



# **Bronson Avenue Operational and Safety Review**

**Prepared by  
Traffic Management and Operational Support  
Branch  
Public Works Department  
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## 1.0 INTRODUCTION

At its 7 November 2012 Transportation Committee meeting, Councillor Chernushenko brought forward a Councillor's report on the reduction of speed limit on Bronson Avenue between Holmwood Avenue and the pedestrian crossing at Brewer Way. This report was referred to staff to bring back a comprehensive In-Service Safety Review in March 2013; recognizing the current high speeds and historic rate of accidents, and efforts to be made to enforce existing limits and safe driving practices in the interim.

Public Works Staff completed a Safety and Operational review of the Bronson Avenue corridor and the outcome of the study follows. The proposed countermeasures identified in this report strike a balance between the needs of pedestrians and cyclists travelling through the corridor and the needs of motorists utilizing this roadway as a primary north-south travel route. The plan aims to enhance the safety of pedestrians and cyclists at potential conflict points with motorists while ensuring that the function of Bronson Avenue as an arterial road is maintained at its current state.

## 2.0 PREVIOUS STUDIES

A previous In-Service Road Safety Review (ISRSR) was completed for the same study area of Bronson Avenue in February 2006. A summary of the recommendation and implementations for the 2006 report are outlined in **Table 1**.

The implementation plan for this ISRSRA focused primarily on the implementation of low-cost signage and pavement marking changes and on the awareness of driver operating speeds and enforcement with treatments linked to reducing rear-end collisions and clarifying the configuration of the roadway. These measures were implemented in 2009. The majority of the recommendations from the ISRSR which were not implemented were those high costs measures linked to operational and/or infrastructure modifications to reduce vehicle operating speeds. Many of the recommendations that were proposed for speed reduction require major roadway modifications which would only be considered when the roadway will be rehabilitated.

**Table 1: Status of Recommendations from 2006 Bronson In-Service Road Safety Review**

<b>Summary of Recommendations/Implementations From 2006 Bronson Avenue Road Safety Review</b>			
<b>Problem</b>	<b>Treatment</b>	<b>Implementation</b>	<b>Date</b>
<b>Excessive Vehicle Operating Speeds</b>	Speed limit reduction	<i>Not implemented</i>	
	Police enforcement - <b>Non Engineering</b>		Ongoing/Periodic
	Speed boards		Ongoing/Periodic
	Provide an urban cross section	<i>Not implemented</i>	
	Horizontal deflection treatments (lane narrowing)	<i>Not implemented</i>	
	Vertical deflection treatments	<i>Not implemented</i>	
	Landscaping and other improvements	<i>Not Implemented</i>	
	Retime advance warning flasher (NB Bronson)	<i>Not supported by Traffic Operations</i>	
<b>Rear End Collisions</b>	Improve pavement friction	Testing not conducted.	
	Improve legibility and placement of signs	Implemented	2009
	Post a NO STOPPING zone throughout study area	Implemented	2009
	Provide bus bays on NB Bronson Ave	<i>Not supported by Transit Services</i>	
<b>Differences in Configuration and Control Strategies</b>	Standardize traffic control on Colonel By ramps	Implemented	2009
	Clarify configuration of Brewer Way	Implemented	2007-2010
<b>Unsafe Pedestrian and Cyclist Behaviour</b>	Reduce cross section width on Bronson Ave	<i>Not implemented</i>	
	Shorten signal cycle length at Brewer Way	<i>Not implemented</i>	
	Provide a time to next WALK display (Brewer Way)	Time to end of walk implemented	
	Change bus stop locations (NB Bronson)	<i>Not supported by Transit Services</i>	
	Prevent mid-block crossings (landscaping)	<i>Not implemented</i>	
	Provide sidewalk facilities on west side of Bronson	Implemented	2009
	Public education campaign - <b>Non Engineering</b>		Ongoing

### **3.0 EXISTING CONDITIONS**

Bronson Avenue is a 6-lane divided arterial roadway from 275m north of Sunnyside Avenue at the Colonel By Drive/Bronson Place ramps to the southern limit of the study area. The roadway reduces to a 4-lane divided cross-section north of this point to Holmwood Avenue and beyond. Bronson Avenue provides access to Highway 417 north of the Glebe and Dalhousie South communities. South of Heron Road, Bronson Avenue develops into the Airport Parkway that

provides direct access to the Ottawa International Airport and communities in the southern part of the City. The section between Brewer Way and Holmwood Avenue serves as a transition zone from a higher speed environment (the Airport Parkway) to a moderate speed arterial through a dense urban environment (the Glebe/Dow's Lake communities).

Bronson Avenue is classified as an arterial roadway within the City's roadway classification system. According to the City's *Transportation Master Plan* (2008), the primary function of an arterial roadway is to "serve 'through' travel between points not accessed directly from the road itself". That being said, Bronson is a high volume corridor that must retain mobility for all motorised users, including automobiles, transit, and emergency response vehicles.

Within the study area, as shown in **Figure 1**, Bronson Avenue is bordered on the west side by the Carleton University and the Old Ottawa South community to the east. Brewer Park and the National Capital Commission (NCC) pedestrian and cycling pathways are located adjacent to this section of Bronson Avenue. Each of these land uses generates high volumes of pedestrian and cyclist activity in the corridor.

### **Pedestrian Facilities**

There are sidewalks located on both sides of Bronson Avenue. A 2.0 m boulevard is located between the curb and sidewalk on the eastside of the roadway between Brewer Way and Sunnyside Avenue. The remaining sidewalks on Bronson Avenue abut the curb. The sidewalk is approximately 2.0 m wide between the southern limit of the study to Findlay Avenue, on both sides of the roadway. Beyond Findlay Avenue, the sidewalk narrows to approximately 1.5m.

### **Cycling Facilities**

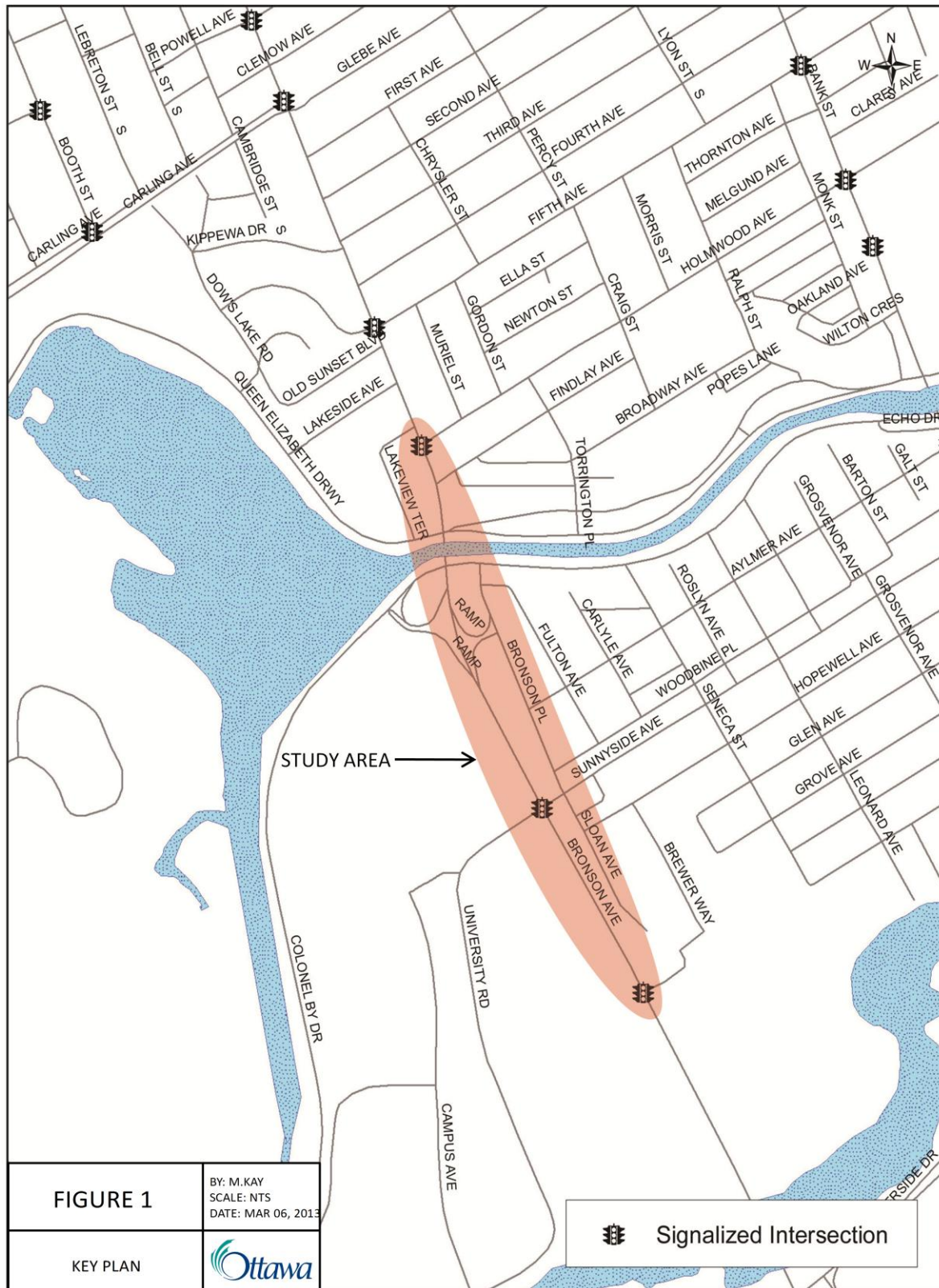
On-road cycling lanes are painted adjacent to the curb, for both the northbound and southbound direction. The widths of the lanes vary between 1.5 m and 1.8 m. The *City of Ottawa 2008 Cycling Master Plan* identifies the cycling facilities on this section of Bronson Avenue as existing routes on the City-wide (spline) cycling route.

In addition, there is an off road cycling facility running east-west that provides a connection between Carleton University and Bronson Avenue. Multi-use pathways are typically designed to encourage a wide range of users including both pedestrians and cyclists.

### **Posted and Operating Speeds**

Posted speed limits in the study area range from 50 km/h to 70 km/h. The 70 km/h posted speed extends from the southern limit of the study area to 50 m south of Sunnyside Avenue. At this location, the posted speed reduces to 60 km/h and extends to Findlay Avenue. Between Findlay Avenue to Holmwood Avenue and to the north, the posted speed limit is 50 km/h.

**Figure 1: Key Plan**



Speed surveys were conducted in the corridor to determine the average and 85<sup>th</sup> percentile operating speeds. The 85<sup>th</sup> percentile speed is the speed which 85 percent of the traffic is operating at or below. A speed survey captures vehicle travelling speeds passing a point under free flow conditions. A summary of the data is outlined below in **Table 2**.

As shown in **Table 2**, operating speeds are fairly consistent along the corridor but those in the southbound direction are slightly higher than those in the northbound direction. An average of 70% of motorists complied with the posted speed limit between 200m south of Brewer Way to Sunnyside Avenue. Motorist compliance reduces to 6% for the section between Sunnyside Avenue and Findlay Avenue. The operating speeds of auxiliary lanes to go to and from Col By Drive and the right turn lane to get to Findlay Avenue are also noted.

**Table 2: Average and 85<sup>th</sup> Percentile Vehicle Speeds within Bronson Avenue Study Area**

LOCATION	Survey Date	Posted Speed (km/h)	Average Speed (km/h)			85th Percentile (km/h)		
			NB	SB	Combined	NB	SB	Combined
200m south of Brewer Way to Sunnyside Avenue	October, 2012	70	65	68	66	74	76	75
Sunnyside Avenue to Findlay Avenue	October, 2012	60	68	70	69	74	77	76
Bronson Avenue NB right turn lane to Bronson PI	October, 2012	-	N/A	-	-	45	-	-
Bronson Avenue NB right turn lane to Findlay Avenue	October, 2012	-	N/A	-	-	47	-	-
Bronson Avenue SB off ramp to Col By Drive	October, 2012	-	-	N/A	-	-	53	-
Col By Drive On ramp to Bronson Avenue SB	October, 2012	-	-	N/A	-	-	60	-

### **Pedestrian, Cyclist and Traffic Volumes**

**Table 3** summarizes recent pedestrian and cycling volumes at the intersections within the study area. Summer and winter counts have been included where possible. The winter counts were



undertaken when school was in session at Carleton. Note that cycling volumes drop off in the winter but pedestrian volumes are much higher while school is in.

**Table 3: Cyclist and Pedestrian Volumes within the Bronson Avenue Study Area**

INTERSECTION	Cyclists on Bronson		Pedestrians Crossing Bronson	Date of Count	Season
	Northbound	Southbound			
Bronson at Holmwood	87	136	188	27-Jun-11	Summer
	7	8	266	09-Jan-13	Winter
Bronson at Findlay	148	171	6	07-Aug-07	Summer
Bronson at Sunnyside	120	21	192	27-Jun-11	Summer
	2	8	984	09-Jan-13	Winter
Bronson at Brewer	176	105	263	27-Jun-11	Summer
	2	2	1290	09-Jan-13	Winter

