Traffic Mitigation Strategy

Prepared for The Town of Bradford West Gwillimbury.

By Arcadis Professional Services (Canada).

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1. Introduction

1.1. Background

The Town of Bradford West Gwillimbury (BWG) has undergone substantial residential and commercial development in recent years, marked by a population growth rate that stands as the second highest in Ontario. With this growth comes increased traffic flows and the need to accommodate all road users via a “complete street” community oriented approach.

This Traffic Mitigation Strategy (TMS) serves to provide its users with a data-oriented technical process (using industry best practices) to respond to traffic safety concerns addressable via traffic calming solutions. One of the key goals of this TMS is to facilitate and encourage sustainable non-automobile based travel modes in communities via the premise that roads are shared equally by drivers, pedestrians, and cyclists. Therefore, topics regarding pedestrian crossing facilities, methods of addressing speeding, all-way stop usage, automated speed enforcement, and assessing changes to on-street parking are contained within.

This TMS serves to facilitate traffic calming solutions only on local and collector roads types in urban and rural environments. Arterial road speeding concerns should be directed towards guidance contained in the “Transportation Association of Canada (TAC) Canadian Guide to Traffic Calming (2018)”.

Inappropriate driver behaviour can significantly impact road safety, community perception of safety, and the overall quality of life. The issue of speeding in particular has become a focal point of concern in various communities, emphasizing the need for effective speed management. This challenge is particularly pronounced in residential neighborhoods and near schools / institutions, where higher volumes of pedestrians and cyclists necessitates greater consideration for their comfort and well-being.

Speed enforcement (e.g., police and automated speed cameras) can lead to temporary compliance when present but is not an effective long-term solution as a standalone measure. Achieving a sustainable long-term approach to speed management involves the implementation of traffic calming measures and sensible road design. These measures aim to alter driver behaviour via policies and / or physical road treatments.

1.2. Objectives of this Traffic Mitigation Strategy

This guide provides a clear process for evaluating, prioritizing, implementing, and monitoring traffic calming requests submitted by residents and stakeholders in the Town of Bradford West Gwillimbury. The technical criteria and detailed descriptions of each step in this process guide the decision-making process and serve to provide users with a clearly-defined and defendable, data-based approach. The toolbox of traffic calming measures contained in this guide aim to mitigate concerns related to vehicular speeding, traffic volumes, and other driver behaviour on rural and urban roads in the Town.

This strategy was developed in consultation with Town staff, Councillors, and residents. Councillors were involved at the Steering Commitee and also met with project staff in one-on-one meetings. Residents participated through three public information centres (PICs) and provided comments through the process. Input from these groups provided invaluable guidance on the development of the TMS. In addition to the public consultation, Arcadis used current and historic traffic data provided by town staff to inform the policies, warrants, and tools outlined in this strategy.

1.3. Using the Right Tools for the Job

It should be noted that traffic control and traffic calming are often mixed together and misunderstood to be identical concepts to mitigate speeding. In reality, traffic control devices such as stop signs, traffic signals, and posted speed limits are regulatory measures that are enforceable by law enforcement. The overuse of stop signs, specifically, can lead to unsafe driver behaviour side affects at surrounding areas, such as aggressive driving to make up for lost time, and frustration leading to lower compliance of other nearby signs.

In comparison, the premise of traffic calming treatments is to encourage safer and more responsible driving behaviour, such as reducing speeds and reducing cutting-through neighbourhoods. This altered road user behaviour then leads towards the goal of reducing hazards to nearby vulnerable road users, and safer driving habits when in a higher risk area.

Traffic calming involves the implementation of a broad range of measures, devices, and technqiues based on a combination of parallel strategies, known collectively as the “three E’s” (education, enforcement, and engineering).

1.4. What do residents do if they notice traffic safety issues along a road?

If residents observe traffic issues along a road they can report issues through the **"myBWG"** Mobile App. The App enables residents to quickly report problems, upload photos, stay informed about the latest news, and access other popular services. The app can be found on App Store or Google Play Store by searching for **"myBWG".**

Alternatively, you residents have the option to report your their concerns to the Town using the online form available under the "Use Our Online Form" section via the link, **https://www.townofbwg.com/en/living-in-bwg/report-an-issue.aspx.**

The Town's email **(traffic@townofbwg.com)** and phone (+1 905-775-5366) contact information is listed at **www.Townofbwg.com** at the bottom of the home page.

Your Town in the palm of your hand

MyBWG screenshot from the App Store

2. Guiding Principles

There are several guiding principles for naturally calmed roads (i.e., roads that encourage driving behaviours that are compatible with the comfort and safety of other road users). These principles illustrate the interrelated nature of community layout, traffic calming elements, and engineering design standards. These themes are discussed below in Sections 2.1 to 2.4 and can be applied to retrofit existing neighbourhood roads, as well as to guide the development of new communities.

2.1. Elevating Active Transportation

Naturally calmed roads accommodate dynamic curbside activity in the form of pedestrians and cyclists using the corridor in addition to motor vehicles. This influences more cautious driving and slower vehicle speeds. Naturally calmed roads can be achieved by encouraging cycling through the provision of on-road or off-road cycling infrastructure (e.g., dedicated on-road bicycle lanes or off-road multi-use paths in the boulevard).

To promote pedestrian activity, sidewalks should be included and designed with desire lines (i.e., path of travel destination) in mind.

Pedestrian crossing safety at intersections and mid-block locations can be enhanced via a variety of features including but not limited to:

- Visible crosswalk markings;
- Elevated crosswalks;
- Raised intersections;
- Curb extensions;
- Intersection pedestrian signals (IPS); and
- Flashing pedestrian crossovers (PXO).

Areas where vulnerable road users are present, such as school zones, should incorporate features like these. Elevating active transportation should be a goal of not only existing infrastructure, but also new developments. Guidelines to promote active transportation in new developments can be found in **Section 5.3** (New Development Checklist).

2.2. Integrating Traffic Calming into Intersections

Naturally calmed roads are often found in communities with short, regular blocks, where intersections present an opportunity to integrate traffic calming at common conflict points. Integrating traffic calming into intersections can establish a change from a higher-speed, higher-volume operating environment to one with lower speeds. These improvements can address concerns related to traffic speeds, turning behaviour, traffic infiltration, and pedestrian crossing safety. Traffic calming features can be retrofitted into existing intersections or integrated into the design of new ones.

At intersections, it is critical to give careful consideration to the selection of appropriate traffic calming measures, and to avoid confusing or inappropriate usage of traffic control devices. At intersections, traffic control devices serve to provide direction on right-of-way (ROW) (e.g., stop signs) or prohibited movements (e.g. “no right-turn on red” signs). If improperly used, these devices can become ineffective or ignored. By comparison, traffic calming measures serve to discourage certain driver behaviours such as speeding and traffic infiltration by physically blocking or constraining movements.

2.3. Design Compact Communities

Land use decisions have a profound impact on driver behaviour, with many instances of undesirable road-user behaviour stemming from auto-oriented neighbourhood layouts and long, circuitous travel paths from origins to destinations. Naturally calmed roads tend to be located in transit supportive communities with prominent non-automobile travel options and in communities with short, regular blocks that minimize travel times to and from the broader road network. Sidewalks in these communities tend to be designed with pedestrian desire lines in mind to nearby destinations, thereby offering the opportunity for residents to reconsider the need to make a trip via automobile.

2.4. Active School Travel Zones

Providing walkable communities helps facilitate programs that enable more convenient and safer travel to school. Such programs have been written and implemented by various municipalities and the Ontario Active School Travel (AST) Council. For BWG, the most applicable initiative in effect is the Simcoe County “On the Move”, which promotes active modes (walking, cycling, skateboarding, etc.) of travel to school, traffic congestion reduction near schools, air quality, safety education, community engagement, and potential infrastructure improvements.

An AST zone consists of a framework for identifying routes for students to travel via active modes. Such routes designated as an AST zone typically incorporates traffic calming measures and enhanced wayfinding, supplemented with education resources such as walking maps coded by distance (e.g., 5/10/15 minute walking routes, 400/800/1000 metre route distances) and curbside rules (e.g., no curbside parking, no stopping, etc.).

AST zones may also consider “Active School Streets”, which are temporary road closures implemented 30-60 minutes before / after school bell times a few times a month along the road segment (e.g. 75-300 metres) fronting a school. The goal of this is to promote physical activity, public space for playing, and raise awareness for safety and the AST program.

2.5. Use the Appropriate Road Design

Many instances of undesirable road-user behaviour stem from over-designing roads in a way that enables comfortable higher operating speeds that are inappropriate for the intended community context. For example, a design typology with a 50 to 60 km/hr design speed intended for collector roads is sometimes used despite a desire for operating speeds to be more consistent with a 30 to 40 km/hr local road. Naturally calmed roads use design elements which are appropriate for the desired operating speed and the road's intended role within the community.

Retrofitting existing neighbourhoods can be accomplished via road diet solutions, such as providing curb extensions, bicycle lanes, and / or widened sidewalks. These improvements can be easily accommodated with minimal work by modifying road markings to reduce excessive lane widths. This can serve to lower operating speeds closer to an appropriate level. However, retrofitting can be costly and as such new developments should ensure that their road designs are aligned with the target operating speeds. Developers should use the new development checklist to ensure that there will not be a need to retrofit traffic calming measures. Town staff can work together with land developers to allow the submission of alternative road design cross sections for consideration to achieve these goals.

3. The Traffic Mitigation Strategy

This section provides information about neighbourhood traffic calming, the traffic calming process, and the key elements of the Town's Traffic Mitigation Strategy (TMS).

3.1. Neighbourhood Traffic Calming

The primary objectives of traffic calming are to alleviate safety concerns by modifying driver behaviour and enhancing conditions for pedestrians and non-motorized road users. Notable improvements in the safety of neighborhoods and roads can be achieved by implementing a combination of the "three-Es": education, enforcement, and engineering strategies.

Neighborhood traffic calming describes actions taken to tackle speeding, excessive traffic infiltration / short-cutting, and other safety concerns (e.g., a lack of safe crossing opportunities) on roads. Achieving the desired result can involve applying a specific mix of policies, regulations, and physical measures to improve driver behaviour and safety for all road users within a specific area.

Examples of regulatory / policy tools for traffic management include lowering speed limits in specific areas, and establishing Community Safety Zones (CSZ) and crossing guard programs. Passive, education, types of tools include providing curbside parking to effectively narrow road widths, and education-type tools such as flexible bollards with speed limits printed on them. Physical traffic calming measure examples include raised crosswalks, curb extensions, and speed humps. These devices can be implemented either as temporary trials or as permanent retrofits to existing roads.

This TMS is written as a public facing document but is primarily used by BWG staff to assess traffic calming requests and apply the most effective and cost-efficient solutions to mitigate the issue. This TMS has been prepared based on the latest industry best practices, policies, and guidelines, as well as traffic data and road network characteristics (i.e. urban and rural areas) specific to BWG along with input from the BWG community.

3.2. Traffic Calming Process

Establishing a single overarching traffic calming process ensures consistency and fairness when responding to traffic calming requests. By applying this same process to the implementation of all traffic calming measures (e.g. flexible bollards, line painting, radar message signs, speed humps), the Town can identify whether traffic calming measures are warranted and should be subsequently implemented.

This established process guides the progression of a traffic calming request from initiation to implementation, with key steps outlined in **Exhibit 3.1.** The process involves multiple stages, including:

1. Receiving a traffic calming request;
2. Assessing the necessity of a traffic calming measure;
3. Prioritizing requests based on predefined ranking criteria;
4. Designing the measure;
5. Obtaining approvals; and
6. Implementing and evaluating its effectiveness.

Implementing and evaluating its effectiveness. The purpose of establishing a single overarching traffic calming process that applies to the implementation of all traffic calming measures (e.g., flexible bollards, line painting, radar message signs, speed humps) is to ensure consistency and fairness in determining whether specific traffic calming measures are warranted and subsequently implemented.

This established process guides the progression of a traffic calming request from initiation to implementation, with key steps outlined in **Exhibit 3.1.** The process involves multiple stages, including receiving a traffic calming request, determining the necessity of a traffic calming measure, prioritizing requests based on predefined ranking criteria, confirming community support, designing the measure, implementing, and evaluating the measure.

Exhibit 3.1 Traffic Calming Process

While the TMS is intended to assist Town Staff and Council in addressing traffic calming requests, it is also a valuable resource for the community to effectively contribute to the decision making and feedback process of implementing road safety improvements.

Key elements included in this TMS are as follows:

- A detailed step-by-step data and decision-based process that uses the framework noted in **Exhibit 3.1** to screen and prioritize traffic calming requests based on specific technical criteria;
- A toolbox of traffic calming measures that can be installed to improve road user safety;
- Warrants for specific measures, including:
  - Education: Deploying in-road flexible bollards and / or pavement markings;
  - Enforcement: Automated speed enforcement;
  - Pedestrian Facilities: Pedestrian crossovers (PXO) and Intersection pedestrian signals (IPS);
  - All-way stop intersection control;
  - Changes to on-street curbside parking; and
- A framework for designing safer roads in new neighborhoods.

4. Implementing Traffic Calming

This section outlines a structured procedure to be followed when receiving requests for traffic calming measures within both rural and urban areas of BWG. It covers the entire process from the receipt of concerns to the implementation and evaluation of measures. This standardized process ensures uniformity and fairness in assessing the necessity and appropriateness of deploying traffic calming measures throughout BWG's road network.

4.1. Traffic Calming Policy Overview

This guide provides a standard framework to address concerns related to speeding and / or traffic infiltration through the implementation of traffic calming measures, where deemed appropriate, via the application of a process and set of warrants.

