Appendix D: City of Peterborough Road Safety Strategy

Tables

Figures

1 Introduction

Road safety has increasingly become an area of focus in federal, provincial and municipal jurisdictions, recognizing the societal and economic impact of serious and fatal collisions on municipal roadways.

Federally, Transport Canada has developed Transportation 2030, a transportation strategy for the future that includes 5 key themes, with safer transportation being featured as one of the themes. At the Federal level transportation safety measures focus on regulatory measures for new vehicle standards, improvements to railway safety including railway crossings, and evaluating and regulating the use of new vehicle technologies such as automated vehicles.

The Canadian Council of Motor Transport Administrators, an organization representing Canada's 14 provincial, federal and territorial governments, developed Canada's Road Safety Strategy 2025, which established a vision for making Canada's Roads the safest in the world combined with a vision of Towards Zero, representing an aspirational vision for the future that results in Zero road fatalities in Canada. The Road Safety Strategy is based on the adoption of a Safe Systems Approach, which places human life and health above all other objectives of the road or traffic system, recognizes that there is a shared responsibility between road users and roadway regulators for safety, requires the design and management of the roadway system to take into account that humans make mistakes and that programs should minimize the opportunities for collisions to occur and the harm done when they occur. The Road Safety Strategy is designed to recognize that various jurisdictions will implement a Safe Systems Approach in a manner that is appropriate for their environment and context.

A number of municipalities in Ontario and across Canada have implemented Road Safety Strategies in the past few years. Some of these strategies have been modelled after the "Vision Zero" program, while others have adopted elements of Vision Zero but designed their programs to address local needs and priorities. The City of Toronto and New York City were two early adopters of the Vision Zero concept. Other Road Safety Plans prepared in medium sized municipalities such as London, Hamilton, and Kingston have tended to focus on local problems and issues while endorsing the concept of Vision Zero, or at least setting goals to significantly reduce fatal and serious injury collisions. Elements of the Road Safety programs in these other jurisdictions can inform a Road Safety Strategy for the City of Peterborough.

In Peterborough, a Transportation Safety Group (TSG) was established in 2017 to provide a forum for co-operation and co-ordination of transportation safety activities undertaken by the various members with the goals of collaborating in terms of sharing information and resources and feedback. Members of TSG include various departments within the City of Peterborough, the County of Peterborough, Peterborough Police Service, Ontario Provincial Police (Peterborough Detachment), Peterborough Public Health, GreenUP, Active School Travel Peterborough, and the Peterborough Bicycle Advisory Committee (PBAC)'.

The TSG provides a forum for co-operation and co-ordination of transportation safety activities undertaken by the various members with the goals of collaborating in terms of sharing information and resources and feedback. The key areas of work are currently focused on Education, Enforcement, and Engineering strategies that can support enhanced road safety, combined with Evaluation and Engagement activities to monitor success, inform future strategies and build support for improvements in the community.

The first challenge in developing a Road Safety Strategy is the collection and assembly of data to understand what types of collisions are happening, where they are happening, when they are happening, who and what types of vehicles are involved, and what are effects in terms of injuries or fatalities. The Peterborough Police Service (PPS) and the Ontario Provincial Police (OPP) are responsible for investigating and/or collecting information for all reportable collisions that occur in the Peterborough Area, either through on site investigations at the scene of a collision or through managing Collision Reporting Centres, where residents who are involved in minor collisions can self report their collision and provide details about the collision. The respective police departments transmit the collision data to the Ministry of Transportation, who assembles the data in a centralized database that they use to administer their Road Safety Programs, including the management of any follow up charges, demerit points, or other penalties that may be applied as a result of charges laid under the Highway Traffic Act.

Between 2017 and 2019 the City and County initiated agreements with the Ministry of Transportation to obtain collision data owned by the Province for roadways under their respective jurisdictions in order to develop safety programs as part of managing their roadways. In the City, centralized database applications were developed to maintain and store the collision data, which currently includes all data between 2014 and 2020, and links to the City GIS systems were developed in order to allow for the mapping and analysis of the data.

The City and County also collect and maintain traffic volume data, and some speed study information that is collected at various locations across their respective road networks to support a number of programs, including road safety assessments. Traffic data collection can be obtained through intersection traffic counts, or through automated traffic counters using video detection technologies or road tubes laid across the roadway. The City of Peterborough typically collects annual traffic counts in the fall of each year, at approximately 320 stations covering the majority of the arterial and collector roads in the City. Intersection turning counts are also collected at 80-120 intersections each year, as part of maintaining the City's 125 signalized intersections and to support studies investigating the need for intersection improvements. Additional data is collected for specialized or ad hoc projects on certain roadways to support ongoing programs such as traffic calming studies, crossing guard requests, road reconstruction projects, or in order to respond to resident concerns.

Data on injuries is also collected at the hospital where Emergency Department Visits, Hospitalizations, and Fatalities due to range of causes are collected and maintained by the Ministry of Health and Long Term Care. Form this source, data related to collisions of all types, including off road vehicles and snow mobiles, can be obtained and assessed. This data is collected and organized based on the location of where the person visiting the hospital lives, not where the actual collision occurred, which limits the applicability of this information for detailed safety studies. Accordingly, this data is primarily used to corroborate the MTO Collision data and to provide an indication of collisions occurring in off road locations. Other sources of data that can be accessed to assist in program design or evaluation includes enforcement related data from police forces, Statistics Canada Data from the Census or from the Canadian Community Health Survey, and local data collected by Active School Travel Peterborough.

2 Overview - City-Wide Collision Statistics

The primary source of data used in preparing the draft Safe Moves program is the MTO Collision Data downloaded for the roadways falling within and under the jurisdiction of the City of Peterborough. Collision data for County Roads, township roads, and for Ministry of Transportation Highways (such as Highway 7, 28, and 115) are not included in the statistics reported herein**.**

On average, in a typical year, there are approximately 1,542 reportable collisions that occur on City of Peterborough roadways. Reportable collisions are those involving injuries, property damage in excess of $2000, or any collision involving the opening of a door on a vehicle that comes into contact with another vehicle or bicycle, as required under the Highway Traffic Act. Of these collisions, approximately 1,473 collisions (95.5%) involved only cars and trucks, while 42 collisions (2.7%) involved pedestrians and 27 collisions (1.8%) involved cyclists, as summarized in **Table 1.**

Table 1: Vehicle, Pedestrian and Cyclist Collision Data – 2014 to 2020

Year	Vehicles Only	Pedestrians	Cyclists	Total
2014	1353	51	36	1440
2015	1470	50	35	1555
2016	1565	58	32	1655
2017	1597	41	28	1666
2018	1646	38	25	1709
2019	1598	27	20	1645
2020	1081	29	16	1126
Average	**1473**	**42**	**27**	**1542**

On a year by year basis, total collisions in the City were increasing between 2014 and 2018, with a reduction in collisions observed in 2019, followed by a significant drop in 2020, due to reduced driving during COVID lock-downs and restrictions as illustrated in **Figure 1**.

To some extent a growth in population may be assumed to translate into a growth in collisions on the City's roads. **Table 2** summarizes the annual collision totals compared to the recent growth in population in the City. Between 2014 and 2018, the per capita collision rate (collisions per 1000 residents) also increased, from 18.0 in 2014 to a high of 20.8 collisions per 1000 people in 2018. Based on the increased rate of collisions, the number of collisions between 2014 and 2018 increased at a higher rate than the population. In 2019, this rate dropped to 19.9 collisions per 1000 residents, followed by a further drop in 2020 to 13.5 collisions per 1000 people.

Figure 1: Total Reported Collisions by Year – 2014 to 2020

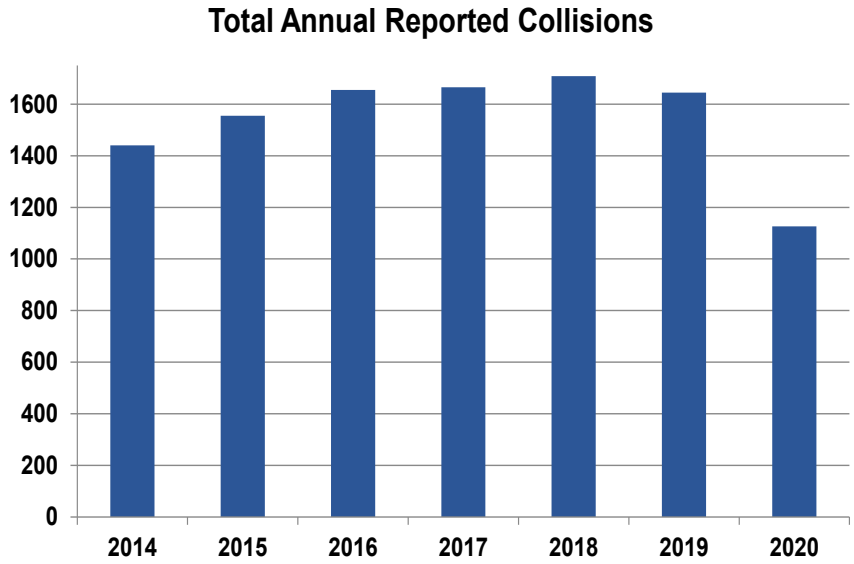


Table 2: Per Capita Collision Rate by Year – 2014 to 2020

	2014	2015	2016	2017	2018	2019	2020
Collisions	1,440	1,555	1,655	1,666	1,709	1,645	1,126
Population (000)	80.1	80.6	81.0	81.5	82.0	82.5	83.0
Collisions Per 1000 People	18.0	19.3	20.4	20.4	20.8	19.9	13.5

2.1 Comparisons With Other Communities

To put the City's collision statistics into context, a comparison of annual collisions and collision rates was undertaken for 2018, the most recent data provided by the Ministry of Transportation as part of their Road Safety Annual Report. **Table 3** summarizes the estimated 2018 population, collisions, and collision rate per capita for 8 other communities in Ontario of a similar size as Peterborough.

It should be noted that the reported collisions in the MTO Road Safety Annual Report occurring within the City of Peterborough are lower than the total collisions reported for 2018 in the City collision database. The differences between these two databases are likely due to a number of collisions occurring at intersections with Provincial Highways or County Roads on the boundary of the City which may have been included in the City collision statistics but excluded from the provincial summaries. One example of this would include the Highway 7/115 off ramps at the Parkway, where the City operates the traffic signals on behalf of the Ministry although the intersection is under the jurisdiction of the province.

Table 3: Comparison of Per Capita Collision Rates – 2018

City	2018 Population (Est.)	2018 Collisions**	Collisions per 1000 People
Sarnia	70,262	869	12.4
Sault Ste Marie	62,780	982	15.6
Peterborough	**86,756**	**1,308**	**15.1**
Niagara Falls	99,143	1,194	12.0
Brantford	106,395	1,624	15.3
Kingston	123,375	1,764	14.3
Guelph	154,580	1,723	11.1
St. Catharines	136,596	1,500	11.0
Barrie	156,589	2,349	15.0

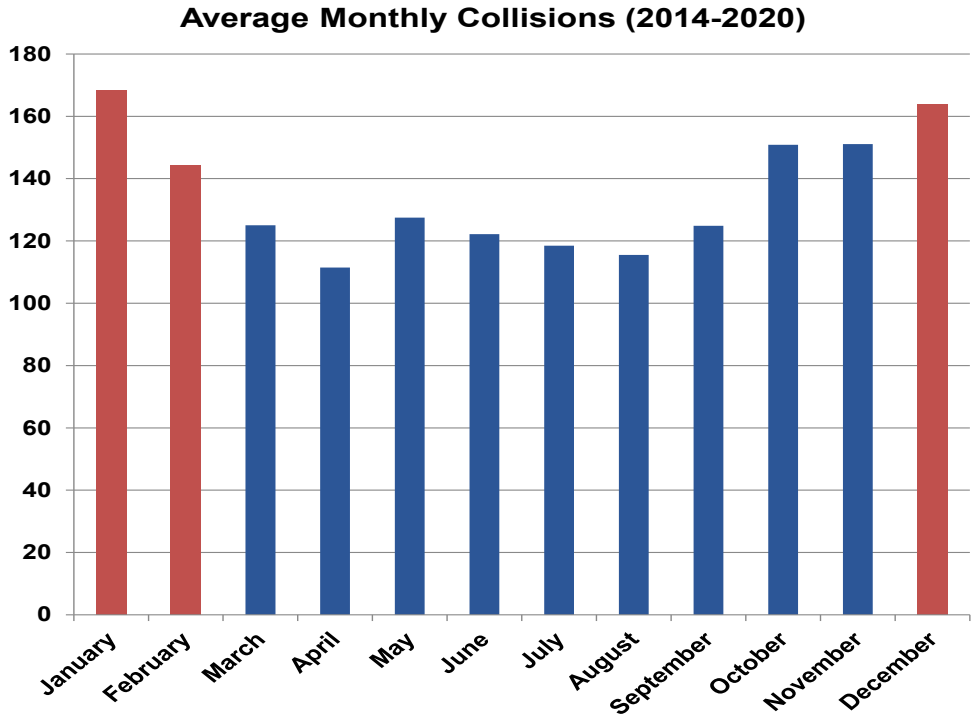
** Based on statistics from Ontario Road Safety Annual Report, 2018

Peterborough's per capita collision rate of 15.1 collisions per 1000 residents is lower than Sault Ste Marie and Brantford and is comparable to the rate observed in Barrie. It is interesting to note that some of the communities with lower per capita collision rates (Guelph, St Catharines, and Niagara Falls) have multiple provincial highways within the urban areas of these communities which may be serving significant local travel demands in additional to longer distance provincial traffic. This could shift some of the collision experience onto the provincial highways away from local roads, which might explain some of the differences in per capita collision rates, which ignore the amount of traffic travelling on the local roads in question. While care should be taken in drawing conclusions based on the comparisons above, it is evident that per capita collision rates in Peterborough are in the range of rates observed in other similar sized communities in the province.