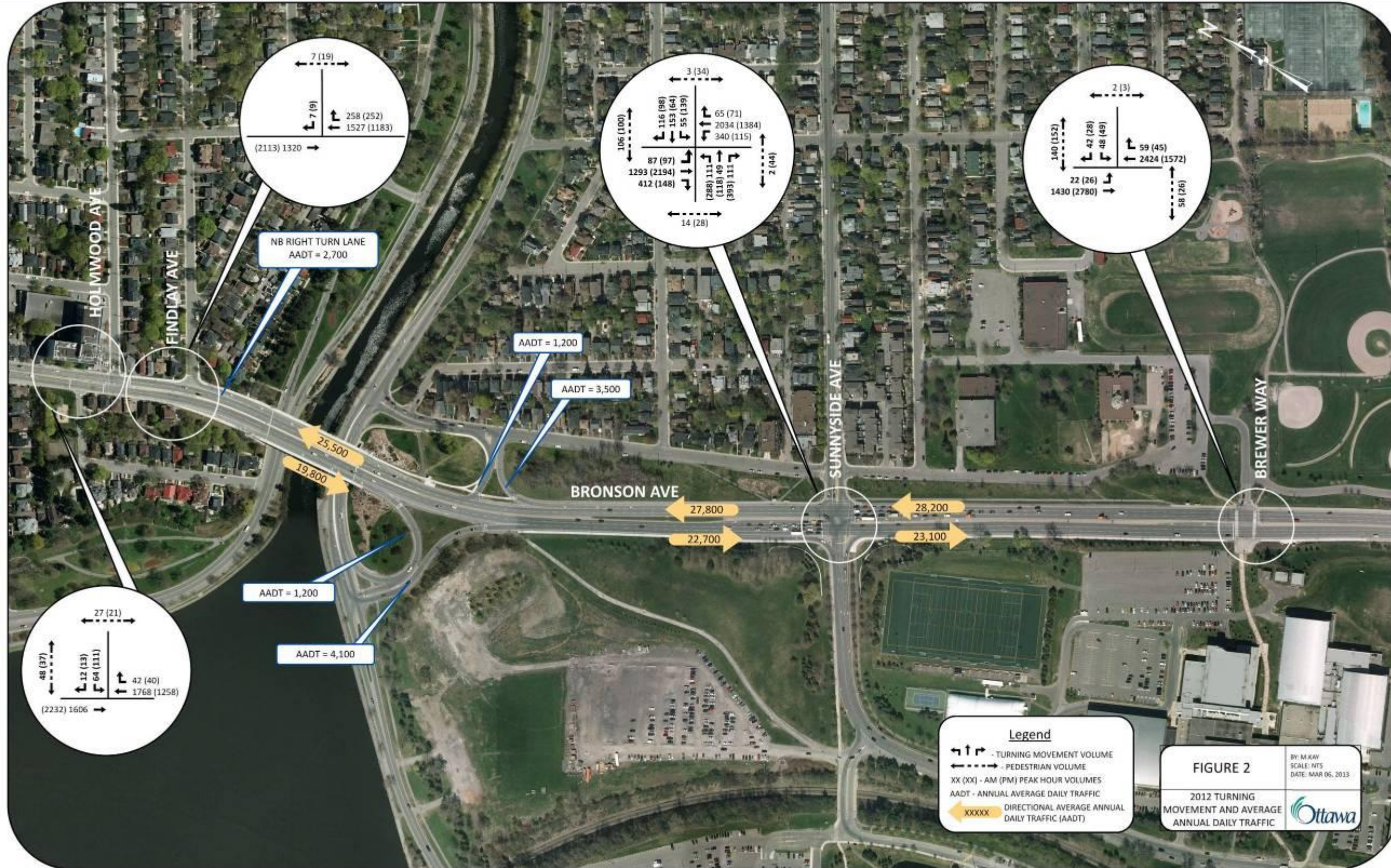
Northbound and southbound vehicular traffic volumes on Bronson Avenue are fairly high in the study area. Turning movement counts were conducted for each signalized intersection and the on/off ramps for Bronson Avenue and Colonel By Drive as part of this review. Figure 2 illustrates the traffic volumes at these locations. In addition, 2011 two-way Average Annual Daily Traffic (AADT) volumes were also used in this review. The 2012 traffic count data were analyzed to determine the directional AADT volumes on Bronson Avenue. It was determined the northbound/ southbound directional split is 45% and 55%, respectively. A summary of the AADT volumes on Bronson Avenue are summarized in the **Table 4**. A diagram illustrating the 2012 turning movement and AADT volumes in the corridor is shown in **Figure 2**.

The traffic volumes along this corridor are comparable to those on major arterial roadways within the city.

**Table 4: Average Annual Daily Traffic within the Bronson Avenue Study Area**

LOCATION	Average Annual Daily Traffic (AADT)		
	NB	SB	Combined
Brewer Way to Sunnyside Avenue	28,200	23,100	51,300
Sunnyside Avenue to south-end of Canal	27,800	22,700	50,500
South-end of Canal to Findlay Avenue	25,500	19,800	45,300

Figure 2: Turning Movement and AADT Volumes (2012)



## 4.0 COLLISION ANALYSIS AND DISCUSSION

A collision analysis for a ten year time period between 1 January 2002 and 31 December 2011 was undertaken as part of this review. Over this ten year time period, there was a total of 604 collisions within the study area. Information was obtained from police motor vehicle accident reports, and analysed to determine if there were any trends that might indicate issues that may be addressed by engineering, education or enforcement. Cycling and pedestrian related collisions were analysed in detail.

Collision diagrams for each intersection and mid-block location are included in **Appendix A**. The spatial collision diagrams indicate that there is a concentration of collisions at the intersections with Brewer Way and Sunnyside Avenue. The majority of collisions along the corridor are rear-ends. This is typical of signalized intersections. At the intersection with Brewer Way, there is a higher proportion of collisions in the northbound direction. This is indicative of the change in the roadway environment that occurs at this location, from free flow between the Airport and Brewer Way, to signalized intersections from Brewer Way, northbound. When compared to all signalized intersections in the City, the rear-end collision occurrence northbound at Brewer Way is not over-represented. At the Sunnyside intersection, collisions in the southbound direction are higher than in the northbound direction. This is likely a result of the speeds resulting from the downward slope of Bronson Avenue approaching the intersection. Also, the right-angle collisions all involve southbound vehicles, which is an indication of speed and grade related issues.

### Overall Collisions

The City's Safety Improvement Program prioritizes locations for study based on the frequency of collisions (number of collisions per year) and the collision rate (number of collisions relative to traffic volumes). When compared to other roadway corridors within the City, this section of Bronson Avenue ranks 30<sup>th</sup> in terms of frequency of collisions and 96<sup>th</sup> for collision rate based on 2011 data. **Table 5** outlines the 3-year collision frequency and rate by location for the study area. These numbers do not distinguish Bronson Avenue as a high safety concern for the City.

**Table 5: Collision Frequency and Rates for Bronson Avenue Study Area, 2009-2011**

Intersection with Bronson Avenue	Collision Frequency ( <i>Collision Rate</i> )*		
	2009	2010	2011
Brewer Way	17 (1.00)	11 (0.65)	22 (1.26)
Sunnyside Ave/University Dr	15 (0.88)	14 (0.76)	21 (0.99)
Findlay Ave	0 (0.00)	0 (0.00)	1 (0.08)
Northbound at Bronson Place On-Ramp	1 (0.11)	1 (0.11)	1 (0.11)
Southbound at Colonel By Off-Ramp	2 (0.24)	0	0
Holmwood Ave	3 (0.21)	5 (0.36)	3 (0.22)
Mid-Block Location on Bronson Avenue	Collision Frequency ( <i>Collision Rate</i> )*		
	2009	2010	2011
200m S of Brewer Way to Brewer Way	3 (0.18)	7 (0.42)	1 (0.06)
Brewer Way to Sunnyside Ave/University Dr	6 (0.38)	3 (0.19)	8 (0.45)
Sunnyside Ave to Colonel By Off-Ramp	4 (0.26)	2 (0.12)	3 (0.16)
Colonel By Off-Ramp to Findlay Ave	1 (0.08)	2 (0.15)	4 (0.31)
Findlay Ave to Holmwood Ave	2 (0.14)	6 (0.43)	1 (0.07)

\* A collision frequency is a representation of the number of collisions occurring during a specified time period. A collision rate is determined either by intersection or mid-block basis as collisions per million vehicles entering the intersection or per million vehicle-kilometres.

### Over-representation Analysis

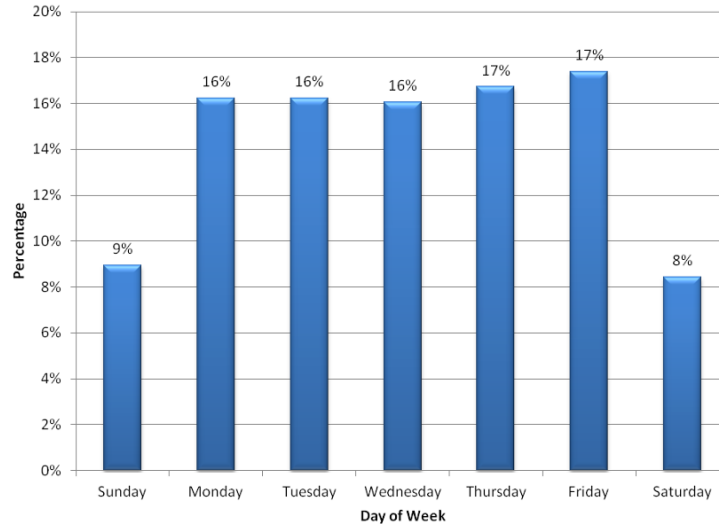
The over-represented results, which are discussed in the following analysis, came from a CHI square analysis. The CHI square analysis is a measure of the differences between measured and expected frequencies at an intersection. The collision data at an intersection provides the measured frequency; the combined collision data from a large number of similar intersections provide the expected frequency.

The collision data on Bronson Avenue was compared to data at all signalized intersections in the City of Ottawa for the same 10-year time frame. The key collision characteristics which were found to be over-represented in the Bronson Avenue study area are documented over the following pages. Other collision characteristics, not explained below were found to be in line with expected results.

### Day of Week

The collision data was reviewed for trends relating the day of the week collisions occurred. **Figure 3** represents a summary of the analysis.

**Figure 3: Percentage of Collisions by Day of Week for Bronson Avenue Study Area, 2002-2011**

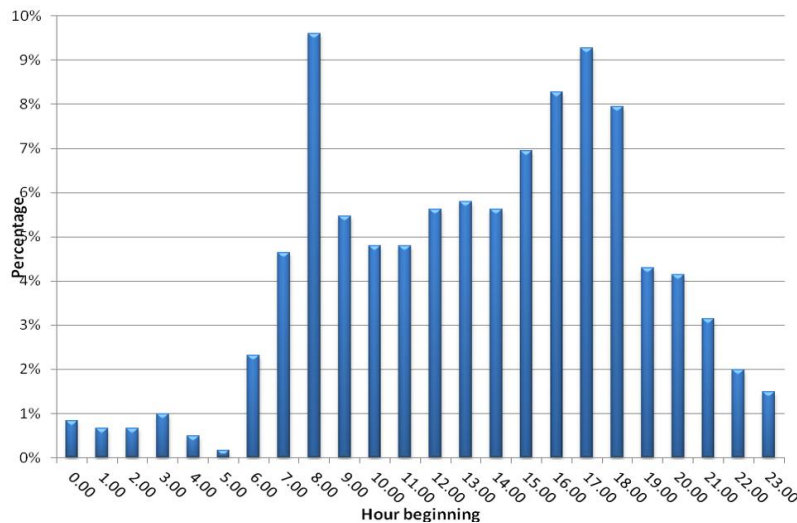


The day of the week analysis indicates a typical distribution of collisions occurring with a higher frequency during weekdays than on weekends. The monthly analysis indicates more collisions during the winter months, which is also typical in Ottawa. However, the month of January is significantly higher than average for that month in Ottawa. Conversely, December is significantly lower.

### Time of Day

The collision data was reviewed for trends relating the day of the week collisions occurred. **Figure 4** represents a summary of the analysis.

**Figure 4: Percentage of Collisions by Time of Day for Bronson Avenue Study Area, 2002-2011**

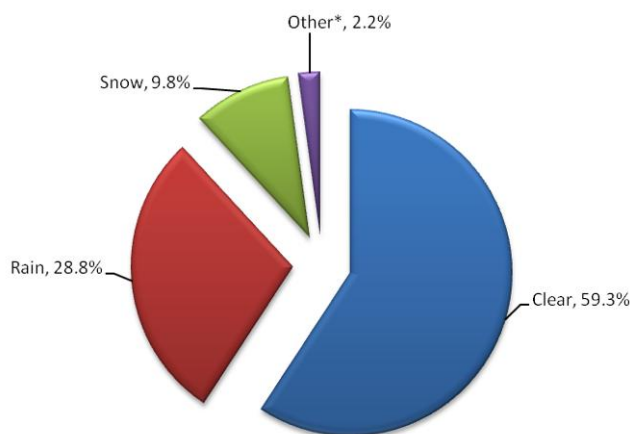


The hourly collision analysis indicates a typical distribution of collisions peaking in occurrence during the morning and afternoon rush hours. However, the Bronson data exhibits a higher peak in the morning rush hour, than in the afternoon rush hour, which is not typical for Ottawa. Compared to all collisions in Ottawa, the afternoon rush hour has a higher peak.

### Weather Conditions

The collision data was reviewed for trends relating to the weather conditions when the collisions occurred. **Figure 5** represents a summary of the analysis.

**Figure 5: Percentage of Collisions by Weather Condition for Bronson Avenue Study Area, 2002-2011**



Compared to Ottawa averages, Bronson Avenue experiences more crashes during rainy and snowy weather. The “other” weather collisions represent drifting, freezing rain and strong wind conditions.

### **Collisions Involving Pedestrians**

Collisions involving pedestrians along the study corridor were analysed separately. A total of 14 collisions involving pedestrians occurred over the 10 year time period. The following list provides a breakdown of the number of collisions by location:

- Two collisions occurred at Brewer Way
- Six collisions occurred at Sunnyside Avenue/University Drive
- Three collisions occurred in the vicinity of the Colonel By Drive on/off ramps
- One collision occurred on the bridge south of Findlay Avenue
- One collision occurred at Holmwood Avenue
- One collision occurred mid-block between Sunnyside Avenue and Brewer Way

The collisions along the study corridor were compared to pedestrian collisions city wide, during the same 10 year time period. This comparison showed that the proportion of pedestrians involved in collisions occurring after dark was higher in the study section than city wide. A total

of 7 or 45% of pedestrian collisions occurred at night. The other pedestrian collision characteristics were comparable to city wide averages. The study corridor typically has one or two pedestrian collisions per year. There is a higher representation of collisions involving pedestrians in the Fall and Winter months; and all of them occurred on weekdays.

### **Collisions Involving Cyclists**

Collisions involving cyclists along the study corridor were analysed separately. A total of 18 collisions involving cyclists occurred over the 10 year time period. The following outlines location specific characteristics:

- Six collisions occurred at Brewer Way
- Five collisions occurred at Sunnyside Avenue/University Drive
- Four collisions occurred in the vicinity of the Colonel By Drive on/off ramps
- One collision occurred at Findlay Avenue
- Two collisions occurred mid-block south of Findlay Avenue

The collisions along the study corridor were compared to cycling collisions city wide, during the same time period. The following list provides a breakdown of the number of collisions by location:

- Collisions with bicycles in September were over-represented
- Collisions with bicycles during dark conditions were over-represented
- Collisions with bicycles during wet conditions were over-represented

The September over-representation could be the result of new students riding to Carleton. While the over-representation of dark and wet conditions could indicate that the student population is more likely to ride during those conditions, than the average Ottawa cyclists. This may be a reflection of the commuting nature of cycling in and around Bronson.

The cycling collision data was also reviewed for trends relating to severity. Examples of severity type include injury or fatal collisions. Within the study section, collisions with cyclists occur between 0 and 3 times per year. Within the 10 year period ending in December 2011, there were no cycling collisions that resulted in a fatality, but 95 percent resulted in an injury. It should be noted that a cycling fatality did occur in October 2012 at the northern end of the study area.

