



ACTIVE TRANSPORTATION AND TRANSPORTATION MASTER PLANS

APPENDIX C RECOMMENDED POLICIES





CONTENTS

1	SIDEWALK PRIORITIZATION POLICY	1
1.1	PURPOSE	1
1.2	BACKGROUND	1
1.3	REVIEW OF CURRENT AND BEST PRACTICE	1
1.4	PRIORITIZATION CRITERIA AND FRAMEWORK	2
2	TRAFFIC CALMING IMPLEMENTATION PROTOCOL	10
2.1	PURPOSE	10
2.2	BACKGROUND	10
2.3	PROTOCOL BASIS	11
2.4	TRAFFIC CALMING OVERVIEW	11
2.5	APPLICATION OF TRAFFIC CALMING MEASURES	12
2.6	TRAFFIC CALMING TOOLKIT	13
2.7	NEIGHBOURHOOD TRAFFIC CALMING STUDY PROCESS	19
2.8	USE OF REGULATORY SIGNS FOR TRAFFIC CALMING PURPOSES	27
2.8.1	ALL-WAY STOP SIGNS	27
2.8.2	SPEED REDUCTION AND MOVEMENT RESTRICTION SIGNS	27
3	ROUNDBOUT FEASIBILITY POLICY	28
3.1	PURPOSE	28
3.2	BACKGROUND	28
3.3	APPLICATION	29

ATTACHMENTS

ATTACHMENT A ROUNDBOUT SCREENING TOOL



FIGURES

FIGURE 2.1:	LEGEND FOR TABLE 2.1.....	13
FIGURE 2.2:	NEIGHBOURHOOD TRAFFIC CALMING STUDY PROCESS	20

TABLES

TABLE 1.1:	SIDEWALK PRIORITIZATION CRITERIA.....	3
TABLE 1.2:	PRIORITIZATION RANKING FOR SIDEWALKS	5
TABLE 2.1:	POTENTIAL TRAFFIC CALMING MEASURES	14
TABLE 2.2:	SCREENING CRITERIA.....	21
TABLE 2.3:	PRIORITIZATION CRITERIA.....	23
TABLE 3.1:	ADVANTAGES AND DISADVANTAGES OF ROUNDABOUTS.....	30



1 SIDEWALK PRIORITIZATION POLICY

1.1 PURPOSE

The **Sidewalk Prioritization Policy** is intended to aid the Township in prioritizing upgrades and improvements to sidewalks in existing and potential future settlement areas.

1.2 BACKGROUND

The Township of Scugog Official Plan and the **Active Transportation and Transportation Master Plans** (AT and TMP) encourage walking as a sustainable, energy efficient, affordable, and accessible form of travel, and outline actions to achieve this goal. Unfortunately, some roads within the Township lack pedestrian facilities on one or both sides, creating pedestrian connectivity issues inconsistent with these goals. As well, in some locations, existing sidewalks do not meet accessibility and mobility needs of residents.

The Township has limited funds available for construction of sidewalk upgrades and improvements in most years. A policy is needed to identify and prioritize upgrades and improvements so funding can be allocated accordingly.

1.3 REVIEW OF CURRENT AND BEST PRACTICE

The Township does not currently have a policy for prioritizing upgrades and improvements to sidewalks.

Sidewalk prioritization policies from other North American municipalities and applicable reference documents were reviewed to assess current best practice and identify relevant features to include in the Township's guidance. The research indicated other jurisdictions tend to prioritize future sidewalk development based on the following criteria, plus the overall objective of addressing small gaps in the sidewalk network:

- Roadway classification (i.e. arterial, collector, local) – Arterial and collector roads should have sidewalks on both sides, while local roadways should have sidewalks on at least one side;
- Length of road;
- Traffic volumes;
- Speed limit;



- Number of dwellings served; and
- Proximity to schools, parks, churches, transit stops, and recreational and commercial establishments.

