

THE REGIONAL MUNICIPALITY OF YORK

ARTERIAL REVIEW

YONGE STREET (YR 1)

DAVIS DRIVE (YR 31) TO GREEN LANE (YR 19)

TOWN OF NEWMARKET



Paul G. Ham
Operations Technologist – Traffic
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Executive Summary

The Yonge Street corridor between Davis Drive (YR 31) and Green Lane (YR 19) in the Town of Newmarket has been subject for concern by area residents. An arterial review for this corridor has been completed to improve the level of service, improve progression and decrease delays.

This section of Yonge Street has an Annual Average Daily Traffic of 40000 vehicles. With over 11000 residents to the east of this section of Yonge Street and continued commercial and residential developments to the west, short - term capital work plans should be investigated to assist with current and future congestion.

Elements investigated in this report are:

1. Traffic Signal Progression
2. Evaluation of fully protected vs. protected/permissive left turn phasing at the intersection of Yonge Street and Davis Drive
3. Average Daily Traffic (ADT) growth on Yonge Street between Davis Drive and Green Lane
4. Review of collisions from 1999 to 2002 on Yonge Street between Davis Drive and Green Lane
5. Neighbourhood Infiltration

York Region and the Town of Newmarket have formed a partnership to address the concerns of gridlock on Yonge Street. It is recommended that the following actions be undertaken:

1. Repaint crosswalk lines at signalized intersections on Yonge Street from Davis Drive to Green Lane.
2. Paint pavement markings (lane directional arrows) for all lanes on all approaches at signalized intersections on Yonge Street from Davis Drive to Green Lane.
3. Install right turn arrow lane markings of northbound right lane from the intersection at Yonge Street at Savage Road North to Yonge Street at Upper Canada Mall.
4. A weekend arterial review to be completed in September 2003 on Yonge Street from Savage Road North to Green Lane.
5. The Town of Newmarket complete a comprehensive origin – destination study east of Yonge Street, west of Main Street, north of Davis Drive and south of Green Lane.
6. Further investigations into removing protected left turn phasing at the intersection of Yonge Street and Davis Drive and instituting protected/permissive phasing. To be undertaken after the Bathurst Street extension from Hwy. 9 to Green Lane is opened to traffic.
7. Investigate alternatives to increasing capacity on Yonge Street from Davis Drive to Green Lane:
 - Installation of raised medians
 - Widening Yonge Street from Davis Drive to Green Lane from 5 to 7 lanes
 - Consolidating Accesses
 - Intersections improvements
8. Construction of a collector road on the west side of Yonge Street.

The completion of Bathurst Street from Highway 9 to Green Lane and Green Lane to Yonge Street is expected in the fall/winter 2003. It is expected that a substantial amount of traffic will transfer from Yonge Street to Bathurst Street upon completion.

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- Attachment A Annual Collisions from 1999 to 2002 at Intersections on
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- Attachment B Neighborhood Infiltration

1.0 Introduction

1.1 BACKGROUND

Over the last several years the Town of Newmarket has seen an increase in development along Yonge Street between Davis Drive and Green Lane. With no collector road system connecting these developments, vehicular traffic is dependent on Yonge Street to move from site to site. Yonge Street is also used for commuter traffic for residents residing in the northeastern part of Yonge Street and Green Lane.

The broad range of land uses along Yonge Street and the increase in commuter traffic has resulted in traffic volumes rising above capacity resulting in poor progression. This has resulted in numerous complaints regarding weekend “gridlock”, increased delays and increased driver frustration. Furthermore, there is a growing perception by local residents that vehicles are infiltrating adjacent residential neighbourhoods to avoid Yonge Street, resulting in an increase of complaints to the Town of Newmarket.

York Regional staff and Town of Newmarket staff formed a partnership to identify problematic situations and solutions to the growing “gridlock” along this corridor, and the infiltration problem.

1.2 PURPOSE

The objective of this report is to investigate, analyze and recommend potential solutions to alleviate congestion along Yonge Street and neighbourhood infiltration.

The benefits of the analysis will:

- Maximize the capacity at the intersections
- Increase the level of service
- Reduce the potential for accidents
- Improve progression
- Identify capital work projects for the study area

1.3 SCOPE

The main focus of the project encompasses the Yonge Street corridor from Davis Drive to Green Lane. However, the traffic signal progression analysis study area included Yonge Street from Savage Road North to Green Lane. This review includes several factors to identify problem areas and develop possible solutions to ease congestion. The factors investigated were:

1. Traffic Signal Progression Analysis.
2. Evaluation of fully protected vs. protected/permissive left turn phasing at the intersection of Yonge Street and Davis Drive.
3. ADT growth on Yonge Street between Davis Drive and Green Lane
4. Review of collisions from 1999 to 2002 on Yonge Street between Davis Drive and Green Lane.
5. Neighbourhood Infiltration.

1.4 YONGE STREET BETWEEN DAVIS DRIVE AND GREEN LANE

This section of Yonge Street is classified as a principal arterial with a design category that spans between Intermediate and Urban. Some of the roadway characteristics are:

- High driveway /access density
- Undivided with two or more lanes
- No on-street parking
- 2 to 6 traffic signals /km
- 60 km/h
- some pedestrian activity
- intensive commercial/retail uses

This portion of Yonge Street is a multilane undivided highway with a centre turning lane. There are many access points along Yonge Street with seven signalized intersections from Davis Drive to Green Lane marked by red lettering.

MAP 1.4.1 STUDY CORRIDOR – YONGE STREET FROM DAVIS DRIVE TO GREEN LANE



2.0 ANALYSIS

2.1 TRAFFIC SIGNAL PROGRESSION ANALYSIS

The review of the progression along Yonge Street from Savage Road North to Green Lane, consisted of the following:

- Turning Movement Counts (TMC) for Saturday and Sunday
- Travel time/delay studies
- Capacity Analysis using Synchro 5.0
- Signal Progression Analysis

Turning movement counts were completed during the weekend period and analyzed using Synchro 5.0. Before and after travel time studies were completed on June 21st and June 28th respectively. Revised signal timing plans were implemented during the week of June 23rd.

The following tables summarize the Yonge Street corridor study for the Saturday AM (11:00 to 1:30 p.m.) and PM (3:30 p.m. to 6:00 p.m.) peak periods. The delay is the total amount of time, in seconds, that the test vehicle was delayed going from node to node. This is based on the average speed compared to the posted speed. The number (No.) of stops shows the total number of times the study vehicle had to stop during the run.

Table 2.1.1 Yonge Street between Savage Road North and Davis Drive

Peak Period	Before		After		Analysis		
	Delay (sec/veh)	No. of Stops	Delay (sec/veh)	No. of Stops	Delay (sec/veh)	(%)	No. of Stops
<i>Am Peak (NB)</i>	205	1	181	1	-24	-12	0
<i>Am Peak (SB)</i>	96	0	75	0	-21	-22	0
<i>Pm Peak (NB)</i>	186	1	186	3	0	0	2
<i>Pm Peak (SB)</i>	91	1	120	1	29	32	0

Table 2.1.2 Yonge Street between Davis Drive and Green Lane

Peak Period	Before		After		Analysis		
	Delay (sec/veh)	No. of Stops	Delay (sec/veh)	No. of Stops	Delay (sec/veh)	(%)	No. of Stops
<i>Am Peak (NB)</i>	181	2	134	0	-47	-26	-2
<i>Am Peak (SB)</i>	251	1	157	0	-94	-37	-1
<i>Pm Peak (NB)</i>	148	1	140	1	-8	-5	0
<i>Pm Peak (SB)</i>	150	0	155	0	5	3	0

There is a slight increase in delay for the PM Peak southbound (SB) direction, which resulted in adjustments to the offsets and/or timings. These adjustments were completed on Wednesday July 3, 2003.

Generally, travel times decreased north of Davis Drive during the Saturday AM & PM peak periods, with a slight increase in the PM Peak southbound direction. With the completion of the adjustments a further decrease in the travel time is expected.

Observations by Regional staff indicated that progression along Yonge Street has significantly improved with the adjusted timings. Because of the noticeable decrease in the volume of traffic due to summer conditions weekend timings will be reviewed in September 2003.

2.2 EVALUATION OF FULLY PROTECTED VS. PROTECTED/PERMISSIVE LEFT TURN PHASING AT YONGE STREET AND DAVIS DRIVE

A review of the operations at Yonge Street and Davis Drive in regards to the left turn protected phases for all directions were undertaken. The fully protected left turn phase has been in operation since the 1950s when Yonge Street at Davis Drive was a rural intersection and experienced high operating speeds. There is no documentation from the Ministry of Transportation or York Region justifying the fully protected left turn phasing.

Fully protected phasing allows vehicles to proceed through the intersection without conflict from opposing traffic and only during that phase. Protected/permissive phasing has an advance left turn signal and traffic is also allowed to turn left on a green ball when there is a gap in oncoming traffic.

Turning count information collected on Tuesday June 24, 2003 was used to compare the existing fully protected vs. protected/permissive left turn phasing. The following table summarizes the intersection delay and volume/capacity (v/c).