2.2 Assessment of City Collision Patterns

On average there are approximately 135 reported collisions each month in the City, although the number of collisions vary quite significantly throughout the year, as illustrated in **Figure 2**. During the winter months, there are approximately 30% more collisions occurring on City roads, largely due to winter weather conditions combined with earlier onset of dark driving conditions that can reduce visibility.

Figure 2: Average Collisions by Month – 2014 to 2020



Collision reported to the province are categorized by four levels of severity; Fatalities, Major Injuries (requiring extensive treatment or hospital stays), Minimal/Minor Injuries, and No Injuries (often referred to as Property Damage Only collisions). For analysis purposes Fatal collisions and Major Injury Collisions are typically grouped and reported together as both types of collisions are very traumatic and the conditions that result in major injuries can often also result in fatalities. These combined collisions are often reported as KSI collisions (where someone is killed or seriously injured).

On average KSI collisions represent just under 1% of total annual collisions, with an average of 12 KSI collisions per year between 2014 and 2020. Of these, there has been an average of 1 fatal collision per year between 2014 and 2020, with an average of 11 major injury collisions per year over the same period. Collisions involving minor injuries represent approximately 19% of average annual collisions and the remaining 80% of collisions involve property damage only.

A multi-year analysis is typically used when examining collision severity to ensure random events from one year do not get misinterpreted as annual trends. As illustrated in **Figure 3**, there was an abnormally high number of major injury collisions in 2015 and a higher than average number of fatal collisions were experienced in 2016 compared to the six year average. Despite the overall lower number of collisions reported in 2020, during the pandemic, the number of KSI collisions increased noticeably with 13 KSI collisions reported compared to 9 KSI collisions reported in the previous two years. This too, may be a one year anomaly or it may be an indication of an increase in aggressive and reckless driving that was anecdotally reported in a number of communities during the pandemic lockdowns[1].

[1] It's scary': Toronto police report 222% jump in stunt driving charges during COVID-19 pandemic, April 12,2021, Aaron D'Andrea, Toronto.com

Figure 3: Annual KSI Collisions – 2014 to 2020

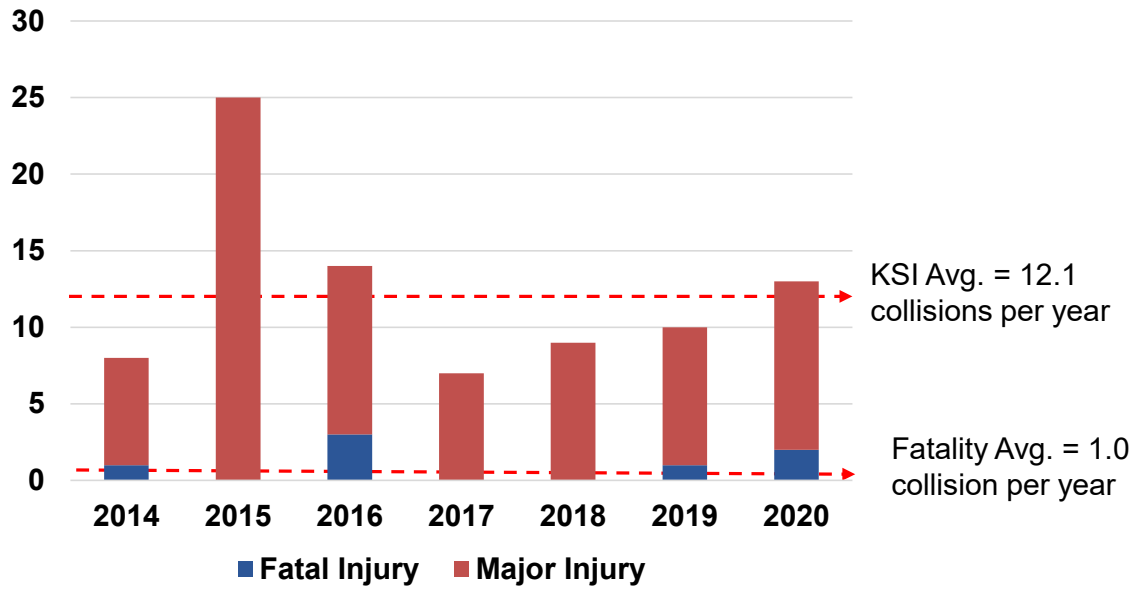


Table 4 summarizes the collisions between 2014 and 2020 by collision severity and mode of travel. Over this period 16.3 % of all collisions have resulted in some form of injury, with the majority being minor injuries (15.5%). However, when this is broken down by mode of travel, pedestrian and cyclist collisions represent 42% of all serious / fatal collisions and 22% of minor injury collisions in the City. Approximately 92% of pedestrian and 74% of cyclist collisions result in some form of injury, versus only 13% of collisions involving motor vehicles. Of these, approximately 10% of pedestrian collisions and 4% of cyclist collisions result in serious / fatal injuries.

Table 4: Collision Severity by Mode of Travel – 2014 to 2020

Type	Vehicle	Pedestrian	Cyclist	Total
KSI	**50**	**28**	**7**	**85**
% of mode	(0.5%)	(9.6%)	(3.6%)	(0.8%)
% by mode	(58.8%)	(32.9%)	(8.3%)	(100%)
Minor Injury	**1,298**	**239**	**134**	**1,671**
% of mode	(12.6%)	(82.2%)	(69.8%)	(15.5%)
% by mode	(77.7%)	(14.3%)	(8.0%)	(100%)
No Injury	**8,965**	**24**	**51**	**9,040**
% of mode	(86.9%)	(8.2%)	(26.6%)	(83.7%)
% by mode	(99.2%)	(0.3%)	(0.5%)	(100%)

Total	**10,313**	**291**	**192**	**10,796**
% of mode	**(100%)**	**(100%)**	**(100%)**	**(100%)**
% by mode	**(95.5%)**	**(2.7%)**	**(1.8%)**	**(100%)**

Despite the observation that pedestrian and cyclist collisions only represent 5% of total collisions occurring in Peterborough, these two user groups are the most vulnerable users of the road network in terms of the share of collisions resulting in the potential for injuries.

Table 5 summarizes the actions for the at fault participants in the KSI collisions (fatal or major injuries) reported between 2014 and 2020. Of the 85 collisions categorized as KSI, 27% of these were due to one of participants (either the driver, cyclist or pedestrian) failing to yield the right-of-way to other road users. Approximately 13% of these collisions were caused by the driver or cyclist losing control of their vehicle, and close to 12% were due to the driver or cyclist disobeying a traffic control device. In 11% of serious injury collisions the driver was driving properly according to the police report.

In 8% of serious injury collisions the driver was following too close and another 8% involved doing some other action. Speed played a role in about 9% of serious injury collisions, with exceeding the posted speed limit noted in 5% of these collisions, while driving too fast for road conditions was cited in almost 4%. Improper passing and pedestrians crossing without the right-of-way were factors in close to 4% of serious injury collisions.

Table 5: KSI Collisions by Action – 2014 to 2020

Action	Driver	Pedestrian	Cyclist	Total	Share
Driving Properly	9			**9**	**10.6%**
Following Too Close	7			**7**	**8.2%**
Exceed Speed Limit	4			**4**	**4.7%**
Speed Too Fast for Conditions	3			**3**	**3.5%**
Improper Turn	2			**2**	**2.4%**
Disobey Traffic Control	9		1	**10**	**11.8%**
Failed to Yield ROW	22		1	**23**	**27.1%**
Improper Passing	3			**3**	**3.5%**
Lost Control	10		1	**11**	**12.9%**
Wrong Way	1			**1**	**1.2%**
Improper Lane Change	1			**1**	**1.2%**
Crossing Without Right of Way		3		**3**	**3.5%**
Running Onto Roadway		1		**1**	**1.2%**
Other	7			**7**	**8.2%**
Total	**78**	**4**	**3**	**85**	**100%**

Table 6 summarizes the types of collisions that have occurred on City roadways between 2014 and 2020 and compares these statistics to the most recent figures for the entire province, based on data contained in the 2019 Road Safety Annual Report. Collisions reported to the police are categorized into different types of collisions to assist in determining the causes of collisions and potential solutions. For the purpose of this summary, 8 different collision types have been summarized which include:

- Approach - collisions involving vehicles travelling in opposite directions on the same roadway (i.e. head on collisions);
- Angle - collisions typically occurring at intersections or driveways, where vehicles are travelling on different roadways and collide on a right angle;
- Rear End - collisions on the same road and in the same direction of travel where one vehicle hits the rear of another vehicle;
- Sideswipe – collisions on the same road where one vehicle hits another vehicle in another lane of travel or while in the process of changing lanes;
- Turning - collision where both vehicles are on the same road and one vehicle strikes another vehicle while in the process of making a turn at an intersection or driveway;
- Single Vehicle Unattended – collision where a vehicle strikes an unattended vehicle, usually parked;
- Other Single Vehicle – all other collisions involving a single vehicle either leaving the roadway or striking another object; and
- Other – all other collisions.

Table 6: Collisions by Type – 2014 to 2020

Type	Collisions 2014-2020	Collision %	Provincial Avg. (2019)
Approach	127	1.2%	3.0%
Angle	1381	12.8%	12.7%
Rear End	2937	27.2%	25.6%
Sideswipe	1261	11.7%	5.5%
Turning	2415	22.4%	23.1%
Single Vehicle Unattended	1023	9.5%	0.9%
Other Single Vehicle	1064	9.9%	28.6%
Other	588	5.4%	0.5%
Total	**10,796**	**100%**	**100%**

On City roads, rear end collisions are the most frequently occurring collision, representing approximately 27% of all collisions. Rear end collisions tend to be less severe than other types of collisions and often occur at intersections or in areas with congestion. City patterns for rear end collisions are similar to the provincial average. Turning collisions are the second most frequent in the City, representing 22% of total

collisions, versus the provincial average of 23%. Turning collisions are most common at intersections and driveways where vehicles fail to yield to oncoming traffic or pedestrians crossing the intersecting roadway.

Single vehicle collisions represent just over 19% of total collisions, with approximately half of these being collisions with unattended vehicles and the other half due to vehicles losing control and leaving the roadway or hitting some other object. The total share of single vehicle collisions is similar to the provincial average, however the share of vehicles striking unattended vehicles is significantly higher than the provincial average.

Angle collisions represent approximately 13% of total collisions, which is also in line with the provincial average. Angle collisions tend to be more severe and are typically caused by one vehicle that fails to yield the right-of-way to another vehicle on the other roadway.

Sideswipe collisions account for just under 12% of total collisions on City roads, which is more than double the provincial average. Sideswipe collisions are common on multi-lane roads that either do not have separate turning lanes, or feature congestion, both of which can lead to increased lane changing. On multi-lane roadways with narrow lanes, such as Water Street and Clonsilla Avenue (for example), sideswipe collisions can occur when larger vehicles such as trucks and buses collide with other vehicles that are passing.