The TMS provides a streamlined public and stakeholder consultation process, warranting procedures, and a toolbox of traffic calming measures. This process was developed through consultation with BWG staff, councillors, and residents and was designed based on the needs of BWG as a whole. This decision-making and implementation process is illustrated in **Exhibit 4.1** and should take place twice a year. The time frame between reevaluating specific locations of concern is three years. It details the evaluation screening process for traffic calming requests that are received by the Town, and prioritizes them based on a ranking criteria that is applied to all received concerns. The process also helps BWG staff immediately identify if the concern is a pedestrian crossing issue or a stop sign request, which this TMS also includes BWG specific warrants for.

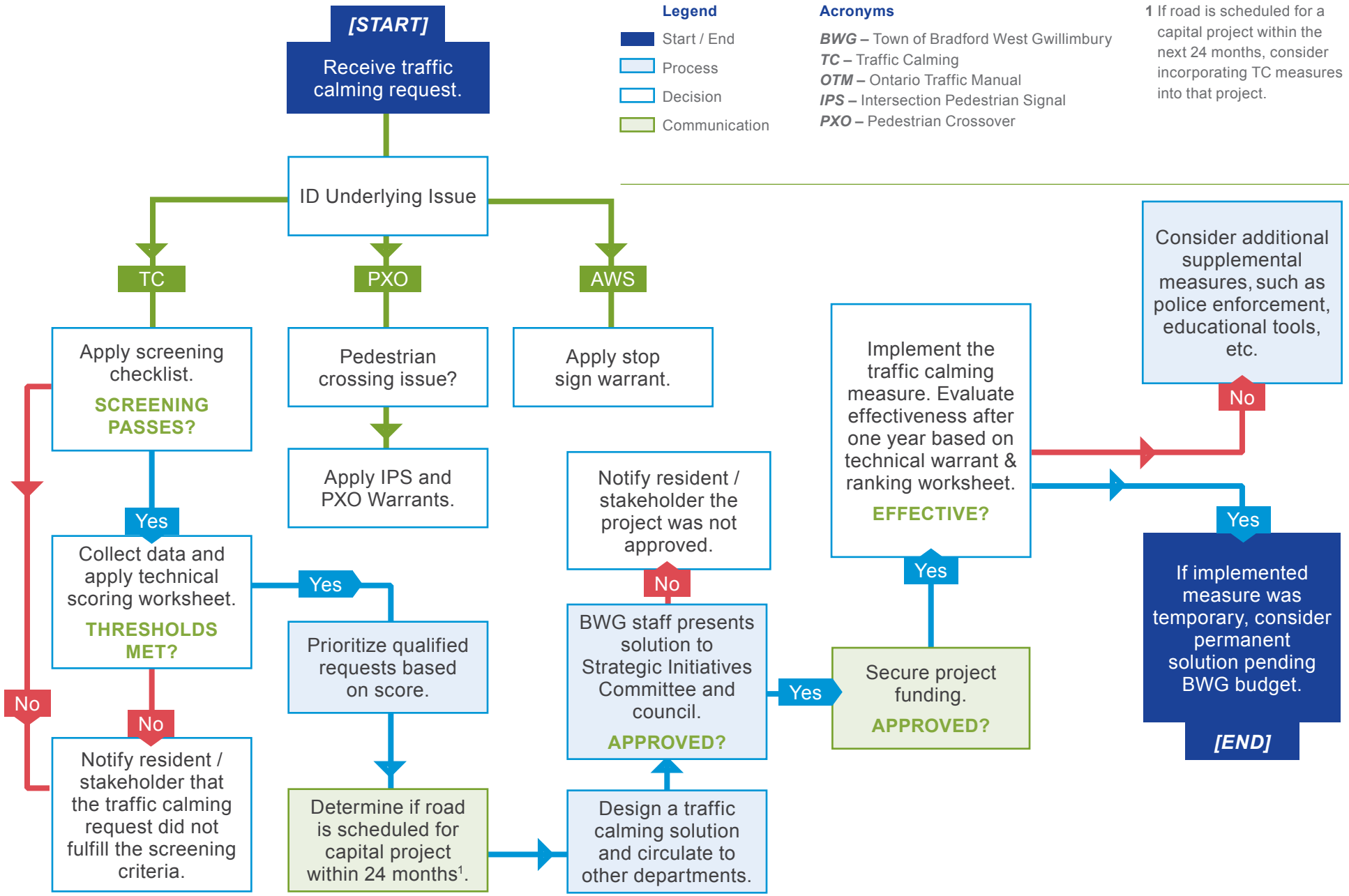
The implementation of traffic calming measures is contingent on: a screening process, traffic data review, minimum justification criteria, prioritization, treatment feasibility, and funding availability.

The preferred order of selection of traffic calming measures follows the “three-Es” approach noted in **Section 3.1: education, enforcement, and engineering type measures,** with consideration given to ease and cost of implementation. The following are key considerations regarding the traffic calming process and implementation of measures:

- In retrofit projects, it is recommended to start by testing and assessing the effectiveness of low-cost (i.e. temporary or “quick-build”) education and enforcement-oriented traffic calming measures before considering more expensive and permanent measures. Examples of low-cost measures include in-road flexible bollards, curb extensions, pavement markings, portable speed radar signs, and automated speed enforcement;
- The use of active police enforcement is considered as an alternative or supplementary option within this process. It is recommended when physical traffic calming measures are deemed unsuitable or ineffective;
- The process outlined in the TMS recognizes the importance of addressing concerns related to pedestrian crossings and acknowledges the role of vulnerable road users in neighbourhood traffic calming. The warrant criteria contained herein for pedestrian crossing facilities, is based on guidelines outlined in Book 15 (Pedestrian Crossing Treatments) of the Ontario Traffic Manual (OTM), while also considering BWG traffic data and the existing road networks;
- For all-way stop sign intersection control requests, the TMS warrant criteria contained herein is based on OTM Book 5 (Regulatory Signs) criteria, while also considering BWG traffic data and the existing road network.

BWG Process Flow for Implementing Calming Measures

Exhibit 4.1 Traffic Calming Implementation Flowchart



4.2. Warranting Process

Warranting is used to validate received traffic concerns and determine the suitability of a location for implementing traffic calming measures. These warrants are developed using BWG traffic data and were developed in consultation with Town staff, residents, and councillors. **These warrants are specifically tailored to BWG and should not be applied to other municipalities.**

The warranting process evaluates requests to decide whether action should be taken and what treatment would be most appropriate. This process ensures that Town resources are allocated to locations that would benefit the most from implementing traffic calming measures.

Concerns received by the Town are first checked to determine if the concern is a **pedestrian crossing or stop sign request,** which are validated using specific standalone warrants contained in **Section 4.2.**

If the concern is neither of these, then the review process continues through two more screening and ranking steps before developing a formal traffic calming solution. This aids staff in prioritizing which roads should be addressed first. Further details about these processes are summarized in the subsections below.

4.2.1. Initial Screening Checklist

The first step upon receiving a traffic calming request is to determine if further action is justified. The screening checklist establishes prerequisites for a location to qualify for traffic calming implementation, including physical, educational, or enforcement treatments. The prerequisites are based on BWG traffic data.

Filtering locations is based on the factors detailed in **Exhibit 4.2**, which aim to ensure the following:

- The location of interest falls within the jurisdictional BWG boundaries;
- The traffic issue raised can be addressed within the scope of traffic calming measures;
- The road segment has a minimum length that demonstrates potential for speeding and that a traffic calming treatment can be appropriately spaced from any nearby traffic control devices, such as stop signs;
- Any prior assessments performed by BWG staff have been given adequate time to take effect. This aims to help ensure fair allocation of Town resources;
- The magnitude of speeding exceeds minimum thresholds;
- Daily traffic volumes exceeds minimum thresholds; and
- The road grade is not too steep to install devices.

For a concern to pass the initial screening, all criteria must be met. In cases where any criteria are unfulfilled, the requests may be redirected to another, more suitable department for resolution. Traffic concerns that meet the requirements of the screening checklist become eligible for resolution through traffic calming measures, with prioritization based on the score obtained via the ranking worksheet discussed in the next section.

Exhibit 4.2 Initial Screening Checklist for Traffic Calming Requests

Initial Screening Checklist			
CRITERIA #	**SCREENING CRITERIA**	**MINIMUM REQUIREMENT**	**YES/NO**
1	Road Jurisdiction	The road of concern is under the jurisdiction of BWG.	
2	Road Length	The area of concern is an uninterrupted road segment, with at least 100 m long, between two traffic control devices (e.g., stop sign to stop sign).	
3	History	There have been no assessments within the past 36 months, unless significant road or land use changes have occurred nearby, likely affecting traffic patterns.	
4	Nature of concern	The request can be addressed through the use of traffic calming measures (i.e., issues are related to speeding, traffic infiltration, cut-through traffic, etc.)	
5	Speeding	**Posted speed of:**	
		40 km/hr or below: 85th% exceeds speed limit?	
		50 km/hr or below: 85th% > 10 km/hr?	
		60 km/hr: 85th% > 10 km/hr?	
		70 and 80 km/hr: 85th% > 10 km/hr?	
6	**Volume Thresholds:** Average Daily Traffic (ADT)	Does the road studied meet / exceed the minimum average daily traffic (ADT) volume threshold below?	
		Rural Road: Minimum ADT met?	
		• Local: 500 vehicles/day	
		• Collector: 500 vehicles/day	
		OR	
		Urban Road: Minimum ADT met?	
		• Local: 750 vehicles/day	
		• Collector: 2000 vehicles/day	
7	Road grade	Less than or equal to maximum threshold of 6%?	
CRITERIA #1 TO #7 ALL MET? If YES, then the traffic calming request satisfies the screening criteria and should proceed to Step 2 – Ranking Worksheet.			

4.2.2. Ranking Criteria

Once a traffic calming request passes the initial screening, the next step is to assess it against the ranking criteria detailed in **Exhibit 4.3.** The ranking aims to provide a comprehensive validation of the traffic calming concern by evaluating specific criteria such as speeding, traffic volumes, truck volumes, collision history, and exposure to vulnerable road users.

Different thresholds are applied for urban and rural roads, and are based on BWG traffic data. For rural roads, driveway density is also considered. This phase typically involves more extensive data collection and analysis.

For Criteria 2, with regards to the average daily traffic (ADT) minimum thresholds, these are sourced from a review of BWG network traffic data for the various road types and classifications. Town staff may adjust the volume threshold as development increases in rural and / or urban areas.

The scoring (i.e., ranking) aspect of the process is used to determine the relative priority of candidate locations across the Town's roads for which traffic concerns have been received. These locations are then prioritized from highest to lowest total scores. The resulting ratings of confirmed traffic concerns represent their relative ranking compared to others across the Town. Once budget is allocated for a request the requests then move to the subsequent stages of treatment selection, design, implementation, and evaluation, as detailed in the following sections.

Exhibit 4.3 Traffic Calming Site Selection – Urban Ranking Worksheet

Ranking Worksheet						
CRITERIA		**URBAN**		**RURAL**		**POINTS**
		Local	**Collector**	**Local**	**Collector**	
Speeding		Local: 1 point per km/hr over posted speed limit Collector: 1 point per km/hr over 10 km/hr over posted speed limit				
ADT	**Y (veh/day ADT overage amount)**	100	200	50	75	0-20
	Z (veh/day ADT threshold)	750	2000	500	500	
	ADT minimum threshold	1 point for every Y vehicles/day over Z vehicles/day				
Collision Rate		1 point for each 2 collisions within a 50 m radius + 2 points for each pedestrian collision				0-10
Truck Volume		1 point for each % that truck traffic volumes represent greater than 2% of the 24 hr traffic volumes				0-5
Vulnerable Road Users		5 points if there are no protected walking or cycling facilities		n/a		0-5
		5 points for each nearby pedestrian generator fronting the road		5 points for each nearby pedestrian generator fronting the road		0-10
Driveway Density (ρ) **ρ = number of driveways per 1 km**		n/a		• 0 points if ρ < 0.5 • 1 points if 0.5 ≤ ρ < 5.5 • 2 points if 5.5 ≤ ρ < 10.5 • 3 points if 10.5 ≤ ρ < 15.5 • 4 points if 15.5 ≤ ρ < 20.5 • 5 points if ρ ≥ 20.5		0-5
					Total Score	/75

4.3. Treatment Selection and Design

This step involves developing a traffic calming treatment for the locations identified with the highest priority. Based on available funding, the Town determines feasible locations for implementing traffic measures. Once a location is prioritized, the next step is to choose and design suitable traffic calming measure(s). This selection is based on the specific concern being addressed, collected data, outcomes of warrant analysis, and relevant contextual factors influencing treatment selection.

It is crucial to consider maintaining clear and unimpeded access routes for emergency service vehicles. Ensuring that the selected measures do not hinder the response time and effectiveness of emergency services is vital, and incorporating input from local emergency service providers can help in designing solutions that balance safety with efficient emergency response.

Bradford Fire and Simcoe EMS were consulted on this TMS toolbox of measures. From this, it was determined that arterial roads shall be free from obstructions, and vertical treatments may damage vehicles/equipment, cause patient discomfort, and delay response times.

Section 5 presents a diverse selection of traffic calming measures used to address warranted issues. This includes treatment purpose, applicability, anticipated effectiveness, design constraints, impacts, advantages, disadvantages, and estimated implementation costs.

4.4. Implementation and Evaluation

Once a traffic calming treatment is determined, it will be circulated to the relevant Town internal departments, Strategic Initiatives Committee, and Council. Upon approval and securing funding, Town staff will implement the treatment.

