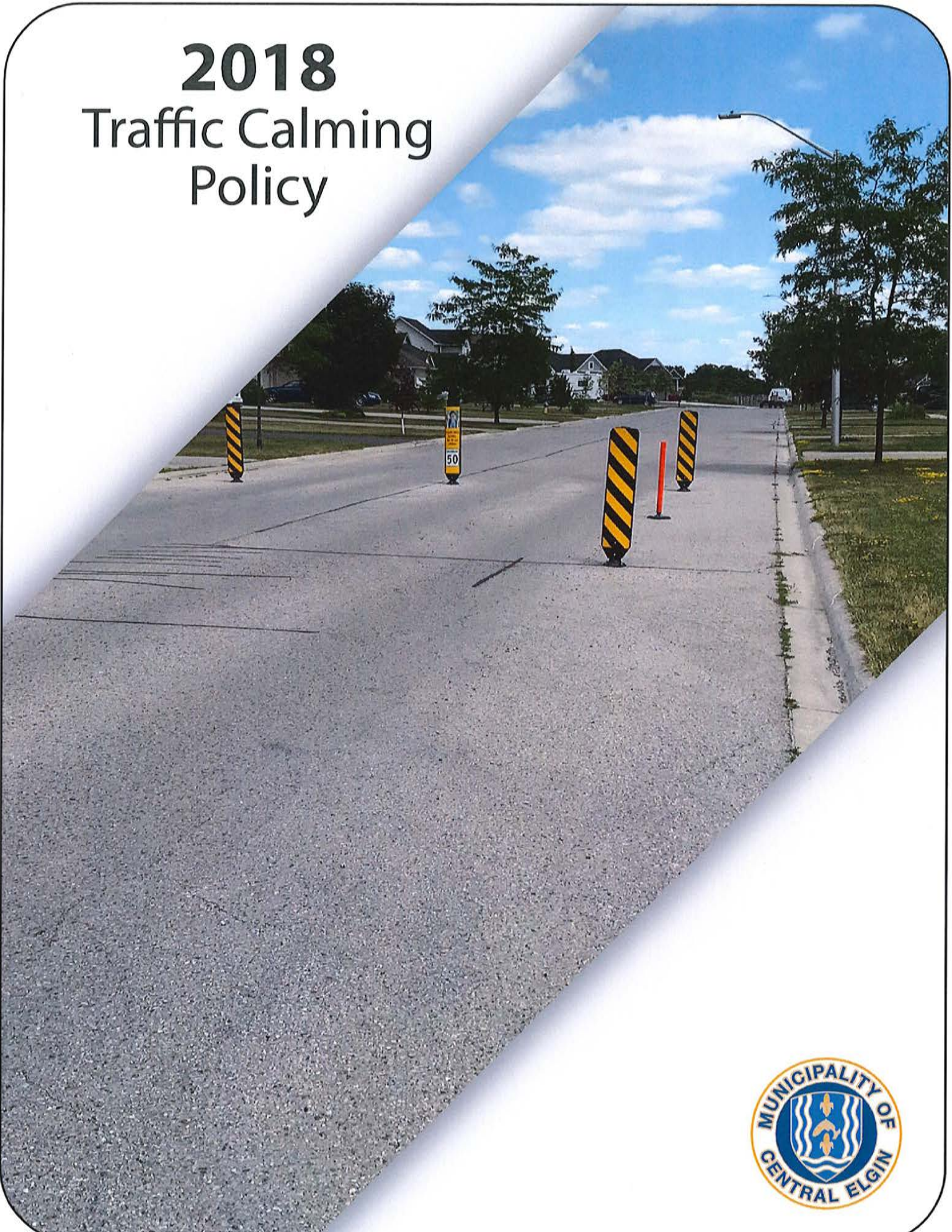


2018 Traffic Calming Policy



ACKNOWLEDGEMENTS

The source of some of the material that was used for this policy was retrieved from the following Municipality's:

1. Town of Oakville, ON
2. City of London, ON

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MUNICIPALITY OF CENTRAL ELGIN – TRAFFIC CALMING PROGRAM

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1. INTRODUCTION

1.1 Background

The Municipality of Central Elgin is responsible for ensuring its roadways and pedestrian facilities are safe for all users including motorists, cyclists and pedestrians including those with accessibility needs. Concerns are raised by citizens of Central Elgin every year in regards to vehicles speeding through residential neighborhoods. Municipal Staff responds by measuring traffic volumes and speed to assess the need for traffic calming devices.

1.2 Purpose

Traffic Calming can be a contentious issue in neighborhoods with many differing options on the need or solution for speeding problems. The Municipality needs a clear and concise policy for the implementation of traffic calming so that all complaints / requests are dealt with equally and efficiently. This policy will also require public participation from local residents so that the process is open and transparent.

1.3 What is Traffic Calming

Traffic Calming has been defined by the Institute of Transportation Engineers as “The combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users.” The main function of the policy is to slow traffic speeds in neighbourhoods where this policy dictates traffic calming is required. Examples of devices that are not traffic calming devices are; unwarranted all way stop, 40km/hr zones, children at play signs, speed limit signs, rumble strip and speed bumps (not to be confused with speed humps).

1.4 Advantages and Disadvantages of Traffic Calming

Below some of the advantages and disadvantages of traffic calming are listed:

Advantages

- Reduced vehicle speeds
- Reduced traffic volumes
- Improved neighbourhood safety and livability
- Reduced conflict between roadway users

Disadvantages

- Potential increase in emergency vehicle response time
- Reduced ease of access to neighbourhoods
- May result in expensive solutions
- May shift or divert traffic onto other streets
- Increased maintenance times and costs
- Result in implementation of devices some find unattractive

2. TRAFFIC CALMING MEASURES

This section of the policy provides a brief description of each traffic calming technique that is appropriate for use in the Municipality of Central Elgin.

2.1 Measures for use in the Municipality of Central Elgin

The Canadian Guide to Neighbourhood Traffic Calming identifies traffic calming techniques that are commonly used in Canada. The Guide does however, note that not all measures that have been used for traffic calming are appropriate for traffic calming measures. Some measures, such as stop signs and maximum speed signs, for example, should not be used for traffic calming purposes. Although effective for other purposes, these measures are not recommended for use as traffic calming techniques in Central Elgin.

The Measures are organized into the following categories;

- passive traffic calming – simple modifications that are intended to visually reduce the effective lane width for a motorist
- vertical deflection traffic calming – provides obstructions or changes in pavement height that vehicles are able to travel over but cause discomfort when travelling at excessive speeds
- horizontal traffic calming measures – tries to prevent vehicles from travelling in a straight line at excessive speeds
- physical obstructions – involve full or partial closure of the road.

2.2 Passive Traffic Calming Measures

2.2.1 Neighbourhood Sign

The “Drive Slowly Think of Us” sign is an informational sign used to remind motorists to slow down in a residential area where residents are concerned about the safety of their neighbourhood. Over use of these types of sign can have a negative impact on motorist activities, therefore these signs should be limited to areas where motorist are entering a residential area off of a highway where they were previously running higher speeds.



2.2.2 SIDEWALK EXTENSION / TEXTURED CROSSWALK



Source: City of Ottawa

Description and Purpose:

A sidewalk extension is a sidewalk continued across a local street intersection at the level of the roadway. Textured/patterned elements that contrast the roadway can be incorporated into the sidewalk extension.

The purpose of a sidewalk extension is to visually enhance a pedestrian crossing location so drivers become more aware of its presence. It is not intended to indicate whether drivers or pedestrians are required to yield (traffic must comply with local or provincial regulations governing the type of pedestrian crossing system being enhanced by the sidewalk extension / textured crosswalk).

With a sidewalk extension/textured crosswalk the continuation of the surface and enhanced visual/tactile identification of the crosswalk area emphasizes pedestrian priority.

Design Details: Chapter 4, Section 4.5.1

Advantages:

- ▶ Conflicts:
 - Extension of sidewalk and textured surface reinforces pedestrian priority and may reduce pedestrian-vehicle conflict
 - Visually-impaired pedestrians are better able to differentiate between the sidewalk and the travelled portion of the street if crosswalk is appropriately textured and detectable
- ▶ Environment: Textured treatment enhances appearance of street, particularly when combined with other landscaping techniques
- ▶ Other: No effect on resident access, on-street parking and police enforcement

Disadvantages:

- ▶ Active Transportation and Transit:
 - May result in a false sense of pedestrian security, if not accompanied by pedestrian right-of-way legislation
 - Textured surfaces may create traction and/or stability problems for seniors, the disabled, and wheelchairs

2.2.2 SIDEWALK EXTENSION / TEXTURED CROSSWALK

‣ Maintenance:

- Asphalt and textured pavement will settle differently and requires ongoing maintenance to repair uneven transition between surfaces
- Textured surfaces may increase street sweeping time if texturing incorporates deep grooves, and some dust and debris may remain in the grooves
- Less effective in winter conditions due to snow/ice cover

‣ Other: Rough or pronounced texturing may create additional noise from vehicle wheels

Limited or No Data Available (Further Research Encouraged):

- Speed reduction
- Traffic volume reduction

Applicability:

- Road Classification: Local, collector and arterial streets; urban commercial streets
- Traffic Conditions: All traffic volumes, with consideration of buses and heavy vehicles on truck routes
- Roadway: Urban cross-section – curb and gutter; sidewalks exist along street

Elements to Consider:

- May be used in combination with other measures, such as raised intersection or curb radius reduction

Cost:

- Low – Medium
 - Cost varies depending on width of roadway, labour and material costs

2.2.3 Targeted Enforcement

The Municipality can request the OPP provide targeted enforcement of the speed limits. The OPP do this regularly at the request of staff and residents. Targeted enforcement is used to make drivers more aware of their speed. It also can be used after data analysis from the Municipality's smart counter shows of speeding motorists at certain times of the day.

