



**STAFF REPORT
ACTION REQUIRED**

City Initiatives for Reducing Pedestrian Collisions and Improving Traffic Safety

Date:	April 30, 2013
To:	Public Works and Infrastructure Committee
From:	General Manager, Transportation Services
Wards:	All
Reference Number:	p:\2013\ClusterB\tra\pr\pw13001pr

SUMMARY

Pedestrian safety is an important issue for all Torontonians, and the City has developed and implemented a wide number of initiatives designed to enhance pedestrian safety across the city. This report provides a review of the methodology used by Global News to identify its '100 most dangerous intersections for pedestrians' and develops a more detailed approach to the identification of those intersections most prone to pedestrian collisions in Toronto. An action plan to improve the safety performance of the 'top 10' priority intersections was developed to include immediate actions which can be implemented within existing budget and staff resources, as well as mid and long-term approaches which may, dependent on the intersection, require further consultation, approvals by the local Community Council and additional capital funding. A number of the proposed safety improvements will be of benefit to all road users – not just pedestrians.

In addition, Transportation Services staff are now consulting with key stakeholders as to the development of an Integrated Traffic Safety Strategy whose goal is to create an continuous process which consistently reviews safety performance for all road users and works in partnership with other agencies, such as the Toronto Police Services and Public Health to identify problem areas, prioritize projects and interventions, and evaluate their effectiveness once implemented. This integrated approach focused on the safety of all road users and involving other agencies is designed to ensure that the responsibility for safety is placed at the forefront of all decisions surrounding the many competing demands on Toronto's transportation network.

RECOMMENDATION

The General Manager, Transportation Services recommends that:

1. The Public Works and Infrastructure Committee receive this report for information.

Financial Impact

The estimated cost of implementing the 'immediate actions' described in this report is \$70,000 and funding is available in the 2013 Transportation Services Operating Budget within various Cost Centres. The implementation will be accomplished with existing funding through the re-prioritization of safety requests that incorporates these top 10 locations. Medium and longer term proposals that have financial impacts, and may require both community consultation and Community Council approval, will be considered as part of future Operating and Capital Budget processes.

The Deputy City Manager and Chief Financial Officer has reviewed this report and agrees with the financial impact information.

DECISION HISTORY

City Council, at its meeting of June 14, 2011, referred Motion MM9.4, "Protecting pedestrians at the 100 most dangerous intersections in Toronto" to the Public Works and Infrastructure Committee.

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2011.MM9.4>

At its meeting of September 7, 2011, the Public Works and Infrastructure Committee directed staff to respond to the findings contained within the Worst 100 Intersections Global News Network Report and also on initiatives the City is undertaking to improve pedestrian safety across the city of Toronto.

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2011.PW7.12>

ISSUE BACKGROUND

On June 7, 2011, Global News Network released a report entitled, "Toronto's Most Dangerous Intersections for Pedestrians," in which the news agency presented a list and corresponding map of signalized intersections in the City with the highest ratio of pedestrian collisions to pedestrian volume. The report focused on 100 locations with the highest ratio deemed "Toronto's worst 100 intersections for pedestrians" and further identified the "worst 10" locations.

COMMENTS

Ongoing Initiatives to Promote Pedestrian Safety

It is important to note that Transportation Services has many ongoing initiatives to make Toronto safer for pedestrians including the implementation of the Toronto Walking Strategy, approved by Council in 2009. The Toronto Walking Strategy is a 52-action blueprint that includes a range of projects that involves internal and external partners to improve walking conditions and to encourage walking. Some of the existing initiatives are:

- **Traffic Calming areas.** The city has a Traffic Calming policy (2010) and a program to traffic calm locations, using a range of devices such as speed humps, intersection narrowing, raised medians, chicanes and bump-outs.
- **Sidewalk Construction and Repair.** Transportation Services undertakes projects each year to build sidewalks where they are missing, to rehabilitate existing sidewalks and to repair sidewalk cuts.
- **Pedestrian Countdown Signals.** These provide information on the available time left to cross an intersection. To date, almost all intersections have been converted, while the remainder cannot be converted at this time for specific operational reasons.
- **Leading Pedestrian Intervals (LPI).** These signals provide pedestrians with a few seconds head start so they are more visible while crossing to drivers making turns at intersections. Some of the LPIs now installed include Adelaide/University, Christie/St.Clair, and Yonge/Harbour/Lake Shore.
- **Longer Pedestrian Walk Times.** To accommodate many pedestrians such as seniors and persons with disabilities, beginning in 2007 signalized intersections are being converted to permit a longer pedestrian crossing time.
- **Zebra Crossing Pavement Markings.** These markings increase the visibility of the pedestrian crossing area. They are being installed on all major road reconstruction and resurfacing projects, and on new traffic control or pedestrian crossover installations.
- **Replacement of Pedestrian Crossovers ('PXOs') with traffic signals on major and minor arterial roads.** To date, about one-third of the PXOs on major arterial roadways have been converted to fully signalized intersections and the rest enhanced with brighter lights and larger lenses to enhance visibility. On minor arterial roadways, almost 40 PXOs have been replaced with traffic control signals, and the remaining PXOs have also been enhanced. PXOs on collector and local roads are also being enhanced on a priority basis and all new PXO new installations are constructed to the new standard.
- **Accessible Pedestrian Signals.** These improve conditions at signalized intersections for the vision-impaired. About 525 of 2,140 signalized intersections have been converted to date, and all new installations now include this feature.

- **Red Light Cameras.** These have proven to reduce injury collisions attributed to red light running by more than 60 percent. There are about 80 red light cameras operating at Toronto signalized intersections.
- **Pedestrian Priority Crossings.** Toronto has implemented pedestrian priority crossings at three downtown intersections with high pedestrian volumes. Staff are currently evaluating the effectiveness of these intersections.
- **No Right Turn on Red Prohibitions.** The development of criteria for 'No Right Turn on Red' prohibitions, where appropriate, to reduce pedestrian collisions.
- **iNavigait.** The City is a partner with the Toronto Area Safety Coalition and Toronto Police Services in a pedestrian safety program called iNavigait. It also works closely with School Boards and Public Health on safe routes to school programs, and with the Toronto Area Safety Coalition on community safety days and participates in RISK Watch Safety Nights for school-aged children and their families.
- **Traffic Safety Education Programs.** The City administers a 'Watch Your Speed' program and publishes quarterly pedestrian injury collision data leaflets to raise awareness about the need for safety among all road users.

In addition, more recent pedestrian safety initiatives include:

- Participation in the development of the City's Seniors Strategy (led by Social Development, Finance and Administration) to consider the needs of older adult pedestrians. Among others, seniors have identified the need for regular sidewalk inspections, snow clearing assistance program for seniors and snow clearing standards, signal improvements at intersections for pedestrian crossing, curb ramps for people using wheelchairs or scooters, and wide, uncluttered sidewalks for people to move and pass each other even when using assistive devices. Transportation staff also work on senior safety awareness issues with B.A.S.S.I.C. ("Bringing an Awareness of Senior Safety Issues to the Community").
- Development of pedestrian-demand mapping including vulnerable pedestrians such as seniors.
- Implementation of a new accessibility standard for tactile pavers to assist the visually-impaired.
- Staff participation on the expert panel for the Coroner's review of Pedestrian Deaths in Ontario (report was released on September 19, 2012).
- An evaluation has been completed, jointly with the TTC, for the preferred curb cut design to enable accessibility of the new low-floor streetcars, arriving in 2013.
- Experts and community leaders on pedestrian issues have been recruited to establish the Staff Reference Group on Pedestrian Issues. The first meeting was held in May 2012, as well as a sub-group meeting of experts and advocates on

pedestrian matters in November 2012. The next meeting will be in late April 2013.

