



COMMUNITY SAFETY ZONES WARRANT

REGION OF WATERLOO

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Region of Waterloo

Prepared For: Regional Municipality of Waterloo

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1.0 INTRODUCTION

Bill 26, Highway Traffic Act Amendment (Community Safety Zones), an Act to promote public safety through the creation of community safety zones ("CSZ"), was passed by the Ontario Legislature on June 26, 1998. Under section 214.1 of the Highway Traffic Act, "The council of a municipality may, by by-law, designate a part of a highway under its jurisdiction as a Community Safety Zone if, in the Council's opinion, public safety is of special concern in that part of a highway." Areas of special concern may include roadways near schools, day care centres, playgrounds, parks, hospitals, senior citizen residences or may be collision-prone areas within a community.

The intent of CSZs is to provide road users with visual awareness that they should be diligent in their attentiveness to roadway safety when traveling in or through these areas. While the rules of the road do not change within the CSZ, the penalties for violations of the traffic laws are substantially increased. The doubling of traffic offence fines assists in reinforcing the importance of safety and modifying driver behavior. CSZs are marked with signs at the beginning and end of the areas denoting the legal limits and are in effect twenty-four hours a day. CSZs do not require road authorities to lower the posted speed limit in that section.

The effectiveness of CSZs is dependent on selective and appropriate deployment through a data-driven approach. The Region of Waterloo currently has eight (8) designated CSZs, mostly in rural sections of road (By-law 16-023, Schedule XVIII). However, the Region historically has not used an established data-driven and consistent methodology for the identification and designation of CSZs.

Another important factor for the successful implementation of CSZs is a commitment to increased enforcement. Traditional police enforcement is only able to conduct occasional operations at CSZs, which may reduce their effectiveness in changing driver behaviour and enhancing safety. In 2017, Bill 65 – the Safer School Zones Act – amended the Highway Traffic Act to introduce the use of automated speed enforcement ("ASE") in school zones and CSZs across the province. This makes continuous speed enforcement possible in CSZs. In the Region of Waterloo, the installation of ASE started in 2021 in support of the Region's comprehensive Road Safety Program goal to eliminate road-related injuries and deaths that occur because of excessive speeding.

The first ASE units in the Region were installed in school zones and there are plans to expand the ASE program to many more school zones across the Region. However, expansion of the ASE program will require the designation of additional areas of special concern as CSZs to address areas outside of school zones where speeding issues are concerning for members of the community. To that effect, a CSZ Warrant and Process was developed to ensure that ASE is deployed at locations where they are most necessary and expected to result in the greatest safety benefits. This report summarizes the development of the CSZ warrant and process, which included a jurisdictional scan and a pilot study. The recommended warrant and process has specifically been developed for the Regional Road context, but will be shared with area municipalities for collaboration, allowing them to adapt recommendations for road under their jurisdiction, which will ensure a unified commitment to improving road safety across the entire Region.

2.0 JURISDICTIONAL SCAN

A jurisdictional scan was conducted to understand current industry practices for the implementation of CSZs in Ontario municipalities. The following is a list of municipalities that currently have a policy or process for designating CSZs:

- ▶ Wellington County
- ▶ Oxford County
- ▶ Niagara Region
- ▶ Halton Region
- ▶ York Region
- ▶ City of Toronto
- ▶ City of Hamilton
- ▶ City of Brantford
- ▶ City of Richmond Hill
- ▶ Town of Oakville
- ▶ Town of Milton

The jurisdictions reviewed included those that have some level of similarity with the Region of Waterloo, including regional municipalities, local municipalities within these regional municipalities, as well as single-tier municipalities and counties geographically close to the Region of Waterloo. City of Toronto was also included in the jurisdictional scan due to its relevance within the Province and the large scope of its road safety programs.

The jurisdiction scan focused primarily on understanding the following elements of existing CSZ policies:

- ▶ Eligibility, particularly relating to land use considerations;
- ▶ Warrant criteria;
- ▶ Minimum and maximum length of CSZs; and
- ▶ Treatment of school zones.

The following sections summarize the findings of the jurisdictional scan.

2.1 Eligibility

2.1.1 Areas of Special Concern

Most municipalities reserve the use of CSZs to “areas of special concern” or “sensitive areas”, which are typically defined by the presence of facilities that generate a substantial amount of vulnerable road user (VRU) traffic. These facilities typically include:

- ▶ Elementary and secondary schools;
- ▶ Daycare centres;
- ▶ Community centres;
- ▶ Seniors’ centres and residences;
- ▶ Hospitals;
- ▶ Parks;
- ▶ Playgrounds;
- ▶ Neighbourhoods with cut-through traffic; and
- ▶ Roadways with non-separated bicycle facilities.

With respect to schools, several jurisdictions (including York Region, City of Richmond Hill, Town of Milton and Oxford County) restrict their definition as areas of special concern to elementary or secondary schools. Others (Wellington County, Niagara Region, and City of Brantford) only refer to “schools” in general. The City of Toronto has gradually expanded the scope of schools eligible for CSZs in recent years, with private elementary and public/catholic secondary schools being included in 2019, and private high schools being included in 2020.

High-pedestrian areas are also defined as areas of special concern for some jurisdictions. York Region, Oxford County and Town of Milton define these as locations experiencing an average of 100 pedestrians per hour or more for any 8 hours of the day.

Per OTM Book 5, “collision-prone locations” can also be considered areas of special concern. However, none of the policies reviewed included these locations in their eligibility criteria. As such, no specific definition of such locations was found. City of Toronto and Halton Region use network screening, a statistical analysis method used to identify and prioritize high-risk locations based on data such as collision history, traffic volumes, pedestrian volumes, operating speeds, and certain infrastructure attributes.