This measure typically provides a short term benefit as enforcement is not available on a regular on-going basis.



2.2.4 Speed Display

There are two types of speed display, the OPP has a trailer mounted radar with speed display and there is a more permanent device that can be mounted to a hydro pole or street light. The advantage of the trailer mounted radar is that it can easily be rotated around the municipality as needed. The devices are effective in reducing speeds in a short time frame, however, long-term effectiveness is uncertain. Another disadvantage of this method is that it only serves traffic in one direction.



2.2.5 ON-STREET PARKING



Source: Marshall Elizer

Description and Purpose:

On-street parking is the reduction of the roadway width available for vehicle movement by allowing motor vehicles to park adjacent and parallel to the curb. Angled parking is not appropriate as a traffic calming measure, due to the increased potential for conflicts.

The effect of using on-street parking to narrow the effective roadway space is to reduce vehicle speeds and to reduce possible short-cutting or through traffic.

Design Details: Chapter 4, Section 4.4.2

Advantages:

- ▶ Conflicts: Parked vehicles provide a buffer between traffic and pedestrians on sidewalks
- ▶ Environment: Traffic noise may be reduced due to a reduction in traffic volumes or speeds
- ▶ Other: No effect on resident access and police enforcement

Disadvantages:

- ▶ Active Transportation and Transit:
 - On-street parking may reduce mutual visibility for pedestrians crossing the roadway
 - Requires a minimum width to allow for safe passing of cyclists around opened car doors
- ▶ Maintenance: Parked vehicles may obstruct street sweeping and snow removal operations, unless parking restrictions are applied for these operations
- ▶ Other:
 - Parked vehicles may obstruct driveways, or reduce visibility for motorists entering the roadway from driveways
 - Could increase rear-end or sideswipe collisions

Limited or No Data Available (Further Research Encouraged):

- ▶ Speed reduction
- ▶ Traffic volume reduction
- ▶ Conflict reduction
- ▶ Effects of on-street parking on two-way roadways compared to one-way roadways

Applicability:

- ▶ Road Classification: Local and collector streets; urban commercial streets
- ▶ Traffic Conditions: All traffic volumes
- ▶ Roadway: Urban cross-section – curb and gutter
- ▶ May be used in combination with speed humps, curb extensions, etc.
- ▶ Due to varying jurisdictional guidelines and regulations, on-street parking should not be implemented if it results in substandard roadway widths which conflict with lane width, transit or

2.2.5 ON-STREET PARKING

emergency services requirements

- ▷ Locations to Avoid: Driveways, areas with limited sight distance, bus zones, designated school zones, unfenced playgrounds, and poorly illuminated streets

Elements to Consider:

- ▷ Narrower roadway widths may not be appropriate in municipalities with significant snowfall, or for streets with relatively high two-way traffic volumes (use with caution on roads > 10,000 veh/day)

Cost:

- ▷ Low – Medium

2.2.6 ROAD DIET



Description and Purpose:

A road diet is a reconfiguration of a roadway where the number of travelled lanes and/or the effective width of the road is reduced in order to allocate the reclaimed space for other uses, such as wider sidewalks, turning lanes, bus lanes, pedestrian refuge islands, bike lanes, parking, etc.

Typically, a Road Diet involves converting an existing four-lane, undivided roadway segment to a three-lane segment consisting of two through lanes, a centre two-way left-turn lane, and two bicycle lanes. However, other conversions are possible, such as 4-lane to 5-lane, 2-lane to 3-lane, 3-lane to 3-lane, and 5-lane to 3-lane.⁷⁸

Design Details: Chapter 4, Section 4.4.4

Advantages:

- ▶ Vehicle Speeds: Reduction between 5 and 12 km/h^{15,65}
- ▶ Conflicts: Reduction of 25% in the number of collisions per kilometre (collision density) and of 18% in the collision rate (controlled for volume)⁶⁴

Disadvantages:

- ▶ Emergency Response: May affect emergency vehicle response times due to added congestion, however vehicle can bypass congestion and there is a space for vehicles to pull to side of the road

Limited or No Data Available (Further Research Encouraged):

- ▶ Traffic volume reduction
- ▶ Environmental benefits

Applicability:

- ▶ Road Classification: Most appropriate for four-lane collector and arterial roads
- ▶ Traffic Conditions: Moderate traffic volumes (subject to before/after capacity analysis)
- ▶ Roadway: Urban cross-section – curb and gutter

Elements to Consider:

- ▶ Effective for widening sidewalks, adding bicycle lanes, and creating friendly streets for pedestrians and transit users
- ▶ Preferred to be combined with other traffic calming devices and “complete street” elements
- ▶ Refer to FHWA Road Diet Informational Guide for safety, operational, and quality of life considerations from research and practice, as well as guidance for decision-making process and

2.2.6 ROAD DIET

post-implementation evaluation

Cost:

- Variable depending on the extent and scope of the project
 - Lower if just pavement markings, signs, and potential adjustment of signals at intersections
 - Cost can be reduced if implemented at the same time as a repaving project or road repairs

2.3 Vertical Deflection Traffic Calming

2.3.1 SPEED CUSHION



Source: City of Ottawa

Description and Purpose:

A raised area on a road, similar to a speed hump, but does not cover the entire width of the road. The width is designed to allow a large vehicle, such as a bus, to “straddle” the cushion, while light vehicles will have at least one side of the vehicle deflected upward. Speed cushions are intended to produce sufficient discomfort to limit passenger vehicle travel speeds yet allow the driver to maintain vehicle control, while allowing larger vehicles such as buses and emergency vehicles to pass without difficulty.

With speed cushions:

- ▶ The vertical deflection of the passenger vehicle produces an uncomfortable sensation for vehicle occupants travelling at speeds higher than the design speed
- ▶ Larger vehicles (transit, emergency vehicles) are minimally affected
- ▶ The design speed is determined by the dimensions of the speed hump, and the spacing between speed humps
- ▶ Sufficient pavement width should be provided on the curb side to accommodate bicycles
- ▶ Installation of WA-50 Speed Hump sign is considered mandatory

Design Details: Chapter 4, Section 4.2.3

Advantages:

- ▶ Vehicle Speeds: Reduction in 85th percentile speed up to 8 km/h⁵
- ▶ Traffic Volumes: Reduction of approximately 30%⁷⁰
- ▶ Environment: Traffic noise may be reduced due to lower speeds (benefits may be offset by increased noise due to braking and accelerating)
- ▶ Other:
 - No effect on bicycles riding at moderate speeds
 - No effect on resident access, street sweeping (small amount of debris may remain at edges of speed cushion), and police enforcement

Disadvantages:

- ▶ Emergency Response: May slightly affect emergency vehicle response times but not as much as speed humps or speed tables
- ▶ Active Transportation and Transit: May slightly affect transit routes; a series of vertical deflection measures may increase travel time
- ▶ Maintenance: Negative effects on snow plowing/removal; plow operators must use caution to

2.3.1 SPEED CUSHION

avoid damaging speed cushion surface

▶ Other:

- More difficult to construct compared to speed humps requiring more precise hand work
- Increased traffic noise levels due to braking and accelerating
- Increased gas consumption and emission levels if there are significant variations in speed, especially if there are multiple devices within close proximity on the same street
- Pavement markings and signing could detract from the appearance of a street
- Traffic may be diverted to parallel streets without traffic calming measures

Limited or No Data Available (Further Research Encouraged):

- ▶ Conflict reduction
- ▶ Maintenance requirements

Applicability:

- ▶ Road Classification: Local and collector streets
- ▶ Traffic Conditions: Posted speed limit ≤ 50 km/h; all traffic volumes
- ▶ Roadway: Urban cross-section – curb and gutter
- ▶ Locations to Avoid:
 - Small turning radius curves and other areas with limited sight distance, intersections, and driveways
 - Traffic signals – locate at least 75 m distance from traffic signals so that the speed cushion is not within the decision or braking zones
 - Grades over 8%

Elements to Consider:

- ▶ Allows greater access for transit and emergency services compared to other traffic calming devices
Could be considered as an alternative to speed humps on emergency routes
- ▶ Speed humps are more effective in reducing speed
- ▶ Snow removal personnel may require special training in speed cushion areas
- ▶ A series of speed cushions is more effective than a single installation; spacing can range from 60 m to 250 m depending on the desired 85th percentile speed²⁴

Cost:

- ▶ Low

2.3.2 RAISED INTERSECTION



Source: City of Ottawa

Description and Purpose:

A raised intersection is an intersection, that may include crosswalks, constructed at a higher elevation than the adjacent approach roadways.