### **Pedestrian and Cyclist Safety**

In the 10 year collision history period ending December 2011, the only fatality along the corridor was a pedestrian which occurred mid-block between Sunnyside Avenue and Brewer Way in 2003 (along with the noted cycling fatality in 2012). There were 604 collisions within the corridor, 38 (approximately 6 %) of which involved a cyclist or pedestrian. Pedestrian and cycling volumes are in the range of 1% of the vehicular volumes along the corridor.

## 5.0 PUBLIC CONSULTATION

In order to gauge the comfort level of the pedestrians and cyclists who use the facility on a regular basis, there was a public consultation component included in this review. Throughout the process there were regular meetings with an advisory group which included representation from the community associations in the surrounding area, delegates from Carleton University (students and administration staff), the ward Councillor and his staff. Public feedback was also gathered through the administration of an online and in-field user survey as well as a Public Open House.

The information gathered through the public consultation helped identify areas of concerns to provide guidance during the selection of appropriate countermeasures.

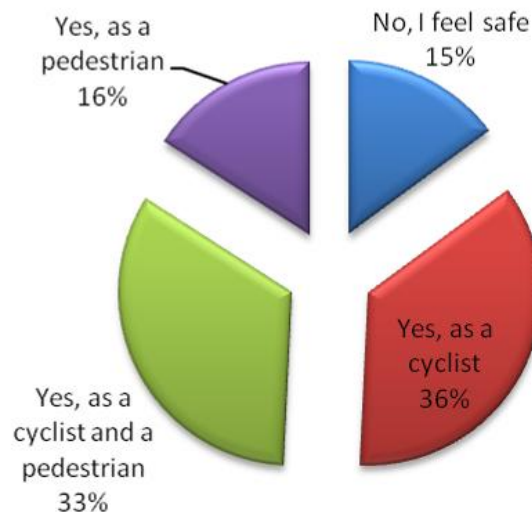
### In-field Cycling and Pedestrian Survey

An in-field survey with pedestrians and cyclists was conducted at three locations on Bronson Avenue to identify safety concerns in the corridor. The survey was completed on Friday 16 November 2012 between 8:00 a.m. and 10:00 a.m. Surveys were conducted at the following locations:

- Intersection of Brewer Way at Bronson Avenue
- Intersection of Bronson Avenue at Sunnyside Avenue
- West side of Bronson Avenue, at the south-end of the canal bridge

A brief questionnaire was presented to cyclists or pedestrians who were willing to stop and answer questions for a few minutes. An option to fill out the survey online was also provided. The total number of surveys completed was 668. Of the 668 surveys, 102 were completed in-field and 566 were completed and submitted online as of 7 January 2013. A summary of the survey results are depicted in **Figure 6** through **Figure 10**.

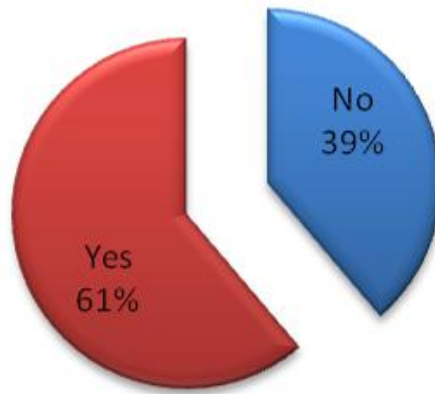
**Figure 6: Do you often feel unsafe at this segment of roadway?**





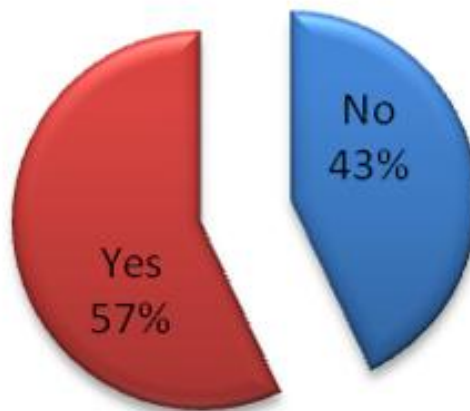
A large majority of pedestrians and cyclists surveyed felt unsafe as a user of the corridor. Of the total surveyed, 101 felt safe, 239 felt unsafe as cyclists, 106 felt unsafe as pedestrians and 222 felt unsafe as a pedestrian and cyclist.

**Figure 7: Do high vehicle speeds make you feel unsafe along this roadway?**



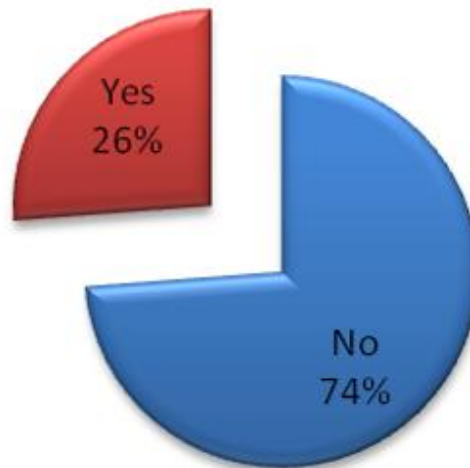
More than half of those surveyed considered high vehicle speeds as one of the factors affecting their safety while walking or cycling. Of the total surveyed, 409 felt unsafe due to the high speeds along this segment of roadway.

**Figure 8: As a cyclist, does sharing the narrow travel lanes make you feel unsafe on this roadway?**



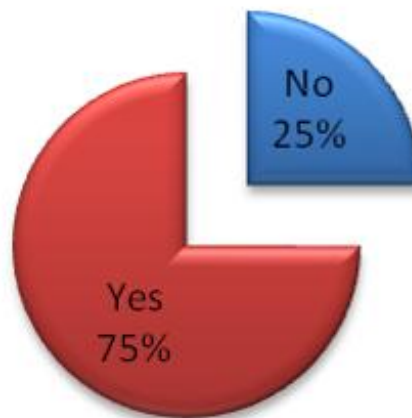
Of the total surveyed, 381 felt that sharing the narrow travel lanes with motorized vehicles made them feel unsafe as cyclists along this segment of roadway.

**Figure 9: As a pedestrian, do narrow sidewalks make you feel unsafe?**



Approximately three quarters of those surveyed did not feel that the width of the sidewalks affected their feeling of safety while walking along the corridor. Of the total surveyed, 175 of them felt that the narrow sidewalks made them feel unsafe as pedestrians along this segment of roadway.

**Figure 10: Do you notice motorists being impatient when making right-turns at pedestrian crossing locations?**



Of the total surveyed, 500 noticed motorists being impatient when making right turns at pedestrian crossing locations along this segment of roadway.

Based on these results, the majority of those surveyed felt unsafe while walking or biking along the corridor. The main areas of concern were found to be: high vehicular speeds, impatient right-turning motorists, crossing ramps to/from Colonel By, and narrow travel lanes for cyclists.

## **Advisory Committee Group**

An advisory committee was assembled to provide input on specific safety related issues on Bronson Avenue and to review potential countermeasures to address safety issues. The group had an opportunity to comment on the proposed countermeasures as well as assist in the organization a Public Open House. Representatives from the following organization and associations were present at the meetings:

- Carleton University
- Carleton University Department of University Safety
- Carleton University Graduate Student Association
- Carleton University (CU) Cycling
- Citizens for Safe Cycling
- Walk Ottawa
- Old Ottawa South Community Association
- Glebe Community Association
- Dows Lake Community Association

## **Public Open House**

A Public Open House was held at Carleton University on 27 February 2013, between 6:30 p.m. and 8:30 p.m. The purpose of the Open House was to present some of the proposed solutions. Twenty-two people filled out the sign-in sheet and ten residents provided written comments on the comment sheets provided that night. Three additional residents provided comments via email in the days following the event. Although the written record indicated 22 people attended the open house, it is estimated 80 people were actually present and viewed the drawings. The feedback from the Open House was generally favourable. Specific comments included:

- Apply green paint to the bike lane crossovers at the turn lanes
- Revise the long term treatment so that there are sidewalks and bike paths along both sides of the Colonel By access.
- Shorten pedestrian wait times for crossing at Sunnyside Avenue.
- Look at making it easier to get NB cyclists traveling west of Bronson (eg. To Little Italy)
- Prohibit the use of bicycles on the university pathway which runs from University Drive to Bronson Avenue, near the Colonel By on ramp

The information gathered through the public consultation helped identify areas of concerns to provide guidance during the selection of appropriate countermeasures.

## 6.0 SUMMARY OF ISSUES

The results of the operational review, collision analysis and the public consultation highlighted the following safety issues/concerns along the corridor:

- Wrong-way cycling due to the path connection from the University to Bronson
- Vehicle speeds along the corridor
- Midblock pedestrian crossing between Sunnyside and Brewer Way
- Pedestrian crossing difficulty (motorists not yielding to pedestrians) at a variety of crossing locations (Sunnyside, Colonel By ramps)
- Cyclist collisions over-represented after dark, September, and under wet conditions
- High rear end collision occurrence at Brewer Way in the NB direction

## 7.0 COUNTERMEASURE ASSESSMENT

The City's Road Safety Group conducted a review of known safety countermeasures to determine which ones might be most suitable to address the identified safety issues. As well, a literature review was conducted to determine if other jurisdictions had tried and/or evaluated any of the potential countermeasures for similar safety concerns. Immediate and proposed future measures were identified. Conceptual sketches of these measures as shown in **Proposed Future Countermeasures**

Proposed future countermeasures are countermeasures will require geometric changes and funding is possible through existing Capital Works programs. The modifications include:

- Modifications to the Colonel-By Drive Ramp intersections on the west side of Bronson Avenue to reduce the long auxiliary lanes and provide a more typical urban street T-intersection design. The benefits of this modification include:
  - Road width will be reallocated to segregate the bike lane in the southbound direction.
  - Motorists turning right onto and from Bronson Avenue will be required to slow down to very low speeds to make their turn, improving pedestrian and cycling comfort and safety.
- Pedestrian signal installed just north of the Colonel By Drive ramp intersection, with cross-rides. To meet warrants for a pedestrian signal at this location, 55 pedestrians/cyclists would have to be delayed more than 10 seconds. Based on the pedestrian and cycling data noted earlier in this report, this location meets the warrants for a pedestrian signal. The traffic control signal will provide a protected crossing location of Bronson Avenue in the proximity of the outlet of the pedestrian and cycling path that accesses Carleton University. This is a popular short-cut for pedestrians and cyclists. The installation of this signalized crossing will require the construction of an off-road multi-use pathway to connect the existing pathway to Carleton University with the crossing location. As well, the addition of this signal will eliminate the need for the sidewalk cycling bylaw on the west sidewalk. The benefits on the installation of the Traffic Control Signal include:
  - Provides a protected pedestrian crossing at a location that has latent demand (from the pathway, and the bus stop).
  - Provides northbound cyclists arriving from Carleton University the ability to safely cross Bronson Road and continue their northbound travel within the existing northbound bicycle lane.

- Reduce motorist speeds as motorists make right turns from Bronson Avenue to Col By Drive and as they turn onto Bronson from Col By Drive.
- Modifications to the northbound right turn lane to access Colonel By Drive to reduce the radius of the curve. The benefits of this modification include:
  - Improves pedestrian and cycling environment at the point where they meet vehicles.
  - Reduce vehicle speeds as they make the right turn from Bronson Avenue.

Other future countermeasures are countermeasures that require further study, significant funding and extensive geometric changes to the corridor. Funds for these works have not been identified and are not available within existing programs. They include:

- Modifications to the cross-section of Bronson Avenue to include a wider centre median, reduced width of vehicle travel lanes and landscaping to create a more typical urban streetscape design. The benefits of this modification include:
  - Road width allocation to provide boulevard separation between sidewalks and the roadway.
  - Improves the transition zones between higher and lower posted speeds.
  - May reduce driver speed through this section of Bronson Avenue.
- Construction of a 'gateway' feature at Brewer Way. The benefits of which is to indicate to drivers they are entering a "special" area, potentially affecting their speed.
- Raised segregated cycling lanes on Bronson Avenue. The primary benefit of this countermeasure is to provide a definitive separation between the vehicle travel lanes and adjacent cycling lanes. The installation will improve the safety of cyclists travelling on Bronson Avenue.
- Construction of cycling facilities to provide a cycling link between Findlay Avenue and Holmwood Avenue. This will be reviewed as part of the Bronson Road Rehabilitation from Carling Avenue to Rideau Canal.

Figure 11 through **Figure 13**.

## **Immediate Countermeasures**

Immediate countermeasures included items such as signage and pavement markings; items that could be implemented through Delegated Authority and within existing operating and capital budgets immediately. Some have been already been completed and others are planned for installation in spring 2013. They included:

- Bylaw modification on the Bronson Bridge over the Rideau Canal, to allow for cycling on the sidewalk. This is a temporary measure that will be removed when a traffic control signal is installed in the vicinity of the on/off ramps to Colonel By Drive. Sidewalk cycling is illegal in Ottawa, unless there is signage stating otherwise. This measure was completed in the Fall 2012.
- Installation of hatching on the bridge to shorten the southbound right-turn lane on Bronson Avenue at the Colonel By Drive on-ramp and the northbound right-turn lane on Bronson Avenue at Findlay Avenue. The intent of the hatching is to visually narrow the approaches so that drivers feel some discomfort at higher speeds which may lead to a reduction in operating speeds in this area. This measure will be monitored to determine effectiveness.
- Installation of advanced warning signs on the on/off ramps to Colonel By Drive to alert motorists to the fact that there are pedestrians/cyclists crossing the ramps.
- Installation of regulatory signage and associated pavement markings (diamonds) to establish the cycling lanes along Bronson as designated cycling facilities. In the absence of the signage, there is no legal way to enforce encroachment into the lanes by motorized vehicles.
- Installation of flexible post delineators along the lane line separating the cycling lanes from the general purpose traffic lanes along Bronson from south of Findlay Avenue to south of Brewer Way. Installation will be seasonal from approximately April to November. Such posts have been used in various traffic calming applications in Montreal and other cities with some measure of success. The intent is to introduce side-friction to help slow motorists down as well as to provide some level of segregation for the cyclists. The effectiveness of these devices in this type of application is unknown. As such, this measure will be implemented as a pilot in 2013 and monitored to determine effectiveness in future years.
- Installation of speed display boards in both northbound and southbound direction on Bronson Avenue. These boards will inform motorists of their travel speeds. Staff have seen increased adherence to the speed limit at locations where these signs have been installed on City roadways.
- Installation of enhanced pavement markings at the intersection of Bronson Avenue and Sunnyside through the installation of ladder-style crosswalk markings.
- Installation of enhanced pavement markings at the intersection of Brewer Way at Bronson Avenue, including: ladder-style crosswalk markings to facilitate pedestrian crossing of Bronson as well as cross-rides to facilitate crossing of Bronson by cyclists. Installation of cyclist detection on the west side of Bronson to allow cyclists to activate a dedicated signal phase for crossing. This will be the first installation of cross-rides within

the City of Ottawa and some educational material will be developed through the Cycling Safety Awareness Program. The benefits of this modification include:

- Increasing motorists' awareness and the visibility of cyclists.
- Providing cyclists with a designated space through the intersection, so that they are given guidance on where to position themselves.
- Installation of large font street signs. The street signs at Brewer Way and Sunnyside Avenue, visible to Bronson motorists are standard size. Larger signs will assist unfamiliar motorists with guidance.
- Reduced pedestrian walking time from 1.2m/s to 1.0m/s at the intersections with Brewer Way and Sunnyside. The modification to the walking speed will increase the amount of pedestrian walking time to cross Bronson Avenue.
- Modifications to signal heads including the installation of backboard reflective tape and upgraded LED lens to improve the visibility of the traffic signal heads at Brewer Way and Sunnyside Avenue.
- Partner with Carleton University and pedestrian and cycling groups to conduct a "Be Safe Be Seen" event on Campus in September through coordination with the Safer Roads Ottawa program. It includes instruction on the use of bike lights, reflective tape, pedestrian lights, etc. The purpose of the event is to educate students on how best to be seen when walking or cycling at night time in an attempt to lower the frequency of pedestrian or cyclist collisions occurring after dark.