2.1.2 Ability to Enforce / Automated Speed Enforcement

The Town of Milton limits the number of CSZs to a maximum of four at any one time in order to ensure that sufficient resources are available to provide the necessary enforcement. The Town considers one year as an adequate time for the CSZ to provide a lasting effect on driver behaviour (which, if not achieved after one year of stepped-up enforcement under increased fines, will likely require other countermeasures).

The City of Richmond Hill recognizes that the use of CSZs without automated speed enforcement tends to be ineffective and not result in a marked change in driver behaviour; their effectiveness relies on an active enforcement of speeds, which is only feasible for short periods using traditional police enforcement.

The City of Toronto has included a one-time feasibility review of candidate sites (site audit) to determine if they are suitable for ASE. The site audit for ASE suitability reviews the following:

- ▶ There is adequate boulevard space to accommodate the ASE equipment;
- ▶ There are no obstructions for the camera, including on-street parking;
- ▶ There are no sharp curves in the road or extreme grading that may affect the operation of the ASE system;
- ▶ No speed limit reductions are planned or recently implemented;
- ▶ If the location is a speed limit transition zone, the ability to accommodate a sufficient buffer;
- ▶ There is no road work that will impact ASE operation;
- ▶ Segment length is adequate and consideration for adjacent existing CSZs.

2.1.3 Speed Limit and Traffic Calming

Some jurisdictions (Wellington County, York Region, Oxford County) restrict the use of CSZs to sections of roads with speed limits of 60 km/h or lower. City of Toronto also exclude locations with existing or planned traffic calming, since these locations would not be appropriate for ASE.

2.2 Warrant Criteria

A two-warrant system is most commonly used by the jurisdictions reviewed, where both warrants must be met for a candidate location to be designated as a CSZ. The two warrants typically consist of an eligibility warrant and a points-based assessment of risk factors. The two-warrant system is illustrated in **Figure 1**.

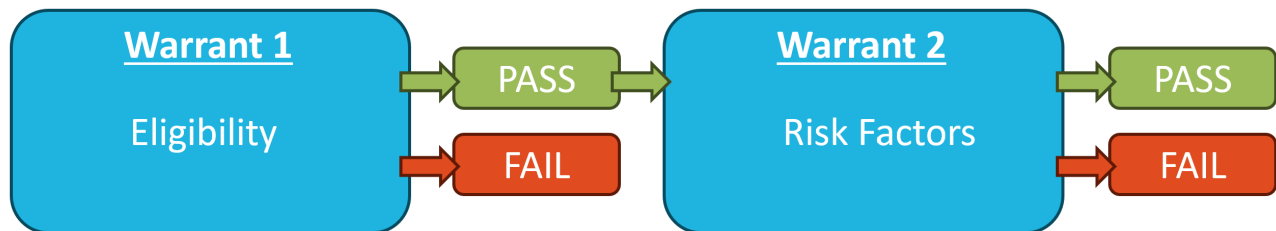


Figure 1: Two-warrant System for Community Safety Zones

The eligibility warrant is typically based on some of the criteria described in Section 2.1, while the risk factors warrant assign points based on whether certain risk factors (typically six to eight different factors) present. The risk factors are categorized into various risk levels and each level receives a score: high (3 points), medium (2 points) or low (1 point).

Table 1 summarizes the typical risk factors and how many jurisdictions reviewed use them in their warrant system.

Table 1: Typical risk factors used by other jurisdictions

Risk Factor	Number of Jurisdictions
Average daily traffic	6
Pedestrian volume	6
Truck percentage / truck route	5
Speed limit	2
85 th percentile speed	4
Number of lanes	5
Collisions in a 3-year period	2
Intersections / accesses per km	5
Number of bus stops per km	1
Presence or number of community facilities	2
Presence / length of sidewalks	5

The total points for a candidate location are added up and the location is considered eligible if the total score reaches a certain threshold; this threshold is usually within the range of 65% to 75% of the maximum possible score that a candidate location can achieve (i.e., if it presents ‘high’ risk factors).

Some additional considerations on risk factors include:

- ▶ City of Brantford staff indicated that, while the CSZ policy does not include collisions, it would have been beneficial for this risk factor to be included as part of the warrant criteria.
 - However, collisions are considered as an eligibility criterion: “Field observations should also verify that there is an unusually high violation and/or collision rate on the specific road section. A CSZ should be implemented if the collision ratio is less than 1:900 (collisions per year: AADT) averaged over 36 consecutive months.”
- ▶ York Region and Oxford County use the same collision ratio threshold of 1:900 (collisions per year: AADT), averaged over 36 consecutive months, as an additional warrant (i.e., a CSZ is warranted if either the collision component or the risk factors component is met).
- ▶ The City of Richmond Hill CSZ policy used to include sidewalks among its warrant criteria, however they were removed due to an understanding that there is a certain correlation / redundancy between the presence of sidewalks and vehicle and/or pedestrian volumes.
- ▶ The City of Richmond Hill assigns a high-risk score for average daily traffic to roads above the City's 85th percentile volumes; a low risk score is assigned to roads below the City's 50th percentile volumes.
- ▶ The City of Richmond Hill uses the absolute value of the 85th percentile rather than the excess over the speed limit (high over 50 km/h, low risk under 40 km/h). The rationale provided is the pedestrian survivability rate vs. speed relationship (**Figure 2**). Oxford County also uses the absolute value of the 85th percentile speed.

