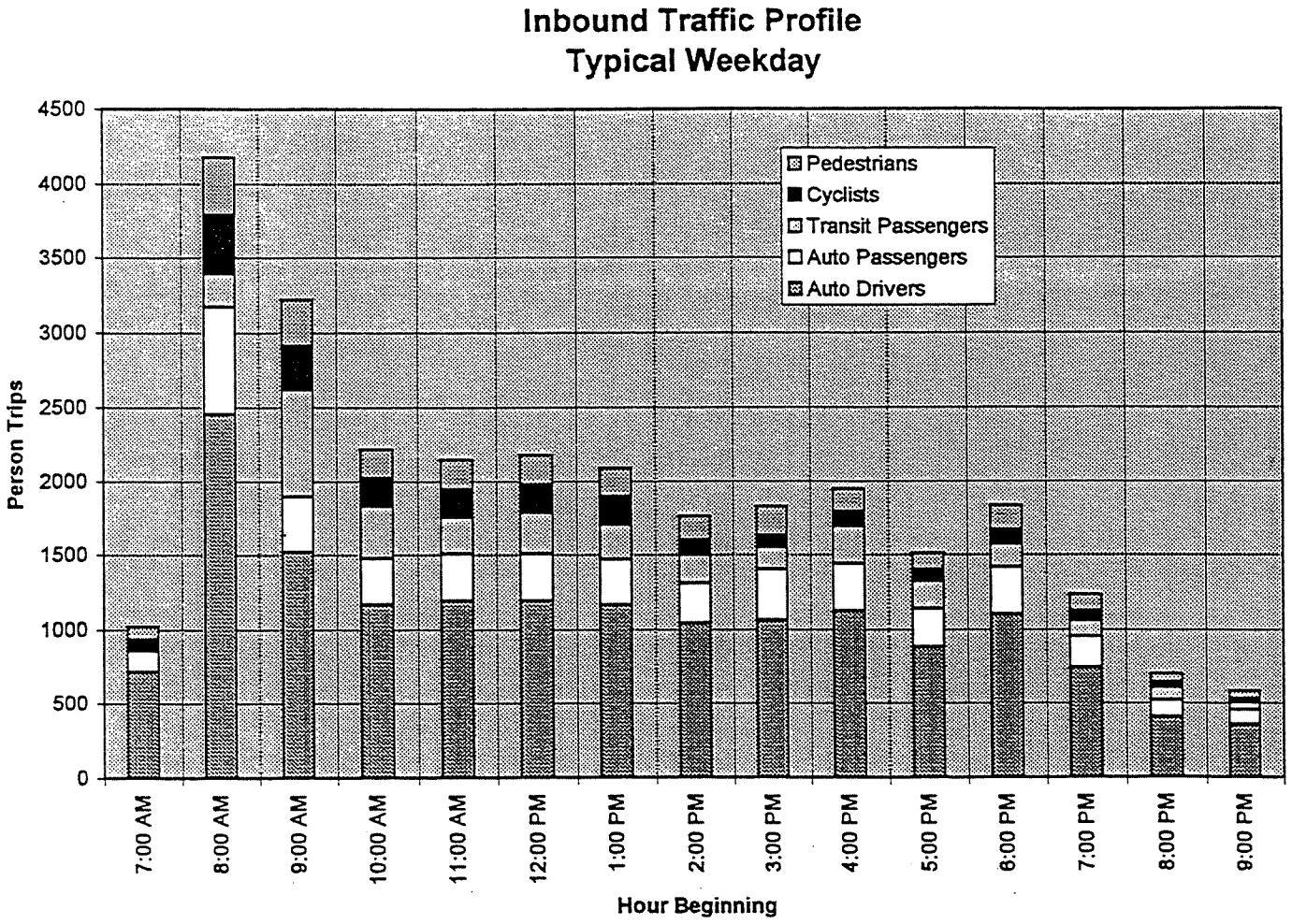
Hour Beginning	Automobile Drivers	Automobile Passengers	Transit Passsengers	Cyclists	Pedestrians	Total
7:00 AM	715	143	7	74	84	1,023
8:00 AM	2,455	715	219	401	392	4,181
9:00 AM	1,522	376	720	297	303	3,217
10:00 AM	1,169	307	354	192	194	2,216
11:00 AM	1,193	314	245	196	198	2,146
12:00 PM	1,193	314	277	196	198	2,178
1:00 PM	1,166	306	232	191	194	2,089
2:00 PM	1,046	263	188	107	160	1,763
3:00 PM	1,066	336	147	87	193	1,828
4:00 PM	1,125	315	254	100	155	1,948
5:00 PM	882	258	181	80	111	1,512
6:00 PM	1,102	314	155	100	165	1,836
7:00 PM	745	212	101	67	112	1,237
8:00 PM	407	116	83	37	61	704
9:00 PM	354	101	45	32	53	585
Totals	16,138	4,389	3,208	2,155	2,572	28,462
Modal Split	56.7%	15.4%	11.3%	7.6%	9.0%	100.0%

(ii) Outbound Trips

Hour Beginning	Automobile Drivers	Automobile Passengers	Transit Passsengers	Cyclists	Pedestrians	Total
7:00 AM	238	62	1	26	28	354
8:00 AM	693	180	80	30	90	1,072
9:00 AM	714	186	74	58	86	1,118
10:00 AM	913	238	78	63	113	1,405
11:00 AM	1,262	328	139	87	156	1,972
12:00 PM	1,373	357	169	95	169	2,163
1:00 PM	1,422	370	209	98	175	2,274
2:00 PM	1,414	396	212	168	215	2,404
3:00 PM	1,349	378	397	165	235	2,523
4:00 PM	1,945	544	458	244	294	3,484
5:00 PM	1,435	402	405	224	215	2,680
6:00 PM	949	266	339	124	148	1,826
7:00 PM	612	171	194	80	95	1,152
8:00 PM	634	177	115	82	99	1,107
9:00 PM	919	257	90	120	143	1,530
Totals	15,871	4,312	2,960	1,661	2,260	27,065
Mode Split	58.6%	15.9%	10.9%	6.1%	8.4%	100.0%

(iii) Total Inbound + Outbound Trips (Overall Mode Split)

Daily Totals	Automobile Drivers	Automobile Passengers	Transit Passsengers	Cyclists	Pedestrians	Total
Totals	32,009	8,701	6,168	3,816	4,832	55,527
Mode Split	57.6%	15.7%	11.1%	6.9%	8.7%	100.0%



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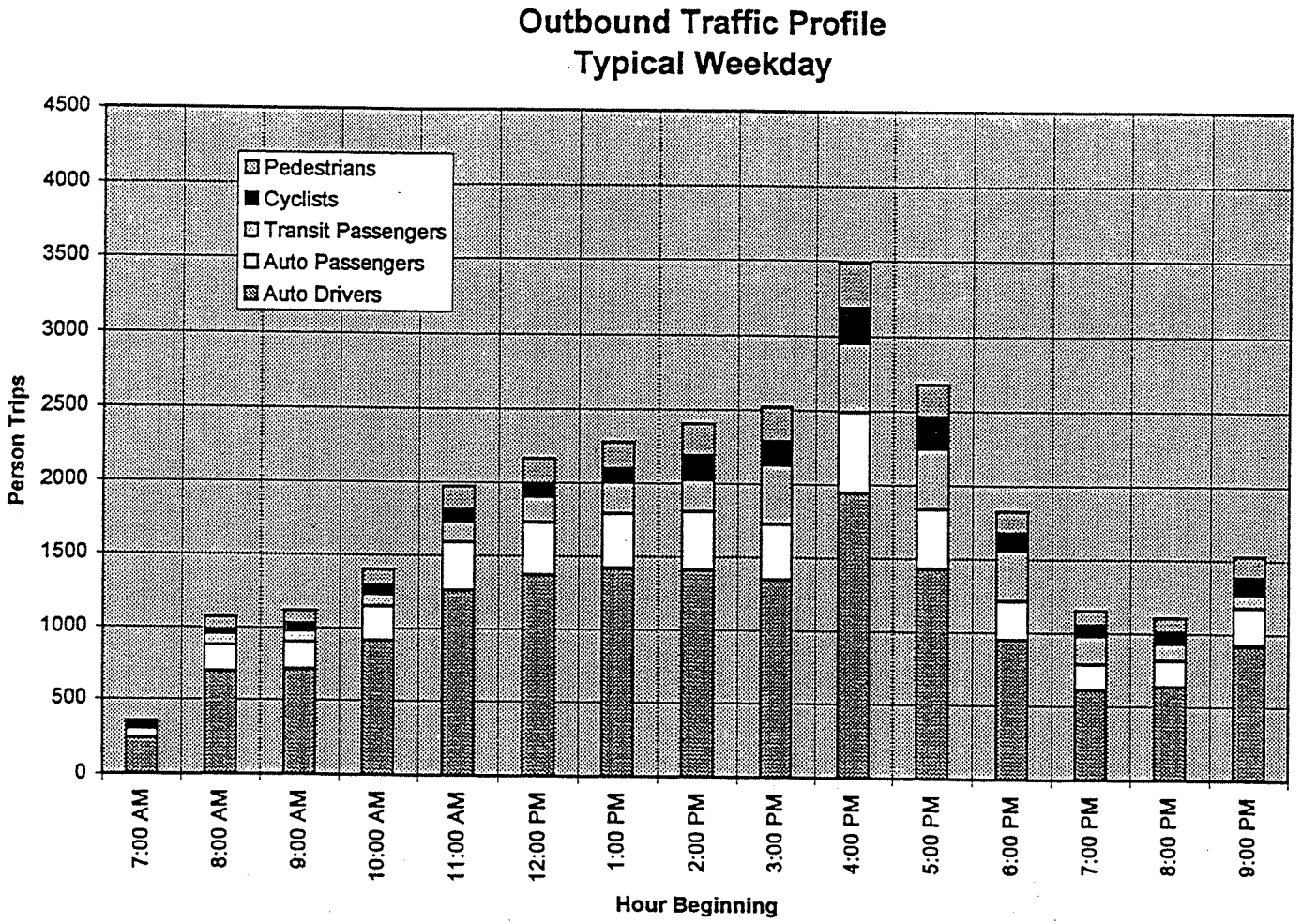
Inbound Traffic Profile (All Travel Modes)