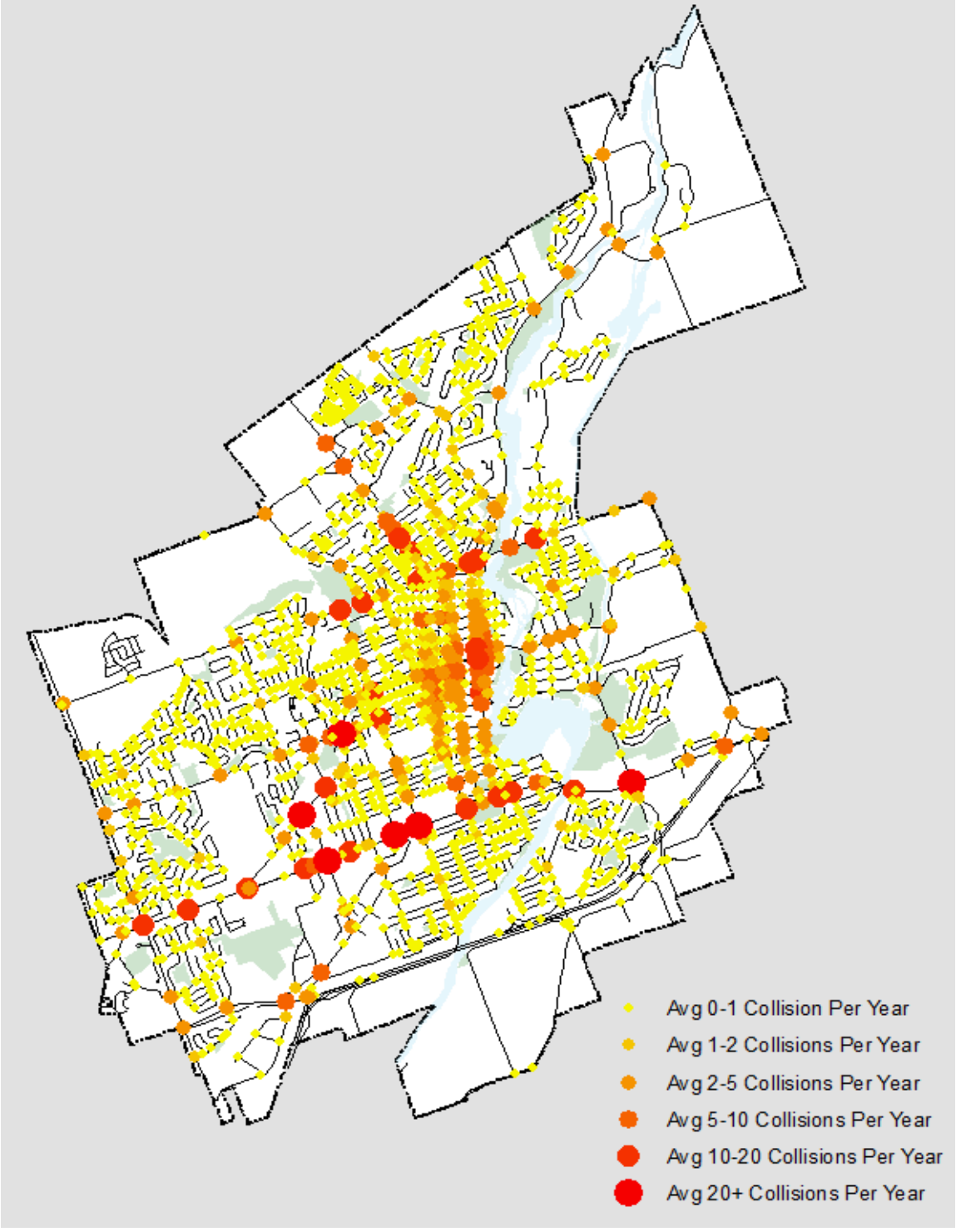
Table 7 summarizes the locations where collisions occur on City roads. The majority of collisions in Peterborough occur at intersections, which is typical in an urban setting as these locations feature the highest potential for conflicts between vehicles and between vehicles and other road users. An additional 17.5% of collisions have been categorized as intersection related, which typically means the collision occurred in close proximity to an intersection or was related to the operation of the intersection. An example of this would be a rear end collision, which may occur upstream of an intersection due to stopped traffic. The share of intersection and intersection related collisions in Peterborough, at almost 55% of all collisions, are collectively higher than the provincial average of approximately 41% of all collisions. Similarly, collisions at private driveways are almost double the provincial average.

Table 7: Collisions by Location – 2014 to 2020

Location	Collisions 2014-2020	Collision %	Provincial Avg. (2019)
Non-Intersection	2974	27.5%	49.5%
Intersection Related	1888	17.5%	20.4%
At Intersection	4035	37.4%	20.4%
Private Drive	1832	17.0%	9.0%
Railway Crossing	12	0.1%	0.1%
Underpass / Tunnel	2	0.0%	0.0%
Overpass / Bridge	11	0.1%	0.2%
Other	42	0.4%	0.3%
Total	**10,796**	**100%**	**100%**

Figure 4 illustrates the collision locations geographically dispersed across the City. As illustrated in the map, the influence of intersection collisions in very apparent along Lansdowne Street, Clonsilla Avenue, Parkhill Road, Chemong Road and in the downtown.

Figure 4: Collisions by Location – 2014 to 2020



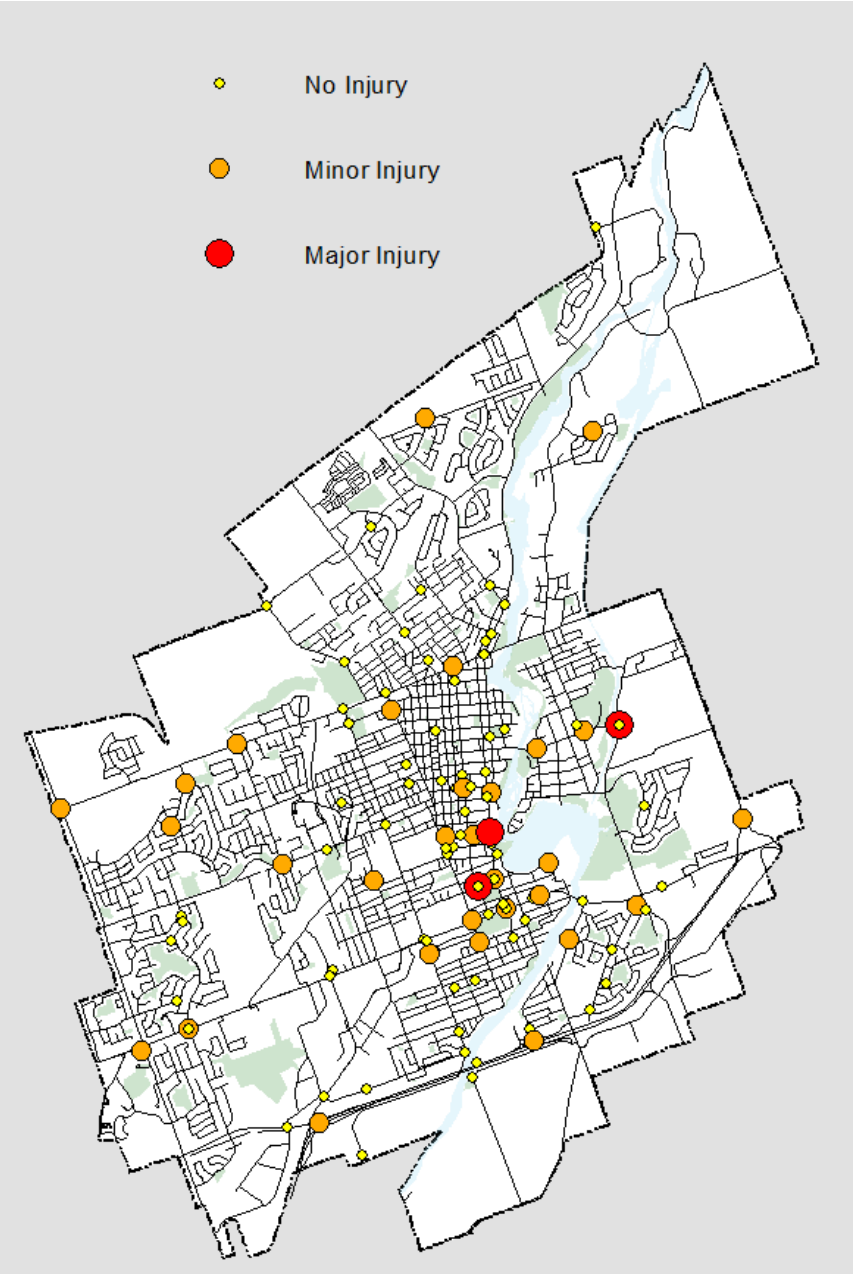
Unfortunately, impaired driving continues to be a source of collisions in the community despite the widespread education campaigns, the increasingly stiff penalties, and the targeted enforcement programs over the years. Between 2014 and July of 2020 (only partial data for 2020 was available at the time this was assembled) there have been 116 collisions in the City where one of the drivers was charged with impaired driving. Of these, 34 collisions resulted in some form of injury. As summarized in **Table 8**, impaired driving collisions represent approximately 1.1% of all annual collisions on an average basis, although since 2018 the annual percentage of total collisions has been trending higher. The highest rate was observed in 2020 with impaired driving causing 1.6% of collisions. While the total number of collisions in 2020 reflects the full year, the number of impaired driving collisions is only based on partial data collected for the first seven months of 2020, meaning the number of impaired driving collisions may be higher than reported.

Table 8: Collisions Involving Impaired Driving – 2014 to 2020

Year	Total Collisions	Impaired Driving Collisions	Annual Percentage	Injuries (Major and Minor)
2014	1440	10	0.7%	3
2015	1555	17	1.1%	6
2016	1655	13	0.8%	4
2017	1666	14	0.8%	3
2018	1709	23	1.3%	7
2019	1645	21	1.3%	8
2020	1126	18 (Jan-Jul)	1.6%	3
Average	**1611**	**17.8**	**1.1%**	**5.2**

Figure 5 illustrates the locations where impaired driving collisions have been reported across the City and the type of injuries (major, minor, and no injury) that have been attributed to these collisions. Impaired driving collisions and injuries are generally distributed across all areas of the City, however there appear to be more of these occurring in the downtown area than other areas, which is not necessarily unexpected and may be reflective of the locations where the majority of bars and restaurants are located. Despite that, a significant number of impaired driving collisions are reported in largely residential areas of the City as well, suggesting that this is not necessarily a downtown area problem.

Figure 5: Collisions Involving Impaired Driving – 2014 to 2020



2.3 Framework for a Road Safety Strategy

Based on the collision overview and a review of other road safety programs in other municipalities it is recommended that future road safety initiatives should be aligned with existing safety issues and patterns observed in the Peterborough context. The collision data in Peterborough suggests that there are a number of key areas where safety can be enhanced. In some cases, the collision statistics suggest areas for targeted programs, and in other areas, such as neighbourhoods, residents often feel unsafe due to traffic and infrastructure conditions even when collision frequencies are low.

Road Safety initiatives will incorporate evidence-based strategies and solutions where practical, and a safe systems approach will be considered in the design of new transportation infrastructure to enhance the safety for vulnerable users of the transportation network.

The Road Safety Vision for the City will target a 50% reduction in fatalities and major injuries over the next 10 years, such that collisions involving fatalities and major injuries will represent no more than 0.5% of total annual collisions by 2031.

Each area of road safety emphasis should include a shared vision for safety amongst all users and should feature a mixture of initiatives that include:

- Education measures to inform residents of safety risks and safe habits,
- Enforcement measures that enhance the ability of the Peterborough Polices Service to target at-risk behaviours and use enforcement to compliment education, and
- Engineering measures to improve transportation infrastructure in ways that reduce the opportunity for collisions, including the use of emerging technology to reduce collision risk.

The proposed Road Safety Strategy will feature “Five safe moves” which target the key opportunities to enhance road safety in the City:

- Safe School Zones
- Safe Neighbourhoods
- Safety for Vulnerable Users
- Safe Corridors
- Safe Intersections

Each safe move is further discussed in the sections that follow.

3 Five safe moves

3.1 Safe School Zones

The City has 31 elementary and secondary schools distributed geographically across the City. Of these, 28 of the schools border on arterial or collector roadways which provide good access from various areas of the City, but due to higher traffic volumes and higher operating speeds of vehicles on these roads, the potential for vehicle / pedestrian conflicts around school areas is increased.

In order to address this potential risk, the City of Peterborough currently has 13 school zone locations with reduced speed limits in place. Most of the school zone speed limits are activated on a time of day basis when schools are open, and the speed limit (40 km/h when flashing) is enforced via signs with flashing beacons indicating when the 40 km/h limit is in force. Two school zones are located in an area with a permanent 40 km/h speed limit in place.

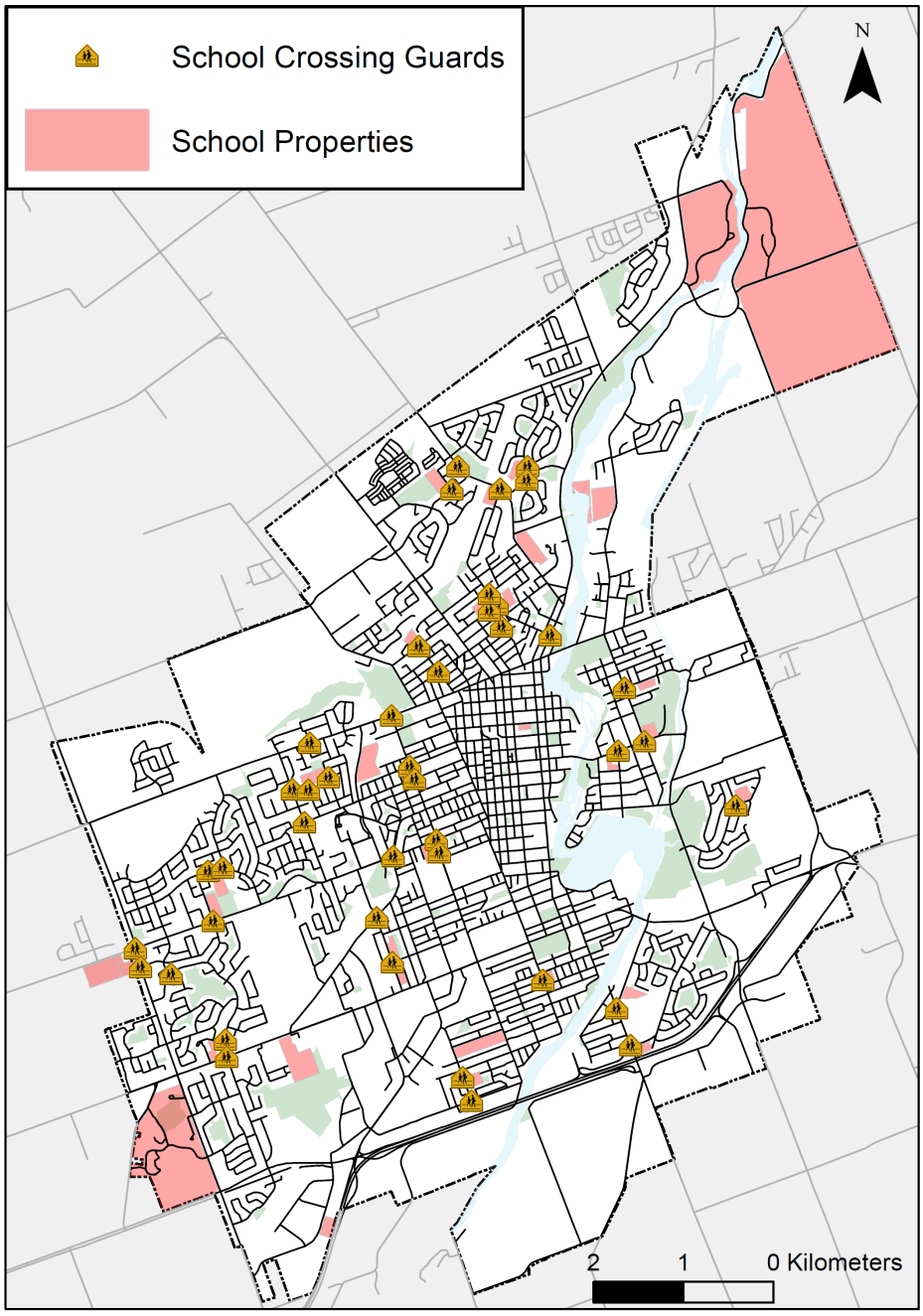
Most of these locations with reduced speed limits have been implemented in response to concerns expressed in the community, and after a review of operating conditions in the area of each school area. Reduced speed limits require sustained enforcement to be effective, and anecdotal feedback from the police have indicated that the reduced speed limits “when signs are flashing” are harder to enforce as the officer needs to be sure the sign was flashing at the time the speeding infraction was recorded. Without that evidence charges could be reduced, or the case dismissed when it gets to court.