## **Proposed Future Countermeasures**

Proposed future countermeasures are countermeasures will require geometric changes and funding is possible through existing Capital Works programs. The modifications include:

- Modifications to the Colonel-By Drive Ramp intersections on the west side of Bronson Avenue to reduce the long auxiliary lanes and provide a more typical urban street T-intersection design. The benefits of this modification include:
  - Road width will be reallocated to segregate the bike lane in the southbound direction.
  - Motorists turning right onto and from Bronson Avenue will be required to slow down to very low speeds to make their turn, improving pedestrian and cycling comfort and safety.
- Pedestrian signal installed just north of the Colonel By Drive ramp intersection, with cross-rides. To meet warrants for a pedestrian signal at this location, 55 pedestrians/cyclists would have to be delayed more than 10 seconds. Based on the pedestrian and cycling data noted earlier in this report, this location meets the warrants for a pedestrian signal. The traffic control signal will provide a protected crossing location of Bronson Avenue in the proximity of the outlet of the pedestrian and cycling path that accesses Carleton University. This is a popular short-cut for pedestrians and cyclists. The installation of this signalized crossing will require the construction of an off-road multi-use pathway to connect the existing pathway to Carleton University with the crossing location. As well, the addition of this signal will eliminate the need for the sidewalk cycling bylaw on the west sidewalk. The benefits on the installation of the Traffic Control Signal include:
  - Provides a protected pedestrian crossing at a location that has latent demand (from the pathway, and the bus stop).
  - Provides northbound cyclists arriving from Carleton University the ability to safely cross Bronson Road and continue their northbound travel within the existing northbound bicycle lane.

- Reduce motorist speeds as motorists make right turns from Bronson Avenue to Col By Drive and as they turn onto Bronson from Col By Drive.
- Modifications to the northbound right turn lane to access Colonel By Drive to reduce the radius of the curve. The benefits of this modification include:
  - Improves pedestrian and cycling environment at the point where they meet vehicles.
  - Reduce vehicle speeds as they make the right turn from Bronson Avenue.

Other future countermeasures are countermeasures that require further study, significant funding and extensive geometric changes to the corridor. Funds for these works have not been identified and are not available within existing programs. They include:

- Modifications to the cross-section of Bronson Avenue to include a wider centre median, reduced width of vehicle travel lanes and landscaping to create a more typical urban streetscape design. The benefits of this modification include:
  - Road width allocation to provide boulevard separation between sidewalks and the roadway.
  - Improves the transition zones between higher and lower posted speeds.
  - May reduce driver speed through this section of Bronson Avenue.
- Construction of a 'gateway' feature at Brewer Way. The benefits of which is to indicate to drivers they are entering a "special" area, potentially affecting their speed.
- Raised segregated cycling lanes on Bronson Avenue. The primary benefit of this countermeasure is to provide a definitive separation between the vehicle travel lanes and adjacent cycling lanes. The installation will improve the safety of cyclists travelling on Bronson Avenue.
- Construction of cycling facilities to provide a cycling link between Findlay Avenue and Holmwood Avenue. This will be reviewed as part of the Bronson Road Rehabilitation from Carling Avenue to Rideau Canal.



Figure 11: Immediate Measures at Brewer Way and Sunnyside Avenue/University Drive

- UPGRADE TRAFFIC SIGNAL LENSES (LED)
- ADD TRAFFIC SIGNAL BACKBOARD REFLECTIVE TAPE
- INCREASE PEDESTRIAN/CYCLIST CROSSING TIME
- BE SAFE BE SEEN CAMPAIGN AT CARLETON UNIVERSITY - FALL 2013



FIGURE 11 - PROPOSED IMMEDIATE MEASURES AT BREWER WAY AND SUNNYSIDE AVENUE

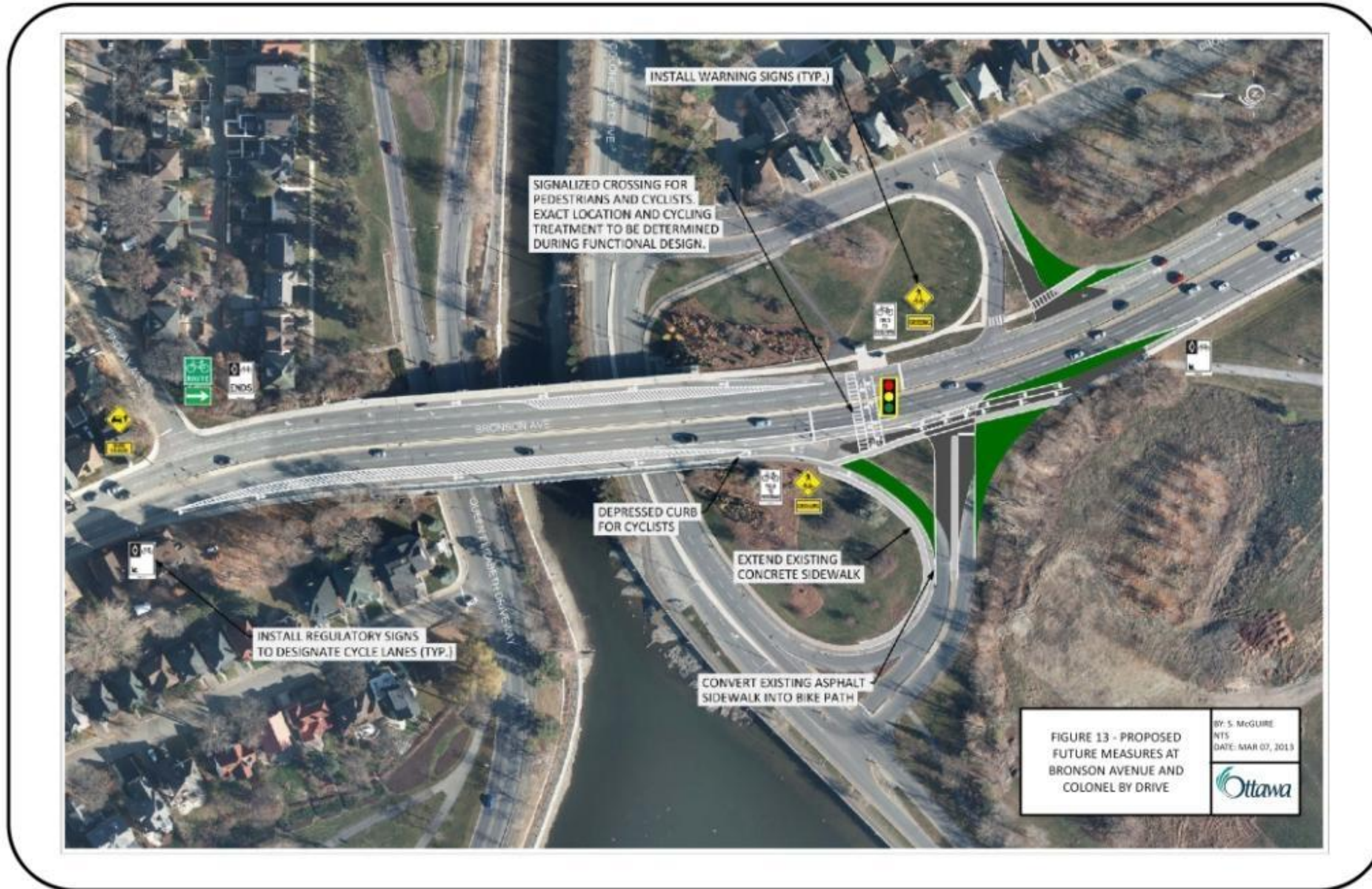
BY: S. MCGUIRE  
NTS  
DATE: MAR 7, 2013



Figure 12: Immediate Measures on Bronson Avenue at Colonel By Drive



Figure 13: Proposed Future Measures on Bronson Avenue at Colonel By Drive

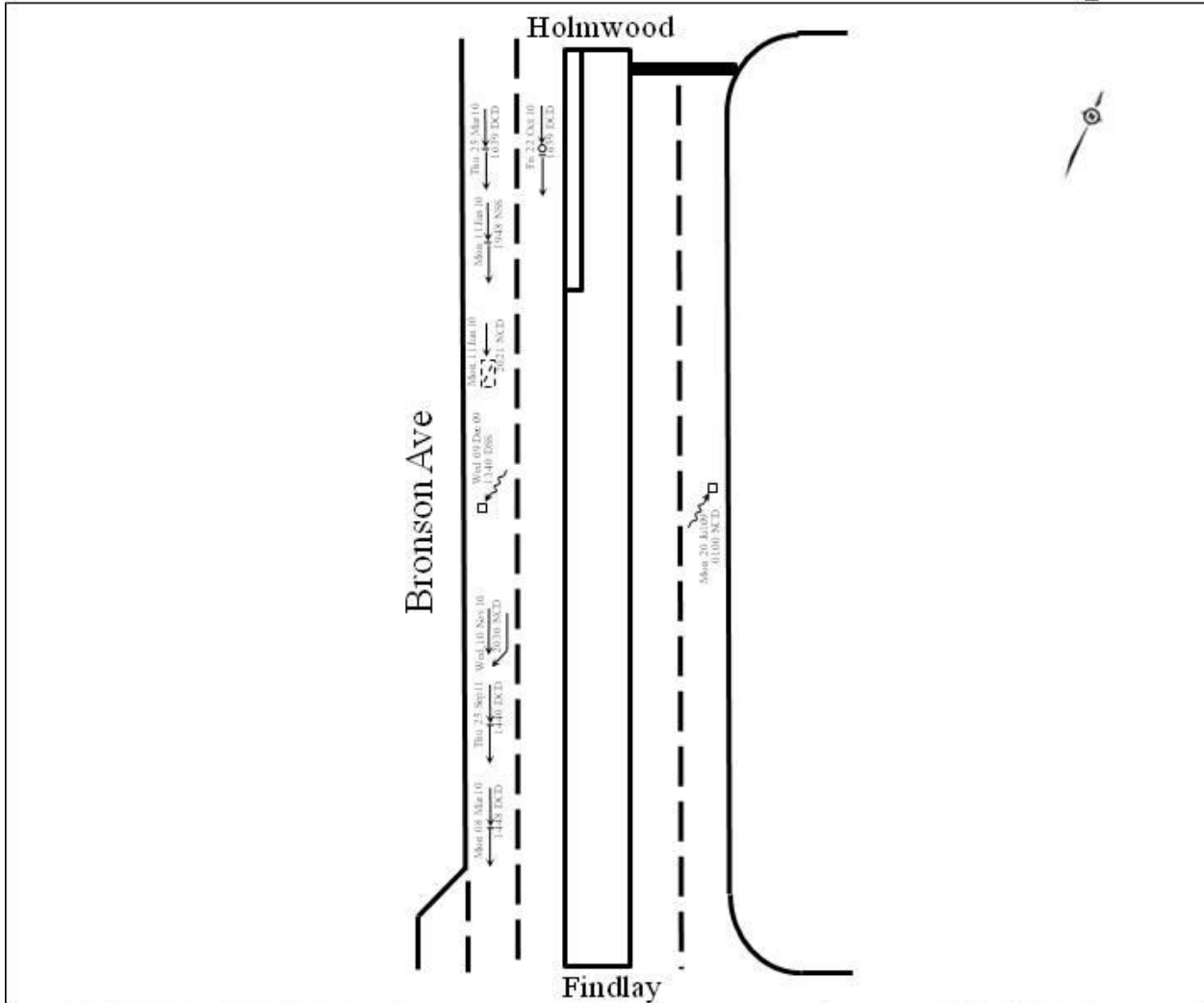


## **Appendix A: Collision Diagrams**

# Safety and Traffic Services COLLISION DIAGRAM

LOCATION: Bronson Ave – Homewood to Findlay PERIOD: 1 Jan 2009 to 31 Dec 2011

PREPARED ON: 14 December 2012 BY: M.Kay TOTAL COLLISIONS: 9  
(Daylight 5 Dark: 4)

