1-1-2006

Improving safety and traffic operations in urban zones with a high propensity for rear-end collisions at signalized intersections

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IMPROVING SAFETY AND TRAFFIC OPERATIONS IN URBAN ZONES WITH A HIGH PROPENSITY FOR REAR-END COLLISIONS AT SIGNALIZED INTERSECTIONS

By

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A project

presented to Ryerson University

in partial fulfillment of the

requirements for the degree of

Master of Engineering

in the Program of Civil Engineering

Toronto, Ontario, Canada, 2006

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Master of Engineering, 2006

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Abstract

At signalized intersections, rear-end accidents are frequently the predominant accident type. These accidents result from the combination of a lead-vehicle's deceleration and the ineffective response of the following vehicle's driver to this deceleration. The frequency and severity of rear end collisions can be reduced through traffic control and operational improvements. There are different traffic operation strategies for rear-end collision reduction like "Employ multiphase signal operation", "Optimize clearance intervals" or "Restrict or eliminate turning maneuvers (including right turns on red)". In practice, the most cost-effective strategy appears to be "Employ Signal Coordination".

The first objective of this research report was to use spatial analysis tools to disaggregate Toronto into 76 spatial zones (Toronto is usually divided into 158 zones). The second objective was to rank the 76 zones according to their propensity for rear-end collisions at 4-legged signalized intersections. The third objective was to demonstrate how safety can be improved through signal coordination and progression. The software package Synchro-4.00 was used to recommend improved signal coordination through optimization of cycle lengths, splits and offsets. The coordination analysis for the 15 intersections located in the zone with the highest propensity for rear-end collision revealed the following results:

- Coordination was definitely not recommended for three of the intersections;
- Coordination was probably not recommended for six of the intersections; and
- Coordination was definitely recommended for six of the intersections.

The coordinatability analysis for the 15 intersections located in the zone with the highest propensity for rear-end collisions was performed on the basis of current cycle length (based on field observations). At the nine intersections where coordination is either definitely not recommended or probably not recommended, current cycle length needs to be optimized.

Acknowledgements

I am grateful to many individuals for their assistance during the course of this project. First, I specially thank my co-advisor, **Dr.Mike Chapman** for his continuous effort and guidance during the research and preparation of this project report. Special thanks go to my co-advisor, **Dr.Bhagwant Persaud**, who is most responsible for helping me complete the writing of this dissertation as well as the challenging research that lies behind it. He taught me how to write academic project reports, made me a better planner, had confidence in me when I doubted myself, and brought out the good ideas in me. I would like to thank Ms. Amy Ko from the City of Toronto for providing me with turning movement counts. In addition, I would like to thank Felix Wong and Ravi Bhim for providing me timely assistance during the research.

I dedicate this work to my family; whose constant encouragement, understanding and moral support played an important role throughout the course of this work. My thanks go especially to my parents whose love has supported me throughout. Last, but not the least; I thank my friends **Muhammad Asif,Waseem Muhammad** and **Asim Mahboob** for their moral support and loving friendship.

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Chapter1 Introduction

Traffic accidents at urban intersections are an important cause of deaths in many countries. Most traffic accidents may be caused by one or a combination of several factors including errors in road user judgments and actions, poor road geometric designs, inappropriate traffic or regulatory controls, unsuitable road conditions, adverse environmental conditions and vehicle defects.

Road accidents can be categorized by "Collision distribution by season, day of week, and time of day", "Collision severity", "Collision type" and "Weather, light, and road surface conditions," etc. In this report, the main focus is on rear-end collisions at 4-legged signalized intersections in the City of Toronto. The conceptual flow chart of rear-end accident occurrence provided in **Figure 1** shows that rear-end accidents are the result of a lead vehicle's deceleration and the ineffective response of the following vehicle's driver.

Rear-end accidents for 4-legged intersections in "Greater Toronto Area" are targeted because they are one of most frequent types of collision. The frequency and severity of rear-end collisions can be reduced through traffic control and operational improvements. There are different traffic operation strategies, including "Employ multiphase signal operation", "Optimize clearance intervals" and "Restrict or eliminate turning maneuvers (including right turns on red)," but the most common and effective strategy is "Employ Signal Coordination".

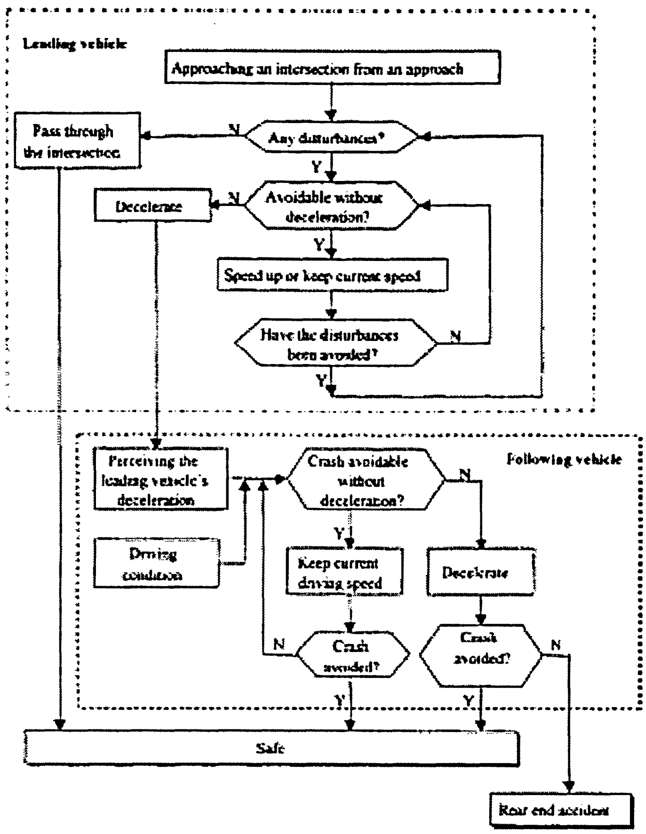


Figure 1: Flow Chart of Rear-end accident causation (5)

In this research report, "Signal Co-ordination" was employed as the countermeasure for rear-end collisions. Good signal coordination can generate measurable safety benefits in two main ways. Firstly, coordinated signals produce platoons of vehicles that can proceed without stopping at multiple consecutive signalized intersections. Reducing the number and frequency of required stops and maintaining constant speeds for all vehicles reduce rear-end conflicts. Secondly; signal coordination can improve the operation of turning movements. Increased platooning can create more gaps of increased length for permitted vehicle movements at intersections and can result in improved intersection operation. Also, platooning will contribute to consistent vehicle speeds along a corridor, which will help decrease rear-end type crashes.

The objectives of this research were to:

- use spatial analysis tools to disaggregate Toronto into 76 spatial zones (Toronto is usually divided into 158 zones);
- ranked the 76 zones according to their propensity for rear-end collisions at 4-legged signalized intersections; and
- demonstrate how safety can be improved through signal coordination and progression.

Chapter2 Literature Review

2.1 Brief Introduction of "SYNCHRO" (12)

SYNCHRO is a macroscopic traffic signal timing tool that can be used to optimize signal timing parameters for isolated intersections, generate coordinated traffic signal timing plans for arteries and networks, and also develop time-space and platoon dispersion diagrams for interactive fine-tuning. SYNCHRO can analyze fully actuated coordinated signal systems by mimicking the operation of a NEMA controller, including permissive periods and force off points.

SYNCHRO runs under Windows 95/NT and OS/2. Using a mouse, the user can draw either individual intersections or a network of intersecting arteries, and can also import .DXF map files of individual intersections or city maps. The program has no limitations on the number of links and nodes. It can analyze multi-legged signalized intersections with up to six approaches per intersection. SYNCHRO does not, however, analyze sign-controlled intersections.

SYNCHRO is designed to optimize cycle lengths, splits, offsets, and phase orders. The program also optimizes multiple cycle lengths and performs coordination analysis. When performing coordination analysis, SYNCHRO determines which intersections should be coordinated and those that should run free. The decision process is based on an analysis of each pair of adjacent intersections to determine the "coordinability factor" for the links between them.

SYNCHRO calculates intersection and approach delays based either on Chapter 9 of the HCM or a new internal method. The major difference between the HCM method and the SYNCHRO method is the treatment of actuated controllers. The HCM procedures for calculating delays and LOS are embedded in SYNCHRO; thus, the user does not need to acquire HCM software.

SYNCHRO is useful for agencies that want to operate groups of arteries on different cycle lengths. Using SYNCHRO, the user can optimize the entire network or groups of arteries and intersections in a single run and can determine the control boundaries of the different arterial groups, based on the program's selection of the cycle lengths.

SYNCHRO requires mostly the same traffic flow and geometric data asTRANSYT-7F. The program can be used to evaluate existing traffic signal timing or to optimize the settings for individual intersections, arteries, or a network. The program performance measures include average approach delay, intersection delay, and volume-to capacity ratio, intersection level of service, 50- and 95-percentile queue lengths, total stops, travel time, emissions, and fuel consumption. Further, SYNCHRO has a generous listing of user-specified reports, including capacity analysis, LOS, delay, stops, fuel consumption, blocking analysis, and signal timing settings.

SYNCHRO has unique visual displays, including interactive platoon dispersion diagrams. The user can change the offsets and splits with a mouse, then observe the impacts on delay, stops, and LOS for the individual intersections, as well as the entire network. Another significant strength of SYNCHRO is its ability to create data input streams.

2.2 Brief Review for Traffic Operation [7]

2.2.1 Traffic Signal Controller Types

Traffic signals are control devices which can alternately direct the traffic to stop and proceed at intersections using automatic red, yellow and green traffic light signals. The signals provide orderly movement of traffic, increase the traffic handling capacity of intersections, reduce accidents, and increase the safety of pedestrian crossings. Traffic signals can operate in several different modes:

- Pre-timed Signal Control
- Traffic Actuated Signal Control
    - Semi-Actuated Control
    - Fully Actuated Control.

2.2.1.1 Pre-Timed Signal Control:

Pre-timed signals are the simplest type of traffic signals. The length of the cycle, the phases and all of the intervals are predetermined.

2.2.1.2 Traffic Actuated Signal Control:

Traffic-actuated control of isolated intersections attempts to adjust green time continuously. In some cases, traffic-actuated control also attempts to adjust the sequence of phasing. These adjustments occur in accordance with real-time measures of traffic demand obtained from vehicle detectors placed on one or more of the approaches to the intersection. The full range of actuated control capabilities depends on the type of equipment employed and the operational requirements.

Actuated signals work like this. Vehicle detectors are placed on one or more of the approaches to the intersection. **Fully-actuated signals** have detectors on all of the approaches. **Semi-actuated signals** have detectors on only some of the approaches. whether or not there is a car at the intersection. registers a vehicle it makes a **call** to the controller. The controller registers the need for the phase to be serviced, or have the right of way.

When this phase is in service, it retains the right of way for a minimum time and additional time can be given if more cars are detected during the green light. This additional time is called the **passage time.** If there is enough traffic, extensions (in the form of passage time) will be added to the phase up to some set **maximum green** time. However, if no call is received during the green time, the phase will end. This is known as **gap out.** The cycle then progresses based on calls received during the previous cycle. The signal controller then changes to the next phase in the phase sequence that has a call.

2.3 Coordinated Signal Timing

Coordinating signal timing allows a system of signals to work together so that groups of vehicles are able to move through the signals without stopping

Uncoordinated signals often force the vehicles to have to stop. As this is a great inconvenience to drivers, transportation engineers try to minimize such stopping with good signal coordination. Depending on the size of the network in question, this can become very complex. There are two types of coordination: one-way coordination and two-way coordination

2.4 One-way Coordination

Coordination on a one way street is a relatively simple process. To start out with, we will define some terms that are commonly used with signal coordination.

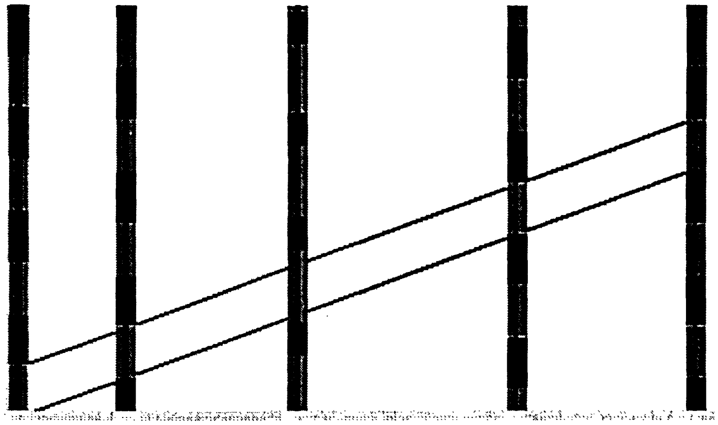


Figure 2: Time-Space Diagram for One-way Coordination [6]

Figure 2 is a time-space diagram that shows five intersections that are coordinated for eastbound traffic. In this simple example, the intersections are all the same distance apart (4 and 5 are twice the normal distance), the cycle lengths are all the same, and the splits are 50/50 (i.e. half of the time, the through movement get the green, and half of the time, the cross streets get the green).

The **through band** is the strip bordered by dark green. The band indicates the length of time available for vehicles going at a certain speed can travel without stopping. If the **bandwidth** (the width of the through band in time) is 12 seconds, and if the minimum headway is two seconds per vehicle, we could have a maximum of six cars per lane per travel cycle passing through this system without stopping.

The **offset** is the time from when the signal turns green until the succeeding signal turns green. If the offset was **zero**, then the lights would turn green at the same time.

In the example above, the bandwidth (12 seconds) happens to be the same as the green time at the first intersection. This intersection has a green time of 50%, so the efficiency is 50% of the cycle length.

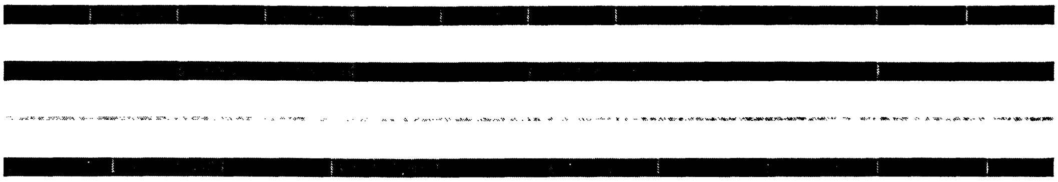
While the bandwidth efficiency is a good measure of effectiveness, it should not be the only requirement used to coordinate a system of signals. The most efficient bandwidth does not necessarily provide the best service over the system. This is because the system serves cross-street and turning traffic which may or may not benefit from large bandwidth efficiencies being given to the major through movement.

The **efficiency** of the bandwidth is defined by the following equation:

$$e = \frac{bw}{C} \cdot 100\%$$

[Roess, et al, 1998] [7]
e = Bandwidth efficiency (%)
bw = Bandwidth (sec)
C = Cycle length (sec)

For one-way coordination, the first step is to calculate the cycle lengths for each intersection. The cycle lengths must be equal or be multiples of each other (such as 45 seconds and 90 seconds) or else they will not always align properly for uniform through bands, and coordination will then not be possible. The image below shows this phenomenon. The first line depicts cycles half as long as the cycles in the second line. Even though the greens do not match up perfectly, they at least are always in the same position relative to each other, which will allow through bands to be created for every other short cycle. The phases in the third line tend to "wander" relative to those in the other two lines and, as a result, it is not possible to coordinate the third line with the other two. The requirement that the cycle lengths be multiples of each other creates a tendency for cycle lengths to be equal except at major intersections where exceptionally long cycle lengths are necessary.



Although cycle lengths must be multiples of each other, the phases within the cycles can be any length. This is because the green times will still occur at the same point relative to each other, that is to say, the offset will be constant. Differing phase lengths arise when cross streets have different volumes, where some will need significantly more green time than others. In cases of differing phase lengths, the bandwidth will be limited to the smallest green time given to the through movement on the coordinated street.

Once the cycle length has been set for a street, the next step is to determine the offsets. The ideal offsets can be determined by the following equation:

$$t_i = \frac{D}{S}$$

[Roess, et al, 1998]

- t_i = Ideal Offset
- D = Distance Between Intersections (m)
- S = Ideal Vehicle Speed (m/s)

2.5 Coordination and Optimization by Synchro

Synchro allows to quickly generate optimum timing plans. Synchro optimizes the split, cycle length, and offsets. Synchro optimizes to reduce delays and stops.

The Coordinatability Factor (CF) is a measure of the desirability of coordinating the intersections. Several criteria are used in an attempt to determine whether coordination is warranted. These criteria are used to determine a CF on a scale from **0** to **100.** Any score above **80** indicates that the intersections must be coordinated to avoid blocking problems; any score below **20** indicates the intersections are too far apart, or coordination is otherwise not desirable.

2.6 Overview of Optimizations

Synchro contains a number of optimization functions. It is important to understand what each function does and to use the optimizations in the correct order.

2.7 Steps for Optimization

Optimization requires 3 steps.

Step 1: Set Up Intersection Timing Plans

The first step is to make timing plans for each individual intersection. This step includes:

- Enter **Volume** Data
- Enter **Lane** Data
- Setup **Phase** numbers for each movement along with phase parameters
- Optimize **Cycle Lengths** and **Splits**
- Check **capacity.**

Step2: Optimize Network Cycle Length

The next step is to determine a system cycle length. It is possible to create multiple zones and assign a different cycle length to each zone.