The purpose of a raised intersection is to reduce vehicle speeds, better define crosswalk areas, and reduce pedestrian-vehicle conflicts.

With a raised intersection:

- ▶ The vertical movement of the vehicle produces an uncomfortable sensation for vehicle occupants travelling at higher speeds
- ▶ The raised roadway surface emphasizes pedestrian priority at intersections
- ▶ The raised centre section includes crosswalks
- ▶ The roadway approaches to and departures from the raised intersection are appropriately ramped in consideration of vehicle types and desired speed
- ▶ Installation of WA-50 Speed Hump sign is considered mandatory

Design Details: Chapter 4, Section 4.2.2

Advantages:

- ▶ Vehicle Speeds: Reduction in 85th percentile speed of up to 10 km/h^{11,52}
- ▶ Conflicts:
 - 54% of drivers yielding to pedestrians compared to 18% before⁶⁴
 - Pedestrian area better defined; vehicles forced to slow through intersection area
- ▶ Environment:
 - Traffic noise may be reduced due to lower speeds (benefits may be offset by increased noise due to braking and accelerating)
 - Aesthetic benefits if raised intersection incorporates pavement treatments such as coloured and/or texture pavement
- ▶ Other:
 - No effect on bicycles riding at moderate speeds
 - No effect on resident access, on-street parking, street sweeping (small amount of debris may remain at edges of ramped sections of intersections), and police enforcement

Disadvantages

- ▶ Emergency Response: Slows emergency vehicles to approximately 25 km/h⁵²
- ▶ Active Transportation and Transit:
 - May slightly affect transit routes; a series of vertical deflection measures may increase

2.3.2 RAISED INTERSECTION
<p>travel time</p> <ul style="list-style-type: none"> ○ Cyclists may experience loss of control at speeds over 40 km/h⁵² <p>↳ Maintenance: Snow clearing time may be increased</p> <p>↳ Other:</p> <ul style="list-style-type: none"> ○ Increased traffic noise levels due to braking and accelerating ○ Increased gas consumption and emission levels if there are significant variations in speed, especially if there are multiple devices within close proximity on the same street ○ Pavement markings and signing could detract from the appearance of a street ○ Traffic may be diverted to parallel streets without traffic calming measures
<p>Limited or No Data Available (Further Research Encouraged):</p> <ul style="list-style-type: none"> ↳ Traffic volume reduction
<p>Applicability:</p> <ul style="list-style-type: none"> ↳ Road Classification: Local and collector streets ↳ Traffic Conditions: Posted speed limit ≤ 50 km/h; all traffic volumes⁵² ↳ Roadway: Urban cross-section – curb and gutter; consider design carefully for roads wider than two lanes ↳ Locations to Avoid: Designated emergency access routes
<p>Elements to Consider:</p> <ul style="list-style-type: none"> ↳ May be used in commercial areas and business districts with high pedestrian activity ↳ Flexible delineator post may be needed to alert snow plow operators to lift their blades
<p>Cost:</p> <ul style="list-style-type: none"> ↳ Medium – High <ul style="list-style-type: none"> ○ Wide range for typical cost ○ Can be higher depending on width of intersecting roads and drainage requirements

2.3.3 RAISED CROSSWALK



Source: City of Ottawa

Description and Purpose:

A raised crosswalk is a marked pedestrian crosswalk at an intersection or mid-block location constructed at a higher elevation than the adjacent roadway.

The purpose of a raised crosswalk is to reduce vehicle speeds, improve pedestrian visibility, and reduce pedestrian-vehicle conflicts.

Raised crosswalk effects/characteristics include:

- ▶ The vertical movement of the vehicle producing an uncomfortable sensation for vehicle occupants travelling at higher speeds
- ▶ The raised surface improving visual identification of crosswalk areas and emphasizing pedestrian priority
- ▶ The roadway approaches to and departures from the crosswalk are appropriately ramped in consideration of vehicle types and desired speed
- ▶ Installation of WA-50 Speed Hump sign is considered mandatory
- ▶ The use of textured materials is possible

Design Details: Chapter 4, Section 4.2.1

Advantages:

- ▶ Vehicle Speeds: Reduction in 85th percentile speed from 5 km/h to 13 km/h^{11,52,65}
- ▶ Traffic volumes: Reduction of up to 26%, and increase of up to 7% on neighbouring streets⁵²
- ▶ Conflicts:
 - 53% of drivers yielding to pedestrians compared to 13% before⁶⁴
 - Pedestrian crossing area better defined; vehicles are forced to slow through pedestrian conflict zone
- ▶ Environment: Traffic noise may be reduced due to lower speeds (benefits may be offset by increased noise due to braking and accelerating)
- ▶ Other:
 - No effect on bicycles riding at moderate speeds
 - No effect on resident access, street sweeping (small amount of debris may remain at edges of raised crosswalk), and police enforcement

2.3.3 RAISED CROSSWALK

- Pedestrians using assistive devices are able to cross more easily and with increased comfort due to no accumulation of rain or snow at the bottom of the curb

Disadvantages:

- ▶ Emergency Response: Impacts and delays to emergency vehicles; Fire vehicles – 3.8 seconds' delay per raised crosswalk⁵²
- ▶ Active Transportation and Transit:
 - May result in a false sense of pedestrian security
 - Visually-impaired pedestrians may have difficulty differentiating between the curb and the travelled portion of the street (can be mitigated with appropriate design elements for accessibility requirements such as tactile walking surface indicators)
 - Some cyclists may experience loss of control at speeds over 40 km/h⁵²
 - May slightly affect transit routes; a series of vertical deflection measures may increase travel time
- ▶ Maintenance:
 - Snow clearing time may be increased
 - Raised crosswalks interfere with pavement overlays
- ▶ Other:
 - Catch basins may be required to provide drainage depending on location of raised crosswalk and site specific conditions
 - If catch basins become blocked, ponding may occur on uphill edge of crosswalk
 - Increased traffic noise levels due to braking and accelerating
 - Increased gas consumption and emission levels if there are significant variations in speed, especially if there are multiple devices within close proximity on the same street
 - Pavement markings and signing could detract from the appearance of a street
 - Traffic may be diverted to parallel streets without traffic calming measures

Applicability:

- ▶ Road Classification:
 - Local and collector streets; commercial collector streets
- ▶ Traffic Conditions: Posted speed limit ≤ 50 km/h; all traffic volumes⁵²
- ▶ Roadway: Urban cross-section – curb and gutter
- ▶ School zones
- ▶ Locations to Avoid:
 - Designated emergency access routes
 - Small turning radius curves and other areas with limited sight distance, intersections, and driveways
 - Transit routes where articulated buses are used due to potential decoupling
 - Bus stops – locate at least 25 m in advance to minimize potential stability problems
 - Traffic signals – locate at least 75 m distance from traffic signals so that the crosswalk is not within the decision or braking zones
 - Grades over 8%

Elements to Consider:

- ▶ Not recommended unless there is an existing marked crosswalk
- ▶ Not recommended in limited right-of-way
- ▶ There must be a sidewalk on at least one side of the road and landing areas on each end of the

2.3.3 RAISED CROSSWALK

raised crosswalk

- ▷ May cause discomfort for transit users
- ▷ Consistent configuration throughout a community is desirable to facilitate safe use by those with mental impairment
- ▷ Snow removal personnel may require special training in raised crosswalk areas
- ▷ Raised crosswalks with gentle approach and exit gradients, flush leading edges and smooth surfaces pose a less significant hazard to cyclists

Cost:

- ▷ Low – Medium
 - Requires more material than speed hump

2.3.4 SPEED HUMP / TABLE



Source: City of Ottawa

Description and Purpose:

A speed hump is a raised area of a roadway, which causes the vertical upward movement of a traversing vehicle. The purpose of a speed hump is to cause discomfort for drivers travelling at higher speeds and to reduce vehicle speeds.

A speed table is an elongated raised speed hump with a flat-topped section that is long enough to raise the entire wheelbase of a vehicle. They may be constructed with brick or other textured materials on the flat section.