The Highway Traffic Act (HTA), specifically R.R.O. 1990, Regulation 615 (Signs), has recently been revised to include signage that states the times, days and months a school area speed limit is applicable to partially address this concern. Instead of requiring a flashing beacon, the reduced limits would be in place during set school arrival and departure times indicated on the signs, allowing these times to be customized for each school.

In addition to school area speed zones, the City operates the crossing guard program to assist schools in providing safe road crossings for students who walk to school. There are currently 44 crosswalks that are supervised by crossing guards at 22 different schools. Typically crossing guards are not used at high schools. Under the Highway Traffic Act crossing guards must be over 16 years of age and must be employed by a municipality or by a corporation under contract with a municipality. City of Peterborough crossing guards undergo yearly training and background checks, and new guards are provided with in-person training assistance during their first few shifts.

Figure 6 illustrates the locations of schools and designated crossing guard locations in the City. Of the 44 crossing guard locations, 23 are mid-block crossings with school crossing signs and cross walk pavement markings, 12 are located at signalized intersections, 4 are located at All-Way Stop intersections, 3 are located at mid-block pedestrian crossing signals and 2 are located at intersections with stop signs on the minor roadway.

Figure 6: Peterborough Schools and Crossing Guard Locations



At each school area, standardized signing and pavement markings are used to highlight the location of designated school crossings for approaching drivers on the roadway, as illustrated in **Figure 7**. Using standard treatments for all schools improves driver perception and reaction to upcoming school areas fostering improved recognition of the upcoming school area.

Figure 7: Typical School Crossing

Source: Google Street View

The City, in partnership with GreenUP, operates Active School Travel Peterborough, formerly Active and Safe Routes to School, which is a program designed to promote the use of active and sustainable transportation for the daily trip to school. The program has been in operation since 1999 and works with local schools to implement programs that encourage students to walk, run, cycle, skate or bus to school and in doing so addresses health and traffic safety issues while taking action on air pollution and climate change. Since the program initiation various programs have been offered including:

- On the Bus – a program that takes grade 3 students on a guided tour of the city on a Peterborough Transit Bus to teach them about public transit;
- Grade 8 Transit Quest – similar to On the Bus, this program provides free transit passes to grade 8 students each March Break to allow them to use transit for their travel during the break;
- Car Free Wednesdays – a campaign that encourages students to walk, bike or ride the bus on the first Wednesday of each month;
- International Walk to School Day – for 15 years Peterborough has been supporting this international program at local schools;
- School Travel Mapping – which is a program that provides school travel maps for individual schools to support safe and informed school travel planning;
- In School Cycling Education – providing hands on training for children on safe cycling practices, rules of the road, and skill development programs;
- School Travel Surveys - school travel data is collected annually to understand school travel choice and behaviour; and
- Teacher Resources – such as lesson plans that teach children safe travel habits and awareness of local hazards on their route to school.

Table 9 summarizes the annual number of collisions occurring in school areas. Between 2014 and 2020 there have been an average of 146 collisions in school zones each year, however, after filtering these to only include the collisions that occurred during the school year and only the collisions that occurred during the hours when schools are in operation, it is estimated that an average of 63 collisions per year occur in school areas when schools are in operation. This does not suggest that these collisions are related to the operation of the school areas or the crossings, just that the collisions occurred in the school area and during school hours. Since 2017, the number of annual collisions in school areas has been higher than the 7 year average.

Table 9: School Area Collisions by Injury Class – 2014 to 2020

	2014	2015	2016	2017	2018	2019	2020*	Avg
Collisions	1440	1555	1655	1666	1709	1645	1126	**1542**
School Area Collisions	155	146	137	143	142	141	163	**146**
School Area Collisions during School Year and School Hours**	65	56	56	58	72	67	69	**63**
KSI Collisions (fatal + major injury)	1	1	0	0	0	0	0	**0.3**
Minor Injury	4	7	7	8	4	0	6	**5.1**
No Injury	60	48	49	50	68	67	63	**57.9**

Serious collisions in school zones resulting in major injuries or fatalities are rare, with only 2 observed between 2014 and 2020. On average there are approximately 5 school area collisions per year that involve minor injuries.

There are approximately 41.5 km of roadway in the City designated as a school zone, and based on the average collision occurrences there are approximately 1.5 collisions per kilometre per year in these areas. On a City-wide basis, there are approximately 3.21 collisions per kilometer of roadway across the entire City. Given that most of the school areas are located on arterial and collector roads, which tend to have higher volumes and a higher number of collisions, the reduced collision rate in school zones shows that existing programs, awareness, and signage have some benefit in enhancing safety in school areas.

Table 10: School Area Collisions by Type – 2014 to 2020

Collision Type	Number of Collisions (2014-2020)	Percentage of School Area Collisions (2014-2020)	Percentage of City-Wide Collisions
Approaching	7	1.6%	1.17%
Angle	47	10.6%	12.58%
Rear End	**178**	**40.2%**	**27.34%**

Sideswipe	47	10.6%	11.82%
Turning Movement	94	21.2%	22.56%
Single Motor Vehicle	42	9.5%	9.50%
Other	**66**	**14.9%**	**9.71%**
Total	**443**	**100.0%**	**100%**

As indicated in Table 10, the vast majority of collisions in school areas during school operation are rear end collisions, which make up 40% of all collisions during these periods. By comparison, rear end collisions make up approximately 27% of total collisions across the City. Turning movement collisions are the next highest type that occur in school areas, however at 21% of total school area collisions these are slightly below the city-wide average. Other collision types represent approximately 15% of total school area collisions compared to just under 10% on city-wide basis. Other collisions are typically collisions that involve drivers backing out of their driveways and hitting moving vehicles or vehicles parked on the roadway.

Table 11: School Area Collisions by Mode of Travel – 2014 to 2020

Year	Pedestrian	Cyclist	Vehicle Only	Total
2014	3	1	61	**65**
2015	2	0	54	**56**
2016	1	0	55	**56**
2017	4	1	53	**58**
2018	2	0	70	**72**
2019	0	0	67	**67**
2020	1	1	67	**69**
Total	**13**	**3**	**427**	**443**

Of the 443 total collisions reported in school areas during school operations between 2-14 and 2020, 13 of these involved pedestrians (2.9%), 3 involved cyclists (0.7%), and the remaining 427 (96.4%) were vehicle only collisions. Compared to the city-wide trends, discussed previously, cycling related collisions in school zones are under- represented.

Of the 13 pedestrian collisions in school zones during school hours, 1 involved major injuries and 10 resulted in minor injuries. Two of the cyclist collisions noted in **Table 11** involved minor injuries. Again, similar to the city-wide trends, while the frequency of pedestrian and cyclist collisions is relatively low, these vulnerable users are more likely to be injured when they are involved in a collision.

Safe School Zone Recommendations

The following key education, engineering and enforcement recommendations outlined in **Table 12** are proposed to compliment existing school area safety programs:

Table 12: Sample Safe School Zone Recommendations

Education Measures	Description
Enhance promotion of walking and cycling to school	Build on the Active School Travel Peterborough program and undertake additional outreach to more schools each year to promote safety awareness for those walking and cycling to schools.
Safe arrival plans – managing on-site/on-road parking	Develop school area traffic management plans to better manage on-site and on-street parking, student pick-up and drop off protocols, management of school bus loading areas, and designating safe walking and cycling routes to schools
Engineering Measures	**Description**
Enhanced signage and markings in school zones	Develop enhanced school area signing plan incorporating additional warning signs, active speed feedback signs, and additional pavement marking treatments to raise awareness of school zones – apply consistently across City
Enhanced school crossings, where required	Investigate application of enhanced ladder cross walks for all school crossings to enhance visibility and awareness
Enforcement Measures	**Description**
Default school area speed limits	Establish default 40 km/h speed limit in all school zones – eliminate “when flashing” signs
Introduce community safety zones (2x fines)	Establish Community Safety Zones in all school zones to enable double fines to be applied
Parking Enforcement	Proactive enforcement of no parking / no stopping restrictions in school areas during school times
Enhanced Automated Enforcement	Investigate feasibility of Automated Speed Enforcement cameras for school zones

3.2 Safe Neighbourhoods

Road safety in local neighbourhoods is often raised by residents as a topic of concern. Every neighbourhood is different and has different types of roads within the neighbourhood boundaries, which makes analysis of neighbourhood collisions on a city wide basis a little more challenging. As most neighbourhoods are made up of collector and local roads, this initial analysis has focussed on collision patterns for these types of roads as an indication of what is happening in neighbourhoods in general.

Table 13 summarizes the collision history in the City by roadway classification. Approximately 75% of all collisions between 2014 and 2020 occurred on the Arterial Roads in the City, while 10% were located on Collector Roads, 14% were on Local Roads, and 1% were on other road types.

Arterial Roads make up 23% of the total length of roadway in the City, Collector Roads account for 17% and local roads account for 50%, with about 10% characterized as other road types (private roads in condominium complexes making up most of this total). As such, collisions on Arterial Roads are overrepresented compared to collisions occurring on the Collector and Local Road networks in neighbourhoods.

Table 13: Collisions by Road Class

Year	Total Collisions	Arterial	Collector	Local	Other
2014	1440	1054	150	228	8
2015	1555	1150	154	239	12
2016	1655	1279	166	202	8
2017	1666	1245	178	237	6
2018	1709	1304	173	228	4
2019	1645	1261	157	221	6
2020	1126	826	143	154	3
Total	**10,796**	**8,119**	**1,121**	**1,509**	**47**
Average (%)	**1542**	**1160 (75%)**	**160 (10%)**	**216 (14%)**	**7 (1%)**

Neighbourhood roads are also very different in terms of the locations of collisions. As summarized in **Table 14**, on Arterial Roads in the City, approximately 66% of the collisions occur at intersections, while the other 34% occurred at mid-block (non intersection) locations. For Collector Roads this pattern is almost reversed, with intersections accounting for 37% of total collisions with 63% occurring in mid block locations. On Local Roads, 91% of collisions occur at mid-block locations, with only 9% located at intersections.

Table 14: Collisions by Road Class and Location

Year	Arterial		Collector		Local	
	Mid Block	Intersection	Mid Block	Intersection	Mid Block	Intersection
2014	353	701	88	62	202	26
2015	372	778	94	60	222	17
2016	427	852	103	63	181	21
2017	457	788	112	66	218	19
2018	407	897	113	60	213	15
2019	456	805	110	47	203	18
2020	261	565	91	52	137	17
Total	**2,733**	**5,386**	**711**	**410**	**1,376**	**133**
Average (%)	**390 (33.7%)**	**769 (66.3%)**	**102 (63.4%)**	**59 (36.6%)**	**197 (91.2%)**	**19 (8.8%)**

As noted in **Table 15**, major injury collisions on neighbourhood roads are relatively rare. While no fatal collisions were reported on either collector or local neighbourhood roads between 2014 and 2020, there were an average of 1.3 collisions per year occurring on Collector Roads and 1.1 collisions per year on Local Roads which were classified as major injury.

Table 15: Neighbourhood Collisions by Injury Level

Year	Collector			Local		
	Major Injury	Minor Injury	No Injury	Major Injury	Minor Injury	No Injury
2014	0	24	126	2	26	200
2015	1	29	124	4	15	220
2016	2	26	138	0	21	181
2017	1	25	152	0	15	222
2018	2	12	159	1	10	217
2019	1	11	145	1	11	209
2020	2	10	131	0	9	145
Total	**9**	**137**	**975**	**8**	**107**	**1,394**
Average (%)	**1.3 (0.8%)**	**19.6 (12.2%)**	**139.3 (87.0%)**	**1.1 (0.5%)**	**15.3 (7.1%)**	**199.1 (92.4%)**

Collisions resulting in minor injuries represent 12% of total collisions on Collector Roads with just under 20 collisions per year, and about 7% of collisions on Local Roads, with just over 15 collisions each year.