University of Victoria - 1996 Traffic Survey

Exhibit 9



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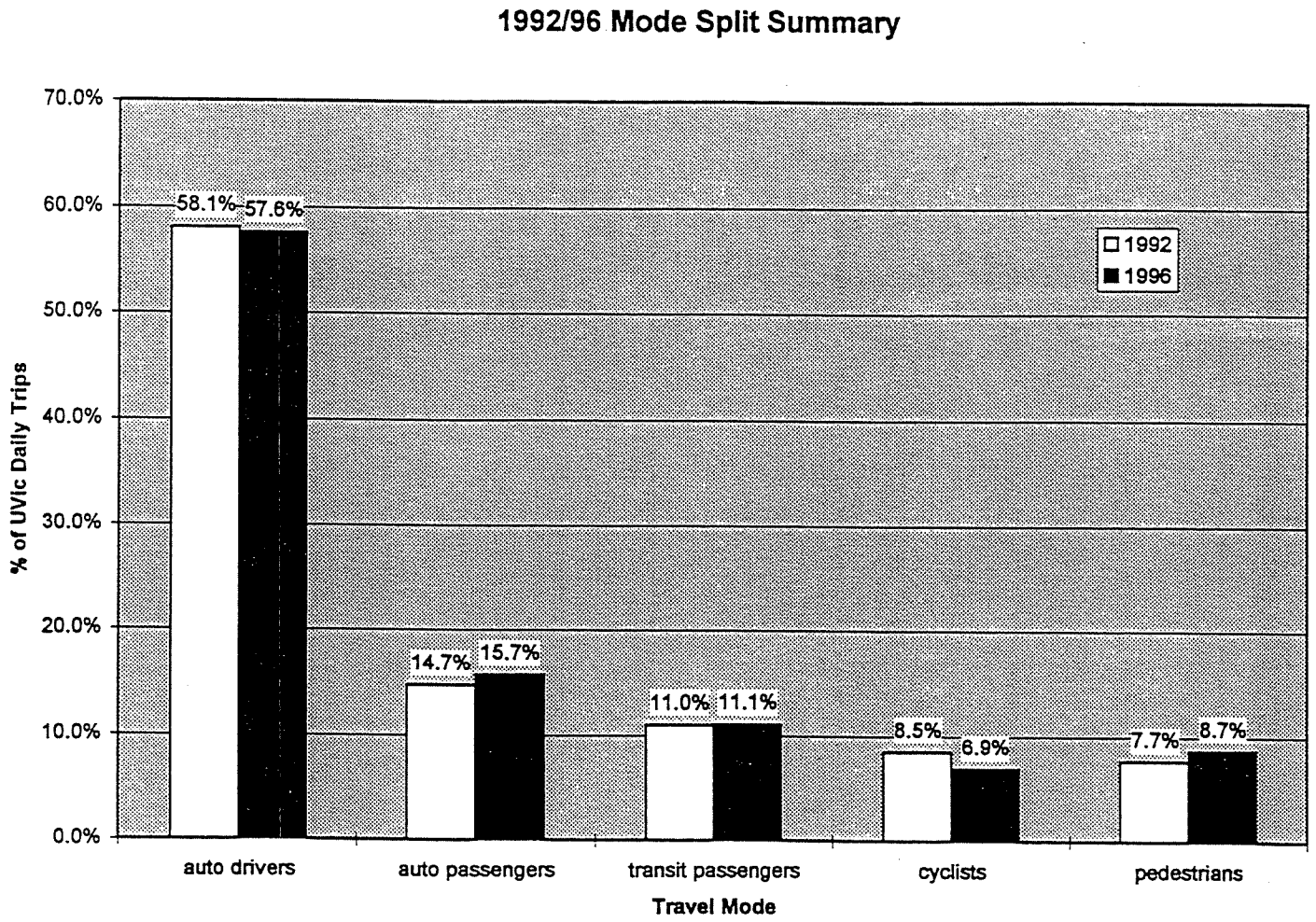
Outbound Traffic Profile (All Travel Modes)

University of Victoria - 1996 Traffic Survey

Exhibit 10



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1992/1996 Travel Mode Split Summary

University of Victoria - 1996 Traffic Survey

Exhibit 11

Table 7: Modal Split Summary

Travel Mode	1992 Survey	1996 Survey
Auto Drivers	58.1%	57.6%
Auto Passengers	14.7%	15.7%
Transit Passengers	11.0%	11.1%
Cyclists	8.5%	6.9%
Pedestrians	7.7%	8.7%
	100.0%	100.0%

As noted in the 1992 survey, there continues to be approximately 150-200 vehicles of off-site parking on neighbouring streets, or roughly 1-2% of the total daily vehicle trips to the University. Most of this off-site parking occurs on Cedar Hill Cross Road and to a lesser extent Gordon Head Road. Since this parking occurs outside the traffic count cordon established for the University, these trips are reflected as pedestrian trips rather than vehicle trips. Therefore, allowing for off-site parking, the percentage of automobile driver trips reported in the above modal split summary may be understated by 1-2% and automobile driver trips overstated by this same 1-2%.

In summary, the overall travel mode patterns at the University of Victoria have not changed substantially from the 1992 survey:

- Single-occupant vehicles (auto driver only trips) are down slightly while auto passenger trips (mainly two person per vehicle trips) are up slightly. There has been relatively little change in the number of three person per vehicle trips, the minimum number to be eligible for the University's carpool program.

- Transit ridership to/from the University has remained virtually unchanged since 1992, despite the fact that transit has become relatively less expensive to vehicle trips on account of parking rate increases, while the student transit cost has remained unchanged.

- Cyclist trips to/from the University appear to have decreased slightly from 1992 to 1996, though there may be some seasonal influence on this result. The 1992 survey was conducted in good weather conditions in late October, while the 1996 survey was conducted in good weather in late February.

- While cyclists trips appear to have fallen somewhat, the percentage of pedestrians has increased slightly.

4.0 LICENSE PLATE MATCH SURVEY: RESULTS

As described previously in Section 2.2, a "license plate survey" of morning and afternoon peak period vehicle trips (inbound and outbound) was recorded on the University Drive and Finnerty Road access driveways to the University. The survey was conducted by Transtech Data Services on Thursday, February 29/96. The purpose of the survey was to determine more accurately the number of suspected "external" (non-University) vehicle trips presently passing through the campus driveway/ring road system.

A full summary of the license plate matching analysis is provided in Appendix 5. As reported in the data summary, and summarized in Exhibit 12 for both the weekday morning (7-9am) and afternoon (3:30-5:30pm) peak periods observed, the estimated volume of external traffic is as follows:

<u>During the 7-9am peak period</u>:

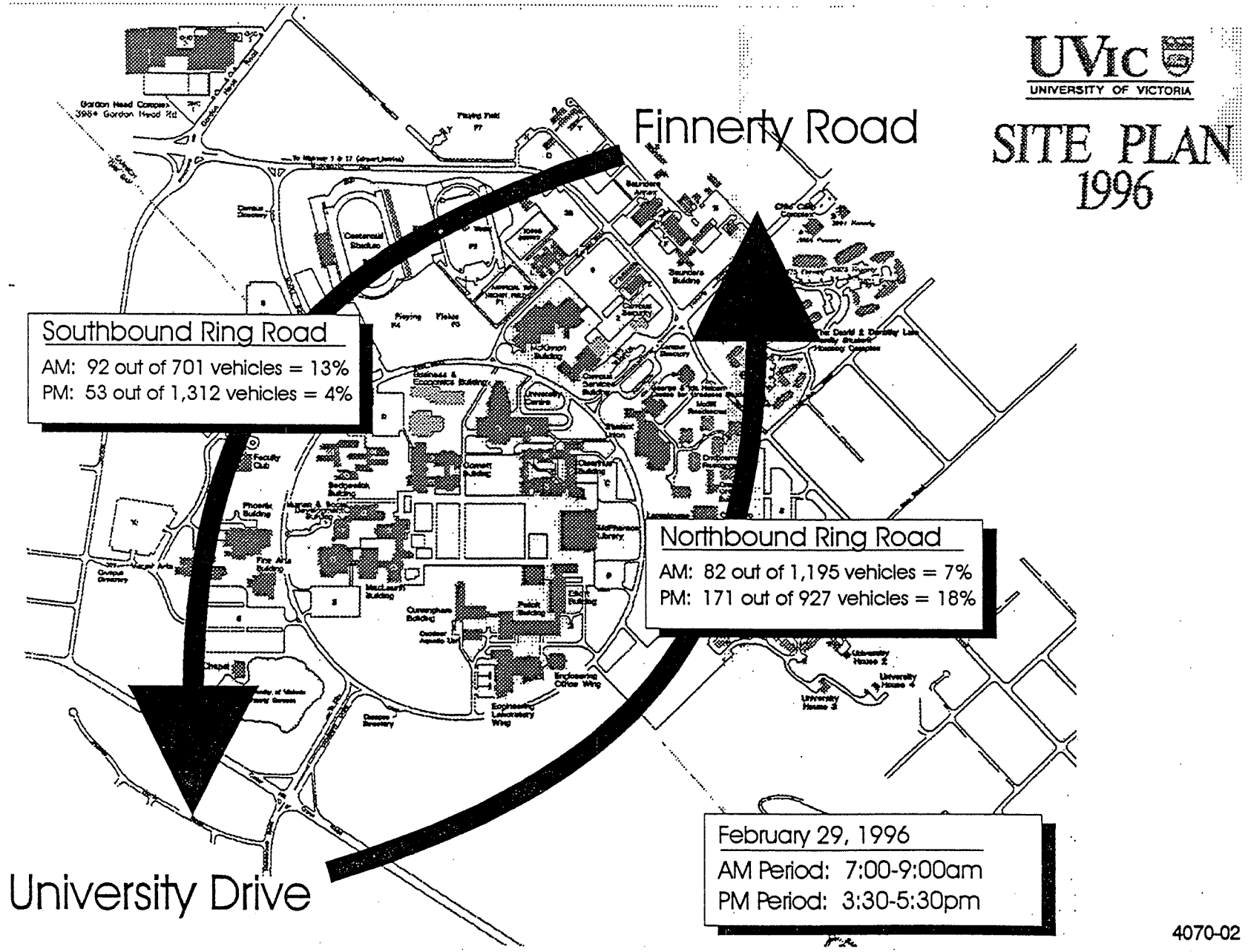
Northbound around the ring road from University Drive to Finnerty Road:	82 vehicles out of 1,195 vehicles = 7%
Southbound around the ring road from Finnerty Road to University Drive:	92 vehicles out of 701 vehicles = 13%

<u>During the 3:30-5:30pm peak period</u>:

Northbound around the ring road from University Drive to Finnerty Road:	171 vehicles out of 927 vehicles = 18%
Southbound around the ring road from Finnerty Road to University Drive:	53 vehicles out of 1,312 vehicles = 4%

As would be expected, the presence of external traffic passing through the University is more prevalent southbound during the weekday morning period and northbound during the afternoon period, corresponding to the area commuter traffic patterns. Factoring up these observed peak period external trips indicates potentially between 1,000 to 1,500 external vehicle trips through the University over the course of a typical weekday, or roughly 7-8% of all daily vehicle trips at the University.

In addition to this north to south and south to north through traffic routing, the license plate survey revealed a number of in effect "u-turn" vehicle trips involving vehicles entering the campus, circling around the ring road and exiting back out the same driveway, all within 10 minutes. This is more apparent at the University Drive access, and was observed to involve 8 vehicles during the morning peak period, and as many as 30 vehicles during the afternoon peak period. This activity is attributed mainly to courier vehicle trips to/from the south which is legitimate university-generated traffic.



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External (Non-University) Travel Patterns

University of Victoria - 1996 Traffic Survey

Exhibit
12

5.0 UNIVERSITY DRIVE BICYCLE ACCESS

5.1 ISSUES

As described in the previous sections, University Drive is the single busiest driveway at the University, used by over 11,500 vehicles and 1,400 bicycles on a typical weekday. At present bicycles share the driveway lanes with the vehicle traffic.

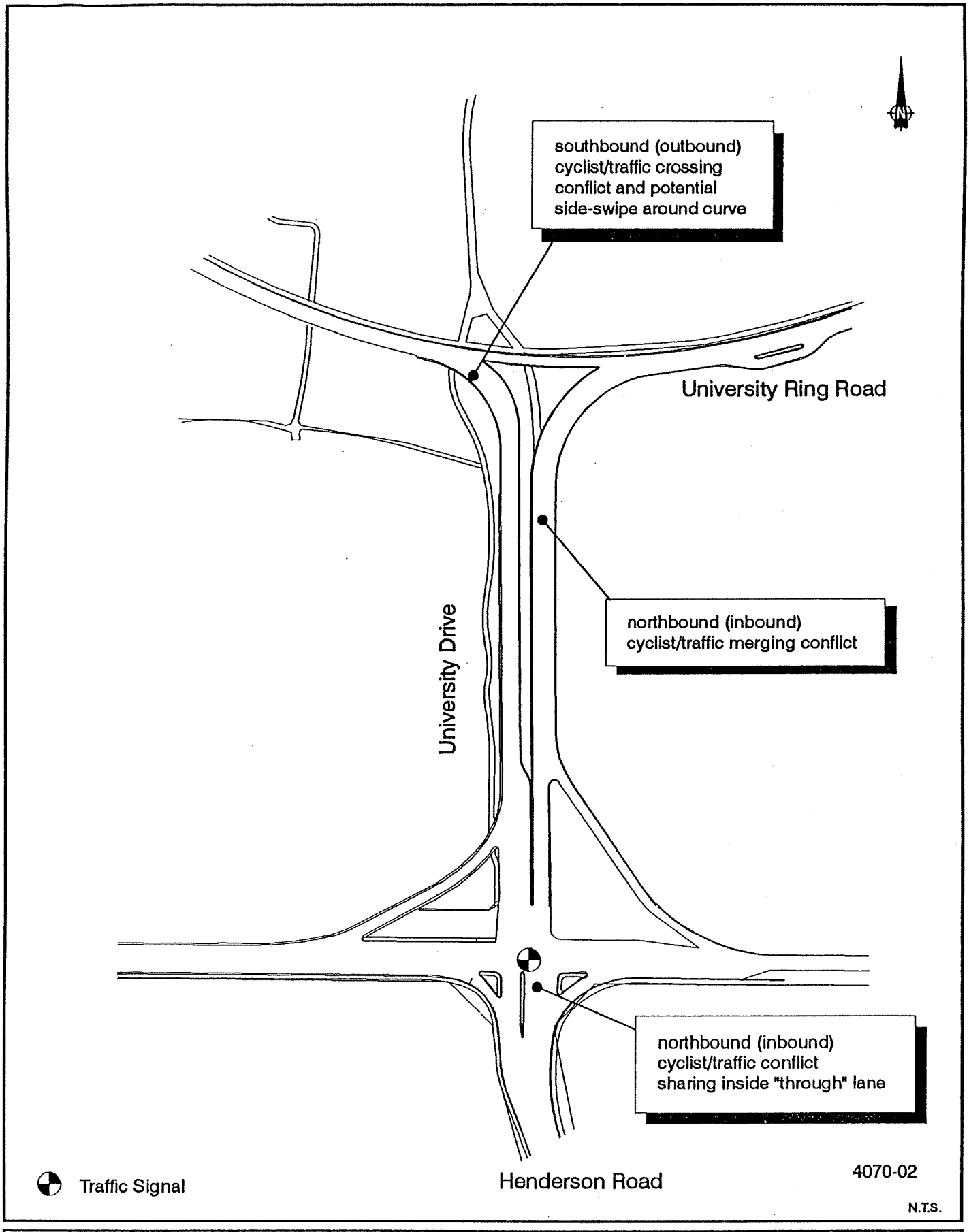
Based on input from University officials as well as direct observation of morning and afternoon peak period activity on this driveway, it is apparent that this mix of vehicle and bicycle traffic is unsafe and should be improved. From our perspective the principal traffic safety issues on the driveway are as outlined in Exhibit 13, and include:

(i) For northbound (entering) driveway traffic, the location of the bicycle pathway crossing the traffic island at the north end of University Drive (at the ring road) compels cyclists to travel on the inside traffic lane. Anticipating this, many cyclists are positioning themselves in this lane even south of the driveway on the Henderson Road approach to the Cedar Hill Cross Road intersection, while some remain in the outside through traffic lane.

This mix of cyclists using both the through traffic lanes from Henderson Road toward University Drive is both a safety risk and affects vehicle traffic capacity through the intersection.