The **Optimize→Network-Cycle-Length** command will set up a timing plan for each cycle length, and select the cycle length with the best performance based on Measures of Effectiveness (MOE).

When optimizing cycle lengths, it is necessary to optimize offsets to see how well the cycle length performs. In this step, a quick offset optimization is usually sufficient to determine how the cycle length will perform. Once the cycle length is selected, a thorough offset optimization can take place.

Step 3: Optimize Offsets, Lead/lag Phasing

After determining a system cycle length (or several cycle lengths), the last step is to optimize offsets. This step uses the Synchro command **Optimize→Network-Offsets.**

Setting **Allow Lead/Lag Optimize?** to Yes, will also optimize phase orders.

Chapter 3 General Features of Data Used

3.1 Traffic Safety Improvement Program [12]

The data used in this project were extracted from the database of Toronto's Traffic Safety Improvement Program (**TSIP**). The database, which includes accident data, traffic volume data and geometric information, was assembled by the City of Toronto and the consulting company **iTRANS.** The data are organized and stored in electronic and geo-coded format and are available from 1996 to 2000.

Signalized intersection data were used for this study. All collisions within a 20m radius of the center-point of the intersections were considered as 'intersection-related' accidents.

TSIP is comprised of a number of datasets: accident data; traffic volume data; geometric information; map data; and a traffic signal database. The datasets are introduced in the following sections.

3.2 Accident Data

There are more than 1700 signalized intersections included in the Toronto dataset. Each intersections is represented with a unique number (PX) and classified as 3-legged or 4-legged. As all the datasets used the identical PX number for each signalized intersection, the PX values served as the bridge between the accident, traffic volume, geometric and digital map data, and allowed the merging of the various datasets for analysis purposes.

The accident data are categorized into five accident types. The types are general collision, angle collision; rear-end collision, left-turn collision and pedestrian collision. The collisions are categorized into three levels of severity: fatal, non-fatal injury and property damage only (PDO). The relevant statistics from the datasets on rear-end collisions for 3-legged and 4-legged intersections are used in this study report.

3.3 Traffic Volume Data

Each intersection stored in the traffic volume data had a unique number (PX) that matched its counterpart in the accident data. Traffic_volumes_data include Average Annual Daily Traffic (AADT) and average traffic volumes of each approach, including through, right-turn and left-turn movements, were reported.

3.4 Geometric Information

The geometric information database provides data on the numbers of left-turn and right-turn approaches of each intersection.

3.5 Map Data

The City of Toronto also has a set digital maps and a traffic signal database linked to TSIP database. The digital maps include Toronto centerline and Toronto Property Data Map (PDM) boundaries.

The maps are in "Shape" format. This format can be applied to **ArcGIS**, a geographical information system (GIS) computer program. The geographic coordinates systems of the point, line and polygon features are identical. They are in units of three-degree Modified Transverse Mercator (MTM) projection, and are based on the 1927 North American Datum (UTM).The appropriate X and Y coordinates of each signalized intersection were extracted from the traffic signal database.

Chapter 4: Preparation of the Dataset

Data sets are seldom in exactly the condition that we need for a project. If we lack the data required for the analysis, it may be possible to obtain data from another source. Sometimes, we have the opposite problem. For example, the data available may apply to an area greater than our specific study area or, in the case of a map, we may have thousands of features cluttering the map with unnecessary detail.

An overview of the research approach adopted is illustrated in the following "Flow-Chart."

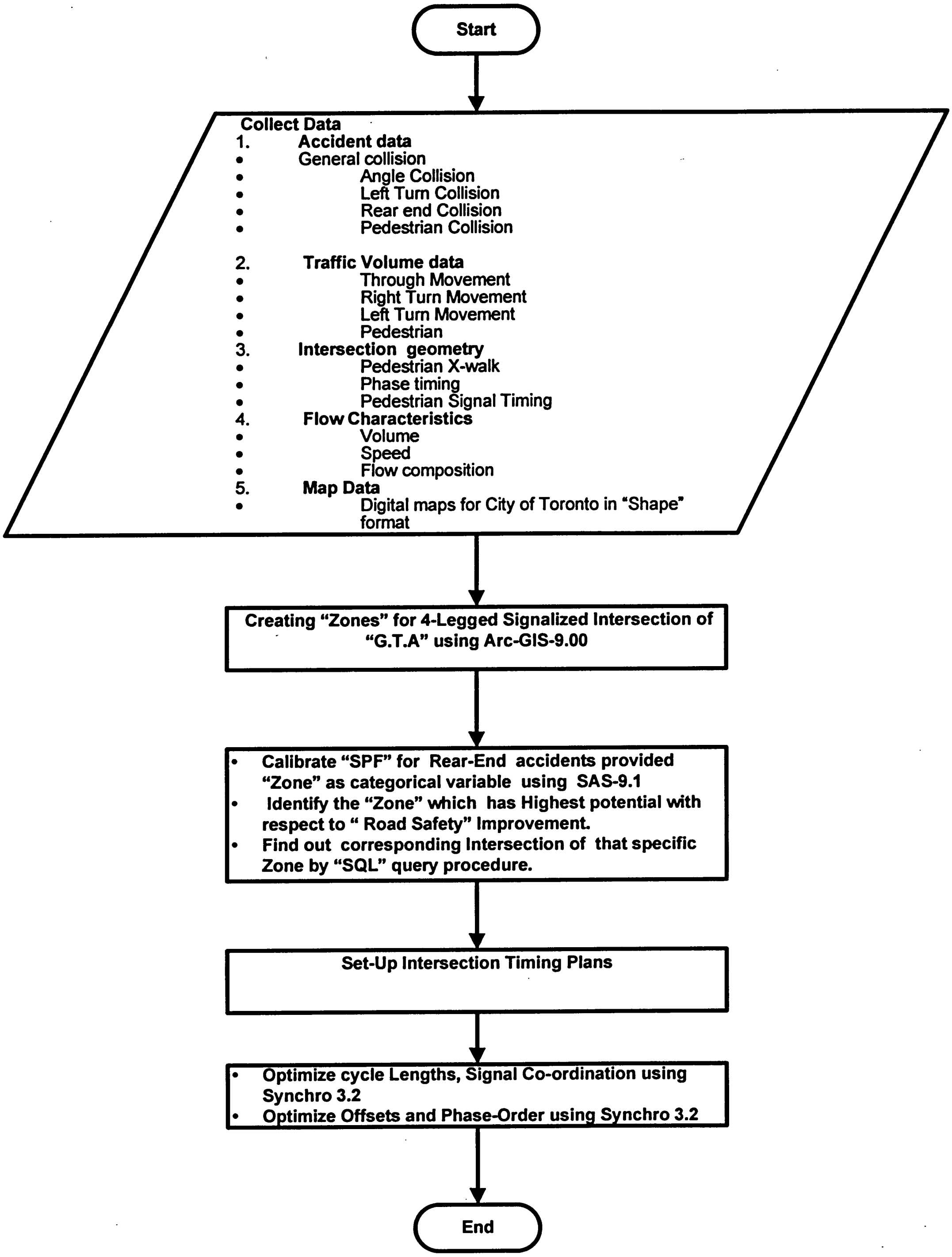


Figure 3 : Overview of Research Approach

4.1 Database Normalization

As a database grows, it grows not only in size, but also complexity. One way to reduce complexity and minimize the size of the database is to reduce the amount of redundant data. For example, storing only a single record (observation) using the PX number as the ID- key and removing duplicate records improves the consistency of the data and the reliability of the analysis. Removing redundant data from the tables improves the storage efficiency, data integrity and scalability.

There are 2062 records (rows) for 4-Legged signalized intersections in Toronto, but there are only 1263 four-legged intersection in Toronto. Many intersections are located on the boundary between zones and most of these intersections were found to occur as duplicate entries. Hence, a large amount of redundant information is stored in the database. To minimize the amount of redundant information stored in the database, it was necessary to decide which region each of the duplicated intersections belongs to.

Therefore, a rule was devised in order to remove redundancy in database and to maintain atomicity of the attribute table for 4-legged signalized intersections. The rule devised required intersections on the boundary between different zones to be assigned to the smaller value of region. Thus, the results obtained when the zones were ranked on the basis of their propensity for rear-end collision were not affected by duplicated entries.

4.2 Querying Spatial Data

A great strength of GIS is that it does not only show things geographically, but it also tells us a lot about them. GIS can provide a great deal of additional information. The additional information is readily accessed using "Select" Query options.

In **ArcMap** [(8),] there are several ways to retrieve additional information about the features mapped. We can click on features to display their "**Attributes**". This is called "Identifying

Features". We can write a query that automatically selects features meeting specific criteria (for example, intersection with 4-legs). This is called "Selecting Features by Attributes".

Queries are not written in ordinary English, but in Structured Query Language (SQL). All we need to do, however, is open a dialog and click the attributes, values and operators we want. Arc Map creates the query. There is also Query Wizard that lets you write queries by choosing from drop-down lists.

4.2.1 Steps for Finding 4-Legged Signalized Intersections for the TSIP Database

1) Open the "Attribute-table" of "TL3_ICONC_INTERSECT" and Select it active layer.
2) From "Selection"→ "Select by Attribute" and write down a query that "Num_Legs" = 4.
3) Create a new layer of Selected Features.

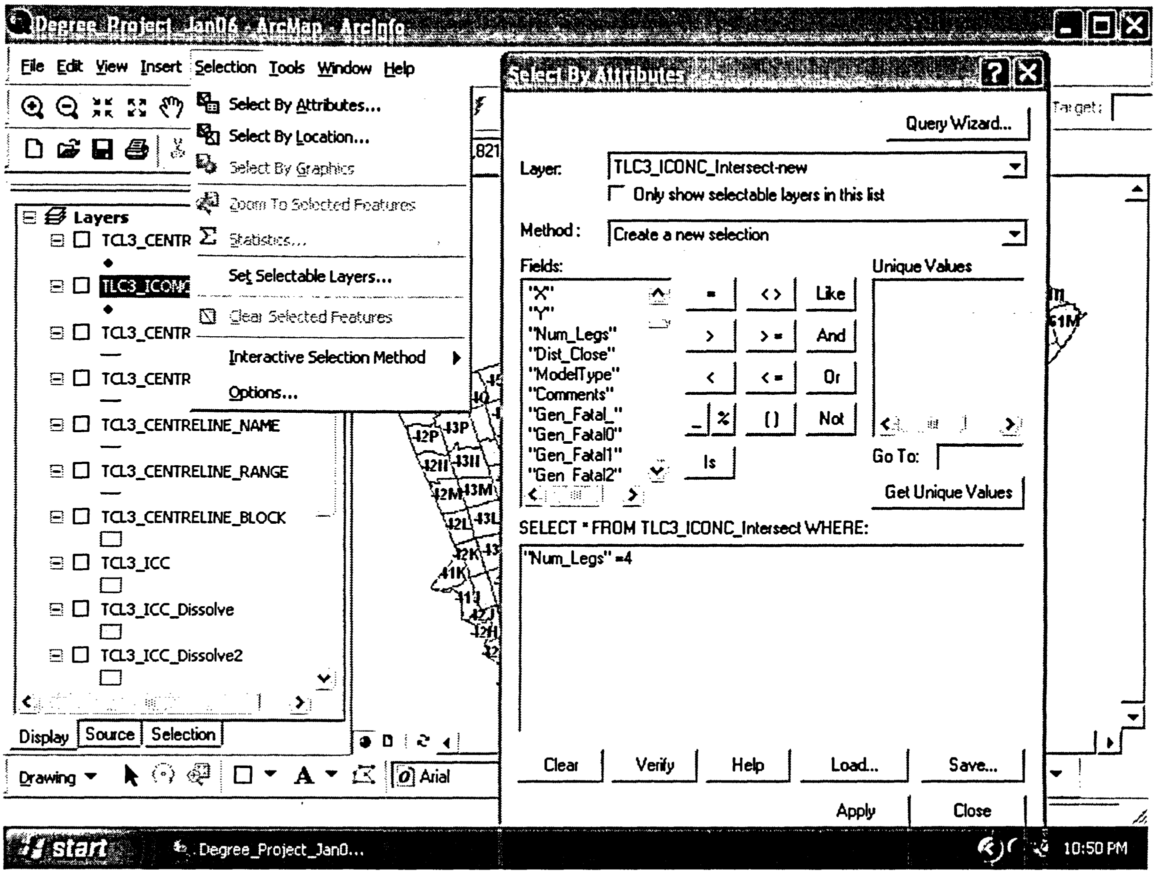


Figure 4: Query-Wizard for Finding 4-Legged Intersections of Toronto

4.3 Reclassification of Zones for 4-Legged Signalized Intersections

Toronto is usually divided into 158 zones. It was necessary to give careful consideration to the number of regions used in the analysis of the Toronto collision data. To rank the Toronto zones by the frequency of rear-end collisions, this study used the same SPF as Wong used. In Wong's analysis, which divided the Toronto into 158 regions, the regions were inevitably very small. Wong's analysis did not produce good results for 4-legged intersections. (The Chi-Squared "Goodness of Fit" test did not produce good results due to large differences between the "expected" and "actual" accident frequencies. The analysis for 3-legged intersections was more successful.)

In this study, it was decided that it was more appropriate to use a smaller number of zones for the analysis and ranking of 4-legged intersections. Since intersections are "point-features", but regions and zones are "polygon features", the only way to use the same SPF that Wong used was to "dissolve" the spatial classification based on 158 zones. (The term "dissolve" is the term used by ArcGIS.) The new spatial classification was based on 76 regions. These regions were given the attribute name of "Zone" in ArcGIS.

A new "Shape" file was created for the 76 regions. The analysis using the 76 regions, the new "Shape" file and an "overlay" of the 4-legged intersections produced good results in terms of the Chi-Squared "Goodness of Fit" test.

4.3.1 Old Classification

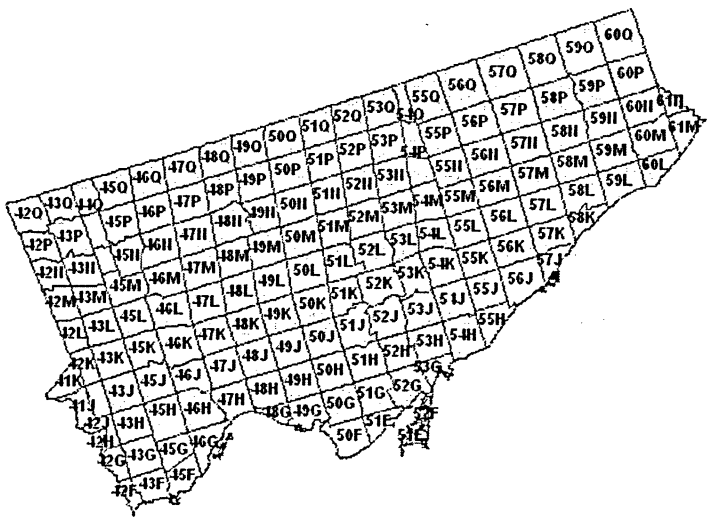


Figure 5: Dividing the City of Toronto into 158 Zones

4.3.2 New Classification

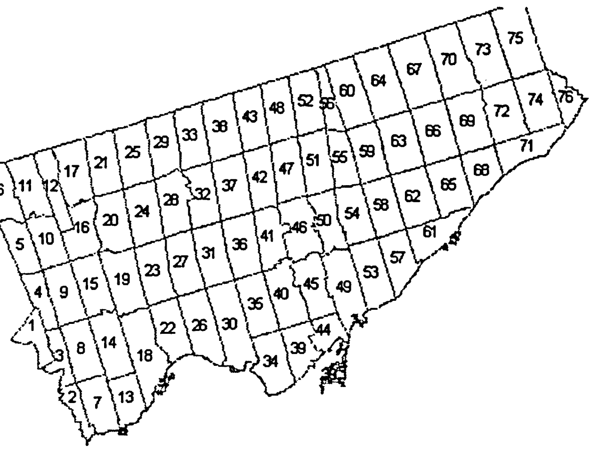


Figure 6: Dividing the City of Toronto into 76 Zones

Chapter 5: Ranking of Toronto Zones Number of Rear End Collisions

It is impossible to improve the safety of all the intersections, regions or zones in a jurisdiction at one time, even when only one specific type of accident is targeted. Some sort of screening mechanism is needed for flagging and ranking hazardous locations.

Until recently, the screening process relied on accident counts. Road safety analysts are now aware that this is problematic because accident counts fluctuate over time (regression-to-the-mean). The high accident count of one time period may well be lower in the next time period. This problem means that selecting the site with the greatest accident problems is not a simple matter. Mathematical modeling is required to overcome the problem of regression-to-the-mean. In the modeling, "observed" values are extracted from accident records and "expected" values are calculated using Safety Performance Functions (SPF).

SPFs relate the collision experience of a road location or type to its traffic, operational and geometric characteristics and are indispensable in modern day safety analysis. Whereas accident counts are subject to random variation which may be misleading, the expected accident frequencies obtained from SPFs provide a far more accurate presentation of the "true" situation and are used to identify and rank sites. The ranking of sites identifies which sites have the greatest potential to have their safety improved.