Global News Report Findings

The Global News Network report helped raise awareness of pedestrian safety and the need for motorists, cyclists and pedestrians to respect each other, and the rules of the road - for the safety of all road users. In their report, Global News Network undertook an analysis of pedestrian collisions at 1,337 signalized intersections in the City. In their analysis, they used an 'accident ratio' calculated by dividing the number of pedestrian collisions in a 10-year period (2000-2009) by the volume of pedestrians from traffic counts at each intersection and multiplying by 1,000 based on data provided by Transportation Services. Only intersections with more than 500 pedestrians in the peak periods were included in their study. Collision rates such as the Global News 'accident ratio' is one method of assessing the level of safety in a road network and identifying locations of concern. However, there are shortcomings to this 'accident ratio,' including:

- Failure to account for the influence of vehicle volume on collision occurrence;
- Using a 10-year pedestrian collision total to calculate collision rates of intersections that have been signalized and operating for less than 10 years, and comparing with these with intersections that have been signalized for greater than 10 years;
- The method used to calculate the rates inaccurately assumes that collision rates are consistent over time, and that there are no changes to the operation and infrastructure of the road network;
- Exclusion of more than 600 intersections with less than 600 pedestrians counted; and
- Disregard of pedestrian collisions at mid-block road sections.

Identifying High Priority Locations Using A Combined Rate/Frequency Method

The simplest methods available to determine safety performance are frequency and rate – both of which have shortcomings. In the collision frequency method, locations are ranked in descending order based on the total number of incidents in a given time period (e.g. 50 collisions in 5 years or 10 collisions per year). However, the number of collisions generally increases as the volume of pedestrian and vehicle traffic increases, and thus, this approach results in a bias towards high-volume locations. Using the collision rate method can account for the effect of pedestrian and vehicle traffic volume on collision occurrence by dividing the total number of incidents in a given time period by the pedestrian and vehicle traffic volume. However, the rate method has a tendency to over-represent low-volume locations because it incorrectly assumes a predictable, linear relationship between collisions and volume. In actuality, collisions can occur anywhere and anytime as a result of many variables and factors, some controllable, such as road

design and others uncontrollable, such as driver inattentiveness. As a result, even a seemingly safe, low-volume intersection can experience one or two random collisions and mistakenly appear to be collision-prone after dividing by pedestrian and vehicle volume.

To address these issues, Transportation Services has developed a combined collision rate/frequency method to identify high priority signalized intersections which overcomes the individual shortcomings of both the rate and frequency methods.

There are a number of additional considerations affecting pedestrian collision rates and frequency which were also factored into the analysis. While the unpredictability of collision events can be problematic whenever analyzing short-term data, the effects can be reduced by using more years of data. However, using too long a time period also introduces inaccuracies, such as failing to account for changes in traffic conditions, road user composition, land use, road infrastructure and traffic operations. In this model, staff used only collision data from the most recent five-year period (2007-2011), which is a standard traffic engineering practice, and those intersections which have been signalized for less than five years were excluded – as the presence of new traffic control devices also has an impact on collision patterns and frequencies.

Priority Intersections for Pedestrian Safety Improvements

Using the above methodology, staff has identified the highest priority intersections for pedestrian safety improvement.

Table 2 identifies the 10 highest priority intersections, and Attachment 1 identifies the full list of 100 priority intersections.

Table 2: 10 Highest Priority Signalized Intersections

Street Name	Intersecting Street Name	Intersecting Street Name
Sheppard Ave.E.	Ambrose Rd.	Provost Dr.
St Dennis Dr.	Deauville Ln.	
Steeles Ave.E.	Ashcott St.	Fenton Rd.
Neilson Rd.	Mclevin Ave	
St. Clair Ave.E.	Brimley Rd.	
Roncesvalles Ave.	Fermanagh Ave.	High Park Blvd.
Steeles Ave.E.	Strawberry Hills Dr.	Hillcroft Dr.
Rexdale Blvd.	Queens Plate Dr.	Woodbine Racetrack

Street Name	Intersecting Street Name	Intersecting Street Name
Wilson Ave.	Allingham Gdns.	
Keele St.	Annette St.	