(ii) Once on University Drive, those cyclists who approached using the outside traffic lane, or who entered as a right-turn from Cedar Hill Cross Road, are forced to weave across the driveway from right to left to gain access to the bicycle path crossing the traffic island. This weave movement is highly unsafe, particularly during the morning "surge" arrival period between 8:15 to 8:30am.

(iii) For southbound (departing) driveway traffic, the present configuration of the pedestrian/bicycle crossing of the ring road is unsafe at the point traffic turns off from the ring road onto University Drive. From our observations almost all cyclists choose to travel on the driveway rather than the paved path along the west side of the driveway. After crossing the ring road, cyclists tend to make their way to the outside (right-side) curb lane rounding the corner onto University Drive and then travel this lane toward the Cedar Hill Cross Road intersection. It is in rounding this curve that bicycle traffic conflicts with vehicle traffic and susceptible to side-swipe type accidents.



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University Drive Bicycle Access Issues

University of Victoria - 1996 Traffic Survey

Exhibit 13

5.2 PEAK PERIOD TRAFFIC/CYCLIST VOLUMES

As a basis for our evaluation of traffic conditions on the driveway and potential design improvements, weekday AM and PM peak period traffic volumes (vehicles, bicycles, and pedestrians) were recorded at the University Drive/Cedar Hill Cross Road intersection, and the University Drive/ring road intersection. A summary of the morning peak hour (8:00 to 9:00am) and afternoon peak hour (4:15 to 5:15pm) conditions is reported in Exhibits 14 and 15 respectively.

Highlights include:

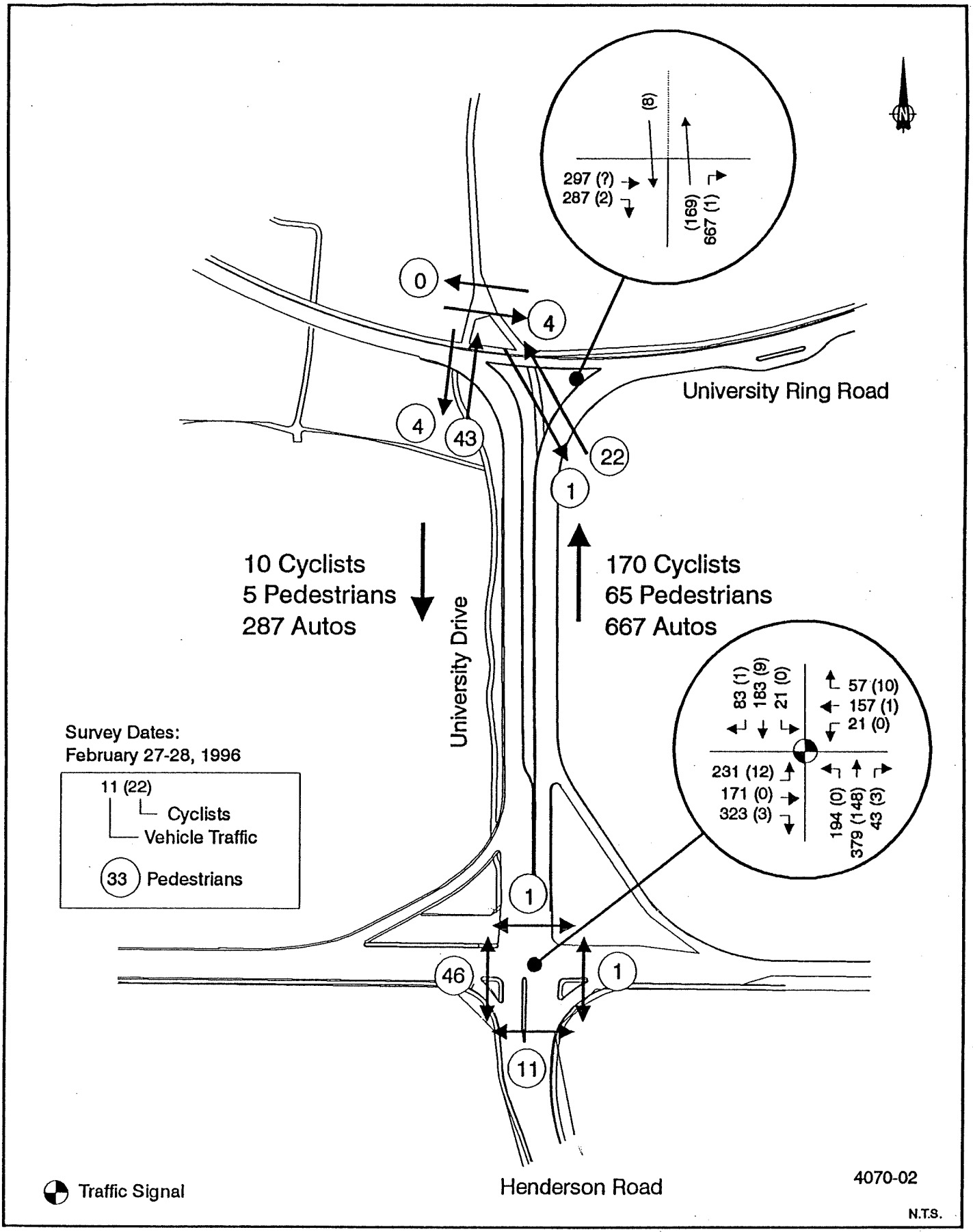
- In the morning peak hour period, the northbound (entering) traffic condition is heaviest with approximately 670 vehicles, 170 cyclists, and 65 pedestrians. In the afternoon peak hour, the southbound (exiting) traffic condition is heaviest with approximately 620 vehicles, 100 cyclists, and 40 pedestrians.

- For entering vehicle traffic in the morning, roughly 55% approaches from Henderson Road, 35% as a left-turn from Cedar Hill Cross Road, and 10% as right-turns from Cedar Hill Cross Road. Nearly 90% of all cyclist traffic in the morning approaches on Henderson Road. Of the cyclist traffic on the Henderson Road approach, roughly half uses the inside "through" traffic lane while half uses the outside "through" traffic lane.

- Pedestrian traffic along the driveway is roughly two-thirds on the west side (using the existing paved path) and one-third on the east side where there is presently no path. This east side pedestrian activity is for the most part associated with persons parking on-street along Cedar Hill Cross Road east of University Drive/Henderson Road. Pedestrians on the east side of the driveway either walk on the grass boulevard or on the "hatched" strip of pavement adjacent the outside driveway traffic lane.

- For departing vehicle traffic in the afternoon, the distribution onto Henderson Road and Cedar Hill Cross Road is very similar to the morning inbound pattern. Roughly 80% of departing cyclist traffic travels south onto Henderson Road, while the balance are split between left and right-turns onto Cedar Hill Cross Road. After rounding the curve from the ring road onto University Drive, cyclist traffic using the outside (right-side) driveway lane presents relatively little conflict with vehicle traffic since most cars use the inside lane.

- As is common for a major traffic generator, driveway traffic on University Drive is characterized by a major "surge" of inbound traffic in the morning (in this case from 8:15 to 8:30am), and a secondary surge of outbound traffic in the afternoon (in this case from 4:30 to 4:45pm). The morning period 15 minute surge of inbound traffic equates to an effective vehicle flow rate of nearly 1,100 vehicles per hour (up nearly 65% from the 8:00 to 9:00am