5.1 Calibration of "Rear-end collision" for 4-Legged Intersections in Toronto

Rear-end accidents at 4-legged signalized intersections in the Toronto were used as a case study to demonstrate the calibration of the SPF of a specific accident type (total rear end accident) for a group of signalized intersections in a small region in a jurisdiction. The computer software packages ArcGIS-9 and SAS-9[10] were used. The data analysis procedure followed the following steps.

Step 1: Divide the jurisdiction into zones for further investigation. Toronto was divided into 76 (zones).

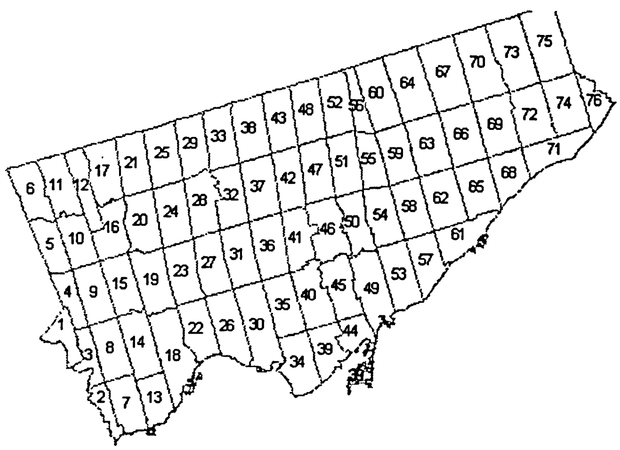


Figure 7: Zones in Toronto

Step 2: Use the "Intersect" function in ArcGIS-9 in the "Overlay" option to classify the signalized intersections into their corresponding regions.

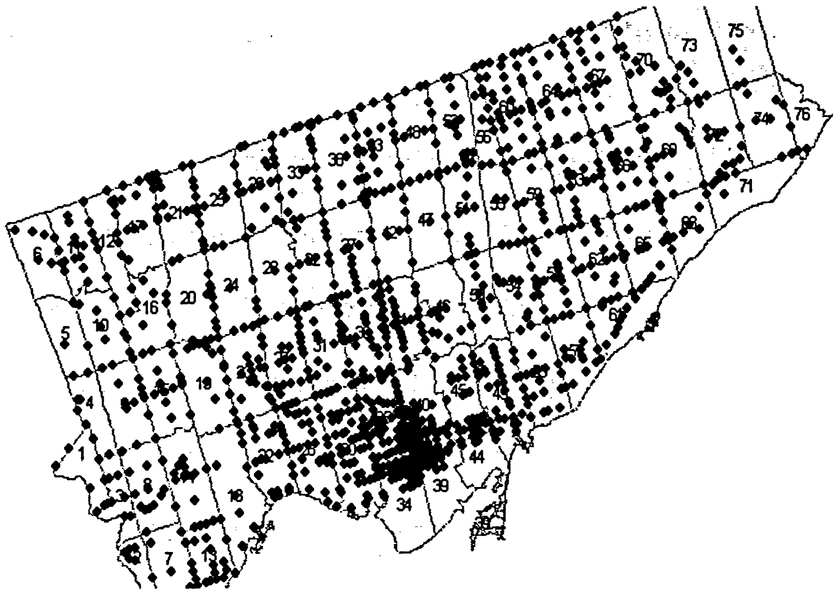


Figure 8: Location of 4-Legged Intersections in Toronto in Relation to Zones

Step 3*:* As many intersections are located on the boundary between regions, duplicated entries are found. Duplications were removed as described in Section 4.1.

Step 4*:* After removing duplicated and redundant entries, the database can be imported to SAS [8] and the **GENMOD** procedure is run to calibrate the SPF with regional information. The attribute "region" is defined as the categorical variable. The variables "major" traffic flow, "minor" traffic flow and "region" are used for calibrating rear-end accidents. Different regions have different alphas, but the coefficients (β_1 and β_2) for "major" and "minor" will remain the same. The SPF for rear-end collision at 4-legged signalized intersections is:

$$\textbf{Accidents / year} = \boldsymbol{\alpha}_{\textbf{region}} \left(\frac{Major}{1000}\right)^{\beta 1} \left(\frac{Minor}{1000}\right)^{\beta 2}$$

Step 5: Since each region has its own alpha (α) and all regions have the same β_1 and β_2, the regions can be ranked in descending order of alphas in order to determine which regions have the highest accident potential. The ranking for rear-end collisions at 4-legged signalized intersections is shown in the table below.

Table 1: Ranking of Zones for Rear-end Collisions

Rank	Zone	Alpha
1	16	0.8132
2	26	0.5548
3	27	0.5156
4	23	0.5134
5	11	0.4852
6	72	0.4603
7	20	0.4464
8	45	0.4359
9	44	0.4339
10	28	0.4291
11	21	0.4195
12	63	0.4095
13	53	0.4006
14	22	0.3845
15	25	0.3775
16	17	0.3764
17	59	0.3727
18	19	0.3681
19	30	0.3598
20	18	0.3187
21	62	0.3162
22	57	0.3143
23	24	0.3096
24	54	0.2845
25	65	0.2731
26	67	0.2595
27	31	0.2477
28	40	0.2188
29	64	0.2185
30	52	0.2185
31	49	0.1997
32	12	0.1997
33	29	0.1853
34	33	0.1678
35	73	0.1598
36	13	0.1556
37	71	0.1501
38	38	0.1444
39	51	0.1083

40	36	0.1029
41	70	0.1027
42	46	0.0861
43	55	0.0729
44	10	0.0629
45	58	0.0582
46	69	0.0575
47	66	0.0569
48	68	0.055
49	48	0.0386
50	6	0.0365
51	35	0.0252
52	75	0
53	41	-0.005
54	61	-0.0073
55	15	-0.0116
56	2	-0.0304
57	47	-0.0407
58	60	-0.0504
59	14	-0.0507
60	9	-0.0594
61	43	-0.0636
62	32	-0.0656
63	50	-0.0756
64	56	-0.0759
65	7	-0.0864
66	37	-0.0908
67	42	-0.1045
68	1	-0.1336
69	74	-0.1484
70	34	-0.2373
71	4	-0.3071
72	39	-0.3157
73	3	-0.4291
74	8	-0.5639
75	5	-1.7262

Chapter 6: Reduction of Rear-end Collision by Signal Coordination

6.1 Background

At signalized intersections, rear-end accidents are frequently the predominant accident type. The number of rear-end accidents can be reduced by signal coordination and progression.

Signal progression can help improve driver expectancy of changes in right-of-way assignment due to signal changes. Increased platooning of vehicles can create more defined gaps of increased length for permissible vehicle movements at intersections and can result in improved intersection operation. Increased platooning of vehicles may also result in a decrease in rear-end crashes. Effective coordination of signals should reduce the required number of stops for the higher priority movements (usually the major street through movement).

6.2 The Safety Benefits of Signal Coordination and Progression

Studies have proven the effectiveness of signal coordination in improving safety. The ITE Traffic Safety Toolbox: a Primer on Traffic Safety cites two studies of coordinated signals. Intersection crash frequencies dropped by 25 and 38 percent. [(1)] One study showed a decrease in crash rates for midblock sections as well. A study on the effectiveness of traffic signal coordination in Arizona concluded that there is a small but significant decrease in crash rates on intersection approaches after signal coordination.[(2)] Crashes along the study corridor decreased by 6.7 percent. Another study of the safety benefits of signal coordination, carried out in Phoenix, Arizona, compared coordinated signalized intersections to uncoordinated signalized intersections citywide. The coordinated intersections were found to have 3 to 18 percent fewer total collisions, and 14 to 43 percent fewer rear-end collisions. (3)

Table 6.1 shows examples of the safety benefits associated with signal coordination and progression.

Table 6.1: Examples of the Safety Benefits Associated with Signal Coordination and Progression

Treatment Details	Finding
Signal Coordination[3]	an estimated reduction of 3 to 8% for total collisions along the corridor an estimated reduction of 14 to 43% for rear-end collisions along the corridor
Signal Progression[4]	an estimated reduction of 10 to 20% for total collisions along the corridor

6.3 The Applicability of Signal Coordination for Reduction of Rear-End Collisions

Signal coordination may be applicable for intersections with any of the following problems:

- Rear-end conflicts/collisions are occurring due to the high probability of drivers having to stop at many of the traffic signals;
- Lack of coordination is causing unexpected and/or unnecessary stopping of traffic approaching from adjacent intersections; and
- Congestion between closely spaced intersections is causing queues from one intersection to interfere with the operation of another intersection.

In general, signals that are spaced within 0.8 km (0.5 mi) of each other on a major route, or in a network of major routes, should be coordinated. Signals that are spaced farther apart than 0.8 km (0.5 mi) may be candidates for coordination if platooning can be maintained. [13]

Signal coordination can lead to a number of operational improvements, for example:

- Signal progression can help to improve driver expectancy of changes in right-of-way assignment due to signal changes; and
- Effective coordination of signals should reduce the number of stops made by the higher priority movements (usually the major street through movements).

6.4 Improving Safety Performance

Apart from its operational benefits, signal coordination is known to reduce vehicle conflicts along corridors where traffic signals are coordinated. The main benefit is that signal coordination reduces the number of rear-end conflicts, as vehicles tend to move more in unison from intersection to intersection.

Chapter 7: Coordinatability Analysis for the City of Toronto Zone with the Highest Propensity for Rear-end Collisions

7.1 Introduction

After ranking the zones according to their propensity for rear-end collisions (as discussed in Chapter 5), the next phase was to consider how to reduce the frequency of rear-end collisions through traffic control and improvement procedures.

The "Ranking of Zones" in the City of Toronto is already illustrated in Table 1. Zone **16** is clearly the most significant one with respect to rear-end collisions because it has the highest value of alpha (α). Hence zone "16" was selected as the "Study Area". Zone 16 consists of the following 15 intersections.

Intersection Details of Zone 16

PX	Main	Side
0732	KIPLING AV	REXDALE BL
0434	DIXON RD	ISLINGTON AV
1424	ALBION RD	ARMEL CT
0433	DIXON RD	ROYAL YORK RD
0731	KIPLING AV	BELFIELD RD
0435	DIXON RD	KIPLING AV
1071	ALBION RD	IRWIN RD
0942	WESTON RD	OAK ST
0715	ISLINGTON AV	BERGAMOT AV
0795	WESTON RD	GAYDON AV
0716	ISLINGTON AV	ELMHURST AV
0718	REXDALE BL	BERGAMOT AV
0985	DIXON RD	WINCOTT DR
0712	ISLINGTON AV	HWY #401
0888	KIPLING AV	KINGSVIEW BL

Traffic operation strategies for rear-end collision reduction include "Employ multiphase signal operation", "Optimize clearance intervals" and "Restrict or eliminate turning maneuvers (including right turns on red)". In practice, the most cost-effective strategy seems to be "Employ Signal Coordination".

Studies have proven the effectiveness of signal coordination in improving road safety. [(1), (2), (3)] Synchro 4.00 was used for the coordination and progression analysis of the adjacent intersections in the study area. The **Coordinatability Factor** in Synchro is a parameter for a measure of the desirability of coordinating intersections. Synchro's **Coordinatability Factor** (CF) can be used to determine whether coordination is warranted.

7.2 Network

The network for zone 16 (the study area) is shown below as a map window. The map window in Synchro is the user interface where individual links for the intersections or network of intersections is created.

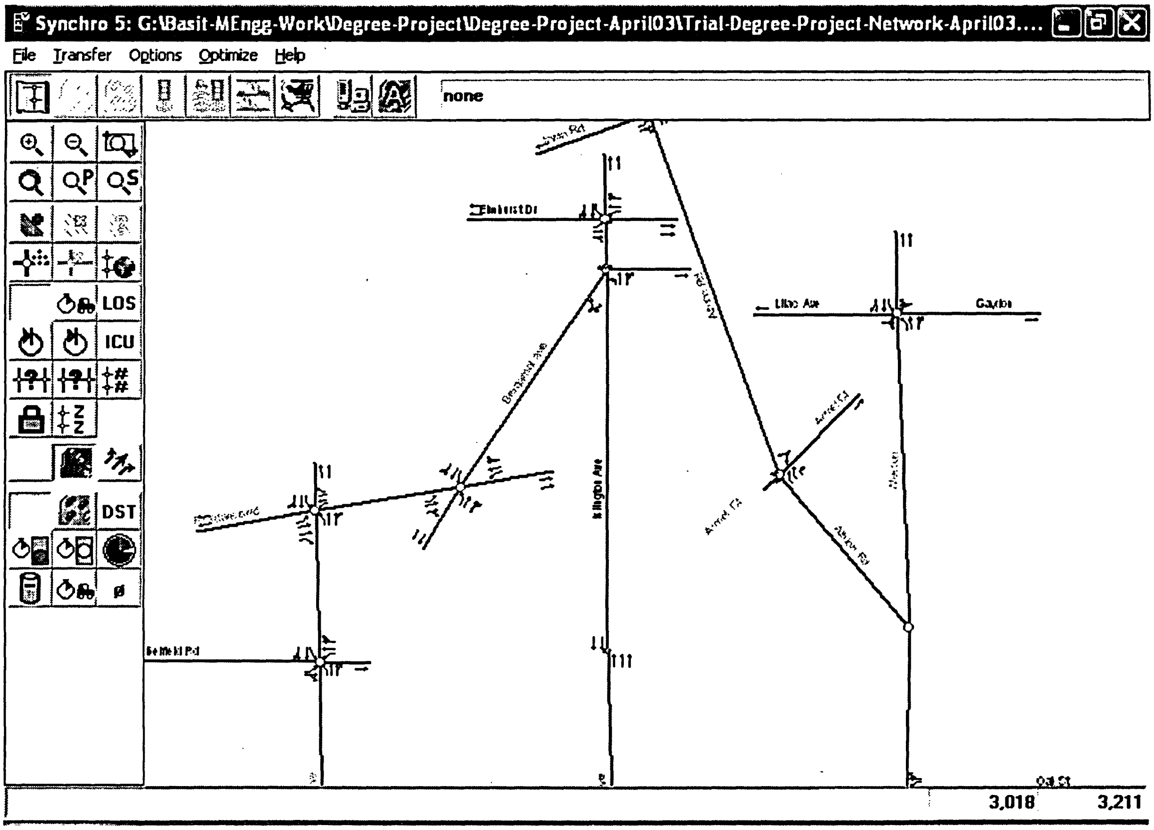


Figure 9: Synchro Map Window showing Road Network of Study Area

7.3 Default Input Windows

The default "Lane" configuration according to City of Toronto Guidelines [11] is shown below. The "Network Setting" which is applicable to the whole network is set implicitly according to "The City of Toronto-Traffic Management Centre" guidelines. However, changes in any intersection geometry, or traffic data (for volumes, timing, phases) are obtained from field observations and these inputs are updated in the "Volume, Timing, Phases" windows of the specified intersection or segments (link) explicitly.

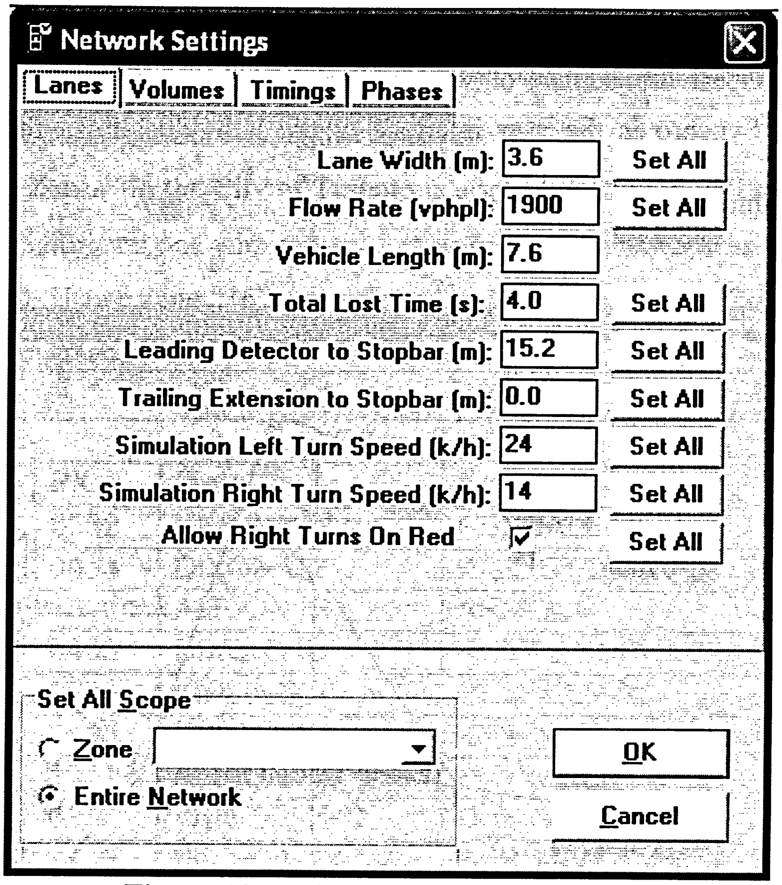


Figure 10: Default Lane Configuration

The "Default Volume" specification according to City of Toronto Guidelines [11] is shown below.