Table 16 summarizes the locations where neighbourhood collisions have occurred between 2014 and 2020, separated by Collector and Local Roads. On Collector Roads, almost 36% of collisions occurred at intersections or close enough to be related to the way an intersection operates, while intersections only account for about 10% of collisions on Local Roads. Non -intersection (mid block) collisions make up 35% of the total collisions on Collector Roads, but this increases to 44% of collisions on Local Roads. Private driveways are a major source of collisions on Collector and Local Roads, representing 29% and 45% of total collisions respectively. Local roads tend to feature many more private driveways, spaced closer together, than Collector Roads, which likely contributes to this pattern.

Table 16: Neighbourhood Collisions by Injury Level & Location

Year	**Collector**				**Local**			
Location	Major Injury	Minor Injury	No Injury	**Total**	Major Injury	Minor Injury	No Injury	**Total**
Non Intersection	6	46	335	**387 (34.5%)**	6	58	602	**666 (44.1%)**
Intersection Related	1	37	86	**124 (11.1%)**	0	13	28	**41 (2.7%)**
At Intersection	1	36	239	**276 (24.6%)**	0	21	88	**109 (7.2%)**
At/Near Private Drive	1	18	308	**327 (29.2%)**	2	14	658	**674 (44.7%)**
At Railway Crossing	0	0	0	**0**	0	0	2	**2 (0.1%)**
Overpass Or Bridge	0	0	2	**2 (0.2%)**	0	1	3	**4 (0.3%)**
Other	0	0	5	**5 (0.4%)**	0	0	13	**13 (0.9%)**
Total	**9**	**137**	**975**	**1,121**	**8**	**107**	**1,394**	**1,509**
Average (%)	**1.3 (0.8%)**	**19.6 (12.2%)**	**139.3 (87.0%)**		**1.1 (0.5%)**	**15.3 (7.1%)**	**199.1 (92.4%)**	

Table 17 summarizes the neighbourhood collisions on Collector and Local Roads by the type of vehicle action involved. In 39% of neighbourhood collisions vehicles stuck another vehicle that was travelling ahead. Approximately 36% of neighbourhood collisions involved a vehicle striking a parked car, and 10% involved hitting a vehicle that was stopped, either at an intersection or on the side of the road. This is much more likely on Local roads versus Collector Roads, which are much more likely to have on-street parking restrictions in place. In just over 4% of collisions a vehicle struck another vehicle that was reversing, which in most cases suggests they were backing out of a driveway or entrance. Approximately 5% of collisions involved vehicle making a left or right turn and 2% were related to striking vehicles which were slowing or stopping, for any number of reasons. These types of collisions are likely intersection related and tend to occur more frequently on Collector Roads.

Table 17: Neighbourhood Collisions by Vehicle Action

Action	Collector Roads	Local Roads	Total	%
Going Ahead	538	489	1027	39.0%
Slowing Or Stopping	29	24	53	2.0%
Overtaking	2	6	8	0.3%
Turning Left	67	35	102	3.9%
Turning Right	22	14	36	1.4%
Making 'U' Turn	2	1	3	0.1%
Changing Lanes	19	28	47	1.8%
Merging	3	8	11	0.4%
Reversing	43	74	117	4.4%
Stopped	163	101	264	10.0%
Parked	220	721	941	35.8%
Pulling Away From Shoulder Or Curb	3	5	8	0.3%
Pulling Onto Shoulder Or Toward Curb	0	2	2	0.1%
Other	10	1	11	0.4%
Total	**1,121**	**1,509**	**2,630**	**100%**

There were 48 collisions involving pedestrians in neighbourhoods between 2014 and 2020, with 23 of these collisions occurring on Collector Roads and 25 on Local Roads. Collisions involving pedestrians represented 2.0% of the total number of collisions on neighbourhood Collector Roads and 1.6% of the collisions on Local Roads, as summarized in **Table 18**.

During the same period, there were 36 collisions involving bicycles in neighbourhoods, with 15 on Collector Roads and 21 on Local Roads. Collisions involving cyclists represented 1.3% of the total number of collisions on neighbourhood Collector Roads and 1.4% of the collisions on Local Roads. Of a

total of 36 cyclist collisions on neighbourhood roads between 2014 and 2020, 11 of these (31%) involved a cyclist hitting a parked or stopped car.

Table 18: Neighbourhood Pedestrian and Cyclist Collisions by Vehicle Action – 2014 to 2020

Action	Collector Roads		Local Roads	
	Pedestrian	Cyclist	Pedestrian	Cyclist
Going Ahead	23	9	25	12
Slowing Or Stopping				
Overtaking				1
Turning Left				
Turning Right		**3**		
Making 'U' Turn				
Changing Lanes				
Merging				
Reversing				
Stopped		**1**		3
Parked		**2**		5
Pulling Away From Shoulder Or Curb				
Pulling Onto Shoulder Or Toward Curb				
Other				
Total	**23**	**15**	**25**	**21**

Of the 23 pedestrian collisions on Collector Roads 5 involved pedestrians walking on the shoulder or walking on the roadway, with the remaining collisions involving crossing the roadway. On Local Roads, 7 of the 25 pedestrian collisions involved pedestrians walking on the shoulder or walking on the roadway, with the remaining collisions involving crossing the roadway.

There are a number of existing safety programs that the City already has in place to address concerns in neighbourhoods. To address vehicle speeding, one of the most common complaints received from neighbourhood residents, the City has a number of speed monitoring programs. In some neighbourhoods, City staff will deploy a portable radar message board that monitors the speed of approaching vehicles and displays the speed being travelled on a digital display that shows the driver how fast they are going. The control unit also collects and records the speeds of passing vehicles for download and analysis after the trailer has been moved to a new location. The radar message board is mounted on a trailer allowing it to be moved and deployed in different locations as required. Being trailer mounted, there needs to be

sufficient roadway space, or space available on the boulevard, to park the trailer for a period of time where it will not interfere with traffic flow.

The City also has a number of pole mounted radar speed signs as well. Two of these signs have been installed on a permanent basis and require continuous power supply to operate the unit. These permanent units collect data on the speeds of all passing vehicles, and displays the speed being travelled on a digital display that shows the driver how fast they are going. More recently, the City purchased portable speed feedback signs. These solar powered units can be deployed to various locations around the City as long as there is sufficient sunlight to recharge the batteries on the unit. These devices work the same as the permanent units, however the portable nature of the devices allow them to be deployed on a rotational basis to various locations with speeding concerns. Anecdotal evidence from these signs suggests that they tend to be more effective than the stationary signs, which tend to be ignored after they have been in a location for a long period of time. When the portable signs are redeployed to a new location, the “new signs” tend to catch drivers attention and can result in better initial speed compliance.

In 2021, the City established a Traffic Calming Policy, which was approved by Council. The policy includes criteria for when Traffic Calming will be considered, a tool box of typical Traffic Calming treatments that can be used to address various issues, and a neighbourhood consultation process to provide a consistent approach to developing a Traffic Calming Plan and obtaining support from residents. As part of developing the policy the City completed 5 neighbourhood Traffic Calming Studies on various streets, with one location in each of the 5 City wards. The initial traffic calming studies provided an opportunity to test the new policy and processes, and a trial installation of the recommended treatments for each of the 5 neighbourhoods was installed in the fall of 2021. After a 12-16 month monitoring period, additional consultation with the neighbourhoods will be undertaken to review the trial installations and determine the level of support for installing permanent measures. Following approval of the Traffic Calming Policy, neighbourhood studies have been initiated in 3 additional locations, and staff have received requests for Traffic Calming on 33 additional streets. In 2023, a proposal to make the Traffic Calming Program permanent will be presented to Council for consideration.

Targeted speed enforcement programs have also been effective in reducing speeding through neighbourhoods, although sustaining enforcement programs have been difficult due to competing demands for police services and resource constraints. On many days, there are only one to two police officers available for traffic duty which includes enforcement activities and responding to vehicle collisions. Using data from speed monitoring devices, City staff have worked with the Peterborough Police Service to identify key locations and times of day when speeding seems to be more a problem, allowing for a targeted enforcement program to be run when the likelihood of catching offenders in the greatest. Targeted enforcement combined with clear thresholds of speed tolerance (the speed where an officer will issue an infraction) can be very visible and effective ways of encouraging drivers to comply with posted speed limits.

Safe Neighbourhoods Recommendations

The following key education, engineering and enforcement recommendations outlined in **Table 19** are proposed to compliment existing neighbourhood safety programs:

Table 19:Sample Safe Neighbourhood Recommendations

Education Measures	**Description**
Expanded use of Community Safety Zones (CMZ)	Establish Community Safety Zones in key neighbourhoods to raise awareness of safety concerns, to promote safe driving habits, and to permit double fines to be applied for infractions. This could be implemented in conjunction with lower speed limits on local roads.
Expansion of Speed Monitoring Program	Expand the number of radar speed monitoring signs to allow for additional locations to be monitored.
Engineering Measures	**Description**
Annual Traffic Calming Program	Establish funding to support annual traffic calming program including staff resources to complete neighbourhood studies, plus annual capital funding to implement plans.
Accelerating implementation of missing sidewalks	Secure additional dedicated funding to accelerate the construction of missing sidewalks, according to the Sidewalk Strategic Plan.
Improving Arterial performance to benefit neighbourhoods	Improving the operation of key intersections and arterial road segments can reduce the perceived benefits of short cutting through neighbourhoods, which is one of the main concerns expressed by residents.
Expansion of Speed / Driver Feedback sign program	Expand the number of radar speed monitoring signs to allow for additional locations to be monitored at the same time. Use of portable signs will allow for 4 to 5 locations to be targeted in rotation for each new sign purchased.
Enforcement Measures	**Description**
Investigate automated speed enforcement in CMZ	Investigate feasibility of Automated Speed Enforcement cameras for neighbourhoods where Community Safety Zones have been established.
Pilot default area speed limits (reduce to 40km/h)	Pilot project to implement default 40km/h speed limit for all local roads in 2-3 neighbourhoods, with potential expansion to other neighbourhoods across the City.
Safe under 7 program	Establish “Safe Under 7” program for speed enforcement – charge all vehicles travelling more than 7 km/h over the posted speed limit – instead of using the demerit point threshold of 15 km/h over posted speed limit

3.3 Safety for Vulnerable Users

A safe systems approach to road safety planning considers the needs of the most vulnerable users of the transportation system explicitly, as one of the primary considerations in the design and operation of transportation infrastructure. There are a number of different types of vulnerable users with different considerations to take into account when planning for their needs, as summarized in **Table 20**.

Table 20: Categories of Vulnerable Users

Vulnerable Users	Considerations
Pedestrians	Pedestrians can be exposed to collision risk on sidewalks or road shoulders, at intersections and at mid-block crossings, and other mid-block locations (non designated crossings) and are most likely to be injured if involved in a collision.
Cyclists	Cyclists can be exposed to collision risk on roadways, at intersections and at mid-block trail crossings and are more likely to be injured if involved in a collision with a larger vehicle.
Seniors	Seniors, Children and Persons with Disabilities are a subcategory of either pedestrians or cyclists who have additional risk due to mental or physical characteristics that may increase their level of exposure to a collision, impair their perception of risk, or impact their ability to react to danger.
Children	
People with Disabilities	

Over the past 5 years the City has implemented a number of programs to enhance safety for vulnerable users of the transportation system. In 2019 the initiated a capital program to install pedestrian countdown timer and enhanced cross walks at signalized intersections across the City. Implementation started in the downtown and has been expanded to other areas of the City with high pedestrian activity.

Pedestrian countdown timers are installed as part of the traffic signal system at an intersection to provide a visual countdown to pedestrians attempting to cross the roadway and indicate how much time is left before the don't walk symbol is displayed.

This relatively new technology improves upon the "flashing don't walk" indication that was widely misunderstood by pedestrians and places the decision in the hands of the pedestrian to decide if they have enough time to cross. Flashing don't walk indications typically activate when the signal is about to change, however the time allotted to the flashing don't walk would provide enough time for an average pedestrian to cross halfway across the intersection. This approach is based on the assumption that a pedestrian in the intersection already would typically still have enough to reach the other side after the flashing don't walk started. For those on the curb, the flashing don't walk indicates that there is not enough time to fully cross the intersection.

Enhanced crosswalk markings were also installed as part of this program, as illustrated in **Figure 8**. Enhanced crosswalk markings, also known as Ladder Crosswalks", provide a better visual cue to an approaching motorist of the upcoming crosswalk to enable them to better perceive if a pedestrian is in the cross walk or approaching the crosswalk and getting ready to cross. The more defined crosswalk also helps to encourage motorists to avoid creeping into the crosswalk, which can cause conflicts with pedestrians.

Since 2019, 89 of the 131 signalized intersections and pedestrian crossings in the City have been outfitted with countdown timers and 35 intersections (plus all controlled pedestrian and trail crossings) also have the enhanced crosswalk markings. These new devices are now incorporated as a standard for all new construction and reconstruction projects, where applicable.