1.4 PRIORITIZATION CRITERIA AND FRAMEWORK

The recommended prioritization method involves assigning a point score to the criteria outlined in **Table 1.1**, generally grouped into the following categories:

- Existing sidewalk condition;
- Compliance with *Accessibility for Ontarians with Disabilities Act* (AODA) requirements;
- Conformity with the AT and TMP;
- Land use and connectivity;
- Road characteristics;
- Public support;
- Constructability; and
- Cost.

The total score for each sidewalk segment, calculated by summing the individual criteria points, provides the basis for ranking, with projects exhibiting the highest scores given top priority. Pedestrian safety and accessibility are given higher weights in the evaluation matrix.

Table 1.2 summarizes the criteria and point scoring system for prioritizing sidewalk upgrades and improvements. The table also indicates the anticipated source of data for the assessment.

The maximum score based on this methodology is 105. In the event of a tied score between initiatives, priority should be given to the lower cost project as it would create more benefit per dollar spent. When project costs are similar, priority should be given to the segment that best serves more vulnerable users such as seniors and children.

The Township should incorporate the recommendations of the prioritization process into its long-range capital plan.

The Township should maintain a consistent schedule of assessing sidewalks for upgrades and improvements. This assessment can be undertaken completed by mid-June each year in preparation for annual budgeting.



TABLE 1.1: SIDEWALK PRIORITIZATION CRITERIA

Criteria	Sub-Criteria	Guidelines
Existing Condition	Surface, Curb, and Boulevard Condition	<ul style="list-style-type: none"> Evidence of cracks and uneven surfaces (should not impede pedestrian movement) Evidence of unmaintained or narrow boulevard (should not impact the comfort and safety of all road users)
Compliance with AODA Requirements	Width	<ul style="list-style-type: none"> 1.5 metre minimum, 1.8 metre recommended
	Running and Cross-Slopes	<ul style="list-style-type: none"> Slope should not exceed the running slope of the adjacent roadway, nor should the sidewalk cross-slope exceed 1:20
	Curb Ramps and Depressions	<ul style="list-style-type: none"> 1.2 metre minimum clear width and 1:8 maximum running slope for curb ramps Depressed curbs should align with the direction or travel and have a maximum running slope of 1:20
Conformity with Plans	Active Transportation and Transportation Master Plans Identification	<ul style="list-style-type: none"> Location identified on Map 7 – Proposed Pedestrian Network – Port Perry Urban Area or Map 8 – Proposed Pedestrian Network – Hamlets
Land Use and Connectivity	Proximity to Pedestrian Trip Generators	<ul style="list-style-type: none"> Proximity to locations generating greater numbers of pedestrian trips (generally considered 400 to 1500 metres) Evidence of existing pedestrian use (e.g., beaten path)
	Located within Residential or Commercial Area	<ul style="list-style-type: none"> Location within residential or commercial area per the Township Official Plan
	Proximity to Vulnerable Users	<ul style="list-style-type: none"> Proximity to facilities with vulnerable users (i.e. school zones, hospitals, and seniors' residences and centres) In school zones, factors include designated walking zones, number of walkers and impact on bus needs. Assessed in consultation with school boards and transportation providers.
	Proximity to Transit	<ul style="list-style-type: none"> Priority to locations on bus routes Proximity to stops/stations