With speed humps/tables:

- ▶ The vertical deflection of the vehicle produces an uncomfortable sensation for vehicle occupants travelling at speeds higher than the design speed
- ▶ The design speed is determined by the dimensions of the hump, and the spacing between humps
- ▶ The hump extends across the roadway, with gaps for drainage at the curbs
- ▶ Consideration should be given for maintaining hump across the width of an adjacent bicycle lane or a physical separation (median, delineator posts) could be provided to 'protect' the bicycle lane from motorists trying to avoid the hump
- ▶ Installation of WA-50 Speed Hump sign is considered mandatory

Design Details: Chapter 4, Section 4.2.4**Advantages:**

- ▶ Vehicle Speeds: Reduction in 85th percentile speed between 6 and 13 km/h^{52,65}
- ▶ Traffic Volumes: Reduction between 15% and 27%⁵²
- ▶ Conflicts: Significant conflict reduction has been reported in many jurisdictions
- ▶ Environment: Traffic noise may be reduced due to lower speeds (benefits may be offset by increased noise due to braking and accelerating)
- ▶ Other:
 - No effect on bicycles riding at moderate speeds
 - No effect on resident access, street sweeping (small amount of debris may remain at edges of speed hump), and police enforcement

2.3.4 SPEED HUMP / TABLE

Disadvantages:

- ▶ Emergency Response:
 - Delay between 2.3 and 15 seconds for emergency vehicle response times⁵²
 - Speed tables may slightly affect emergency vehicle response times
- ▶ Active Transportation and Transit:
 - Cyclists may experience loss of control if travelling at speeds over 40 km/h⁵²
 - Speed humps have negative effects on transit route travel times
 - Speed tables may slightly affect transit routes but not as much as speed humps; a series of vertical deflection measures may increase travel time
- ▶ Maintenance: Negative effects on snow plowing/removal; plow operators must slow and manage blade carefully to avoid damaging speed hump surface
- ▶ Other:
 - Increased traffic noise levels due to braking and accelerating
 - Increased gas consumption and emission levels if there are significant variations in speed, especially if there are multiple devices within close proximity on the same street
 - Pavement markings and signing could detract from the appearance of a street
 - Traffic may be diverted to parallel streets without traffic calming measures

Applicability:

- ▶ Road Classification: Local and collector streets
 - Speed humps are less suitable for collector streets compared to alternatives such as speed cushions and speed tables
- ▶ Traffic Conditions: Posted speed limit ≤ 50 km/h; all traffic volumes⁵²
- ▶ Roadway: Urban cross-section – curb and gutter; not effective on rural cross-sections unless obstructions (posts or bollards) are placed on roadside at speed hump location; generally two traffic lanes (one each direction) but can be used on one-way streets
- ▶ Preferred installation in a series close to/underneath street lighting and downgrade from catch basins to minimize potential for ponding
- ▶ Speed tables may be used as part of a system that includes speed humps and high-visibility crosswalks
- ▶ Locations to Avoid:
 - Designated emergency access routes
 - Small turning radius curves and other areas with limited sight distance, intersections, and driveways
 - Transit routes where articulated buses are used due to potential decoupling
 - Bus stops – locate at least 25 m in advance to minimize potential stability problems
 - Traffic signals – locate at least 75 m distance from traffic signals so that the speed hump/table is not within the decision or braking zones
 - Grades over 8%⁵²

Elements to Consider:

- ▶ Snow removal personnel may require special training in speed hump/table areas
- ▶ A series of speed humps/tables is more effective than a single installation; spacing can range from 60 m to 250 m depending on the desired 85th percentile speed²⁴
- ▶ Speed humps/tables with gentle approach and exit gradients, flush leading edges and smooth surfaces pose a less significant hazard to cyclists
- ▶ On-street parking can be permitted on speed humps, unless the measure is used in conjunction

2.3.4 SPEED HUMPS / TABLE

with curb extensions

Cost:

- ▷ Low – Medium for permanent humps in concrete or asphalt
 - Speed tables require more material than speed humps

2.4 Horizontal Deflection Traffic Calming

2.4.1 CURB EXTENSION / NECKDOWN / CHOKER



Source: Watt Consulting Group

Description and Purpose:

A curb extension (also known as neckdown, choker, curb bulb, or bulb-out) is a horizontal intrusion of the curb into the roadway resulting in a narrow section of roadway. The curb is extended on one or both sides of the roadway to reduce its width to as little as 6.0 m for two-lane, two-way traffic. In urban environments, it is possible to implement curb extensions by removing existing parking spaces.

The purpose of a curb extension is to reduce vehicle speeds, reduce crossing distance for pedestrians, increase visibility of pedestrians, and prevent parking close to an intersection.

Design Details: Chapter 4, Section 4.4.1

Advantages:

- ▷ Vehicle Speeds: Reduction between 2 and 8 km/h^{11,52}
- ▷ Conflicts:
 - Reduced pedestrian crossing distance at intersections may reduce pedestrian-vehicle conflicts
 - Better mutual visibility between pedestrians and motorists if crosswalks are installed between curb extensions
- ▷ Environment: Landscaped curb extensions, can improve the appearance of a street
- ▷ Other:
 - No effect on resident access, snow plowing, street sweeping, and police enforcement
 - Can provide additional storage for snow, however, height of windrow should not negatively impact pedestrian visibility

Disadvantages:

- ▷ Active Transportation and Transit:
 - Not compatible with bicycle lanes
 - Can be hazardous for drivers and cyclists if not designed and maintained properly
 - Cyclists can feel squeezed closer to vehicles as motorists attempt to overtake them at the narrowing points
- ▷ Parking: Potential loss of on-street parking
- ▷ Maintenance: Increased snow removal cost and snow plow damage to grass, trees and curb extensions
- ▷ Other:
 - Long trucks, buses and other large vehicles may need to cross into oncoming travel lanes in order to negotiate turns at intersections with curb extensions

2.4.1 CURB EXTENSION / NECKDOWN / CHOKER
<ul style="list-style-type: none"> ○ Between snow removals in winter environments, the roadway's effective width can be significantly reduced
<p>Limited or No Data Available (Further Research Encouraged):</p> <ul style="list-style-type: none"> ▶ Traffic volume reduction ▶ Bicycle-friendly curb extensions to allow cyclists to travel over or through the curb extension
<p>Applicability:</p> <ul style="list-style-type: none"> ▶ Road Classification: Local and collector streets; urban arterial streets ▶ Traffic Conditions: All traffic volumes ▶ Roadway: Urban cross-section – curb and gutter
<p>Elements to Consider:</p> <ul style="list-style-type: none"> ▶ The effectiveness of a curb extension can be increased when used in combination with other traffic calming measures (speed humps, raised crosswalks, raised intersections, textured crosswalks, curb radius reductions, raised median islands) ▶ Used often with on-street parking to create bays and increase pedestrian visibility at crossings <ul style="list-style-type: none"> ○ Keeps road narrow when parked vehicles are not present ○ On urban arterial streets, applicability may not be recommended if the arterial street has a parking lane that can be needed to carry occasional traffic volume increases (e.g., Emergency Detour Route (EDR), evacuation route, ceremonial route, flexibility of flow management during road repair, etc.) ▶ Drainage system adjustments may be required where curb extensions are needed ▶ Should be marked with signs or other objects to be visible to motorists and plow operators ▶ Sight lines should be respected if there is landscaping
<p>Cost:</p> <ul style="list-style-type: none"> ▶ Medium – High <ul style="list-style-type: none"> ○ Cost can increase if drainage alteration is required

2.4.2 CURB RADIUS REDUCTION

Description and Purpose:

A curb radius reduction is the reconstruction or modification of an intersection corner with a smaller radius, usually between the 3.0 m to 5.0 m range.

The purpose is to slow down right-turning vehicles, reduce crossing distances for pedestrians, and to improve visibility of pedestrians.

Design Details: Chapter 4, Section 4.3.2

Advantages:

- ▶ **Vehicle Speeds:** Speed reduction for right-turning vehicles
- ▶ **Traffic volumes:** No effect on volume reduction
- ▶ **Conflicts:** Reduced pedestrian crossing distance / improved visibility may reduce pedestrian – vehicle conflicts
- ▶ **Other:** No effect on resident access, bicycle travel, on-street parking, street sweeping, and police enforcement

Disadvantages:

- ▶ **Active Transportation and Transit:** Maintenance and pedestrian conflicts due to large vehicles and buses possibly mounting the curb unless designed with an appropriate pedestrian waiting and crossing area
- ▶ **Other:**
 - No significant reduction in traffic noise, air quality benefits, or aesthetic benefits
 - Long trucks, buses and other large vehicles may need to cross into adjacent (and sometimes oncoming) travel lanes in order to negotiate turns at intersections with radius reduction; this is a function of the choice of design vehicle – the device is more effective if a smaller design vehicle is appropriate, based on fleet mix

Limited or No Data Available (Further Research Encouraged):

- ▶ Environmental benefits

Applicability:

- ▶ **Road Classification:** Local, collector, and low volume arterial streets (with consideration of buses and heavy vehicles on truck routes)
- ▶ **Traffic Conditions:** All traffic volumes
 - Not suitable at intersections with significant volume of turning trucks and buses
 - Not suitable if larger vehicles cannot physically complete the turn without riding over the curb
 - Use with caution on major roads > 10,000 vehicles per day⁶⁵
- ▶ **Roadway:** Urban cross-section – curb and gutter; all number of lanes
- ▶ **Locations to Avoid:** Intersections of designated truck routes or transit routes; primary emergency

2.4.2 CURB RADIUS REDUCTION
vehicle routes
Elements to Consider: <ul style="list-style-type: none">▶ No impact on emergency services provided that there is sufficient road width for turning radius needs
Cost: <ul style="list-style-type: none">▶ Low - Medium<ul style="list-style-type: none">○ Cost varies depending on the radius of the original curb, drainage requirements, presence of utilities, and labour and material costs

2.4.3 TRAFFIC CIRCLE / TRAFFIC BUTTON / MINI-ROUNDBABOUT

Source: www.cityofvancouver.ca

Source: Tollazzi, 2015

Description and Purpose:

A traffic circle/traffic button/mini-roundabout is an island located at the centre of an intersection, which requires vehicles to travel through the intersection in a counter-clockwise direction around the island.