TABLE 2.2.1 LEFT TURN PROTECTED VS. PROTECTED/PERMISSIVE

Left Turn Phasing	Intersection Delay (LOS)			v/c		
	AM Peak	Off Peak	PM Peak	AM Peak	Off Peak	PM Peak
Existing	55.1 (E)	90.6 (F)	116.4 (F)	1.33	2.51	2.14
Protected/Permissive	34.2 (C)	63.0 (E)	100.2 (F)	0.92	1.55	1.69
% Difference	38%	30 %	14%	31%	38%	21%

In Synchro 5.0 the average control delay per vehicle is estimated for each lane group and aggregated for each approach and for the intersection as a whole. The level of service (LOS) is directly related to the control delay. The criteria are listed in Table 2.2.2.

TABLE 2.2.2 LOS CRITERIA FOR SIGNALIZED INTERSECTIONS

LOS	Control Delay per Vehicle (s/veh)
A	< 10
B	> 10 – 20
C	> 20 – 35
D	> 35 – 55
E	> 55 – 80
F	> 80

In summary there is an improvement in the intersection operation with the implementation of a protected/permissive left turn phasing. Consideration should be given to removing the fully protected and implementing protected/permissive phasing for the following reasons:

- Protected/ Permissive operation decreases v/c by an average of 30%
- Protected/Permissive operation should reduce driver frustration
- Yonge Street at Davis Drive intersection has similar geometrics with other intersections with protected/permissive operation(s)
- Yonge Street at Davis Drive is no longer a rural intersection with high operating speeds

Due to the longevity of the fully protected phases, it is imperative that additional studies be completed:

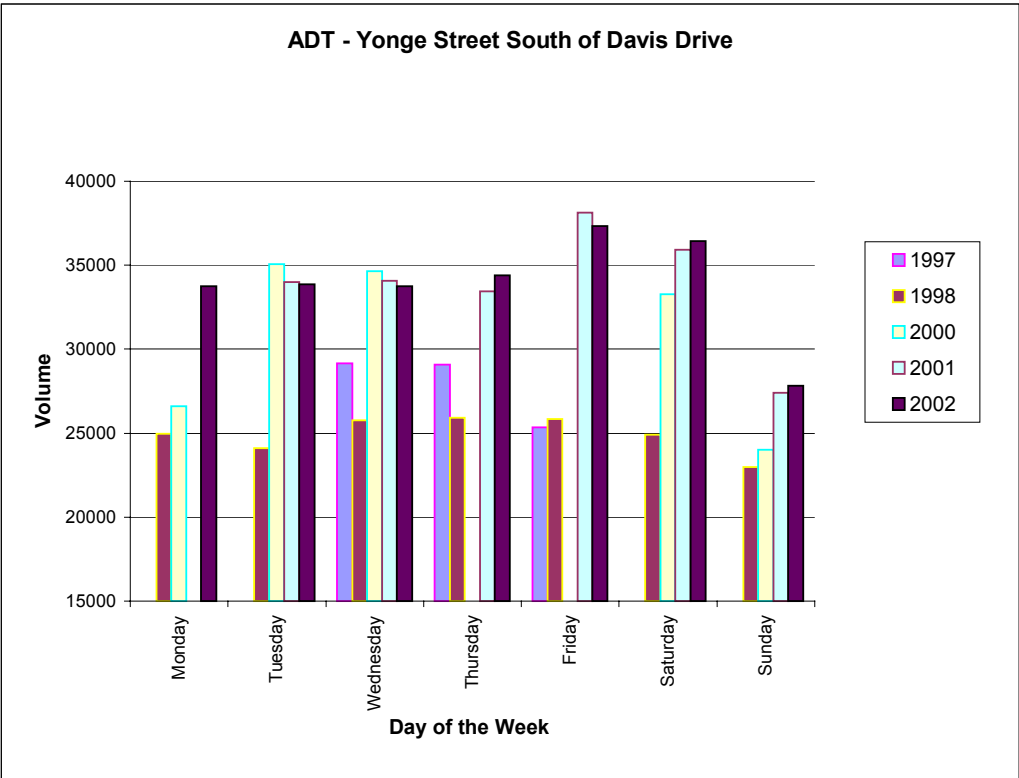
- Ensuring the stopping sight distances for each left turn lane approach is in conformity with the Transportation Association Of Canada Manual (TAC) guidelines
- A review of the potential increase in collisions that may occur as a result of the change in phasing
- Implications from expectations of motorist

Dual left turns for the EB and WB directions to be considered as the volumes exceed 300 veh/hour as well as future consideration for dual left for NB and SB directions. If implemented this would require fully protected phasing.

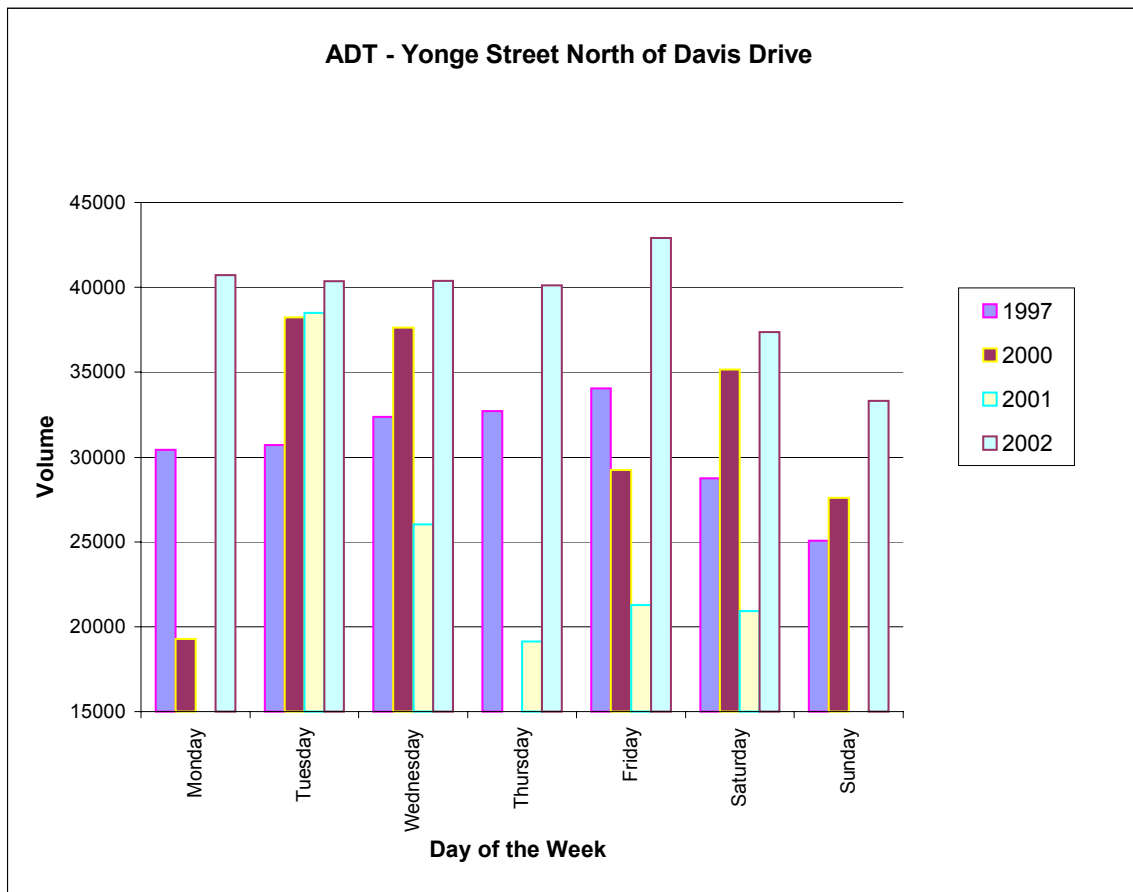
2.3 AVERAGE DAILY TRAFFIC (ADT) GROWTH ON YONGE STREET BETWEEN DAVIS DRIVE AND GREEN LANE

Yonge Street between Davis Drive and Green Lane has transformed from a rural road in the early 1990's, to the urban arterial it is today. The ADT has grown from approximately 27 000 vehicles in 1996 to over 40 000 vehicles in 2002 an increase of 52%. The following bar graphs illustrate the growth along Yonge Street from the available ATR counts. The highest volumes occur on a Friday and Saturday