TABLE 1.1: SIDEWALK PRIORITIZATION CRITERIA

Criteria	Sub-Criteria	Guidelines
Road Characteristics	Existing Sidewalk	<ul style="list-style-type: none"> Priority to roads without existing sidewalk on one (Local roads) or both (Arterial and Collector roads) sides
	Number of Lanes	<ul style="list-style-type: none"> Priority to roads with four or more lanes
	Posted Speed Limit	<ul style="list-style-type: none"> Priority to roads with higher posted speeds
	Traffic Volume	<ul style="list-style-type: none"> Priority to roads with higher average annual daily traffic (AADT) volumes
Public Support	Number of Requests	<ul style="list-style-type: none"> Priority based on the number of resident requests for sidewalk improvements in the preceding year
Constructability	Right-of-Way and Cross-Section	<ul style="list-style-type: none"> Priority to locations where sidewalk can be constructed within the existing right-of-way and does not require significant changes to the roadway cross-section
	Utility Impacts	<ul style="list-style-type: none"> Priority to locations where sidewalk can be constructed with no impact to existing utilities
	Impacts to Sensitive Environmental Features	<ul style="list-style-type: none"> Priority to locations where sidewalk can be constructed with no impact to sensitive environmental features
	Coordination with Other Planned Works	<ul style="list-style-type: none"> Priority to locations where sidewalk construction can be coordinated with another planned road/service project.
Cost	n/a	<ul style="list-style-type: none"> No points assigned at this stage. Considered in final prioritization of projects for budget purposes.



TABLE 1.2: PRIORITIZATION RANKING FOR SIDEWALKS

Criteria	Sub-Criteria	Description	Point Allocation (110 maximum)		Data Source
Existing Condition (30 points)	Surface, Curb, and Boulevard Condition	Assign points based on the overall condition of the sidewalk surface and curb. Sidewalks in worse condition receive more points.	Good – New or recently constructed, occasional cracks but no significant decay. No missing or broken bays, trip ledges, spalling, heaving, and stepping, presence of ponding, or damage by tree roots. Wide boulevard width.	0	Site visit and survey
			Fair – Some cracks and weathering, uneven in places. Some presence of broken bays, trip ledges, spalling, heaving, and stepping, ponding, and damage by tree roots. Sufficient boulevard width.	15	
			Poor – Heavily cracked and uneven. Considerable presence of broken bays, trip ledges, spalling, heaving, and stepping, ponding, and damage by tree roots. Insufficient or no boulevard width.	30	
Compliance with AODA Requirements (20 points)	Width	Assign points to sidewalks less than 1.8 metres wide. Sidewalks narrower than 1.5 metres receive additional points.	Width < 1.5 m	10	GIS mapping, aerial photography, site visit
			1.5 m < Width < 1.8 m	5	
			Width ≥ 1.8 m	0	
	Running and Cross-Slopes	Assign points to sidewalks with running slopes exceeding those of the adjacent roadway <u>or</u> with cross-slopes exceeding 1:20.	5 points		Topographical survey, site visit, AODA Design of Public Spaces Standards



TABLE 1.2: PRIORITIZATION RANKING FOR SIDEWALKS

Criteria	Sub-Criteria	Description	Point Allocation (110 maximum)		Data Source
	Curb Ramps and Depressions	Assign points if the sidewalk does not have curb ramps or depressions that meet AODA standards. Assign points if Tactile Walking Surface Indicators are not present.	Curb ramps or depressions do not meet AODA standards	3	Aerial photography, site visit, AODA Design of Public Spaces Standards
			No Tactile Walking Surface Indicators	2	
Conformity with Plans (10 points)	Active Transportation and Transportation Master Plans Identification	Assign points if the sidewalk is identified as a candidate for improvement on Map 7 or Map 8.	10 points		2021 AT and TMP
Land Use and Connectivity (20 points)	Proximity to Pedestrian Trip Generators	Assign points based on <i>Walk Score</i> . The website analyzes proximity to amenities within walking distance and assigns a score. Locations closer to more pedestrian generators receive more points.	Walk Score > 50	5	www.walkscore.com
			Walk Score between 0 and 50	3	
			Walk Score n/a	0	
	Located within Residential or Commercial Area	Assign points if the sidewalk is located within an area designated for residential or commercial uses as defined in the Township Official Plan.	5 points		Township Official Plan Land Use Designation Schedule (Schedule A)
	Proximity to Vulnerable Users	Assign points if the sidewalk is located within the designed walking zone of an	5 points		School board student transportation