Mini-roundabouts are designed in accordance with full-size roundabout design principles presenting splitter islands and deflection of vehicles on all approaches, except that they have a smaller diameter and traversable islands. A traffic circle is typically smaller than a mini-roundabout and does not have splitter islands on the approaches. A traffic button is similar to a traffic circle, however, the former is typically made of coloured asphalt while the latter is landscaped.

The turning radius for left-turning trucks, buses, or emergency vehicles may require a diameter which would be larger than the intersection space commonly available. Consequently vehicles may turn in left in front of the traffic circle or mount the centre raised island rather than travelling around it.

Yield traffic control is recommended.

Design Details: Chapter 4, Section 4.3.4**Advantages:**

- ▶ Vehicle Speeds: Reduction in 85th percentile speed up to 14 km/h^{10,52}
- ▶ Traffic volumes: Reduction of up to 20%⁵²
- ▶ Conflicts: Collision rate reductions of approximately 30% compared to signalized intersections⁵²
- ▶ Environment:
 - Traffic noise reduction of 3 dBA due to lower speeds (benefits may be offset by increased noise due to braking and accelerating)⁵²
 - Environmental benefit through reduced delay, fuel consumption, and vehicle emissions
 - When landscaped, can improve the appearance of a street
- ▶ Other: No effect on resident access, street sweeping, and police enforcement

Disadvantages:

- ▶ Emergency Response: Delay between 1.3 and 10.7 seconds for emergency vehicle response times⁵²
- ▶ Active Transportation and Transit:
 - May force vehicles into crosswalk area increasing potential for pedestrian-vehicle conflicts
- ▶ Parking: May require removal of some on-street parking in vicinity of traffic circle
- ▶ Maintenance: "Minor" effects on winter maintenance by increasing snow plowing time

2.4.3 TRAFFIC CIRCLE / TRAFFIC BUTTON / MINI-ROUNDAABOUT

- ▷ Other:
 - Restricted access for trucks and longer school buses
 - Traffic may be diverted to parallel streets without traffic calming measures

Applicability:

- ▷ Road Classification: Local and collector street intersections
- ▷ Traffic Conditions:
 - Posted speed limit ≤ 50 km/h
 - < 1500 vehicles per day; Use with caution for low-volume collectors with 1500 to 5000 vehicles per day⁶⁵
- ▷ Roadway: Urban cross-section – curb and gutter; rural cross-section; maximum two traffic lanes (one each direction)
- ▷ Locations to Avoid:
 - Designated emergency access routes and transit routes
 - Intersections with high pedestrian volumes
 - Intersections where collector street traffic volumes are significantly higher than the intersecting street

Elements to Consider:

- ▷ Preferred with textured crosswalks and most effective when used in series
- ▷ Sight lines should be respected if there is landscaping

Cost:

- ▷ Traffic Circle / Traffic Button: Low – Medium
- ▷ Mini-Roundabout: Medium – High

2.4.4 RAISED MEDIAN ISLAND



Source: Watt Consulting Group

Description and Purpose:

A raised median island is an elevated median constructed on the centerline of a two-way roadway to reduce the overall width of the adjacent travel lanes.

The purpose of a raised median island is to reduce vehicle speeds and to reduce pedestrian-vehicle conflicts.

Design Details: Chapter 4, Section 4.4.3

Advantages:

- ▶ Vehicle Speeds: Reduction between 3 and 8 km/h^{11,52}
- ▶ Conflicts: Can function as a pedestrian refuge resulting in reduced pedestrian-vehicle conflicts
- ▶ Environment: Aesthetic benefit if well-maintained planting is incorporated
- ▶ Other: No effect on snow plowing (islands are visible due to signing), street sweeping, or police enforcement

Disadvantages:

- ▶ Local Access: May restrict access to driveways from one direction only
- ▶ Active Transportation and Transit: Cyclists may feel squeezed where insufficient room has been left between a central median and the adjacent curb (aggravated on roads with high proportions of heavy vehicles)
- ▶ Parking: May require additional right-of-way and/or removal of on-street parking
- ▶ Other: Speeds may increase if mid-block left turn movements are not possible

Limited or No Data Available (Further Research Encouraged):

- ▶ Traffic volume reduction
- ▶ Maintenance requirements

Applicability:

- ▶ Road Classification: Local and collector streets, urban arterials
- ▶ Traffic Conditions: All traffic volumes
- ▶ Roadway: Urban cross-section – curb and gutter; rural cross-section; most effective on roads with two traffic lanes (one each direction)

Elements to Consider:

- ▶ Effectiveness can be increased if used in combination with curb extensions before and/or after raised median islands
- ▶ If required, bicycle lanes can be included to prevent motorists from intruding into the path of cyclists
- ▶ In retrofit situations, there are risks of overhead tree canopy and utility poles coming into contact with larger vehicles due to the median shifting vehicles closer to the curb
- ▶ Median landscaping should not negatively impact or reduce pedestrian visibility

2.4.4 RAISED MEDIAN ISLAND

Cost:

- ▷ Medium – High
 - Cost is a direct function of length and width of the median island

2.4.5 CHICANE (ONE-LANE / TWO-LANE)



Description and Purpose:

A chicane is a series of curb extensions on alternating sides of a roadway, which narrow the roadway and require drivers to steer from one side of the roadway to the other to travel through the chicane. Multiple series of curb extensions can be used.

The purpose of this measure is to discourage shortcutting or through traffic and reduce overall speeds by forcing the lateral shifting of vehicles travelling through the chicane.

With a chicane, through traffic is further discouraged when a chicane on a two-way roadway incorporates a narrowing to less than the width of two vehicles (one-lane chicane), so that when vehicles travelling in opposite directions meet at the chicane, one vehicle must yield.

Design Details: Chapter 4, Section 4.3.1

Advantages (one-lane):

- ▶ Vehicle Speeds: Reduction between 6 and 10 km/h⁵²
- ▶ Traffic Volumes: Reduction of up to 47%⁵²
- ▶ Conflicts: Collision rate reduction up to 40%⁵²
- ▶ Environment:
 - Traffic noise may be reduced due to reduced vehicle speeds and traffic volumes
 - Air quality may be improved due to a reduction in traffic volume
 - Improved street appearance through landscaping
- ▶ Other: No effect on resident access and police enforcement

Advantages (two-lane):

- ▶ Vehicle Speeds: Reduction between 6 and 11 km/h⁵²
- ▶ Traffic Volumes: Reduction of up to 22%⁵²
- ▶ Environment:
 - Traffic noise may be reduced due to reduced vehicle speeds and traffic volumes
 - Air quality may be improved due to a reduction in traffic volume
 - Improve street appearance through landscaping
- ▶ No effect on resident access and police enforcement

2.4.5 CHICANE (ONE-LANE / TWO-LANE)

Disadvantages (one-lane):

- ▶ Emergency Response: May affect emergency vehicle response times
- ▶ Parking: Loss of on-street parking; must be removed inside and within 5.0 m of the chicane⁵²
- ▶ Maintenance:
 - Negative effects on snow plowing/removal; may require specialized vehicles
 - Cannot clean through chicane using street sweeping vehicles; drainage gutter must be swept manually
- ▶ Other:
 - Relies on regulatory signs and driver courtesy to ensure there is not a two-way conflict
 - May introduce a head-on collision hazard
 - May divert significant volume of traffic to parallel streets without traffic calming measures

Disadvantages (two-lane):

- ▶ Emergency Response: May slightly affect emergency vehicle response times
- ▶ Parking: Loss of on-street parking; must be removed inside and within 5.0m of the chicane⁵²
- ▶ Maintenance:
 - Negative effects on snow plowing/removal
 - Cannot sweep through chicane using street sweeping vehicles; drainage gutter must be swept manually
- ▶ Other: Some motorists may attempt to travel at higher speeds by crossing the centerline

Limited or No Data Available (Further Research Encouraged):

- ▶ Conflict reduction for two-lane chicane

Applicability:

- ▶ Road Classification: Local (one-way, two-way) and collector (two-way only) streets
- ▶ Traffic Conditions:
 - Posted speed limit ≤ 50 km/h⁵²
 - Minimum 750 veh/day or 100 veh/hr during the peak hour⁵²
- ▶ Roadway: Urban cross-section – curb and gutter; maximum two traffic lanes (one each direction)
- ▶ Locations to Avoid:
 - Driveways
 - Grades $> 8\%$ ⁵²
 - Transit routes or designated emergency access routes (one-way)

Elements to Consider:

- ▶ Traffic may be diverted to parallel streets without traffic calming measures
- ▶ Traffic volumes in each direction should be similar for greatest effectiveness
- ▶ May be combined with other traffic calming tools in order to have a significant impact on speed
- ▶ Proper advance warning signage is important, especially in areas with winter snow conditions
- ▶ Use with caution on roads with significant bicycle volumes; tends to force motorists and cyclists into a narrow space; for roads with bicycle routes, the treatment is only appropriate where traffic volumes are very low ($< 1,000$ veh/day)⁴

Cost:

- ▶ Medium
 - May require replacement of existing curbing or modifying drainage structures

2.4.6 LATERAL SHIFT



Description and Purpose:

A lateral shift in a roadway occurs where an otherwise straight section is redesigned using pavement markings or curb extensions to create a curvilinear alignment (a 'jog') in the roadway similar to a chicane. This effect can also be achieved with the use of a central island.

