APPENDIX D

TRAFFIC CALMING POLICY

IBI GROUP

Prepared by the City of Waterloo
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City of Waterloo

POLICY PAPER: TRAFFIC CALMING

Revised

CITY OF WATERLOO TRANSPORTATION MASTER PLAN

FEBRUARY 4, 2009

IBI GROUP

TABLE OF CONTENTS

1. INTRODUCTION

The following provides information and supporting data on why traffic calming is required in the City of Waterloo, how it is practiced in other similar municipalities, how the City's current Traffic Calming Policy should be updated and how this relates directly to City wide strategic planning documents and master plans in process, including:

- Official Plan Review – Plan it! Imagine Waterloo,
- 2007-2010 Strategic Plan,
- Recreation and Leisure Master Plan,
- City of Waterloo Transportation Master Plan (TMP),
- Region of Waterloo Transportation Master Plan (RTMP),
- 2008 Accessibility Plan'
- Joint Emergency Services Operational Advisory Group: Traffic Calming Measures in Waterloo Region Municipalities – The Emergency Services Perspective: a position statement prepared for RESCU (June 2008)

1.1 Recommended Traffic Calming Policy Update

This report provides the rationale to make the following important updates to the City's current Traffic Calming Policy.

The overall aim of an updated traffic calming policy for the City of Waterloo is to build upon the strengths of the existing policy and establish a methodology that provides, where possible, a balanced approach between the sometimes conflicting needs of the service providers but recognizes a shift in transportation and urban planning and design principles. It must also recognize that undesirable traffic speeds on city streets has a direct and negative impact on overall safety for everyone, whether a pedestrian, cyclists or driver. Updating the City of Waterloo Traffic Calming policy should consider the following principles:

- Vision statement of the City of Waterloo TMP,
- Reflect the shift away from an auto dominated society,
- Support and encourage healthy lifestyles and safe communities,
- Support the shift towards an intensified urban form,
- Reflect the way the City is being planned for the next 20 years by promoting and encouraging a sustainable transportation approach,
- Support the vision of the Regional TMP for a transit oriented transportation system,
- Consider the cumulative impacts of traffic calming on emergency response times;

- Encourage and support walking and cycling of all ages and levels of ability,
- Support Walking School Bus and Active and Safe Routes to School practices, and
- Provide a mechanism to review and select any traffic calming measures that best serves the issues identified.

To better reflect these transportation planning principles in how the City of Waterloo implements traffic calming, the following changes to the current policy are recommended:

Initiation Request

An initial request to consider the use of traffic calming anywhere in the City of Waterloo can be made by an interested residents or residents, a ward Councillor, an established community organization including a Neighbourhood Association, School Council or Business Association and/or a municipal department of the City of Waterloo.

Review / Warranting Process

When an initiation request is made, City staff should undertake a two-part screening investigation using the following warranting criteria taken from Appendix 1 of the existing policy with further modifications:

Exhibit 1-1 Proposed Technical Warrants

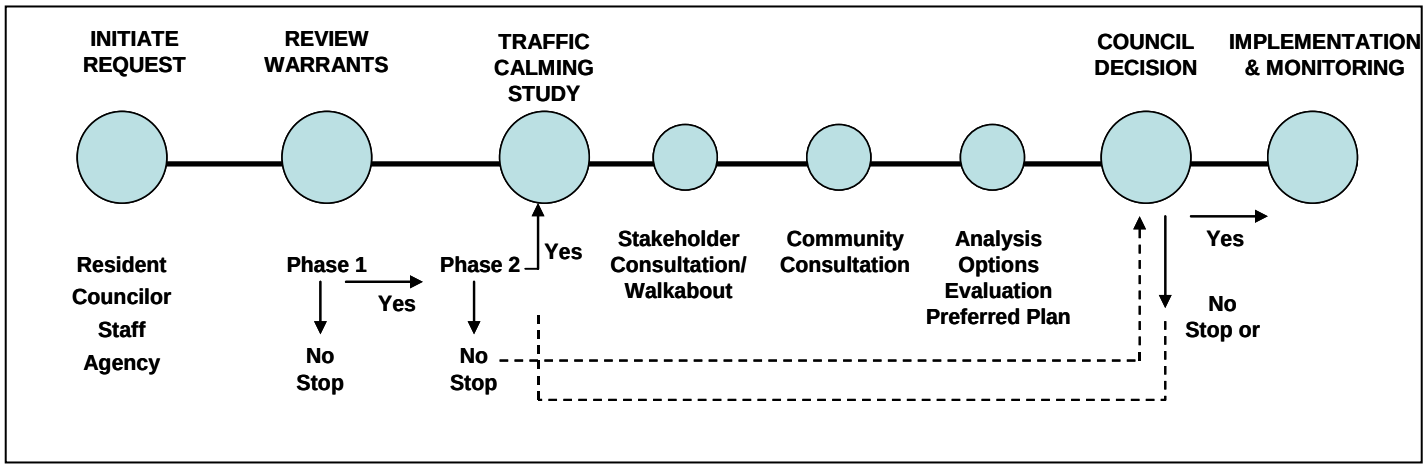
CRITERIA	MEASUREMENT
Phase 1	
Operating Speed (85th percentile)	Recorded > than 10 km/hr over posted limit
Motorized Traffic Volumes: Local Street 2-lane Collector Street	 Counted > 900 vpd Counted > 2,000 vpd
Phase 2 If Phase 1 Minimums Are Met	
Cycling / Pedestrian Traffic Volumes	Counted or Observed
Collision History	Recorded
Emergency Response Use	Input
Transit Use	Input
Road Grade (max. 8%)	Calculated
Proximity to Schools and School Crosswalks	Observed

The Review/Warranting Process extending through the Phase 1 and Phase 2 screening investigations **should not** require polling to determine any minimum level of support from the affected or general community, as with the City's current Traffic Calming Policy. Resident input will be collected and considered if a Study Process is found to be warranted from the Phase 1 and 2 investigations, but should not dictate whether a study is initiated. This should be left as a technical decision made objectively by City Staff.

Study Process

The revised Traffic Calming Study process recommended for the City of Waterloo is shown on Exhibit 1-2, and as described as follows:

Exhibit 1-2 – Recommended Study Process



- City Staff will report the results of the Phase 1 and 2 screening investigation, and where the results warrant further consideration of a traffic calming program, Council should be asked to authorize City Staff to commence a Traffic Calming Study of the subject location or area.

- A Traffic Calming Study should be designed to include consultation with affected residents, the general community and involved stakeholders including City and Region departments.

- Installation of stop signs should not be considered as a viable traffic calming measure since they are intended only for traffic flow management and control, not traffic calming.

- There should be no limitations on the types of traffic calming measures to be considered in Traffic Calming Studies. Instead, the Studies should evaluate all appropriate measures, with appropriateness determined by traffic conditions, terrain, adjacent land use, stakeholder and public input and best practice information on the application and effectiveness of traffic calming measures elsewhere in the City and Region, and in other comparable cities. The type of traffic calming measures available for consideration in the City of Waterloo should include:

  Active Traffic Calming – Vertical Deflections:

  - Speed humps, speed cushions and speed tables
  - Raised Crosswalks
  - Raised Intersections
  - Textured Pavement

Active Traffic Calming – Horizontal Deflections:

- Narrowed Travel Lanes
- Curb Extensions
- Raised Median Islands
- On-Road Parking Bays
- On-Road Exclusive Bike Lanes
- Modern or Mini-Roundabouts and Neighourhood Traffic Circles
- Intersection Channelization
- Directional Road Diverters and Closures

Passive Traffic Calming:

- Neighbourhood and Location-Specific Signage (NOTE: does not include Stop Signs)
- Vehicle-Activated Traffic Calming Signs (VATCS), i.e. Radar Speed Signs
- Pavement Colourization
- Pavement Warning Markings and Reflective Pavement Markers

Study Approval

- Traffic Calming Studies should include community involvement in a form and scope appropriate for each study. This should include a minimum of two (2) points of contact with the community and general public to; 1) discuss the problems and improvement options, and 2) to discuss the preferred traffic calming plan.
- The final decision to implement a Traffic Calming Study should rest solely with City Council in response to technical information provided by the Study and input from affected residents and the larger community.
- Any approval of a Traffic Calming Study should include a monitoring program to measure the degree of traffic change provided by the program up to two (2) years following installation.

2. A TRANSPORTATION VISION FOR THE CITY OF WATERLOO

The vision statement of the City of Waterloo TMP is to "*develop a coordinated and integrated transportation system that provides realistic alternative travel options to the auto thereby creating a city that is truly accessible to all*". To add context to this, "alternative travel options" are essentially transit, walking and cycling, while "coordinated and integrated: considers the inter-relationship and connectivity between these three modes and the dominant auto. A key objective of the TMP is to facilitate the development of a transit oriented transportation network – also a key goal of the RTMP.