TABLE 1.2: PRIORITIZATION RANKING FOR SIDEWALKS

Criteria	Sub-Criteria	Description	Point Allocation (110 maximum)		Data Source
		elementary or secondary school as identified by the school board. Assign points if the sidewalk is located within 400 metres of the hospital or seniors' residence or centre.			information, location of hospital and seniors' residences and centres
	Proximity to Transit	Assign points if the sidewalk is located within 800 metres of a transit stop or station.	5 points		GO Transit and Durham Region Transit (DRT) service maps
Road Characteristics (10 points)	Existing Sidewalk	Assign points if there is currently a sidewalk on only one side of an Arterial (any type) or Collector road or no sidewalk on a Local road as defined in the Township Official Plan.	3 points		Township Official Plan Transportation System Schedule (Schedule C)
	Number of Lanes	Assign points based on the number of travel lanes. Wider roads receive more points.	4 lanes or greater	2	GIS mapping
			2 lanes	1	
			Cul-de-sac/dead end	0	
	Posted Speed Limit	Assign points based on the posted speed limit. More points awarded to roads with higher posted speed limits.	70 km/h or higher	3	GIS mapping
60 km/h			2		
50 km/h			1		
Less than 50 km/h			0		



TABLE 1.2: PRIORITIZATION RANKING FOR SIDEWALKS

Criteria	Sub-Criteria	Description	Point Allocation (110 maximum)		Data Source
	Traffic Volume	Assign points based on existing traffic volumes. Roads with higher average annual daily traffic (AADT) volumes receive more points.	Greater than 4,000	2	Traffic counts
			2,000 – 4,000	1	
			Less than 2,000	0	
Public Support (10 points)	Number of Requests	Assign points based on the number of requests received from the public in the preceding year. Locations with more requests receive additional points.	More than 10 requests	10	Township records
			5 – 10 requests	5	
			1 – 5 requests	3	
Constructability (10 points)	Right-of-Way and Cross-Section	Assign points if sufficient right-of-way or road platform exists to widen the sidewalk to 1.8 metres without the need for additional property or significant changes to the road cross-section (e.g. need for curb and gutter).	3 points		GIS mapping, aerial photography, site visit
	Utility Impacts	Assign points if there are no impacts to existing utilities with the sidewalk improvements.	2 points		
	Impacts to Sensitive Environmental Features	Assign points if there are no impacts to sensitive environmental features with the sidewalk improvements.	3 points		



TABLE 1.2: PRIORITIZATION RANKING FOR SIDEWALKS

Criteria	Sub-Criteria	Description	Point Allocation (110 maximum)	Data Source
	Coordination with Other Planned Works	Assign points if the sidewalk improvements can be incorporated into another planned road/service project.	2 points	Township/Region Capital Works Plan
Cost (No points)	n/a	Consider cost in the final prioritization of projects for budget purposes	No points assigned at this stage	Cost estimate based on length, typical width and other features needed



2 TRAFFIC CALMING IMPLEMENTATION PROTOCOL

2.1 PURPOSE

The **Traffic Calming Implementation Protocol** is intended to aid the Township in identifying eligible locations for traffic calming and provide guidance on the application of traffic calming measures. The policy is intended for use on existing and future streets in Scugog.

2.2 BACKGROUND

Growth in traffic volumes and heightened resident concerns about excessive speeding, traffic infiltration/shortcutting, and other undesirable driver behaviour has led to an increase in requests for traffic calming interventions on neighbourhood streets in the municipality. Unfortunately, the Township is unable to accommodate all requests within current resources, nor are all locations suitable for traffic calming. To provide a transparent, fair, and standardized process for addressing all traffic calming requests submitted for review, the Township has developed this protocol, which includes a:

- Process for receiving, evaluating, and responding to citizen requests for traffic calming;
- Methodology and evaluation criteria to determine if traffic calming is appropriate for a given street and prioritize locations being considered for measures; and
- List of traffic calming measures (the “toolbox”) the Township will consider implementing on streets in Scugog.