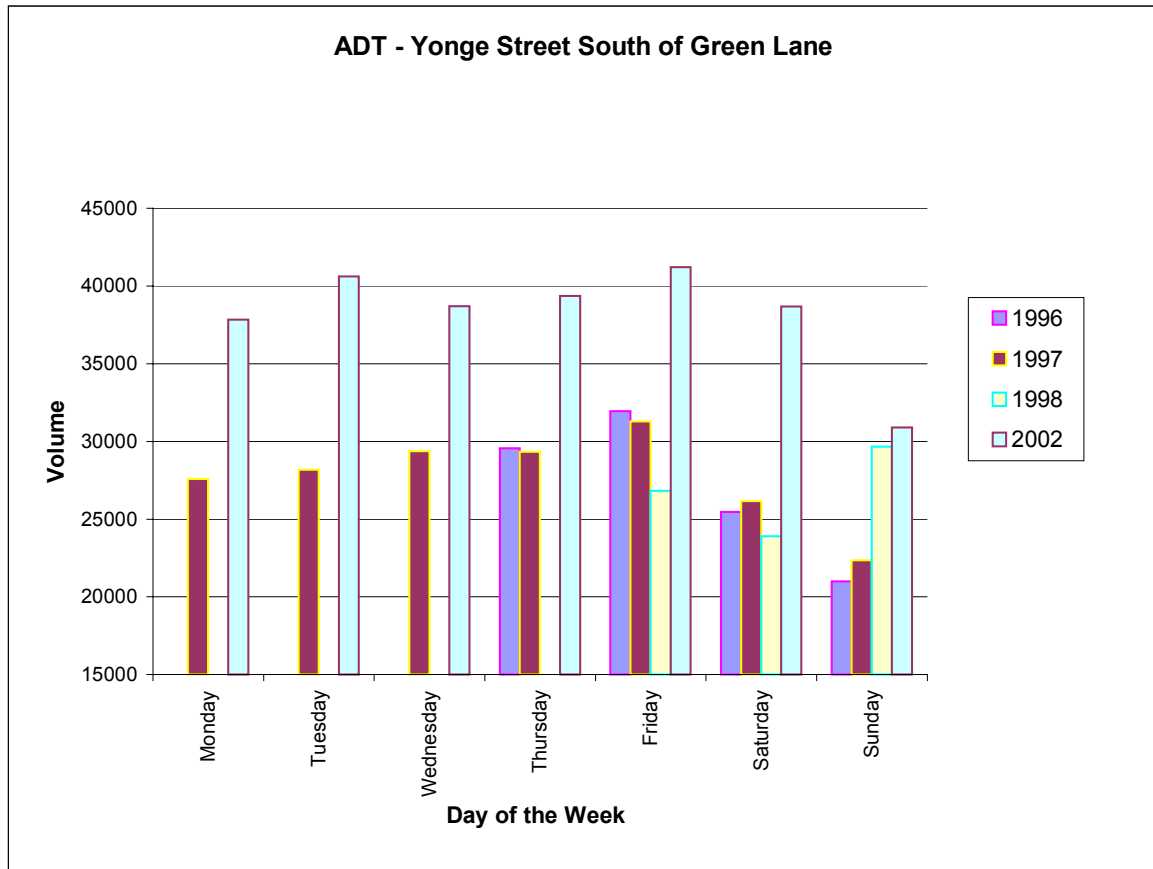
GRAPH 2.3.1: ADT – YONGE STREET SOUTH OF DAVIS DRIVE



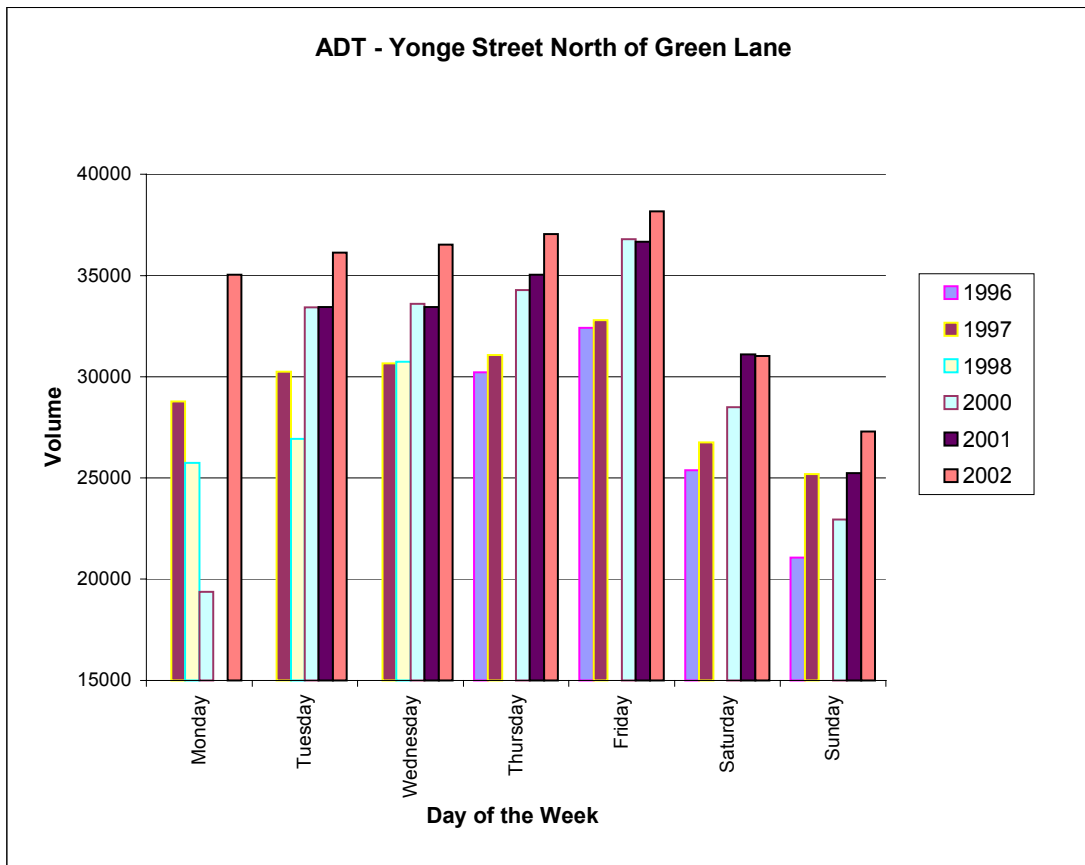
GRAPH 2.3.2: ADT – YONGE STREET NORTH OF DAVIS DRIVE



GRAPH 2.3.3: ADT – YONGE STREET SOUTH OF GREEN LANE



GRAPH 2.3.4: ADT – YONGE STREET NORTH OF GREEN LANE



It is estimated that for a LOS C, this section of Yonge Street has the capacity to service 1250 veh/h for two lanes. Currently, Yonge Street is servicing approximately 1700 veh/h for two lanes during the peak periods. This results in congestion, high delays and extensive queuing.

The development of residential and commercial property with numerous access points onto Yonge Street between Davis Drive and Green Lane have resulted in an increase in vehicle volumes and a decrease in progression. **For every 6-access points per kilometre there is an estimated decrease in the travel speed of 4 km/h.**

Several options to minimize delays and increase progression along Yonge Street between Davis Drive and Green Lane include:

- Installation of a raised centre median there by restricting access points to right in, right-out only.
- Construction of a collector road to join the commercial development to the west of Yonge Street.
- Widening Yonge Street from Davis Drive to Green Lane from 5 lanes to 7 lanes.

The completion of Bathurst Street from Highway 9 to Green Lane and Green Lane to Yonge Street is expected to occur in the fall/winter of 2003. This will aid in a reassignment of some traffic from Yonge Street. At which time an assessment of the reassignment and an arterial review of Yonge Street will be undertaken.

2.4 COLLISIONS FROM 1999 TO 2002 ON YONGE STREET BETWEEN DAVIS DRIVE AND GREEN LANE

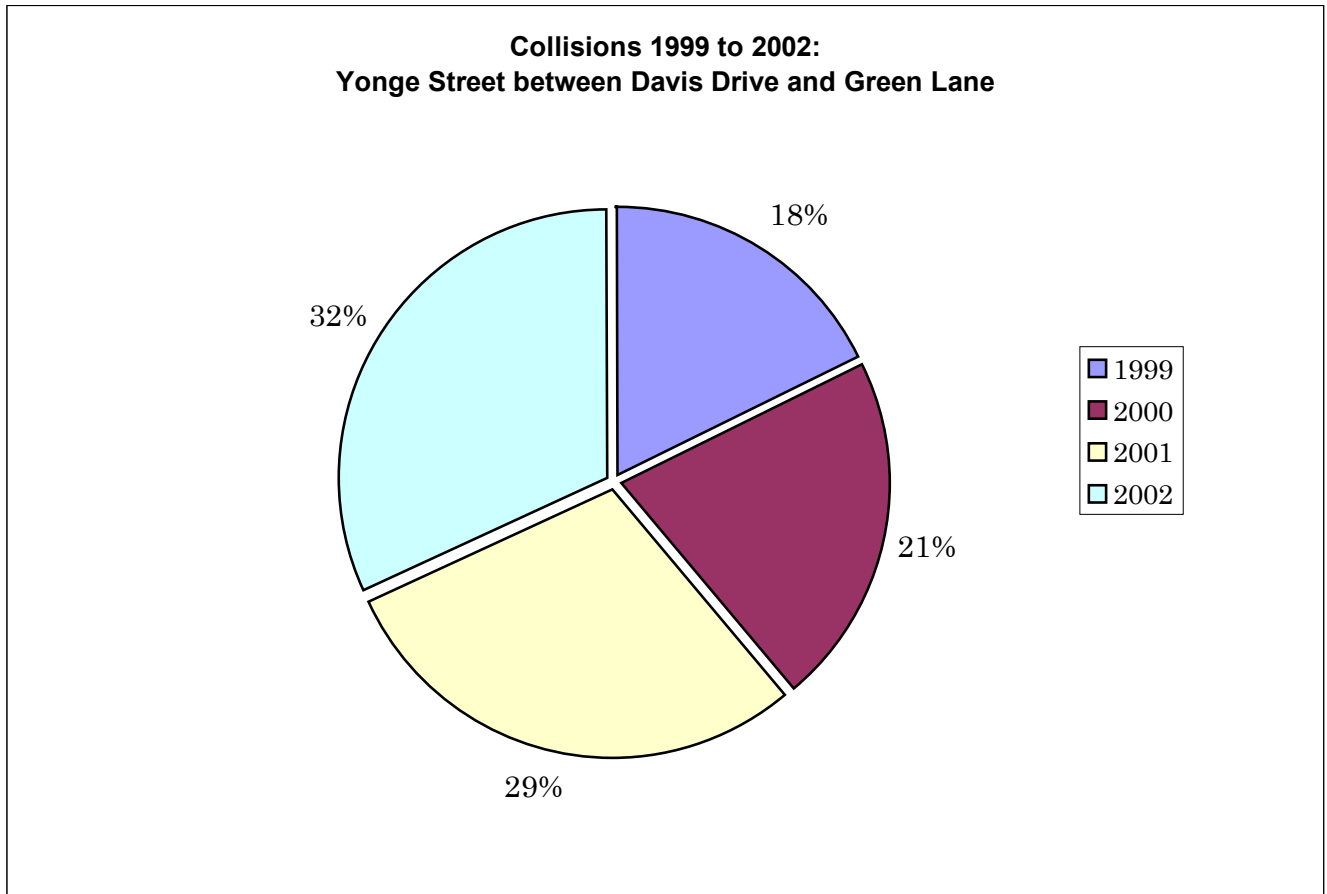
Collisions in the York Regions Traffic Database Management System (TDMS) were compiled for analysis on Yonge Street between Davis Drive and Green Lane. The collisions were separated into the years from 1999 to 2002 and further separated into the following collision types:

- Rear end
- Turning Movement
- Approaching
- Angle
- Sideswiped
- Other

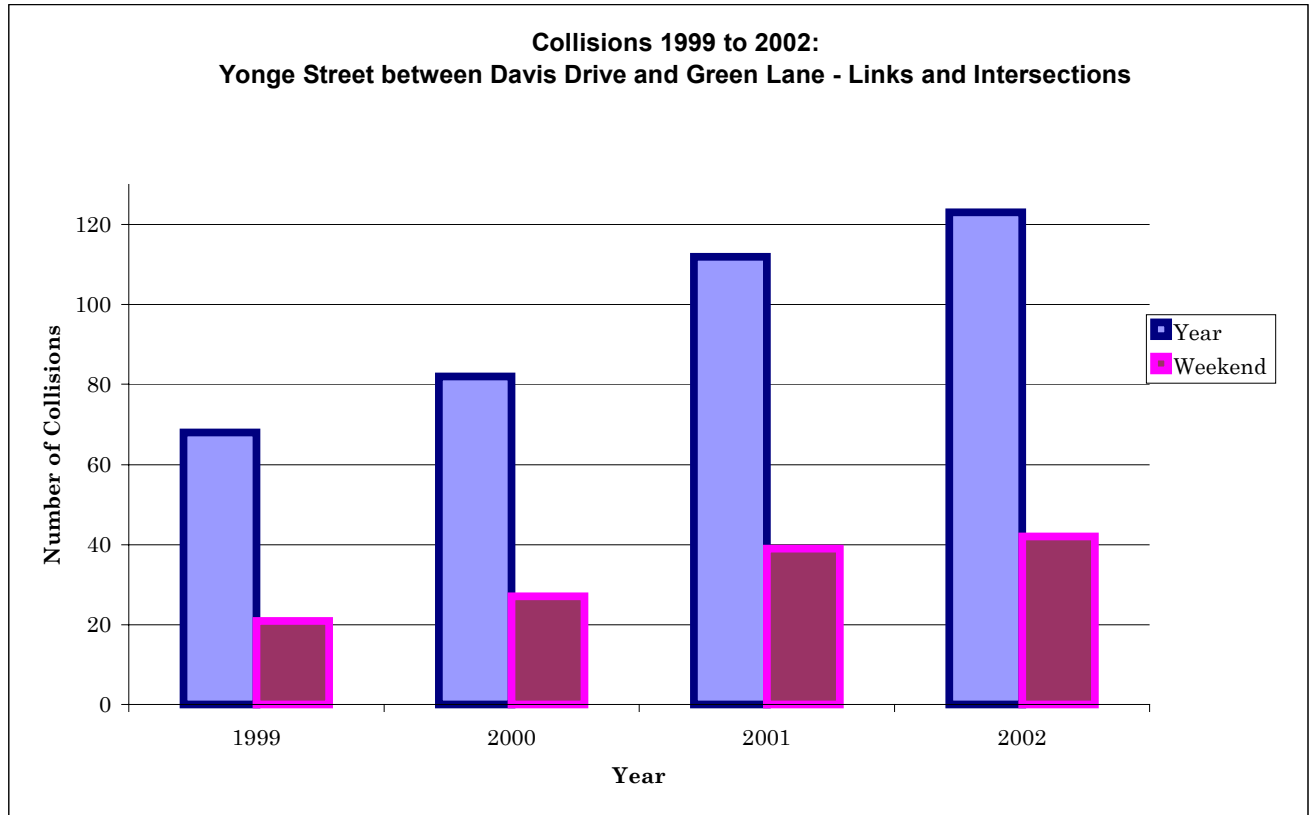
The number of collisions that occurred during the weekend period, Saturday and Sunday was also determined.

The first graph illustrates the growth of collisions from 1999 to 2002.