2.1 A Transportation Strategy

Facilitating these transportation visions requires all road users to both feel and be safe within the municipal right-of-way, and achieving that requires a reconsideration of the way we plan and design the roadway. In simple terms a road is a barrier, both physically and psychologically to most pedestrians and cyclists, but particularly the vulnerable road users of today's society, such as children, disabled, elderly and parents with strollers. Each user has their comfort level and ability in being able to navigate the road system and cross the road safely. Children walk at a slower pace than an adult and therefore when crossing the roadway their exposure time to vehicular traffic is considerably greater.

This is why the first General Transportation Strategy established for the new City of Waterloo Official Plan is to:

"1. Plan for the safe and convenient movement of goods and people with varying degrees of mobility within and to/from Waterloo"

Also on the subject of safety, the final General Transportation Strategy states:

"11. The transportation system will facilitate the achievement of emergency response targets".

2.1.1 SAFETY

Traditionally, higher order roads were planned and designed solely with the auto in mind, often at the detriment to pedestrian and cyclist safety. They were constructed straight and wide to achieve maximum vehicular capacity. Wide roads encourage faster travel speeds which create an even greater obstacle to the non-motorized user. Research shows that the facts are simple – at 65km/h (just 15km/h over limit), a pedestrian has only **15%** chance of survival if struck by a vehicle. In contrast, if struck by same vehicle at 50km/h, the percentage increases to nearly **50%.**

Often speeds are well in excess of the posted speed (50km/h on city streets unless otherwise posted).

2.1.2 THE COST FACTOR

The annual societal costs associated with injury crashes is an important factor used by the Region of Waterloo in Intersection Control Studies that compare the use of signalized intersections compared to roundabouts. The $30,000 societal cost per crash used by the Region comes from "*Default Values in Collision Costs, Table 4.1, Canadian Guide to 3R/4R, Transportation Association of Canada, August 2001".* Another source, the Ministry of Transportation's Analysis and Recommendations of the Social Cost of Motor Vehicle Collisions in Ontario (August 2007), places this number at $77,000 in 2004 based on all collision severities.

3. TRAFFIC CALMING – THE NEW APPROACH

Traffic calming has traditionally only been considered for lower order streets as seen in neighbourhoods, sub-divisions and around schools. However, there has been a significant shift in how the higher order roads such as Arterial and Major Collectors are now being planned and designed. They are being seen as multi-modal transportation corridors where all modes of transportation are equally planned and designed for within the municipal right-of-way. This new `Shared Space or Shared Street' concept includes traffic calming incorporated within the

streetscape design. The Region of Waterloo is undertaking a new study to revise the way their main transportation corridors will be planned and designed, thereby embracing this new approach.

As the urban form of the City of Waterloo shifts to higher density at nodes and along the major transportation corridors, and becomes the transit-oriented vision of the RTMP, the look and feel of these higher order streets will be the catalyst in promoting a walkable and therefore sustainable community. Cities that place an emphasis on walking, cycling, connectivity to transit systems and overall intelligent land use strategies to promote wider travel choice are more likely to become an accessible place and therefore, sustainable place.

At the 2008 Bike Summit held in Toronto emphasis was made on the need to reduce vehicular speeds on roads where on-street cycle lanes are either planned or implemented to encourage greater use. A key theme of the 2007 International Walk 21 Conference held in Toronto was the need to re-think the way everyone plans and designs roads with particular emphasis on the streetscape to encourage and promote more walking and cycling, thereby reducing the need for auto travel. Traffic calming supports all these requirements.

3.1 City of Waterloo Current Traffic Calming Policy

The current Traffic Calming Policy of the City of Waterloo establishes the purpose of traffic calming, which is:

"To restore streets to their intended function by reducing vehicular speeds, discouraging through traffic and minimizing conflicts between street users".

The Policy includes list of traffic calming measures – or the `tool box' that currently includes:

- Curb extension
- Intersection channelization
- On-street parking
- Raised crosswalks
- Raised intersections
- Road closures
- Speed humps
- Stop signs

Furthermore, the current process to consider the application of traffic calming in the City begins with the City receiving a resident request in writing for traffic calming. The City then investigates the request to identify if traffic calming is warranted in the requested location using a series of 3 warrants with seven (7) specific evaluation criteria listed as follows:

Warrant 1: Survey	1.1 Resident Survey
	1.2 Impacts to Adjacent Streets
Warrant 2: Safety Requirements	2.1 Road Grade

	2.2 Emergency Response/Service Delivery
Warrant 3: Technical Requirements	3.1 Minimum Speed
	3.2 Minimum Traffic Volume
	3.3 Transit Service

This process is dependent on the resident survey showing there is resident support for traffic calming. If a minimum 40% response rate from affected residents and minimum 60% support for traffic calming is not achieved by these residents, then the current policy states that the City will not consider the second and third warrants, thereby eliminating consideration of a traffic calming installation.

This process is somewhat problematic in that it leaves the decision on whether to apply traffic calming solely with "affected" residents, defined as a residents who lives on a street under study within the limits of the block or blocks being considered for traffic calming. It therefore does not consider the opinion of other area residents or the public as a whole, especially in cases where the root cause of traffic problems on a particular block or within a specific study area extends beyond the affected residents, which is often the case in most neighbourhood traffic problems.

3.2 Recommended City of Waterloo Traffic Calming Policy Changes

3.2.1 INITIATING THE TRAFFIC CALMING PROCESS

The best practices review conducted by IBI Group for this Policy Paper, reported in **Appendix A,** shows that a number of comparable municipalities use additional procedures to initiate the consideration of traffic calming, rather than only using resident complaints or requests, namely;

- Initiate investigation of traffic issues and potential traffic calming application by (i.e. Hamilton, Ottawa);
    - the Ward Councillor
    - an established organization such as a Community Association, School Council or Business Association
    - from a municipal department
- or by a special review committee established by Council such as the Safe Streets Task Force in Vaughn or the Safer Street Traffic Calming Review Committee in Pickering

Once the decision has been made to investigate a traffic calming request, some other municipalities also use warranting support rates to determine if calming should be implemented. For example, Windsor requires a 66% support rate within a comprehensive area surrounding a potential traffic calming application, and Markham requires 60% approval of the proposed calming plan. Other municipalities do not poll residents to determine support rates, but rather have Council make the final decision on traffic calming implementation based on technical information and public input.

It is also important that emergency service providers become involved in any consideration of traffic calming at the initial consideration stage. In Waterloo this includes:

- Waterloo Fire Rescue

- Waterloo Regional Police Services
- Regional Emergency Medical Services (EMS).

Grand River Transit should also be consulted when the area for traffic calming consideration involves GRT routes.

3.2.2 TRAFFIC CALMING MEASURES

The types of traffic calming measures for potential implementation where warranted in Waterloo should also be updated based on proven experience in the City, best practices in comparable municipalities (see **Appendix A**) and the evolution of new technologies. It should also be noted that the TAC/ITE Canadian Guide to Traffic Calming is now 10 years old, and therefore new and evolving technologies should be incorporated into the traffic calming toolbox.

An update to the City's typical traffic calming measures list should include the following adjustments (used in developing the Section 1.1 list of potential traffic calming measures that may be considered for use in the City of Waterloo):

- **Do Not Include Stop Signs –** Stop signs are not intended as traffic calming devices and so should be addressed in the City's Intersection Control Policy, and not the Traffic Calming Policy.
- **New Vertical Deflections** – Vertical deflection is proven to be the most effective form of traffic calming to reduce vehicle speed. However they also have the most impact on emergency response operations. To address this potential dichotomy in the intended function of vertical deflections, their design is no longer limited to the standard speed hump. New speed hump designs such as speed cushions allow larger vehicles with wider wheelbases to pass through or over the device.
- **Narrower Lane Width -** Include travel lane narrowing as a traffic calming measure. Creating more side friction between passing vehicles, and between the vehicle and road edge, is proven to be effective in physically and physiologically slowing driver speed. Travel lanes in the range of 3.0 to 3.3 m wide should be considered in local and minor collector street construction or reconstruction where there is a potential for or observed conditions of speeding, respectively.
- **Raised Median Islands** – Installing raised centre medians on a street should also be added as a form of traffic calming horizontal deflection. They visually and physically narrow or "choke" the travel surface so as to slow opposing vehicle speeds. They also offer the added benefits of providing a pedestrian refuge in the centre of a street, depending on the median width, and opportunities for streetscaping within the right-of-way that also acts as a visual form of traffic calming.
- **Roundabouts** – Over the past 5 years, there has been considerable success in the Region of Waterloo with the strategic installation of modern roundabouts at selected regional road intersections. Similarly, the City of Waterloo has also installed a number of smaller one-lane modern roundabout in both residential and commercial areas, and more recently a mini-roundabout at the intersection of Margaret Ave. and Union St. The feasibility of installing and operating various types of roundabouts in Waterloo should continue to be evaluated as a form of traffic calming based on capacity analysis and physical property constraints. This

analysis should be performed using the methods described in the FHWA[1] publication *ROUNDABOUTS: An Informational Guide* as a basis to ensure that a roundabout installation will provide sufficient capacity during all times of day. Appropriate public consultation and education efforts are also required with the potential installation of any roundabout in the City. It is noted that the three (3) emergency response providers support the use of roundabouts as traffic control devices on the road network.