Monitoring of traffic calming measures post-implementation is essential. For example, traffic speed and volume data collection at the location of concern helps ensure that the treatments achieve the desired impacts, this should be done 12-24 months after the measure is implemented. Once the speed and volume data are collected it should go through the screening and ranking process again to help evaluate what the changes have been. Additionally, if the concern was speeding, looking at the reduction in 85th and 95th percent speed can also be an effective tool to evaluate the effectiveness of the implemented measure. This evaluation process assists in deciding whether to transition a temporary treatment into a permanent solution or opt for an alternative traffic calming measure.

Additionally, this evaluation phase informs the Town's future decisions regarding treating similar issues at other locations by identifying effective and ineffective measures. During this phase, additional supplemental measures may be considered, including educational tools, enforcement, and / or other engineering measures.

5. Traffic Calming Toolbox and Warrants

5.1. Traffic Calming Toolbox

The following pages outline multiple traffic calming measures through renderings, examples, cost of implementation, advantages / disadvantages, and temporary measure variants (where applicable). These measures can be used to decrease vehicle speeds, lower volumes, and improve road sharing comfort and safety by reducing vehicle-vehicle, vehicle-pedestrian and vehicle-cyclist conflicts. The range of measures provided in the toolbox allows Town staff to customize treatments to match the needs of the community.

A summary table of potential traffic calming measures is presented in **Exhibit 5.1**. The various measures have been grouped by ascending difficulty of implementation and cost, namely education-type measures, enforcement, and engineering solutions. The engineering solution-type measures are categorized based on the design characteristics to calm traffic, specifically vertical deflection, horizontal deflection, and obstruction measures. The summary table also provides strengths and weaknesses of each measure, as well as an indication of the types of roads that the measure is best suited for.

Scores cannot be used to determine the specific measures to be used. This is due to every measure having different strengths and weaknesses the score acquired in the ranking section cannot be used to pick specific measures. The score is calculated using many factors and using a measure that focuses on speed control when volume is the main issue that gave the roadway a high score will not be effective. The first thing that should always be done is an education measure, then enforcement, and finally engineering.

Exhibit 5.1 Traffic Calming Toolbox

Traffic Calming Toolbox

Level of Impact: ○ Low/None ◉ Medium ● High

	Measures	Potential Advantages			Potential Disadvantages			Road Classification				
										Rural		
		Speed Reduction	Volume Reduction	Conflict Reduction	Emergency Response	Active Transportation	Maintenance	Local	Collector	Hot Mix Asphalt	Surface Treatment	Gravel
	Education											
Positive	Flexible Bollards	◉	○	◉	○	◉	●	✓	✓	×	×	×
Positive	Pavement Markings[2]	●	○	○	○	○	◉	✓	✓	✓	✓	×
Positive	Radar Message Board	◉	○	○	○	○	◉	✓	✓	✓	✓	✓
Regulation	C.S.Z.	●	◉	◉	○	○	○	✓	✓	✓	×	×
Regulation	40 km/hr Speed Limit Area	●	○	◉	○	○	○	✓	✓	✓	×	×
	Enforcement											
	Automatic Speed Enforcement (ASE)	●	◉	○	○	○	●	✓	✓	✓	✓	✓
	Engineering – Horizontal Measures											
Engineering	Chicane	●	●	●	◉	◉	◉	✓	✓	✓*	×	×
Engineering	Curb Extension	◉	○	○	○	◉	◉	✓	✓	✓*	×	×
Engineering	Curb Radius Reduction	◉	○	○	○	◉	◉	✓	✓	✓*	×	×
Engineering	On-Street Parking	◉	○	○	◉	◉	◉	✓	✓	✓*	×	×
Engineering	Raised Median Island	◉	○	◉	○	○	◉	✓	✓	✓	✓	×
Engineering	Traffic Circle	●	◉	●	◉	◉	◉	✓	✓	✓	✓	×
	Engineering – Vertical Measures											
Engineering	Raised Intersection	●	○	◉	◉	◉	◉	✓	✓	✓*	×	×
Engineering	Speed Cushion	●	◉	●	◉	◉	◉	✓	✓	✓*	×	×
Engineering	Speed Hump	●	◉	●	●	◉	◉	✓	✓	✓*	×	×
	Engineering – Obstruction Measures											
Engineering	Directional Closure	●	●	◉	◉	◉	◉	✓	✓	✓*	✓*	✓*
Engineering	Diverter	○	●	◉	◉	◉	◉	✓	✓	✓*	✓*	✓*
Engineering	Full Closure	○	●	●	●	◉	◉	✓	✓	✓*	✓*	✓*

[1] Effectiveness of regulatory measures are dependent on enforcement

[2] Various pavement markings have different levels of impacts for "Speed Reduction", the upper ranges of speed reduction effectiveness was cited

✓* Only acceptable if the speed limit is less than or equal to 50 km/hr

Flexible Bollards

A flexible bollard is a rubber post placed in the centre of a road in order to make drivers uncomfortable travelling at high speeds due to less space on the road.

Applicability:

- **Road Classification: Urban and Rural:** Local and Collector.
- **Traffic Conditions:** All traffic volumes.
- **Avoid:** Close proximity to stop signs.

Design Constraints

- **Posted Speed Limit:** Not greater than 40 km/hr.
- **Travel Lane Cross Section:** Not more than one lane per direction.
- **Road Material:** Must not be gravel / loose surface.

Impacts

- **Environmental:** Traffic noise may be reduced due to lower speeds.
- **Safety:** Decrease speeds may result in decrease in accidents and severity of accidents.

ADVANTAGES

- **Speed Reduction:** Reductions between 2 and 5 km/hr.
- **Safety:** Minimal to no damage to vehicles if bollard is struck.
- May be used to create temporary curb extensions and / or chicanes.

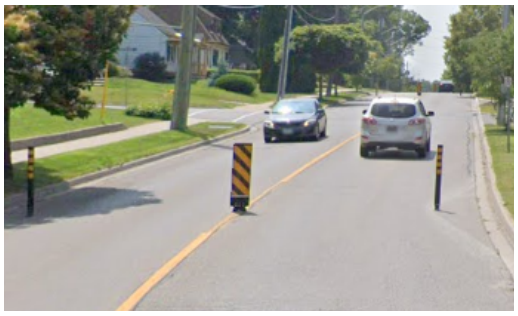
DISADVANTAGES

- **Maintenance:** May need to install for spring and uninstall for winter.
- If not removed for winter, may be damaged by snowplow.
- May cause small delays due to busses slowing down at flexible bollards.

Example of a flexible bollard with delineators

Example of a flexible bollard with delineators

Signage



Case Study

Newmarket

Primary Purpose

- Speed Reduction

Cost Estimate

- < $2,000

Pavement Markings

Pavement markings can be used to draw attention to a specific area or information. They can also be used to create the illusion that the driver's speed is increasing.

Applicability:

- **Road Classification:** Varies per pavement marking, most can be used on all urban and rural roads.
- **Traffic Conditions:** All traffic volumes.
- **Road Material:** Must not be gravel / loose surface.

Impacts:

- **Environmental:** No increase in noise.
- **Maintenance:** No impact to snow removal and street sweeping.

Types of Pavement Markings:

- Centreline and edgeline pavement markings.
- Converging Chevrons.
- Dragon's Teeth.
- Full-Lane Transverse Bars.
- On-Road "Sign".
- Peripheral Transverse Bars.
- Optical Illusion Pavement Markings (should be used with caution).

Primary Purpose:

- Speed Reduction.

Cost Estimate:

- $1,000–$5,000 per km, depending on amount of markings.

ADVANTAGES

- **Speed Reduction:** Reductions in 85th percentile speed between 5 and 15 km/hr (depending on type of pavement marking used).
- **Emergency Response:** No impact to emergency vehicles.
- **Implementation:** Can be implemented quickly.

DISADVANTAGES

- **Maintenance:** Requires regular maintenance.
- **Seasonal:** Less effective in winter months due to snow / ice cover.
- **Visibility:** Not as visible as other forms of traffic calming from upstream.

Example of full-lane transverse bars

Example of converging chevron

Example of on-road "sign"

Example of dragon's teeth

Radar Message Board

Radar message boards can be used to alert drivers if they are speeding by displaying a message.

Applicability:

- **Road Classification:** All urban and rural road types.
- **Traffic conditions:** All traffic volumes.

Impacts:

- **Environmental:** No increase in noise.
- **Maintenance:** No impact to snow removal and street sweeping.

ADVANTAGES

- **Speed Reduction:** Speed reduction between 3 and 6 km/hr.
- **Emergency Response:** No impact to emergency vehicles.
- **Implementation:** Can be implemented without disruption to road network.

DISADVANTAGES

- **Usage:** When there are multiple vehicles traveling at different speeds may be difficult to make use of the radar speed sign.
- **Driver Response:** Impact may be reduced over time.
- **Maintenance:** Requires direct sunlight for solar panel.

Example of radar speed sign

Example of radar speed sign

Case Study

Newmarket & Hamilton

Primary Purpose:

- Speed Reduction

Cost Estimate:

- $3,000 - $8,000

Community Safety Zone (CSZ)

A CSZ is a marked and designated portion of a road, where the community and municipality have determined that road safety is a concern.

Recognized under the Provincial Highway Traffic Act (HTA):

- Recognition from the HTA allows fines for speeding, distracted driving, and similar offences to double within these zones.
- HTA states that CSZ are eligible for Automated Speed Enforcement (ASE).
- Seniors centres and residents.
- High pedestrian traffic locations.

Factors to consider

- CSZ designation can be extended up to 150 m beyond the boundary of the frontage of the facilities.
- CSZ designations only take effect when municipal by-laws are in place and related signs are posted.

Automated Speed Enforcement

- ASE is an automated system which uses a camera and a speed measurement device to enforce the posted speed limit.
- Images captured by AE are stored and reviewed by a provincial offences officer.

Possible Locations for CSZ

- Elementary or secondary schools.
- Universities or colleges.
- Licensed childcare facilities.
- Seniors home.
- City parks.
- Community centres and churches.

Primary Purpose

- Volume Reduction.
- Speed Reduction.

Cost Estimate

- $75–$200 per sign.

Example of C.S.Z. signage

Example of C.S.Z. signage in Point Edward

Signage

40 km/hr Speed Limit Area (SLA)

A 40 km/hr SLA is a policy tool aimed at lowering speed limits across a neighbourhood or specific areas of a road network.

Provincial Highway Traffic Act (HTA)

- Amendments to the Ontario HTA now allow municipalities to designate these areas by passing a by law.
- If the speed limit area is within a CSZ and / or School Zone, the speed limit is eligible to be enforced through ASE.

Factors to consider

- Signage is only needed at entry and exit points of these areas, minimizing the number of signs needed overall.
- Community petitions are not required.
- Applicable to local and collector roads.
- SLA's can be a cost-effective way of introducing an area-wide speed limit reduction if multiple entrances to the same neighbourhood warrant a 40 km/hr speed limit.

Possible Locations for 40 km/hr SLA

- Elementary or secondary schools.
- Universities or collages.
- Licensed childcare facilities.
- City parks.
- Community centres and churches.
- Seniors' centres and residences.
- High pedestrian traffic locations.
- Locations with on-street active transportation infrastructure.

Primary Purpose

- Volume Reduction.
- Speed Reduction.

Cost Estimate

- $75–$200 per sign

Example of Area Speed Limit Sign

Example of Area Speed Limit Sign

Signage

Automated Speed Enforcement

ASE is an automated system that uses a camera and a speed measurement device to detect and photograph vehicles travelling more than the posted speed limit. Tickets are then mailed to the address corresponding to the vehicle's licence plate.

Applicability:

- **Road Classification:** All urban and rural road types.
- **Traffic conditions:** All traffic volumes.
- **Location:** Must be in a community safety zone / school zone.

Impacts

- **Environmental:** No increase in noise.
- **Maintenance:** No impact to snow removal and street sweeping.

ADVANTAGES

- **Extended compliance:** once drivers are aware of an ASE location, tendency to maintain a slower speed remains after ASE removal.
- **Emergency Response:** No impact to emergency vehicles.
- **Implementation:** Can be implemented without disruption to road network.

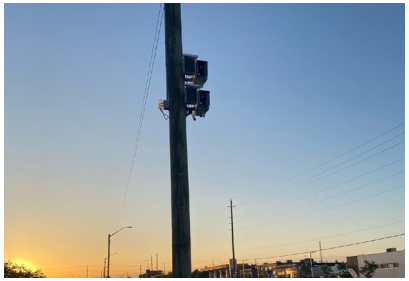
DISADVANTAGES

- **Driver Response:** Impact may result in driving excessively below the posted speed limit to avoid tickets.
- **Driver Response:** Drivers can start taking alternate routes to avoid the cameras.

Automated Speed Enforcement coming soon to Bradford West Gwillimbury

Signage

Case Study



Newmarket & BWG & Barrie

Primary Purpose:

- Speed Reduction

Chicane

A chicane is a series of curb extensions on alternate sides of a road which narrow the road and require drivers to steer in an S-shape, therefore reducing the vehicles speed and through traffic.

Applicability

- **Road Classification:**
  Urban: Local (one-way and two-way) and collector (two-way).
- **Traffic Conditions:**
  Posted speed limit ≤ 50 km/hr.
  Minimum 750 veh/day or 100 veh/hr peak hour.
- **Avoid:** Driveways if possible.