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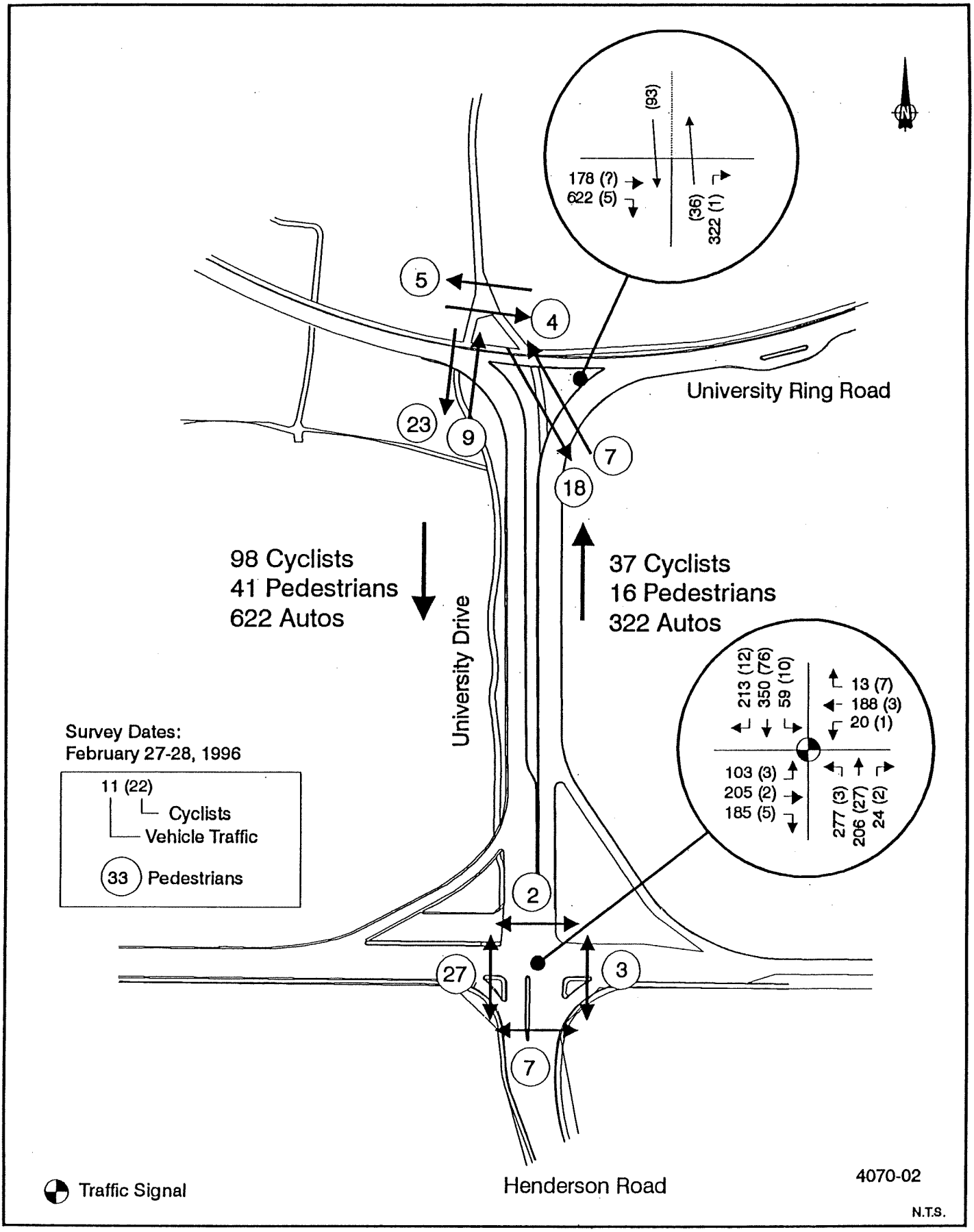
Weekday AM Peak Hour Traffic (8-9am)

University of Victoria - 1996 Traffic Survey

Exhibit 14



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Weekday PM Peak Hour Traffic (4:15-5:15pm)

University of Victoria - 1996 Traffic Survey

Exhibit 15

observed flow of 670 vehicles). In the afternoon the 15 minute surge period occurs from 4:30 to 4:45pm, and equates to an effective vehicle flow rate of approximately 770 vehicles per hour, up roughly 25% from the observed hourly flow of 620 vehicles between 4:00 and 5:00pm.

These surge flow rates are important considerations in the evaluation of driveway traffic capacity, particularly in assessing whether existing vehicle traffic lanes can be converted to exclusive bicycle use lanes.

5.3 TRAFFIC OPERATIONS ANALYSIS

To improve the safety of vehicle/bicycle mixed traffic flow on University Drive, one design option that has been considered in the past is to convert two vehicle traffic lanes (one northbound and one southbound) on the driveway to bicycle lanes only. This would leave a single lane southbound and a single lane northbound for vehicle traffic on the driveway. For such a proposal the key traffic impact considerations include:

(i) Traffic capacity at the University Drive/Cedar Hill Cross Road intersection;
(ii) Resulting vehicle queues on northbound Henderson Road (morning) and southbound on University Drive (afternoon);
(iii) Single lane flow conditions turning from University Drive onto the ring road (morning) and from the ring road onto University Drive (afternoon).

Traffic Capacity at the University Drive/Cedar Hill Cross Road Intersection

To evaluate the impact of single northbound/southbound traffic lane operation at the Cedar Hill Cross Road intersection, an intersection capacity analysis was undertaken using the standard methods of the 1985 Highway Capacity Manual. The results of this analysis are presented in Table 8. Reported is the calculated volume to capacity (v/c) ratio for traffic at the intersection and the corresponding traffic Level of Service (LOS) indicator, ranging from ideal LOS "A" conditions (little or no delay) to capacity conditions at LOS "F" with excessive delay and queuing.

Table 8: UNIVERSITY DRIVE/CEDAR HILL CROSS ROAD INTERSECTION CAPACITY ANALYSIS

Traffic Condition	Existing Lane Configuration	Single Vehicle Traffic Lanes on Driveway
(1) Peak Hour Traffic Conditions		
- Weekday Morning:	v/c = 57%, LOS "B"	n/a
- Weekday Afternoon:	v/c = 64%, LOS "C"	
(2) Peak Hour "Surge" Traffic Conditions		
- Weekday Morning:	v/c = 67%, LOS "B"	v/c = 80%, LOS "C"
- Weekday Afternoon:	v/c = 73%, LOS "C"	v/c = 94%, LOS "D"

As indicated, the University Drive/Cedar Hill Cross Road intersection presently operates at roughly 55% to 65% of capacity during the weekday morning and afternoon peak periods generally. However, during the morning inbound and afternoon outbound surge flow conditions, capacity utilization increases to between roughly 65% to 75% of capacity, though still with quite acceptable LOS B/C traffic conditions.

In the event that one of the two inbound traffic lanes and one of the two outbound traffic lanes on University Drive were converted to bicycle lane use only, the resulting capacity utilization at the Cedar Hill intersection increases to 80% of capacity during the morning surge period, and 94% during the afternoon surge period, with more pressured but still acceptable LOS C/D traffic conditions.

Vehicle Queuing Conditions

Another consideration is the resulting vehicle queuing conditions that would result under single inbound and outbound vehicle traffic flow on University Drive. In the morning period, under surge traffic conditions the resulting vehicle queue on the northbound Henderson Road approach would potentially extend back up to 100 metres from the Cedar Hill intersection, versus half this amount (50 metres) under the existing two-lane approach. The longer queue with the single lane approach would extend back along Henderson Road and occasionally block the Frederick Norris Road and Murdoch Crescent intersections, which could become a problematic neighbourhood traffic issue.

In the afternoon period, the resulting queue on the University Drive southbound approach to the Cedar Hill Cross Road intersection would similarly extend back a distance of 100 to 110 metres versus roughly half this amount with the existing two-lane configuration. However, the impact of this afternoon southbound queuing on University Drive is not problematic since there are no intersecting streets or driveways until the ring road which is roughly 200 metres back from the Cedar Hill Cross Road intersection.

Traffic Flow at the University Drive/Ring Road Intersection

As presently configured, traffic turning to the right from University Drive onto the ring road has two lanes available, and similarly there are two lanes for right-turns from the ring road onto University Drive. In the event that one inbound and one outbound driveway lane is converted to bicycle use only, these right-turn movements between University Drive and ring road will be single lane only.

For a channelized right-turning lane with fairly wide radius curvature as is the case here, the normal capacity or saturation flow rate would be in the range of 1,500 to 1,600 vehicles per hour per lane. As described above, the "surge" condition traffic flow on the driveway has roughly 1,100 vehicles per hour of entering on the driveway traffic in the morning period, and roughly 800 vehicles per hour of departing traffic in the afternoon period. Therefore, for both the

morning and afternoon surge periods there is sufficient turning capacity at the ring road intersection to reduce the number of turning lanes from two to one.

In summary, from an intersection traffic capacity consideration, both at the Cedar Hill Cross Road intersection and the ring road intersection, it is feasible to convert one of the two inbound traffic lanes and one of the two outbound traffic lanes on University Drive to bicycle use only. However, the resulting single lane vehicle queue on the northbound Henderson Road approach to the Cedar Hill Cross Road intersection during the morning peak period would potentially be problematic. Single lane vehicle queuing on the southbound University Drive approach to the Cedar Hill Cross Road intersection, on the other hand, would be manageable.

5.3 Access Design Options

The University Drive vehicle/cyclist access concern has been issue for some time and over this period a number of improvement options have come forward in concept form. These include the traffic lane to bicycle lane conversions as described above, possible use of the centre median as a bike path, etc.