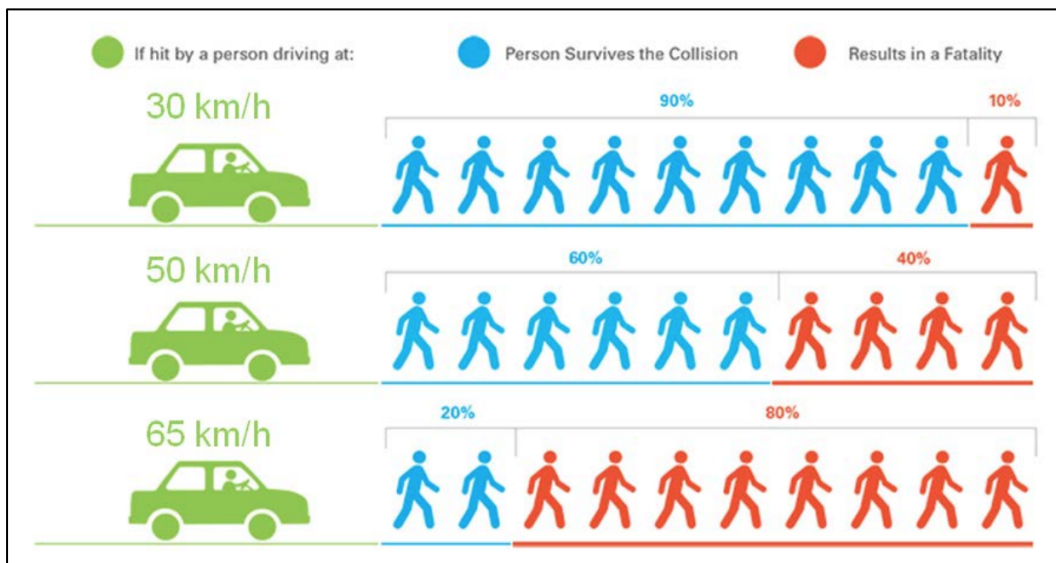


Figure 2: Pedestrian survivability rate vs. vehicle speed (Institute of Transportation Engineers)

Town of Milton’s CSZ policy also includes two additional warrants: Warrant 3 (Other Applicable Measures/Devices) excludes from consideration sections of road that are contained within an existing stepped up enforcement program provided by the Region of Halton Police and has not been identified as a section of road for the implementation of any traffic calming measures or intersection related

improvements such as geometrics, pavement markings and signal timing; and Warrant 4 (Ability to Enforce) limits the number of active CSZs in the Town to four at any given time, in order to ensure that sufficient resources are available to provide the necessary enforcement (however, this may not be a concern in the context of an automated speed enforcement program).

2.3 Minimum and Maximum Length

Most jurisdictions reviewed do not identify minimum or maximum CSZ lengths in their policies. York Region, Halton Region, City of Richmond Hill and Oxford County specify a minimum length of 500 m, while the Town of Milton specifies that CSZs should start and finish within 250 m of areas of special concern.

York Region and City of Richmond Hill also specify a maximum length of 2.5 km, while Oxford County specifies a maximum length of 1.5 to 2.0 km.

2.4 Treatment of School Zones

Most jurisdictions reviewed do not explicitly address the treatment of school zones in their CSZ policy. The policies that do address this matter have the following approaches:

- ▶ York Region designates all 40 km/h school zones fronting an elementary school on a major road as CSZs.
- ▶ City of Toronto designates all elementary and secondary school frontages as CSZs.
- ▶ City of Hamilton and City of Brantford allow for dual designation.
- ▶ Wellington County treats school zones independently from CSZs. While not explicitly stated, it appears to also allow dual designation.

2.5 Miscellaneous

Other noteworthy information identified in the jurisdictional scan includes:

- ▶ Wellington County and York Region require an assessment of speed violation and/or collision rates prior to applying the risk factors warrant.
- ▶ City of Richmond Hill's risk factors warrant with a points system is temporary and will eventually be replaced with a network screening method to rank priority locations across the City.

3.0 RECOMMENDED COMMUNITY SAFETY ZONE CRITERIA

Based on the findings from the jurisdictional scan, a two-level warrant system, including an eligibility warrant and a points-based assessment of risk factors, is recommended for the Region of Waterloo. This type of system is consistent with many other jurisdictions in Ontario and is relatively simple to implement.

The following sections discuss the recommended criteria and rationale for their selection.

3.1 Eligibility

A candidate location will be considered eligible if it meets all of the following five criteria:

3.1.1 Area of Special Concern

The location is defined as an “area of special concern” due to the presence of:

- ▶ At least one elementary or secondary school, community centre, medium or large park, or hospital; or
- ▶ Two or more of any of daycare centre, seniors’ centre or residence, small park, or playground.

A candidate road section can be defined as an area of special concern if the above noted land uses either front it or create pedestrian desire lines across it.

Regional staff may apply judgment to define other locations as areas of special concerns, as long as the main goal of ‘reducing the risk of speed related injuries for vulnerable road users’ is preserved. Examples include areas with considerable activity of community members with vision loss or other physical disabilities.

Locations where School Zones are already present are not excluded from consideration for a CSZ. Assessment of these locations can be completed independently, and dual designation is permitted if both are warranted.

The Highway Traffic Act and the Ontario Traffic Manual reserve the use of CSZs to sections of roadways where public safety is of special concern; these sections typically include roadways near schools, day care centres, playgrounds, parks, hospitals and/or senior citizen residences. These types of facilities typically attract higher volumes of vulnerable road users, including pedestrians (particularly children or senior citizens) and cyclists, who are at a higher risk of serious injuries if they are involved in a collision with motor vehicles. The different number of facilities, based on their type, required to designate a candidate location as an area of special concern, was chosen based on the potential to attract larger volumes of pedestrians and/or cyclists and to prevent that the presence of any single, smaller facility, creates an excessive number of eligible locations throughout the Region.