Design Constraints

- **Grade:** ≤ 8%.
- **Traffic Volumes:** Traffic volumes should be similar in both directions (for two-ways) for greatest effectiveness.
- **Drainage:** Chicanes may need to be offset from curbs to maintain proper drainage.

Impacts

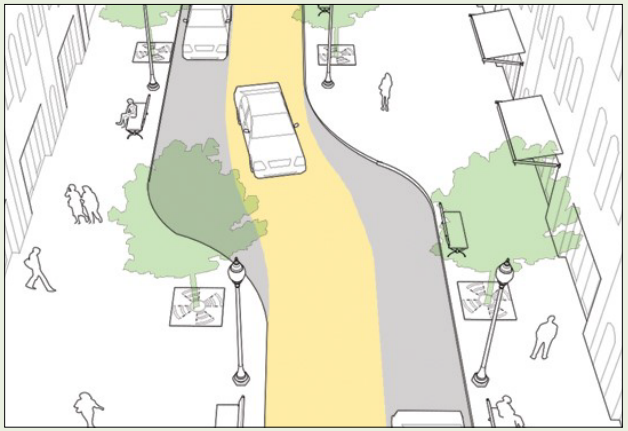
- **Environmental:** Traffic Noise may be reduced due to lower speeds.
- **Safety:** Collision reduction up to 40%.

ADVANTAGES

- **Speed Reduction:** Reductions between 6 and 11 km/hr.
- **Volume Reduction:** Reductions up to 47%.

DISADVANTAGES

- **Parking:** Loss of on-street parking, no parking in and within 5 m of chicane.
- **Maintenance:** Parked vehicles may obstruct maintenance such as street sweeping and snow removal.
- May cause small delays due to slower vehicle speeds.



N.A.C.T.O. rendering of chicane

Example of chicane

Signage

Needed for two-way one lane chicane

Case Study

Toronto

Primary Purpose

- Speed Reduction

Cost Estimate

- $15,000–$50,000

Temporary Measure

Curb Extension

A curb extension is a horizontal intrusiton into the road resulting in a narrow section. The narrowed road causes a driver to feel confined, resulting in lower speeds.

Applicability

- **Road Classification:** Urban and Rural: Local and Collector.
- **Traffic Conditions:** All traffic volumes.
- **Avoid:** Small turning radius curves.

Design Constraints

- **Drainage System:** Drainage system adjustments may be necessary in location of extension.
- **At intersection:**
  - **Approach Lane:** ≥ 2.5 m.
  - **Departure Lane:** ≥ 3 m.
  - **Length:** 5-7 m.
- **Mid-Block Extension:**
  - **Lane:** ≥ 2.75 m.
  - **Length:** ≥ 7 m.
  - **Extension:** ≥ 2 m.
- **Road Material:** Must not be gravel / loose surface.

Impacts

- **Environmental:** Can improve street appearance.
- **Safety:** Cyclists and vehicles are pushed closer together.

ADVANTAGES

- **Speed Reduction:** Reductions between 2 and 8 km/hr.
- **Conflict Reduction:** Reduces pedestrian crossing distance.

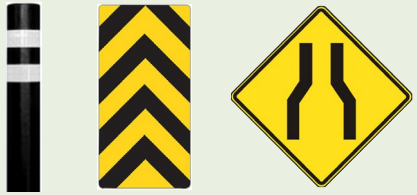
DISADVANTAGES

- May interfere with bike lanes.
- **Large Vehicles:** Large vehicles may need to cross into oncoming lanes.

N.A.C.T.O. rendering of curb extension

Example of curb extension

Signage



Case Study

Toronto

Primary Purpose

- Speed Reduction

Cost Estimate

- $50,000–$100,000+

Temporary Measure

Curb Radius Reduction

A curb radius reduction is an intersection corner with a reduced radius, which slows down right-turning vehicles. This reduces crossing distances for pedestrians and improves visibility of pedestrians

Applicability:

- **Road Classification:** Urban: Local and Collector.
- **Traffic Conditions:** Use with caution when > 10,000 veh/day.
- **Avoid:** Truck, transit, and emergency vehicle routes.

Design Constraints

- **Radius:** Typically 3 - 5 m.
- Implications of chosen radius on larger vehicles must be checked.
- Curb extensions may be used as a complimentary traffic calming measure.

Impacts

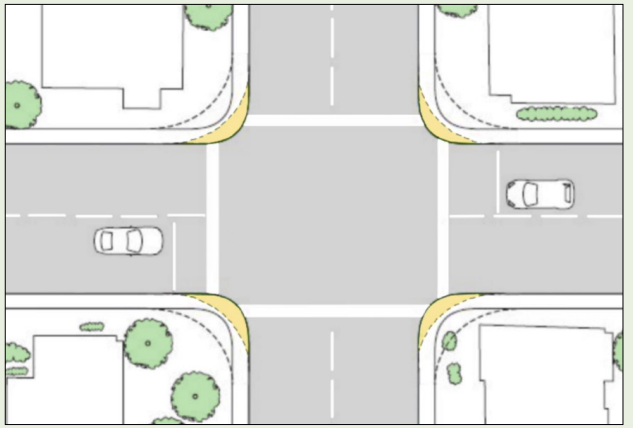
- **Aesthetics:** Increase of space allows for more room to enhance streetscape.
- **Safety:** Reduced pedestrian crossing and improved visibility of pedestrians.

ADVANTAGES

- **Speed Reduction:** Reduction in right-turning vehicles and reduction in turning speed.
- **Conflict reduction:** Reduced pedestrian crossing distance and improved visibility for vulnerable users.

DISADVANTAGES

- **Large Vehicles:** May need to cross into adjacent lanes in order to make turns.
- **Maintenance:** Extra maintenance may be needed due to vehicles mounting the curb.
- Larger transit vehicles may find right turns more challenging.



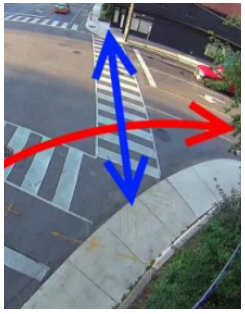
City of Toronto rendering of curb radius reduction

Example of curb radius reduction

Signage

Only in combination with curb extension

Case Study



Davenport Road & Christie Street, Toronto.

Reduced conflict rates and the speed of turning vehicles involved in conflicts[1]

Primary Purpose

- Speed Reduction

Cost Estimate

- $50,000–$100,000+

1. Impact of Curb Radius Reduction on Pedestrian Safety: A Before-After Surrogate Safety Study in Toronto by Brisk Synergies Tech Corp

On-Street Parking

On-street parking allows vehicles to park parallel to curb, effectively reducing the width of the road. This reduces vehicle speed and through traffic.

Applicability:

- **Road Classification: Urban and Rural:** Local and Collector.
- **Traffic Conditions:** All traffic volumes.
- **Avoid:**
  - Areas with limit sight distance.
  - Driveways.
  - Bus zones.
  - Designated school zones.

Design Constraints

- N/A

Impacts

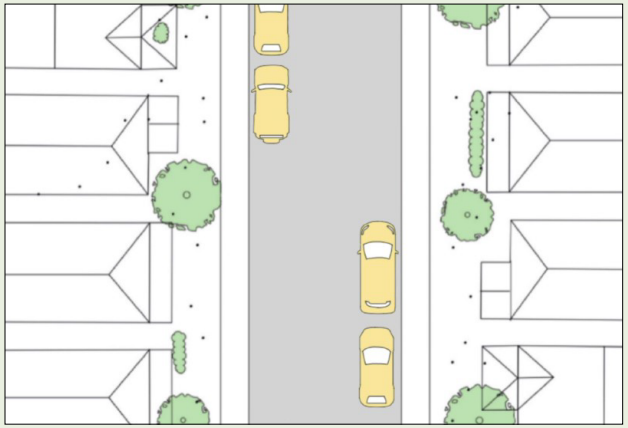
- **Environmental:** Traffic noise may be reduced due to lower speeds.
- **Safety:** May increase rear-end or sideswipe collisions.

ADVANTAGES

- **Conflict Resolution:** Creates buffer between pedestrians on sidewalks and traffic.

DISADVANTAGES

- **Conflict:** Requires a minimum width in order for cyclists to safely pass around opened car doors.
- **Maintenance:** Parked vehicles may obstruct maintenance, such as sweeping and snow removal.



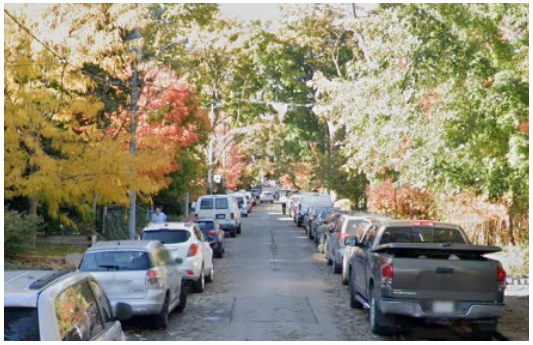
City of Toronto rendering of on-street parking

Example of on-street parking

Signage

If curb extensions are used to define a parking area, signage for curb extensions should be used.

Used in areas with minimum pavement width.



Case Study

Toronto

Primary Purpose

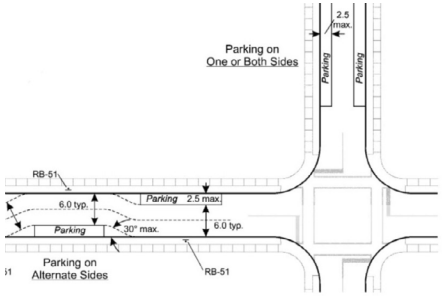
- Speed Reduction

Cost Estimate

- $1,000–$5,000

Temporary Measures

- Temporary signage may be used to allow parking.
- A temporary cover on prohibited parking signs may be used to indicate that parking is available.



Raised Median Island

A raised median island is a raised median in the centreline of a two-way road. This reduces the travel lane width, causing a reduction in vehicle speeds.

Applicability:

- **Road Classification: Urban and Rural:** Local and Collector.
- **Traffic Conditions:** All traffic volumes.

Design Constraints

- **Length:** ≥ 5-7 m.
- **Lane width:** ≤ 3.5 m.
- **Median width:** ≥ 1.5 m.
- Works best on roads with two-way traffic.
- Effectiveness can be increased if used in combination with curb extensions.
- **Road Material:** Must not be gravel / loose surface.

Impacts

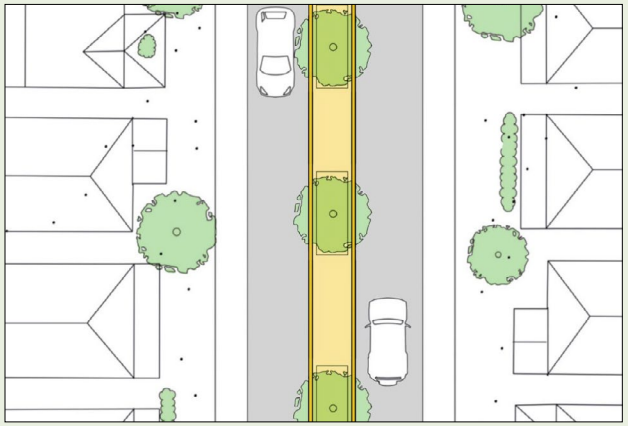
- **Environmental:** Aesthetic benefits if well kept.
- **Safety:** Decrease vehicle-pedestrian conflict by acting as a refuge.

ADVANTAGES

- **Speed Reduction:** Reductions between 3 and 8 km/hr.

DISADVANTAGES

- **Local Access:** May block driveways from one direction.
- **Active Transportation:** Cyclist may feel uncomfortable due to lack of space.



City of Toronto rendering of raised median island

Example of raised median island

Signage

Case Study

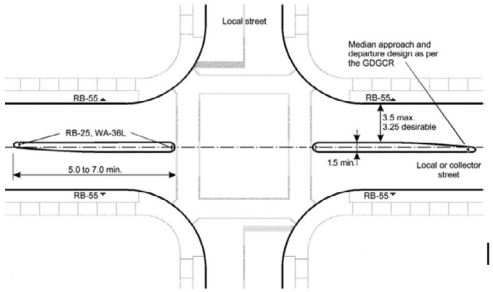
Thornhill & Toronto

Primary Purpose

- Speed Reduction

Cost Estimate

- $15,000–$50,000



Traffic Circle

A traffic circle is an island located in the centre of an intersection which causes drivers to travel through the intersection in a counter-clockwise direction. The traffic circle can also have landscaping in it that blocks vision to the other side of the intersection, promoting slower approach speeds.

Applicability:

- **Road Classification: Urban and Rural:** Local and Collector.
- **Traffic Conditions:** Posted speed limit ≤ 50 km/hr.
- < 1500 veh/day.
- **Avoid:** Intersections with high pedestrian traffic.

Design Constraints

- **Dimensions:** Dependent on road width.
- **Raised Island:** Locate at least 25 m in advance.
- **Traversable Island:** Height ≤ 125 mm.
- **Slope:** 5-6%.
- **Road Material:** Must not be gravel / loose surface.

Impacts

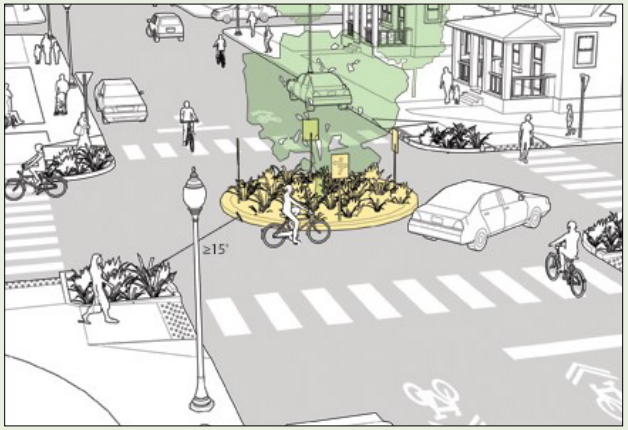
- **Environmental:** Traffic noise may be reduced due to lower speeds.
- **Safety:** Collision rate reduction of approximately 30%.
- Potentially increase pedestrian-vehicle conflict by forcing vehicles into cross-walk area.