A lateral shift causes drivers to have to negotiate the alignment and increases awareness in attempt to reduce vehicle speeds.

Design Details: Not Available

Advantages:

- ▶ Limited or no data available

Disadvantages:

- ▶ Parking: Potential loss of on-street parking

Limited or No Data Available (Further Research Encouraged):

- ▶ Vehicle speed reduction
- ▶ Traffic volume reduction
- ▶ Conflict reduction
- ▶ Environmental impacts

Applicability:

- ▶ Road Classification: Local and collector streets
- ▶ Traffic Conditions: Posted speed limit ≤ 50 km/h; all traffic volumes
- ▶ Roadway: Urban cross-section
- ▶ Locations to Avoid: Grades > 8%

Elements to Consider:

- ▶ Narrow pavement surface requires consideration for providing space for bicycles
- ▶ Curb extensions can become expensive in retrofit situations if drainage system adjustments are required

Cost:

- ▶ Low – Medium for curb extensions

2.4.7 Roundabouts

Roundabouts are typically much larger than traffic circles and typically require additional land outside of the right of way in order to construct. Roundabouts are best used on collector and arterial roads in place of an intersection controlled by traffic lights or stop signs. Advantages of roundabouts are; they moderate speed and enhance safety to motorists. Disadvantages are; they are expensive to construct, often require the purchase of land and are more difficult for pedestrians to navigate.



2.4.8 VERTICAL CENTRELINE TREATMENT



Source: City of Ottawa

Description and Purpose:

The use of vertical treatments such as flexible post-mounted delineators or raised pavement markers to create a centre median. This could be used to give drivers a perception of lane narrowing and create a sense of constriction.

Flexible post-mounted delineators are similar in appearance to bollards. They are commonly used in work zones, high-occupancy vehicle (HOV) lanes, and on-ramp exits to direct vehicles or prevent particular movements.

Design Details: Not Available

Advantages:

- ▶ Vehicle Speeds: Reduction in 85th percentile speed up to 5 km/h⁶⁷
- ▶ Conflicts: Separation of traffic has the potential to reduce collisions
- ▶ Other: Collapsible design is able to withstand impact with a vehicle

Disadvantages:

- ▶ Maintenance:
 - May require regular maintenance with collection of debris around posts and repeated impacts from vehicles
 - Permanent installation may cause difficulty of snow removal
- ▶ Other:
 - In rural areas, wider vehicles or farm equipment may have difficulty passing if post-mounted delineators excessively narrow the roadway
 - May cause confusion as measure can be perceived as temporary or as an indication of a construction zone

Limited or No Data Available (Further Research Encouraged):

- ▶ Traffic volume reduction
- ▶ Conflict reduction
- ▶ Environmental benefits

Applicability:

- ▶ Road Classification: Local and collector streets
- ▶ Traffic Conditions: All traffic volumes
- ▶ Roadway: Urban or rural cross-section; two-lane roadways in order to achieve lane narrowing
- ▶ Locations to Avoid: Where it may block driveways or cross streets
- ▶ Separation of conflicting movements when barriers are too costly or impractical

Elements to Consider:

- ▶ Typically are between 18 and 36 inches tall, spaced 32 inches apart, and be yellow in colour⁶⁷
- ▶ The majority of research regarding these devices pertains to their use at highway-railroad grade crossings; only one study documenting the use of post-mounted delineators to reduce speeds on roadway midblock segments was identified

2.4.8 VERTICAL CENTRELINE TREATMENT

Cost:

▷ Low

2.5 Physical Obstructions



2.5.1 DIRECTIONAL CLOSURE



Description and Purpose:

A directional closure is a curb extension or vertical barrier extending to approximately the centerline of a roadway, effectively obstructing (prohibiting) one direction of traffic.

When combined with other measures elsewhere in a neighborhood, directional closures obstruct short-cutting or through traffic routes.

Bicycles are typically permitted to travel through a directional closure in both directions, including the direction in which motor vehicle traffic is obstructed. In some cases, gaps or a contra-flow bicycle lane are used to provide bicycle access.

Design Details: Chapter 4, Section 7.1

Advantages:

- ▶ Vehicle Speeds: Reduction in 85th percentile speed up to 11 km/h⁵²
- ▶ Traffic Volumes: Reduction up to 60%⁵² or 100% in one direction
- ▶ Conflicts: Reduced pedestrian crossing distance may reduce pedestrian-vehicle conflicts
- ▶ Environment:
 - Locally, traffic noise may be reduced and air quality may be improved due to a reduction in traffic volume
 - When landscaped, can enhance the appearance of a street
- ▶ Other: No effect on bicycle or pedestrian access, on-street parking, emergency vehicles (can be circumvented), and police enforcement

2.5.1 DIRECTIONAL CLOSURE

Disadvantages:

- ▶ Local Access: Restricts resident access
- ▶ Maintenance:
 - May complicate street sweeping and snow removal
 - No significant implications for snow removal, provided the edges of the directional closure are identified for the plow operator
- ▶ Other:
 - Some motorists may deliberately circumvent directional closures, particularly during off-peak hours when volumes are lower
 - Cannot be used at local street intersections with other local streets (will shift the problem to other local streets instead of the arterial system)
 - May affect garbage collection routes
 - Traffic may be diverted to parallel streets without traffic calming measures

Applicability:

- ▶ Road Classification: Local streets at intersections with collector or arterial streets
- ▶ Traffic Conditions: <1500 vehicles per day for local streets; use with caution for low volume collectors (1500-5000 vehicles per day)⁶⁵
- ▶ Roadway: Urban cross-section – curb and gutter

Elements to Consider:

- ▶ Preferred orientation is to prevent ingress to a street, rather than prevent egress from a street
- ▶ Drainage system adjustments may be required where curb extensions are needed
- ▶ On-street parking can be permitted on both sides of a roadway on which there is a directional closure
- ▶ Not effective on rural cross-sections unless obstructions (posts or bollards) are placed at roadside at directional closure location
- ▶ Sight lines should be respected if there is landscaping

Cost:

- ▶ Low – High
 - Lower cost for asphalt, pre-cast curb bulb with no drainage modifications
 - Higher cost for measure fully integrated into streetscape with poured-in-place concrete corner extensions, landscaping and drainage modifications

2.5.2 RAISED MEDIAN THROUGH INTERSECTION



Source: Steven Vance / www.nacto.org

Description and Purpose:

A raised median through an intersection is a concrete or asphalt island located on the centerline of a two-way roadway through an intersection, which prevents left turns and through movements to and from the intersecting roadways. It can create a refuge for pedestrians and cyclists, enabling them to cross one direction of travel at a time, thereby reducing waiting time for gaps when crossing the roadway.

The purpose of a raised median through an intersection is to obstruct short-cutting or through traffic and reduce crossing distance for pedestrians.

Design Details: Chapter 4, Section 4.7.5

Advantages:

- ▶ Traffic Volumes:
 - Volume reduction of 35%⁵²
 - Eliminates all cut-through traffic
- ▶ Environment:
 - Locally, traffic noise may be reduced and air quality may be improved due to a reduction in traffic volumes
 - When landscaped, can enhance the appearance of a street
- ▶ Other: No effect on bicycle or pedestrian access and police enforcement if designed appropriately

Disadvantages:

- ▶ Local Access: Restricts resident access
- ▶ Emergency Response: May restrict emergency vehicle access if not designed to accommodate
- ▶ Parking: May require removal of some on-street parking in vicinity of raised median
- ▶ Maintenance:
 - May slow snow removal operations and result in accumulated snow on the raised median
 - May complicate street sweeping
- ▶ Other:
 - Motorists may deliberately circumvent the raised median
 - Reduction in traffic volume can result in an increase in vehicle speeds
 - May affect garbage collection routes
 - Traffic may be diverted to parallel streets without traffic calming measures

Limited or No Data Available (Further Research Encouraged):

- ▶ Vehicle speed reduction
- ▶ Conflict reduction

Applicability:

- ▶ Road Classification: Collector or arterial streets at intersections with local residential streets
- ▶ Traffic Conditions: All traffic volumes (provided alternative routes exist with sufficient capacity to

2.5.2 RAISED MEDIAN THROUGH INTERSECTION

accommodate diverted traffic)


- ▷ Roadway: Urban cross-section – curb and gutter; rural cross-section
- ▷ Locations to Avoid: Local street intersections with other local streets (motorists are likely to deliberately circumvent raised medians in low-volume locations)

Elements to Consider:

- ▷ Should extend a minimum of 5.0 m beyond perpendicular extensions of intersecting streets⁵²
 - Extension beyond 5.0 m is preferred (without impacting accesses to driveways) in order to discourage U-turns around medians
- ▷ Can reduce speed in some instances especially when combined with narrow lanes
- ▷ Sight lines should be respected if there is landscaping

Cost:

- ▷ Low – Medium
 - Cost can range depending on length and width of barrier, construction materials, drainage, and landscaping