3.1.2 Maximum Speed Limit

The speed limit of the road does not exceed 60 km/h.

Speed limits higher than 60 km/h are typically used on arterial roads where vehicular traffic movement is a primary consideration compared to access. These high speeds are incompatible with the presence of vulnerable road users and CSZs or ASE are unlikely to be effective in reducing the risk for them, even

if high rates of speed limit compliance can be achieved (refer to **Figure 2**). Instead, on high-speed road, facilities should be designed to promote physical separation between vulnerable road users and motor vehicles.

3.1.3 Actual Speeding Issue on a Road with an Appropriate Speed Limit

The 85th percentile speed of the road exceeds 10 km/h above the speed limit, and the speed limit is appropriate for the road characteristics based on the Transportation Association of Canada's (TAC) guidelines.

The 85th percentile speed (i.e., the speed at or below which 85% of vehicles travel) is typically used, in the traffic engineering industry, to represent the operating speed of the road. On most roads, 85th percentile speed is typically observed to be within 10 km/h above the speed limit. Limiting the implementation of CSZs and ASE to locations that exceed this threshold will ensure a more efficient allocation of resources by targeting roadways where a more pronounced speeding issue is present.

However, it is important to confirm that the posted speed limit is compatible with the physical characteristics of the roadway and motorists' expectations. TAC's Canadian Guidelines for Establishing Posted Speed Limits state that it is inappropriate to set a posted speed limit that is inconsistent with drivers' perceptions, and then to rely on enforcement efforts to reduce operating speeds. Furthermore, artificially low (i.e., established through regulatory signage only but incompatible with the physical characteristics of the road) can contribute to speed dispersion (where some drivers comply the posted speed limit while others choose their speed based on the road environment) and a to higher risk of collisions. Therefore, if the speed limit at a candidate location is not appropriate for the road characteristics, it should be adjusted before a CSZ can be considered (or, alternatively, the road environment should be modified so that it is compatible with the desired speed limit).

3.1.4 Traffic Calming

There is no existing or planned physical traffic calming.

The goal of CSZs and ASE is to encourage motorists to reduce their speeds; physical traffic calming has the same effect and, therefore, implementing a CSZ would be redundant and an inefficient allocation of resources.

3.1.5 ASE Eligible and Feasible

The location is eligible for automated speed enforcement and able to physically accommodate speed cameras, based on the Region's current ASE policies and practices.

The effectiveness relies on an active enforcement of speeds, which is only feasible for short periods using traditional police enforcement. Therefore, the ability to implement ASE is essential to achieve a consistent and sustained change in driver behaviour.

3.2 Community Safety Zone Limits

The limits of a CSZ will be defined as 250 m before and 250 m after the property line of (or the pedestrian desire lines created by) the facilities that define the candidate location as an area of special concern. This automatically defines a minimum CSZ length of 500 m.

Staff may use judgment and consider other logical CSZ boundaries; for example, an intersection or point along the roadway where the road or land use environment substantially changes. However, if the modified CSZ limits are less than 250 m from the relevant property line or pedestrian desire line, staff must ensure that the total length of the resulting CSZ is a minimum of 500 m, and that the location of the ASE camera complies with all applicable regulations, policies and procedures.

If two or more CSZs begin and end within less than 500 m from each other, they should be merged into a single CSZ. In theory, this means that there is no maximum CSZ length; in practice, however, it is unlikely that this would result in a CSZ that exceeds 1.5 km or 2 km.

3.3 Risk Factors and Scoring

If a candidate location is considered eligible based on the criteria outlined in 3.1, it will proceed to the assessment of risk factors. **Table 2** defines the eight recommended risk factors considered to be key in assessing whether a candidate site shall be designated as a CSZ, as well as their thresholds for determining their risk level. Each risk factor is assigned a score ranging from 1 to 3 depending on the threshold values. The thresholds for the risk levels were determined based on typical values used by other jurisdictions, a review of available Region-wide data, and the pilot study conducted as part of this study (refer to Section 4.0).

Table 2: Risk factors and scoring

Risk Factor	High (3 points)	Medium (2 points)	Low (1 point)
Average Daily Traffic (vehicles per day)	> 20,000	10,000 – 20,000	< 10,000
Total 8-hour Pedestrian Volume	> 100	50 – 100	< 50
Presence of Community Facilities	2+ Major	1 Major or 2+ Minor	1 Minor or less
Truck %	> 5%	3 – 5%	< 3%
85 th Percentile Speed (km/h)	> 60	50 – 60	< 50
Eligible Injury Collisions in a 3-year Period	> 2	1 – 2	0
Number of Intersections / Accesses per km	> 10	5 – 10	< 5
Presence of Sidewalks	None	One side	Both sides

The following are clarifications necessary for the data gathering process when assessing some risk factors:

▶ **8-hour pedestrian volumes:**

- Total 8-hour volume of pedestrians crossing the candidate road segment at the point of highest volume (e.g., busiest intersection from a pedestrian crossing perspective).

- ▶ **Presence of community facilities:**
 - Major facilities include elementary or secondary schools, community centres, medium or large parks and hospitals.
 - Minor facilities include daycare centres, seniors’ centres or residences, small parks and playgrounds.
- ▶ **85th percentile speed:**
 - Minimum 24 hours of data collected using automatic traffic recorders (ATR).
- ▶ **Eligible injury collisions:**
 - Midblock injury collisions involving vulnerable road users (VRU) **or** aggressive driving;¹
 - Intersection injury collisions involving VRU **or** aggressive driving, **only if** the intersection is minor road stop controlled or has pedestrian crossover (PXO) or intersection pedestrian signal (IPS) control on the major road;
 - Intersection injury collisions involving VRU if the intersection is fully signalized or all-way stop controlled.
- ▶ **Number of intersections / accesses per km:**
 - Single family home driveways excluded.