Actions for Reducing Pedestrian Collisions at the 10 Highest Priority Locations

In order to develop an action plan for the highest priority intersections, staff conducted a thorough review of the specific collision data to identify the prevailing pedestrian collision types and to determine if there were significant trends at the highest priority intersections. The data for the high priority intersections was also compared to collision types found at all other city intersections.

The results show that the four most common pedestrian collision types at the 10 Highest Priority Signalized Intersections are similar to those found at all signalized intersections within the city and are as follows:

- left-turning vehicles striking pedestrians crossing with the right-of-way (47 percent);
- vehicles going straight through the intersection striking pedestrians crossing without the right-of-way (16 percent);
- right-turning vehicles striking pedestrians crossing with the right-of-way (13 percent); and
- vehicles going straight through the intersection striking pedestrians crossing with the right-of-way (10 percent).

Table 3 below summarizes the pedestrian collision types at all signalized intersections, including the highest priority intersections in the City for the period 2007-2011.

Table 3: Pedestrian Collision Types at All Signalized Intersections 2007 - 2011

Pedestrian Collision Type	Signalized Intersections
Vehicle turns left while pedestrian crosses with right-of-way at intersection	1,864 (39%)
Vehicle turns right while pedestrian crosses with right-of-way at intersection	951 (20%)
Vehicle is going straight while pedestrian	639 (13%)

Pedestrian Collision Type	Signalized Intersections
crosses without right-of-way at intersection	
Vehicle is going straight while pedestrian crosses with right-of-way at intersection	347 (7%)
Vehicle turns left while pedestrian crosses without right-of-way at intersection	160 (3%)
Pedestrian hit at pedestrian crossover (PXO)/ pedestrian-only signal	151 (3%)
Unknown	121 (3%)
Pedestrian hit at mid-block	117 (2%)
Pedestrian involved in a collision with transit vehicle	103 (2%)
Pedestrian hit at parking lot/ private property	101 (2%)
Vehicle turns right while pedestrian crosses without right-of-way at intersection	100 (2%)
Vehicle hits pedestrian walking or running out from between stopped or parked vehicles	44 (1%)
Pedestrian involved in a collision with transit vehicle	15 (<1%)
Pedestrian hit at private driveway	8 (<1%)
Pedestrian hit on sidewalk or shoulder	8 (<1%)
Vehicle is reversing and hits pedestrian	5 (<1%)
Other/ Undefined	5 (<1%)

The issue of vehicular speed and pedestrian safety has also been raised in two recent reports. A Toronto Board of Health report entitled, "Road to Health: A Healthy Toronto by Design" dated April 16, 2012 and the Coroner's Review of Pedestrian Deaths in Ontario dated September 19, 2012, both identify vehicular speed as one of the top causal factors in pedestrian deaths. As a result, staff reviewed the *Highway Traffic Act* charges data (speeding, various dangerous and careless driving-related charges and "Fail to Yield") and cross-referenced this with those collision types in which speeding was likely to be a contributing factor. These included those pedestrian collisions where vehicles were going straight while pedestrians crossed with the right-of-way at intersections, pedestrians hit at pedestrian crossover (PXO)/pedestrian-only signals, and pedestrians hit

on the road shoulder or sidewalk. The result of this review indicates that speed may have been a contributing factor in 42 percent of the incidents at the top 100 locations.

Based on the results of the collision data analysis, Transportation Services staff then conducted site reviews of the top 10 locations to develop specific actions to enhance pedestrian safety. Feedback on the methodology, various pedestrian issues and possible actions for each intersection was also solicited from the transportation and planning members of the Staff Reference Group on Pedestrian Issues. The result is a set of 'immediate actions' as well as medium to longer term proposals to address pedestrian safety while also considering the operational issues of overall traffic safety and congestion challenges and which are detailed by each intersection in Attachment 2.