The leading options considered to this point are summarized in Exhibits 16 through 20, including a list of the traffic pro's and con's in each case. A brief assessment of each is provided below, incorporating the traffic operations considerations from the previous section:

Option 1: Median Bicycle Path (Exhibit 16):

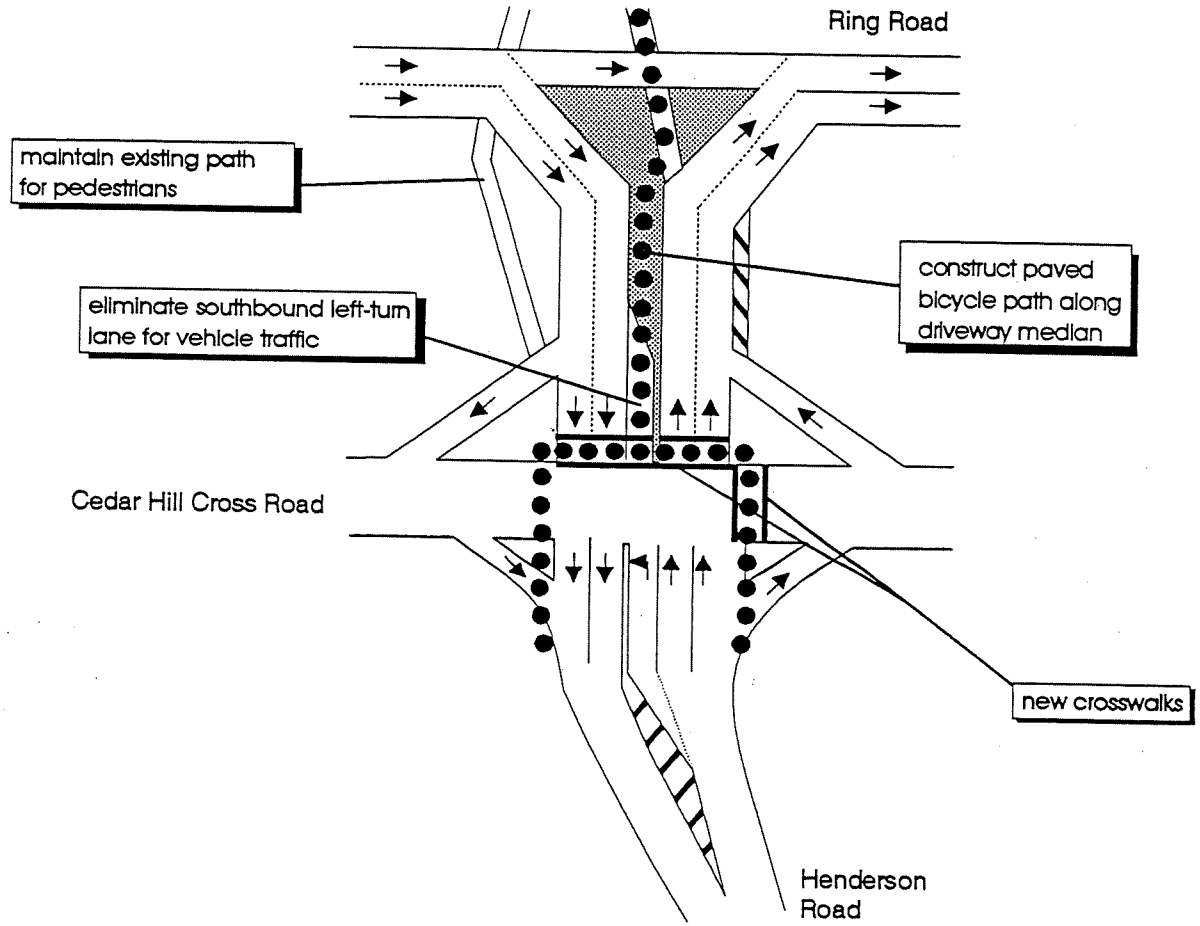
The existing grass median separating the inbound and outbound traffic lanes on University Drive is approximately 4.5 metres wide, though this narrows to roughly one metre on the south end to accommodate the southbound left-turn lane at the Cedar Hill Cross Road intersection.

As per the Ministry of Transportation and Highways (MoTH) Interim Cycling Policy guidelines, the minimum width recommended for a two-way bike path is 2.4 metres. For shared pedestrian/bicycle use, the minimum width increases to 4.0 metres though 5.0 metres is preferable. As such, physically there is room to locate a bicycle path (or combined bicycle/pedestrian path) on the driveway median though, as shown in Exhibit 16, this would eliminate the southbound left-turn lane at the Cedar Hill Cross Road intersection (southbound left-turn traffic would share the inside through traffic lane, or more safely, be prohibited outright).

However, from a traffic safety consideration, the median bicycle path option is not recommended. The concern being that bicycle traffic crossing Cedar Hill Cross Road is more likely to travel diagonally through the intersection than use the crosswalk system shown. This potential "random" bicycle flow pattern through the intersection would conflict with vehicle traffic and be highly unsafe.

Option 1

Median Bicycle Path



Pro's

- separates bicycle/vehicle traffic on driveway

Con's

- high potential for cyclist/vehicle conflicts at Cedar Hill Cross Road intersection
- potentially significant construction costs
- negative impact to median landscaping
- no provision for pedestrians on east side of driveway

4070-02

Option 2: Pedestrian/Bicycle Pathways (Exhibit 17):

This option involves considerable reconstruction of the existing west side pedestrian pathway to accommodate shared pedestrian/bicycle use (widen to a minimum 4.0 metres), and new construction of an east side pedestrian/bicycle path, also a minimum 4.0 metres. Bicycle traffic in theory would be removed from the driveway except at the more formalized driveway crosswalk locations as shown.

While potentially a solution to the driveway mixed traffic issue, it very well could turn out to be ineffective in that cyclists may find that the driveway, despite the potential for conflict with vehicles, remains the more convenient and direct access route.

Option 3: Exclusive Bicycle Lane on Driveway, Configuration A (Exhibit 18):

This option involves the conversion of the inside (left-side) northbound traffic lane and outside (right-side) southbound traffic lane to exclusive use bicycle lanes.

For northbound (entering) traffic, the inside lane option works well in terms of providing a direct flow path onto the existing bike path crossing the ring road traffic island. The problem, however, with this solution is the configuration required on the Henderson Road northbound approach to the Cedar Hill Cross Road intersection. As shown in Exhibit 18, to access the bicycle lane on this approach would require cyclists to weave across traffic from the right-side of the road to the inside bicycle lane. This weaving condition is precisely the problem that exists presently on University Drive and this option merely shifts the problem to the south.

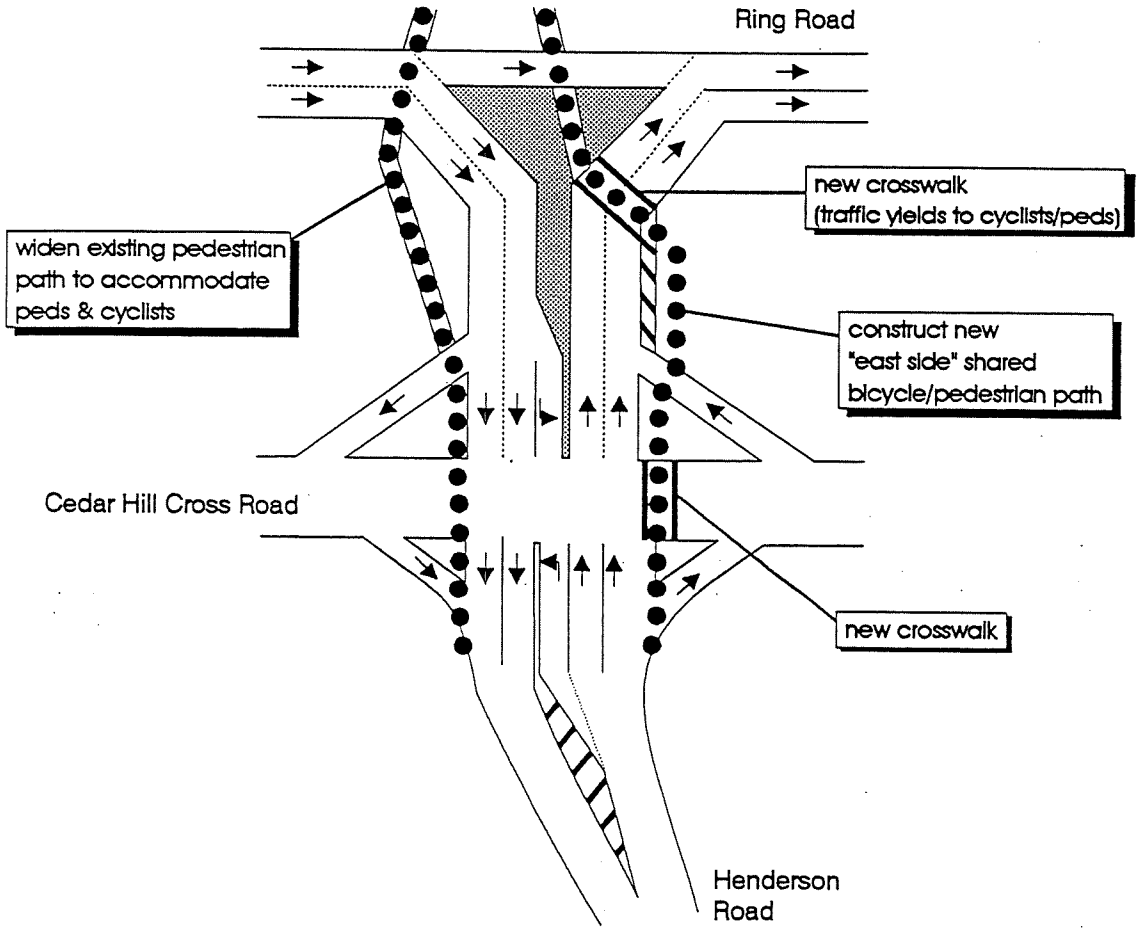
For southbound (departing traffic), the conversion of the outside (right-side) traffic lane to a bicycle lane as shown in Exhibit 18 would function quite well along the length of the driveway and across Cedar Hill Cross Road onto Henderson Road.