- **Other New Technologies -** In addition to proven traffic calming measures, various new technology has advanced over recent years with intelligent systems such as Vehicle Activated Traffic Calming Signs (VATCS) and more choice of pavement materials and colour.

3.2.3 DECIDING ON TRAFFIC CALMING IMPLEMENTATION

The City's current Traffic Calming Policy requires an initial polling of affected residents and establishment of minimum response and approval rates from these residents before calming will be considered further in the City. It is recommended that this policy be changed so that the technical warrants presented in Exhibit 1-1 are first used to determine if traffic calming should be considered based on objective and technical information provided by City Staff. This recommendation is made for the following reasons:

1. Ensuring the safety of all street users, as the public right-of-way affects everybody using it, should first be the responsibility of the City, and specifically City Staff. The City took this approach in 2005 by adopting a Sidewalk Policy based upon a simple warrant so that pedestrians would be able to walk safely down a street irrespective of whether they lived on that street or even lived in the city - it is not based upon a resident survey. The use of adult crossing guards in the City is also based on safety issues and challenges for school-aged children and the developed criteria of the warrant procedure - it is not based upon a resident survey.

2. Residents on any street and in any neighbourhood change over time, as do their circumstances and therefore opinions. Changing demographics change travel behaviours and capabilities, whereas in general traffic issue(s) rarely change or improve.

3. In Waterloo, some neighbourhood traffic issues can change with changes in neighbourhood occupancy (i.e. student housing areas). Therefore, polls and surveys taken in some areas can result in different outcomes depending on the neighbourhood makeup at the time.

4. City Staff have attempted to address a number of traffic issues through studying roads/streets prior to reconstruction (i.e. Ellis Crescent in 2007 and Margaret Ave in 2008). This allows for more efficient and cost-effective provision of traffic calming measures where warranted. If an opportunity to implement traffic calming measures is lost at this early stage because of the outcome of a resident survey, then either the issue remains for some considerable time or there may be an expensive retrofit at a later date. It is true to say that some of our projects to date have been undertaken and implemented that have not been in full compliance with the existing policy, but rather because a safety issue has been identified by City Staff.

5. In undertaking traffic calming studies, the municipality carries out its due diligence in addressing traffic issues in the City. The decision to conduct this diligence should be made by Council, and not affected residents.

[1] Federal Highway Administration, U.S, Department of Transportation

3.2.4 FOLLOWING AN EA-TYPE PROCESS

It is important to note that prior to the 2007 update of the MEA Municipal Class Environmental Assessment (EA) process, consideration of traffic calming required the completion of a Schedule B or C EA depending on the project scale and capital cost. Since then, traffic calming measures have been removed from the EA process, therefore no longer requiring the systematic and consultative evaluation of the problem, alternative solutions and the preferred solution previous included in an EA.

However, some municipalities including the City of Waterloo have decided to continuing requiring that traffic calming evaluations follow a similar EA-type of process that clearly documents the problem, the need and justification for traffic calming, the available alternatives, a systematic evaluation of these alternatives and a description of the preferred solution. This must all be conducted with appropriate public consultation. It is recommended that this current City practice to follow an EA-type of process continue in any consideration of traffic calming in the City.

3.2.5 CONTEXT-SENSITIVE IMPACTS AND TRADE-OFFS OF TRAFFIC CALMING

Any potential installation of traffic calming measures must consider and balance the pros and cons of the installation using criteria than includes, at a minimum, traffic operations and effectiveness, public safety, measure-specific or cumulative impacts on emergency response times, impacts on transit operations (where applicable), property impacts, aesthetics and capital and life cycle cost. For example, vertical deflecting measures (i.e. speed humps, raised crosswalks and intersections), deflect vehicle paths vertically and are proven to have the most impact upon speeding traffic. However, they create some real and perceived impacts to transit, winter maintenance operations and emergency response.

Vertical measures, particularly speed humps and speed cushions are relatively low cost items compared to most other physical forms of traffic calming and their strategic use should be evaluated in the planning process to ensure budget allocation is not exceeded.

Increased cumulative use of certain types of traffic calming devises will negatively impact emergency (fire) vehicle response times, and may result in the need for additional fire stations and staff to maintain Council-approved response times.

Horizontal deflecting measures (i.e. bump-outs, chicanes, roundabouts at intersections), deflect vehicle paths laterally. They have minimal impacts upon services and operations but in general, also have less impact upon speeding traffic.

As a result of the positive and negative impacts that result from traffic calming, it is important to plan traffic calming using a context-sensitive approach that takes into consideration the individual and cumulative impacts of the calming measures being considered. This should include the location of primary and secondary emergency response routes (basically responding to arterial and major collector roads respectively), fire stations, EMS centres and transit routes.

APPENDIX A: BEST PRACTICES REVIEW

1. INTRODUCTION

As the need and justification for traffic calming and remedial measures varies considerably from one jurisdiction to the next, a number of jurisdictions have developed their own traffic calming "warrants" based on traffic/pedestrian volumes, operating speeds, collisions/conflicts and a number of other factors. Much like traffic signal warrants, traffic calming warrants provide guidance for the appropriateness and implementation of traffic calming measures. In most cases, the warrants were developed to quantify the above-perceived problems that residents raise in their traffic calming requests. In many jurisdictions, the warrants go beyond a simple minimum score required for traffic calming and also offer a means to rank or prioritize potential traffic calming sites through secondary evaluation criteria.

1.1 Document Purpose

The purpose of this document is to review best practices of jurisdictions throughout Ontario in the area of warrants that evaluate, rank and prioritize traffic calming requests. The review will lay the foundation for an appropriate warrant process for the City of Waterloo.

Specifically, the review analyzes the state of traffic calming in Ontario. As it is infeasible to review the practices of every Canadian or North American municipality that has implemented a traffic calming policy, the selected Ontario communities represent the forefront of traffic calming (through early adoption, unique practices or number of implementation sites), or they may share similar characteristics with Waterloo, e.g. similar size and/or suburban setting (i.e. Toronto is not used).

2. REVIEW OF BEST PRACTICES

2.1 Summary

CITY	TYPE OF RESTRICTION	DESCRIPTION
Cambridge	None	Prior to 2008 the Traffic Calming Policy stated that vertical deflections were undesirable on emergency response and transit routes. In the draft Traffic Calming Policy update this restriction has been removed in favour of allowing the consideration of all calming technique options within any location-specific context. This includes use of new vertical deflection measures such as speed cushions that accommodate large vehicles such as fire trucks and transit buses.
Kitchener	Vertical Deflections	Not permitted on transit routes, emergency response routes and major collectors.
London	None	Requires identification of speeding or cut-through traffic problems and then selecting appropriate measures. Speed cushions have been used and are acceptable to London Transit.
Ottawa	None	-
Hamilton	Speed Humps	Not recommended for routes comprising primary emergency response or transit routes.

Windsor	Vertical Deflections	No vertical deflections recommended on collector roads. The level of calming with the type of treatment is based on a scoring system for local vs. collector roads.
Pickering	None	All traffic calming measures can be considered for local, collector and Type C arterial roads.
Markham	Locational	No physical traffic calming considered on 4-lane collector roads. Emergency routes qualify for potential traffic calming where average speed is more than 55 km/h.
Vaughan	None	Use warrants to determine type of calming to use.
Oakville	None	Based on warrants.
Guelph	Locational	Traffic calming limited to local and 2-lane collector roads.
Kingston	Locational	Traffic calming only on local and collector roads.

Transport Canada has also identified a list of Canadian municipalities with significant traffic calming experience. The list, presented in **Exhibit 2-1**, was used as a starting point for the best practices review.

Exhibit 2-1: Canadian Municipalities with Significant Traffic Calming Experience

Municipality	Detailed Policy or Guidelines	Project Focus	
		Street	Area
British Columbia			
City of Burnaby			■
City of Coquitlam	■		■
Corporation of Delta	■		■
City of Kelowna	■ *		■
City of Langley	■		■
City of North Vancouver	■		■
City of Port Moody	■	■	
District of Saanich	■		■
City of Surrey	■		■
City of Vancouver	■		■
City of Victoria			■
District of West Vancouver	■	■	
Alberta			
City of Calgary	■		■
City of Edmonton			■
Saskatchewan			
City of Saskatoon			■

Municipality	Detailed Policy or Guidelines	Project Focus	
		Street	Area
Manitoba			
City of Winnipeg	■ +	■	
Ontario			
City of Ottawa	■ *		■
City of Oakville	■		
City of Markham	■ *		■
City of Pickering	■		■
City of Vaughan	■		■
City of Windsor	■		■
Quebec			
Gatineau	■		■
Montreal			■
Sherbrooke		■	
Quebec			■
New Brunswick			
City of Fredericton	■		■
Nova Scotia			
Halifax Regional Municipality	■ *		■

* Component of broader policies or guidelines for traffic management or road safety

\+ Limited to the use of speed humps

Traffic Calming in Canadian Urban Areas. Transport Canada. May 22, 2007. June 18, 2007. <http://www.tc.gc.ca/programs/Environment/UTSP/trafficCalming.htm>

2.2 Ontario

Most of the major cities and population centres in Ontario have used traffic calming to mitigate the negative effects of traffic within their neighbourhoods. These communities typically have official traffic calming policies, and most of them follow a warrant process for screening and prioritization. Some examples from Ontario are discussed below.