A CSZ will be considered warranted at a candidate location if:

- ▶ A minimum total of 17 points (approximately 71% out of a maximum of 24 points possible) is accumulated; or
- ▶ A minimum total of 16 points and at least two out of the following three factors present a ‘high’ risk level:
 - 8-hour pedestrian volume;
 - 85th percentile speed; and
 - Eligible injury collisions in a 3-year period.

3.4 Detailed Engineering Studies

The Ontario Traffic Manual also states that “collision-prone areas within a community” may be considered as areas of special concern; this definition was not included as an eligibility criterion because these areas may require more specific assessments, through in-service road safety reviews or road safety audits, to identify potential engineering deficiencies and countermeasures that may go beyond the ability of CSZs to be effective.

Regional staff may recommend the implementation of CSZs at locations that are not considered eligible or warranted based on the criteria outlined in the previous section if a detailed engineering study is undertaken and finds that ASE is the most appropriate countermeasure to address an existing speeding issue. This option should be used sparingly to address concerns at locations that do not meet the CSZ warrant but might present other conditions that merit its application. The engineering study should

¹ Collisions involving aggressive driving are defined by one of more drivers being reported with one of the following apparent driver actions: exceeding speed limit, speed too fast for condition, following too close, disobeyed traffic control, failed to yield right of way.

follow relevant traffic engineering standard and guidelines to determine the presence and magnitude of a speeding issue and only consider CSZ designation and ASE deployment if other measures are determined not to be appropriate.

4.0 PILOT STUDY

A pilot study was conducted to test whether the recommended risk factors and scoring (Section 3.3) are suitable for the Region of Waterloo's context. The goals of the pilot study are to determine if the proposed scoring system and its thresholds provide balanced outcomes, ensuring that:

- ▶ The scoring system does not result in all or a majority of candidate locations being warranted;
- ▶ The scoring system does not result in all or a majority of candidate locations being unwarranted;
- ▶ Warranted candidate locations with a substantial number of high-risk factors would continue to be warranted even with slight variations in the risk factor thresholds; and
- ▶ Unwarranted candidate locations with a substantial number of low-risk factors would continue to be unwarranted even with slight variations in the risk factor thresholds.

The pilot study included 13 locations across the Region. These locations were selected by TNS and Regional staff based on the presence of land uses (mostly schools) that qualify as areas of special concern on Regional roads. The 13 pilot locations are the following:

- ▶ Arthur Street from South Street W to Second Street (Woolwich);
- ▶ Courtland Avenue E from Peter Street to Madison Avenue S (Kitchener);
- ▶ Fischer-Hallman Road from Queens Boulevard to Forest Hill Drive (Kitchener);
- ▶ King Street W from Mount Hope Street to Agnes Street (Kitchener);
- ▶ Lobsinger Line from Three Bridges Road to Apple Grove Road (Woolwich);
- ▶ Sawmill Road from Snyders Flats Road to St Charles Street W (Woolwich);
- ▶ Sawmill Road from Northfield Drive E to Flax Mill Drive (Woolwich);
- ▶ Victoria Street S from Westforest Trail to Westforest Trail (Kitchener);
- ▶ Westmount Road W from Gage Avenue to Karn Street (Kitchener);
- ▶ Bridge Street W from Bridle Trail to Woolwich Street (Waterloo);
- ▶ University Avenue W from Resurrection Drive to Glasgow Street (Kitchener);
- ▶ Charles Street E from Madison Avenue S to Pandora Avenue S (Kitchener); and
- ▶ Herrgott Road from Geddes Street to Broadway Street (Wellesley).

While best efforts were made to select locations across other municipalities, land uses that qualify as areas of special concern would not typically front or create obvious desire lines connecting to Regional roads. For this reason, most selected locations are in the City of Kitchener and in the Township of Woolwich, where fronting or creating desire lines connecting to Regional roads were found to be more common.

It should also be noted that the selected locations were not assessed for other eligibility criteria (maximum speed limit, ASE feasibility, etc.), since the main purpose of the pilot study is to test the scoring system. If locations had been excluded from the pilot study based on the eligibility criteria, the reduced sample size may have produced fewer insights.

4.1 Scoring System Variations

A total of 11 scoring system variations were tested, including 6 with small modifications to a single risk factor thresholds and 5 with different combinations of these modifications. **Table 3** shows Scoring Option 1 (Base), which was the scoring system originally proposed based on the jurisdictional scan alone.

Table 3: Scoring Option 1 (Base)

Risk Factor	High (3 points)	Medium (2 points)	Low (1 point)
Average Daily Traffic (vehicles per day)	> 20,000	10,000 – 20,000	< 10,000
8-hour Pedestrian Volume	> 100	50 – 100	< 50
Presence of Community Facilities	2+ Major	1 Major or 2+ Minor	1 Minor or less
Truck %	> 5%	3 – 5%	< 3%
85 th Percentile Speed (km/h)	> 60	50 – 60	< 50
Eligible Injury Collisions in a 3-year Period	> 2	1 – 2	0
Number of Intersections / Accesses per km	> 10	4 – 10	< 4
Presence of Sidewalks	None	One side	Both sides

The remaining scoring options tested were as follows:

- ▶ **Scoring Option 2:** truck % thresholds were changed from 3% and 5% to 4% and 6%.
- ▶ **Scoring Option 3:** pedestrian volume thresholds were changed from 50 and 100 to 75 and 150.
- ▶ **Scoring Option 4:** presence of community facilities was removed (to test whether it could be redundant with pedestrian volumes).
- ▶ **Scoring Option 5:** number of intersections / accesses per km thresholds were changed from 4 and 10 to 5 and 10.
- ▶ **Scoring Option 6:** 85th percentile speed was changed from the absolute value to the excess over the speed limit.
- ▶ **Five combinations of the previous options:**
 - Options 3 and 4 combined.
 - Options 3 and 5 combined.
 - Options 4 and 5 combined.
 - Options 2, 3 and 5 combined.
 - Options 3, 4 and 5 combined.