ADVANTAGES

- **Speed Reduction:** Reductions in 85th percentile speed up to 14 km/hr.
- **Volume Reduction:** Reduction up to 20%.

DISADVANTAGES

- **Emergency Response:** Response times delayed between 1 and 10 seconds.
- **Large Vehicles:** Restricts movement due to less intersection space.
- May cause small delays due to busses slowing down to navigate the traffic circle.



N.A.C.T.O rendering of traffic circle

Example of traffic circle

Signage

Case Study

Ancaster & Toronto

Primary Purpose

- Speed Reduction

Cost Estimate

- $15,000–$50,000

Temporary Measure

Raised Intersection

A raised intersection elevates the roadway to encourage drivers to slow down, enhancing safety for pedestrians and cyclists by better defining crosswalk areas.

Applicability

- **Road Classification:** Urban and Rural: Local and Collector.
- **Traffic Conditions:** Posted speed limit ≤ 50 km/hr.
- **Avoid:** Emergency access routes.

Design Constraints

- **Height:** Equal to adjacent sidewalks.
- **Slope of Ramp:** ≤ 6%.
- **Slope:** ≥ 1% in all drainage areas.
- Speed hump signs are not required on Stop sign approaches.
- **Road Material:** Must not be on gravel / loose surface.

Impacts

- **Environmental:** Traffic noise may be reduced due to lower speeds.
- **Safety:** Lower speeds and an increase in yielding from drivers provides safety for pedestrians.

Rural

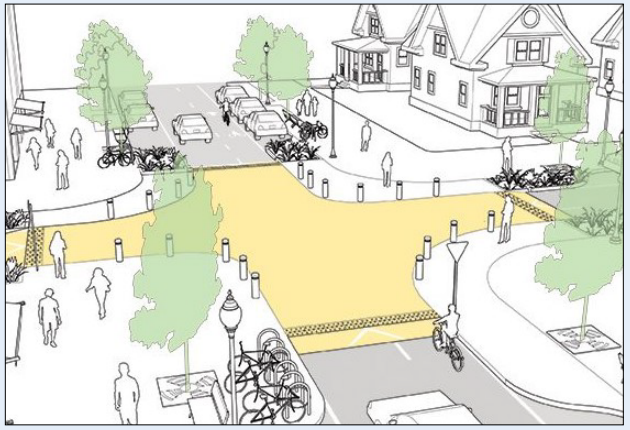
- Can be used in rural towns where speed limits are ≤ 50 km/hr (e.g. Bond Head).

ADVANTAGES

- **Speed Reduction:** Reductions in 85th percentile speed up to 10 km/hr.
- **Conflict Reduction:** Rise from 18% to 54% of drivers yielding to pedestrians.
- Sidewalk to curb accessibly improvement

DISADVANTAGES

- **Emergency Response:** Slows emergency vehicles to approximately 25 km/hr.
- **Maintenance:** Snow plowing / removal negatively effected due to need for careful maneuvering.
- May cause small delays due to slower vehicle speeds at the intersection.



N.A.C.T.O. rendering of raised intersection

Example of raised intersection

Signage

Case Study

Newmarket

Primary Purpose

- Speed Reduction

Cost Estimate

- Cost Varies

Speed Cushion

Speed cushions are traffic calming devices designed to reduce passenger vehicle speeds in residential areas, while larger vehicles can “straddle” the cushions and pass with lower difficulty.

Applicability

- **Road Classification:** Urban and Rural: Local and Collector.
- **Traffic Conditions:** Posted speed limit ≤ 50 km/hr.
- **Avoid:** Small turning radius curves and areas with limited sight distance.

Design Constraints

- **Grade:** ≤8%.
- **Traffic Signals:** Locate at least 40 m in advance.
- **Spacing: Between Sets:** 60 m to 250 mm. **Between Cushion and Curb:** 0.6 m. **Between Cushions:** ≥ 1.5 m.
- **Width:** 1.8 m.
- **Road Material:** Must not be gravel / loose surface.

Impacts

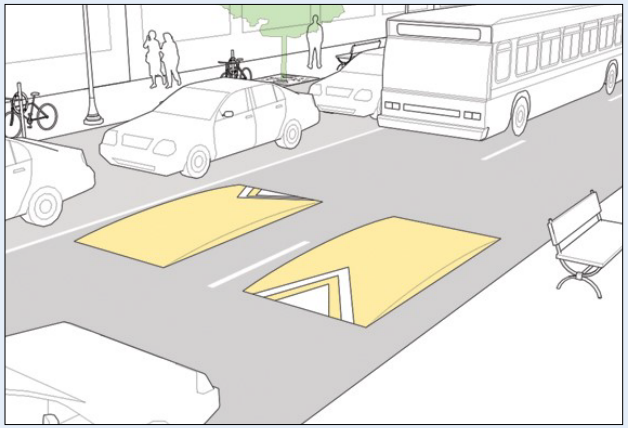
- **Environmental:** Traffic noise may be reduced due to lower speeds.
- **Safety:** Does not disrupt emergency vehicle response times.

ADVANTAGES

- **Speed Reduction:** Reductions in 85th percentile speed up to 8 km/hr.
- **Volume Reduction:** Reductions of approximately 30%.

DISADVANTAGES

- **Construction:** Difficult to construct speed cushion due to precision work required.
- **Maintenance:** Snow plowing / removal negatively effected due to need for careful maneuvering.
- Minimal transit impacts.



N.A.C.T.O. rendering of speed cushions

Example of speed cushion

Signage

Installed facing traffic immediately adjacent to speed cushion

Case Study

Mississauga

Primary Purpose

- Speed Reduction

Cost Estimate

- $4,000–$6,000

Temporary Measure

Speed Humps

Speed humps, similar to speed cushions, are road features designed to slow down vehicles by creating a raised section of pavement across the roadway.

Applicability

- **Road Classification:** Urban and Rural: Local and Collector.
- **Traffic Conditions:** Posted speed limit ≤ 50 km/hr.
- **Avoid:** Small turning radius curves.

Design Constraints

- **Grade:** ≤ 8%.
- **Bus Stop:** Locate at least 25 m in advance.
- **Traffic Signals:** Locate at least 40 m in advance.
- **Spacing:** 80 m to 150 m is recommended.
- **Height:** 80 mm.
- **Road Material:** Must not be gravel / loose surface.

Impacts

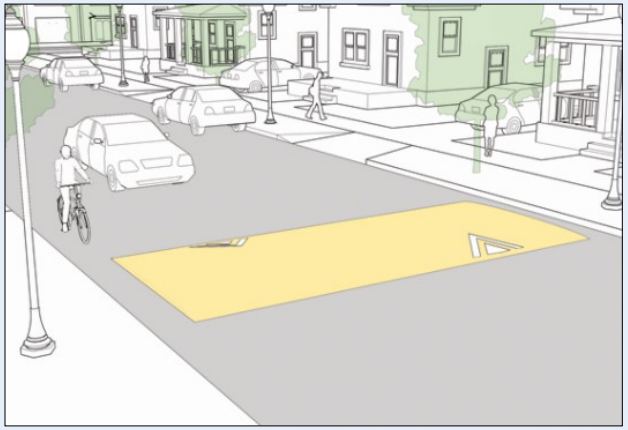
- **Environmental:** Traffic noise may be reduced due to lower speeds.
- **Safety:** Decrease the number of injury accidents by up to 40%.

ADVANTAGES

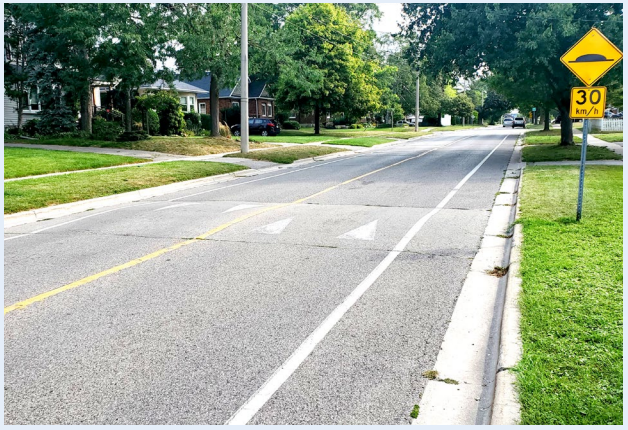
- **Speed Reduction:** Reductions in 85th percentile speed between 6 and 13 km/hr.
- **Volume Reduction:** Reductions between 15% and 27%.

DISADVANTAGES

- **Emergency Response:** Response times delayed between 2.3 and 15 seconds.
- **Maintenance:** Snow plowing / removal negatively effected due to need for careful maneuvering.
- May cause small delays due to slowing down for speed humps.



N.A.C.T.O. rendering of speed hump

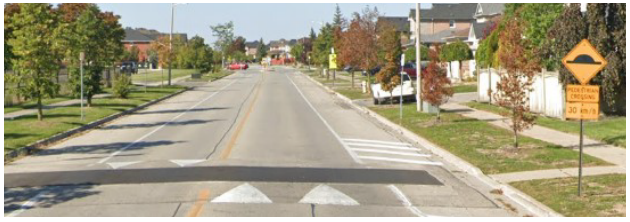


Example of speed hump

Signage

Installed facing traffic immediately adjacent to speed hump

Case Study



Markham & Vaughan

Primary Purpose

- Speed Reduction

Cost Estimate

- $4,000–$6,000

Directional Closure

A directional closure is a curb extension or barrier which extends to the centreline of the road in order to prohibit traffic in one direction of travel.

Applicability:

- **Road Classification: Urban and Rural:** Local and Collector.
- **Traffic Conditions:**
  - **Local roads:** <1500 veh/day.
  - **Collector Roads:** 1500-5000 veh/day.

Design Constraints

- **Drainage:** Drainage system adjustments may be required.
- **Spacing between closure and curb:** 1.5 - 2 m.
- **Exceptions:** Exceptions can be made for bicycles, requires signage.

Impacts

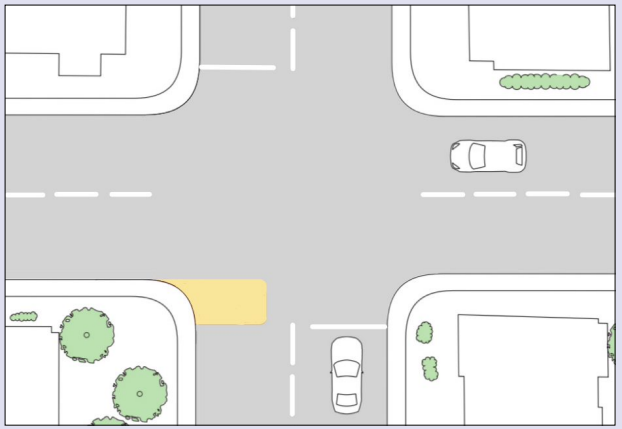
- **Environmental:** Traffic noise may be reduced due to lower traffic volume.
- **Safety:** Decrease of pedestrian-vehicle conflict due to reduced crossing distance.

ADVANTAGES

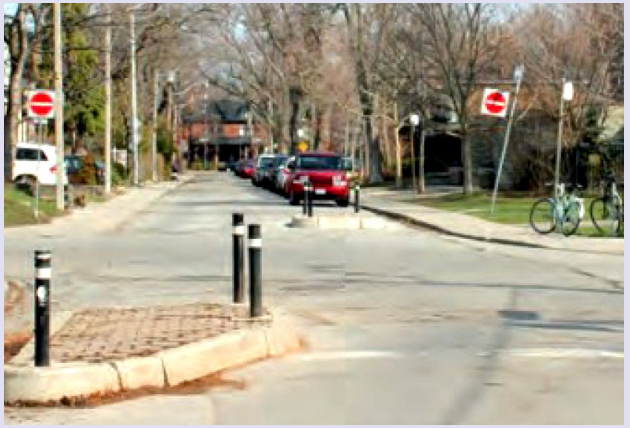
- **Speed Reduction:** Reductions in 85th percentile speed up to 11 km/hr.
- **Volume Reduction:** Reductions up to 60% or 100% in one direction.

DISADVANTAGES

- **Local Access:** Restricts access to local residents.
- **Traffic:** Traffic may be diverted to other streets without closure.
- **Services:** May affect garbage collection and transit routes.



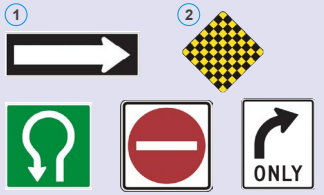
Rendering demonstrating directional closure

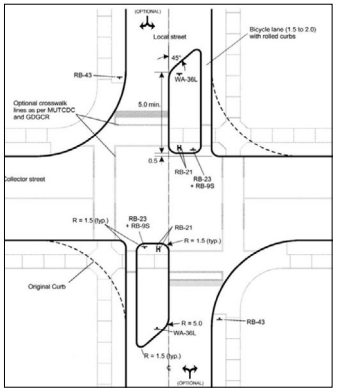


Example of a directional closure sign

Signage

1. Exit-only closure
2. Entrance-only closure





Case Study

Entrance Only Design

Primary Purpose

- Volume Reduction

Cost Estimate

- $15,000–$50,000

Temporary Measures

Diverter

A diverter is a barrier which covers the entire width of an intersection and limits the turning movements that can be made by vehicles traveling along the road.