The protocol incorporates best practices in traffic calming with local context to provide an appropriate, efficient, and flexible framework for addressing the variety of inquiries received by the Township. It supplements guidance contained in the Transportation Association of Canada (TAC) *Canadian Guide to Traffic Calming*¹ and *Geometric Design Guide for Canadian Roads*² with considerations specific to Scugog. The protocol also reflects applicable Provincial legislation including the *Accessibility for Ontarians with Disabilities Act (AODA)* and the *Highway Traffic Act (HTA)*. The planning, design, and implementation of traffic calming plans in Scugog must comply with relevant provisions of these and other statutes.

¹ Transportation Association of Canada. *Canadian Guide to Traffic Calming*. February 2018.

² Transportation Association of Canada. *Geometric Design Guide for Canadian Roads*. June 2017.



2.3 PROTOCOL BASIS

The Township of Scugog Official Plan (2010) and the Active Transportation and Transportation Master Plans provide the basis for the protocol. The Official Plan includes specific policy direction on the application of traffic calming in the following sections:

- *4.1.6.c) Residential neighbourhoods shall be developed in accordance with the following urban design principles:*
 - *xii) A variety of traffic calming measures such as curb extensions and landscape medians should be included within the proposed street network where appropriate.*
- *8.3.5.b) Road designs may incorporate traffic calming techniques such as narrower right-of-way, traffic circles and speed control devices, where appropriate, to promote a safer pedestrian environment and/or to maintain vehicles within designated speed limits. The Township will consider alternative standards for public road rights-of-way in order to achieve urban design objectives in certain areas of the municipality.*

2.4 TRAFFIC CALMING OVERVIEW

The *Canadian Guide to Traffic Calming* describes traffic calming as:

The process and measures applied by road authorities to address concerns about the behaviour of motor vehicle drivers travelling on streets within their jurisdictions.³

Traffic calming measures are usually applied in locations experiencing excessive vehicle speed and/or high volumes of shortcutting traffic. The application of these measures is intended to restore streets to their desired function of providing mobility and access in differing combinations depending on the specific location, role, and classification of the roadway.

When applied properly, traffic calming can help “reduce the negative effects of motor vehicle use, alter driver behaviour, and improve conditions for non-motorized street users.”⁴ However, physical measures can be costly and time-consuming to design, install, and maintain. The installation of traffic calming can also cause unintended consequences if used inappropriately.

³ Transportation Association of Canada. *Canadian Guide to Traffic Calming*. February 2018. p. 1.

⁴ Institute of Transportation Engineers Subcommittee of Traffic Calming. Washington, D.C. 1997.



Like any tool, traffic calming presents advantages and implications depending on its application. Advantages of traffic calming can include:

- Reduced motor vehicle speeds;
- Reduced traffic volumes;
- Less shortcutting;
- Improved neighbourhood livability; and
- Reduced conflicts between roadway users.

Consequences of traffic calming can include:

- Increased emergency vehicle response and transit operating times;
- Reduced or impeded access and egress from neighbourhoods;
- Shifting or diverting traffic volumes or speeding concerns onto other roadways;
- Increased maintenance costs, including snow clearing and curbside waste collection; and
- Increased vehicle emissions and/or noise.

2.5 APPLICATION OF TRAFFIC CALMING MEASURES

The Township may consider the implementation of traffic calming measures on residential Local, Collector, and Type C arterial roads within the settlement areas of the municipality shown on Schedule A and A-1 of the Township of Scugog Official Plan:

- When there is a demonstrated safety, excessive speed, or shortcutting traffic concern and acceptable alternative measures have been exhausted;
- After exploring methods to improve operation of the arterial road network, such as signal timing optimization; and
- Only after education, enforcement, and traffic engineering efforts have failed to produce the desired results.

Where the installation of traffic calming measures is deemed the preferred course of action, the Township will:

- Determine whether an area-wide plan or street-specific scheme is more suitable. An area-wide plan will be pursued if a street-specific scheme would likely result in the displacement of traffic onto adjacent streets. The area-wide approach will typically



be applied in assessing traffic calming requests on Collector or Type C Arterial roads; and

- Not impede non-motorized modes of transportation through the introduction of traffic calming. Measures will be designed to enhance and minimize impacts to pedestrian and cyclist movement.