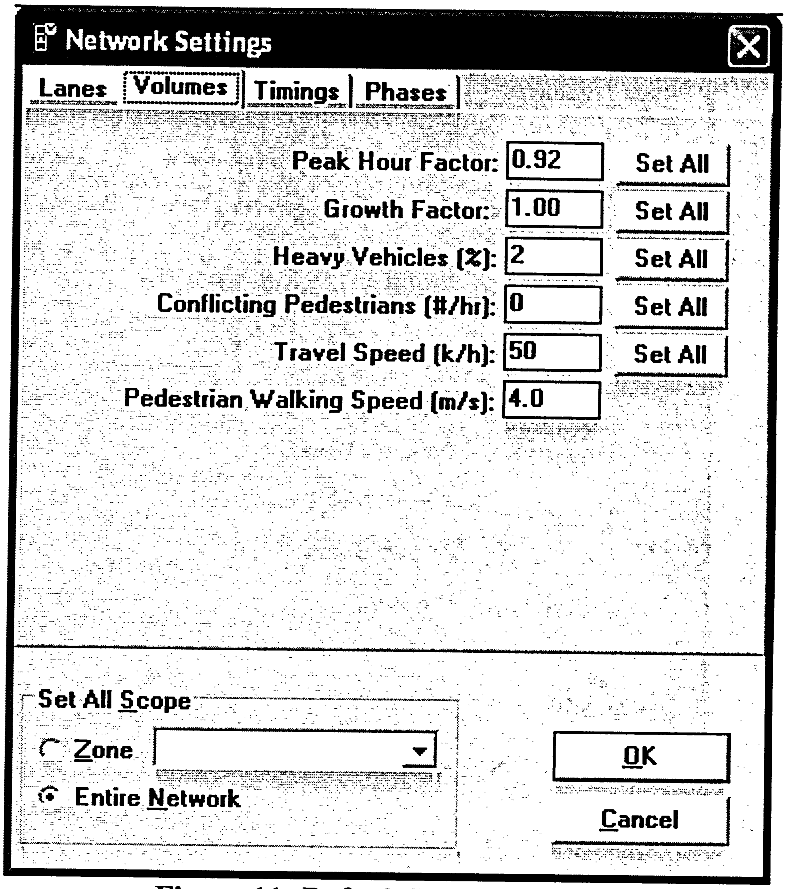


Figure 11: Default Volume Setting

The "Default Timing Specifications" are illustrated as follows.

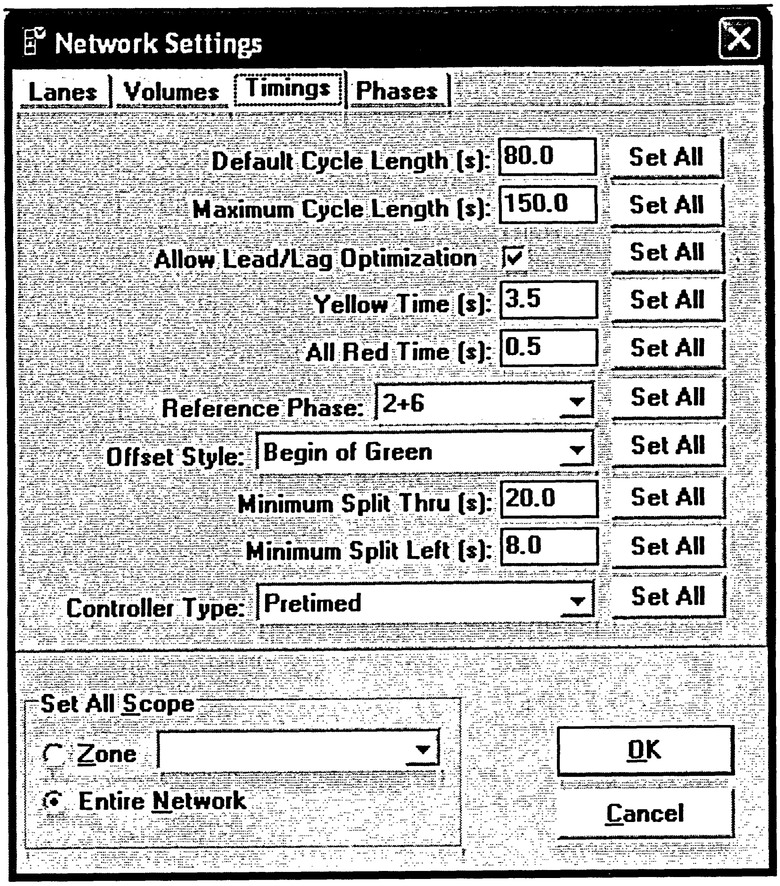


Figure 12: Default Timing Setting

The default "Phasing-Scheme" is shown below.

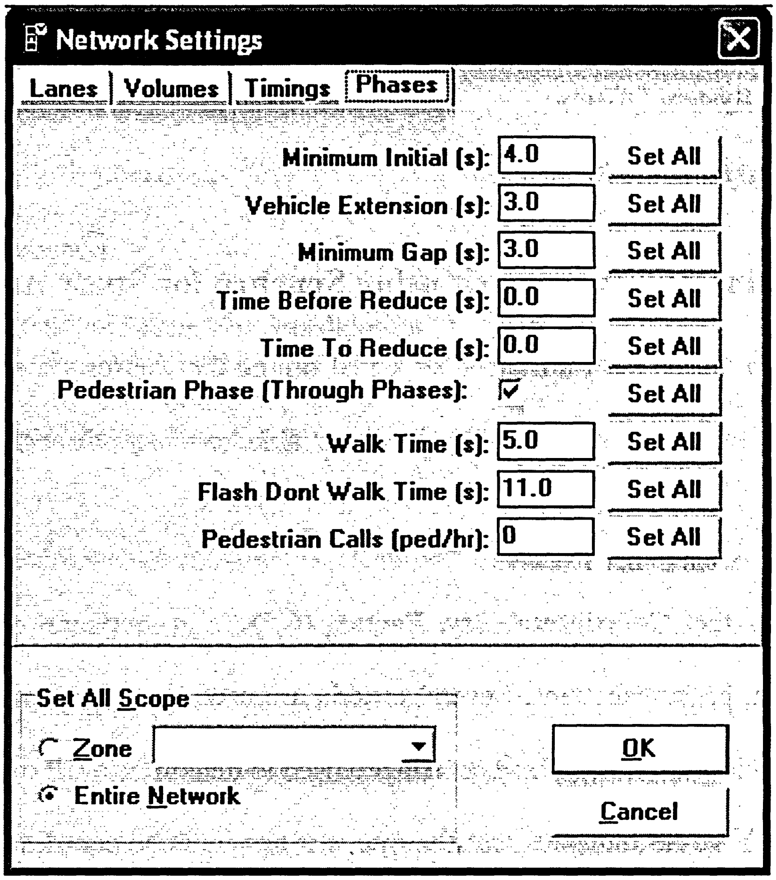


Figure 13: Default Phase Setting

All the Default Settings, i.e., Lanes, Volumes, Timings, Phases are based on City of Toronto Guidelines[11] using Synchro.

7.4 Stepwise Procedure for Analysis of Network using Synchro:

7.4.1 Summary of Steps

- Step 1 – Start Synchro 4, Start a New File
- Step 2 – Create Streets and Nodes
- Step 3 – Enter Lane Geometry
- Step 4 – Enter Flow Rate Data
- Step 5 – Check Left Turn Protections
- Step 6 – Locking Intersection Timing

- Step 7 – Optimizing the Network
- Step 8 – Set System Offsets
- Step 9 – Analyzing the Results.

7.5 Coordinatability Analysis using Synchro for Study Area

Coordination means that "a method of signal timing that causes systems of signals to work together so that groups of vehicles will be able to move through the signals without stopping".

In Synchro, the **Coordinatability Factor (CF)** is a measure of the desirability of coordinating the intersections. Several criteria are used in an attempt to determine whether coordination is warranted. These criteria are used to determine a CF on a scale from **0** to **100** Any score above **80** indicates that the intersections must be coordinated to avoid blocking problems; any score below **20** indicates the intersections are too far apart, or coordination is otherwise not desirable.

The Current Coordinatability Factors uses the current cycle length and timings to calculate the CF. The Natural Coordinatability Factor uses the intersection's natural cycle length. The Natural CF is used initially to determine which intersections should be coordinated. The Current CF is used to analyze the current timing plan and justify whether or not to coordinate additional intersections

The "Coordinatability Analysis Report" in Synchro gives information about Coordinatability Factors and the Factors used to calculate them:

- Travel time;
- Traffic to storage space;
- Proportion of traffic in platoon;
- Main street volume; and
- Increase in cycle lengths needed for coordination

7.6 Results of the Coordinatability Analysis

Synchro's **"Coordinatability Analysis Report"** shows each Factor that affects the **Coordinatability Factor (CF)** with the effect it has on the CF. Each CF ranges from **0** to **100** or more. Any value above **50** means that coordination is recommended. The higher the CF, the more likely that segment will benefit from coordination.

Table 2 presents the results of the Coordinatability Analysis for the 15 intersections analyzed. These results are based on Current Cycle length. Synchro categorizes the results as follows:

- Coordination definitely not recommended;
- Coordination probably not recommended; and
- Coordination definitely recommended.

Main	Side	Proportion of Traffic in Platoon	Value	Comments
KIPLING AV	REXDALE BL	Traffic moderately platooned	40	Coordination probably not recommen
DIXON RD	ISLINGTON AV	Traffic heavily platooned, coordination is appropriate	80	Coordination definitely recommended
ALBION RD	ARMEL CT	Traffic even across cycle, coordination not appropriate	27	Coordination definitely not recommer
DIXON RD	ROYAL YORK RD	High Volumes, coordination is high priority	36	Coordination probably not recommen
KIPLING AV	BELFIELD RD	Traffic heavily platooned, coordination is appropriate	48	Coordination probably not recommen
DIXON RD	KIPLING AV	Traffic heavily platooned, coordination is appropriate	96	Coordination definitely recommended
ALBION RD	IRWIN RD	Moderate Volumes, coordination is appropriate	80	Coordination definitely recommendec
WESTON RD	OAK ST	High Volumes, coordination is high priority	18	Coordination probably not recommer
ISLINGTON AV	BERGAMOT AV	Moderate volumes, coordination is appropriate	77	Coordination definitely recommendec
WESTON RD	GAYDON AV	Moderate Volumes, coordination is not appropriate	26	Coordination definitely not recommer
ISLINGTON AV	ELMHURST AV	High Volumes, coordination is high priority	43	Coordination probably not recommen
REXDALE BL	BERGAMOT AV	Traffic heavily platooned, coordination is appropriate	74	Coordination definitely recommended
DIXON RD	WINCOTT DR	Traffic heavily platooned, coordination is appropriate	73	Coordination definitely recommendec
ISLINGTON AV	HWY #401	Traffic heavily platooned, coordination is not appropriate	52	Coordination probably not recomme
KIPLING AV	KINGSVIEW BL	Moderate Volumes, coordination is appropriate	76	Coordination definitely recommendec

Table 2: Coordinatability Analysis of Study Area

Table 2 shows that:

- Coordination was definitely not recommended for three of the intersections (Albion Rd and Armel Ct, Weston Rd and Oak St, Weston Rd and Gaydon Dr);
- Coordination was probably not recommended for six of the intersections (Kipling Ave and Rexdale Blvd, Dixon Rd and Royal-York Rd, Kipling Ave and Belfield Rd, Islington Ave and Elmhurst Ave, Islington Ave and Highway 401-East); and
- Coordination was definitely recommended six of the intersections. (Dixon Rd and Islington Ave, Dixon Rd and Kipling Ave, Albion Rd and Irwin Rd, Islington Ave and Bergamot Ave, Rexdale Blvd and Bergamot Ave, Dixon Rd and Wincott Dr, Kipling Ave and Kingsview Blvd).

7.7 Summary and Conclusions

The first objective of this research report was to use spatial analysis tools to disaggregate Toronto into 76 spatial zones. The second objective was to rank the 76 zones according to their propensity for rear-end collisions at 4-legged signalized intersections. The third objective was to demonstrate how safety can be improved through signal coordination and progression. The software package Synchro-4.00 was used to recommend improved signal coordination through the optimization of cycle lengths, splits and offsets. The analysis of how safety can be improved through signal coordination and progression was conducted in the zone with the highest propensity for rear-end collisions. This zone had 15 intersections. The Coordinatability Analysis for this zone revealed the following results and recommendations:

- Coordination was definitely not recommended for three of the intersections;
- Coordination was probably not recommended for six of the intersections; and
- Coordination was definitely recommended six of the intersections.

The Coordinatability Analysis was performed on the basis of Current Cycle Length (based on field observations). Hence, it is recommended that the current cycle length of the nine intersections where coordination was definitely not recommended or probably not recommended needs to be optimized.

References

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12. Wong, F. Network Screening for Specific Collision Types at Urban Signalized Intersections-Conventional and Spatial Methods. Ryerson, 2005
13. Signalized Intersections: Informational Guide (FHWA-HRT-04-091)

Appendices

City of Toronto - Traffic Data Centre & Safety Bureau

Turning Movement Count Summary Report

DIXON RD AT ISLINGTON AVE

Survey Date: 2006-Jan-25 (Wednesday)

Survey Type: Routine Hours

Time Period	Vehicle Type	Exits	NORTHBOUND Left	Thru	Right	Total	Exits	EASTBOUND Left	Thru	Right	Total	Exits	SOUTHBOUND Left	Thru	Right	Total	Exits	WESTBOUND Left	Thru	Right	Total		Peds	Bike	Other
08:15-09:15	CAR	1,378	100	936	108	1,144	774	269	506	91	866	834	160	687	80	927	979	56	799	173	1,028	N	37	0	0
	TRK	34	0	30	0	30	32	0	27	2	29	27	5	24	6	35	32	1	26	4	31	S	49	0	0
AM PEAK	BUS	19	0	18	0	18	11	0	10	0	10	11	1	10	0	11	8	1	8	1	10	E	67	0	0
																						W	65	0	0
	TOTAL:	1,431	100	984	108	1,192	817	269	543	93	905	872	166	721	86	973	1,019	58	833	178	1,069				
17:00-18:00	CAR	919	71	605	69	745	1,125	151	899	134	1,184	1,193	157	998	219	1,374	873	61	583	163	807	N	61	0	0
	TRK	30	0	28	0	28	41	0	36	4	40	35	5	31	10	46	32	0	22	2	24	S	22	0	0
PM PEAK	BUS	19	0	19	0	19	14	0	12	2	14	16	2	14	0	16	7	0	7	0	7	E	74	2	0
																						W	21	0	0
	TOTAL:	968	71	652	69	792	1,180	151	947	140	1,238	1,244	164	1,043	229	1,436	912	61	612	165	838				
OFF HR AVG	CAR	849	79	569	62	710	716	150	524	131	805	694	130	516	65	711	570	47	426	130	603	N	21	1	0
	TRK	24	1	19	0	20	37	2	31	4	37	28	6	22	2	30	24	2	21	3	26	S	21	0	0
	BUS	11	0	9	0	9	11	0	9	0	9	8	2	7	0	9	8	1	8	2	11	E	40	5	0
																						W	22	0	0
	TOTAL:	884	80	597	62	739	764	152	564	135	851	730	138	545	67	750	602	50	455	135	640				
07:30-09:30	CAR	2,694	179	1,883	177	2,239	1,484	493	972	180	1,645	1,662	335	1,315	159	1,809	1,986	167	1,648	318	2,133	N	69	0	0
	TRK	70	0	60	0	60	66	1	55	3	59	60	11	49	8	68	54	8	46	9	63	S	86	0	0
2 HR AM	BUS	33	0	32	0	32	26	0	22	0	22	24	4	21	0	25	19	3	19	1	23	E	95	0	0
																						W	112	0	0
	TOTAL:	2,797	179	1,975	177	2,331	1,576	494	1,049	183	1,726	1,746	350	1,385	167	1,902	2,059	178	1,713	328	2,219				
16:00-18:00	CAR	1,913	130	1,234	115	1,479	2,139	332	1,703	262	2,297	2,250	321	1,874	396	2,591	1,726	114	1,200	347	1,661	N	105	0	0
	TRK	47	0	42	0	42	87	0	67	8	75	67	20	57	18	95	73	2	55	5	62	S	43	0	0
2 HR PM	BUS	32	0	31	0	31	29	0	24	2	26	28	5	26	0	31	16	0	16	1	17	E	150	4	0
																						W	53	0	0
	TOTAL:	1,992	130	1,307	115	1,552	2,255	332	1,794	272	2,398	2,345	346	1,957	414	2,717	1,815	116	1,271	353	1,740				
07:30-18:00	CAR	7,999	625	5,391	540	6,556	6,487	1,424	4,770	967	7,161	6,690	1,177	5,253	813	7,243	5,989	470	4,551	1,184	6,205	N	259	5	0
	TRK	213	4	179	0	183	297	9	244	26	279	237	53	194	32	279	221	17	185	25	227	S	212	0	0
8 HR SUM	BUS	105	0	97	0	97	97	0	80	2	82	84	17	76	0	93	68	6	68	8	82	E	403	25	0
																						W	253	0	0
	TOTAL:	8,317	629	5,667	540	6,836	6,881	1,433	5,094	995	7,522	7,011	1,247	5,523	845	7,615	6,278	493	4,804	1,217	6,514				