2.2.1 OTTAWA

The City of Ottawa implements traffic calming measures as part of a broad Area Traffic Management program. Other measures within the program include enforcement, education, transportation demand management and regulation. The City has developed extensive principles and procedures surrounding the concept of equity for all users of City roads. The Ottawa program is too detailed for full exploration within this report. Instead, this section will focus on the screening and prioritization process used by the City.

Initial requests for traffic management must come from one of three categories:

- At least 10 households or businesses or 25% of the homes/businesses of the affected area;
- The City Councillor for the ward; or

- The community association, school council, or business association for the area.

All requests then follow the same process. Some requests can be addressed through a "quick fix," such as replacement of a missing sign or an increased enforcement campaign. Another category of requests needs to be referred to other City departments. The remaining requests are subject to the Area Traffic Management Project Screening. The screening process requires the City to collect a variety of traffic data and apply it to a three-step screening process, as described in **Exhibit 2-2**.

Exhibit 2-2: City of Ottawa Traffic Management Screening Process

	Screening Results (complete tests 1 and 2 listed below)
Yes/No	One serious collision involving a vulnerable street user within the past three years
Yes/No	At least ONE of the Context Criteria and at least TWO of the Traffic Criteria met. (See Test One and Test Two below)
If either of the above is answered with YES, the issue is carried forward as a project.	

Test One - Context Criteria: the street/area must have the proper context, demonstrating susceptibility to negative impacts associated with traffic by meeting at least one of the following criteria:

Check All that Apply	**Context**
	Presence of schools, parks, community centres, or cluster of vulnerable street users (e.g. care facility, childcare centres, seniors' residences)
	Primarily residential frontage.
	Pedestrian activity levels which are not adequately served by pedestrian facilities.
	Pedestrian-oriented retail (e.g. "main street" district).

Test Two - Traffic Criteria: the City will collect or extract from its records sufficient data to determine if at least two of the following indicators are satisfied:

Meets Threshold (Check all that apply)		**Indicator**	**Measure**
Local or Collector	**Arterial**		
		Inappropriate driver behaviour	There must be clear evidence of inappropriate driver behaviour, characterized by a history of complaints and verified through enforcement efforts.
		Speed	15% of vehicles are traveling at or above 50 km/h unless the street is posted at a higher speed limit, in which case 15 % of vehicles must be traveling at or above the posted speed limit (i.e. same as the 85th percentile measurement). - or - 5% of vehicles are traveling at or above 60 km/h, unless the posted speed is higher than 50 km/h in which case 15 % of vehicles must be traveling 10 km/h or more above the posted speed limit (i.e. same as 95th percentile measurement).
	N/A	Volume	The average motorized traffic volume is at least:

			– 1000 vehicles per day or 120 vehicles per peak hour, if the street is a local street – 2500 vehicles per day or 300 vehicles per peak hour, if the street is a collector street – 5000 vehicles per day or 600 vehicles per peak hour, if the street is a major collector street
	N/A	Through traffic volumes	There must be tangible evidence of "through" traffic (defined as motorized vehicles using a lower classification road during an intermediate portion of a trip) exceeding 20% of the total traffic volume. Through traffic may include vehicles circling a neighbourhood to find parking.

Exhibit 3-4 Sample - Screening Checklist. City of Ottawa. June 25, 2007.
<http://www.ottawa.ca/residents/onthemove/driving/traffic/atm/exhibits/ex_3_4_en.html>

If a request satisfies the screening criteria, the next step is to categorize it as a localized or comprehensive study, as follows:

- Localized Studies:
  - Confined to one or few streets;
  - Local, collector or major collector streets (i.e. no arterials);
  - One clearly defined problem and limited potential for wider problem statement or study area;
  - Few or minor competing interests;
  - Solution(s) can be reasonably anticipated; and
  - Limited time and effort expected for completion.

Twice yearly, newly identified localized studies are added to an existing list of localized studies based on the prioritization worksheet presented in **Exhibit 2-3**. The top ranked studies (number undefined) are to be investigated over the following six months. Studies of selected projects that are not undertaken within the six-month period will carry over, even if newer studies score higher on the next ranking.

Exhibit 2-3: City of Ottawa Localized Study Prioritization Worksheet

Indicator	Point Score / Maximum Score	Local Roads	Collector Roads	Major Collector Roads
Inappropriate driver behaviour	/10	Up to 10 points if there is a history of complaints that can be verified through enforcement efforts		
Generators of vulnerable street users	/10	5 points per generator of vulnerable street users (schools, parks and community centres) on or in close proximity to street		
Pedestrian facilities	/10 (5 for local)	5 points if no sidewalk exists	10 points if no sidewalk exists; 5 points if one sidewalk exists	
Abutting land use	/10	Up to 10 points based percentage of street frontage that is primarily residential or pedestrian-oriented retail (e.g. "main		

Indicator	Point Score / Maximum Score	Local Roads	Collector Roads	Major Collector Roads
		street")		
15% of vehicles traveling at or over 50 km/h or speed limit	/15	1 point for every km/h over 50 km/h (or over posted speed limit if it is greater than 50 km/h)		
5% of vehicles traveling at or over 60 km/h (or if speed limit is more than 50 km/h, 15% travelling 10 km/h or more the speed limit)	/15	1 point for every km/h over 60 km/h (or 1 point for every km/h greater than 10 km/h over the posted speed limit if it is greater than 50 km/h)		
Motorized traffic volumes	/15	1 point for every 100 vehicles per day over 1000 or 1 point for every 10 vehicles per hour over 120 (in the busiest hour)	1 point for every 250 vehicles per day over 2500 or 1 point for every 25 vehicles per hour over 300 (in the busiest hour)	1 point for every 350 vehicles per day over 5000 or 1 point for every 35 vehicles per hour over 600 (in the busiest hour)
Through traffic volumes	/15	1 point for every 2% in the proportion of through traffic over 20% (minimum 20 through vehicles per hour)		
Collisions	/30	Ratio of collision rate to average collision rate (for streets or intersections, whichever is greatest).		
			Less than 0.75	0 points
			0.75 to 1.25	5 points
			1.25 to 2.0	15 points
			2.0 to 3.0	25 points
			Greater than 3.0	30 points
		If a vulnerable street user is involved in a collision within the most recent three-year period, the maximum of 30 points are given.		

Exhibit 3-5 Sample Prioritization Worksheet - Localized Studies . City of Ottawa. June 25, 2007. <http://www.ottawa.ca/residents/onthemove/driving/traffic/atm/exhibits/ex_3_5_en.html>

- Comprehensive Studies:
  - Affect several streets or entire neighbourhood;
  - May include arterials;
  - Many concerns that may be poorly defined;
  - Many or severe competing interests;
  - Solutions are not readily apparent; and
  - Significant expected time and effort.

Comprehensive studies are ranked using a similar prioritization process, as described in **Exhibit 2-4**. All comprehensive studies up for evaluation are ranked against each other on an indicator-by-indicator basis. The study with the most severe concern receives the full score for a particular indicator. The highest-ranking studies are then selected for implementation, based on available funding and resources required for completion within five years.

Exhibit 2-4: City of Ottawa Comprehensive Study Prioritization Worksheet

Indicator	Point Score (Relative to Other Projects)	
	Local or Collector	Arterial
Inappropriate driver behaviour	/10	/15
Generators of vulnerable street users	/10	/15
Pedestrian facilities	/10 (5 for locals)	/15
Abutting land use	/10	/10
15% of vehicles traveling at or over 50 km/h or speed limit	/15	/20
5% of vehicles traveling at or over 60 km/h (or if speed limit is more than 50 km/h, 15% travelling 10 km/h or more the speed limit)	/15	/20
Motorized traffic volumes	/15	N/A
Through traffic volumes	/15	N/A
Collisions	/30	/40

Exhibit 3-6 Sample Prioritization Worksheet - Comprehensive Studies. City of Ottawa. June 25, 2007. <http://www.ottawa.ca/residents/onthemove/driving/traffic/atm/exhibits/ex_3_6_en.html>

2.2.2 HAMILTON

As part of the development of its Transportation Master Plan, the City of Hamilton developed 23 policy papers on a variety of transportation engineering, planning and infrastructure topics, including traffic calming. These policy papers were endorsed in principle by Council on November 24, 2004 and are currently used to guide day-to-day decisions. Due to the fact that the policy papers were developed as part of a larger exercise (i.e. Transportation Master Plan), they are perhaps less formal than a stand-alone policy on a specific issue.