GRAPH 2.4.1 COLLISIONS 1999 TO 2002

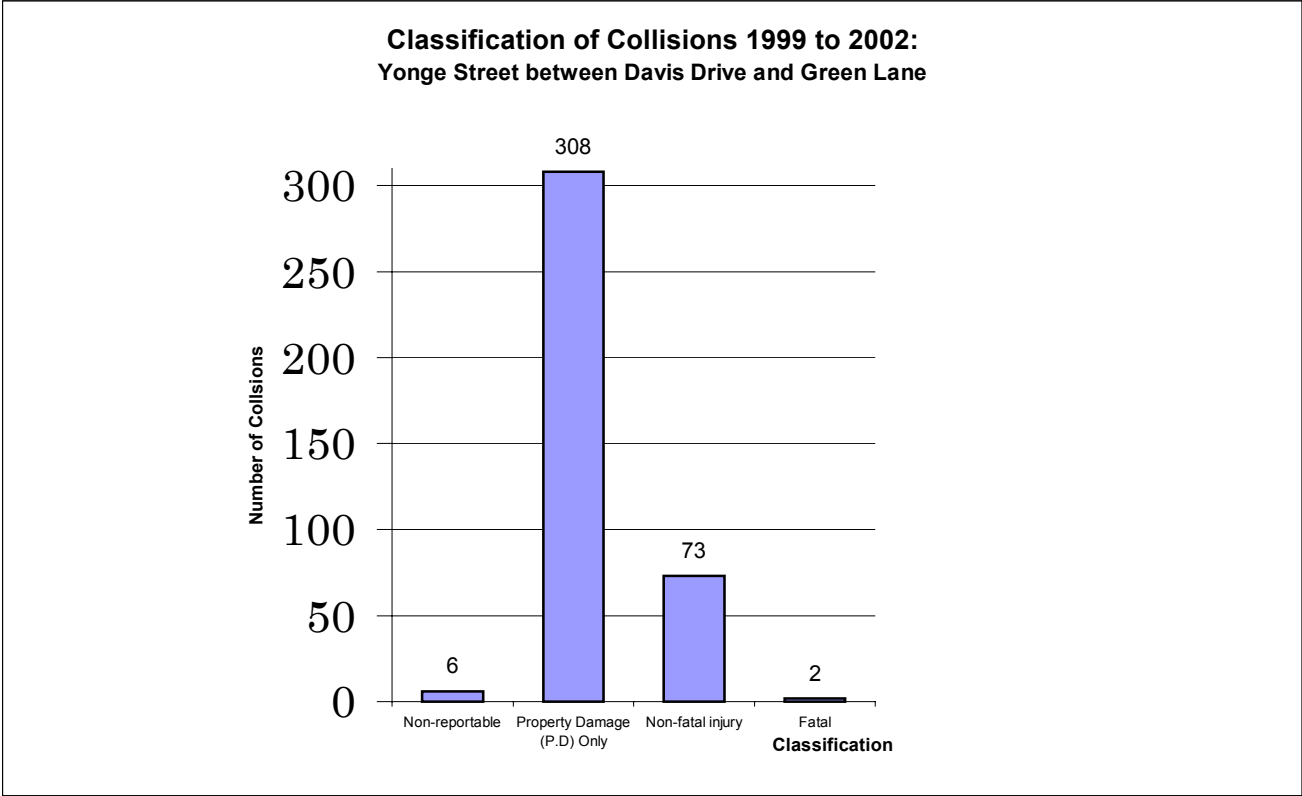


GRAPH 2.4.2 ANNUAL AND WEEKEND COLLISIONS -1999 TO 2002

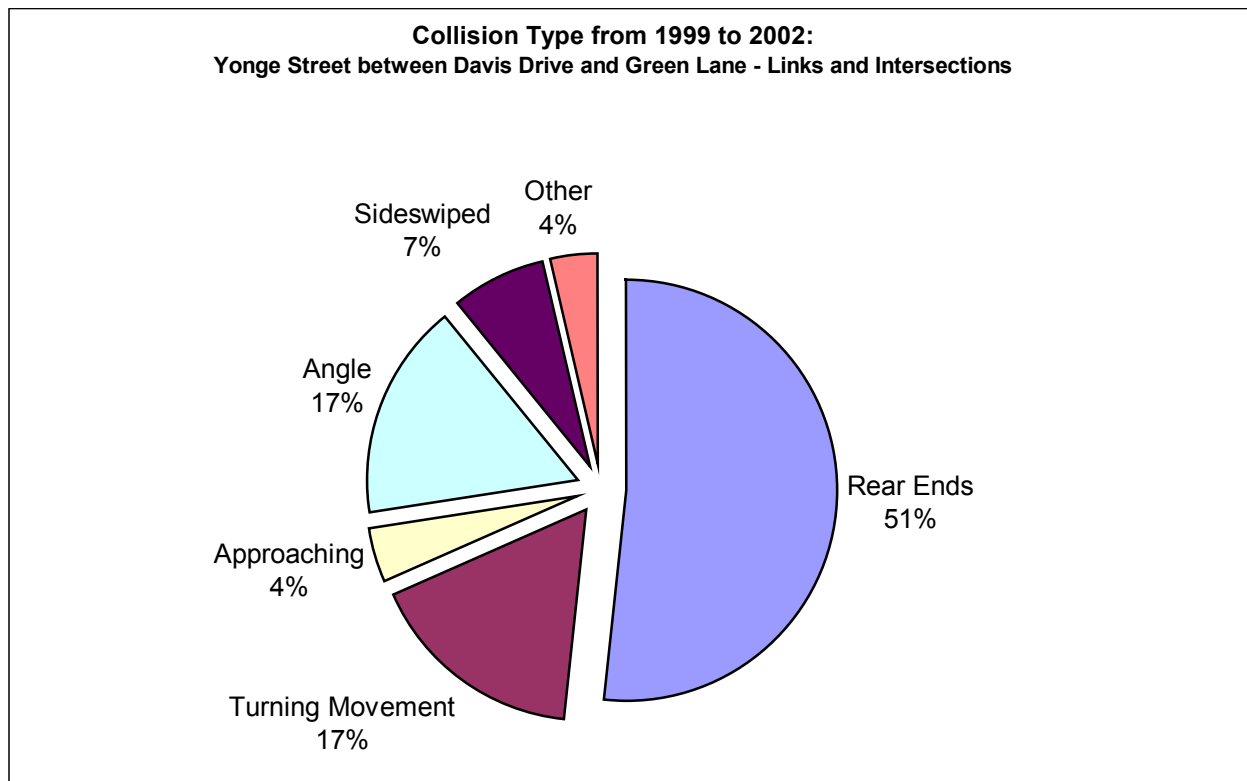


Graph 2.4.2 compares the total annual collisions to collisions that occurred during the weekend (Saturday/Sunday). As is expected, there is a direct correlation between the annual collision increase and the increase of weekend collisions.

GRAPH 2.4.3 CLASSIFICATION OF COLLISIONS 1999 TO 2002



GRAPH 2.4.4 COLLISION TYPE FROM 1999 TO 2002



Graph 2.4.4 represents the type of collisions from 1999 to 2002. As is illustrated rear end collisions account for 51% of all reportable collisions. Some probable causes for the large percentage in rear end collisions may be:

- large number of turning vehicles
- Excessive speed on approach
- Lack of adequate gaps
- Crossing Pedestrians
- Slippery surface
- Poor visibility of signals

This is followed by 17% Angle and 17% Turning Movement collisions. Which may be caused by:

- Large volume of left turns
- Restricted sight distance
- Excessive speed on approach
- Large total intersection volume

Annual collisions from 1999 to 2000 that occurred at the intersections on Yonge Street between Davis Drive and Green Lane are illustrated in attachment A.

In January 2001, the Council of the Regional Municipality of York approved the results of a Road Safety Appraisal for the entire Regional road network. This appraisal involves using provincial average collision numbers as a benchmark, and comparing them against collisions on similar Regional road sections. The road safety appraisal identified Yonge Street between Davis Drive and Green Lane as a road operating with fewer collisions than other similar road sections throughout the Region.

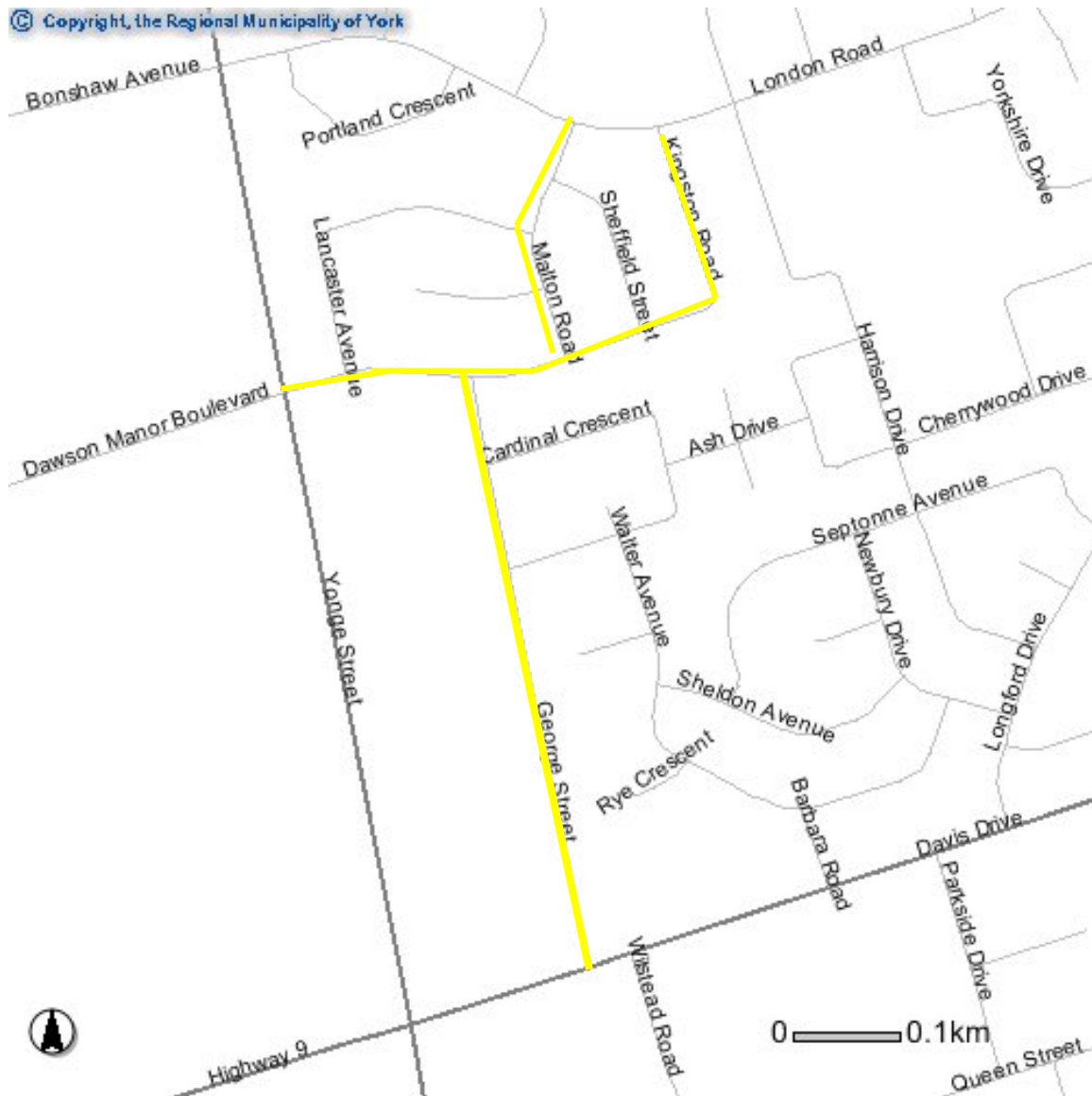
The Region has obtained a consultant to generate a new Road Safety Appraisal that will provide a better representation of the Regional road network. It is expected that the updated Road Safety Appraisal will be completed late fall of this year. The Region will re-evaluate Yonge Street between Davis Drive and Green Lane using the updated Safety Appraisal and provide the results to the Town of Newmarket at that time.

2.5 NEIGHBOURHOOD INFILTRATION

The Town of Newmarket has received concerns from area residents about the increase in the volume of vehicles on the local and collector road systems east of Yonge Street from Davis Drive to Bristol Road and to the east on Main Street. The perception is that motorists are avoiding Yonge Street due to “gridlock” and using the adjacent local and collector road system.

The following map outlines the area of concern, and the perceived route of the infiltration outlined in yellow.