Total 8 Hour Vehicle Volume: 28,487

Comment:

Total 8 Hour Bicycle Volume: 30

Total 8 Hour Intersection Volume: 28,517

Printed On: 17 Mar, 2006 9:51:31AM

TORONTO

City of Toronto - Traffic Data Centre & Safety Bureau

Turning Movement Count Summary Report

DIXON RD AT KIPLING AVE

Survey Date: 2004-Dec-14 (Tuesday)
Survey Type: Routine Hours

Time Period	Vehicle Type	NORTHBOUND Exits	NORTHBOUND Left	NORTHBOUND Thru	NORTHBOUND Right	NORTHBOUND Total	EASTBOUND Exits	EASTBOUND Left	EASTBOUND Thru	EASTBOUND Right	EASTBOUND Total	SOUTHBOUND Exits	SOUTHBOUND Left	SOUTHBOUND Thru	SOUTHBOUND Right	SOUTHBOUND Total	WESTBOUND Exits	WESTBOUND Left	WESTBOUND Thru	WESTBOUND Right	WESTBOUND Total		Peds	Bike	Other
08:00-09:00	CAR	1,247	134	867	74	1,075	856	176	672	65	913	843	110	643	152	905	1,360	135	1,074	204	1,413	N	152	1	0
	TRK	37	2	24	5	31	32	10	24	7	41	46	3	36	3	42	31	3	26	3	32	S	98	0	0
AM PEAK	BUS	18	0	17	0	17	26	0	17	0	17	14	9	14	1	24	15	0	14	1	15	E	49	0	0
																						W	51	0	0
	TOTAL:	**1,302**	**136**	**908**	**79**	**1,123**	**914**	**186**	**713**	**72**	**971**	**903**	**122**	**693**	**156**	**971**	**1,406**	**138**	**1,114**	**208**	**1,460**				
16:15-17:15	CAR	1,115	91	777	88	956	1,381	188	1,040	133	1,361	1,061	253	854	175	1,282	930	74	664	150	888	N	66	0	0
	TRK	31	2	24	4	30	38	6	30	2	38	44	4	41	3	48	24	1	19	1	21	S	51	0	0
PM PEAK	BUS	19	0	18	0	18	17	0	16	0	16	25	1	25	1	27	10	0	9	1	10	E	59	0	0
																						W	128	0	0
	TOTAL:	**1,165**	**93**	**819**	**92**	**1,004**	**1,436**	**194**	**1,086**	**135**	**1,415**	**1,130**	**258**	**920**	**179**	**1,357**	**964**	**75**	**692**	**152**	**919**				
OFF HR AVG	CAR	713	101	523	54	678	588	128	427	76	631	626	107	499	104	710	564	51	359	62	472	N	36	2	0
	TRK	28	2	19	3	24	21	8	16	5	29	27	2	22	1	25	15	0	12	1	13	S	23	0	0
	BUS	10	0	9	0	9	9	0	8	0	8	12	1	12	1	14	6	0	5	1	6	E	35	1	0
																						W	41	0	0
	TOTAL:	**751**	**103**	**551**	**57**	**711**	**618**	**136**	**451**	**81**	**668**	**665**	**110**	**533**	**106**	**749**	**585**	**51**	**376**	**64**	**491**				
07:30-09:30	CAR	2,244	240	1,546	118	1,904	1,606	317	1,282	138	1,737	1,471	206	1,145	269	1,620	2,146	188	1,637	381	2,206	N	181	4	0
	TRK	63	5	41	8	54	57	16	43	11	70	83	6	69	5	80	57	3	47	6	56	S	139	0	0
2 HR AM	BUS	39	0	35	0	35	43	0	33	0	33	37	10	37	3	50	24	0	21	4	25	E	66	0	0
																						W	108	0	0
	TOTAL:	**2,346**	**245**	**1,622**	**126**	**1,993**	**1,706**	**333**	**1,358**	**149**	**1,840**	**1,591**	**222**	**1,251**	**277**	**1,750**	**2,227**	**191**	**1,705**	**391**	**2,287**				
16:00-18:00	CAR	2,053	178	1,437	183	1,798	2,784	314	2,173	231	2,718	1,993	428	1,616	366	2,410	1,784	146	1,240	302	1,688	N	120	5	0
	TRK	48	4	37	4	45	64	10	54	4	68	69	6	64	4	74	37	1	29	1	31	S	95	0	0
2 HR PM	BUS	38	0	36	0	36	35	0	33	0	33	48	2	48	5	55	21	0	16	2	18	E	83	4	0
																						W	184	0	0
	TOTAL:	**2,139**	**182**	**1,510**	**187**	**1,879**	**2,883**	**324**	**2,260**	**235**	**2,819**	**2,110**	**436**	**1,728**	**375**	**2,539**	**1,842**	**147**	**1,285**	**305**	**1,737**				
07:30-18:00	CAR	7,150	820	5,076	516	6,412	6,740	1,144	5,163	672	6,979	5,969	1,061	4,758	1,052	6,871	6,185	539	4,313	930	5,782	N	446	16	0
	TRK	222	18	155	25	198	205	56	159	35	250	262	21	222	13	256	156	5	125	11	141	S	327	0	0
8 HR SUM	BUS	113	0	105	0	105	114	0	97	0	97	132	17	132	10	159	66	0	56	8	64	E	288	7	0
																						W	455	0	0
	TOTAL:	**7,485**	**838**	**5,336**	**541**	**6,715**	**7,059**	**1,200**	**5,419**	**707**	**7,326**	**6,363**	**1,099**	**5,112**	**1,075**	**7,286**	**6,407**	**544**	**4,494**	**949**	**5,987**				

Total 8 Hour Vehicle Volume: 27,314
Comment:

Total 8 Hour Bicycle Volume: 23

Total 8 Hour Intersection Volume: 27,337

Printed On: 17 Mar 2006 10:00:20AM

City of Toronto - Traffic Data Centre & Safety Bureau

Turning Movement Count Summary Report

ALBION RD AT ARMEL CT

Survey Date: 2003-Apr-03 (Thursday)
Survey Type: Routine Hours

Time Period	Vehicle Type	Exits	NORTHBOUND Left	NORTHBOUND Thru	NORTHBOUND Right	NORTHBOUND Total	Exits	EASTBOUND Left	EASTBOUND Thru	EASTBOUND Right	EASTBOUND Total	Exits	SOUTHBOUND Left	SOUTHBOUND Thru	SOUTHBOUND Right	SOUTHBOUND Total	Exits	WESTBOUND Left	WESTBOUND Thru	WESTBOUND Right	WESTBOUND Total		Peds	Bike	Other
07:45-08:45	CAR	93	2	1	1	4	1,610	57	1,487	4	1,548	5	122	0	103	225	797	1	692	35	728	N	85	0	0
	TRK	3	0	0	0	0	34	2	33	0	35	0	1	0	2	3	24	0	22	1	23	S	19	0	0
AM PEAK	BUS	7	0	0	0	0	41	4	36	0	40	0	5	0	4	9	25	0	21	3	24	E	20	0	0
																						W	100	0	0
	TOTAL:	103	2	1	1	4	1,685	63	1,556	4	1,623	5	128	0	109	237	846	1	735	39	775				
17:00-18:00	CAR	182	0	1	4	5	1,169	79	1,121	2	1,202	4	44	0	51	95	1,483	2	1,432	102	1,536	N	26	0	0
	TRK	3	0	0	0	0	20	2	18	0	20	0	2	0	2	4	29	0	27	1	28	S	6	0	0
PM PEAK	BUS	2	0	0	0	0	10	0	10	0	10	0	0	0	1	1	11	0	10	2	12	E	8	0	0
																						W	27	0	0
	TOTAL:	187	0	1	4	5	1,199	81	1,149	2	1,232	4	46	0	54	100	1,523	2	1,469	105	1,576				
OFF HR AVG	CAR	89	4	0	3	7	739	37	666	2	705	4	70	0	39	109	675	2	632	52	686	N	15	0	0
	TRK	2	0	0	0	0	25	1	24	0	25	0	1	0	1	2	26	0	25	1	26	S	7	0	0
	BUS	1	0	0	0	0	19	1	18	0	19	0	1	0	0	1	14	0	14	0	14	E	8	0	0
																						W	18	0	0
	TOTAL:	92	4	0	3	7	783	39	708	2	749	4	72	0	40	112	715	2	671	53	726				
07:30-09:30	CAR	206	3	1	3	7	2,887	127	2,649	10	2,786	12	235	0	174	409	1,520	2	1,343	78	1,423	N	100	0	0
	TRK	5	0	0	0	0	67	3	65	0	68	0	2	0	3	5	47	0	44	2	46	S	31	0	0
2 HR AM	BUS	12	0	0	0	0	68	8	63	0	71	0	5	0	9	14	55	0	46	4	50	E	32	0	0
																						W	158	0	0
	TOTAL:	223	3	1	3	7	3,022	138	2,777	10	2,925	12	242	0	186	428	1,622	2	1,433	84	1,519				
16:00-18:00	CAR	346	1	2	4	7	2,248	165	2,130	5	2,300	7	114	0	95	209	2,616	2	2,520	179	2,701	N	59	0	0
	TRK	3	0	0	0	0	47	2	44	0	46	0	3	0	2	5	49	0	47	1	48	S	14	0	0
2 HR PM	BUS	3	0	0	0	0	25	0	25	0	25	0	0	0	3	3	32	0	29	3	32	E	17	0	0
																						W	59	0	0
	TOTAL:	352	1	2	4	7	2,320	167	2,199	5	2,371	7	117	0	100	217	2,697	2	2,596	183	2,781				
07:30-18:00	CAR	908	19	3	18	40	8,090	439	7,443	21	7,903	32	629	1	423	1,053	6,834	10	6,392	466	6,868	N	217	0	0
	TRK	14	0	0	1	1	213	8	204	1	213	1	8	0	7	15	196	0	189	6	195	S	72	0	0
8 HR SUM	BUS	20	0	0	0	0	169	13	159	0	172	0	10	0	13	23	144	0	131	7	138	E	81	0	0
																						W	290	0	0
	TOTAL:	942	19	3	19	41	8,472	460	7,806	22	8,288	33	647	1	443	1,091	7,174	10	6,712	479	7,201				

Total 8 Hour Vehicle Volume: 16,621 **Total 8 Hour Bicycle Volume: 0** **Total 8 Hour Intersection Volume: 16,621**

Comment: THE SOUTH LEG IS THE 2ND COVENANT REFORMED CHURCH

Printed On: 17 Mar, 2006 9:53:49AM

City of Toronto - Traffic Data Centre & Safety Bureau

Turning Movement Count Summary Report

ALBION RD AT ARCOT BLVD & IRWIN RD

Survey Date: 2003-Nov-24 (Monday)
Survey Type: Routine Hours

Time Period	Vehicle Type	NORTHBOUND Exits	Left	Thru	Right	Total	EASTBOUND Exits	Left	Thru	Right	Total	SOUTHBOUND Exits	Left	Thru	Right	Total	WESTBOUND Exits	Left	Thru	Right	Total		Peds	Bike	Other
07:45-08:45	CAR	712	11	677	14	702	55	5	14	27	46	1,357	27	1,248	6	1,281	38	82	21	30	133	N	30	0	0
	TRK	17	0	17	0	17	1	0	0	1	1	43	1	40	1	42	2	2	1	0	3	S	29	0	0
AM PEAK	BUS	15	0	13	0	13	14	1	1	1	3	25	13	13	1	27	4	11	3	1	15	E	7	0	0
																						W	7	0	0
	TOTAL:	**744**	**11**	**707**	**14**	**732**	**70**	**6**	**15**	**29**	**50**	**1,425**	**41**	**1,301**	**8**	**1,350**	**44**	**95**	**25**	**31**	**151**				
16:15-17:15	CAR	1,309	24	1,273	28	1,325	93	11	21	14	46	1,115	44	1,067	14	1,125	57	34	19	25	78	N	6	0	0
	TRK	11	0	11	1	12	2	0	1	2	3	26	0	20	1	21	3	4	2	0	6	S	18	0	0
PM PEAK	BUS	13	0	11	1	12	2	0	0	0	0	8	1	7	1	9	1	1	0	2	3	E	5	0	0
																						W	0	0	0
	TOTAL:	**1,333**	**24**	**1,295**	**30**	**1,349**	**97**	**11**	**22**	**16**	**49**	**1,149**	**45**	**1,094**	**16**	**1,155**	**61**	**39**	**21**	**27**	**87**				
OFF HR AVG	CAR	623	11	593	22	626	51	5	9	13	27	637	20	600	9	629	27	24	7	25	56	N	3	1	0
	TRK	25	0	25	0	25	1	0	0	1	1	27	1	25	0	26	0	1	0	0	1	S	10	0	0
	BUS	10	0	9	1	10	1	0	0	0	0	10	0	8	0	8	1	2	1	1	4	E	3	0	0
																						W	2	0	0
	TOTAL:	**658**	**11**	**627**	**23**	**661**	**53**	**5**	**9**	**14**	**28**	**674**	**21**	**633**	**9**	**663**	**28**	**27**	**8**	**26**	**61**				
07:30-09:30	CAR	1,332	33	1,267	27	1,327	98	11	32	42	85	2,364	39	2,192	16	2,247	93	130	44	54	228	N	38	0	0
	TRK	34	0	34	0	34	3	0	1	2	3	69	2	63	2	67	3	4	1	0	5	S	43	0	0
2 HR AM	BUS	30	1	27	3	31	19	1	1	1	3	41	15	25	1	41	5	15	3	2	20	E	13	0	0
																						W	12	0	0
	TOTAL:	**1,396**	**34**	**1,328**	**30**	**1,392**	**120**	**12**	**34**	**45**	**91**	**2,474**	**56**	**2,280**	**19**	**2,355**	**101**	**149**	**48**	**56**	**253**				
16:00-18:00	CAR	2,544	38	2,469	59	2,566	186	17	41	31	89	2,091	86	2,013	27	2,126	101	47	36	58	141	N	8	2	0
	TRK	52	0	52	1	53	4	0	1	2	3	39	2	32	2	36	4	5	2	0	7	S	36	0	0
2 HR PM	BUS	20	1	15	3	19	6	0	2	0	2	12	1	11	1	13	3	1	1	5	7	E	11	0	0
																						W	0	0	0
	TOTAL:	**2,616**	**39**	**2,536**	**63**	**2,638**	**196**	**17**	**44**	**33**	**94**	**2,142**	**89**	**2,056**	**30**	**2,175**	**108**	**53**	**39**	**63**	**155**				
07:30-18:00	CAR	6,365	114	6,107	172	6,393	485	48	108	126	282	7,000	205	6,603	78	6,886	298	271	106	210	587	N	56	5	0
	TRK	186	1	184	2	187	12	1	2	6	9	214	8	195	4	207	9	13	4	1	18	S	117	1	0
8 HR SUM	BUS	88	3	77	10	90	31	2	4	2	8	92	17	68	2	87	12	22	7	9	38	E	37	0	0
																						W	18	0	0
	TOTAL:	**6,639**	**118**	**6,368**	**184**	**6,670**	**528**	**51**	**114**	**134**	**299**	**7,306**	**230**	**6,866**	**84**	**7,180**	**319**	**306**	**117**	**220**	**643**				

Total 8 Hour Vehicle Volume: 14,792
Total 8 Hour Bicycle Volume: 6
Total 8 Hour Intersection Volume: 14,798

Comment:

City of Toronto - Traffic Data Centre & Safety Bureau

Turning Movement Count Summary Report

CHETTA PL AT DIXON RD & WINCOTT DR

Survey Date: 2003-Dec-01 (Monday)
Survey Type: Routine Hours

Time Period	Vehicle Type	NORTHBOUND Exits	NB Left	NB Thru	NB Right	NB Total	EASTBOUND Exits	EB Left	EB Thru	EB Right	EB Total	SOUTHBOUND Exits	SB Left	SB Thru	SB Right	SB Total	WESTBOUND Exits	WB Left	WB Thru	WB Right	WB Total		Peds	Bike	Other
08:00-09:00	CAR	102	31	5	59	95	810	72	687	13	772	37	64	8	152	224	1,223	16	1,040	25	1,081	N	15	0	0
	TRK	0	0	0	0	0	43	0	43	0	43	0	0	0	0	0	21	0	21	0	21	S	19	0	0
AM PEAK	BUS	1	1	0	3	4	20	0	15	1	16	2	2	0	2	4	23	1	20	1	22	E	28	0	0
																						W	57	1	0
	TOTAL:	**103**	**32**	**5**	**62**	**99**	**873**	**72**	**745**	**14**	**831**	**39**	**66**	**8**	**154**	**228**	**1,267**	**17**	**1,081**	**26**	**1,124**				
16:45-17:45	CAR	173	12	5	32	49	1,784	111	1,684	23	1,818	63	68	4	63	135	993	36	918	57	1,011	N	16	0	0
	TRK	0	0	0	0	0	32	0	31	0	31	0	1	0	0	1	27	0	27	0	27	S	16	0	0
PM PEAK	BUS	0	0	0	0	0	12	0	12	0	12	0	0	0	1	1	11	0	10	0	10	E	4	0	0
																						W	14	1	0
	TOTAL:	**173**	**12**	**5**	**32**	**49**	**1,828**	**111**	**1,727**	**23**	**1,861**	**63**	**69**	**4**	**64**	**137**	**1,031**	**36**	**955**	**57**	**1,048**				
OFF HR AVG	CAR	100	13	2	28	43	670	66	597	12	675	29	45	1	67	113	693	16	613	32	661	N	14	0	0
	TRK	2	0	0	1	1	35	1	34	2	37	2	0	0	1	1	37	0	36	1	37	S	17	0	0
	BUS	0	1	0	0	1	11	0	10	0	10	0	1	0	1	2	11	0	9	0	9	E	3	0	0
																						W	14	0	0
	TOTAL:	**102**	**14**	**2**	**29**	**45**	**716**	**67**	**641**	**14**	**722**	**31**	**46**	**1**	**69**	**116**	**741**	**16**	**658**	**33**	**707**				
07:30-09:30	CAR	174	52	7	102	161	1,590	120	1,385	28	1,533	64	103	8	228	339	2,185	28	1,905	47	1,980	N	41	0	0
	TRK	1	0	1	1	2	79	0	78	1	79	2	0	0	0	0	50	1	50	0	51	S	37	0	0
2 HR AM	BUS	7	1	0	3	4	42	2	36	2	40	4	3	1	4	8	42	1	37	5	43	E	41	1	0
																						W	91	3	0
	TOTAL:	**182**	**53**	**8**	**106**	**167**	**1,711**	**122**	**1,499**	**31**	**1,652**	**70**	**106**	**9**	**232**	**347**	**2,277**	**30**	**1,992**	**52**	**2,074**				
16:00-18:00	CAR	342	25	15	76	116	3,269	214	3,062	48	3,324	128	131	9	120	260	1,937	71	1,792	113	1,976	N	29	0	0
	TRK	1	0	0	0	0	58	1	57	0	58	0	1	0	1	2	56	0	55	0	55	S	42	0	0
2 HR PM	BUS	3	1	1	2	4	30	2	26	0	28	0	2	0	1	3	31	0	29	0	29	E	22	0	0
																						W	36	1	0
	TOTAL:	**346**	**26**	**16**	**78**	**120**	**3,357**	**217**	**3,145**	**48**	**3,410**	**128**	**134**	**9**	**122**	**265**	**2,024**	**71**	**1,876**	**113**	**2,060**				
07:30-18:00	CAR	912	130	29	288	447	7,536	596	6,836	123	7,555	307	412	20	615	1,047	6,895	164	6,150	287	6,601	N	124	1	0
	TRK	8	0	1	3	4	274	4	269	7	280	10	2	1	5	8	255	2	250	3	255	S	147	0	0
8 HR SUM	BUS	12	4	1	6	11	113	5	100	3	108	5	7	1	7	15	111	1	100	6	107	E	73	1	0
																						W	184	4	0
	TOTAL:	**932**	**134**	**31**	**297**	**462**	**7,923**	**605**	**7,205**	**133**	**7,943**	**322**	**421**	**22**	**627**	**1,070**	**7,261**	**167**	**6,500**	**296**	**6,963**				

Total 8 Hour Vehicle Volume: 16,438
Comment:

Total 8 Hour Bicycle Volume: 6

Total 8 Hour Intersection Volume: 16,444

Printed On: 17 Mar, 2006 11:09:17AM

City of Toronto - Traffic Data Centre & Safety Bureau

Turning Movement Count Summary Report

DIXON RD AT ROYAL YORK RD / ST PHILLIPS RD

Survey Date: 2003-Nov-06 (Thursday)
Survey Type: Routine Hours

Time Period	Vehicle Type	NORTHBOUND Exits	NB Left	NB Thru	NB Right	NB Total	EASTBOUND Exits	EB Left	EB Thru	EB Right	EB Total	SOUTHBOUND Exits	SB Left	SB Thru	SB Right	SB Total	WESTBOUND Exits	WB Left	WB Thru	WB Right	WB Total		Peds	Bike	Other
08:00-09:00	CAR	1,757	185	1,277	48	1,510	1,412	261	1,295	255	1,811	742	69	470	124	663	1,095	17	786	219	1,022	N	38	0	0
	TRK	40	7	36	0	43	47	3	44	2	49	12	3	9	2	14	32	1	23	1	25	S	85	6	0
AM PEAK	BUS	20	0	18	7	25	24	0	16	5	21	14	1	7	0	8	11	2	11	2	15	E	37	0	0
																						W	110	5	0
	TOTAL:	1,817	192	1,331	55	1,578	1,483	264	1,355	262	1,881	768	73	486	126	685	1,138	20	820	222	1,062				
16:30-17:30	CAR	708	129	464	34	627	1,076	136	809	80	1,025	912	233	821	177	1,231	1,160	11	854	108	973	N	26	0	0
	TRK	24	0	19	0	19	38	1	35	0	36	11	3	11	2	16	18	0	16	4	20	S	16	3	0
PM PEAK	BUS	10	0	9	0	9	18	0	17	0	17	9	1	7	0	8	10	2	10	1	13	E	10	0	0
																						W	30	1	0
	TOTAL:	742	129	492	34	655	1,132	137	861	80	1,078	932	237	839	179	1,255	1,188	13	880	113	1,006				
OFF HR AVG	CAR	925	132	623	34	789	757	211	647	124	982	457	76	321	107	504	633	12	394	91	497	N	9	0	0
	TRK	22	1	16	0	17	14	1	11	1	13	11	3	10	4	17	20	0	15	5	20	S	29	4	0
	BUS	8	0	8	3	11	10	0	7	1	8	7	0	6	1	7	8	0	7	0	7	E	13	0	0
																						W	36	4	0
	TOTAL:	955	133	647	37	817	781	212	665	126	1,003	475	79	337	112	528	661	12	416	96	524				
07:30-09:30	CAR	3,434	374	2,493	93	2,960	2,573	508	2,318	409	3,235	1,330	162	892	222	1,276	2,103	29	1,507	433	1,969	N	61	0	0
	TRK	78	9	67	1	77	87	6	79	3	88	22	7	18	3	28	50	1	38	5	44	S	142	8	0
2 HR AM	BUS	38	0	32	12	44	41	2	28	8	38	23	1	12	0	13	16	3	16	4	23	E	65	0	0
																						W	175	7	0
	TOTAL:	3,550	383	2,592	106	3,081	2,701	516	2,425	420	3,361	1,375	170	922	225	1,317	2,169	33	1,561	442	2,036				
16:00-18:00	CAR	1,336	240	865	60	1,165	1,968	273	1,486	161	1,920	1,721	422	1,539	296	2,257	2,141	21	1,605	198	1,824	N	38	0	0
	TRK	42	1	34	1	36	48	2	42	0	44	19	5	18	3	26	34	1	30	6	37	S	46	3	0
2 HR PM	BUS	17	0	16	0	16	23	0	22	0	22	17	1	15	0	16	20	2	20	1	23	E	28	0	0
																						W	83	1	0
	TOTAL:	1,395	241	915	61	1,217	2,039	275	1,550	161	1,986	1,757	428	1,572	299	2,299	2,195	24	1,655	205	1,884				
07:30-18:00	CAR	8,467	1,143	5,849	290	7,282	7,568	1,625	6,392	1,064	9,081	4,876	886	3,716	945	5,547	6,776	96	4,688	993	5,777	N	136	0	0
	TRK	206	12	163	3	178	191	13	166	6	185	84	22	75	23	120	164	3	129	30	162	S	304	28	0
8 HR SUM	BUS	87	0	80	22	102	101	2	77	11	90	66	2	49	2	53	64	6	62	5	73	E	144	0	0
																						W	402	22	0
	TOTAL:	8,760	1,155	6,092	315	7,562	7,860	1,640	6,635	1,081	9,356	5,026	910	3,840	970	5,720	7,004	105	4,879	1,028	6,012				

Total 8 Hour Vehicle Volume: 28,650
Total 8 Hour Bicycle Volume: 50
Total 8 Hour Intersection Volume: 28,700

Comment:

Printed On: 17 Mar, 2006 9:55:49AM

City of Toronto - Traffic Data Centre & Safety Bureau

Turning Movement Count Summary Report

HIGHWAY 401 S TCS AT ISLINGTON AVE & RESOURCES RD

Survey Date: 2001-Apr-24 (Tuesday)
Survey Type: Routine Hours

Time Period	Vehicle Type	Exits	NORTHBOUND Left	NORTHBOUND Thru	NORTHBOUND Right	NORTHBOUND Total	Exits	EASTBOUND Left	EASTBOUND Thru	EASTBOUND Right	EASTBOUND Total	Exits	SOUTHBOUND Left	SOUTHBOUND Thru	SOUTHBOUND Right	SOUTHBOUND Total	Exits	WESTBOUND Left	WESTBOUND Thru	WESTBOUND Right	WESTBOUND Total		Peds	Bike	Other
07:45-08:45	CAR	853	0	695	1,057	1,752	1,592	5	12	7	24	1,273	523	1,170	144	1,837	203	96	59	153	308	N	1	0	0
	TRK	29	0	17	21	38	64	2	5	5	12	45	38	40	5	83	10	0	5	10	15	S	2	0	0
AM PEAK	BUS	15	0	15	6	21	7	0	0	0	0	19	1	19	0	20	0	0	0	0	0	E	9	0	0
																						W	1	0	0
	TOTAL:	**897**	**0**	**727**	**1,084**	**1,811**	**1,663**	**7**	**17**	**12**	**36**	**1,337**	**562**	**1,229**	**149**	**1,940**	**213**	**96**	**64**	**163**	**323**				
17:00-18:00	CAR	1,165	0	862	882	1,744	1,515	68	62	31	161	1,414	571	1,355	24	1,950	35	28	11	235	274	N	0	0	0
	TRK	20	0	7	20	27	38	1	2	1	4	27	16	24	0	40	2	2	2	12	16	S	2	0	0
PM PEAK	BUS	11	0	11	1	12	1	0	0	0	0	11	0	11	0	11	0	0	0	0	0	E	4	0	0
																						W	0	0	0
	TOTAL:	**1,196**	**0**	**880**	**903**	**1,783**	**1,554**	**69**	**64**	**32**	**165**	**1,452**	**587**	**1,390**	**24**	**2,001**	**37**	**30**	**13**	**247**	**290**				
OFF HR AVG	CAR	762	0	528	489	1,017	952	38	29	25	92	829	434	767	49	1,250	70	37	21	196	254	N	0	0	0
	TRK	47	0	18	29	47	78	4	5	5	14	42	44	34	6	84	8	3	2	25	30	S	2	0	0
	BUS	10	0	9	1	10	3	0	0	0	0	11	2	11	0	13	0	0	0	1	1	E	4	0	0
																						W	3	0	0
	TOTAL:	**819**	**0**	**555**	**519**	**1,074**	**1,033**	**42**	**34**	**30**	**106**	**882**	**480**	**812**	**55**	**1,347**	**78**	**40**	**23**	**222**	**285**				
07:30-09:30	CAR	1,569	0	1,242	1,751	2,993	2,681	22	29	10	61	2,275	901	2,080	244	3,225	358	185	114	305	604	N	1	0	0
	TRK	68	0	37	43	80	135	4	5	12	21	91	87	78	8	173	15	1	7	27	35	S	4	0	0
2 HR AM	BUS	38	0	32	8	40	10	0	0	0	0	33	2	33	0	35	0	0	0	6	6	E	20	0	0
																						W	3	0	0
	TOTAL:	**1,675**	**0**	**1,311**	**1,802**	**3,113**	**2,826**	**26**	**34**	**22**	**82**	**2,399**	**990**	**2,191**	**252**	**3,433**	**373**	**186**	**121**	**338**	**645**				
16:00-18:00	CAR	2,390	0	1,733	1,762	3,495	3,037	185	182	81	448	2,617	1,093	2,475	62	3,630	80	61	18	472	551	N	3	0	0
	TRK	48	0	20	40	60	88	2	3	6	11	73	45	63	3	111	7	4	4	26	34	S	13	0	0
2 HR PM	BUS	24	0	24	2	26	2	0	0	0	0	23	0	23	0	23	0	0	0	0	0	E	13	0	0
																						W	1	0	0
	TOTAL:	**2,462**	**0**	**1,777**	**1,804**	**3,581**	**3,127**	**187**	**185**	**87**	**459**	**2,713**	**1,138**	**2,561**	**65**	**3,764**	**87**	**65**	**22**	**498**	**585**				
07:30-18:00	CAR	7,004	0	5,086	5,470	10,556	9,526	359	328	189	876	8,206	3,728	7,623	501	11,852	715	394	214	1,559	2,167	N	4	0	0
	TRK	305	0	130	197	327	530	22	26	37	85	330	307	277	36	620	56	16	20	153	189	S	23	0	0
8 HR SUM	BUS	103	0	93	15	108	26	0	0	0	0	98	11	98	0	109	0	0	0	10	10	E	50	0	0
																						W	16	0	0
	TOTAL:	**7,412**	**0**	**5,309**	**5,682**	**10,991**	**10,082**	**381**	**354**	**226**	**961**	**8,634**	**4,046**	**7,998**	**537**	**12,581**	**771**	**410**	**234**	**1,722**	**2,366**				

Total 8 Hour Vehicle Volume: 26,899
Total 8 Hour Bicycle Volume: 0
Total 8 Hour Intersection Volume: 26,899

Comment: *** CORDON COUNT ***

Printed On: 17 Mar, 2006 11:20:37AM

City of Toronto - Traffic Data Centre & Safety Bureau

Turning Movement Count Summary Report

BERGAMOT AVE AT ISLINGTON AVE

Survey Date: 2005-Feb-28 (Monday)
Survey Type: Routine Hours

Time Period	Vehicle Type	NORTHBOUND Exits	NB Left	NB Thru	NB Right	NB Total	EASTBOUND Exits	EB Left	EB Thru	EB Right	EB Total	SOUTHBOUND Exits	SB Left	SB Thru	SB Right	SB Total	WESTBOUND Exits	WB Left	WB Thru	WB Right	WB Total		Peds	Bike	Other
08:00-09:00	CAR	639	22	472	20	514	172	113	89	47	249	1,008	63	886	71	1,020	152	75	59	54	188	N	34	0	0
	TRK	69	2	51	1	54	20	13	11	4	28	118	8	105	15	128	20	9	3	5	17	S	50	0	0
AM PEAK	BUS	23	2	15	1	18	15	2	3	5	10	24	11	16	4	31	7	3	1	6	10	E	16	0	0
																						W	24	0	0
	TOTAL:	**731**	**26**	**538**	**22**	**586**	**207**	**128**	**103**	**56**	**287**	**1,150**	**82**	**1,007**	**90**	**1,179**	**179**	**87**	**63**	**65**	**215**				
16:15-17:15	CAR	945	45	679	28	752	219	207	111	81	399	804	80	665	141	886	260	58	74	59	191	N	34	0	0
	TRK	81	7	53	5	65	31	17	14	6	37	82	12	71	11	94	26	5	8	11	24	S	21	0	0
PM PEAK	BUS	19	5	16	1	22	10	3	5	6	14	22	4	14	3	21	9	2	1	0	3	E	27	0	0
																						W	24	0	0
	TOTAL:	**1,045**	**57**	**748**	**34**	**839**	**260**	**227**	**130**	**93**	**450**	**908**	**96**	**750**	**155**	**1,001**	**295**	**65**	**83**	**70**	**218**				
OFF HR AVG	CAR	568	47	424	28	499	158	104	80	95	279	570	50	432	103	585	202	43	52	40	135	N	12	1	0
	TRK	83	6	59	5	70	25	18	13	11	42	92	7	71	14	92	28	10	8	6	24	S	22	0	0
	BUS	15	5	10	1	16	3	2	1	4	7	15	1	10	2	13	8	1	1	3	5	E	14	0	0
																						W	21	0	0
	TOTAL:	**666**	**58**	**493**	**34**	**585**	**186**	**124**	**94**	**110**	**328**	**677**	**58**	**513**	**119**	**690**	**238**	**54**	**61**	**49**	**164**				
07:30-09:30	CAR	1,114	41	831	39	911	282	187	127	78	392	1,742	116	1,540	132	1,788	264	124	91	96	311	N	43	0	0
	TRK	132	9	102	5	116	34	20	17	9	46	210	12	183	34	229	52	18	9	10	37	S	68	0	0
2 HR AM	BUS	42	7	30	1	38	21	5	5	11	21	44	15	30	6	51	17	3	4	7	14	E	34	0	0
																						W	39	0	0
	TOTAL:	**1,288**	**57**	**963**	**45**	**1,065**	**337**	**212**	**149**	**98**	**459**	**1,996**	**143**	**1,753**	**172**	**2,068**	**333**	**145**	**104**	**113**	**362**				
16:00-18:00	CAR	1,889	91	1,367	63	1,521	417	408	205	148	761	1,505	149	1,257	262	1,668	486	100	133	114	347	N	58	0	0
	TRK	146	15	97	10	122	54	32	24	14	70	158	20	133	27	180	63	11	21	17	49	S	53	0	0
2 HR PM	BUS	51	11	38	2	51	14	7	6	14	27	48	6	32	9	47	22	2	2	6	10	E	53	0	0
																						W	56	0	0
	TOTAL:	**2,086**	**117**	**1,502**	**75**	**1,694**	**485**	**447**	**235**	**176**	**858**	**1,711**	**175**	**1,422**	**298**	**1,895**	**571**	**113**	**156**	**137**	**406**				
07:30-18:00	CAR	5,274	320	3,895	213	4,428	1,330	1,009	652	605	2,266	5,523	465	4,523	804	5,792	1,556	395	432	370	1,197	N	148	2	0
	TRK	607	48	434	33	515	184	124	91	65	280	735	60	600	116	776	225	70	61	49	180	S	209	0	0
8 HR SUM	BUS	150	36	107	5	148	43	19	13	41	73	151	25	103	23	151	67	7	8	24	39	E	143	0	0
																						W	179	0	0
	TOTAL:	**6,031**	**404**	**4,436**	**251**	**5,091**	**1,557**	**1,152**	**756**	**711**	**2,619**	**6,409**	**550**	**5,226**	**943**	**6,719**	**1,848**	**472**	**501**	**443**	**1,416**				