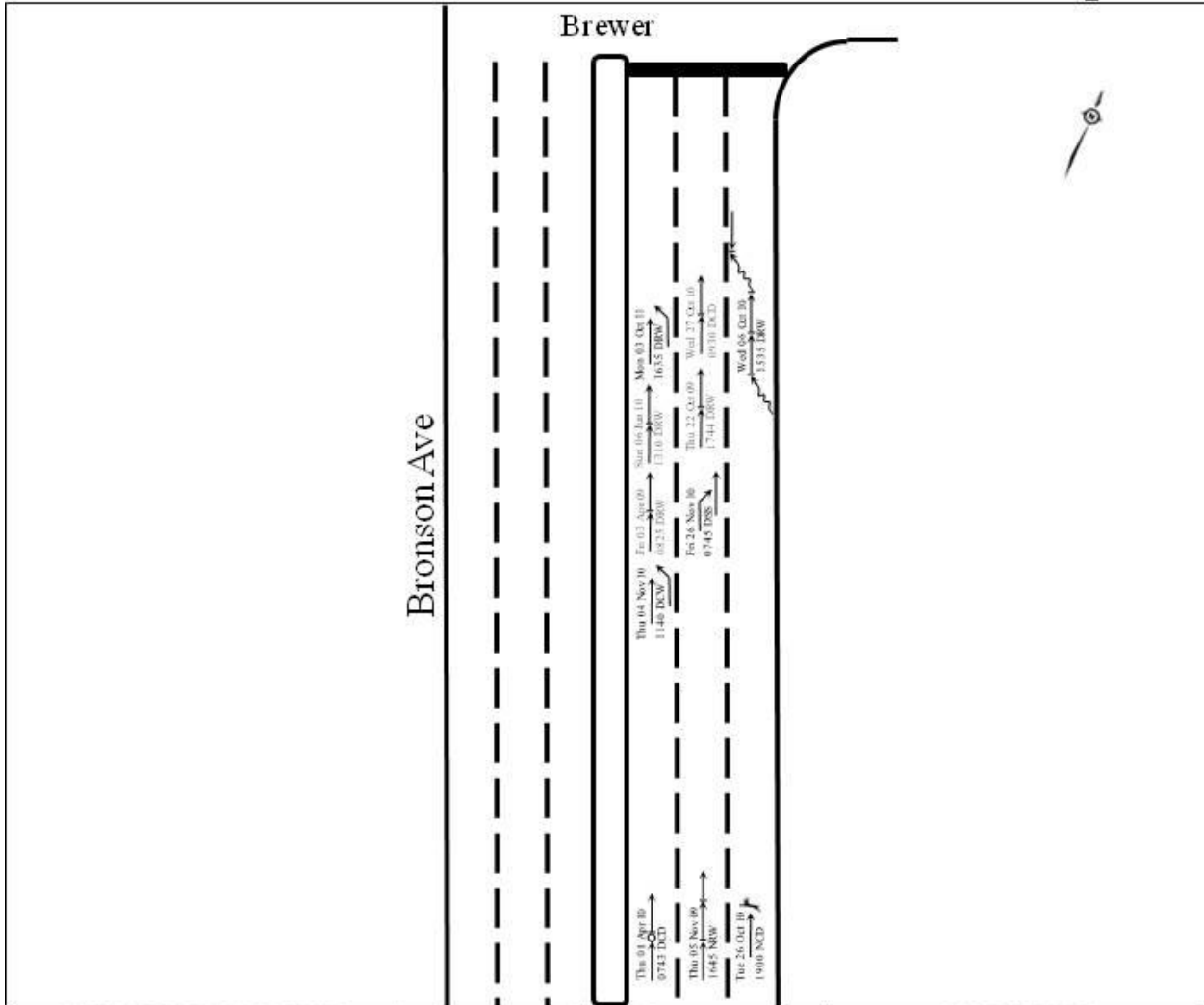


INDICATE FOR EACH ACCIDENT	SYMBOLS	ACCIDENT TYPES
<p><u>DAYNAME; DATE; TIME 24HRS;</u></p> <p>1. <u>LIGHT CONDITIONS:</u> D=DAYLIGHT, F=FOG N=DARK, DAWN or DUSK</p> <p>2. <u>WEATHER CONDITIONS:</u> C=CLEAR, R=RAIN or S=SNOW</p> <p>3. <u>ROAD SURFACE CONDITIONS:</u> D=DRY, W=WET, I=ICE, O=OTHER, S=SNOW or SLUSH</p> <p><u>UNKNOWN:</u> X=ANY OF THE ABOVE</p>	<p>MOVING VEHICLE →</p> <p>INDIRECTLY INVOLVED VEHICLE →</p> <p>BACKING VEHICLE ←</p> <p>PARKED VEHICLE □</p> <p>PEDESTRIAN X</p> <p>BICYCLE </p> <p>DEER </p> <p>INDIRECTLY INVOLVED PEDESTRIAN X</p> <p>FIXED OBJECT □</p> <p>FATAL ACCIDENT ●</p> <p>ACCIDENT INVOLVING PERSONAL INJURY ○</p>	<p>REAR END ←</p> <p>ANGLE ↘</p> <p>SIDESWIPE ↗</p> <p>LOST OF CONTROL </p> <p>TURNING MOVEMENT ↙</p> <hr/> <p>EXAMPLE</p> <p>Sat 26 Nov 10 1706 NCW 1 2 3</p>

# Safety and Traffic Services COLLISION DIAGRAM

LOCATION: Bronson Ave - Brewer Way to 200 m S. of Brewer PERIOD: 1 Jan 2009 to 31 Dec 2011

PREPARED ON: 11 December 2012 BY: K.Delaney TOTAL COLLISIONS: 11  
(Daylight: 9 Dark: 2)

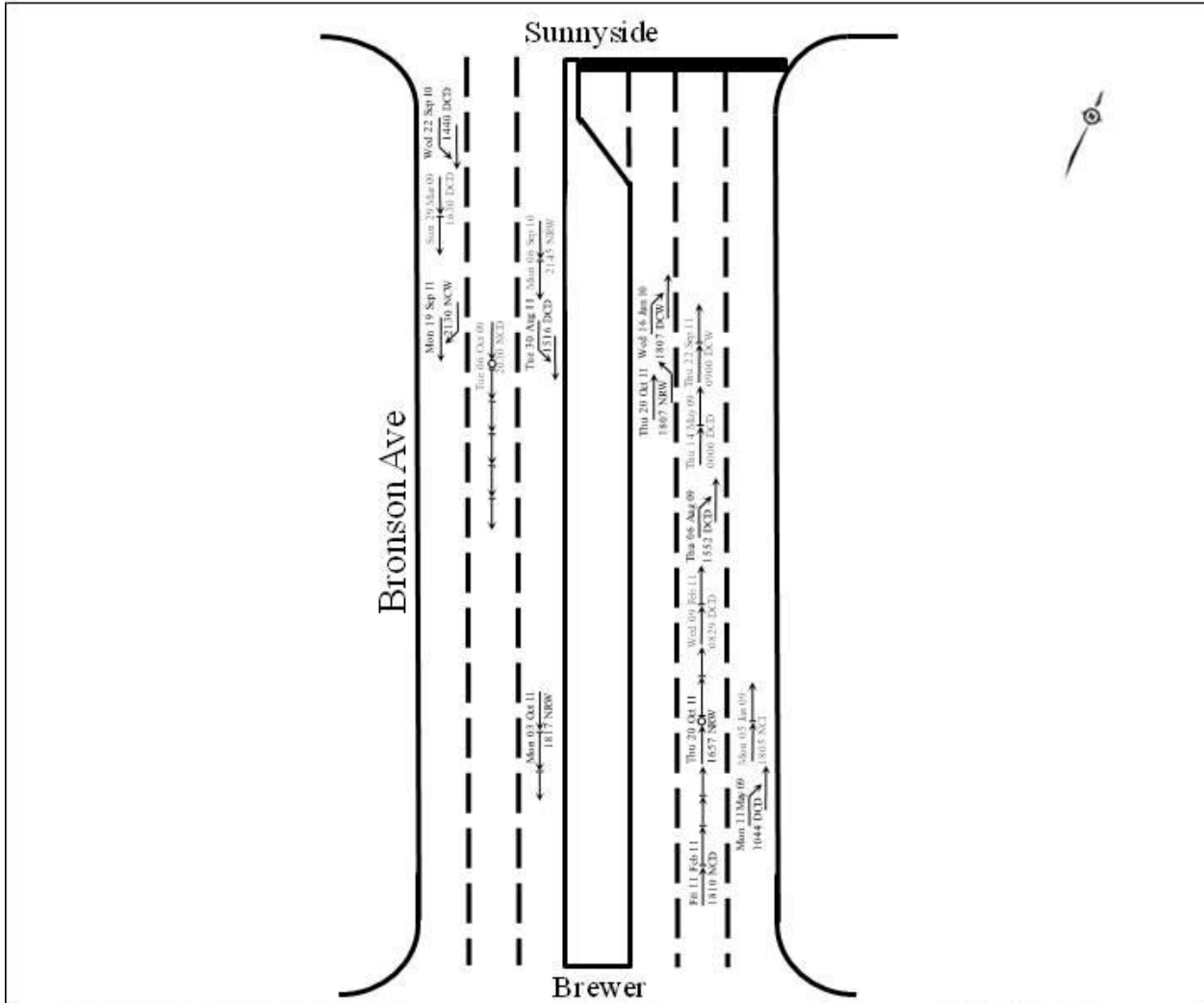


INDICATE FOR EACH ACCIDENT	SYMBOLS	ACCIDENT TYPES
<p><u>DAYNAME; DATE; TIME 24HRS;</u></p> <p>1. <u>LIGHT CONDITIONS:</u> D=DAYLIGHT, F=FOG N=DARK, DAWN or DUSK</p> <p>2. <u>WEATHER CONDITIONS:</u> C=CLEAR, R=RAIN or S=SNOW</p> <p>3. <u>ROAD SURFACE CONDITIONS:</u> D=DRY, W=WET, I=ICE, O=OTHER, S=SNOW or SLUSH</p> <p><u>UNKNOWN:</u> X=ANY OF THE ABOVE</p>	<p>MOVING VEHICLE →</p> <p>INDIRECTLY INVOLVED VEHICLE ⇄</p> <p>BACKING VEHICLE ←</p> <p>PARKED VEHICLE [ ]</p> <p>PEDESTRIAN X</p> <p>BICYCLE [ ]</p> <p>DEER [ ]</p> <p>INDIRECTLY INVOLVED PEDESTRIAN X</p> <p>FIXED OBJECT [ ]</p> <p>FATAL ACCIDENT [ ]</p> <p>ACCIDENT INVOLVING PERSONAL INJURY [ ]</p>	<p>REAR END ← →</p> <p>ANGLE ↘</p> <p>SIDESWIPE ↗</p> <p>LOST OF CONTROL [ ]</p> <p>TURNING MOVEMENT ↘</p> <hr/> <p><b>EXAMPLE</b></p> <p>Sat 26 Nov 10 1706 NCW 1 2 3</p>

# Safety and Traffic Services COLLISION DIAGRAM

LOCATION: Bronson Ave – Sunnyside Ave. to Brewer Way PERIOD: 1 Jan 2009 to 31 Dec 2011

PREPARED ON: 12 December 2012 BY: K. Delaney TOTAL COLLISIONS: 17  
(Daylight: 9 Dark: 8)

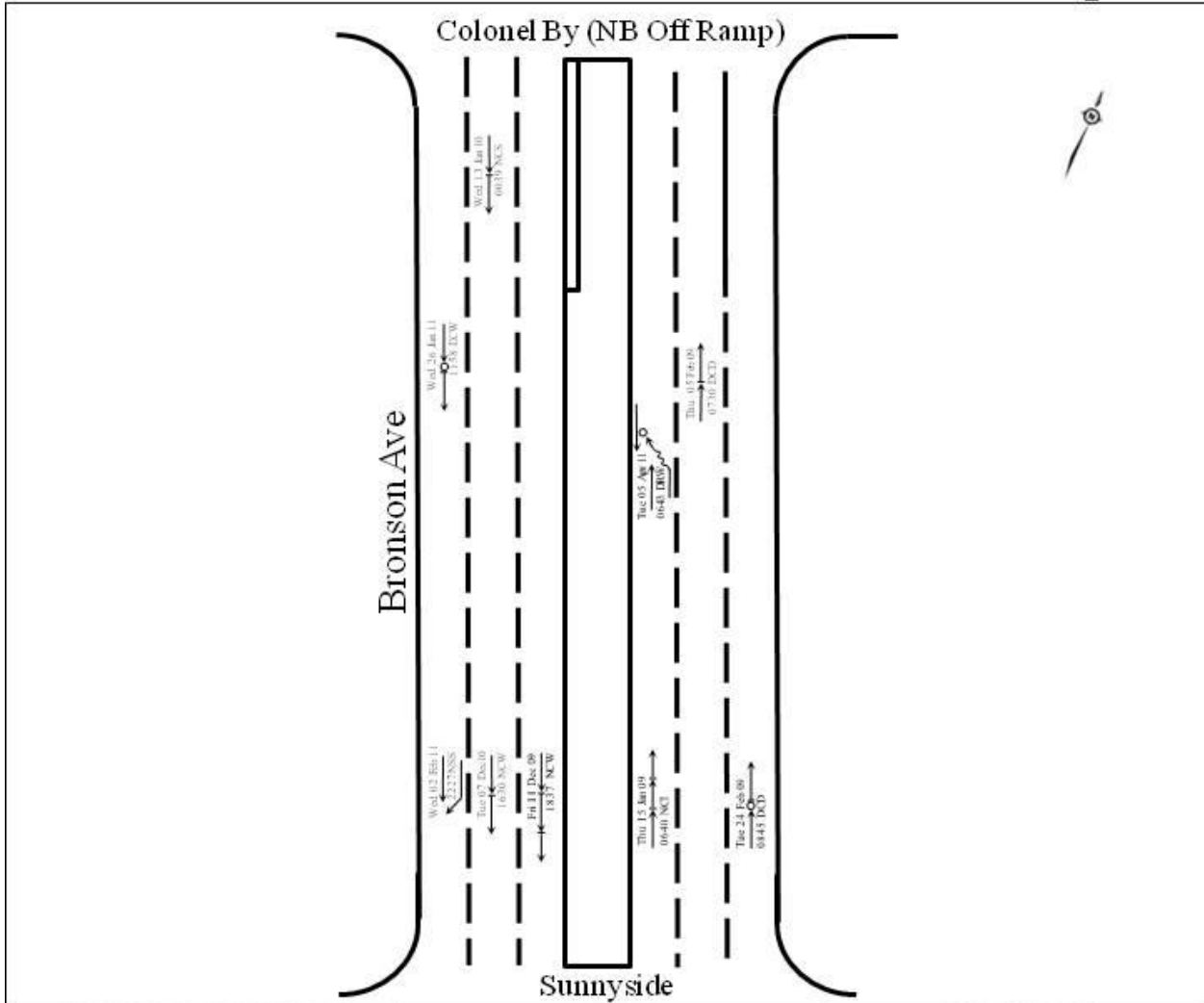


INDICATE FOR EACH ACCIDENT	SYMBOLS	ACCIDENT TYPES
<p><u>DAYNAME; DATE; TIME 24HRS;</u></p> <p>1. <u>LIGHT CONDITIONS:</u> D=DAYLIGHT, F=FOG N=DARK, DAWN or DUSK</p> <p>2. <u>WEATHER CONDITIONS:</u> C=CLEAR, R=RAIN or S=SNOW</p> <p>3. <u>ROAD SURFACE CONDITIONS:</u> D=DRY, W=WET, I=ICE, O=OTHER, S=SNOW or SLUSH</p> <p><u>UNKNOWN:</u> X=ANY OF THE ABOVE</p>	<p>MOVING VEHICLE →</p> <p>INDIRECTLY INVOLVED VEHICLE →</p> <p>BACKING VEHICLE ←</p> <p>PARKED VEHICLE [ ]</p> <p>PEDESTRIAN X</p> <p>BICYCLE [ ]</p> <p>DEER [ ]</p> <p>INDIRECTLY INVOLVED PEDESTRIAN X</p> <p>FIXED OBJECT [ ]</p> <p>FATAL ACCIDENT [ ]</p> <p>ACCIDENT INVOLVING PERSONAL INJURY [ ]</p>	<p>REAR END ←</p> <p>ANGLE ↘</p> <p>SIDESWIPE ↗</p> <p>LOST OF CONTROL [ ]</p> <p>TURNING MOVEMENT ↘</p> <hr/> <p>EXAMPLE</p> <p>Sat 26 Nov 10 1706 NCW 1 2 3</p>