A set of 'immediate actions' have been proposed that are low cost and relatively easy to implement within existing programs through a re-prioritization of projects based on safety needs. These 'immediate actions' include tools such as those listed below and, where appropriate, the tool(s) that is most relevant to the collision issue(s) will be implemented at the respective top 10 location:

- Zebra pavement markings to make the pedestrian crossing more visible (refreshing the markings or painting them where there are none).
- Moving the cross walk closer to the intersection to increase the visibility of pedestrians to drivers making left turns (as left turn issues were a predominant trend in the collisions).
- Implementing and evaluating Leading Pedestrian Interval signals.
- Updating pedestrian walk times according to the city's current standard.
- Installing "push button" signs for pedestrian activated signals to make them more visible based upon new designs currently being developed.
- Providing minimum pedestrian walk times at all times where pedestrian volumes warrant (i.e. pedestrian is crossing at each cycle).
- Installing "Turning Traffic Must Yield to Pedestrians" signs to remind drivers to notice and give right-of-way to pedestrians when making turns.
- Review solid or wider double skip lines (when thru movement is prohibited) for drivers so they stay within their turning lane when making left turns.
- Review proven countermeasures, such as road diets using pavement markings, to reduce speeding in a high collision location.
- A protected or fully protected left turn phasing during peak periods.

Medium or longer-term proposals that require more discussion with other units or agencies like the Toronto Transit Commission (TTC), as well as the local Councillor, community and Community Council, as necessary, include:

- Moving a transit stop to the far side of the intersection to reduce conflicts between pedestrians and turning vehicles.
- Extending the median nose to guide turning vehicles.
- Reducing the corner radius.
- Eliminating a "pork chop" right-turn channel where it is not needed.
- Consider repurposing an underutilized lane (e.g. on-street parking, etc.)

From the preliminary assessment of the top 10 pedestrian collision-prone intersections, some of the tools that could be applied to the remaining top 100 list include:

- a. Leading Pedestrian Interval – recommend refining the criteria for identifying candidates for LPIs for the top 100 locations.
- b. Zebra Pavement Markings – integrate the top 100 list for locations for refreshing or painting zebra pavement markings.
- c. Review top 100 locations for Walking Speeds, especially in areas with a high concentration of vulnerable pedestrians such as seniors, and
- d. Review the criteria for Minimum Walk Times and the pedestrian volumes of the top 100 locations to consider whether any may fit the criteria for minimum pedestrian volumes.
- e. As part of the capital planning process, road safety audits be conducted prior to road reconstruction and to identify opportunities for safety enhancements as required.

Next Steps for Improving Traffic Safety

While this report has been primarily focused on pedestrian safety initiatives at the top '10' intersections – the safety of all road users is critical and is best addressed with a comprehensive approach. Transportation Services staff are now consulting with key stakeholders as to the development of an Integrated Traffic Safety Strategy whose goal is to create a continuous process which consistently reviews safety performance for all road users and works in partnership with other agencies, such as Toronto Police Services and Public Health to identify problem areas, prioritize projects and interventions, and evaluate their effectiveness once implemented.

Key components of the Integrated Traffic Safety Strategy would be the development of safety action plans which:

- Document the city's road user safety performance.
- Identify current problem areas.
- Select interventions as appropriate (engineering, enforcement and education).
- Plans, schedules and implements short, medium and long-term strategies.
- Provides on-going input on police traffic enforcement.
- Seek to reduce EMS response times.
- Monitor progress.
- Generate on-going public interest and attention to road user safety.

- Demonstrate public accountability.
- Deliver results.

An integrated approach focused on the safety of all road users and involving other agencies is designed to ensure that the responsibility for safety is placed at the forefront of all decisions surrounding the many competing demands on Toronto's transportation network.

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SIGNATURE

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ATTACHMENTS

- Attachment 1: Top 100 Highest Priority Signalized Intersections for Pedestrians Combined Rate/Frequency Method (2007-2011 Collision Data)
Attachment 2: Top Priority Intersections for Pedestrian Safety
Attachment 3: Proposed Interventions