Figure 8: Enhanced Crosswalks and Pedestrian Countdown Timers at Intersections

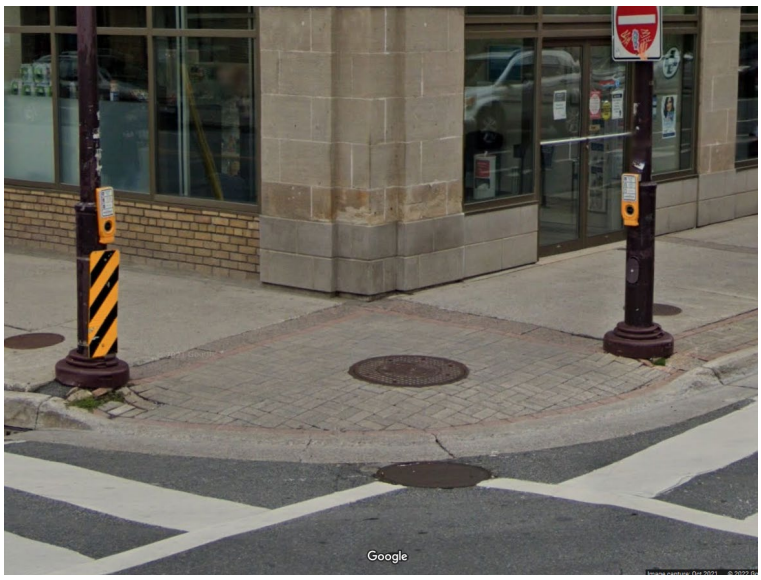
Source: Google Street View

Leading Pedestrian Intervals are a relatively new approach that some municipalities have used to improve pedestrian safety at signalized intersections. This is essentially a signal timing approach that provides the pedestrian walk signal a few seconds in advance of providing the green signal for traffic moving in the same direction. The theory behind this strategy is to allow the pedestrians to get out into the crosswalk before the vehicles start to move, allowing for them to be more visible to motorists and thereby reducing conflicts and the rate of vehicles yielding to pedestrians. Research has showed positive benefits for leading pedestrian intervals in terms of vehicle-pedestrian crash and conflict reduction, however this signal timing strategy is limited to locations that do not have advance green signal phases, since the pedestrian walk signal can not be displayed during an advance green signal phase to avoid right-of-way conflicts.

At a number of downtown intersections, where the pedestrian volumes are the highest, advance green signals are used on some of the east-west roads to ensure that traffic is able to clear the short blocks and short left turn lanes between Water Street and George Street. Without the advance green signal, at many locations turning vehicles would not be able to find a gap in pedestrian or opposing traffic to make their turn and would be forced to make their turn on the amber or all red clearance interval, which would also increase collision risk with pedestrians in the cross walk or with opposing traffic. Care needs to be taken to carefully evaluate the benefits and potential implications of leading pedestrian intervals prior to implementation.

Accessible pedestrian signals (APS), with an example shown in **Figure 9**, are an additional safety improvement strategy that are often implemented to improve safety and accessibility for visually impaired pedestrians using signalized intersections and cross walks. Accessible pedestrian signals have an audible signal that indicates when a pedestrian has the right-of-way to cross at a signalized intersection and in which direction they may cross the intersection. At some signals, the APS operates automatically. At other signalized intersections, a pedestrian pushbutton must be pushed and held for at least three seconds. If the button is not held down for at least three seconds, the audible sound will not be activated even though the walking person display may still appear.

Figure 9: Accessible Pedestrian Signals



Source: Google Street View

Intersection treatments to improve the safety for cyclists have also been implemented in a number of locations in the City over the past few years. In the George Street / Water Street corridor on-street buffered bike lanes have been installed to provide a protected space for cyclists that is separate from road traffic and parked cars. Where the on-road cycling lanes approach intersections green paint combined with cycling symbols have been used to highlight key conflict areas where turning vehicles and cyclists often have to share the same space, as illustrated in **Figure 10**. To provide an alternative option for cyclists making left turns, green “bike boxes” are used in some locations to provide a space where a cyclist can wait in order to make a two-stage left turn – by entering the box on the through movement, and then waiting until the green light appears in the opposite direction to proceed through on the cross street.

Figure 10: Enhanced Intersection Markings for Cyclists

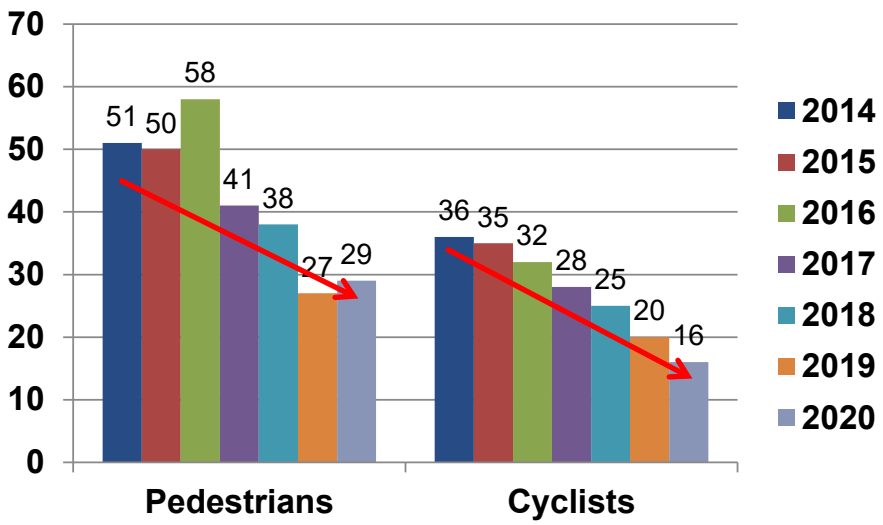
Source: City of Peterborough Air Photos, 2020

Between 2014 and 2020, there have been 486 collisions involving pedestrians or cyclists in the City of Peterborough, which cover the entire range of vulnerable users noted in **Table 20**, above. On average this equated to 42 pedestrian and 27 cyclist collisions per year. Pedestrian collisions over this entire period represent 2.7% of total collisions while 1.8% of total collisions involve cyclists.

On the positive side, this trend has been reducing over time, as illustrated in **Figure 11**, with the total number of collisions for both pedestrians and cyclists showing a downward trend since 2014. In 2019, pedestrian collisions represented 1.6% of total collisions, down from 3.5% in 2014, and cyclist collisions represented 1.2% of total collisions, down from 2.5% in 2014.

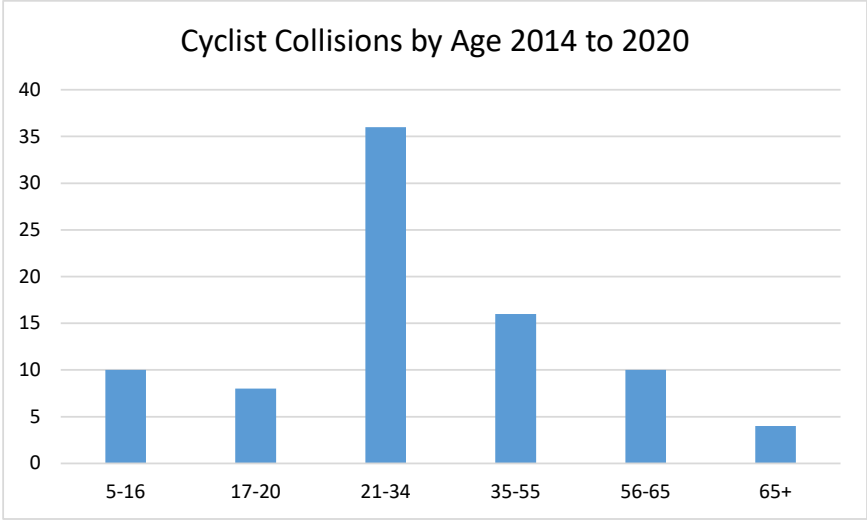
In 2020, despite the continued reduction in both pedestrian and cyclist collisions, their relative share of total collisions increased to 2.6% and 1.4%. In part this is due to the significant reduction in total reported collisions, but this observation also may be due to observed increases in cycling and walking activity during the various COVID lockdown periods.

Figure 11: Pedestrian and Cyclist Collisions – 2014 to 2020



Collisions involving cyclists vary by age, as illustrated in **Figure 12**. Collisions involving younger cyclists (under age 20) are relatively rare with less than 10 collisions recorded over the 2014 to 2020 period for both the age 5 to 16 age group and the age 17-20 group. The highest number of cyclist collisions occurred in the age 21 to 34 age category, followed by those aged 35-55. Outreach with these older groups to emphasize safe cycling habits and skills development may be able to reduce these collisions.

Figure 12: Cyclist Collisions by Age Category of Cyclist – 2014 to 2020



Between 2014 and 2020 there have been 4 fatal collisions involving vulnerable road users, all of which involved pedestrians. As summarized in **Table 21**, 22 major injury collisions involved a pedestrian and 7 involved a cyclist. Minor injuries were reported in 227 pedestrian collisions and 133 cyclist collisions, while only 21 pedestrian and 17 cyclist collisions reported no injuries.

Pedestrian collisions were predominantly single motor vehicle collisions, involving one vehicle striking a pedestrian, however the data also shows a few collisions where a pedestrian was involved in a multiple

vehicle collision as well. The majority of cyclist collisions were related to turning movements followed by right angle collisions, with both types typically occurring at intersections or private driveways. These types of collisions represent 75% of total cyclist collisions and represent approximately 76% of cyclist collisions resulting in major or minor injuries.

Sideswipe collisions, where a vehicle and cyclist are travelling the same direction on a roadway, make up 12% of total collisions involving cyclists and 11% of cyclist collisions resulting in major or minor injuries.

Table 21: Pedestrian and Cyclist Collisions by Injury / Collision Type – 2014 to 2020

Pedestrian	Fatal	Major	Minor	No Injury	Total
Approaching			1		**1**
Angle		1	1		**2**
Turning Movement				1	**1**
SMV	4	21	225	20	**270**
Total	**4**	**22**	**227**	**21**	**274**

Cyclist	Fatal	Major	Minor	None	Total
Approaching				1	**1**
Angle		2	43	1	**46**
Rear End			7		**7**
Sideswipe		3	14	2	**19**
Turning Movement		1	61	10	**72**
SMV Unattended		1	7	3	**11**
Other			1		**1**
Total	**0**	**7**	**133**	**17**	**157**

Table 22 and **Table 23**, below, summarize the pedestrian collisions by the reported pedestrian condition at the time of the collision. In the majority of collisions (56%), the pedestrian condition was reported as normal, however, in 25% of the collisions the pedestrian had either been drinking or their ability was impaired to some degree by alcohol or drugs. In 7% of cases, the pedestrian was reported to be inattentive and in 4% of cases fatigued was reported.

Of the 4 pedestrian collisions over this time period the pedestrian was impaired (over 0.08 blood alcohol) in 2 cases, and in one collision the pedestrian was noted as being inattentive. For the major injury collisions, the pedestrian condition was reported as normal in 41% of the incidents, impaired by alcohol of drugs in 36% of the collisions, with other conditions reported in the remaining cases.

In the majority of pedestrian collisions (73%) the pedestrian was crossing the roadway with the right of way. In 18 collisions (7% of the total) the pedestrian was crossing without the right of way of in a location with no traffic control (such as a midblock location). In 6 cases (2%) the pedestrian was walking on the roadway and in 31 collisions (12%) the pedestrian was walking on the shoulder or on a sidewalk.

Table 22: Pedestrian Collisions by Condition – 2014 to 2020

Pedestrian Condition	Fatal Injury	Major Injury	Minor Injury	Total
Normal		9	132	141
Had been drinking		2	30	32
Ability impaired, alcohol (over .08)	2	5	14	21
Ability impaired, alcohol			5	5
Ability impaired, drugs		1	4	5
Fatigue		1	8	9
Medical or physical disability		1	1	2
Inattentive	1		17	18
Other	1	3	16	20
Total	**4**	**22**	**227**	**253**

Table 23: Pedestrian Collisions by Action – 2014 to 2020

Pedestrian Action	Fatal Injury	Major Injury	Minor Injury	Total
Crossing With Right-Of-Way	1	14	170	185
Crossing Without Right-Of-Way	1	1	11	13
Crossing – No Traffic Control			3	3
Crossing Ped. Crossover			2	2
Crossing Marked Crosswalk Without Right-Of-Way			2	2
Walking On Roadway With Traffic		1	1	2
Walking On Roadway Against Traffic			4	4
On Sidewalk Or Shoulder	1	3	27	31
Running Onto Roadway		1	0	1
Other	1	2	7	10
Total	**4**	**22**	**227**	**253**