Applicability:

- **Road Classification:** Urban and Rural: Local and Collector.
- **Traffic Conditions:**
  - ≤ 5000 veh/day.
  - Use with caution ≥ 1500 veh/day.

Design Constraints

- **Diversion Alignment:** Must have sufficient space and radius for all vehicle turning paths.
- **Parking:** Should not be permitted within diversion.
- **Bike Access:** Openings of 1.5-2 m width.
- **Road Material:** Must not be on gravel / loose surface.

Impacts

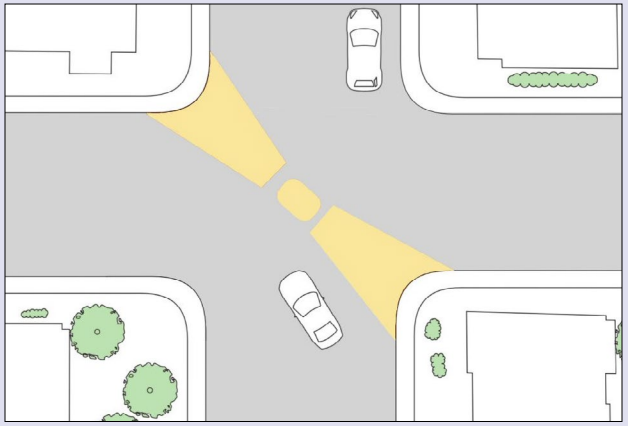
- **Environmental:** Traffic noise may be reduced due to lower traffic volume.
- **Safety:** Motorists may not foresee cyclists who enter intersection through the barrier.

ADVANTAGES

- **Speed Reduction:** No significant effect.
- **Volume Reduction:** Area wide reductions between 20% and 70%.
- Conflicts Reduces conflict points.
- **Local Access:** Restricts access to local residents.
- **Services:** May affect garbage collection and transit routes.
- **Environmental Impacts:** Potentially increases trip times for vehicles.

DISADVANTAGES

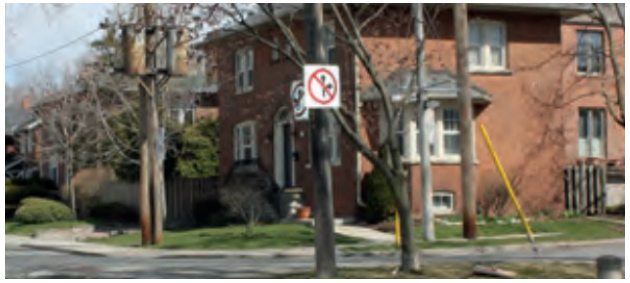
- **Emergency Response:** May restrict emergency access unless designed to be passable.



Rendering demonstrating diverter

Example of a diverter

Signage



Case Study

Toronto

Primary Purpose

- Volume Reduction

Cost Estimate

- $50,000–$100,000+

Temporary Measures

Full Closure

A full closure is a barrier which covers the entire width of he road blocking vehicles from traveling along the road.

Applicability:

- **Road Classification:** Urban and Rural: Local and Collector.
- **Traffic Conditions:** All traffic volumes.
- **Avoid:** Designated emergency routes.

Design Constraints

- **Cul-de-sac:** Must be provided at end of road.
- **Obstructions:** Trees and bollards should be placed to discourage off-road travel.
- **Bike Access:** Openings of 1.5-2 m width.

Impacts

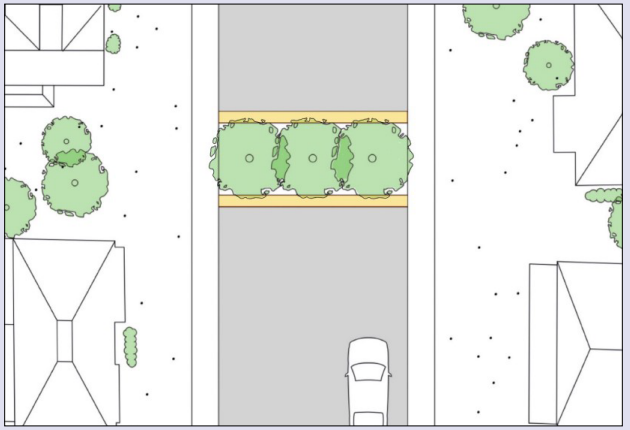
- **Environmental:** Traffic noise may be reduced due to low traffic volume.
- **Safety:** Motorists may not foresee cyclists who enter intersection through barrier.

ADVANTAGES

- **Speed Reduction:** No significant effect.
- **Volume Reduction:** Eliminates all shortcutting or through traffic.
- **Conflicts:** Reduces conflict points.
- **Local Access:** Restricts access to local residents.
- **Parking:** May require parking prohibition near closure.
- **Environmental Impact:** Potentially increase trip times for vehicles.
- **Services:** May affect garbage collection and transit routes.

DISADVANTAGES

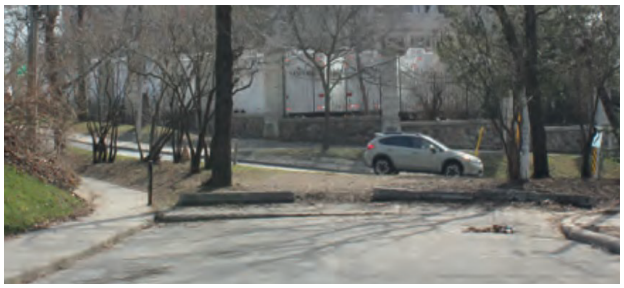
- **Emergency Response:** May restrict emergency access unless designed to be passable.



Rendering demonstrating full closure

Example of road full closure

Signage



Case Study

Toronto

Primary Purpose

- Volume Reduction

Cost Estimate

- $50,000–$100,000+

Temporary Measures

5.2. Specific Warrants - Using the Right Tools for the Job

This section explains the warrants to assist Town staff in determining where it is appropriate to implement certain traffic control and traffic calming devices. The methodology to deploy specific traffic control devices such as mid-block pedestrian crossings, intersection pedestrian signals, and all-way stop controlled intersections is detailed here. Traffic calming worksheets to determine where to appropriately place in-road flexible bollards, curbside parking, and to guide land developers in building communities that safely accommodate all road users are outlined in 5.2.5, 5.2.4, and 5.3 respectively.

5.2.1. Mid-Block and Intersection Pedestrian Crossover Warrant

Pedestrian crossover (PXO) treatments are generally installed midblock, and come in four types (Type A, B, C, and D), with the type guided by traffic volume levels, speed limit, and number of lanes to cross. The warrant shown in **Exhibit 5.2** is based on the contents of "Ontario Traffic Manual (OTM) Book 15 – Pedestrian Crossing Treatments (published June 2016)", specifically the Decision Support Tool (OTM Book 15 Figure 2), for a preliminary assessment. These PXOs, depending on the type, utilize a combination of regulatory and warning signs, flashing beacons, and pavement markings.

Exhibit 5.2 Mid-Block and Intersection Pedestrian Crossing Warrant

Mid-Block and Intersection Pedestrian Crossing (PXO) Warrant			
CRITERIA #	**CRITERIA**	**REQUIREMENT**	**YES/NO**
1	**Pedestrian Network**	Is there a pedestrian desire line or system connectivity requirement here?	
2	**8 or 4 Hour Volumes**	Pedestrian volume* (8 hour total) is or greater than 100?	
		AND	
		Vehicular volume (8 hour total) is or greater than 750?	
		OR	
		Pedestrian volume* (4 hour total) is or greater than 65?	
		AND	
		Vehicular volume (4 hour total) is or greater than 395?	
3	**Proximity From Another Traffic Control Device**	Is the site >200 m from another traffic control device?	
4	**Sight Distance**	Adequate sight distance for motorists and pedestrians? (i.e., motorist stopping sight distance)	
5	**Vulnerable Road Users**	Is the concern near a school or in a community safety zone?	
6	**Posted Speed Limit**	Speed limit is 60 km/hr or lower?	
7	**Vehicular Lanes**	At most 4 lanes of two-way traffic, or 3 lanes of one-way traffic?	
8	**Traffic Volume**	AADT less than 35,000 vehicles?	
		CRITERIA #1-5 ALL ANSWERED YES? If All Yes, Proceed to OTM Book 15 Table 7 (Pedestrian Crossover Selection Matrix) If criteria 6, 7, or 8 answered "No", implement a mid-block pedestrian traffic signal	

* Pedestrian volume is the summation of unassisted pedestrians and assisted pedestrians, per OTM Book 12 and 15
Adjusted pedestrian volume = unassisted volume + 2x assisted volume
Unassisted: Adults and adolescents aged 12 or older
Assisted: Children under 12, senior citizens, pedestrians with accessibility needs

Based on OTM Book 15 (June 2016)

Additionally, it is noted that BWG has some existing pedestrian paths that cross the road without proper facilities. Examples of common omissions include lack of full crosswalk pavement markings from curb to curb, and missing signage / beacons. It is strongly recommended that in any place where a pedestrian path leads toward a road crossing, OTM Book 15 Table 7 should be referenced to determine what type of pedestrian crossing features are required for an adequate retrofit. Current crossings installed on curves should be prioritized for review due to potential road user visibility concerns.

If a PXO is deemed to be warranted, then the selection of the PXO type should be further guided by the OTM Book 15 Table 7 selection matrix.

5.2.2. Intersection Pedestrian Signal (IPS) Warrant

Intersection pedestrian signals (IPS) are generally considered when minimum pedestrian volume and pedestrian delay thresholds are met based on OTM Book 12 (Traffic Signals, March 2012) criteria. An IPS system, sometimes referred to as “half signals”, is generally installed at an existing stop-controlled intersection and is different from a typical traffic signal-controlled intersection. In these instances, the signal only controls one leg of the intersection (to aid pedestrians crossing), whereas the other leg (e.g., side street approach) remains controlled by a stop sign. **Exhibit 5.3** shows the warrant criteria that should be met when an IPS is being considered within BWG.

Exhibit 5.3 Intersection Pedestrian Signal IPS Warrant

Intersection Pedestrian Signal (IPS) Warrant			
CRITERIA #	**CRITERIA**	**REQUIREMENT**	**COMPLIANCE (%)**
1	**OTM Book 12 Justification 1:** Minimum Vehicular Volume (Table 12)	**Rural: Minimum volume met?**	
		A*. Vehicle Volume. All approaches for each of the heaviest 8 hours of an average day is 480 vehicles/hour?	Less than 80%
		B*.** Vehicle Volume, along minor streets for each of the same 8 hours is 120 vehicles/hour?	Less than 80%
		Urban: Minimum volume met?	
		A*. Vehicle Volume. All approaches for each of the heaviest 8 hours of an average day is 480 vehicles/hour?	Less than 80%
		B*.** Vehicle Volume, along minor streets for each of the same 8 hours is 170 vehicles/hour?	Less than 80%
		AND	
2	**OTM Book 12 Justification 2:** Delay to Cross Traffic (Table 13)	**Rural: Minimum volume met?**	
		B*. Combined vehicle and pedestrian volume crossing the major street for each of the same 8 hours is 50 units/hour?	Less than 80%
		Urban: Minimum volume met?	
		B*. Combined vehicle and pedestrian volume crossing the major street for each of the same 8 hours is 75 units/hour?	Less than 80%
		AND	
3	**OTM Book 12 Justification 6:** Pedestrian Volume & Delay (Tables 16-19)	**A.** Plotted point for 8 hr pedestrian volumes vs 8 hr vehicular volumes in justified zone?	Y/N
		B. Plotted point for 8 hr pedestrian volumes experiencing delays vs 8 hr vehicular volume in justified zone?	Y/N
		CRITERIA #1-3 ALL ANSWERED YES?	

Factored pedestrian volume = unassisted volume + 2x assisted volume
OTM Book 12 (Traffic Signals, March 2012)

5.2.3. All-way Stop Control Warrants

The all-way stop warrant (AWS) is based on volume, collision, and visibility qualifying criteria contained in OTM Book 5 – Regulatory Signs (December 2021), with three different thresholds for "urban arterial", "collector road and rural arterial", and local roads. **Exhibit 5.4** shows the warrant criteria that should be met when an AWS is being considered within BWG. As per the beginning of this section and instructions contained in OTM Book 5, all-way stop controls must not be used as a speed control device.

Exhibit 5.4 All-Way Stop Warrant

All-Way Stop Warrant			
CRITERIA #	**CRITERIA**	**REQUIREMENT**	**YES/NO**
1	**Volume Thresholds:** Per Hour for Each of [#] Highest Hours of Day	**Urban Arterial: Minimum volume met?**	
		1.1.All approaches total: 500 vehicles/hour for all 8 hours*	
		1.2.1. Minor Road: Case 1: 200 units/hour for all 8 hours**	
		OR	
		1.2.2. Minor Road: Case 2: 150 units/hour for all 8 hours with average delay of 30 sec	
		Collector Road and Rural Arterial: Minimum volume met?	
		1.1. All approaches total: 375 vehicles/hour for all 8 hours*	
		1.2.1. Minor Road: Case 1: 150 units/hour for all 8 hours**	
		OR	
		1.2.2. Minor Road: Case 2: 120 units/hour for all 8 hours with average delay of 30 sec	
		Local Road: Minimum volume met?	
		1.1. All approaches total: 200 vehicles/hour for all 4 hours*	
		1.2. Minor Road: Case 1: 75 units/hour for all 4 hours**	
		All Road Types: Split within thresholds?	
		1.3. Volume split: Equal to or less than 70/30 for 8 hour period (4 hours if local) • For T-intersection, apply 75/25 split threshold • Major road counts only vehicles** • Minor road counts units*	

All-Way Stop Warrant			
CRITERIA #	**CRITERIA**	**REQUIREMENT**	**YES/NO**
2	Inappropriate areas	**All Answers Below Shall be NO to Qualify**	
		On multi-lane approaches?	
		Intersection has less than 3 or more than 4 approaches	
		Intersection geometry is offset / substandard	
		Stopping on steep grades?	
		Sign's stopping sight distance deficient due to horizontal curves?	
		Using for cut-through traffic issues?	
		Using to reduce speed?	
		Any other traffic control device within 250 m of stop sign?	
		Any progressive / coordinated signal timing on road within 800 m of stop sign?	
		DOES IT PASS THE WARRANT?	