# Safety and Traffic Services COLLISION DIAGRAM

LOCATION: Bronson Ave – NB Off Ramp to Sunnyside PERIOD: 1 Jan 2009 to 31 Dec 2011

PREPARED ON: 14 December 2012 BY: M. Kay TOTAL COLLISIONS: 9  
(Daylight 4 Dark: 5)



INDICATE FOR EACH ACCIDENT	SYMBOLS	ACCIDENT TYPES
<p><u>DAYNAME; DATE; TIME 24HRS;</u></p> <p>1. <u>LIGHT CONDITIONS:</u> D=DAYLIGHT, F=FOG N=DARK, DAWN or DUSK</p> <p>2. <u>WEATHER CONDITIONS:</u> C=CLEAR, R=RAIN or S=SNOW</p> <p>3. <u>ROAD SURFACE CONDITIONS:</u> D=DRY, W=WET, I=ICE, O=OTHER, S=SNOW or SLUSH</p> <p><u>UNKNOWN:</u> X=ANY OF THE ABOVE</p>	<p>MOVING VEHICLE →</p> <p>INDIRECTLY INVOLVED VEHICLE →</p> <p>BACKING VEHICLE ←</p> <p>PARKED VEHICLE [ ]</p> <p>PEDESTRIAN X</p> <p>BICYCLE [ ]</p> <p>DEER [ ]</p> <p>INDIRECTLY INVOLVED PEDESTRIAN X</p> <p>FIXED OBJECT [ ]</p> <p>FATAL ACCIDENT [ ]</p> <p>ACCIDENT INVOLVING PERSONAL INJURY [ ]</p>	<p>REAR END ←</p> <p>ANGLE [ ]</p> <p>SIDESWIPE [ ]</p> <p>LOST OF CONTROL [ ]</p> <p>TURNING MOVEMENT [ ]</p> <hr/> <p><b>EXAMPLE</b></p> <p>Sat 26 Nov 10 1706 NCW 1 2 3</p>



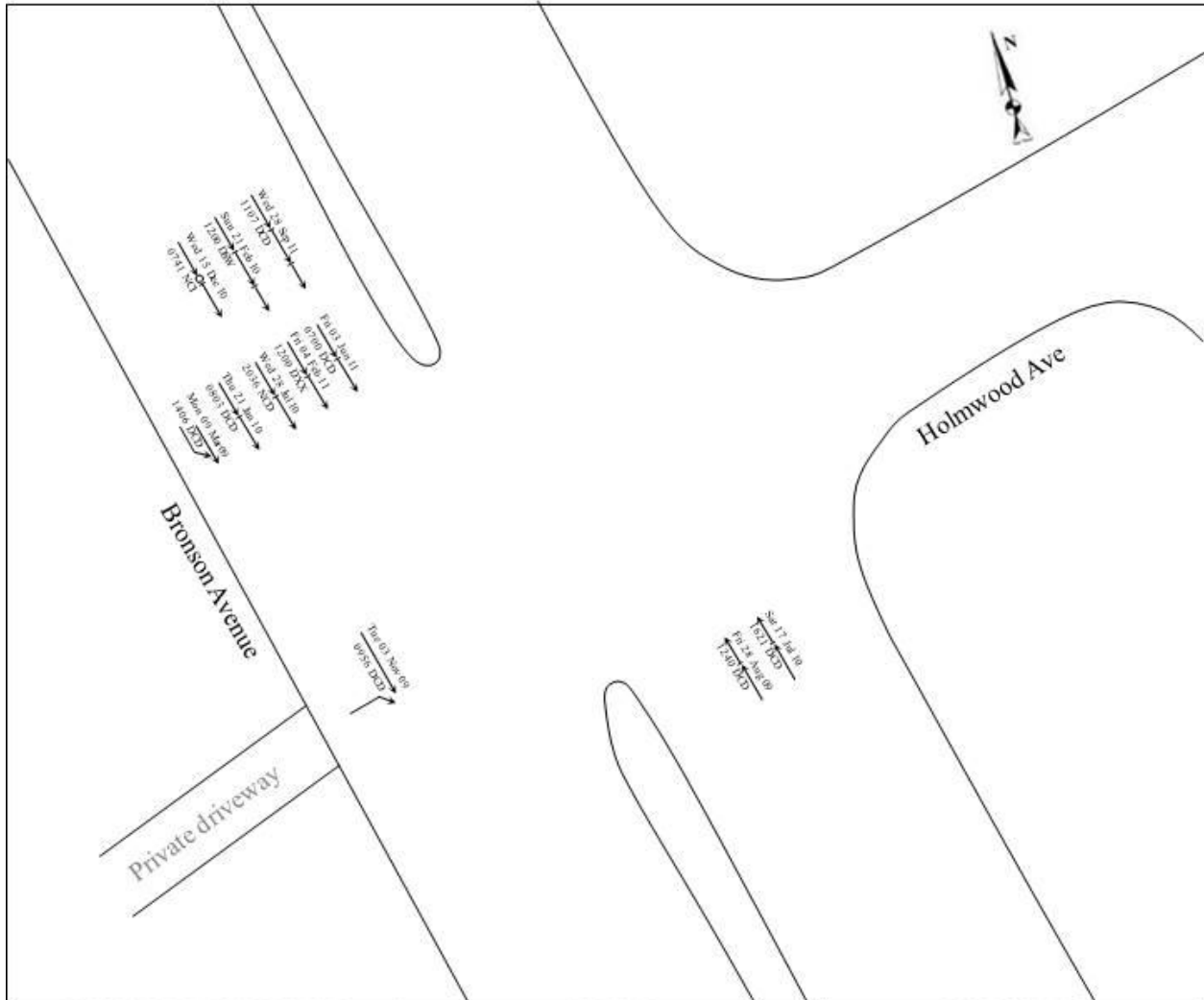
# Safety and Traffic Services COLLISION DIAGRAM

LOCATION: Holmwood Ave at Bronson Avenue

PERIOD: 1 Jan 2009 to 31 Dec 2011

PREPARED ON: 12 December 2012 BY: G. Patry

TOTAL COLLISIONS: 11  
(Daylight: 9 Dark: 2)



INDICATE FOR EACH ACCIDENT	SYMBOLS	ACCIDENT TYPES
<p><b>DAYNAME; DATE; TIME 24HRS;</b></p> <p><b>1. LIGHT CONDITIONS:</b> D=DAYLIGHT, F=FOG N=DARK, DAWN or DUSK</p> <p><b>2. WEATHER CONDITIONS:</b> C=CLEAR, R=RAIN or S=SNOW</p> <p><b>3. ROAD SURFACE CONDITIONS:</b> D=DRY, W=WET, I=ICE, O=OTHER, S=SNOW or SLUSH</p> <p><b>UNKNOWN:</b> X=ANY OF THE ABOVE</p>	<p>MOVING VEHICLE →</p> <p>INDIRECTLY INVOLVED VEHICLE →</p> <p>BACKING VEHICLE ←</p> <p>PARKED VEHICLE [ ]</p> <p>PEDESTRIAN X</p> <p>BICYCLE [ ]</p> <p>DEER [ ]</p> <p>INDIRECTLY INVOLVED PEDESTRIAN X</p> <p>FIXED OBJECT [ ]</p> <p>FATAL ACCIDENT [ ]</p> <p>ACCIDENT INVOLVING PERSONAL INJURY [ ]</p>	<p>REAR END ←</p> <p>ANGLE →</p> <p>SIDESWIPE →</p> <p>LOST OF CONTROL →</p> <p>TURNING MOVEMENT →</p> <hr/> <p><b>EXAMPLE</b></p> <p>Sat 26 Nov 10 1706 NCW 1 2 3</p>

# Safety and Traffic Services COLLISION DIAGRAM

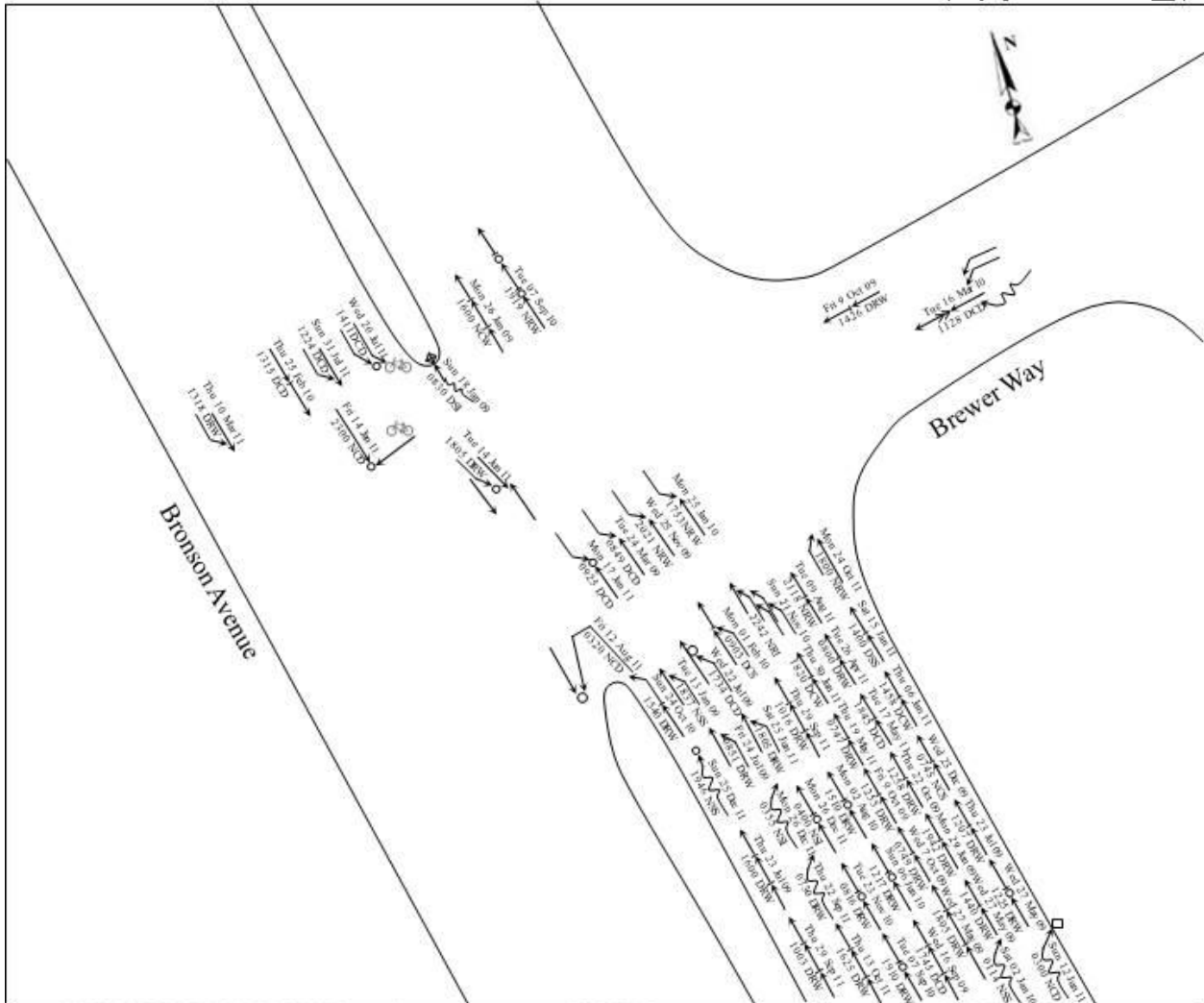
Annex A  
Pg 2 of 2

LOCATION: Brewer Way at Bronson Avenue

PERIOD: 1 Jan 2009 to 31 Dec 2011

PREPARED ON: 11 December 2012 BY: G. Patry

TOTAL COLLISIONS: 52  
(Daylight: 36 Dark: 16)



INDICATE FOR EACH ACCIDENT	SYMBOLS	ACCIDENT TYPES
<p><u>DAYNAME; DATE; TIME 24HRS;</u></p> <p>1. <u>LIGHT CONDITIONS:</u> D=DAYLIGHT, F=FOG N=DARK, DAWN or DUSK</p> <p>2. <u>WEATHER CONDITIONS:</u> C=CLEAR, R=RAIN or S=SNOW</p> <p>3. <u>ROAD SURFACE CONDITIONS:</u> D=DRY, W=WET, I=ICE, O=OTHER, S=SNOW or SLUSH</p> <p><u>UNKNOWN:</u> X=ANY OF THE ABOVE</p>	<p>MOVING VEHICLE →</p> <p>INDIRECTLY INVOLVED VEHICLE - - - - -</p> <p>BACKING VEHICLE ←</p> <p>PARKED VEHICLE □</p> <p>PEDESTRIAN X</p> <p>BICYCLE ○</p> <p>DEER ⚡</p> <p>INDIRECTLY INVOLVED PEDESTRIAN - - - - - X</p> <p>FIXED OBJECT □</p> <p>FATAL ACCIDENT ●</p> <p>ACCIDENT INVOLVING PERSONAL INJURY ○</p>	<p>REAR END ← →</p> <p>ANGLE ↘</p> <p>SIDESWIPE ↗</p> <p>LOST OF CONTROL ⚡</p> <p>TURNING MOVEMENT ↘</p> <hr/> <p>EXAMPLE</p> <p>Sat 26 Nov 10 1706 NCW 1 2 3</p>