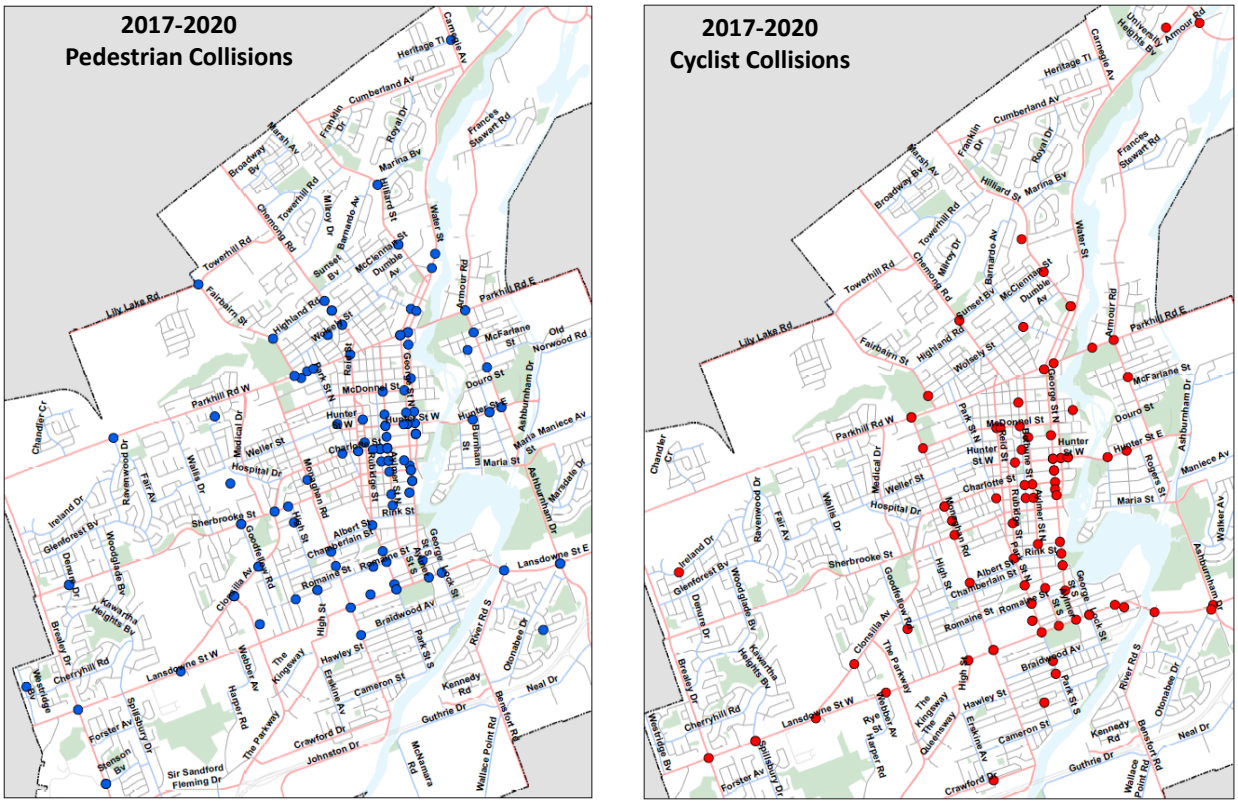
Table 24 summarizes the reported locations of pedestrian and cyclist collisions for the period between 2017 and 2020. The vast majority of both pedestrian (71.9%) and cyclist (62.9%) collisions occurred at intersections or close enough to be related to the operation of the intersection. Approximately 19% of

pedestrian collisions were reported at mid block locations and 7% occurred at private driveways. For cyclists, approximately 21% of collisions occurred at midblock locations and close to 16% occurred at private driveways.

Table 24: Pedestrian and Cyclist Collisions by Location – 2017 to 2020

Location	Pedestrian Collisions	%	Cyclist Collisions	%
Non-Intersection	26	19.3%	19	21.3%
Intersection Related	49	36.3%	22	24.7%
At Intersection	48	35.6%	34	38.2%
Private Drive	10	7.4%	14	15.7%
Railway Crossing	1	0.7%	0	0%
Underpass / Tunnel	0	0%	0	0%
Overpass / Bridge	0	0%	0	0%
Other	1	0.7%	0	0%
Total	**135**	**100%**	**89**	**100%**

Figure 13: Pedestrian and Cyclist Collisions by Location – 2017 to 2020



As illustrated in **Figure 13**, the majority of pedestrian and cyclist collisions have occurred in the downtown, which coincides with the locations where higher pedestrian and cycling use typically occurs. A number of pedestrian and cyclist collisions are also occurring along major arterial roads such as Lansdowne Street, Chemong Road, Monaghan Road, Parkhill Road and Clonsilla Avenue.

Safety for Vulnerable Users Recommendations

The following key education, engineering and enforcement recommendations outlined in **Table 25** are proposed to compliment existing safety programs aimed at protecting vulnerable users:

Table 25: Sample Safety for Vulnerable Users Recommendations

Education Measures	Description
Distracted Driving Education Programs	Develop programs to raise awareness of distracted driving, safety risks, and penalties. Include general programs for the entire population and incorporate a program aimed at new drivers.
Aggressive Driving Education Programs	Develop programs to raise awareness of aggressive driving, safety risks, and penalties. Include general programs for the entire population and incorporate a program aimed at new drivers.
Walk Safe - Pedestrian Safety and Awareness	Develop programs to raise awareness of distracted walking, rules of the road for walking and crossing roads,

	existing safety measures used for crossings, etc. Include section on penalties for disobeying crossing guards.
Engineering Measures	**Description**
Arterial Road Pedestrian Crossing Program	New program to identify locations for controlled pedestrian crossings on Arterial Roads, including warrants for different types of crossings and standardized design treatments.
Update Road Design Standards	Review and update City road design standards to incorporate safety related design considerations, design treatments for pedestrians and cyclists, along with considerations for use
Targeted Intersection Improvements	Develop a program in intersection improvements to address key observed safety patterns while incorporating updated design treatments for pedestrians and cyclists as appropriate
Connected Vehicle Technologies	Explore the use of connected vehicle technology to improve safety programs, including pilot projects to enhance safety for all users
Enforcement Measures	**Description**
Reduced Speed Limits on Key Downtown Corridors	Explore the application of reduced vehicle speed limits within the downtown urban area on key corridors featuring heavy pedestrian / cyclist volumes, enhanced streetscape features, etc.
Speed Monitoring and Targeted Enforcement Program	Implement ongoing speed monitoring program using traffic counters, driver feedback signs, and explore targeted enforcement program to address observed trends
Distracted Driving enforcement program	Continue and expand upon distracted driving enforcement as part of themed enforcement program.

3.4 Safe Corridors

As noted previously in section 3.2, and as summarized in **Table 26**, 75% of the annual collisions in Peterborough occur on the arterial road network. These roadway corridors represent the backbone of the City transportation network and feature the highest traffic volumes and the widest variety of road users; including cars, trucks, pedestrians, cyclists, municipal transit buses, oversized loads, and visitors who may be new to the region.

Table 26: Collisions by Road Class

Year	Total Collisions	Arterial	Collector	Local	Other
2014	1440	1054	150	228	8
2015	1555	1150	154	239	12
2016	1655	1279	166	202	8
2017	1666	1245	178	237	6
2018	1709	1304	173	228	4
2019	1645	1261	157	221	6
2020	1126	826	143	154	3
Total	**10,796**	**8,119**	**1,121**	**1,509**	**47**
Average (%)	**1542**	**1160 (75%)**	**160 (10%)**	**216 (14%)**	**7 (1%)**

Table 27: Arterial Road Collisions by Location

Year	Arterial	
	Mid Block	Intersection
2014	353	701
2015	372	778
2016	427	852
2017	457	788
2018	407	897
2019	456	805
2020	261	565
Total	**2,733**	**5,386**
Average (%)	**390 (33.7%)**	**769 (66.3%)**

Approximately 66% of collisions on Arterial Roads occur at intersections, representing an annual average of approximately 769 collisions each year. Section 3.5 provides additional insight into the collision patterns at intersections and recommendations for education, enforcement and engineering measures that can be implemented to address intersection collision patterns.

The remaining 34% of Arterial Road collisions, representing about 390 collision each year, occur in mid block locations, between major intersections, as summarized in **Table 27**.

Strategies to address these mid block collisions are the focus of the Safe Corridors initiatives discussed in this section.

Table 28 summarizes the types of Arterial Road Mid Block collisions that have occurred by injury type for the 2014-2020 period. Of the 7 fatal collisions that have occurred on City streets since 2014, all of them have occurred on Arterial Roads and 5 of them have occurred at mid block locations. Of the 5 mid block fatal collisions, 4 involved pedestrians, 2 of which were in the process of crossing the road and one was on the sidewalk.

Table 28: Mid Block Arterial Road Collisions by Injury / Collision Type – 2014 to 2020

Collision Type	Fatal	Major	Minor	No Injury	Total	(%)
Approaching	0	1	9	31	**41**	**(1.5%)**
Angle	0	0	18	87	**105**	**(3.8%)**
Rear End	0	7	104	601	**712**	**(26.1%)**
Sideswipe	0	2	28	530	**560**	**(20.5%)**
Turning Movement	0	5	93	463	**561**	**(20.5%)**
Single Vehicle (unattended)	0	0	9	244	**253**	**(9.3%)**
Single Vehicle Other	5	12	76	263	**356**	**(13.0%)**
Other	0	0	4	141	**145**	**(5.3%)**
Total (%)	**5 (0.2%)**	**27 (1.0%)**	**341 (12.5%)**	**2,360 (86.3%)**	**2,733**	

Rear End collisions represent approximately 26% of all mib block collisions, and these exclude the rear end collisions that are related to the operation of major intersections. Rear End collisions tend to be less severe than other types of collisions, however, for rear end collisions on mid block arterial roads they represent 30% of the injury collisions that occurred between 2014 and 2020.

Sideswipe and Turning Movement collisions are the next most frequent collision type, with each representing close to 21% of total mid block collisions on arterial roads, respectively. Rear End and Sideswipe collisions on arterial roads are often related to the lack of separate left turn lanes.

Single vehicle collisions represent 22% of the mid block arterial road collisions but tend to result in 53% of the serious injuries due to fatalities and major injury collisions. This may be due to the fact that approximately 14% of the Single Vehicle -Other collisions involved a pedestrian.

A ranking of arterial road corridors in terms of the average number of mid block collisions occurring per year is summarized in **Table 29**. Many of these arterial road corridors, such as Lansdowne Street (Park Street to Edwards Street, Kawartha Heights Boulevard to Clonsilla Avenue, and Ashburnham Drive to River Road S), Chemong Road (Reid Street to Sunset Boulevard), Clonsilla Avenue (Lansdowne Street to Sherbrooke Street), and a portion of Water Street (University Heights Boulevard to Woodland Drive) are multilane arterial roads with a pattern of rear end or sideswipe collisions that can be attributed to the lack of centre turning lanes. Monaghan Road, between Lansdowne Street and Romaine Street features a number of collisions at private driveways and George Street, between Hunter and Simcoe has

experienced a number of sideswipe collisions related lane changes and interactions between through vehicles and parked vehicles.

Table 29: Top 10 Mid Block Arterial Road Corridors by Average Collisions Per Year

Arterial Road Corridor	Average Collisions Per Year
1) Lansdowne St W - Park St to Edwards St	8.25
2) Clonsilla Av - Lansdowne St W to Sherbrooke St	7.25
3) Chemong Rd - Reid St to Sunset Blvd	6.25
4) Lansdowne St W - Kawartha Heights Blvd to Clonsilla Av	5.88
5) Monaghan Rd - Lansdowne St to Romaine St	5.63
6) Lansdowne St W – Goodfellow Rd to The Parkway	5.63
7) Lansdowne St E - Ashburnham Dr to River Rd S	5.50
8) George St N - Hunter St W to Simcoe St	5.50
9) Parkhill Rd W – Medical Dr to Fairbairn St	4.00
10) Water St - University Heights Blvd to Woodland Dr	3.63

A number of these corridors are already included in the City's capital budgets and reconstruction projects to improve safety have already been identified for Lansdowne Street W, from Kawartha Heights Boulevard to Clonsilla Avenue, Chemong Road from Parkhill Road to north of Sunset Boulevard, and Water Street between Nassau Mills Road and Woodland Drive. The remaining corridors should be prioritized for upgrades to improve safety performance as funding permits.

Safe Corridors Recommendations

The following key education, engineering and enforcement recommendations outlined in **Table 30** are proposed to compliment existing safety programs aimed at improving safety on key corridors:

Table 30: Sample Safe Corridor Recommendations

Education Measures	Description
Aggressive Driving Education Programs	Develop programs to raise awareness of aggressive driving, safety risks, and penalties. Include general programs for the entire population and incorporate a program aimed at defensive driving techniques for busy roadways.
Walk Safe - Pedestrian Safety and Awareness	Develop programs to raise awareness of pedestrians and how they interact with and the challenges they have crossing arterial roads. Include defensive driving

	techniques to anticipate distracted walking and highlight existing safety measures used for crossings. Include section on penalties for disobeying crossing guards.
Engineering Measures	**Description**
Enhanced Markings	Continue with existing program to provide enhanced pedestrian crossings and count down pedestrian signals on arterial road corridors.
Update Road Design Standards	Update Road Design Standards to incorporate Complete Streets approaches and safe systems approaches to design decisions.
Arterial Road Improvement Program	In addition to planned arterial road improvement projects, consider safety improvements for: 1) Lansdowne St W - Park St to Edwards St 2) Clonsilla Av - Lansdowne St W to Sherbrooke St 3) Lansdowne St E - Ashburnham Dr to River Rd S 4) Parkhill Rd W – Medical Dr to Fairbairn St 5) Water St - University Heights Blvd to Woodland Dr 6) Monaghan Rd - Lansdowne St to Romaine St
Access Management Guidelines	Include a section on Access Management policies for Arterial Roads in new design guidelines to reduce friction between through traffic and uncontrolled traffic at busy entrances.
Connected Vehicle Technologies	Continue to monitor advances in connected vehicle technologies and work with private developers to pilot enhanced technologies to support vehicle to infrastructure (V2X) communications to improve upon collision avoidance technologies in newer vehicles.
Enforcement Measures	
Speed Monitoring and Targeted Enforcement Program	Implement ongoing speed monitoring program using traffic counters, driver feedback signs, and explore targeted enforcement program to address observed trends.
Distracted Driving enforcement program	Continue and expand upon distracted driving enforcement as part of themed enforcement program.