Prior to development of the policy paper, the City of Hamilton had implemented a number of traffic management and traffic calming plans in various neighbourhoods. In general, the neighbourhood-wide study approach was considered to be quite successful and generally preferred over a street by street approach. This comprehensive approach was carried through in the development of the City's traffic calming policy.

While not a specific warrant process, Hamilton's traffic calming policy distinguishes between existing and new neighbourhoods, and covers installations on an area-wide basis. Similar to Waterloo's current traffic calming policy, the Hamilton Policy includes a number of general guidelines as follows:

- Consider traffic calming as an effective means of reducing the negative impacts of traffic on the quality of life for Hamilton residents in existing and planned neighbourhoods and other built-up areas.
- Install traffic calming devices only where warranted and in accordance with current standards and existing City practices.
- On arterial roads, consider passive traffic calming devices and improvements that serve a number of travel modes before considering more restrictive methods such as road closures, one-way streets, all-way stop control, and speed humps.
- Build "naturally calm" streets in all new development and redevelopment areas.

In terms of the specific process for existing neighbourhoods, the process is as follows:

- The Traffic Engineering and Operations Department receives a request for traffic calming. The requests may come from various channels such as:
  - Council;
  - Other City departments;
  - Residents or businesses; or
  - Citizen complaints.
- The process described in **Exhibit 2-5** is followed to determine the need and justification for the project. The process was developed to minimize staff resources;

Exhibit 2-5: City of Hamilton Project Initiation Determination

Phase	Description	Product/Decision
Initial Screening Process	City Staff will: • Review previous complaint history and operational and/or safety review undertaken for the corridor or neighbourhood. • Undertake informal field investigations of the concerns, as necessary.	A decision whether a significant problem exists. Carry forward legitimate concerns to the quantification stage.
Quantify the Problem	City Staff will undertake or commission volume, speed, conflict or cut-through traffic studies, as required, to supplement existing data, information and reports	Quantified problem statement(s)
Determine Range of Potential Remedial Measures	City Staff will review the extent of the concerns and determine the most effective means of addressing the traffic-related concerns including enforcement, education, traffic control devices, traffic calming, etc.	If traffic calming is determined to be one of the prominent remedial measures, then carry the project forward to the ranking process
Study Area	City Staff will review the complaint location(s) and determine if the area of concern is a localized issue or a component of a larger neighbourhood or community issue.	Defined study area
Rank the Potential Projects	The project should be placed in City's annual traffic calming ranking process	Ranked priority corridors and neighbourhoods in the City for budget consideration

Traffic Calming Policy Paper. City of Hamilton. January 2005.

- The projects are then ranked by one of two means:
  - **Project Approval** - In a priority sequence, complete corridor and area traffic management studies for only those that can be reasonably implemented in within one fiscal year; or
  - **Funding Approval** - Complete corridor and area traffic management studies as staff resources permit and prioritize funding of completed plan.

Regardless of the approval process used, the requests are ranked using the system described in **Exhibit 2-6**. At the time of the policy paper, this ranking system was proposed as a suggested framework for further refinement.

Exhibit 2-6: City of Hamilton Ranking System

Criterion Measure	Criterion	Relative Weight
Speed	Points assigned for every km/hr above the posted speed	20%
Volume	Points assigned for every 100 vehicles above the "typical" volumes of the roadway based on its road classification / function. Points assigned for every percentage point above 20% non-local traffic.	20%
Collision History	Points assigned for every location that exhibits an "above average" collision history	20%
Pedestrians and Vulnerable Road Users	Points assigned based on high, medium or low pedestrian activity	20%
Adjacent Land Uses	Points assigned for community-based land uses, such as schools, community centres, churches, libraries, etc.	10%
Construction / Reconstruction	Points assigned for roadways scheduled for construction/reconstruction in the next fiscal year.	10%

Traffic Calming Policy Paper. City of Hamilton. January 2005.

The City of Hamilton also has a number of specific warrants for the following topics:

- Traffic Signals
- Intersection Pedestrian Signals
- All-way Stop signs
- Speed Limits
- Speed Humps

The speed hump policy was adopted prior to the development of the traffic calming policy paper. The policy, adopted in May 2000, supports the general concept of the use of speed humps and speed tables to control speeds on two-lane residential streets with a posted speed of 50 km/h or less and a demonstrated speeding concern. In addition, 75% neighbourhood resident support is required for implementation. Speed humps were not recommended for routes that comprise primary emergency response or transit routes. To date, speed humps have only been applied in a few neighbourhoods in Hamilton.

2.2.3 WINDSOR

The City of Windsor's traffic calming policy (September 2005) is one of the few policies reviewed for this project that differentiates policy in existing neighbourhoods from that of new neighbourhoods. The policy states that traffic calming should be constructed in all new neighbourhoods in accordance with the Official Plan road classification for the area. Selected policy statements for new developments include:

- Roundabouts or traffic circles at intersections between local roads;

- Curb extensions and sidewalk treatments at intersections of local roads with collectors;
- Straight sections of roadway greater than 300m in length require chicanes;
- Pedestrian generators require lane narrowings and pavement markings; and
- Extensive use of median islands, especially to discourage cut-through traffic.

The procedure for traffic calming on existing roads is more extensive in Windsor than in many other municipalities. Like many others, it begins with a resident request. The city then performs a detailed warrant study; however, this warrant study goes beyond the requested street to include other streets that may form the study area for a more comprehensive traffic calming project. Factors in determining the study area include school catchment areas, natural landforms and railways. If warrants are met, the City then requests the resident making the complaint to go door to door to with a petition that people must sign to initiate a further development of the traffic calming plan.

Windsor uses an extensive warrant process, considering the following factors, with a maximum score of 90:

- Excessive Speed – to a maximum of 20 points;
- Excessive Volume – to a maximum of 20 points;
- Bicycle Route – to a maximum of 10 points;
- Collisions – to a maximum of 15 points;
- Pedestrian Generators – to a maximum of 15 points; and
- Total Percentage Of Residential Frontage – to a maximum of 10 points.

Where the policy differentiates between collector and local roadways—and also from the policies of other jurisdictions—is how it then assigns the total score to appropriate traffic calming measures. **Exhibit 2-7** and **Exhibit 2-8** illustrate how the scores relate to the type of traffic calming that can be implemented, for local and collector roads, respectively, as well as the City's assessment of the impacts on speed, volumes, conflicts and the environment. For any project, traffic calming measures of a lower level can also be implemented.

Exhibit 2-7: City of Windsor Appropriate Traffic Calming Measures For Local Roads

Measure	Speed Reduction	Volume Reduction	Conflict Reduction	Environment
Level 1 Calming – Score 21<36 - Signing				
Maximum Speed	Minor	Nil	Nil	Nil
Right or Left Turn Prohibited	Nil	Minor	Minor	Minor
Through Traffic Prohibited	Nil	Minor	Minor	Minor
Passive signage (i.e.: Traffic Calmed Neighbourhood)	Nil	Nil	Nil	Minor
Level 2 Calming – Score 36<56 – Horizontal Deflection				
Chicane - Two Lane	Minor	Nil	Minor	Minor
Curb Radius Reduction	Minor	Nil	Nil	Minor
On Street Parking	Minor	Nil	Nil	Minor
Lane Narrowing	Minor	Nil	Nil	Minor
Raised Median Island	Minor	Nil	Minor	Nil

Measure	Speed Reduction	Volume Reduction	Conflict Reduction	Environment
Level 3 Calming – Score 56<76 – Horizontal Deflection				
Chicane - One Lane	Substantial	Substantial	Substantial	Minor
Curb Extension	Minor	Nil	Nil	Substantial
Traffic Circle	Substantial	Minor	Substantial	Substantial
Level 3 Calming – Score 56<76 – Diversion				
Intersection Channelization	Nil	Minor	Minor	Minor
Raised Median Through Intersection	Nil	Substantial	Minor	Minor
Right in / Right out Island	Nil	Substantial	Minor	Minor
Level 4 Calming – Score 76 < Max - Vertical Deflection				
Raised Crosswalk	Substantial	Nil	Minor	Minor
Raised Intersection	Minor	Nil	Minor	Minor
Sidewalk Extension	Minor	Nil	Minor	Nil
Speed Hump	Substantial	Minor	Substantial	Minor
Textured Crosswalk	Nil	Nil	Minor	Minor
Level 4 Calming – Score 76 < Max - Diversion				
Directional Closure	Nil	Substantial	Minor	Minor
Diverter	Nil	Substantial	Minor	Minor
Full Closure	Nil	Substantial	Substantial	Minor

Traffic Calming For Residential Areas Policy Paper. City of Windsor. September 2005.

If the warrant study finds that traffic calming measures are applicable, a petition is circulated among the affected residents. Support from 66% of all affected residences is required for the project to continue. Windsor's policy dates to a time when an EA was required for traffic calming implementation. The Class EA process was followed if the required level of support was achieved. It is not known how the policy will change now that an EA is no longer required.