MAP 2.5.1 NEIGHBOURHOOD INFILTRATION – NEWMARKET



Under the Town of Newmarket's Official Plan, Bristol Road/Aspenwood Drive, London Road/Bonshaw Avenue and Main Street are designated collector roads that provide both land access and traffic circulation within residential, commercial and industrial areas. Kingston Road and Malton Road are designated local roads, yet the ADT for these roads are representative of collector roads.

Over the last few years the Town of Newmarket has implemented traffic calming measures along Kingston Road and Malton Road to decrease the speed of vehicles and discourage “through vehicles”. This has been successful, although residents on Malton Road have identified that there continues to be a high volume of “through” traffic.

The area in question borders to the east of Yonge Street, west of Main Street, north of Davis Drive and south of Green Lane. There are approximately 4500 residential homes and a population of 11135 in this area. Included with the residential homes are various land uses such as schools, commercial and light industrial areas. The traffic generated from these various land uses, in this neighbourhood, would be in line with the ADT provided for the road systems. (Attachment B)

Town of Newmarket staff have requested that Regional staff review the timing plans and possibly implement new timings that may discourage motorists from using the local roads and remain on the collector and/or arterial road system. The suggestions made for staff to consider are:

- Decrease the minor street timing at Yonge Street and Kingston Road/ Dawson Manor Boulevard to encourage the use of London Street.
- Decrease timing to the minor street at Davis Drive and George Street.
- Constrain southbound through and westbound left movements at Green Lane and Main Street by decreasing timings and/or removing advance phases.
- Review the possibility of a split east / west phase at Davis Drive and Main Street.

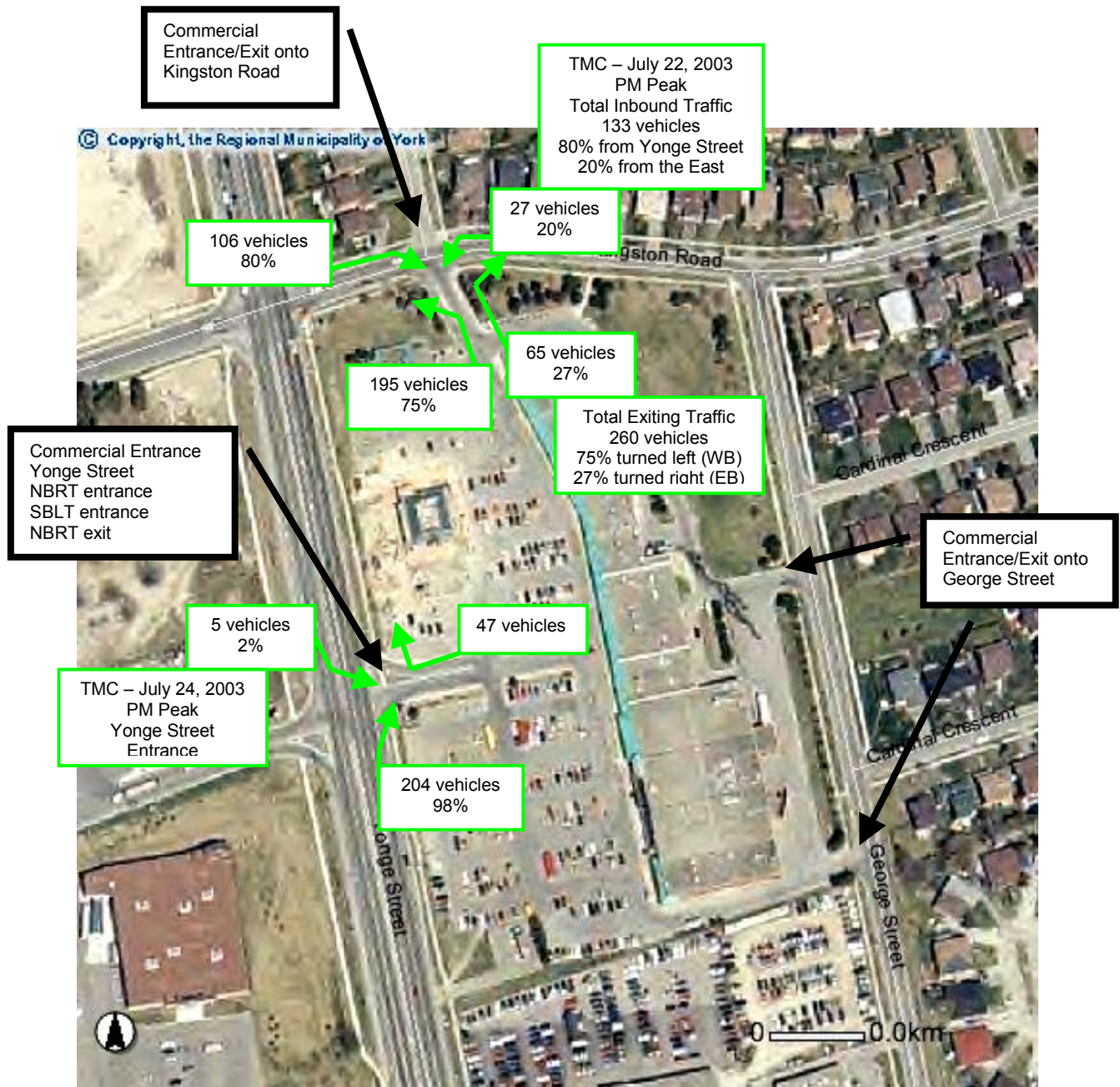
Minimum side street timings are based on pedestrian walk and don't walk timings. This is determined from the curb to curb distance divided by the standard walking speed of 1.2 m/s or 1.0 m/s (for the elderly). The intersections at:

- Yonge Street @ Aspenwood Drive / Bristol Road
- Yonge Street @ Bonshaw Avenue / London Road
- Davis Drive @ George Street

Currently operate at minimum side street timings. With the exception of the intersection of Davis Drive @ George Street, there is a northbound left (NBLT) advance and no southbound left (SBLT) advance.

The main area of concern is Yonge Street at Kingston Road/Dawson Manor Boulevard intersection. The following picture illustrates the commercial development on the south/east corner of this intersection. There is a SBRT and a NBRT into the commercial plaza from Yonge Street and only a NBRT exit onto Yonge Street. There are entrances/exits from the commercial plaza directly onto Kingston Road to the north, and to the east there are two entrance/exits onto George Street.

MAP 2.5.2 COMMERCIAL DEVELOPMENT AT THE CORNER OF YONGE STREET AND KINGSTON ROAD / DAWSON MANOR BLVD.



This commercial development is a strip mall that includes a Grocery Store, Beer Store and a Tim Horton's all of which are major traffic generators. Yonge Street at Kingston Road/Dawson Manor Blvd. has a NBLT and a SBLT advance, the timings are approximately a 50/50 split between the major and minor street due to the east/west traffic volumes.

The Town of Newmarket completed a turning movement count, for the north entrance/exit at this commercial development onto Kingston Road, on July 22, 2003 during the PM Peak. The inbound traffic totalled 133 vehicles of which 80% came from the west and 20% from the east. The exiting traffic totalled 260 vehicles of which 73% turned left to go to Yonge Street and the remaining 27% turned right.

A turning movement count was also completed on July 24, 2003 in the PM Peak for the Yonge Street entrance into the Mall. The results are as follows: NBRT in – 204, SBLT in – 5 and WBRT out – 47.

With the existing volumes at Yonge Street and Kingston Road/Dawson Manor Boulevard and requests from residents for advance phases, any adjustments to the timings to eliminate advance phases and/or decrease timings may result in increase driver aggravation, unsafe driving manoeuvres, and increased collisions.

To verify neighbourhood infiltration it is recommended that the Town of Newmarket conduct an origin-destination study in the area east of Yonge Street, north of Davis Drive west of Main Street and south of Green Lane.

It was suggested that split phasing be used at the intersection of Davis Drive and Main Street for the east/west direction. Split phasing allows left and through traffic to share a

protected phase. This type of phasing is commonly used if a lane is shared between left and through traffic.

There is no exclusive left or right turning lanes in the east/west direction and the rationale is that the left turning vehicles block through traffic increasing delay. Split phasing was modelled in Synchro 5.0 and the following table outlines the result.

TABLE 2.5.1 COMPARISON OF EXISTING TO SPLIT PHASING AT DAVIS DRIVE AND MAIN STREET

Peak Period	Existing			Proposed Split Phasing		
	Max v/c	Intersection LOS	Intersection Delay	Max v/c	Intersection LOS	Intersection Delay
AM Peak	1.52	B	19	1.28	D	53.2
OFF Peak	0.67	B	14	0.82	D	37.3
PM Peak	1.03	C	33.5	1.27	F	113

The table clearly illustrates that east/west split phasing is detrimental for this intersection. Delays to the intersection increase, which will create large queues from upstream traffic. The current east/west left turning volumes do not warrant an exclusive right or left turning lane.

3.0 CONCLUSIONS AND RECOMMENDATIONS

With the completion of the Bathurst Street extension from Davis Drive to Green Lane it is anticipated that there will be a reassignment of some traffic from Yonge Street. As well as the construction of the GO Station on Green Lane in proximity to Main Street is expected to decrease the ADT on Main Street. This is to be determined at that time.