3.5 Safe Intersections

As noted previously, approximately 55% of the total collisions reported between 2014 and 2020 in the City occurred at intersections or were related to the operation of intersections. For the purpose of this

analysis, collisions occurring at intersections and those related to the operation of intersections are treated as intersection collisions. **Table 31** summarizes the intersection collisions by year and by injury type for the years 2014 to 2020. Fatal and Major Injury collisions represent approximately 1% of total intersection collisions, with 20% resulting in minor injuries and 79% resulting in no reported injuries. On average, 846 intersection collisions occur on the City road network each year.

Table 31: Intersection Collisions by Year / Injury Type – 2014 to 2020

Year	Fatal	Major	Minor	No Injury	Total
2014	1	2	196	590	789
2015	0	9	222	624	855
2016	0	6	244	686	936
2017	0	4	172	697	873
2018	0	4	145	820	969
2019	1	3	126	740	870
2020	0	8	81	542	631
Total (%)	**2 (0.03%)**	**36 (0.6%)**	**1,186 (20.0%)**	**4,699 (79.3%)**	**5,923**

Table 32 summarizes the intersection collisions by type of traffic control and by collision type. Approximately 64% of intersection collisions occur at signalized intersections, as these are typically the busiest intersections in the City. Intersections controlled by stop signs result in just under 21% of the intersection collisions and 12% of intersection collisions occur at intersections with no form of traffic control. Collisions at pedestrian crossover or crosswalks controlled by School Crossing Guards represent less than 1% of intersection related collisions.

Approximately 33% of intersection collisions are classified as rear end collisions, with the majority of these occurring at signalized intersections. Turning collisions represent 28% of total intersection collisions, and these also typically occur at signalized intersections. Angle collisions are the next most frequent collision, representing approximately 20% of the total number of intersection collisions. Angle collisions are those where vehicles traveling on different roadways collide at right angles. These are almost equally spilt between intersections controlled by traffic signals and those controlled by stop or yield signs. The number of angle collisions occurring at signalized intersections is much higher than expected given that the intent of a traffic signal is to alternate the right of way. High rates of angle collisions at intersections may be indicative of congestion at intersections, where vehicles extend into the all-red clearance period to proceed through the intersection, creating a higher potential for collisions. This trend may also be indicative of a wide spread pattern of red light running.

Table 32: Intersection Collisions by Traffic Control / Collision Type – 2014 to 2020

	Approach	Angle	Rear End	Sideswipe	Turning Movement	SMV	Other	Total
Traffic Signal	25	567	1507	362	1022	314	49	**3804**
Stop Sign	7	523	174	19	356	152	36	**1237**
Yield Sign	1	34	64	5	8	8	1	**121**
Pedestrian Crossover		1	1		2	2		**6**
Police Control		1	2		1			**4**
School Guard			3					**3**
School Bus			1					**1**
Traffic Gate						1		**1**
Traffic Controller		2	5		11	3		**21**
No Control	14	85	193	73	261	74	10	**716**
Other		1			3	2	3	**9**
Total	**47**	**1214**	**1950**	**459**	**1664**	**556**	**96**	**5923**

The province introduced a Red Light Camera enforcement pilot project for prosecuting red light offenders using photo evidence in 2000. After a four year trial of the system, the Highway Traffic Act was amended in 2004 to permit red light camera enforcement in certain municipalities.

As a vehicle approaches a red light at or above a set speed, loops immediately in front of the intersection stop bar trigger the red light camera system. Two photographs are taken. The first photograph shows the red signal and the vehicle positioned at the stop bar prior to entering intersection. The second photograph shows the red signal and the vehicle positioned in the intersection. Both of the photos are taken of the rear of the vehicle and must clearly show a licence plate. Post processing of the photo is undertaken to include other information related to the offence (location, time, speed, etc.).

Sections 144(18.1) and 205.15 of the Highway Traffic Act provide the authority to prosecute the offence of failing to stop for a red light (commonly referred to as red light running) charges based on photographic evidence gathered through the use of the prescribed red light camera systems. Legislation permits prosecution of these charges using documents certified by a Provincial Offences Officer as evidence, in lieu of the requirement to call witnesses on behalf of the prosecution.

The legislation also provides for regulations, which provide details on areas of the province designated to use red light camera systems, defining the technical components of red light camera systems, prescribing requirements for use of the photographs as evidence and for the service of tickets on offenders by mail.

In Ontario all red light camera photos and infraction notices are processed at a Joint Processing Centre managed by the City of Toronto, where the phots of offending vehicles are downloaded and confirmed, the licence plate information is forwarded to the Ministry of Transportation to obtain the registered vehicle owners' information, and an infraction notice is prepared and sent to the owner of the vehicle. Participation in the program requires a municipality to sign an agreement with the City of Toronto Joint Processing Centre to provide these services. Municipalities wishing to start a red light camera program are also required to purchase the approved equipment from a vendor or record, hired by the Joint Processing Center. This ensures that the equipment has been approved and certified as accurate and able to withstand court challenges.

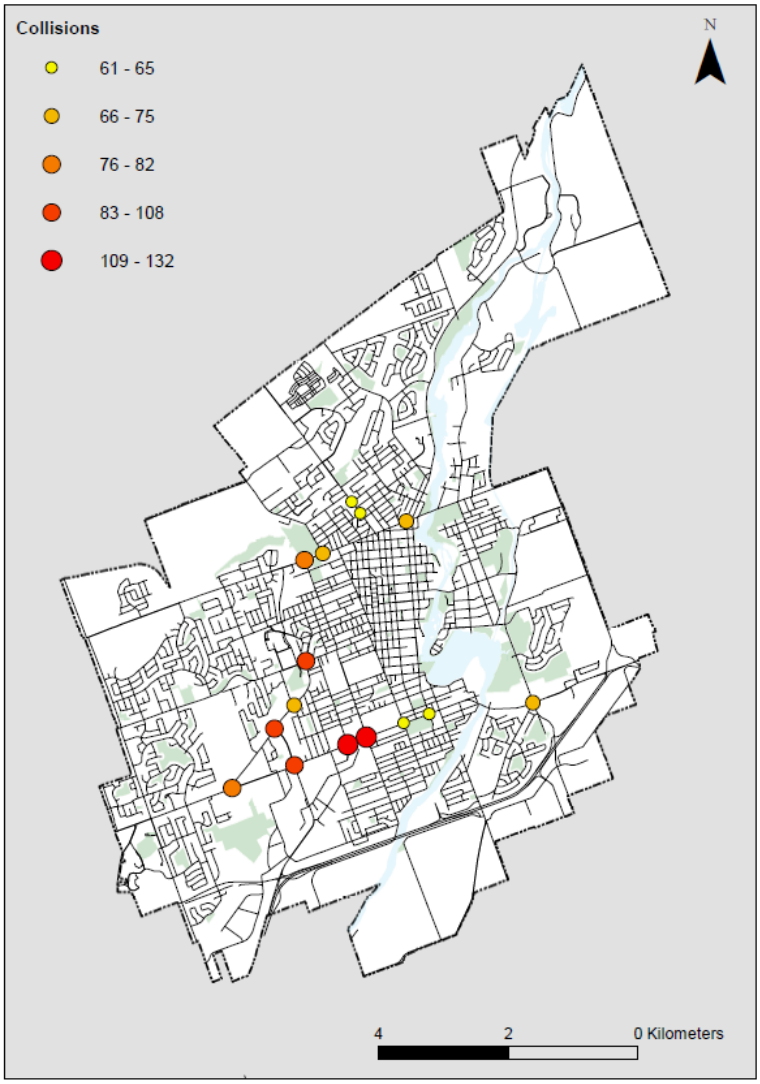
The most reliable statistics currently available suggest that RLC.s can reduce the frequency of right-angle collisions by 25%, based on the Red Light Camera pilot evaluation. In the early stages of Red Light Camera operation, the frequency of rear-end collisions in other jurisdictions has increased by approximately 15% until residents become familiar with the locations and the new technology.

Experience in other municipalities has shown that the cost of a red light camera program is approximately $100,000 per intersection per year, and each camera typically generates just over $90,000 in annual revenues based on an average of 1 infraction per day and an average conviction rate of 95%. On an annual basis, municipalities operating red light camera systems have found that 90% of the costs are recoverable through fines, not including the cost savings due to reduced collisions. Over time, as familiarity with the program increases and the number of locations increase, the fine revenue can be expected to reduce as fewer violations are recorded, however the safety benefits of reduced collisions would be expected to increase as well.

Figure 14 illustrates the top 15 locations, for intersection collisions across the City, all of which experience between 9.3 and 20.6 collisions per year on average. Top locations include the following intersections:

- Lansdowne Street at Monaghan Road, High Street, The Parkway, Clonsilla Avenue, Ashburnham Drive, Park Street, and George Street;
- Clonsilla Avenue at Sherbrooke Street, Goodfellow Road, and The Parkway;
- Parkhill Road at Monaghan Road, Fairbairn Street, and George Street; and
- Chemong Road at Wolsely Street and Bellevue Street.

Figure 14: Top 15 Intersections by Total Number of Collisions – 2014 to 2020



The number of collisions at intersections is positively correlated with the traffic volumes using the intersection, where the higher the total traffic volumes the higher the expected number of collisions, primarily due to the increase in conflicts between vehicles. Another way of comparing intersection performance is to compare the collision rates at each intersection, which is expressed as the number of collisions per million vehicles entering the intersection.

Table 33 summarizes the top 15 locations, for intersection collisions across the City, ranked by collision rate.

Table 33: Top 15 Intersections by Collision Rate – 2014 to 2020

Intersection	Collisions 2014-2020	Avg per Year	Daily Volume	Collision Rate (per 1M Veh)	Rank by Rate
Lansdowne St at Monaghan Rd	144	20.6	39,331	1.43	**4**
Lansdowne St at High St	115	16.4	34,294	1.31	6
Clonsilla Ave at Sherbrooke St	111	15.9	21,966	1.98	**2**
Lansdowne St at The Parkway	111	15.9	38,094	1.14	11
Clonsilla Ave at The Parkway	109	15.6	20,417	2.09	**1**
Parkhill Rd at Monaghan Rd	89	12.7	22,963	1.52	**3**
Parkhill Rd at George St	82	11.7	24,193	1.33	**5**
Lansdowne St at Clonsilla Ave	80	11.4	21,928	1.43	**4**
Lansdowne St at Ashburnham Dr	78	11.1	30,118	1.01	12
Parkhill Rd at Fairbairn St	78	11.1	24,013	1.27	7
Clonsilla Ave at Goodfellow Rd	72	10.3	24,359	1.16	10
Lansdowne St at Park St	71	10.1	29,731	0.93	14
Lansdowne St at George St	70	10.0	27,999	0.98	13
Chemong Rd at Wolsely St	67	9.6	22,052	1.19	9
Chemong Rd at Bellevue St	65	9.3	20,303	1.25	8

These locations represent the first priority for the review and assessment of collision patterns in order to identify patterns and potential corrective measures. Some locations, such as the two locations on the Chemong Road corridor and the Lansdowne Street / Clonsilla Avenue intersection have already been identified for improvements that are currently in design.

Safe Intersections Recommendations

The following key education, engineering and enforcement recommendations outlined in **Table 34** are proposed to compliment existing safety programs aimed at improving safety at intersections across the City:

Table 34: Sample Safe Intersection Recommendations

Education Measures	**Description**
Aggressive Driving Education Programs	Develop programs to raise awareness of aggressive driving, safety risks, and penalties. Include general programs for the entire population and incorporate a program aimed at red light running and defensive driving techniques for busy roadways.
Walk Safe - Pedestrian Safety and Awareness	Develop programs to raise awareness of pedestrians at intersections. Include defensive driving techniques to anticipate distracted walking and highlight existing safety measures used for crossings. Include section on penalties for disobeying crossing guards.
Engineering Measures	**Description**
Enhanced Markings	Continue with existing program to provide enhanced pedestrian crossings and count down pedestrian signals at arterial road intersections.
Intersection Design Standards	Update Road Design Standards to incorporate enhanced intersection design treatments and safe systems approaches to design decisions
Intersection Improvement Program	Establish an intersection improvement program to upgrade intersection designs to promote safety and address key collision patterns.
Traffic Signal Strategies	Review traffic signal timing parameters at key intersections and consider changes to amber and all red clearances, long distance detection, etc. to reduce collisions
Enforcement Measures	**Description**
Investigate Red Light Camera Program	Investigate costs and benefits of introducing a red light camera program in Peterborough
Investigate Connected Vehicle Technology	Continue to monitor advances in connected vehicle technologies and work with private developers to pilot enhanced technologies to support vehicle to infrastructure (V2X) communications to improve upon collision avoidance technologies in newer vehicles.

Next Steps

The proposed Road Safety Strategy is not intended to be a static document nor is it intended to be a complete analysis of safety issues or safety oriented recommendations for the City. The current strategy is a starting point for incorporating road safety into the transportation decision making processes of the City.

Additional analysis of collision data and the assessment of potential measures should be undertaken for each of the five Safe Moves in the future as the implementation of the Road Safety Strategy progresses. Feedback and monitoring of before-after collision trends will help to inform future actions and additional corridor and intersection analysis is expected to be incorporated into the identification of future capital projects and the design of projects that have already been recommended.