Option 4: Exclusive Bicycle Lane on Driveway, Configuration B (Exhibit 19):

As with Option 3, for southbound driveway traffic this design involves the conversion of the outside (right-side) southbound traffic lane to an exclusive use bicycle lane. However, for northbound (entering) traffic, instead of converting the inside traffic lane to a bicycle lane the outside (right-side) lane is converted. The advantage with this over Option 3 is that the potential weaving problem on the Henderson Road northbound approach is eliminated. Option 4 in fact lends itself ideally to possible future bike lane development along Henderson Road (likely to be of a design similar to existing sections of bike lane along Foul Bay Road up to Lansdowne Road).

Option 2

Pedestrian/Bicycle Pathways



Pro's

- resolves bicycle/vehicle conflicts at Cedar Hill Cross Road intersection and on University Drive driveway;
- compatible with future bicycle lane plans for Henderson Road, i.e., bike lanes on right-side of road;
- makes use of existing west side path (though needs to be widened to accommodate peds and bikes);
- provides for bicycle plus pedestrian traffic on east side of driveway;

Con's

- may not solve cyclist/vehicle traffic conflict on driveway, i.e., peds would use the path but cyclists would continue to use the driveway;
- significant new construction costs and impact to landscaping;

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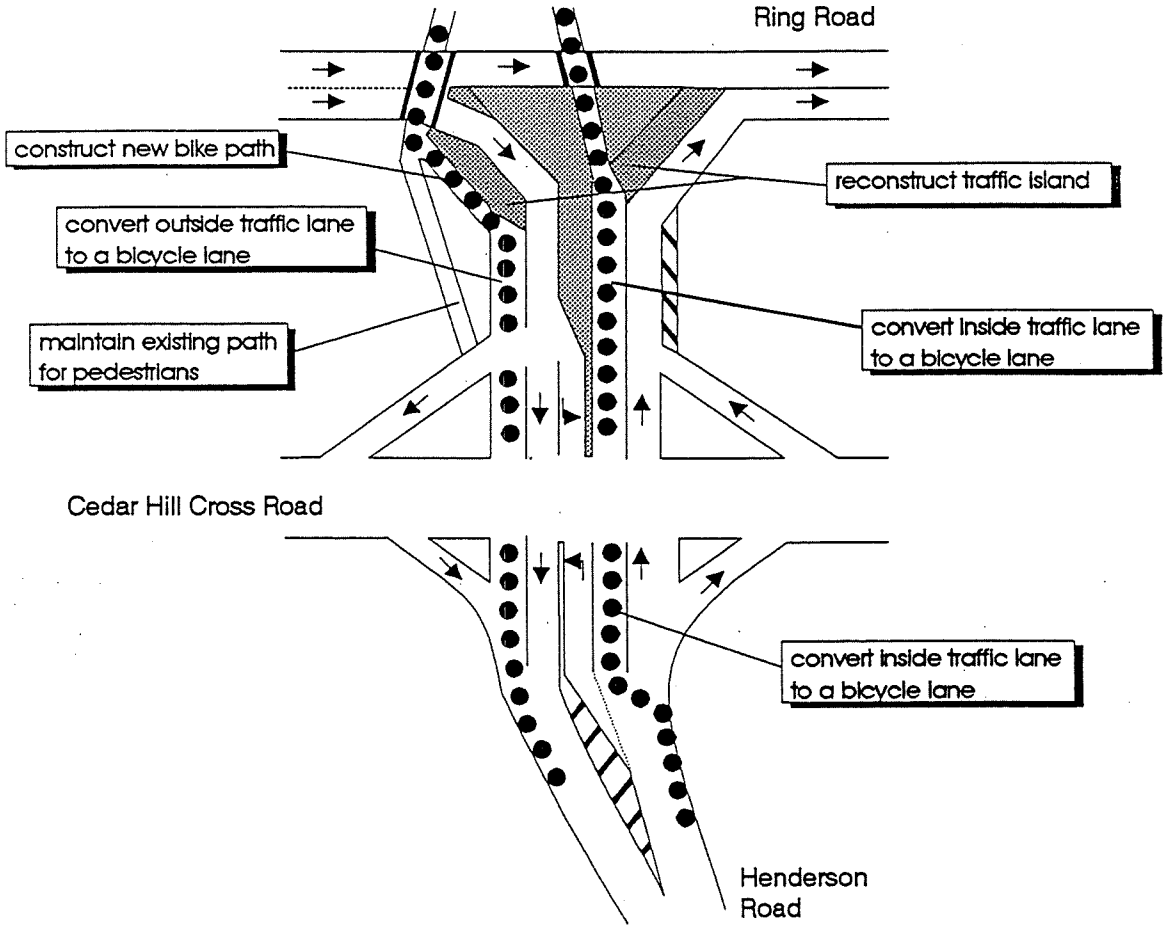
University Drive - Bicycle Access Option 2

University of Victoria - 1996 Traffic Survey

Exhibit 17

Option 3

Exclusive Bicycle Lanes on Driveway (Configuration A)



Pro's

- minimizes the amount of new pathway construction;
- single lane driveway will tend to reduce vehicle speeds turning onto and off the ring road;
- southbound (departing) bicycle lane compatible with possible future bicycle lane on Henderson Road;
- eliminates the need for ring road traffic to yield to northbound (entering) traffic on University Drive;

Con's

- creates a potentially unsafe weave condition for bicycle/vehicle traffic on the Henderson Road northbound approach;
- significant impact to intersection traffic capacity, particularly during the morning surge period from 8:15 to 8:30am;
- no provision for pedestrians on east side of driveway;
- bicycles turning right from Cedar Hill Cross Road onto University Drive must weave across the inbound vehicle traffic lane;

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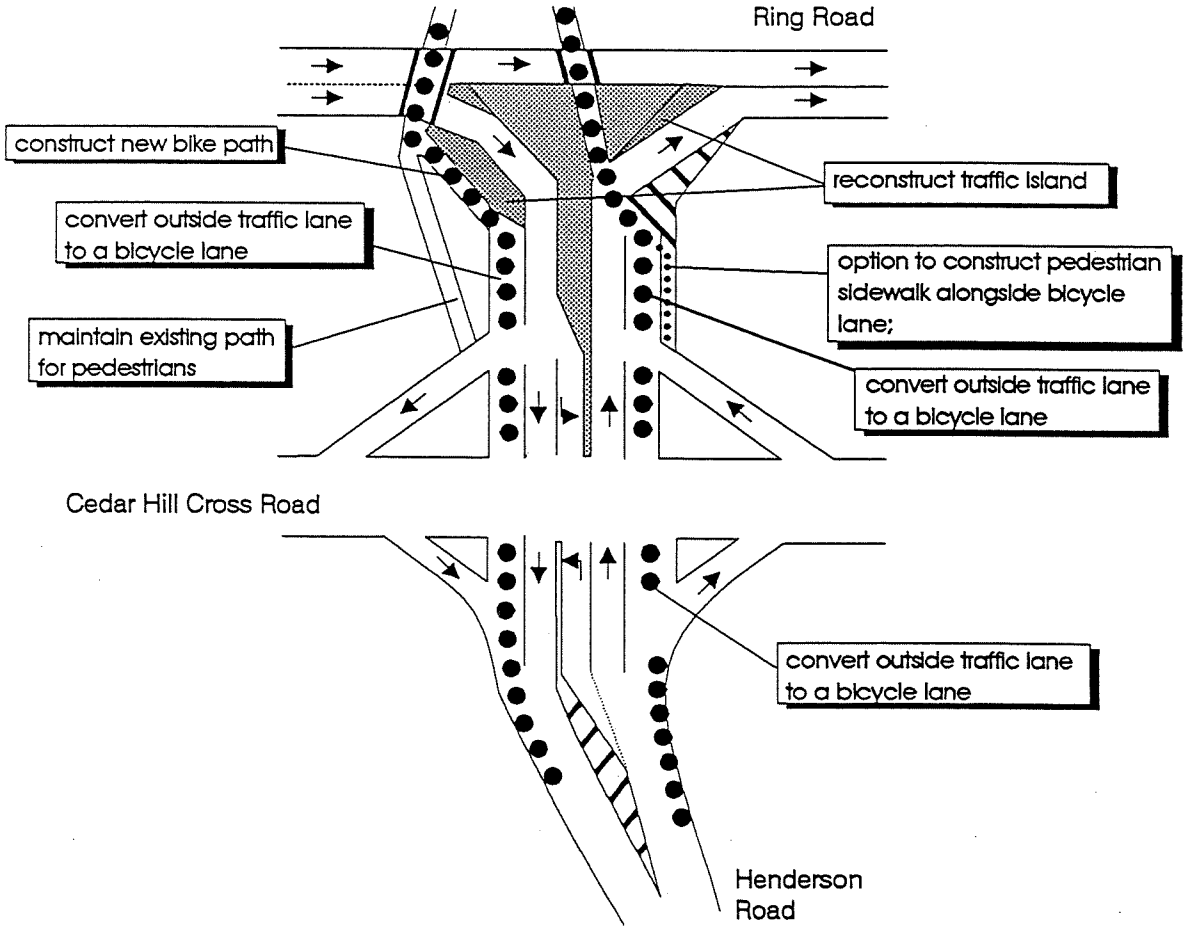
Option 4