# Safety and Traffic Services COLLISION DIAGRAM

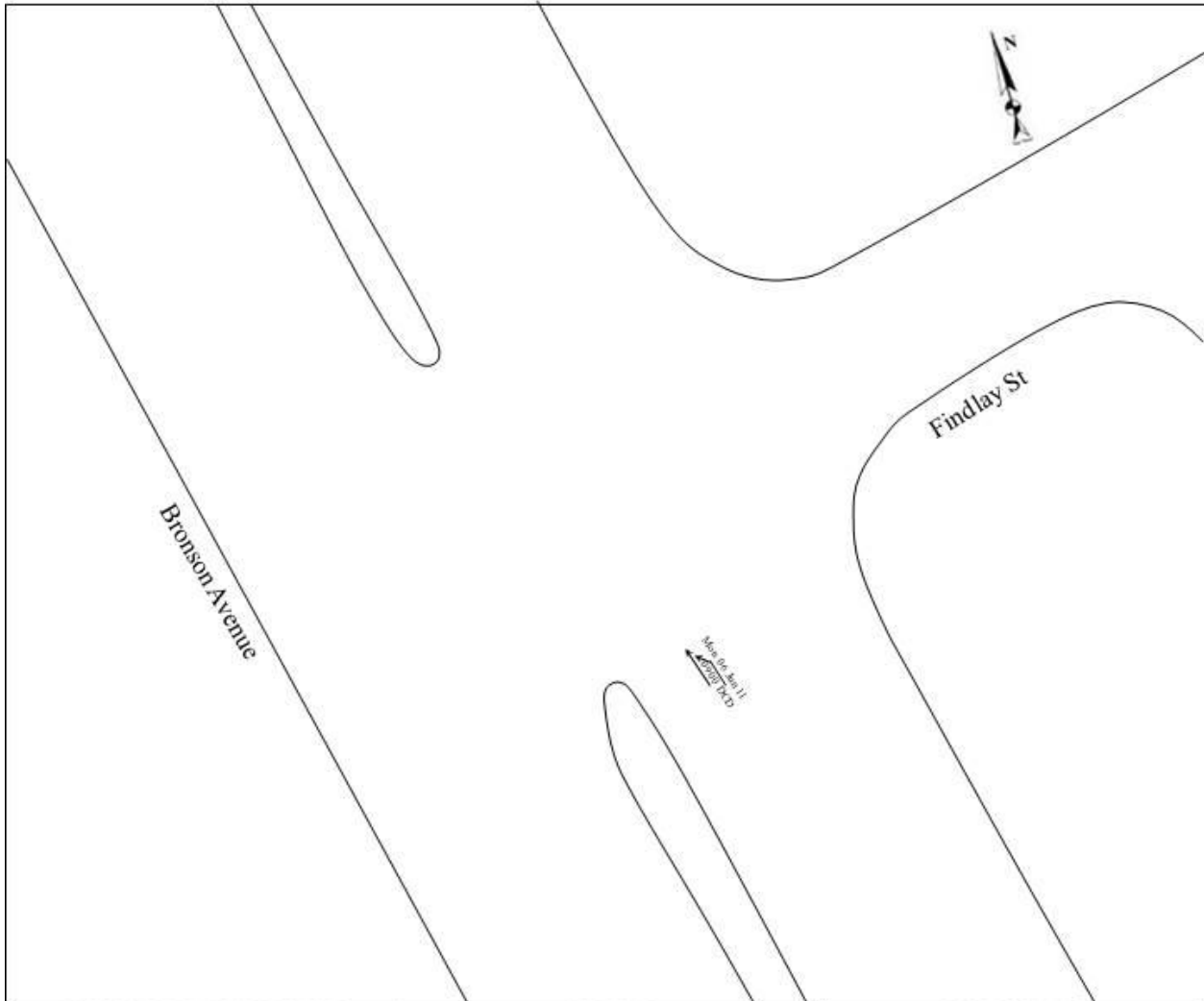
Annex A  
Pg 2 of 2

LOCATION: Findlay Ave at Bronson Avenue

PERIOD: 1 Jan 2009 to 31 Dec 2011

PREPARED ON: 12 December 2012 BY: G. Patry

TOTAL COLLISIONS: 1  
(Daylight: 1 Dark: 0)



INDICATE FOR EACH ACCIDENT	SYMBOLS	ACCIDENT TYPES
<p><u>DAYNAME; DATE; TIME 24HRS;</u></p> <p>1. <u>LIGHT CONDITIONS:</u> D=DAYLIGHT, F=FOG N=DARK, DAWN or DUSK</p> <p>2. <u>WEATHER CONDITIONS:</u> C=CLEAR, R=RAIN or S=SNOW</p> <p>3. <u>ROAD SURFACE CONDITIONS:</u> D=DRY, W=WET, I=ICE, O=OTHER, S=SNOW or SLUSH</p> <p><u>UNKNOWN:</u> X=ANY OF THE ABOVE</p>	<p>MOVING VEHICLE </p> <p>INDIRECTLY INVOLVED VEHICLE </p> <p>BACKING VEHICLE </p> <p>PARKED VEHICLE </p> <p>PEDESTRIAN </p> <p>BICYCLE </p> <p>DEER </p> <p>INDIRECTLY INVOLVED PEDESTRIAN </p> <p>FIXED OBJECT </p> <p>FATAL ACCIDENT </p> <p>ACCIDENT INVOLVING PERSONAL INJURY </p>	<p>REAR END </p> <p>ANGLE </p> <p>SIDESWIPE </p> <p>LOST OF CONTROL </p> <p>TURNING MOVEMENT </p> <hr/> <p><b>EXAMPLE</b></p> <p>Sat 26 Nov 10 </p> <p>1706 NCW 1 2 3</p>

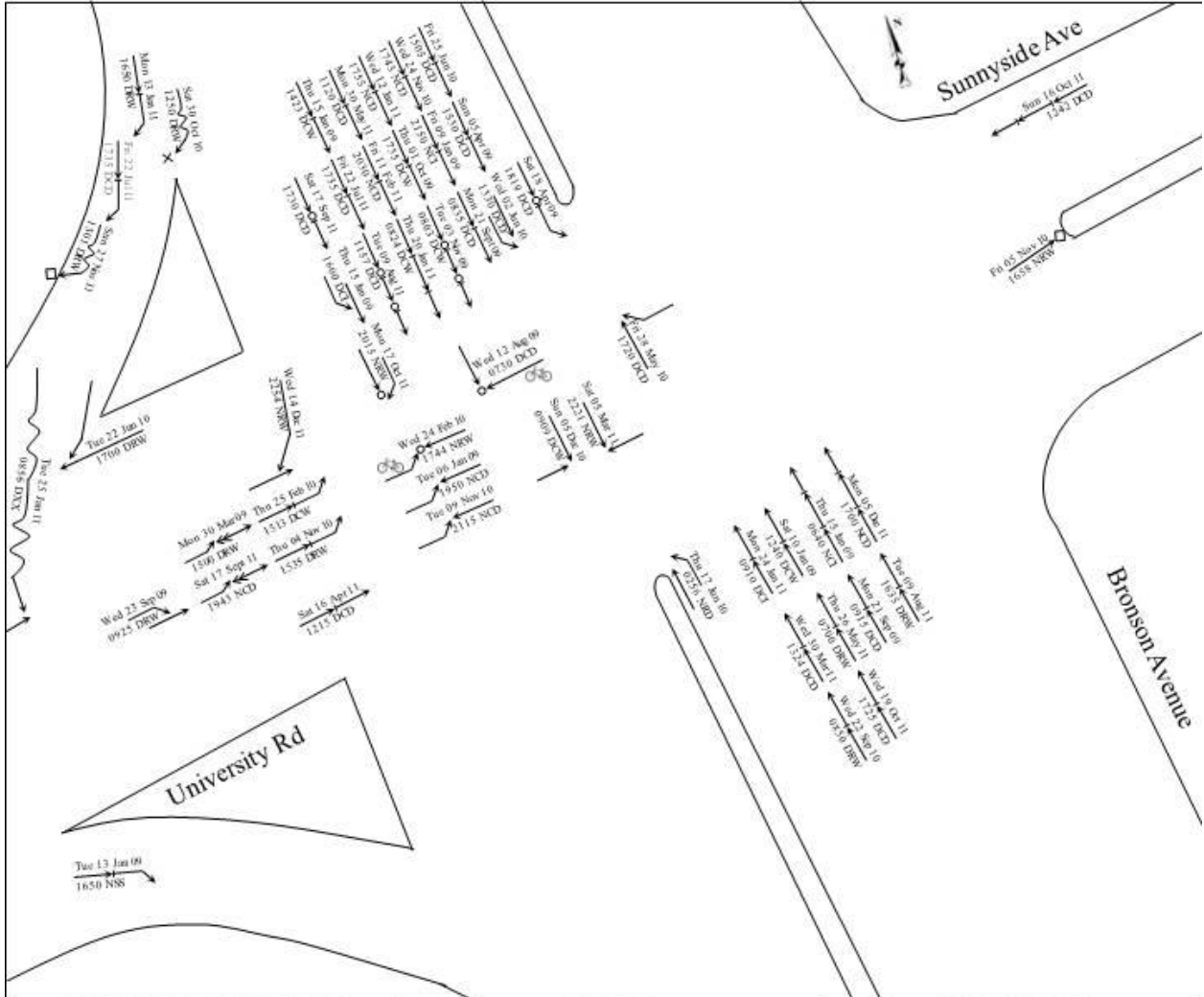
# Safety and Traffic Services COLLISION DIAGRAM

**LOCATION:** Bronson Ave SB & Ramp From Colonel By Drive

**PERIOD:** 1 Jan 2009 to 31 Dec 2011

**PREPARED ON:** 17 December 2012 **BY:** G. Patry

**TOTAL COLLISIONS:** 54  
(Daylight: 37 Dark: 17)



INDICATE FOR EACH ACCIDENT	SYMBOLS	ACCIDENT TYPES
<p><b>DAYNAME; DATE; TIME 24HRS;</b></p> <p><b>1. LIGHT CONDITIONS:</b> D=DAYLIGHT, F=FOG N=DARK, DAWN or DUSK</p> <p><b>2. WEATHER CONDITIONS:</b> C=CLEAR, R=RAIN or S=SNOW</p> <p><b>3. ROAD SURFACE CONDITIONS:</b> D=DRY, W=WET, I=ICE, O=OTHER, S=SNOW or SLUSH</p> <p><b>UNKNOWN:</b> X=ANY OF THE ABOVE</p>	<p>MOVING VEHICLE →</p> <p>INDIRECTLY INVOLVED VEHICLE - - - →</p> <p>BACKING VEHICLE ← →</p> <p>PARKED VEHICLE [ ]</p> <p>PEDESTRIAN — x</p> <p>BICYCLE [ ]</p> <p>DEER [ ]</p> <p>INDIRECTLY INVOLVED PEDESTRIAN - - - x</p> <p>FIXED OBJECT [ ]</p> <p>FATAL ACCIDENT [ ]</p> <p>ACCIDENT INVOLVING PERSONAL INJURY [ ]</p>	<p>REAR END ← →</p> <p>ANGLE → ↓</p> <p>SIDESWIBE → ↗</p> <p>LOST OF CONTROL → [ ]</p> <p>TURNING MOVEMENT → ↘</p> <hr/> <p><b>EXAMPLE</b></p> <p>Sat 26 Nov 10 1706 NCW 1 2 3</p>

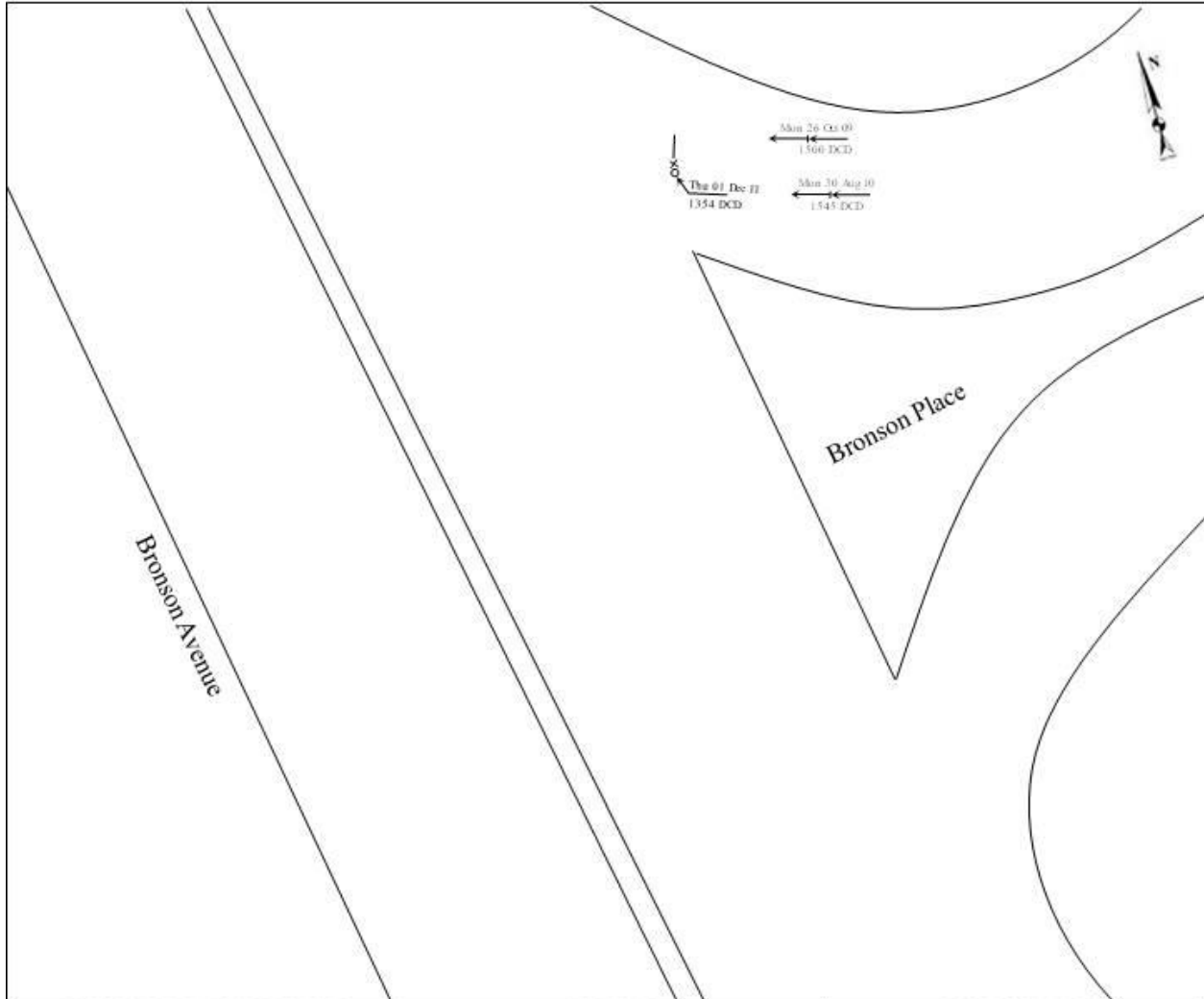
# Safety and Traffic Services COLLISION DIAGRAM