The specific modifications to the risk factor thresholds were selected predominantly based on unbalanced distributions resulting from Score Option 1 (Base). For example, the number of intersections / accesses per km resulted in 4 high-risk, 7 medium-risk and 2 low-risk locations. The threshold was then modified in an attempt to achieve a more balanced distribution, which resulted in 4 high-risk, 4 medium-risk and 5 low-risk locations under Option 5.

For Scoring Option 4, the presence of community facilities was removed to test whether it could be redundant with pedestrian volumes. This risk factor eventually remained because it is understood that it may account for suppressed pedestrian demand (i.e., some pedestrians may choose alternative routes, or make fewer trips, because they perceive the road to be unsafe).

For Scoring Option 6, the 85th percentile speed was changed from the absolute value to the excess over the speed limit to test whether it could better balance high-, medium- and low-risk locations. However, this change resulted in a very low number of locations being warranted.

4.2 Scoring System Selection

The selection of the recommended scoring system considered the number of pilot locations that resulted as warranted or not warranted under each scoring option, as well the number of scoring options under which each location would be warranted or not warranted. For example:

- ▶ If a location was warranted in 6 or more different scoring options, no scoring options in which that location was not warranted were considered appropriate.
- ▶ If a location was warranted in less than 4 different scoring options, no scoring options in which that location was warranted were considered appropriate.
- ▶ If a scoring option resulted in more than 60% of locations being either warranted or unwarranted, that scoring option was not considered appropriate.

Scoring Option 5, with modified thresholds for number of intersections / accesses per km, was selected as the recommended scoring system since it was the only one that satisfied the above noted rationale.

Table 4 summarizes the pilot study results.

Table 4: Pilot study results

Location	Times Warranted	Scoring Option										
		1	2	3	4	5	6	4+5	3+4	3+5	2+3+5	3+4+5
Arthur Street	6	W	W	W	U	W	U	U	U	W	U	W
Courtland Avenue E	0	U	U	U	U	U	U	U	U	U	U	U
Fischer-Hallman Road	4	W	W	W	U	U	W	U	U	U	U	U
King Street W	8	W	W	W	U	W	W	U	U	W	W	W
Lobsinger Line	0	U	U	U	U	U	U	U	U	U	U	U
Sawmill Road (1)	0	U	U	U	U	U	U	U	U	U	U	U
Sawmill Road (2)	0	U	U	U	U	U	U	U	U	U	U	U
Victoria Street S	7	W	W	W	W	W	U	U	W	W	U	U
Westmount Road W	1	U	W	U	U	U	U	U	U	U	U	U
Bridge Street W	6	W	W	U	W	W	W	W	U	U	U	U
University Avenue W	10	W	W	W	W	W	U	W	W	W	W	W
Charles Street E	10	W	W	W	W	W	U	W	W	W	W	W
Herrgott Road	5	W	W	W	W	U	U	U	W	U	U	U
% of Warranted Locations		62%	69%	54%	38%	46%	23%	23%	31%	38%	23%	62%
% of Unwarranted Locations		38%	31%	46%	62%	54%	77%	77%	69%	62%	77%	38%
Assessment		X	X	X	X	✓	X	X	X	X	X	X

Legend

W: Warranted
U: Unwarranted

62%: more than 60% warranted or unwarranted locations

54%: up to 60% warranted or unwarranted locations

X: Not an appropriate scoring option

✓: Appropriate scoring option

This scoring option warrants a location that is warranted in less than 4 different scoring options.
This scoring option does not warrant a location that is warranted 6+ different scoring options.

5.0 WARRANT PROCESS

This section provides a step-by-step process to assist Region staff in assessing whether a candidate location warrants the implementation of a CSZ. **Figure 3** presents a flowchart outlining the overall process; the left half of the flowchart corresponds to the eligibility component, while the right half of the flowchart corresponds to the risk factor assessment.