Exclusive Bicycle Lanes on Driveway (Configuration B)



Pro's

- minimizes the amount of new pathway construction;
- single lane driveway will tend to reduce vehicle speeds turning onto and off the ring road;
- compatible with possible future bicycle lanes on Henderson Road;
- eliminates the need for ring road traffic to yield to northbound (entering) traffic on University Drive;
- resolves bicycle/vehicle conflict at Cedar Hill Cross Road intersection;
- provides option for constructing a pedestrian sidewalk along the east side of driveway;

Con's

- significant impact to intersection traffic capacity, particularly during the morning surge period from 8:15 to 8:30am;
- northbound (entering) bicycle traffic must cross busy inbound traffic lane on University Drive;

4070-02

Option 4 does however require that northbound (entering) bicycle traffic cross the inside traffic lane to gain access to the ring road traffic island. The intended function of the bicycle lane, however, is to localize this crossing to a single controlled point on the driveway rather than the present circumstance which has weaving occurring along the length of the driveway. In terms of traffic operation on the driveway, the bicycle crossing point will impact the efficiency of northbound traffic flow, particularly during the morning 8:15 to 8:30am "surge" period. During this peak interval, the time between successive vehicle arrivals will be between 3-4 seconds on average. Bicycle arrivals to the crossing point will occur every 10-15 seconds, on average.

An added benefit of Option 4 is that the existing "hatched" pavement along the east side of the northbound driveway, which is approximately 2.5 metres wide, can be improved to become a proper pedestrian walkway connecting Cedar Hill Cross Road to the ring road, as shown in Exhibit 19.

The downside of Option 4, like Option 3, is that it forces only a single lane northbound "through" traffic lane on the Henderson Road approach. As described in the previous section, while there is sufficient intersection capacity to handle this configuration, there is potential for significant queuing to develop along Henderson Road, particularly during the morning surge traffic period.

Option 5: Exclusive Bicycle Lane on Driveway, Configuration C (Exhibit 20):

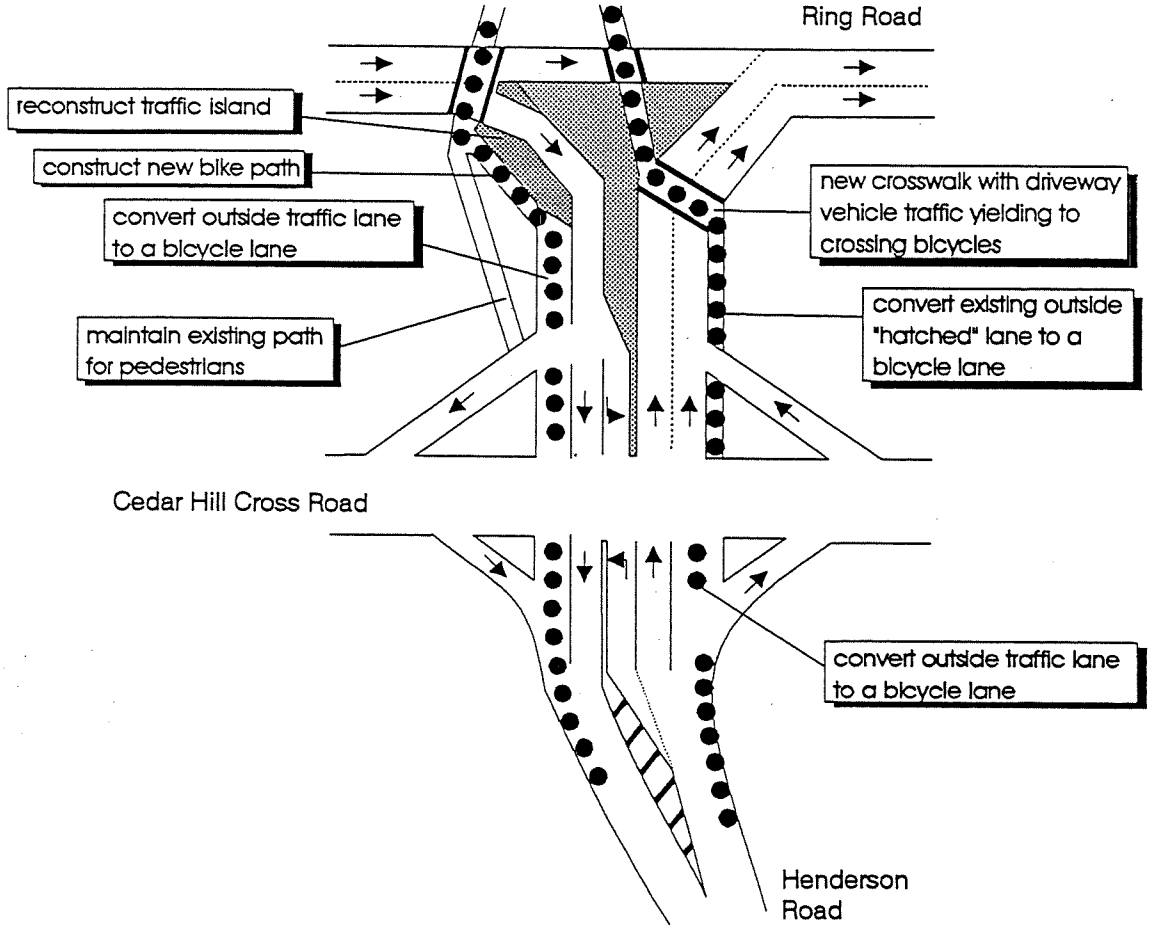
As with Options 3 and 4, for southbound driveway traffic this design involves the conversion of the outside (right-side) southbound traffic lane to an exclusive use bicycle lane.

For northbound traffic on the driveway, Option 5 differs in that it maintains two inbound traffic lanes for the primary purpose of better controlling vehicle queues along Henderson Road. In this case the extra pavement area on the northbound driveway is used to develop a bicycle lane, instead of the pedestrian walkway as described in Option 4. The total width of the northbound driveway, including the hatched pavement area is approximately 8.9 metres. For an on-street bike lane configuration (one-way), the MoTH Interim Cycling Policy guidelines recommend up to a 1.8 metre width, with the adjacent traffic lane a minimum 3.6 metres wide. This leaves 3.5 metres for the inside traffic lane which is quite acceptable. As with Option 4, this configuration still requires bicycle traffic to cross the northbound vehicle traffic but in this case the crossing involves two lanes rather than a single lane. As shown in Exhibit 20, a more formalized crosswalk is recommended at this point of crossing to ensure vehicle traffic yields to bicycle traffic.

If this crosswalk/yield control crossing fails to function satisfactorily, the probable result is that cyclists will do what they do now which is to weave over from the bike lane to the inside traffic lane at random points along the driveway. To control this weaving activity, a roadside barrier could be installed to separate the outside traffic lane from the bicycle lane up to the point of the crosswalk. Here

Option 5

Exclusive Bicycle Lanes on Driveway (Configuration C)



Pro's

- minimizes the amount of new pathway construction, makes use of existing unused portion of paved driveway;
- compatible with possible future bicycle lanes on Henderson Road;
- resolves bicycle/vehicle conflict at Cedar Hill Cross Road intersection;
- maintaining two lane northbound (entering) driveway better accommodates morning period surge traffic;

Con's

- impact to intersection traffic capacity for southbound (departing) traffic, particularly during the afternoon peak period;
- northbound (entering) vehicle traffic on University Drive occasionally delayed in yielding to crossing bicycle traffic;
- may not completely eliminate bicycle traffic using the inside vehicle traffic lane on northbound (entering) University Drive;

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again, however, if access to the bike lane is overly restrictive it will not be used efficiently and cyclists will simply continue to use the driveway traffic lanes.

5.4 RECOMMENDATION

Upon review of the vehicle and cyclist volumes involved and from first-hand observation of the peak period driveway traffic operation, we conclude that there is a significant mixed traffic (vehicles and bicycles) conflict situation on University Drive.

All things considered, Option 4 is, in our opinion, the best option to resolve the existing vehicle/cyclist conflict on University Drive. However, the main traffic concern with Option 4 is the potential for a problematic queuing condition to develop along Henderson Road during the morning "surge" traffic period. If this anticipated queuing condition were to become an over-riding concern then Option 5 would be the recommended course of action.

As such, our recommendation is to proceed with Option 4 on a trial basis to begin with. This would involve the setting up of interim barricades to modify the channelization at the ring road traffic island, a short section of asphalt paving to develop the bike path access to the southbound outside "trial" bicycle lane, and plastic bollards/cones to separate the inside traffic lane from the outside "trial" bicycle lanes. The resulting traffic flows, and particularly the queuing on the Henderson Road approach can then be monitored. If not problematic, then more permanent modifications can be implemented. If, however, the northbound queuing situation on Henderson Road becomes a problem, then the Option 4 "trial" would evolve to implementation of the Option 5 configuration.