Following are immediate recommendations:

1. Improve visibility of lanes at intersections.

Recommendation:

- A. Repaint crosswalk lines at signalized intersections on Yonge Street from Davis Drive to Green Lane.
- B. Paint pavement markings (lane directional arrows) for all lanes on all approaches at signalized intersections on Yonge Street from Davis Drive to Green Lane.
- C. NBLT turning lane paint delineation line at intersection of Yonge Street and Green Lane.

Action: Immediate

2. Proper marking of lane

Recommendation: Northbound right lane, from the intersection of Yonge Street at Savage Road North to Yonge Street at Upper Canada Mall, requires proper right lane pavement marking and a sign posted indicating "Right Lane Exit"

Action: Immediate

3. Investigate southbound right lane at Yonge Street at Upper Canada Mall

Recommendation: To convert southbound right turning lane to a shared through right turning lane from Yonge Street at Upper Canada Mall to Yonge Street at Davis Drive

Action: Pending

4. Improve progression along Yonge Street from Savage Road North to Green Lane.

Recommendation: Complete a signal timing and Progression Analysis on Yonge Street during Saturday and Sunday in September 2003.

Action: September 2003

Future recommendations to consider after Yonge Street from Davis Drive to Green Lane has been reviewed to determine the impact that the Bathurst Street extension from Hwy. 9 to Green Lane and Green Lane to Yonge Street has had are:

5. Review the implementation of protected/permissive phases at Yonge Street and Davis Drive

Recommendation: Analyze the possible impacts of changing the left turn phasing from protected to protected / permissive with regards to: stopping sight distances, potential increase in collisions and the human expectation factor.

Action: Pending

6. Minimize delays and progression along Yonge Street.

Recommendations:

- a. Installation of a raised centre median, restricting access points to right in and right-out only.
- b. Construction of a collector road on the west side of Yonge Street.
- c. Widening Yonge Street from Davis Drive to Green Lane from 5 to 7 lanes
- d. Consolidating Accesses

Action: Pending

7. Decrease collisions on Yonge Street from Davis Drive to Green Lane

Recommendations: Traffic Safety to identify if there are intersections for Potential for Operational Improvements in study corridor.

Action: Pending

8. Verify neighbourhood Infiltration

Recommendation: The Town of Newmarket to conduct an origin – destination study east of Yonge Street, north of Davis Drive, east of Main Street and south of Green Lane

Action: Pending

9. Increase capacity at Yonge Street and Davis Drive

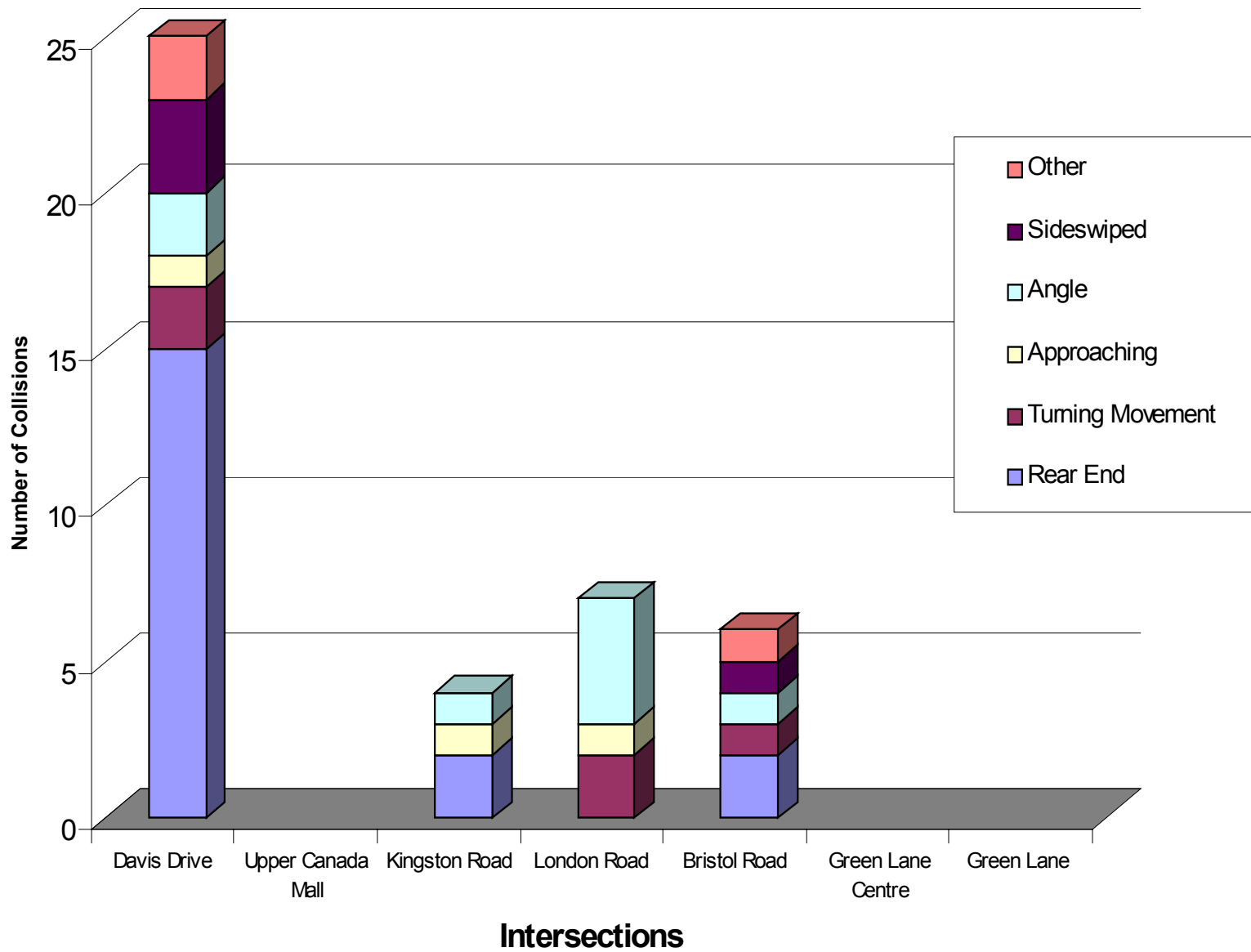
Recommendation: Reconstruction of dual left turns for the EB and WB direction at Yonge Street and Davis Drive