Total 8 Hour Vehicle Volume: 15,845
Total 8 Hour Bicycle Volume: 2
Total 8 Hour Intersection Volume: 15,847

Comment:

City of Toronto - Traffic Data Centre & Safety Bureau

Turning Movement Count Summary Report

ELMHURST DR AT ISLINGTON AVE

Survey Date: 2005-Jan-11 (Tuesday)

Survey Type: Routine Hours

Time Period	Vehicle Type	NORTHBOUND Exits	NB Left	NB Thru	NB Right	NB Total	EASTBOUND Exits	EB Left	EB Thru	EB Right	EB Total	SOUTHBOUND Exits	SB Left	SB Thru	SB Right	SB Total	WESTBOUND Exits	WB Left	WB Thru	WB Right	WB Total		Peds	Bike	Other
08:00-09:00	CAR	570	105	488	52	645	342	51	254	175	480	1,119	36	850	49	935	270	94	116	31	241	N	29	0	0
	TRK	20	0	20	0	20	8	0	8	0	8	14	0	14	0	14	1	0	1	0	1	S	51	1	0
AM PEAK	BUS	12	3	12	1	16	10	0	9	2	11	25	0	18	0	18	18	5	15	0	20	E	63	0	0
																						W	86	0	0
	TOTAL:	602	108	520	53	681	360	51	271	177	499	1,158	36	882	49	967	289	99	132	31	262				
16:15-17:15	CAR	865	142	748	59	949	244	71	136	77	284	1,027	49	850	51	950	460	100	267	46	413	N	42	0	0
	TRK	30	0	28	0	28	2	2	2	0	4	20	0	19	0	19	3	1	3	0	4	S	42	0	0
PM PEAK	BUS	12	1	12	1	14	6	0	5	0	5	19	0	19	0	19	16	0	15	0	15	E	50	0	0
																						W	22	3	0
	TOTAL:	907	143	788	60	991	252	73	143	77	293	1,066	49	888	51	988	479	101	285	46	432				
OFF HR AVG	CAR	370	67	318	99	484	148	36	33	115	184	654	16	469	23	508	171	70	81	16	167	N	17	0	0
	TRK	16	2	14	1	17	4	2	2	1	5	20	1	18	0	19	2	1	0	0	1	S	22	1	0
	BUS	8	2	8	0	10	2	0	2	1	3	11	0	10	0	10	11	0	9	0	9	E	27	0	0
																						W	27	1	0
	TOTAL:	394	71	340	100	511	154	38	37	117	192	685	17	497	23	537	184	71	90	16	177				
07:30-09:30	CAR	1,120	168	963	79	1,210	569	111	429	291	831	1,967	61	1,514	88	1,663	459	162	203	46	411	N	43	0	0
	TRK	43	1	43	1	45	12	0	11	1	12	35	0	32	0	32	3	2	2	0	4	S	112	1	0
2 HR AM	BUS	28	4	28	1	33	21	0	20	2	22	45	0	34	0	34	35	9	31	0	40	E	107	0	0
																						W	120	0	0
	TOTAL:	1,191	173	1,034	81	1,288	602	111	460	294	865	2,047	61	1,580	88	1,729	497	173	236	46	455				
16:00-18:00	CAR	1,671	228	1,480	142	1,850	527	124	315	123	562	1,792	70	1,494	86	1,650	788	175	474	67	716	N	60	0	0
	TRK	60	0	57	0	57	6	3	6	0	9	34	0	33	0	33	3	1	3	0	4	S	59	1	0
2 HR PM	BUS	24	1	24	1	26	8	0	7	0	7	39	0	38	0	38	25	1	24	0	25	E	79	0	0
																						W	25	3	0
	TOTAL:	1,755	229	1,561	143	1,933	541	127	328	123	578	1,865	70	1,565	86	1,721	816	177	501	67	745				
07:30-18:00	CAR	4,270	665	3,713	618	4,996	1,687	379	875	874	2,128	6,374	194	4,885	264	5,343	1,931	615	1,002	178	1,795	N	172	0	0
	TRK	164	9	154	3	166	32	9	26	3	38	144	3	135	0	138	15	6	6	1	13	S	258	7	0
8 HR SUM	BUS	82	14	82	2	98	37	0	35	6	41	128	0	112	0	112	103	10	89	0	99	E	293	0	0
																						W	251	5	0
	TOTAL:	4,516	688	3,949	623	5,260	1,756	388	936	883	2,207	6,646	197	5,132	264	5,593	2,049	631	1,097	179	1,907				

Total 8 Hour Vehicle Volume: 14,967

Total 8 Hour Bicycle Volume: 12

Total 8 Hour Intersection Volume: 14,979

Comment:

Printed On: 17 Mar, 2006 10:41:12AM

City of Toronto - Traffic Data Centre & Safety Bureau

Turning Movement Count Summary Report

BELFIELD RD AT HIGHWAY 409 & KIPLING AVE

Survey Date: 2005-Feb-28 (Monday)
Survey Type: Routine Hours

Time Period	Vehicle Type	NORTHBOUND					EASTBOUND					SOUTHBOUND					WESTBOUND								
		Exits	Left	Thru	Right	Total	Exits	Left	Thru	Right	Total	Exits	Left	Thru	Right	Total	Exits	Left	Thru	Right	Total		Peds	Bike	Other
07:45-08:45	CAR	964	152	676	0	828	5	126	4	165	295	1,204	1	881	240	1,122	728	158	336	162	656	N	9	0	0
	TRK	48	7	28	0	35	0	12	0	46	58	81	0	30	17	47	52	5	28	8	41	S	9	0	0
AM PEAK	BUS	26	5	22	0	27	0	4	0	6	10	36	0	28	1	29	7	2	1	0	3	E	8	0	0
																						W	11	0	0
	TOTAL:	1,038	164	726	0	890	5	142	4	217	363	1,321	1	939	258	1,198	787	165	365	170	700				
16:30-17:30	CAR	1,214	76	833	1	910	10	248	9	525	782	1,831	0	1,073	115	1,188	389	233	198	133	564	N	41	0	0
	TRK	51	5	14	0	19	0	20	0	18	38	52	0	29	12	41	75	5	58	17	80	S	5	0	0
PM PEAK	BUS	18	6	14	0	20	0	3	0	10	13	22	0	12	5	17	17	0	6	1	7	E	34	0	0
																						W	32	0	0
	TOTAL:	1,283	87	861	1	949	10	271	9	553	833	1,905	0	1,114	132	1,246	481	238	262	151	651				
OFF HR AVG	CAR	832	63	521	3	587	7	141	3	179	323	1,006	1	687	148	836	424	140	213	170	523	N	4	0	0
	TRK	69	8	22	0	30	0	20	0	30	50	82	0	41	24	65	94	11	62	27	100	S	1	0	0
	BUS	12	3	9	0	12	0	2	0	13	15	26	0	12	2	14	7	1	2	1	4	E	4	0	0
																						W	4	0	0
	TOTAL:	913	74	552	3	629	7	163	3	222	388	1,114	1	740	174	915	525	152	277	198	627				
07:30-09:30	CAR	1,883	273	1,286	1	1,560	8	243	4	295	542	2,206	3	1,601	430	2,034	1,380	310	677	354	1,341	N	19	1	0
	TRK	102	13	46	0	59	0	32	0	80	112	151	0	60	28	88	108	11	67	24	102	S	14	0	0
2 HR AM	BUS	46	21	39	0	60	0	7	0	21	28	72	0	46	5	51	48	5	22	0	27	E	13	0	0
																						W	22	0	0
	TOTAL:	2,031	307	1,371	1	1,679	8	282	4	396	682	2,429	3	1,707	463	2,173	1,536	326	766	378	1,470				
16:00-18:00	CAR	2,362	151	1,580	2	1,733	21	511	16	957	1,484	3,590	3	2,156	221	2,380	757	477	385	271	1,133	N	44	0	0
	TRK	98	9	33	0	42	0	35	0	35	70	97	0	52	21	73	130	10	100	30	140	S	10	0	0
2 HR PM	BUS	42	15	33	0	48	0	7	0	17	24	45	0	28	11	39	37	0	11	2	13	E	44	0	0
																						W	55	0	0
	TOTAL:	2,502	175	1,646	2	1,823	21	553	16	1,009	1,578	3,732	3	2,236	253	2,492	924	487	496	303	1,286				
07:30-18:00	CAR	7,573	675	4,948	13	5,636	54	1,319	30	1,968	3,317	9,818	11	6,505	1,243	7,759	3,833	1,345	1,915	1,306	4,566	N	79	2	0
	TRK	472	54	165	0	219	0	146	0	236	382	577	0	276	143	419	611	65	414	161	640	S	28	0	0
8 HR SUM	BUS	137	46	108	0	154	0	23	0	89	112	222	0	123	23	146	110	10	41	6	57	E	73	0	0
																						W	92	1	0
	TOTAL:	8,182	775	5,221	13	6,009	54	1,488	30	2,293	3,811	10,617	11	6,904	1,409	8,324	4,554	1,420	2,370	1,473	5,263				

Total 8 Hour Vehicle Volume: 23,407
Comment:

Total 8 Hour Bicycle Volume: 3

Total 8 Hour Intersection Volume: 23,410

City of Toronto - Traffic Data Centre & Safety Bureau

Turning Movement Count Summary Report

KINGSVIEW BLVD AT KIPLING AVE

Survey Date: 2005-Jan-13 (Thursday)
Survey Type: Routine Hours

Time Period	Vehicle Type	NB Exits	NB Left	NB Thru	NB Right	NB Total	EB Exits	EB Left	EB Thru	EB Right	EB Total	SB Exits	SB Left	SB Thru	SB Right	SB Total	WB Exits	WB Left	WB Thru	WB Right	WB Total		Peds	Bike	Other
08:00-09:00	CAR	1,159	19	1,065	108	1,192	155	61	34	40	135	1,103	13	1,005	89	1,107	125	58	17	33	108	N	32	0	0
	TRK	30	0	26	1	27	3	2	0	0	2	77	2	75	3	80	3	2	0	2	4	S	28	0	0
AM PEAK	BUS	17	0	16	1	17	3	1	1	0	2	24	1	22	2	25	2	2	0	0	2	E	3	0	0
																						W	11	0	0
	TOTAL:	1,206	19	1,107	110	1,236	161	64	35	40	139	1,204	16	1,102	94	1,212	130	62	17	35	114				
16:15-17:15	CAR	983	43	896	36	975	100	65	27	28	120	910	37	856	34	927	89	26	12	22	60	N	7	0	0
	TRK	21	0	21	0	21	3	0	1	0	1	74	2	70	1	73	2	4	1	0	5	S	12	1	0
PM PEAK	BUS	11	0	10	0	10	2	1	2	0	3	28	0	27	1	28	1	1	0	0	1	E	6	0	0
																						W	13	0	0
	TOTAL:	1,015	43	927	36	1,006	105	66	30	28	124	1,012	39	953	36	1,028	92	31	13	22	66				
OFF HR AVG	CAR	683	50	617	31	698	75	41	27	29	97	644	17	589	24	630	82	26	8	25	59	N	6	0	0
	TRK	25	1	23	0	24	3	0	0	1	1	100	3	96	4	103	6	3	1	2	6	S	18	4	0
	BUS	10	0	9	1	10	1	1	0	0	1	12	0	12	0	12	1	0	1	0	1	E	3	0	0
																						W	17	0	0
	TOTAL:	718	51	649	32	732	79	42	27	30	99	756	20	697	28	745	89	29	10	27	66				
07:30-09:30	CAR	2,149	49	1,983	181	2,213	287	119	78	71	268	1,921	28	1,763	111	1,902	190	87	30	47	164	N	42	0	0
	TRK	67	0	60	1	61	7	3	3	0	6	149	3	146	7	156	11	3	4	4	11	S	54	0	0
2 HR AM	BUS	31	0	30	1	31	4	1	2	0	3	55	1	53	3	57	4	2	1	0	3	E	10	1	0
																						W	33	0	0
	TOTAL:	2,247	49	2,073	183	2,305	298	123	83	71	277	2,125	32	1,962	121	2,115	205	92	35	51	178				
16:00-18:00	CAR	1,936	84	1,774	61	1,919	176	120	47	48	215	1,740	68	1,651	66	1,785	176	41	26	42	109	N	19	0	0
	TRK	51	0	48	0	48	6	1	1	0	2	136	5	127	4	136	8	9	4	2	15	S	57	2	0
2 HR PM	BUS	26	0	25	0	25	4	1	3	0	4	52	1	51	2	54	4	1	2	0	3	E	10	0	0
																						W	44	0	0
	TOTAL:	2,013	84	1,847	61	1,992	186	122	51	48	221	1,928	74	1,829	72	1,975	188	51	32	44	127				
07:30-18:00	CAR	6,818	333	6,224	364	6,921	759	404	231	234	869	6,236	164	5,769	274	6,207	695	233	88	190	511	N	86	0	0
	TRK	215	2	199	2	203	25	4	5	2	11	680	18	656	27	701	41	22	12	12	46	S	183	17	0
8 HR SUM	BUS	96	0	90	4	94	13	6	6	0	12	154	3	150	6	159	11	4	5	0	9	E	33	2	0
																						W	146	0	0
	TOTAL:	7,129	335	6,513	370	7,218	797	414	242	236	892	7,070	185	6,575	307	7,067	747	259	105	202	566				

Total 8 Hour Vehicle Volume: 15,743
Comment:

Total 8 Hour Bicycle Volume: 19

Total 8 Hour Intersection Volume: 15,762

Printed On: 17 Mar, 2006 11:23:13AM

TORONTO

City of Toronto - Traffic Data Centre & Safety Bureau

Turning Movement Count Summary Report

KIPLING AVE AT REXDALE BLVD

Survey Date: 2005-Mar-01 (Tuesday)
Survey Type: Routine Hours

Time Period	Vehicle Type	NORTHBOUND Exits	NB Left	NB Thru	NB Right	NB Total	EASTBOUND Exits	EB Left	EB Thru	EB Right	EB Total	SOUTHBOUND Exits	SB Left	SB Thru	SB Right	SB Total	WESTBOUND Exits	WB Left	WB Thru	WB Right	WB Total		Peds	Bike	Other
08:00-09:00	CAR	722	197	522	96	815	685	109	440	101	650	971	149	745	96	990	664	125	371	91	587	N	23	0	0
	TRK	33	10	18	5	33	52	9	40	9	58	38	7	23	6	36	27	6	11	6	23	S	44	0	0
AM PEAK	BUS	23	1	22	0	23	6	1	4	1	6	24	2	20	2	24	8	3	5	0	8	E	22	0	0
																						W	22	0	0
	TOTAL:	**778**	**208**	**562**	**101**	**871**	**743**	**119**	**484**	**111**	**714**	**1,033**	**158**	**788**	**104**	**1,050**	**699**	**134**	**387**	**97**	**618**				
16:30-17:30	CAR	1,250	190	903	195	1,288	1,037	193	660	146	999	884	182	596	110	888	784	142	484	154	780	N	27	0	0
	TRK	22	8	15	6	29	43	6	35	4	45	32	2	21	6	29	32	7	18	1	26	S	31	0	0
PM PEAK	BUS	13	0	13	0	13	8	0	8	1	9	18	0	16	0	16	5	1	5	0	6	E	28	0	0
																						W	23	0	0
	TOTAL:	**1,285**	**198**	**931**	**201**	**1,330**	**1,088**	**199**	**703**	**151**	**1,053**	**934**	**184**	**633**	**116**	**933**	**821**	**150**	**507**	**155**	**812**				
OFF HR AVG	CAR	656	174	423	117	714	650	127	378	98	603	618	155	401	102	658	604	119	328	106	553	N	36	0	0
	TRK	36	10	25	11	46	56	6	37	10	53	48	8	31	7	46	51	7	34	5	46	S	31	0	0
	BUS	16	1	12	2	15	9	2	6	1	9	16	1	14	1	16	8	1	6	2	9	E	28	0	0
																						W	20	0	0
	TOTAL:	**708**	**185**	**460**	**130**	**775**	**715**	**135**	**421**	**109**	**665**	**682**	**164**	**446**	**110**	**720**	**663**	**127**	**368**	**113**	**608**				
07:30-09:30	CAR	1,337	389	975	171	1,535	1,280	200	845	203	1,248	1,802	264	1,349	200	1,813	1,272	250	683	162	1,095	N	46	0	0
	TRK	60	17	31	15	63	99	19	71	16	106	65	13	42	8	63	55	7	30	10	47	S	70	0	0
2 HR AM	BUS	47	3	42	3	48	21	1	15	2	18	51	3	44	4	51	17	5	10	4	19	E	36	0	0
																						W	42	0	0
	TOTAL:	**1,444**	**409**	**1,048**	**189**	**1,646**	**1,400**	**220**	**931**	**221**	**1,372**	**1,918**	**280**	**1,435**	**212**	**1,927**	**1,344**	**262**	**723**	**176**	**1,161**				
16:00-18:00	CAR	2,343	382	1,668	364	2,414	2,045	348	1,308	298	1,954	1,744	373	1,168	220	1,761	1,544	278	942	327	1,547	N	52	1	0
	TRK	46	13	33	14	60	76	9	57	8	74	51	5	32	8	45	61	11	40	4	55	S	68	0	0
2 HR PM	BUS	33	0	31	0	31	15	2	14	1	17	37	1	35	1	37	13	1	12	0	13	E	56	0	0
																						W	50	1	0
	TOTAL:	**2,422**	**395**	**1,732**	**378**	**2,505**	**2,136**	**359**	**1,379**	**307**	**2,045**	**1,832**	**379**	**1,235**	**229**	**1,843**	**1,618**	**290**	**994**	**331**	**1,615**				
07:30-18:00	CAR	6,300	1,465	4,333	1,002	6,800	5,922	1,056	3,663	892	5,611	6,017	1,257	4,121	827	6,205	5,227	1,004	2,935	911	4,850	N	242	1	0
	TRK	248	70	162	71	303	398	51	276	63	390	307	51	198	43	292	319	46	206	35	287	S	263	0	0
8 HR SUM	BUS	141	6	120	9	135	69	10	52	5	67	150	8	135	10	153	60	10	44	11	65	E	205	1	0
																						W	173	1	0
	TOTAL:	**6,689**	**1,541**	**4,615**	**1,082**	**7,238**	**6,389**	**1,117**	**3,991**	**960**	**6,068**	**6,474**	**1,316**	**4,454**	**880**	**6,650**	**5,606**	**1,060**	**3,185**	**957**	**5,202**				