*Units include vehicles and pedestrians
**Bikes are vehicles

*** Based on Transportation Association of Canada (TAC) 2017 sight distance calculation methodologies for stopping sight distance (SSD) and departure sight distance (DSD)
Based on OTM Book 5 (2021)

All-Way Stop Warrant – Collision History Justification			
CRITERIA #	**CRITERIA**	**REQUIREMENT**	**YES/NO**
1	Collision History (3 years)	**Urban Arterial:**	
		2.1. 3 collisions/year over 3 years (9 collisions total)	
		Collector Road and Rural Arterial: Minimum volume met?	
		2.2. 4 collisions/year over 3 years (12 collisions total)	
2	Inappropriate areas	**All Answers Below Shall be NO to Qualify**	
		On multi-lane approaches?	
		Intersection has less than 3 or more than 4 approaches	
		Intersection geometry is offset / substandard	
		Stopping on steep grades?	
		Sign's stopping sight distance deficient due to horizontal curves?	
		Using for cut-through traffic issues?	
		Using to reduce speed?	
		Any other traffic control device within 250 m of stop sign?	
		Any progressive / coordinated signal timing on road within 800 m of stop sign?	
		DOES IT PASS THE WARRANT?	

* Only those collisions susceptible to improvement through multi-way stop control must be considered (i.e., rightangle and turning type collisions).

Based on OTM Book 5 (2021)

As per the beginning of this section and instructions contained in OTM Book 5, all-way stop controls must not be used as a speed control device.

5.2.4. On-Street Parking Change Requests

The curbside parking warrant was developed to provide Town staff with a process to receive and respond to resident inquiries regarding changes to on-street parking. The worksheets provided here individually address new parking additions **(Exhibit 5.5)** and new parking restrictions **(Exhibit 5.6).**

For new parking restrictions, an application form for residents to print and complete is illustrated in **Exhibit 5.7.** Support from at least 51% of residents living within 60 metres of the location is required to approve said restrictions. An online version of this form is available at the **"Use Our Online Form"** section via the link, **https://www.townofbwg.com/en/living-in-bwg/report-an-issue.aspx.** The online from allows supporting documentation such as the petition form containing resident signatures to be uploaded as an attachment.

The parking warrant criteria is based on a review of the Town Engineering Design Criteria Manual, Transportation Master Plan (July 2022), Town-Wide Urban Design Guidelines (August 2022), and other industry guidelines, such as the Transportation Association of Canada (TAC) Traffic Calming Guide (2018) and National Association of City Transportation Officials (NACTO) Urban Street Design Guide.

Based on a review of the above documents, on-street parking adjacent to places such as parks can help create a barrier from thru-traffic, whether it be provided via a lay-by or on-street curbside. Caution should be taken however to avoid obscuring visibility (i.e., sightlines) of pedestrian crossings. Care should also be taken to avoid the oversupplying curbside parking, as underutilization will contribute to drivers' interpretation of a wider emptier road capable of faster travel speeds. The Town should also ensure that the road width is sufficiently wide to accommodate curbside parking, to allow safe passing of cyclists around opened car doors.

Exhibit 5.5 Curbside Parking Warrant: New Parking Additions

On-Street Parking Change Worksheet 1			
CRITERIA #	**CRITERIA**	**REQUIREMENT**	**YES/NO**
Nature of Request – New Parking Addition			
1	**Road Classification**	Road is a residential local or collector?	Y/N
2	**Road Length**	At least 60 m long?	Y/N
3	**Road Width**	Road width (to edge of pavement) at least 8.0 m?	Y/N
	Reason	NOT related to school pick-up / drop-off parking capacity?	Y/N
4	**Parking and Road Safety**	Parking is at least 1.5 m from a driveway?	Y/N or N/A
5		Parking is at least 3.0 m from a fire hydrant?	Y/N or N/A
6		Parking is at least 9 m from a crosswalk or stop sign?	Y/N or N/A
7		Not on the inside radius where there is a 90 degree bend in the road, more or less, for a distance of 9 m?	Y/N or N/A
8		Parking is at least 15 m from an intersection / bridge / rail crossing?	Y/N or N/A
9		Parking is at least 10 m from a traffic calming device?	Y/N or N/A
10		Parking is at least 18.5 m prior to bus stop (in direction of travel)? Parking is at least 30.5 m beyond bus stop (in opposite travel direction)?	Y/N or N/A
EVERYTHING ANSWERED YES OR N/A? (MUST BE ALL YES TO ALLOW CURBSIDE PARKING)			**Y/N**

*Based on 1.5 m desired cyclist operating width and 0.6 m buffer for curbside parking (OTM Book 18 Cycling Facilities)

Exhibit 5.6 Curbside Parking Warrant: New Parking Restrictions

On-Street Parking Change Worksheet 2			
CRITERIA #	**CRITERIA**	**REQUIREMENT**	**YES/NO**
		Nature of Request – Parking Restriction	
1	**Reason**	**Related to school pick-up / drop-off parking activities?**	**Y/N**
	If Yes	• Install “no stopping 8 AM- 10 AM and 2 PM- 4 PM M-F” restriction signage on road fronting the school, on far-side • Supplement “no stopping” signs with “no parking” signage on same posts	
2	**Reason**	**Related to other safety concerns?**	**Y/N**
	If Yes	**2.1 Conduct safety assessment:** • Collision history? • Unsafe behaviour noted in field visit?	Y/N
		2.2 Review parking supply / demand • Space is deemed not essential for nearby residents?	Y/N
		2.3 Review appropriate use of road space • Impacting pedestrian crossing visibility? • Impacting emergency vehicles, snow clearance? • Restricting through-traffic movements leading to visible congestion? • Visibly impacting other vulnerable road users (pedestrians, cyclists)?	Y/N
3	**Petition**	Petition completed with at least 51% resident support within approximately 60 m radius of the area of concern.	Y/N
		IF EITHER CRITERIA JUSTIFIED, AND SUFFICIENT PETITION RESPONSE OBTAINED, IMPLEMENT PARKING RESTRICTION	**Y/N**

Exhibit 5.7 On-Street Parking Application: New Parking Restrictions

On-Street Parking Change Request Application

Date of submission:

Requester Information (Primary Contact)

Name:

Phone Numbers:

E-mail Address:

Subject Area

Street Name:

From (street name or landmark):

To (street name or landmark):

Current Parking Restriction(s):

Are there time limits with the current parking restrictions?

☐ Yes ☐ No ☐ I am not sure

If yes, please identify:

Describe your reason and the new requested parking addition / restriction(s):

Are you requesting a time change to the current parking restriction?

☐ Yes ☐ No ☐ I am not sure

Diagram of Proposed Changes:

N

Petition – Signatures of Residents (Within 60 metre radius of Issue):

#	Name	Signature
1		

5.2.5. Flexible Bollard Warrant and Pavement Marking Guidance

Screening criteria recommended for the use of flexible bollards are provided in **Exhibit 5.8**. The criteria are based on "yes/no" components that determines if their use is appropriate for the studied road segment. Responses must satisfy all relevant criteria for the device to be warranted. If a traffic calming device is warranted after going through the process in **Section 4**, this screening criteria can be used to determine if flexible bollards are an appropriate solution.

These warranting criteria focus on roads where vulnerable road users are generally present, such as residential areas, school zones, and park areas. With regards to road characteristics, to mitigate road user hazards and reduce the risk of sideswipe collisions, the locations where flexible bollards are installed should avoid blocking driveways, keep clear of sharp bends and steep grades, and be limited to roads that provide one travel lane per direction. When installed adjacent to cycling lanes or other curbside uses (e.g., on-street parking), additional flexible delineators or physical buffers may be required to avoid vehicle encroachment and preserve the lane narrowing design intent of the bollards.

Exhibit 5.8 Warrant Criteria for Flexible Bollards

Flexible Bollards Warrant			
CRITERIA #	**SCREENING CRITERIA**	**MINIMUM REQUIREMENT**	**YES/NO**
1	**Road Jurisdiction**	The road of concern is under the jurisdiction of BWG	
2	**Road Segment Length**	Installing at least 50 m from all stop signs?	
3		Sufficient length to allow flexible bollards to be placed at least 50 m from all stop signs	
4	**Transit / Emergency Services**	Upon consultation with transit and emergency service providers (paramedic, fire, police), no significant impacts identified	
5	**History**	There have been no assessments within the past 36 months, unless significant road or land use changes have occurred nearby, likely impacting traffic.	
6	**Posted Speed Limit**	Posted speed limit 40 km/hr or lower?	
7	**Road Characteristics**	Road is two lanes wide? (one travel lane per direction)	
8		If residential, installing at least 3 m from house driveways?	
9		If non-residential, installation does not interfere with school / commercial vehicle maneuvers?	
10		Road segment contains no sharp turns or steep grades (>6%)?	
11		If curbside parking is near point of concern, can provide parking restriction 10 m before / after flexible bollards?	
		CRITERIA #1 TO #11 ALL MET? If Yes, then the road satisfies the screening criteria for Flexible Bollards	

The following **Exhibit 5.9** summarizes the recommended use and combination of flexible bollards and delineators based on road width and presence of on-street parking, as suggested by the manufacturer[1]. Individual lane widths on wide roads should be effectively narrowed to 3 metres via the installation of flexible delineators, as narrower lane width discourages higher travel speeds. Lane widths greater than 3 metres generally result in no traffic calming benefit.

Exhibit 5.9 **Flexible Bollard Suggested Layout**

ROAD TYPE	ROAD WIDTH (M)*	INSTALL CLEARANCE	
		FLEXIBLE BOLLARD	FLEXIBLE DELINEATOR* (Maximum clearance between centre bollard and delineator)
Paved Road: Local or Collector	6.0 m – 8.0 m	Install at road centre	N/A
	8.0 m – 12.0 m		3.0 m (both sides)
	9.0 m with parking lane on one side**		3.0 m (side with parking only)
	12.0 m or more		3.0 m (both sides)

* Individual lane widths, should be reduced to effectively be 3.0 metres with the installation of flexible delineators, depending on road type. The neighbourhood context and the specific varieties of vehicles on the road should be considered.

** Delineator installation is optional if there is high on-street parking activity.

Candidate locations for deploying flexible bollards, after passing warrant criteria, can be ranked by the amount that operating speeds exceed the posted speed limit, per **Exhibit 5.10.**

Exhibit 5.10 Multiple Flexible Bollard Sets and Pavement Marking Guidance

To prioritize the deployment of flexible bollards:
• Award 1 point for each km/hr (observed 85th percentile speed,) above the posted speed limit.
To install multiple flexible bollard sets:
• If installing multiple sets school / playground areas, flexible bollards should be spaced 80-100 metres
• If installing multiple sets in residential areas, flexible bollards should be spaced 100-200 metres
To install pavement markings to narrow road:
• If road width ≥ 8 metres and no curbside parking lane present, recommend adding centre and shoulder line markings to effectively narrow to 3.3 metres
• If road width ≥ 8.5 metres and curbside parking lane present, recommend adding parking line markings to effectively narrow lane to 3.3 metres
• If road width ≥ 8.5 metres and no sidewalk present, recommend adding 1.8 metre wide pedestrian clearway

This table also provides guidance on when multiple sets of flexible bollards can be used, and when pavement marking should be applied. Pavement markings can be applied either as a standalone low-cost traffic calming solution, or to enhance the effectiveness of flexible bollards.

5.2.6. Automated Speed Enforcement Warrant

Automated speed enforcement (ASE) is permitted to be implemented in designated school zones and community safety zones (CSZ). Criteria that BWG uses focus on areas with high pedestrian activity such as schools, playgrounds, community centres, and transit bus stops. **Exhibit 5.11** shows the warrant for ASE that must be met before moving on to ranking the location.

Exhibit 5.11 Automated Speed Enforcement Warrant

Automated Speed Enforcement Warrant			
CRITERIA #	**CRITERIA**	**REQUIREMENT**	**YES/NO**
1	**Community Safety Zone**	Is the location a Community Safety Zone?	
2	**Vulnerable Road Users**	Is the location near a school?	
		OR	
		Is the location near a crossing guard?	
		OR	
		Is the location near a bus consortium stop?	
		OR	
		Is the location near a vulnerable road user generator?	
		BOTH CRITERIA MET? * Both criteria MUST be met to continue	

Criteria that allows ASE requests to be ranked per location **(Exhibit 5.12)** include traffic volumes, speeds, school activities, collision history, streetscape characteristics, and prior enforcement history.