Exhibit 2-8: City of Windsor Appropriate Traffic Calming Measures For Collector Roads

Measure	Speed Reduction	Volume Reduction	Conflict Reduction	Environment
Level 1 Calming – Score 31<46 - Signing				
Maximum Speed	Minor	Nil	Nil	Nil
Right or Left Turn Prohibited	Nil	Minor	Minor	Minor
Through Traffic Prohibited	Nil	Minor	Minor	Minor
Passive signage (i.e.: Traffic Calmed Neighbourhood)	Nil	Nil	Nil	Minor
Level 2 Calming – Score 46<76 – Horizontal Deflection				
Chicane - Two Lane	Minor	Nil	Minor	Minor
Curb Radius Reduction	Minor	Nil	Nil	Minor
On Street Parking	Minor	Nil	Nil	Minor
Lane Narrowing	Minor	Nil	Nil	Minor
Raised Median Island	Minor	Nil	Minor	Nil
Level 3 Calming – Score 76 < Max - Horizontal Deflection				
Curb Extension	Minor	Nil	Nil	Substantial
Level 3 Calming – Score 76 < Max - Diversion				
Intersection Channelization	Nil	Minor	Minor	Minor
Raised Median Through Intersection	Nil	Substantial	Minor	Minor
Right In / Right Out Island	Nil	Substantial	Minor	Minor

Traffic Calming For Residential Areas Policy Paper. City of Windsor. September 2005.

Recent conversations with City of Windsor staff revealed that the warrants process is generally working well. One specific challenge is that streets that already have a 40 km/h speed limit meet the warrants more readily than streets posted at 50 km/hr, since the excessive speeding component of the warrant compares observed speeds to posted speeds. This places streets that already have a 40 km/h speed limit at an advantage, even though the severity of traffic problems on a street posted at 50 km/h may be greater. Another challenge in Windsor is that people are generally resistant to traffic calming as their opinions are based on a few examples from several years back that were not aesthetically pleasing. This resistance, and the fact that the petition portion of the warrants process requires someone to go door to door, makes it difficult to gain neighbourhood acceptance. The City is currently looking into using the 311 system to make the petition process easier.

2.2.4 PICKERING

The City of Pickering implemented its traffic calming policy in January 2003. The policy limits physical traffic calming measures to local, collector and Type C arterial roadways in the city. Traffic calming requests are addressed on a first-come, first-served basis. The Safer Streets Traffic Calming Review Committee must approve all proposed sites before recommendation to Council. This committee includes representatives from each of the following areas or city departments: fire, police, ambulance, transit, Planning & Development, Roads, and Traffic, and one resident appointed from City Wards 1 – 3 each. The committee has the ability to deny requests based on factors such as emergency vehicle response times, maintenance or transit operations.

Those requests that are approved are sent to the city Traffic Section for further study, including traffic speed and volume. The site is compared against a checklist as shown in Markham.

2.2.5 MARKHAM

Traffic calming in the Town of Markham is one component of the Markham Safe Streets Task Force (MSSTF). The goal of the MSSTF is to change driver behaviour through education, enforcement and engineering. Traffic calming falls under the engineering category.

Markham has a history of installing speed humps as their primary traffic calming measure on existing roadways. Before and after studies indicate an average speed reduction of 10 km/h. The MSSTF recommends that speed humps continue to be installed as part of the overall City strategy. Measures such as horizontal deflection, short block lengths and connector roads are encouraged for new developments.

However, the Town has realized that physical traffic calming measures on their own are not a suitable solution to reducing speeds, aggressive driving and other traffic-related problems in on its roads. In addition, some measures, particularly speed humps, serve to hinder transit and emergency services operations, as well as the movement of goods and people through the Town. As a result, the MSSTF has approved the following criteria for considering physical traffic calming measures:

- **Major 4-Lane Collector Roads –** These roads are geared towards the enforcement and education components of the MSSTF, and therefore no physical traffic calming measures are to be installed except for heritage districts, e.g. Unionville;

- **Industrial/Commercial Park Roads –** As above. Enforcement and education only;

Exhibit 2-9: City of Pickering Traffic Calming Review Checklist

City of PICKERING

Traffic Calming Review Checklist

DATE: _____

STREET: _____

MINIMUM CRITERIA

Facility Type	☐ Local	☐ Collector	☐ Type 'C' Arterial
Length of Facility	☐ Greater than 300 metres		
Number of Lanes	☐ Maximum of 2		
Local Road			
85th Percentile Speed	_____ km/h	☐ Exceeds 55 km/h	
AND/OR			
Infiltrating Traffic	_____ v/d of	_____ v/d	☐ Exceeds 30%
Collector Road/Type 'C' Arterial			
85th Percentile Speed	_____ km/h	☐ Exceeds 57 km/h	
AND/OR			
Infiltrating Traffic	_____ v/d of	_____ v/d	☐ Exceeds 30%

Note: The Traffic Calming request will be denied if any of the above criteria is not satisfied.

SECONDARY CRITERIA **POINTS**

Transit Route	☐ Yes (0 Points)	☐ No (1 Point)		_____
Emergency Route	☐ Yes (0)	☐ No (1)		_____
Collision Experience	☐ Less than 3/year (0)	☐ More than 3/year (1)		_____
Pedestrian Generators	☐ Yes (5)	☐ No (0)		_____
Residential frontage	☐ < 60% (0)	☐ > 60% (1) + (1)/10%		_____
Service Function	☐ Traffic (0)	☐ Land Use (1)	☐ Combination (.5)	_____
Traffic Volumes	_____ v/d	☐ > Capacity (1)	☐ < Capacity (0)	_____
Roadway Grade	☐ < 5% (1)	☐ < 10% (.5)	☐ > 10% (0)	_____
Posted Speed Limit	☐ 40 km/h (0)	☐ 50 km/h (0)	☐ 60 km/h (0)	_____

Point Assessment Total Points _____

Low Priority 0-5 Medium Priority 6-10 High Priority 11+

Note: Point system is not a warrant but rather a mechanism for reporting and discussion.

Traffic Calming Request Status

☐ Approved for further review ☐ Request Denied

Safer Streets Traffic Management Strategy Traffic Calming Policy. City of Pickering. January 2003.

- **Priority Routes (Emergency Services and Public Transit) –** Average speeds (not 85th percentile) must be greater than 55km/h to qualify for physical traffic calming. Otherwise, these roads will also be the target of education and enforcement campaigns; and

- **All Other Roads –** Average speeds must be greater than 50km/h to qualify for physical measures, **but only after the implementation of enforcement and education initiatives**.

An appendix attached to the MSSTF outlines a method of technical evaluation of neighbourhood traffic problems and the selection of appropriate corrective measures. The contents of the appendix are taken from the Markham Transportation Committee *Guidelines for Neighbourhood Traffic Improvement Projects* (September 22, 1998) and are modelled on ranking and scoring systems developed by ITE and the City of Seattle. As with many other municipalities, the model assigns points to the collision history, traffic volumes and traffic speeds of the identified roadway. The MSSTF does not describe how particular measures are chosen from a street's total score, but it does indicate that solutions have come out of various public meetings that require traffic calming and traffic management to be implemented on a broader scale, rather than just a particular street or block.

The end result is a traffic calming process as follows:

- Resident(s) request traffic calming on a particular street or neighbourhood;

- City of Markham Transportation Safety Committee (TSC) conducts a traffic operational study;

- The road is classified (major 4-lane collector, industrial/commercial, priority route, other);

- The MSSTF ranking system is used to prioritize the request;

- TSC and Council approve or deny the request; and

- The Safe Streets strategy (education and enforcement first) is followed if the request is approved.

Finally, if the request reaches a point where a physical traffic calming plan is developed and presented at a public meeting, 60% of affected property owners—defined as having frontage on the "defined catchment area"—must approve the plan for it to be implemented.

2.2.6 VAUGHAN

The Town of Vaughan implements traffic calming through two primary mechanisms, namely, the development approvals process and the Neighbourhood Traffic Committees. In the former case, the City stipulates the preparation of a Traffic Management Plan as part of residential subdivision approval. In the latter case, Neighbourhood Traffic Committees are formed through Council direction and members of the Committee work with the Town's Engineering department to prepare a traffic calming plan to address volume, speeding and safety concerns.

The Town has developed warrants for speed humps, raised intersections, curb extensions, road narrowing and chicanes, which are the primary types of installations used in their neighbourhoods. The warrant process used in Vaughan is not as complex as in many other jurisdictions, as shown in **Exhibit 2-10**.

Exhibit 2-10: Town of Vaughan, Where Traffic Calming Measures are Permitted

Traffic Calming Measure	Through Traffic Committee Process (Existing Areas)	Through Traffic Management Plan (New Developments)
Speed Hump	Subject to Warrant 1	No
Raised Crosswalk	Subject to Warrant 1	With Pedestrian Signal Only on Primary Roads
Raised Intersection	Where Possible	Yes
Roundabout	Yes	Yes
Median	Subject to Warrant 2	Yes
Curb Extension/Road Narrowing	Subject to Warrant 2	Yes
Chicane	Subject to Warrant 2	Yes
Contrasting Materials	Yes	Yes
Pavement Markings	Yes	Yes
Warning Signage	Yes	Yes

Warrant 1 – Speed Humps and Raised Crosswalks

Speed humps and raised crosswalks can be considered in existing residential areas only where the following three warrants are met:

- The street is not a primary emergency response route. The determination of whether a street is a primary emergency response route shall be made in consultation with the Engineering and Fire Departments.
- The speed limit is 50 km/h or less.
- The average speed on the street is measured to be 10 km/h greater than the speed limit.