2.5.3 RIGHT-IN / RIGHT-OUT ISLAND	
 <p style="text-align: right; font-size: small;">Source: www.sanantonio.gov</p>	<p>Description and Purpose:</p> <p>A right-in / right-out island is a raised triangular island at an intersection approach which obstructs left turns and through movements to and from the intersecting street or driveway.</p> <p>Bicycles are typically permitted to make left turns and through movements from the side street, either through gaps or depressions in the island, or by travelling around the island.</p> <p>The purpose of a right-in / right-out island is to obstruct short-cutting or through traffic.</p>
<p>Design Details: Chapter 4, Section 4.7.6</p>	
<p>Advantages:</p> <ul style="list-style-type: none"> ▶ Traffic Volume: Reduction of 35%⁵² ▶ Conflicts: Reduces conflict points, including vehicle-pedestrian conflicts, due to reduced crossing distance and refuge area ▶ Environment: <ul style="list-style-type: none"> ○ Locally, traffic noise may be reduced and air quality may be improved due to a reduction in traffic volumes ○ When landscaped, may enhance the appearance of a street ▶ Other: No effect on bicycle or pedestrian access, on-street parking, emergency vehicles (can be circumvented), and police enforcement 	
<p>Disadvantages:</p> <ul style="list-style-type: none"> ▶ Local Access: Restricts resident access ▶ Maintenance: May complicate street sweeping and snow removal ▶ Other: <ul style="list-style-type: none"> ○ May increase vehicle speeds depending on geometry and configuration ○ Some motorists may deliberately circumvent the closure in order to make obstructed movement(s); this can be managed through regulatory signing ○ Reduction in traffic volume can result in an increase in vehicle speeds ○ May affect garbage collection routes ○ Traffic may be diverted to parallel streets without traffic calming measures 	
<p>Limited or No Data Available (Further Research Encouraged):</p> <ul style="list-style-type: none"> ▶ Vehicle speed reduction 	
<p>Applicability:</p> <ul style="list-style-type: none"> ▶ Road Classification: Local and collector streets ▶ Traffic Conditions: All traffic volumes (provided alternative routes exist with sufficient capacity to accommodate diverted traffic) ▶ Roadway: Urban cross-section – curb and gutter 	
<p>Elements to Consider:</p> <ul style="list-style-type: none"> ▶ Sight lines should be respected if there is landscaping 	

2.5.3 RIGHT-IN / RIGHT-OUT ISLAND

Cost:

- ▷ Low – Medium
 - Cost can range depending on length and width of barrier, construction materials, and landscaping

2.5.4 INTERSECTION CHANNELIZATION



Description and Purpose:

Intersection channelization is the use of raised islands or bollards located in an intersection to obstruct specific traffic movements and physically direct traffic through an intersection.

Intersection channelization can improve pedestrian crossing safety by reducing crossing distances and providing refuge areas.

Bicycles are typically permitted to make all movements, including those which motor vehicles are prevented from making. Gaps in channelization islands may be used to accommodate bicycles.

Design Details: Chapter 4, Section 4.7.4

Advantages:

- ▶ **Conflicts:** Reduces conflict points, including vehicle-pedestrian conflicts, due to fewer movements, reduced crossing distance and supplied refuge area
- ▶ **Environment:**
 - Locally, traffic noise may be reduced and air quality may be improved due to a reduction in traffic volumes
 - When landscaped, can improve the appearance of a street
- ▶ **Other:** No effect on pedestrian access, bicycle access (where gap in islands are provided), on-street parking, emergency vehicles (islands can be circumvented), and police enforcement

Disadvantages:

- ▶ **Local Access:** Restricts resident access
- ▶ **Maintenance:** May complicate snow plowing/removal and street sweeping
- ▶ **Other:**
 - May increase vehicle speeds depending on geometry and configuration
 - Motorists may deliberately circumvent channelization to make obstructed movement(s)
 - May affect garbage collection routes
 - Traffic may be diverted to parallel streets without traffic calming measures

Limited or No Data Available (Further Research Encouraged):

- ▶ Vehicle speed reduction
- ▶ Traffic volume reduction

Applicability:

- ▶ **Road Classification:** Local or collector streets at intersections with collector or arterial streets
- ▶ **Traffic Conditions:** All traffic volumes (provided alternative routes exist with sufficient capacity to accommodate diverted traffic)
- ▶ **Roadway:** Urban cross-section – curb and gutter; rural cross-section
- ▶ **Locations to Avoid:**

2.5.4 INTERSECTION CHANNELIZATION

- Designated emergency routes
- Low volume local street intersections with other local streets (drivers are likely to deliberately circumvent channelization)

Elements to Consider:

- Sight lines should be respected if there is landscaping

Cost:

- Low – Medium
 - Cost varies depending on extent of channelization, labour and material costs

2.5.5 DIVERTER



Source: Paul Krueger / Creative Commons

Description and Purpose:

A diverter is a raised barrier placed diagonally across an intersection that forces traffic to turn and prevents traffic from proceeding straight through the intersection. Diverters can incorporate gaps for pedestrians, wheelchairs and bicycles and can be mountable by emergency vehicles.

The purpose of a diverter is to obstruct and redirect short-cutting or through traffic.

Design Details: Chapter 4, Section 4.7.2

Advantages:

- ▶ Vehicle Speeds: No significant effect on vehicle speeds, except in the immediate vicinity of the diverter
- ▶ Traffic volumes: Area-wide traffic volume reduction between 20% and 70%
- ▶ Conflicts: Reduces conflict points⁵²
- ▶ Environment:
 - Locally, traffic noise may be reduced and air quality may be improved due to a reduction in traffic volumes
 - When landscaped can enhance the appearance of a street
- ▶ Other:
 - Discourages cut-through traffic
 - No effect on bicycle or pedestrian access, on-street parking, and police enforcement

Disadvantages:

- ▶ Local Access: Restricts resident access
- ▶ Emergency Response: May cause delay for emergency vehicles when slowing to mount and travel over the diverter
- ▶ Maintenance: May complicate street sweeping and snow removal
- ▶ Other:
 - Some motorists may deliberately circumvent diverter, driving across adjacent properties.
 - May affect garbage collection routes
 - Traffic may be diverted to parallel streets without traffic calming measures

Applicability:

- ▶ Road Classification: Local and collector streets
- ▶ Traffic Conditions:
 - Use with caution for volumes greater than 1,500 veh/day⁶⁵
 - Not recommended for volumes over 5,000 veh/day⁶⁵
- ▶ Roadway: Urban cross-section – curb and gutter; rural cross-section – requires bollards or other obstructions to prevent motorists from driving around diverter
- ▶ Locations to Avoid: Designated emergency routes unless design permits passage by emergency

2.5.5 DIVERTER

vehicle

Elements to Consider:

- ▶ Can be unsatisfactory to through cyclists who may be exposed to unsuspecting traffic on both sides of the diverter (depending on the diverter geometry and cyclist manoeuvre)
- ▶ Can be implemented as a part of overall network policy or comprehensive system (limited use can cause traffic to shift to another street or neighbourhood)
- ▶ Proven to be most successful when combined with two or more measures

Cost:

- ▶ Low – Medium
 - Costs can vary widely based on size, drainage, materials, and landscaping

2.5.6 FULL CLOSURE


Source: City of Ottawa

Description and Purpose:

A full closure is a barrier extending the entire width of a roadway, which obstructs all motor vehicle traffic movements from continuing along the roadway. A closure can change a four-way intersection to a three-way intersection, or a three-way intersection to a non-intersection. Gaps can be provided for cyclists or to allow for emergency vehicles.

The purpose of a full closure is to eliminate short-cutting or through traffic.

Design Details: Chapter 4, Section 4.7.3

Advantages:

- ▶ Vehicle Speeds: No significant effect beyond the block in which the closure exists
- ▶ Traffic Volumes: Eliminates all short cutting or through traffic
- ▶ Conflicts: Reduces conflict points
- ▶ Environment:
 - Locally, traffic noise may be reduced and air quality may be improved due to a reduction in traffic volume
 - When landscaped, full closures can enhance the appearance of a street
- ▶ Other: No effect on bicycle or pedestrian access and police enforcement if designed appropriately

Disadvantages:

- ▶ Local Access: Restricts resident access
- ▶ Emergency Response: May restrict emergency access, unless closure is designed to be passable by emergency vehicles
- ▶ Active Transportation and Transit: Motorists may fail to anticipate cyclists who suddenly enter an intersection through a barrier
- ▶ Parking: May require on-street parking prohibitions in vicinity of closure
- ▶ Maintenance: May complicate street sweeping and snow removal
- ▶ Other:
 - Some motorists may deliberately circumvent diverter, driving across adjacent properties
 - May affect garbage collection routes (unless sufficient space is available to reverse and turn around)
 - May divert significant volume of traffic to parallel streets without traffic calming measures

Applicability:

- ▶ Road Classification: Local streets at intersections or mid-block
- ▶ Traffic Conditions: All traffic volumes (provided alternative routes exist with sufficient capacity to accommodate diverted traffic)
- ▶ Roadway: Urban cross-section – curb and gutter
- ▶ Locations to Avoid: Designated emergency routes unless design permits passage by emergency

2.5.6 FULL CLOSURE

vehicles

Elements to Consider:

- ▶ Consider on residential streets with 20% or more cut-through traffic¹
- ▶ Difficult to implement within already built-in areas and are better suited for newly developing subdivisions, as ideal design would incorporate a cul-de-sac
- ▶ May require property acquisition if a turn-around area is required on dead-end street
- ▶ Not effective on rural cross-sections unless obstructions (posts or bollards) are placed at roadside at full closure location

Cost:

- ▶ Medium – High
 - Simple closure will cost less than complex closure with drainage modifications

3. TRAFFIC CALMING PROCESS

3.1 Initiation and Eligibility

Residents who have concerns regarding speeding on Municipal roads are encouraged to submit a written request to the Physical Services Department. Physical Services staff will then go through a screening process to determine the eligibility of the area for traffic calming.