**LOCATION:** Bronson Ave NB & NB onramp from Bronson Pl

**PERIOD:** 1 Jan 2009 to 31 Dec 2011

**PREPARED ON:** 12 December 2012 **BY:** G. Patry

**TOTAL COLLISIONS:** 3  
(Daylight: 3 Dark: 0)



INDICATE FOR EACH ACCIDENT	SYMBOLS	ACCIDENT TYPES
<p><b>DAYNAME; DATE; TIME 24HRS;</b></p> <p><b>1. LIGHT CONDITIONS:</b> D=DAYLIGHT, F=FOG N=DARK, DAWN or DUSK</p> <p><b>2. WEATHER CONDITIONS:</b> C=CLEAR, R=RAIN or S=SNOW</p> <p><b>3. ROAD SURFACE CONDITIONS:</b> D=DRY, W=WET, I=ICE, O=OTHER, S=SNOW or SLUSH</p> <p><b>UNKNOWN:</b> X=ANY OF THE ABOVE</p>	<p>MOVING VEHICLE </p> <p>INDIRECTLY INVOLVED VEHICLE </p> <p>BACKING VEHICLE </p> <p>PARKED VEHICLE </p> <p>PEDESTRIAN </p> <p>BICYCLE </p> <p>DEER </p> <p>INDIRECTLY INVOLVED PEDESTRIAN </p> <p>FIXED OBJECT </p> <p>FATAL ACCIDENT </p> <p>ACCIDENT INVOLVING PERSONAL INJURY </p>	<p>REAR END </p> <p>ANGLE </p> <p>SIDESWIBE </p> <p>LOST OF CONTROL </p> <p>TURNING MOVEMENT </p> <hr/> <p><b>EXAMPLE</b></p> <p>Sat 26 Nov 10 </p> <p>1706 NCW 1 2 3</p>

# Safety and Traffic Services COLLISION DIAGRAM

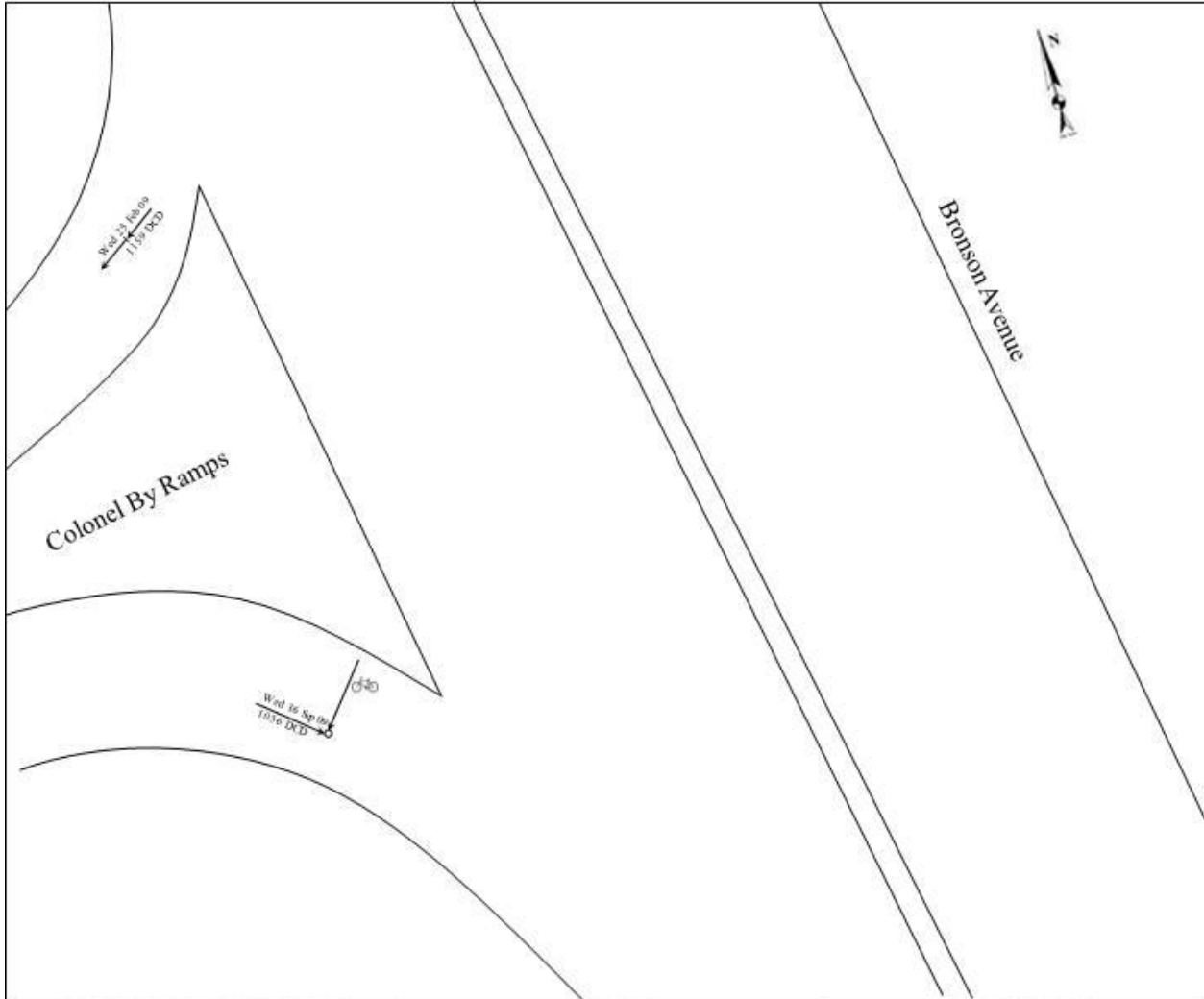
Annex A  
Pg 2 of 2

**LOCATION:** Bronson Ave SB & Ramp From Colonel By Drive

**PERIOD:** 1 Jan 2009 to 31 Dec 2011

**PREPARED ON:** 12 December 2012 **BY:** G. Patry

**TOTAL COLLISIONS:** 2  
(Daylight: 2 Dark: 0)



INDICATE FOR EACH ACCIDENT	SYMBOLS	ACCIDENT TYPES
<b>DAYNAME; DATE; TIME 24HRS;</b>  <b>1. LIGHT CONDITIONS:</b> D=DAYLIGHT, F=FOG N=DARK, DAWN or DUSK  <b>2. WEATHER CONDITIONS:</b> C=CLEAR, R=RAIN or S=SNOW  <b>3. ROAD SURFACE CONDITIONS:</b> D=DRY, W=WET, I=ICE, O=OTHER, S=SNOW or SLUSH  <b>UNKNOWN:</b> X=ANY OF THE ABOVE	MOVING VEHICLE → INDIRECTLY INVOLVED VEHICLE - - - → BACKING VEHICLE ← → PARKED VEHICLE [ ] PEDESTRIAN - X BICYCLE [ ] DEER [ ] INDIRECTLY INVOLVED PEDESTRIAN - - - X FIXED OBJECT [ ] FATAL ACCIDENT [ ] ACCIDENT INVOLVING PERSONAL INJURY [ ]	REAR END ← → ANGLE → ↓ SIDESWIPE → ↗ LOST OF CONTROL → [ ] TURNING MOVEMENT → ↘  <b>EXAMPLE</b> Sat 26 Nov 10 1706 NCW 1 2 3

## **Appendix B: In-Field Survey Questionnaire**

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1) En tant que cycliste, combien de fois par semaine empruntez-vous ce segment de chaussée ?

- 1x par semaine
- 2 à 4x par semaine
- Occasionnellement
- Tous les jours

2) En tant que piéton(ne), combien de fois par semaine empruntez-vous ce segment de chaussée?

- 1x par semaine
- 2x ou plus par semaine
- Occasionnellement
- Ne s'applique pas

3) Avez-vous déjà ressenti un sentiment d'insécurité lorsque vous empruntez ce segment de chaussée ?

- Oui, en tant que cycliste
- Oui, en tant que piéton(ne)
- Oui, en tant que cycliste et piéton(ne)
- Non, Je me sens en sécurité

4) Si vous avez répondu *OUI* à la question 3, identifiez les facteurs vous faisant sentir en danger lorsque vous emprunter ce segment de chaussée?

- Vitesse des véhicules
- En tant que cycliste, partager l'étroite voie réservée au vélo
- En tant que piéton(ne), utiliser les trottoirs étroits
- Autre \_\_\_\_\_

5) Remarquez-vous des chauffeurs impatients effectuant un virage à droite, aux endroits de passage pour piétons ?

- Oui
- Non

6) Traversez vous souvent la chaussée entre deux intersections ?

- Oui, en tant que cycliste
- Oui, en tant que piéton(ne)
- Non

7) En tant que piéton(ne) et/ou utilisateur(trice) du transport en commun, estimez-vous que les arrêts du transport en commun sont facilement accessibles en ce qui concerne le respect des endroits de passages pour piétons ?



- Oui
- Non

8) Avez vous déjà été impliqué ou témoin d'un incident impliquant un chauffeur et un cycliste/ piéton(ne) sur ce segment de chaussée ?

- Oui, un incident entre cycliste/chauffeur
- Oui, un incident entre piéton(ne)/chauffeur
- Non

Si oui, décrivez brièvement et indiquez l'emplacement sur la carte.

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1) As a cyclist, how often do you use this segment of roadway?

- 1x per week
- 3 or more x per week
- Occasionally
- Never

2) As a pedestrian, how often do you use this segment of roadway?

- 1x per week
- 3 or more x per week
- Occasionally
- N/A

3) Do you often feel unsafe at this segment of roadway?

- Yes, as a cyclist
- Yes, as a pedestrian
- Yes, as a cyclist and a pedestrian
- No, I feel safe

4) If 'Yes' to Question 3, what makes you feel unsafe at this segment of roadway?

- High vehicle speeds
- As a cyclist, sharing the narrow travel lanes
- As a pedestrian, narrow sidewalks
- Other \_\_\_\_\_

5) Do you notice motorists being impatient when making right turns at pedestrian crossing locations?

- Yes
- No

6) Do you often cross the roadway at mid-block?

- Yes, as a cyclist
- Yes, as a pedestrian
- No

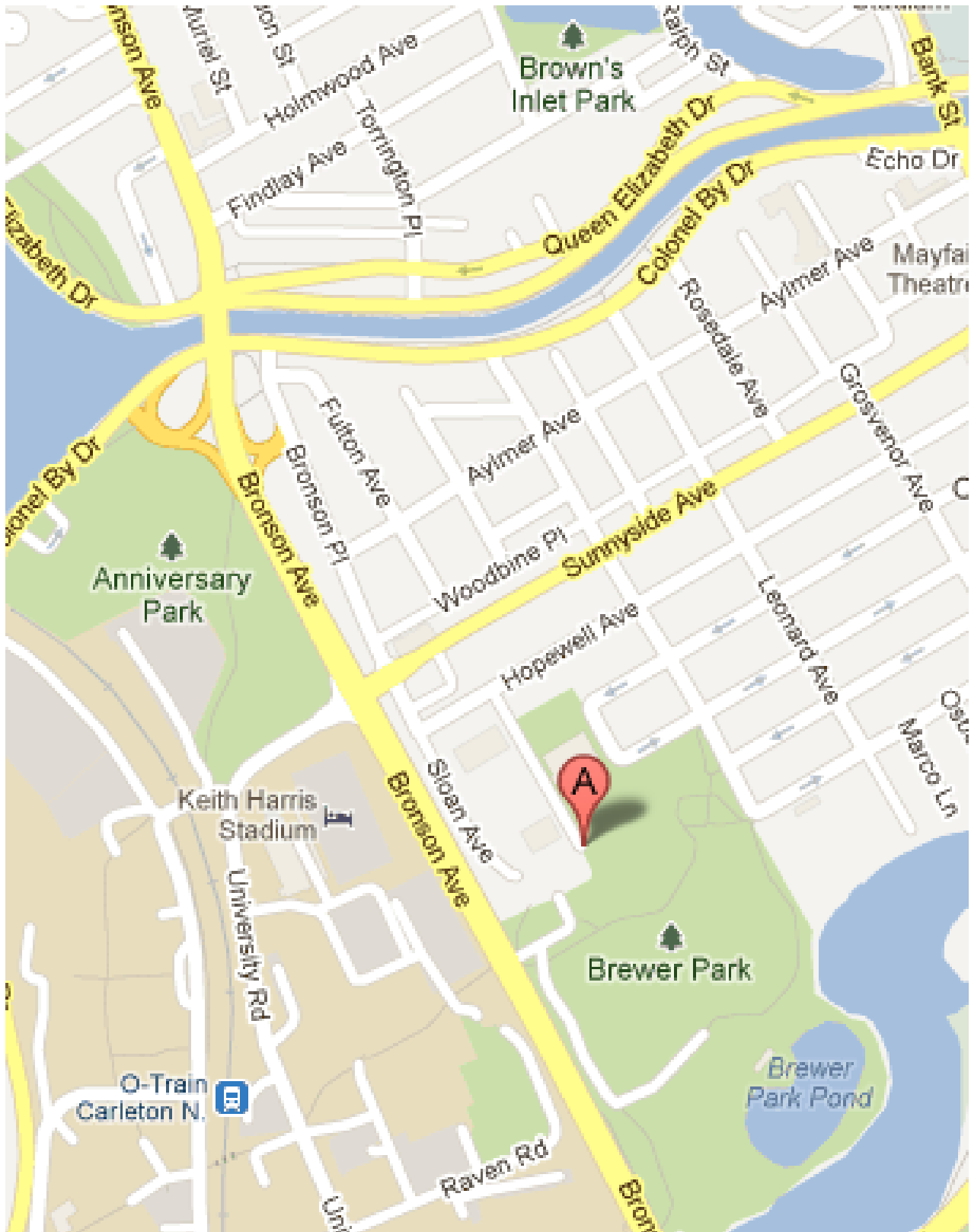
7) As a pedestrian/transit user, do you feel transit stops are easily accessible with respect to crossing locations?

- Yes
- No

8) Have you ever been involved in, or witnessed an incident involving a motorist and a cyclist and/or pedestrian in this segment of roadway?

- Yes, a cyclist/motorist incident
- Yes, a pedestrian/motorist incident
- No

If yes, briefly describe and indicate location on attached map.



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Main areas of concern (in order of priority) for residents based on in-field survey are :

1. Colonel By on/off ramps at Bronson Ave.
  - Pedestrians crossing both ramps find motorists not yielding
  - Cyclists find long deceleration ramp to Colonel By uncomfortable
  - Motorists coming onto Bronson Ave have conflicts with cyclists trying to get onto University pathway
2. Brewer Way/Bronson Ave intersection
  - NB Bronson to EB Brewer Way right turns
3. Sunnyside/Bronson Ave intersection
  - Left turns in all directions
4. Findlay/Bronson Intersection
  - Awkward bike lane design
5. Holmwood/Bronson intersection
  - High speeds
  - Motorists running red lights
6. Bronson Place/Bronson intersection
  - Motorists not yielding to through-travelling cyclists