Warrant 2 – Medians, Curb Extensions/Road Narrowings and Chicanes

Medians, curb extensions/road narrowings and chicanes shall be considered in existing areas only where the following two warrants are met:

- The speed limit is 50 km/h or less.
- The average speed on the street is measured to be 10 km/h greater than the speed limit.

Primary Roads are roads in new developments having a pavement width of 11.5 metres. This provides one travel lane in each direction, and space for on-street parking.

Traffic Calming. City of Vaughan. 2007. June 20, 2007.
<http://www.city.vaughan.on.ca/vaughan/departments/traffic_transportation/traffic_3.cfm>

2.2.7 OAKVILLE

The City of Oakville approved its traffic calming policy in 2003. That year, city staff surveyed 130 locations using the warrant process described below and found that 78 locations qualified for some sort of remedial traffic calming implementation.

Like many other jurisdictions, the Oakville traffic calming policy includes two warrants and a prioritization process. The warrants and methodology were developed via a best practices review and public workshop stakeholder input. Oakville uses two speed warrants, as shown in **Exhibit 2-11**.

Exhibit 2-11: City of Oakville Speed Warrant

Number of Possible Points	40 km/h Posted Speed**	Number of Possible Points	50 and 60 km/h Posted Speeds
0 to 100	85th speeds (10 points for every km/h 10 km/h over posted speed	0 to 100	85th speeds (10 points for every km/h 11-12 km/h over posted speed
0 to 100	High End Speeds (1 point for every high end speeder)	0 to 100	High End Speeds (1 point for every high end speeder)

City of Oakville Traffic Calming Policy for Retrofit Situations Final Report. iTRANS Consulting, Inc. May 2003.

High end speeders are defined as traffic exceeding the posted speed limit by 15, 17 or 20km/h, for a posted speed of 40, 50,or 60 km/h, respectively. For roads with less than 500 vehicles per day, a minimum of 25 vehicles must satisfy this criterion.

Roadways are then ranked within three categories, in order of most tolerance for speeding to least, based on stakeholder input: arterials, local and collector roads, and roads fronting onto elementary schools. The roads are then ranked based on the exposure criteria shown in **Exhibit 2-12**.

Exhibit 2-12: City of Oakville Traffic Calming Exposure Methodology

Possible Number of Points	Exposure Criteria
0 to 15	5 points assigned for every pedestrian public facility (such as parks, playground, community centers, schools, seniors centre, religious institutions or other public institution) that generates a significant number of pedestrians on the street
0 to 15	1 point assigned for every residential driveway per 100 metres (on both side of the roadway)
0 to 10	5 points assigned for streets without sidewalks on one side 10 points assigned for streets without sidewalks
0 to 30	Average of 1 to 3 collisions per year over the past 3 years - 10 points for each average collision
70	**TOTAL POINTS**

City of Oakville Traffic Calming Policy for Retrofit Situations Final Report. iTRANS Consulting, Inc. May 2003.

The product of the warrant score and the exposure score are used to determine the rankings of the studied roads. The City of Oakville requires passive traffic calming measures to be implemented on any qualifying roadways before physical measures.

2.2.8 GUELPH

The City of Guelph implemented their traffic calming policy in 1998, and it was revised in November 2006. The policy outlines criteria for the implementation of traffic calming measures on local roads and two-lane collector roads, explicitly excluding arterials and multi-lane roadways so that they can perform their primary functions of moving traffic through and around the city.

The goals and objectives of the Guelph policy are primarily to improve public safety and general liveability of neighbourhoods by reducing vehicle speeds, discouraging “cut-through” traffic and minimizing conflicts between all road users.

The Guelph policy outlines 12 principles that are to be followed for the selection and implementation of traffic calming measures. These principles are generally inline with the Environmental

Assessment (EA) process that was previously required for traffic calming implementation. It is not known at this time if the Guelph policy will change now that the EA requirement has been lifted.

Traffic calming requests that come from residents are handled on a first-come, first-served basis. The next step is data collection on the requested street(s). The collected data is used to quantify the problem with a simple volume and traffic speed warrant, as shown in **Exhibit 2-13**.

Exhibit 2-13: City of Guelph Neighbourhood Traffic Review Criteria

Road Classification	Speed		Short-Cutting Traffic		Volume			
Local Roadway	IF	85th percentile ≥ 55 km/hr	OR	Infiltrating traffic exceeds 30%	AND	> 900 vehicles per day	➔	Initiate Traffic Review
Two-lane Collector Roadway	IF	85th percentile ≥ 60 km/hr	OR	Infiltrating traffic exceeds 30%	AND	> 2000 vehicles per day	➔	Initiate Traffic Review

Neighbourhood Traffic Management Policy. City of Guelph. July 1998 (revised January 24, 2006).

If the above criteria of the warrant are not satisfied, city staff notifies the applicant, and the requested streets are excluded from further review for 24 months.

If the criteria are met, the applicant is required to distribute a petition to households on staff-identified streets. A 60% response rate is required for further action, with a minimum of 60% of the responses in support of the request. Following a process of public meetings, development of a possible plans and the selection of a preferred draft plan, another survey is distributed. A minimum of 60% of all surveys returned to the city must be in favour of the recommended plan for implementation to occur.

2.2.9 KINGSTON

The City of Kingston currently does not have an official traffic calming policy. To date, the city has completed at least one pilot project, the installation of speed humps and curb extensions on Hudson Drive.

This project arose from resident complaints and requests for traffic calming measures to be implemented on Hudson Drive as well as two other city streets. In 2003, Council asked the Engineering Division to prepare a report to discuss the effectiveness of traffic calming on these streets, and to develop a system that could be used to prioritize and rank the three roads. Kingston modified the City of Toronto traffic calming warrants for their own needs, and produced a ranking table. As the table was designed to rank competing sites, no minimum score was required for traffic calming implementation; however, the volume and speed warrants needed to meet the established minimum criteria.

An EA was conducted for this study as was required at the time. The city has monitored the measures since installation and has deemed them a success. The city has since directed the Transportation Department to develop a traffic calming policy for the city based on the approach of the pilot project.

2.3 Elsewhere in Canada

On a neighbourhood level, the traffic calming policies, practices and implementation processes of large cities are often similar to those of suburban communities and smaller cities. Research

supports this assertion, evidenced by various smaller communities in Ontario adopting and adapting the traffic calming policies of Toronto or Seattle, for example. However, to focus the research effort for the rest of Canada, emphasis was placed on the practices and policies of communities that may be similar to Waterloo, particularly in terms of population and/or suburban setting.

British Columbia is the leader in traffic calming outside of Ontario, and perhaps throughout the entire country. As such, this section consists of current practices in three of its municipalities.

2.3.1 DELTA, BRITISH COLUMBIA

Delta is a district municipality in the British Columbia lower mainland, located midway between Vancouver and the Washington border. Its population is approximately 103,000. Its traffic calming policy, established in March 2003, applies only to its urban roads, and not rural or agricultural roads. Traffic calming studies can be initiated by staff, Council or by resident request. When initiated by residents, requests are evaluated based on the screening process shown in **Exhibit 2-14**.

Exhibit 2-14: Delta, British Columbia Preliminary Scoring for Local Roads

Criteria	Points	Basis for Point Assignment
Speed	0 to 25	85th percentile traffic speeds more than 5 km/h above the posted limit. (5 points for every km/h)
Volume	0 to 25	Average daily traffic volumes (1 point for every 100 vehicles)
Total Points Possible	50	

Neighbourhood Traffic Calming Policy and Procedures, The Corporation Of Delta, British Columbia, March 2003.

Any requests that do not score at least 25 points are removed from consideration. Council prioritizes the candidate projects for funding during their annual budget process. Surveys are sent to all households and businesses in the study area of candidate sites that score at least 25 points. Study areas are defined as the residents and businesses of a street with traffic speed problems, or the residents and businesses of a neighbourhood, if the problem is traffic infiltration. A 50 percent survey rate of return is required, and a majority of responses must be in favour of the project in order for it to advance to the budget consideration stage.

Further prioritization criteria include the following, but the quantification method is not explained:

- Safety performance;
- Traffic characteristics;
- Physical characteristics; and/or
- Environment.

2.3.2 KELOWNA, BRITISH COLUMBIA

The City of Kelowna's Neighbourhood Traffic Management Policy (June 2001; last reviewed April 2006) does not include a warrant process for traffic calming implementation, but it does describe the prioritization process. The first prioritization criterion is the resident request. Locations that do not receive requests for traffic calming will not be considered by the city. Secondary criteria include:

- Number of request locations. Note: refers to number of issues or locations within a neighbourhood, not the number of requests for calming;
- Number of reported collisions within each neighbourhood (excluding arterials);

- Sidewalks in pedestrian areas;
- Locations where road geometry is known to be poor;
- Pending road improvements that may address resident concerns; and
- Planned roadway rehabilitation that may offer an opportunity to implement traffic calming measures.