Action: Pending

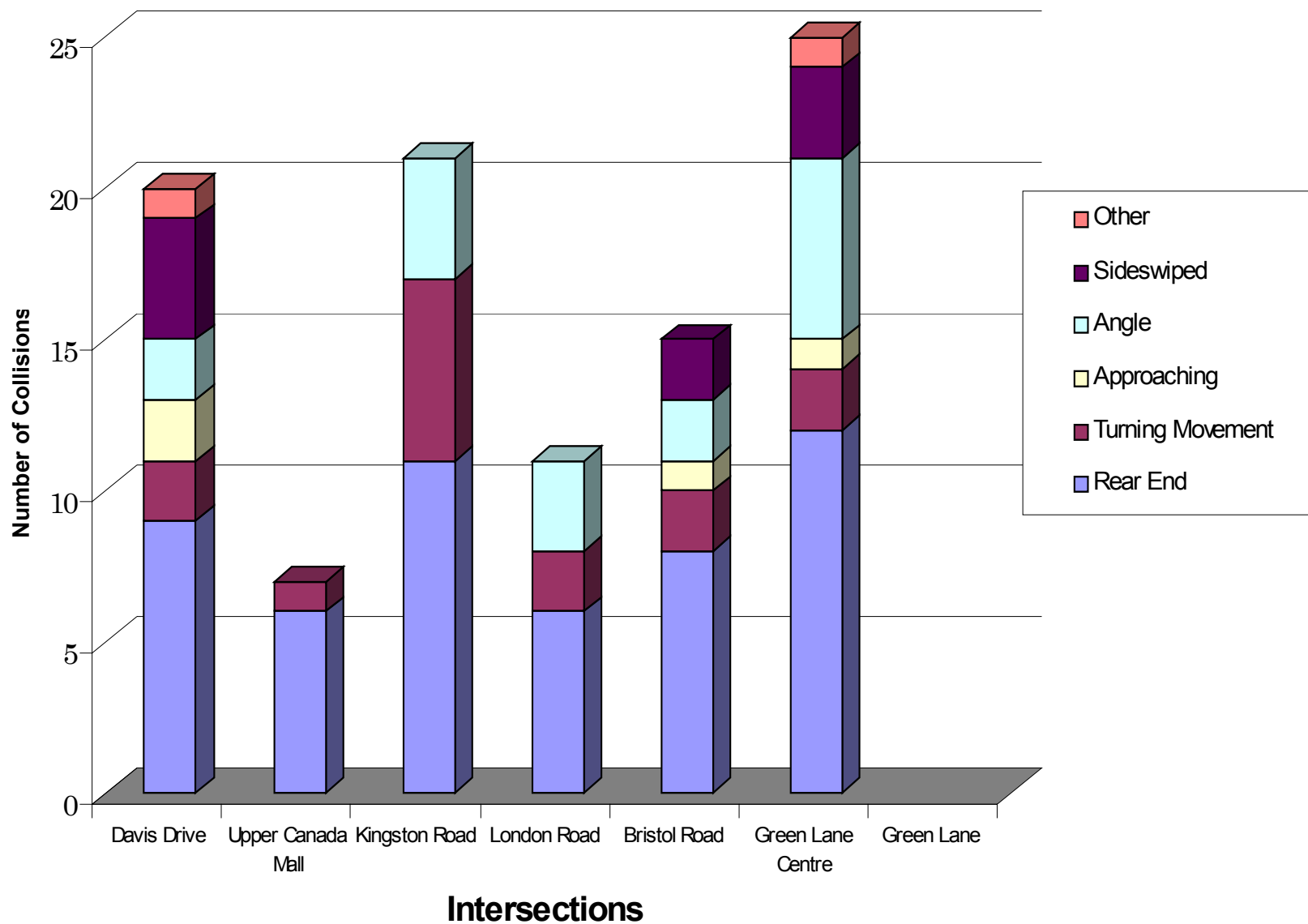
ATTACHMENT A

**ANNUAL COLLISIONS FROM 1999 TO 2002 AT
INTERSECTIONS ON YONGE STREET BETWEEN DAVIS
DRIVE AND GREEN LANE**

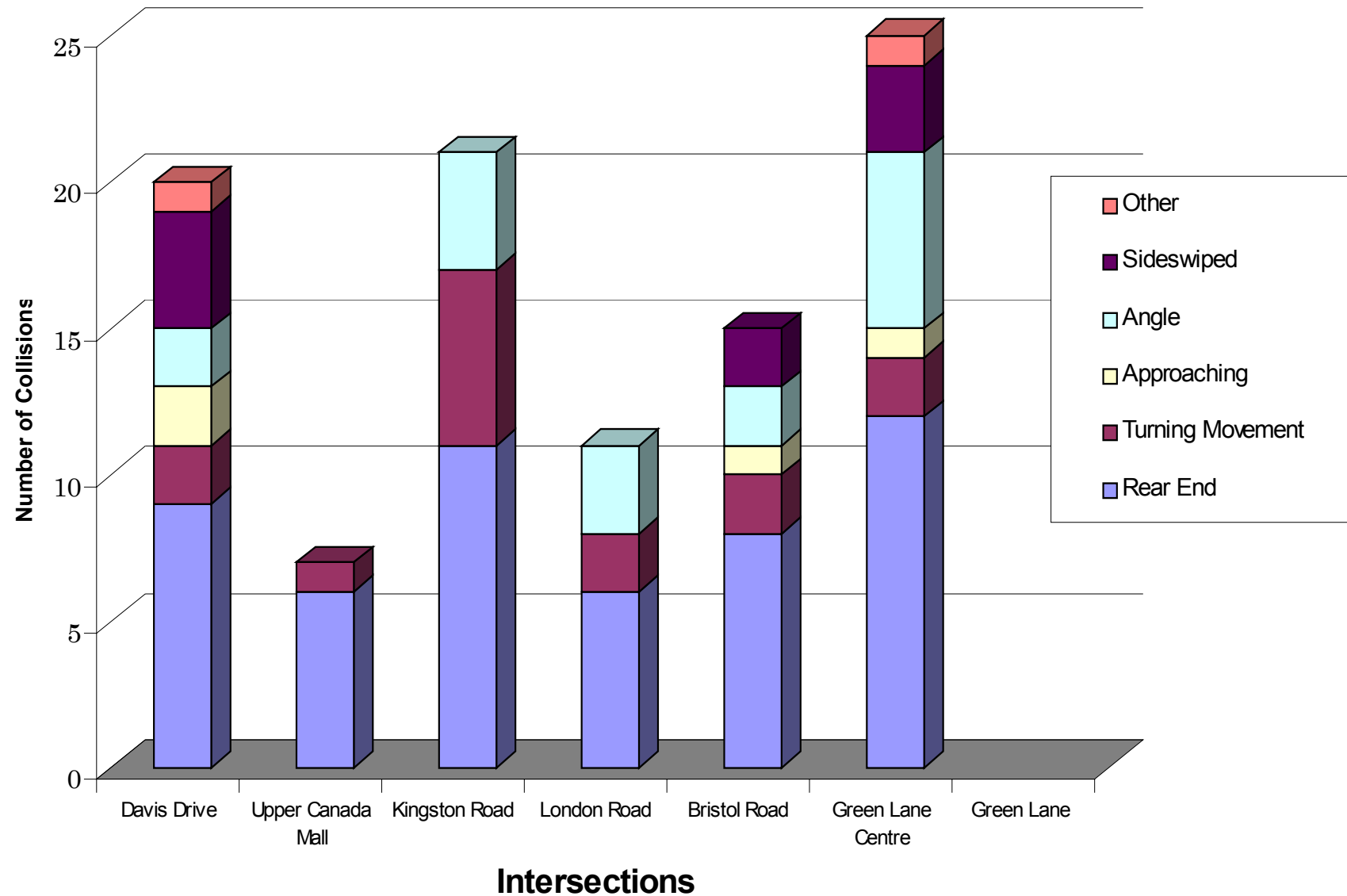
1999 Collisions: Yonge Street between Davis Drive and Green Lane - Intersections



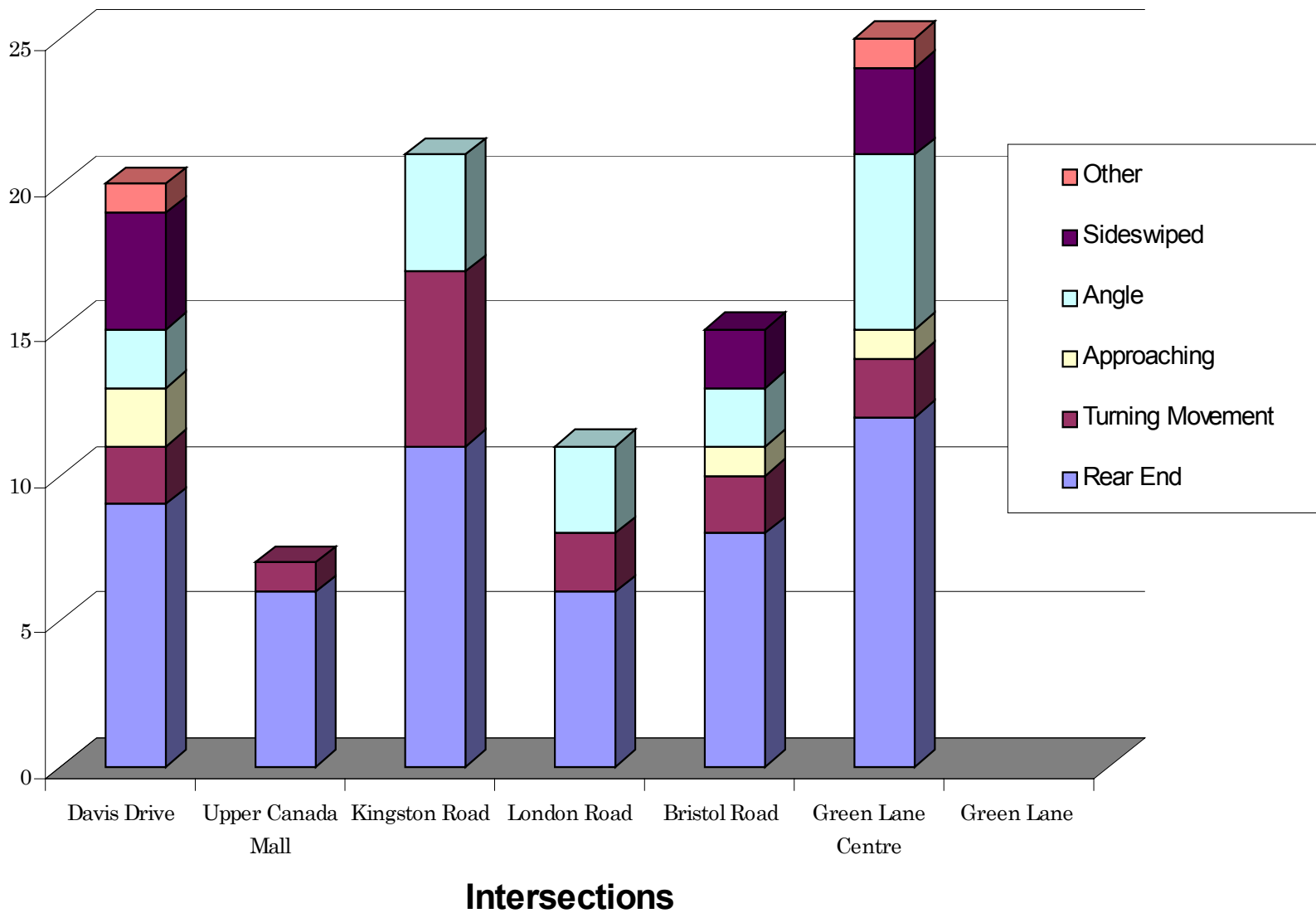
2000 Collisions: Yonge Street between Davis Drive and Green Lane - Intersections



2001 Collisions: Yonge Street between Davis Drive and Green Lane - Intersections



2002 Collisions: Yonge Street between Davis Drive and Green Lane - Intersections



ATTACHMENT B

NEIGHBOURHOOD INFILTRATION

Main Street