Exhibit 5.12 Automated Speed Enforcement Ranking Worksheet

Criteria	Range	Rating	Weight	Score
EXPOSURE				
Traffic Volume	< 1,000 v.p.d (vehicles per day)	1	6	
	1,001 to 2,000 v.p.d	2		
	2,001 to 5,000 v.p.d	3		
	> 5,000 v.p.d	4		
Travel Speed	85th % - posted <10 km/hr	0	8	
	85th % - posted = 11-15 km/hr	2		
	85th % - posted = 16-20 km/hr	3		
	85th % - posted > 21 km/hr	4		
Length of the Zone	< 100 m	1	1	
	101 - 200 m	2		
	201 - 300 m	3		
	> 301 m	4		
School Population	<400 students	1	2	
	401 - 900 students	2		
	901 - 1,200 students	3		
	> 1,201 students	4		
After-Hours School Activities	No	0	1	
	Yes	1		

Criteria	Range	Rating	Weight	Score
COLLISION				
Pedestrian Collision (3 year period)	0	0	8	
	1	1		
	>2	2		
ZONE ENVIRONMENT				
Sidewalks	Both Sides	0	2	
	One Side Only	1		
	None	2		
On-street Parking	None	0	1	
	Present, although prohibited	1		
	Present and Permitted	2		
Roadway Curvature	None	0	2	
	Present	1		
Speed Transition	None	0	2	
	Present	1		
TRADITIONAL ENFORCEMENT				
Site conditions support traditional enforcement	Feasible	0	2	
	Not Feasible	1		
Prior Police Enforcement	Measurable Impact on Travel Speed	0	3	
	No Long Term Impact on Travel Speed	1		

5.2.7. 40 km/hr Speed Limit Zone Warrant

For local and collector roads in urban and rural areas within the town, the following warrant can be used to establish the justification for 40km/hr speed limits; however, professional judgment should be used when determining if 40 km/hr zones are appropriate in specific locations. **Exhibit 5.13** presents the proposed 40 km/hr speed limit warrant. The 40 km/hr speed limit warrant is satisfied if any one of the criteria in the warrant is satisfied.

It is suggested that speed data be collected before and after implementation to gauge the effectiveness of speed limit reductions.

Exhibit 5.13 40 km/hr Speed Limit Zone Warrant

WARRANTS	CRITERIA	REQUIREMENTS
Designated Areas of Special Consideration	Road features, fronts, or is adjacent to any of the following: • Elementary or Secondary School • Private schools • Licensed childcare facilities • Town parks • Crossing guard location • Community centres and churches • Seniors' centre and residence • Locations with on-street active transportation facilities (e.g. on-street bike lanes) • No sidewalk provided on the road • A sidewalk immediately adjacent to traffic flow (i.e. no buffer green space / boulevard area) and not separated by long-term curbside parking, bike lanes, or any other form of physical buffer	At least one criteria is met

5.3. New Development Checklist

The New Development Road Planning Checklist was created to assist developers with integrating traffic calming measures into their projects and to provide municipal staff with the tools required to review the resulting designs.

For developers, this checklist is not intended to be prescriptive or inflexible. Rather, the guidance presented is intended to be interpreted and applied in a context-sensitive manner.

For Town staff, the checklist is not intended to score a development proposal, and the absence of certain elements should not be interpreted as a proposal being inherently deficient. Rather, the checklist is intended to assist reviewers in determining the likelihood that a new development will experience conditions which may require traffic calming retrofits in the future.

It should be noted that achieving naturally calm roads may require allowances for road design elements which differ from municipal standard drawings and other traditional conventions. Additionally, context sensitive guidance may be required to support broader municipal objectives and to confirm that the proposed measures will not have a significant adverse impact on road-user safety, emergency vehicle access, or transit movements. Where deviations from local standards are being proposed, the proposals should include documentation of the associated justifications and an assessment of risks.

GUIDELINE	PROVIDED OR NOT PROVIDED	APPLICANT'S NOTES	REVIEWER'S NOTES
NEIGHBOURHOOD ROAD STRUCTURE			
Have you established a hierarchy of roads?			
Are intersections spaced apart approximately 150 to 250 m?			
Have you designated routes for future transit?			
Does the neighbourhood road structure discourage cut-through traffic?			
For roads longer than approximately 250 to 300 m, can the road have horizontal curves and / or additional intersection connection points?			
ROAD CROSS SECTION			
Have you minimized pavement width by introducing active transportation or other traffic calming elements?			
Have you provided horizontal or vertical deflection traffic calming elements along blocks longer than approximately 250 to 300 m?			
If used, have you selected the municipal standard drawings for a narrow road design with the lowest practical design speed?			
ARTERIAL ROADS			
Have you located new buildings adjacent to arterial roads, and oriented active uses (e.g. main building entrance) towards the arterial road frontage?			
Have you provided wide sidewalks (i.e., wider than 2.1 m) and / or multi-use paths and separated the sidewalk from the road using streetscape elements?			
Have you provided bicycle infrastructure with separation from vehicle lanes?			

GUIDELINE	PROVIDED OR NOT PROVIDED	APPLICANT'S NOTES	REVIEWER'S NOTES
COLLECTOR ROADS			
Have you designed for on-street parking on road curbside / layby, where possible / feasible?			
Have you provided bicycle infrastructure on both sides of the street, where possible / feasible?			
LOCAL ROAD			
Have you designed for bicycle movement as a normal component part of road traffic?			
Have you designed for on-street parking on one side of road via curbside / layby, where possible / feasible?			
ACTIVE TRANSPORTATION NETWORK			
Have you provided sidewalks / multi-use paths (MUP) along the roads?			
Have you designed crosswalks to be visually different from the road surface?			
Have you provided for a network of bicycle routes that connect to the BWG cycling network?			
Have you provided curb extensions and / or raised crosswalks at trail crossing locations and pedestrian crossovers?			
INTERSECTIONS			
Have you provided neighbourhood gateway elements such as landscaping in the boulevard and median?			
Have you provided curb extensions at intersections?			
Have you provided raised intersections?			
Have you provided roundabouts?			

6. Challenges and Opportunities

6.1. Enforcement Considerations

Enforcement resources must be considered when designing any neighbourhood traffic management solution, even more so when a solution includes regulatory measures like lower speed limits and community safety zones. Establishing a CSZ requires active enforcement to be effective. Traditionally, enforcement by police officers is the primary enforcement option. However, as the Safer School Zone Act was enacted, municipalities are allowed to implement ASE in CSZs to expand enforcement capacity in addition to traditional police enforcement.

ASE is an automated system that uses a camera with a speed measurement device to detect and capture images of vehicles travelling faster than the posted speed limit. While images were previously reviewed by Provincial Offences Act (POA) officers, municipalities can now implement an Administrative Monetary Penalty (AMP) regulatory with penalty amounts comparable to the existing POA ticketing scheme. Tickets issued to the owner of the vehicle under the AMP framework typically is done by an employee designated by the municipality.

ASE systems can be placed in designated school zones or CSZ to effectively increase enforcement capacity. For reference, participation in the Ontario ASE program historically requires that municipalities accept common operating procedures and enter into formal agreements with the Province, the Joint Processing Centre that reviews and processes violations, and an approved system supplier.

Automatic speed enforcement can be an effective traffic calming measure by deterring speeding and enhancing road safety. It offers consistent and continuous monitoring and can be strategically deployed in areas with high risk. However, it is essential to address public concerns, maintain transparency, and ensure the accuracy and fairness of the system for it to be widely accepted and effective in reducing speeding-related accidents. ASE can provide valuable data on speeding patterns and hotspots, enabling municipalities to better identify areas where additional traffic calming measures may be needed.

6.2. Parking

Curbside parking can be an effective traffic calming measure for several reasons. Firstly, by allowing vehicles to park along the roadside, it effectively reduces the driveable width of the road. This narrower space influences drivers to slow down, making them more cautious and attentive. The presence of parked cars creates a visual barrier that encourages driving at a reduced speed, enhancing safety for both pedestrians and cyclists. Additionally, roadside parking can help create a sense of enclosure, making drivers feel more enclosed and contained, which in turn encourages them to drive at a slower pace.

However, it is important to note that the effectiveness of curbside parking as a traffic calming measure largely depends on its implementation and location. In some cases, roadside parking can be a good solution when used in residential areas or near schools, as it can discourage speeding in these sensitive areas. It can also provide convenient parking options for residents and visitors, reducing the need for large parking lots or garages. However, if curbside parking is underutilized with largely empty curbside parking lanes, drivers can perceive the road to contain a wider driveable area, thereby resulting in greater comfort driving at higher operating speeds.

There can be other instances where curbside parking can be misused or ineffective. For example, in busy commercial areas or major thoroughfares, roadside parking may impede traffic flow and cause congestion, thereby risking increased traffic infiltration through adjacent roads and communities (“cut through” traffic). Poorly planned parking spaces can create bottlenecks and restrict the smooth movement of vehicles, leading to increased frustration among drivers. Furthermore, if roadside parking is not properly regulated or enforced, it may result in haphazard parking, obstructing visibility and creating hazards for both drivers and pedestrians.

7. Legislative Requirements

These guidelines include the latest revisions to the Municipal Class Environmental Assessment (MCEA) Manual (February 2024) and relevant Ontario Traffic Manual (OTM) Books such as Book 5 (Regulatory Signs) and Book 15 (Pedestrian Crossing Treatments). BWG-specific documents referenced include the Town's Transportation Master Plan, Urban Design Guidelines, and Design Criteria Manual.

7.1. Ontario Highway Traffic Act (HTA)

The Ontario Highway Traffic Act (HTA) is legislation that outlines and governs the rules of the road, including speed limits and regulatory implications of CSZ. The HTA outlines the ways in which municipalities can exercise control over the use of roads that are under their jurisdiction to manage traffic. The HTA can be viewed online at **www.ontario.ca/laws/statute/90h08.**

The HTA indicates that the speed limit on a given urban road should be 50 km/hr unless otherwise indicated by by-laws. Speed limits that differ from the statutory speed limit, for example local roads posted at 40 km/hr, must be both signed and included in the by-law (e.g., associated schedules).

CSZ are designated zones recognized in the HTA. The designation allows for stricter enforcement within the limits of the zone, such as the doubling of fines related to speeding.

7.2. Safer School Zone Act (Bill 65)

In May 2017, the Province of Ontario passed Bill 65, the Safer School Zone Act. The Bill includes a number of provisions that provide municipalities with greater flexibility in designing and implementing traffic control and traffic management measures. Some of the key provisions include the following:

- Allowing municipalities to designate speed limits below 50 km/hr at the neighbourhood or area level, as opposed to on a road-by-road basis; and
- Granting the ability to implement Automated Speed Enforcement (ASE) in designated School Zones and CSZ.

The above provisions address two common criticisms of reducing posted speed limits:

1. They are costly to implement over larger areas / corridors due to the need to sign all speed limits above or below 50km/hr within urban boundaries; and
2. Without significant enforcement or additional traffic calming measures lower speed limits are relatively ineffective.

Bill 65 intends to address these two concerns by reducing the cost to implement through reduced signage requirements, and allowing for automated enforcement, which reduces the burden on police resources and allows for greater coverage throughout the day.

7.3. Ontario Traffic Manual

Under the HTA, the Ministry of Transportation published the Ontario Traffic Manual (OTM). This manual provides a range of traffic control devices and systems for permanent and temporary conditions to promote consistency across the province. Furthermore, the OTM has a set of guidelines intended to provide road authorities the tools to update their own standards which are consistent with the HTA.

When implementing new traffic control or traffic calming devices, compliance with the OTM should be achieved. The result of consistent application is a predictable, and thereby safer, environment for drivers and pedestrians. The OTM is also planned to be continuously updated with new research to ensure that Ontario is implementing best practices and matching the needs of the population.

7.4. Environmental Assessment

The Municipal Class Environmental Assessment (MCEA) manual was first prepared in 1987 by the Municipal Engineering Association and was approved under the Ontario Environmental Assessment. The MCEA manual sets out standardized planning processes for projects which fall under the municipal class, such as transportation.

For instance, in the 2000 M.C.E.A. manual, the Schedule B threshold was less than $1.5 million, while the 2024 MCEA manual Schedule B threshold has increased to $9.5 million. The current M.C.E.A. (2024) has revised thresholds such that traffic calming projects generally are now exempt from the process.

- Typically, traffic calming and traffic control measures will fall under "Schedule A or A+, both regarded as "Pre-Approved,"[2] which requires that a notice of commencement be distributed, but does not require additional public consultation. The manner of public advisement is up to the municipality
- Examples of Schedule A+ projects are low-cost traffic control devices, streetscaping, sidewalk improvements, redesignation of road / one-way or two-way road conversion, adding cycling facilities, adding sidewalks - no financial limit applies; and
- Examples of Schedule A projects are the installation / construction / reconstruction of traffic control devices (e.g., signing, signalization)—applicable to projects values at under $9.5 million

Temporary measures and pilot projects do not fall within the MCEA process. Therefore, the process of implementing traffic calming measures generally now requires less consultation and has a greater focus on technical merit. This evolution in guidance provides some of the reasoning behind the Screening Checklist, Ranking Worksheet provided in **Section 2.**

7.5. Transportation Association of Canada (TAC) Guidelines

TAC is one of the leading authorities in transportation guidelines for Canada. They publish manuals on all aspects of transportation and provide general information and guidance on many measures. Their guidelines are acceptable to follow for any municipality in Canada and are the basis of many public transportation policy documents.

The most recent guidelines for establishing posted speed limits was published in 2009 and is still applicable today. These guidelines can guide town staff when selecting a speed limit for specific roadways.

2 *https://municipalclassea.ca/manual/page75.html*

Bradford
west
Gwillimbury