The secondary criteria are rated on a significance scale of 1 through 5.

Kelowna will only develop traffic calming plans on an area-wide, neighbourhood basis, even if the measures can be implemented at a single point. This ensures that selected measures are appropriate for the whole neighbourhood and that the implementation of calming in a particular location does not simply shift the problem to adjacent streets. To address this, the City has developed boundaries for 50 neighbourhoods. These boundaries will serve as the study area for traffic calming requests. Where necessary, the City will merge neighbourhoods for a particular request.

2.3.3 SAANICH, BRITISH COLUMBIA

The District of Saanich is located just north of Victoria on Vancouver Island. Its population is approximately 110,000. Under its traffic calming policy (2000), resident requests for traffic calming are first evaluated against the criteria in **Exhibit 2-15**, with a minimum score of 40 required for traffic calming consideration. For area-wide requests or those consisting of more than one location, scoring is done for the location with the greatest problems, as perceived by the resident(s) submitting the request.

Localized requests are processed on a first-come, first-served basis; however, wide area requests are ranked and prioritized on the basis of **Exhibit 2-16**. The street with the worst traffic calming situation is used in the assessment.

Exhibit 2-15: Saanich, British Columbia Criteria for Determining Eligibility of Traffic Calming Applications

Criteria	Points	Basis for Point Assignment
Speed	0 to 50	85th percentile speed of traffic. (1 point will be allocated for every kph the 85 percentile speed is over stated speed limit, based on speed reader board information supplied by applicant)
Volume	0 to 50	Average daily traffic volumes (1 point assigned for every 100 vehicles, based on traffic count done whilst using speed reader board)
Education	10	Motorist education program used to no avail.
Enforcement	10	Enforcement program used to no avail.
Total Points Possible	**120**	

Manual on Policy and Procedures for Traffic Calming in Saanich, The District of Saanich, British Columbia, June 2000.

Exhibit 2-16: Saanich, British Columbia Ranking of Area Wide Traffic Calming Applications

Criteria	Points	Basis For Point Assignment
Speed	0 to 50	85 percentile speed of traffic. 5 points will be allocated for every kph the 85 percentile speed is over stated speed limit

Criteria	Points	Basis For Point Assignment
Volume	0 to 50	Average daily traffic volumes (1 point assigned for every 100 vehicles
Vehicle Collisions	0 to 25	Average number of vehicle collisions over the last 3 years, based on police reports. Five points will be allocated for every collision in an average year.
Elementary Schools	0 to 10	5 points assigned for each school zone in the street
Pedestrian Generators	0 to 15	5 points assigned for each public facility (such as parks, community centres, and high schools) that generates a significant number of pedestrians on the street
Safe Route to School	0 to 5	5 points assigned for a safe route to school on the street
Bicycle Routes	0 to 5	5 points assigned if the street is a designated bicycle route
Transit Streets	0 to 5	5 points assigned if the street is a designated transit route
Pedestrian Facilities	0 to 5	5 points assigned if there is no continuous sidewalk on at least one side of the street.
Total Possible Points	170	

Manual on Policy and Procedures for Traffic Calming in Saanich, The District of Saanich, British Columbia, June 2000.

3. SUMMARY AND CONCLUSIONS

Exhibit 3-1 summarizes many of the major traffic calming criteria used by the jurisdictions reviewed in this report. It should be noted that the list is not comprehensive: some of the jurisdictions use screening criteria not on the list below, while other jurisdictions may in fact use some of the unchecked criteria but do not make it clear either in their policies or their websites. The City of Kingston is not included in this table since the literature reviewed does not explicitly indicate their warrant criteria; instead, it indicates that the City of Toronto was used as a model.

It can be seen that while no standard traffic calming warrant exists, most jurisdictions offer variations on a theme. Traffic volumes, speeds and collision histories are the most commonly used criteria, each used by at least 67% of the studied jurisdictions. Pedestrian and/or bicycle concerns (not including sidewalks) are also used in nearly 60% of the jurisdictions. These predominant criteria indicate a strong desire to ensure safety of neighbourhoods and local communities, as traffic calming measures are most often applied to local roadways.

The community-based impetus behind traffic calming measures is further illustrated in the number of jurisdictions that rate cut-through traffic, schools and residential frontage/density as important factors in their warrant processes.

There is also no standard application of traffic calming measures for local versus collector roads, or for local versus area-wide studies. While many jurisdictions do implement different warrant criteria based on facility or area type, no standard practice prevails.

Exhibit 3-1: Studied Jurisdictions vs. Major Traffic Calming Criteria

Jurisdiction	Criteria																
	Operating Speed	Traffic Volumes	Block Length	Transit Route	Collision History	Land Use	Facility Type	Emergency Route	Grade	Pedestrian and/or Bicycle Concerns	Sidewalks	Cut-Through Traffic	Pending or Planned Improvements	Other Programs	Schools	Residential Units/Frontage	Number of Requests / Complaints
Ottawa	X	X			X	X	X			X		X				X	
Hamilton	X	X		X	X	X	X	X		X			X		X		
Windsor	X	X			X					X						X	
Pickering	X	X	X	X	X		X		X	X		X				X	
Markham	X	X			X		X										
Vaughan	X							X									
Oakville	X				X					X	X					X	
Guelph	X	X										X					
Delta	X	X			X												
Kelowna					X						X		X				X
Saanich	X	X		X	X					X				X	X		

The above exhibit indicates the following:

- All jurisdictions with the exception of Kelowna take vehicle speeds and/or volumes into account;
- Collision history is the next highest-utilized factor, used in all but five jurisdictions;
- Pedestrian generators and facilities (sidewalks), and adjacent land uses, typically specified as residential or schools, are widespread in their application;
- No jurisdictions explicitly consider whether a road is a truck route. This may be taken into consideration by the roadway type, e.g. limited traffic calming implementation on arterials and industrial collectors (c.f. Markham); and
- The number of jurisdictions that explicitly consider emergency and transit facilities is lower than expected, although many jurisdictions may consult with their EMS and transit agencies during the study process.

While not addressed explicitly in most traffic calming policies or warrants, it is understood that minimizing staff time and effort is a critical step in the process. The very nature of a traffic calming warrant, in addition to presenting an equitable procedure for the need and justification of traffic calming measures, is to minimize the level of effort necessary to reach a decision. The warrant process is designed for ease of application, as in many cases the traffic data required for the

warrant process can be collected quickly and inexpensively, and much of the other information (e.g. adjacent land uses, roadway classification, collision history) is data that may already be on file.

Two examples that stand out as being potentially onerous on staff are Hamilton and Windsor. In the case of Hamilton, the adopted approach of conducting a neighbourhood wide traffic management study usually requires a formal staff project manager and several moths to complete. The City generally requires the assistance of a consultant due to the nature of the approach and strong emphasis on consultation. However, there may be savings in resources in that once a study has been completed for a neighbourhood, this usually resolves most issues and minimizes on-going requests for further traffic calming. In the case of Windsor, the complexity of the warrants process means that more work may be required by staff to evaluate the warrants; however, this was not raised as a concern in discussions with Windsor staff.

4. LINKS TO MUNICIPAL TRAFFIC CALMING WEBSITES

The following municipal websites were consulted in preparing this document. Specific policy and other documents are directly referenced in the text above.

- **Toronto**—http://www.toronto.ca/transportation/traffic/traffic_calming.htm
- **Hamilton**—http://www.myhamilton.ca/myhamilton/CityandGovernment/CityDepartments/PublicWorks/CapitalPlanning/StrategicPlanning/StrategicEnvironmentalPlanningProjects/GRIDS/Transportation+Master+Plan.htm
- **Ottawa**—http://www.ottawa.ca/residents/onthemove/driving/traffic/atm/index_en.html
- **Windsor**—http://www.citywindsor.ca/001440.asp
- **Pickering**—http://cityofpickering.com/standard/services/traffic/calming.html
- **Markham**—http://www.markham.ca/Markham/channels/engin/transportation/trafficcalming.htm
- **Vaughan**—http://www.city.vaughan.on.ca/vaughan/departments/traffic_transportation/traffic_index.cfm
- **Oakville**—http://www.oakville.ca/trafficcalming.htm
- **Guelph**—http://guelph.ca/living.cfm?itemid=46346&smocid=1809
- **Kingston**—http://www.cityofkingston.ca/residents/transportation/streets/trafficcalming/index.asp
- **Waterloo**—http://www.city.waterloo.on.ca/DesktopDefault.aspx?tabid=1097
- **Delta**—http://www.corp.delta.bc.ca/EN/main/residents/272/907/traffic_calming.html
- **Kelowna**—http://www.city.kelowna.bc.ca/CM/Page376.aspx
- **Saanich**—http://www.saanich.ca/resident/roads/trafficcalm.html