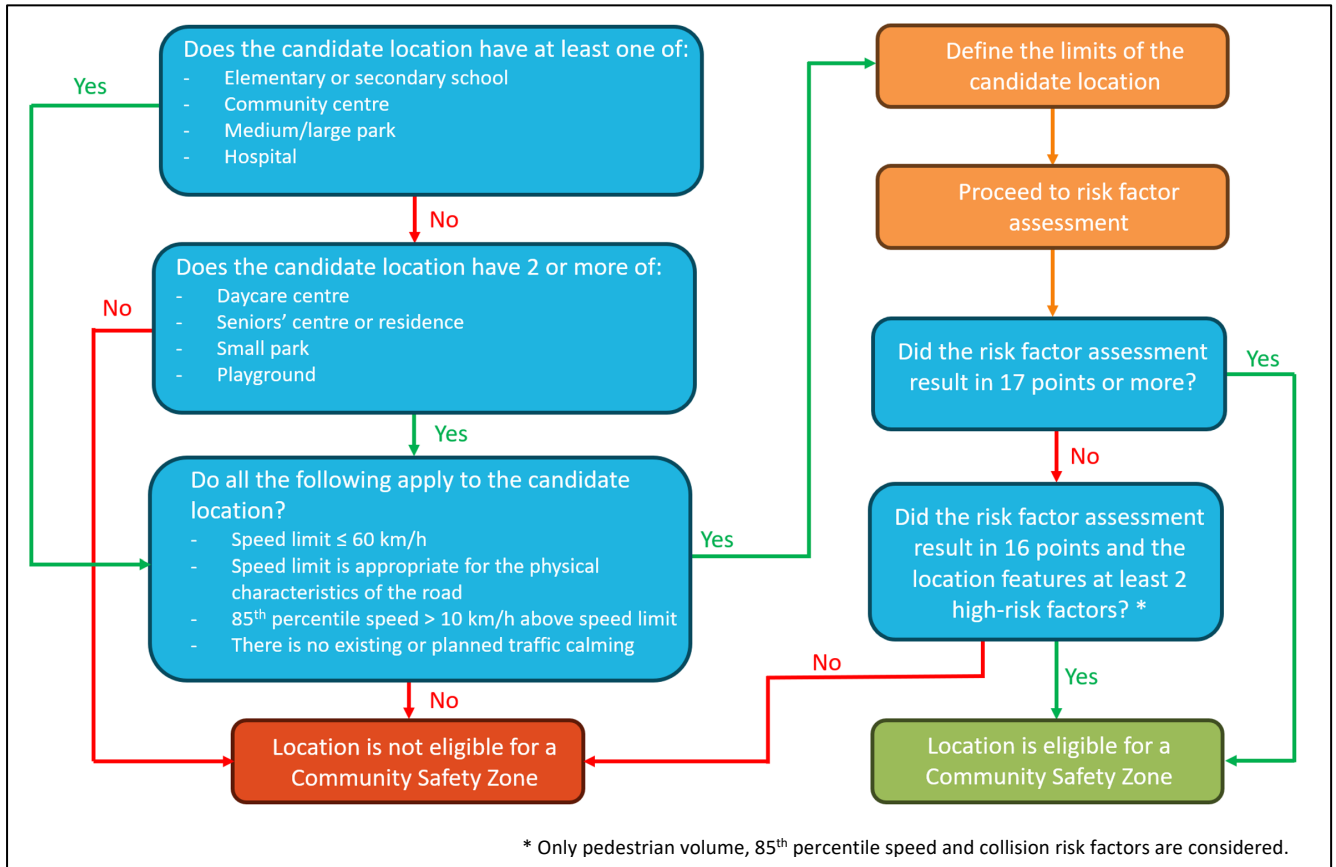


Figure 3: Region of Waterloo Community Safety Zones Process

Upon receiving a request to implement a CSZ at a specific location, Regional staff will review the request according to the following steps:

Step 1: Determine if the Candidate Location is an 'Area of Special Concern'

Review the land use around the candidate location. The location is considered to be an area of special concern if one of the following land use conditions are present:

- ▶ At least one elementary or secondary school, community centre, medium or large park, or hospital; or
- ▶ Two or more of any of the following: daycare centre, seniors' centre or residence, small park or playground.

A candidate road section can be defined as an area of special concern if the above noted land uses either front it or create pedestrian desire lines across it. **Appendix A** shows examples of candidate locations with such desire lines.

If the candidate location is considered an area of special concern, proceed to Step 2.

If the candidate location is **NOT** considered an area of special concern, it is not eligible for a CSZ designation.

Step 2: Determine if the Candidate Location is Operationally Suitable

Review speed limit, speed studies, traffic calming and automated speed enforcement suitability and feasibility. All of the following conditions must be satisfied for the candidate location to be considered operationally suitable:

- ▶ The speed limit of the road does not exceed 60 km/h.
- ▶ There is no existing or planned physical traffic calming.
- ▶ The 85th percentile speed of the road, at or immediately adjacent to the candidate location, exceeds 10 km/h above the speed limit.²
- ▶ The speed limit is appropriate for the road characteristics.³
- ▶ The location is eligible for automated speed enforcement and able to physically accommodate speed cameras.⁴

If the candidate location is considered operationally suitable, proceed to Step 3.

If the candidate location is **NOT** considered operationally suitable, it is not eligible for a CSZ designation.⁵

Step 3: Define the Limits of the Candidate Location and Gather Data

For the purposes of the risk factor assessment (Step 4), the candidate location is defined by extending it to the next intersection, in both directions along the subject road, beyond the property line(s) of the land use(s) that makes it an area of special concern (refer to Step 1). **Appendix A** shows examples of candidate location limits in map format.

Once these limits are defined, the following additional data – beyond those used in Steps 1 and 2 – should be gathered (or collected, as needed):

- ▶ Average annual daily traffic from the Region's AADT Summary List.
- ▶ Turning movement and/or pedestrian volume counts at all intersections and midblock crossings within the candidate location limits (including the intersections ones at both ends).
 - New counts should be collected for intersections where no counts are available, or the most recent count is older than 3 years.

² Collect speed data if speed studies not older than 3 years are not readily available.

³ Assess speed limit in accordance with the methodology from the Canadian Guidelines for Establishing Posted Speed Limits (TAC).

⁴ Assess based on the Region's current ASE policies and practices.

⁵ Some locations can be made operationally suitable by reducing the speed limit, as long as the new speed limit is appropriate for the road characteristics.

- Minor intersections may be omitted if it is obvious that the highest pedestrian crossing volumes occur at other locations.
- ▶ Vehicle classification studies, collected through automatic traffic recorders (ATR). This information is typically collected together with speed studies.
- ▶ Collision records for the most recent 3-year period.
- ▶ Recent aerial imagery and GIS data allowing for the identification of community facilities, accesses and sidewalks.