3.1.1 Screening Process

The following criteria will be used to screen concerns:

- Must be a local or collector Central Elgin owned roadway
- Must have a minimum Annual Average Daily Traffic of 500
- The posted speed shall be no greater than 50km/hr
- The road is in a primarily residential environment
- The road section must be longer than 150m
- Have Traffic Calming measure been considered within the last 12 months

For roads that do not meet the above requirements, other tools such as enforcement, education, signage and pavement marking modifications may be utilized.

3.2 Traffic Calming Neighbourhood Petition

After it has been determined that the request meets the required screening criteria, the proponent will be notified. The proponent will be provided with a petition that they are required to circulate. That petition must be signed by 51% of the households within the target area as determined by staff. Each household will be represented by one signature regardless of the number of people residing in the home. This is a vital step in determining the level of concern within the neighbourhood. If the petition is not signed by 51% of the residents within 60 days, the process will be terminated.

3.3 Data Collection

Once a petition has been received by the Municipality with required support, data collection and analyses will commence. The Municipality will use standard traffic measuring devices and methods to study traffic volume, speed, existing roadway conditions and potential traffic displacement. The data that is collected will be used in a point assessment system to determine the need for traffic calming.

3.4 Point Assessment System

The point assessment system is a screening process focused on the various attributes of a roadway in order to quantify its potential need for traffic calming. By means of assigning weighted points based on the severity of certain road attributes (e.g. 85th percentile speed), this process will bring to the forefront roadways requiring consideration while quantifying the current conditions. A point assessment system is provided in Appendix A.

The point assessment system will also be used to prioritize locations for consideration. Those locations with an extremely high point assessment will be given priority based on the quantitative nature of the point assessment system. Depending on funding availability, locations will be selected based on the point system with those locations with the highest points constructed first. If funding does not permit all locations to be constructed in one year, roadways will be carried forward to the next year when they will then be re-prioritized to include any new locations.

The minimum number of points required to proceed with the investigation of traffic calming measures differs based on the classification of roadway. In keeping with the objective of restoring roadways to their intended function, local and collector roadways are designed and expected to convey varying levels of traffic volume. This in turn, has a bearing on the minimum point value required to proceed, as traffic volume is a major consideration. Based on this, the following are minimum point values for each road type.

Local road minimum 35 points

Collector road minimum 52 points

Should a location fail to meet these requirements, residents will be notified in writing and the investigation for traffic calming measures will discontinue. However, staff may continue to address the concerns of the residents by means of the passive traffic calming techniques.

3.5 Traffic Calming Design Considerations

The data collected combined with site visits, historical information, future maintenance and construction plans, as well as resident feedback will be taken into consideration to determine potential traffic calming measures.

Appropriate traffic calming measures will be determined based on the list of traffic calming measures outlined previously in Section 2 of this policy. The traffic calming design could include one or more different types of traffic calming techniques. The proposed traffic calming measures will be in accordance with the design guidelines outlined in the Canadian

Guide to Neighbourhood Traffic Calming and the engineering judgement and experience of staff.

The preferred design will first be presented to emergency, transit and maintenance services. It will then be presented at a public meeting. After any required modifications to the preferred design as a result of this input, a traffic calming survey will be delivered to affected residents.

3.6 Comments from Emergency Services

Staff will provide the preferred design to emergency services for comment. Comments from the potentially affected services will be solicited and feedback with respect to possible impacts will be encouraged. As required, Municipal staff will work with agencies to modify the design, as necessary. While it is preferable to modify the traffic calming design, if modifications are not able to remedy agency concerns, the traffic calming process will be discontinued for the roadway under consideration and residents will be notified.

3.7 Public Information Centre & Public Notice

A notice will be delivered to all households that front or flank the section of road being proposed for traffic calming notifying them of a public information centre (PIC). The meeting will also be advertised on the www.centralelgin.org as well as the Municipality's Social Media. At the PIC the purpose, objectives and implementation process for traffic calming will be presented. At the PIC staff will present residents with the preferred method of traffic calming and provide the opportunity for feedback.

3.8 Community Support Survey

Surveys will be mailed out to all residents who front and flank the proposed section of road. The survey will contain at minimum:

- A brief description of traffic calming, including its advantages and disadvantages;
- The results of the traffic studies undertaken by staff;
- A survey question asking if residents are in favour, opposed or neutral to the implementation of traffic calming measures in the identified location(s);
- The preferred traffic calming design;
- A request for comments and feedback; and
- An indication that this is the final opportunity to modify and improve the preferred design to address any outstanding concerns and to incorporate resident input.

3.9 Measuring Community Support

In order for the process to continue, a minimum of 25% of the total surveys delivered must be returned to the Municipality. Of this 25%, 51% acceptance for the implementation of traffic calming is required. This reinforces that community support is vital for the ultimate success of traffic calming. The surveys will be counted 45 days from the mailing date.

3.10 Finalize Preferred Traffic Calming Plan

Using technical data, community feedback and in keeping with the goals and objectives of this policy, staff will finalize the preferred traffic calming design to be put forward as the recommended preferred traffic calming plan.

3.11 Resident Notification

Residents will be notified of the results of the survey and whether the implementation of traffic calming has met the requirements of this policy. Also included in the notice will be the final preferred traffic calming plan. The notice will be sent to all those who were sent surveys as well as being posted on www.centralelgin.org and the Municipality's social media.

3.12 Implementation

Upon approval from council, resident notification and sufficient funding, traffic calming measures will be implemented. Due to the cost of implementation, it may be put off until the next budget year so that implementation costs can be sufficiently funded. Where feasible, staff may decide it is beneficial to phase in the traffic calming plan through the use of temporary or removable traffic calming measures such as pavement markings, barrels and cones. This will allow time to examine the impact of the measures and their effectiveness before recommending projects be funded for permanent treatments.

3.13 Evaluation and Monitoring

Physical Services staff will monitor the roadway to determine the effectiveness of the utilized measures and their impact on the surrounding road network. This information will be used in recommending similar measures in the future. In addition to conducting before and after speed studies, the Municipality will conduct studies to assess if the traffic calming plan has resulted in significant amounts of traffic diverting to adjacent parallel streets in some cases. These after studies will be compared to the Municipality's before studies to determine the change in traffic volume and patterns.

3.14 Removal of Traffic Calming Measures

Traffic calming devices may be removed, at the request of residents provided that at least the same level of support exists to remove as was measured for installation (25% of returned surveys, with 51% of respondents agreeing to the removal). The survey will be delivered to the same homes the original survey was sent to gauge traffic calming. Traffic calming measures must be in place for at least 2 years before the process to remove them can begin. If the traffic calming devices are removed, the subject street must wait 5 years before requesting a new traffic calming plan.

If a request to remove a single traffic calming device within an overall traffic calming plan is received, all traffic calming devices will be considered for removal. Depending on circumstances, it could be possible to remove a single device constructed as part of an overall plan, however, in most cases all devices work together to be effective and to ensure that traffic is not diverted where it should not be. The Municipality reserves the right to remove traffic calming measures if it determines that they are ineffective or unsafe, or if they have created a negative impact that cannot be corrected. The Municipality will mail out a notification as well as post on www.centralelgin.org and its social media informing of its decision to remove traffic calming measures.

APPENDIX A



450 Sunset Drive
 1st Floor
 St. Thomas, Ontario
 N5R 5V1

TRAFFIC CALMING POINT ASSESSMENT				
Location:		Date Completed:		
Roadway Type: <input type="checkbox"/> Local <input type="checkbox"/> Collector				
Traffic Data				
	Feature	Range	Criteria	Total
1a.	Speed	0 to 35	5 points for every 2 km/h that the 85th percentile speed is greater than 10 km/h over the speed limit	
1b.	High Speed	0 to 5	5 points if minimum of 5% of daily traffic exceeds posted speed by 15-20 km/h	
2	Volume	0 to 20	Local Roadway: 5 points for every 1,500 ADT Collector Roadways: 5 points for every 2,000 ADT	
3	Short-Cutting Traffic	0 to 15	5 points if there is a presence of 25% or more short-cutting traffic, additional 5 points for every 10% increment above 25%	
4	Collisions	0 to 10	1 point for every 2 collisions/year over a 3 year period	
Road Characteristics				
	Feature	Range	Criteria	Total
5	Sidewalks	0 to 10	10 points for no sidewalks with evidence of pedestrian activity, 5 points for sidewalks on only one side	
6	Pedestrian Generators	0 to 15	5 points for each nearby pedestrian generator such as a school, playground, community centre, libraries, retail centres, etc.	
Total				
Does the location meet the minimum requirements				
<ul style="list-style-type: none"> Local roadway = minimum 35 points Collector roadway = minimum 52 points 				
<input type="checkbox"/> YES <input type="checkbox"/> NO				