Total 8 Hour Vehicle Volume: 25,158
Total 8 Hour Bicycle Volume: 3
Total 8 Hour Intersection Volume: 25,161

Comment:

City of Toronto - Traffic Data Centre & Safety Bureau

Turning Movement Count Summary Report

BERGAMOT AVE AT REXDALE BLVD

Survey Date: 2003-Mar-24 (Monday)
Survey Type: Routine Hours

Time Period	Vehicle Type	NORTHBOUND Exits	Left	Thru	Right	Total	EASTBOUND Exits	Left	Thru	Right	Total	SOUTHBOUND Exits	Left	Thru	Right	Total	WESTBOUND Exits	Left	Thru	Right	Total		Peds	Bike	Other
07:30-08:30	CAR	262	51	13	25	89	569	236	518	64	818	131	26	17	221	264	760	50	488	13	551	N	18	0	0
	TRK	7	1	5	1	7	50	2	49	4	55	4	0	0	7	7	33	0	25	0	25	S	36	1	0
AM PEAK	BUS	8	0	3	0	3	5	5	5	0	10	1	0	1	6	7	9	0	3	0	3	E	9	0	0
																						W	28	0	0
	TOTAL:	**277**	**52**	**21**	**26**	**99**	**624**	**243**	**572**	**68**	**883**	**136**	**26**	**18**	**234**	**278**	**802**	**50**	**516**	**13**	**579**				
16:15-17:15	CAR	441	193	83	69	345	730	331	646	129	1,106	230	15	10	210	235	972	91	569	27	687	N	6	0	0
	TRK	11	4	6	1	11	66	5	65	0	70	6	0	1	4	5	50	5	42	0	47	S	29	2	0
PM PEAK	BUS	3	0	3	1	4	13	0	12	0	12	1	0	1	10	11	16	0	6	0	6	E	6	0	0
																						W	41	3	0
	TOTAL:	**455**	**197**	**92**	**71**	**360**	**809**	**336**	**723**	**129**	**1,188**	**237**	**15**	**12**	**224**	**251**	**1,038**	**96**	**617**	**27**	**740**				
OFF HR AVG	CAR	304	59	41	28	128	440	242	387	98	727	187	25	19	158	202	633	70	416	21	507	N	7	0	0
	TRK	5	2	1	1	4	64	3	63	2	68	7	0	0	4	4	48	5	42	1	48	S	13	1	0
	BUS	2	0	1	1	2	6	1	5	0	6	1	0	1	3	4	5	0	2	0	2	E	7	0	0
																						W	28	1	0
	TOTAL:	**311**	**61**	**43**	**30**	**134**	**510**	**246**	**455**	**100**	**801**	**195**	**25**	**20**	**165**	**210**	**686**	**75**	**460**	**22**	**557**				
07:30-09:30	CAR	527	86	42	35	163	1,010	454	929	103	1,486	204	46	26	427	499	1,401	75	888	31	994	N	25	0	0
	TRK	8	2	5	2	9	109	3	107	4	114	6	0	0	12	12	70	2	56	0	58	S	59	1	0
2 HR AM	BUS	9	0	3	0	3	11	6	11	0	17	1	0	1	11	12	19	0	8	0	8	E	14	0	0
																						W	54	0	0
	TOTAL:	**544**	**88**	**50**	**37**	**175**	**1,130**	**463**	**1,047**	**107**	**1,617**	**211**	**46**	**27**	**450**	**523**	**1,490**	**77**	**952**	**31**	**1,060**				
16:00-18:00	CAR	854	351	154	130	635	1,414	659	1,258	208	2,125	387	26	19	363	408	1,783	160	1,069	41	1,270	N	12	0	0
	TRK	14	4	6	1	11	104	8	103	2	113	12	0	2	8	10	81	8	69	0	77	S	60	2	0
2 HR PM	BUS	4	0	3	1	4	19	1	18	0	19	1	0	1	18	19	28	0	10	0	10	E	6	0	0
																						W	76	4	0
	TOTAL:	**872**	**355**	**163**	**132**	**650**	**1,537**	**668**	**1,379**	**210**	**2,257**	**400**	**26**	**22**	**389**	**437**	**1,892**	**168**	**1,148**	**41**	**1,357**				
07:30-18:00	CAR	2,595	674	360	278	1,312	4,182	2,080	3,734	702	6,516	1,336	170	120	1,422	1,712	5,718	514	3,622	155	4,291	N	66	0	0
	TRK	42	12	14	7	33	468	24	461	14	499	48	0	3	36	39	342	31	294	4	329	S	170	7	0
8 HR SUM	BUS	18	0	8	3	11	51	9	48	0	57	4	0	4	39	43	66	0	27	1	28	E	47	0	0
																						W	242	6	0
	TOTAL:	**2,655**	**686**	**382**	**288**	**1,356**	**4,701**	**2,113**	**4,243**	**716**	**7,072**	**1,388**	**170**	**127**	**1,497**	**1,794**	**6,126**	**545**	**3,943**	**160**	**4,648**				

Total 8 Hour Vehicle Volume: 14,870
Comment:

Total 8 Hour Bicycle Volume: 13

Total 8 Hour Intersection Volume: 14,883

City of Toronto - Traffic Data Centre & Safety Bureau

Turning Movement Count Summary Report

GAYDON AVE AT LILAC AVE & WESTON RD

Survey Date: 2003-Apr-03 (Thursday)
Survey Type: Routine Hours

Time Period	Vehicle Type	NORTHBOUND Exits	Left	Thru	Right	Total	EASTBOUND Exits	Left	Thru	Right	Total	SOUTHBOUND Exits	Left	Thru	Right	Total	WESTBOUND Exits	Left	Thru	Right	Total		Peds	Bike	Other
07:45-08:45	CAR	1,134	14	1,108	20	1,142	66	12	4	13	29	1,594	42	1,420	2	1,464	16	161	0	14	175	N	11	0	0
	TRK	49	0	49	1	50	1	0	0	0	0	127	0	125	0	125	0	2	0	0	2	S	19	0	0
AM PEAK	BUS	22	0	21	1	22	2	1	1	0	2	29	0	25	0	25	0	4	0	0	4	E	10	0	0
																						W	15	0	0
	TOTAL:	**1,205**	**14**	**1,178**	**22**	**1,214**	**69**	**13**	**5**	**13**	**31**	**1,750**	**42**	**1,570**	**2**	**1,614**	**16**	**167**	**0**	**14**	**181**				
16:45-17:45	CAR	883	13	855	32	900	56	7	3	6	16	1,823	21	1,725	3	1,749	23	92	7	21	120	N	15	0	0
	TRK	53	1	53	1	55	1	0	0	0	0	51	0	50	0	50	1	1	0	0	1	S	5	0	0
PM PEAK	BUS	8	0	7	0	7	0	1	0	0	1	9	0	8	0	8	0	1	0	0	1	E	11	0	0
																						W	15	0	0
	TOTAL:	**944**	**14**	**915**	**33**	**962**	**57**	**8**	**3**	**6**	**17**	**1,883**	**21**	**1,783**	**3**	**1,807**	**24**	**94**	**7**	**21**	**122**				
OFF HR AVG	CAR	728	6	711	25	742	54	5	4	7	16	847	25	778	3	806	11	62	2	12	76	N	10	0	0
	TRK	78	0	78	2	80	3	0	0	0	0	87	1	85	0	86	0	2	0	0	2	S	3	0	0
	BUS	10	0	10	0	10	0	0	0	0	0	12	0	12	0	12	0	0	0	0	0	E	10	0	0
																						W	4	0	0
	TOTAL:	**816**	**6**	**799**	**27**	**832**	**57**	**5**	**4**	**7**	**16**	**946**	**26**	**875**	**3**	**904**	**11**	**64**	**2**	**12**	**78**				
07:30-09:30	CAR	2,141	17	2,101	44	2,162	117	20	8	23	51	2,835	65	2,525	5	2,595	24	287	2	20	309	N	18	0	0
	TRK	111	0	110	3	113	10	0	0	0	0	234	7	228	0	235	1	6	1	1	8	S	23	0	0
2 HR AM	BUS	45	0	42	1	43	3	1	1	0	2	48	1	43	0	44	0	5	0	2	7	E	15	0	0
																						W	20	0	0
	TOTAL:	**2,297**	**17**	**2,253**	**48**	**2,318**	**130**	**21**	**9**	**23**	**53**	**3,117**	**73**	**2,796**	**5**	**2,874**	**25**	**298**	**3**	**23**	**324**				
16:00-18:00	CAR	1,702	19	1,652	63	1,734	121	13	5	9	27	3,319	53	3,139	6	3,198	37	171	12	37	220	N	20	0	0
	TRK	89	1	89	1	91	1	0	0	0	0	104	0	102	0	102	1	2	0	0	2	S	7	0	0
2 HR PM	BUS	14	0	13	0	13	0	1	0	0	1	18	0	17	0	17	0	1	0	0	1	E	20	0	0
																						W	32	0	0
	TOTAL:	**1,805**	**20**	**1,754**	**64**	**1,838**	**122**	**14**	**5**	**9**	**28**	**3,441**	**53**	**3,258**	**6**	**3,317**	**38**	**174**	**12**	**37**	**223**				
07:30-18:00	CAR	6,756	58	6,598	205	6,861	448	53	27	60	140	9,540	216	8,776	22	9,014	101	704	21	105	830	N	78	0	0
	TRK	513	1	511	11	523	20	0	0	1	1	685	9	670	0	679	2	14	1	2	17	S	42	0	0
8 HR SUM	BUS	100	0	96	1	97	4	2	2	0	4	114	1	108	0	109	0	6	0	2	8	E	75	0	0
																						W	69	0	0
	TOTAL:	**7,369**	**59**	**7,205**	**217**	**7,481**	**472**	**55**	**29**	**61**	**145**	**10,339**	**226**	**9,554**	**22**	**9,802**	**103**	**724**	**22**	**109**	**855**				

Total 8 Hour Vehicle Volume: 18,283
Comment:

Total 8 Hour Bicycle Volume: 0

Total 8 Hour Intersection Volume: 18,283

Printed On: 17 Mar, 2006 10:39:18AM

City of Toronto - Traffic Data Centre & Safety Bureau

Turning Movement Count Summary Report

OAK ST AT WESTON RD

Survey Date: 2003-Nov-26 (Wednesday)
Survey Type: Routine Hours

Time Period	Vehicle Type	NORTHBOUND Exits	NB Left	NB Thru	NB Right	NB Total	EASTBOUND Exits	EB Left	EB Thru	EB Right	EB Total	SOUTHBOUND Exits	SB Left	SB Thru	SB Right	SB Total	WESTBOUND Exits	WB Left	WB Thru	WB Right	WB Total		Peds	Bike	Other
08:00-09:00	CAR	1,525	5	1,358	145	1,508	253	27	8	15	50	1,062	100	859	9	968	14	188	0	140	328	N	50	0	0
	TRK	39	0	36	0	36	3	0	0	0	0	39	3	35	0	38	0	4	0	3	7	S	0	0	0
AM PEAK	BUS	24	2	20	4	26	5	1	0	1	2	24	1	18	0	19	2	5	0	3	8	E	16	0	0
																						W	9	0	0
	TOTAL:	**1,588**	**7**	**1,414**	**149**	**1,570**	**261**	**28**	**8**	**16**	**52**	**1,125**	**104**	**912**	**9**	**1,025**	**16**	**197**	**0**	**146**	**343**				
17:00-18:00	CAR	1,285	28	1,201	226	1,455	394	13	7	8	28	1,885	161	1,419	14	1,594	47	458	5	71	534	N	40	0	0
	TRK	52	0	52	3	55	4	0	0	1	1	23	1	19	0	20	0	3	0	0	3	S	0	0	0
PM PEAK	BUS	12	0	10	2	12	2	0	0	1	1	11	0	9	0	9	0	1	0	2	3	E	19	0	0
																						W	0	0	0
	TOTAL:	**1,349**	**28**	**1,263**	**231**	**1,522**	**400**	**13**	**7**	**10**	**30**	**1,919**	**162**	**1,447**	**14**	**1,623**	**47**	**462**	**5**	**73**	**540**				
OFF HR AVG	CAR	880	10	788	157	955	242	11	5	10	26	906	80	657	9	746	22	239	3	81	323	N	28	0	0
	TRK	40	1	33	3	37	8	1	0	0	1	31	5	29	0	34	2	2	1	6	9	S	0	0	0
	BUS	19	0	18	2	20	2	0	0	0	0	19	0	17	0	17	0	2	0	1	3	E	26	0	0
																						W	4	0	0
	TOTAL:	**939**	**11**	**839**	**162**	**1,012**	**252**	**12**	**5**	**10**	**27**	**956**	**85**	**703**	**9**	**797**	**24**	**243**	**4**	**88**	**335**				
07:30-09:30	CAR	2,859	11	2,580	274	2,865	471	39	16	35	90	2,014	181	1,617	18	1,816	30	362	1	240	603	N	74	0	0
	TRK	66	0	57	2	59	12	1	0	0	1	75	10	66	0	76	0	9	0	8	17	S	0	0	0
2 HR AM	BUS	44	2	38	7	47	9	1	0	1	2	55	2	44	0	46	2	10	0	5	15	E	32	0	0
																						W	9	0	0
	TOTAL:	**2,969**	**13**	**2,675**	**283**	**2,971**	**492**	**41**	**16**	**36**	**93**	**2,144**	**193**	**1,727**	**18**	**1,938**	**32**	**381**	**1**	**253**	**635**				
16:00-18:00	CAR	2,509	45	2,294	444	2,783	770	25	14	20	59	3,503	312	2,621	35	2,968	88	862	8	190	1,060	N	107	0	0
	TRK	85	0	83	5	88	7	0	0	1	1	51	2	45	0	47	0	5	0	2	7	S	1	0	0
2 HR PM	BUS	33	0	29	5	34	7	0	0	2	2	33	2	26	1	29	1	5	0	4	9	E	56	0	0
																						W	14	0	0
	TOTAL:	**2,627**	**45**	**2,406**	**454**	**2,905**	**784**	**25**	**14**	**23**	**62**	**3,587**	**316**	**2,692**	**36**	**3,044**	**89**	**872**	**8**	**196**	**1,076**				
07:30-18:00	CAR	8,884	94	8,024	1,347	9,465	2,206	108	48	94	250	9,140	811	6,867	90	7,768	203	2,179	19	752	2,950	N	292	0	0
	TRK	308	2	272	17	291	50	3	0	2	5	252	33	227	0	260	4	23	2	33	58	S	1	0	0
8 HR SUM	BUS	149	2	137	20	159	25	1	0	3	4	161	5	137	1	143	3	21	0	11	32	E	193	0	0
																						W	37	0	0
	TOTAL:	**9,341**	**98**	**8,433**	**1,384**	**9,915**	**2,281**	**112**	**48**	**99**	**259**	**9,553**	**849**	**7,231**	**91**	**8,171**	**210**	**2,223**	**21**	**796**	**3,040**				

Total 8 Hour Vehicle Volume: 21,385 **Total 8 Hour Bicycle Volume: 0** **Total 8 Hour Intersection Volume: 21,385**

Comment: WEST LEG = #2450 WESTON RD ENT