Step 4: Determine Risk Levels of and Assign Points to Each Risk Factor

Review the data gathered in Step 3 and assign risk levels and points (high – 3 points, medium – 2 points or low – 1 point) to each risk factor, according to the thresholds outlined in **Table 2** (Section 3.3). The following is a list of data sources for each risk factor, as well as specific criteria that should be considered:

- ▶ **Average daily traffic:**
 - Obtained from the Region’s AADT Summary List or another source (e.g. the Region’s Miovision Advanced Traffic Management System).
- ▶ **8-hour pedestrian volume:**
 - Obtained from turning movement and/or pedestrian counts.
 - Only volumes at the busiest pedestrian crossing (intersection or midblock) are considered.
 - Only volumes across the candidate road are considered.
 - Add up the volumes for the busiest 8 hours of the day, regardless of whether they are consecutive.
- ▶ **Presence of community facilities:**
 - Obtained from GIS data and/or aerial imagery.
 - Major facilities include elementary or secondary schools, community centres, medium or large parks and hospitals.
 - Minor facilities include daycare centres, seniors’ centres or residences, small parks and playgrounds.
- ▶ **Truck %:**
 - Obtained from ATR data / vehicle classification studies or adjacent turning movement counts.
 - Truck percentage in both directions over the entire study period.
- ▶ **85th percentile speed:**
 - Obtained from ATR data / speed studies.
 - 85th percentile speed in both directions over the entire study period.
- ▶ **Eligible injury collisions in a 3-year period:**
 - Obtained from the Region’s collision database.

- Midblock injury collisions involving vulnerable road users (VRU) **or** aggressive driving;⁶
 - Intersection injury collisions involving vulnerable road users (VRU) **or** aggressive driving, **only if** the intersection is minor road stop controlled or has pedestrian crossover (PXO) or intersection pedestrian signal (IPS) control on the major road;
 - Intersection injury collisions involving vulnerable road users (VRU) if the intersection is fully signalized or all-way stop controlled.
- ▶ **Number of intersections / accesses per km:**
 - Obtained from aerial imagery.
 - Count the number of intersections and accesses (excluding single family home driveways) within the limits of the candidate location (Step 3) and divide it by its length in km.
 - ▶ **Presence of sidewalks:**
 - Obtained from aerial imagery.
 - Exclude sidewalks that are discontinued within the limits of the candidate location.

Step 5: Determine Risk Score

Add up the points for all risk factors from Step 4. A CSZ will be considered warranted at a candidate location if:

- ▶ A minimum total of 17 points (approximately 71% out of a maximum of 24 points possible) is accumulated; OR
- ▶ A minimum total of 16 points and at least two out of the following three factors present a ‘high’ risk level:
 - 8-hour pedestrian volume.
 - 85th percentile speed.
 - Eligible injury collisions in a 3-year period.

Step 6: Determine the Limits of the Community Safety Zone and Proceed to Implementation

If a candidate location is determined to warrant a CSZ based on the previous steps, define the limits of the CSZ as follows:

- ▶ 250 m before and 250 m after the property line of (or the pedestrian desire lines created by) the facilities that define the candidate location as an area of special concern.
 - Staff may use judgment and consider other logical CSZ boundaries; for example, an intersection or point along the roadway where the road or land use environment substantially changes.
 - If the modified CSZ limits are less than 250 m from the relevant property line or pedestrian desire line, staff must ensure that the total length of the resulting CSZ is a minimum of 500 m, and that the location of the ASE camera complies with all applicable regulations, policies and procedures.

⁶ Collisions involving aggressive driving are defined by one of more drivers being reported with one of the following apparent driver actions: exceeding speed limit, speed too fast for condition, following too close, disobeyed traffic control, failed to yield right of way.

- ▶ Check if there are other existing or warranted CSZs beginning or ending within less than 500 m from the candidate location. If there are, they should be merged into a single CSZ.

Once the CSZ limits have been determined, staff will undertake all necessary administrative procedures (e.g., report to Council, by-laws, work orders, etc.) for implementation.

6.0 CONCLUSION

Community Safety Zones (CSZ) provide road users with visual awareness that they should be diligent in their attentiveness to roadway safety when traveling in or through these areas, in addition to doubling traffic offence fines to assist in reinforcing the importance of safety and modifying driver behavior. The successful implementation of CSZs is a commitment to increased enforcement, particularly through automated speed enforcement (ASE).

In the Region of Waterloo, the installation of ASE started in 2021 in support of the Region's comprehensive Road Safety Program goal to eliminate road-related injuries and deaths that occur because of excessive speeding. Expansion of the ASE program will require the designation of additional CSZs; to that effect, a CSZ Warrant and Process was developed to ensure that ASE is deployed at locations where they are most necessary and expected to result in the greatest safety benefits.

This study consisted in the development of CSZ warrant criteria and process for the Region of Waterloo, which included a jurisdictional scan and a pilot study. The recommended warrant includes an eligibility component, based on land use operational characteristics, and a points-based assessment of risk factors. The warrant also provides flexibility for Regional staff to recommend the implementation of CSZs at locations where a detailed engineering study finds that ASE is the most appropriate countermeasure to address an existing speeding issue.

The recommended warrant and process will be shared with area municipalities for collaboration, allowing them to adapt recommendations for road under their jurisdiction, which will ensure a unified commitment to improving road safety across the entire Region.

APPENDIX A: EXAMPLES OF DESIRE LINES AND CSZ LIMITS