2.6 TRAFFIC CALMING TOOLKIT

The *Canadian Guide to Traffic Calming* identifies a broad range of traffic calming techniques. From this catalogue of options, the Township has established a shortlist of potential traffic calming measures for use in Scugog. The list provided in **Table 2.1** captures a range of different approaches to traffic calming, providing a description and photo of each measure. The table also notes whether the measures are applicable on Local, Collector, and/or Type C Arterial roads and summarizes the potential benefits and implementation considerations of each technique. **Figure 2.1** provides the legend for the table.

Legend	
■	Substantial Benefits
▣	Minor Benefits
□	No Benefits or Limited Data Available
●	Substantial Impact
◉	Moderate Impact
○	No Impact or Limited Data Available
\$	Low Cost (\$0-\$10,000)
\$\$	Moderate Cost (\$10,000 to \$100,000)
\$\$\$	High Cost (\$100,000 +)

FIGURE 2.1: LEGEND FOR TABLE 2.1

Using the table will assist the Township in selecting appropriate measures to address specific traffic issues and help to avoid the undesirable consequences of traffic calming noted in Section 2.4. It is important to note that not all traffic calming measures are appropriate in all circumstances. Selection of suitable measures will depend on the specific issues being addressed and site-specific conditions, as discussed in the following section.



TABLE 2.1: POTENTIAL TRAFFIC CALMING MEASURES




Measure	General Description	Applicable Location	Photo	Potential Benefit				Implementation Consideration						Cost
				Speed Reduction	Volume Reduction	Conflict Reduction	Environment	Local Vehicle Access	Emergency Vehicle Response	Cycling Use	Traffic Enforcement	Vehicle Parking	Street Maintenance	
Vertical Deflection														
Speed Cushion	A segmented speed hump that allows for the passage of larger vehicles such as fire trucks and buses without difficulty while still reducing passenger vehicle speeds.	<ul style="list-style-type: none"> Local Roads 		■	■	■	■	○	○	○	○	○	○	\$
Speed Hump/Table	A raised area of a roadway that deflects both the wheels and body of a traversing vehicle. A speed table is an elongated speed hump with a flat-topped section long enough to raise the entire wheelbase of a vehicle.	<ul style="list-style-type: none"> Local Roads 		■	■	■	■	○	●	○	○	○	○	\$-\$\$
Raised Crosswalk	A marked pedestrian crosswalk at an intersection or mid-block location constructed at a higher elevation than the adjacent roadway.	<ul style="list-style-type: none"> Local Roads Collector Roads 		■	□	■	■	○	○	○	○	○	○	\$-\$\$



TABLE 2.1: POTENTIAL TRAFFIC CALMING MEASURES




Measure	General Description	Applicable Location	Photo	Potential Benefit				Implementation Consideration					Cost		
				Speed Reduction	Volume Reduction	Conflict Reduction	Environment	Local Vehicle Access	Emergency Vehicle Response	Cycling Use	Traffic Enforcement	Vehicle Parking		Street Maintenance	
Raised Intersection	A full intersection, including crosswalks, constructed at a higher elevation than the adjacent roadways.	<ul style="list-style-type: none"> Local Roads Collector Roads 		■	□	■	■	○	○	○	○	○	○	○	\$\$\$-\$\$\$
Horizontal Deflection															
Vertical Centreline Treatment	The use of features such as flexible post-mounted delineators or raised pavement markers to create a centre median with the intent of giving drivers a perception of lane narrowing and creating a sense of constriction.	<ul style="list-style-type: none"> Local Roads 		■	□	□	□	○	○	○	○	○	○	○	\$
On-Street Parking	The reduction of the roadway width available for vehicle movement by allowing motor vehicles to park adjacent and parallel to the curb.	<ul style="list-style-type: none"> Local Roads Collector Roads Type C Arterial Roads 		■	□	□	■	○	○	○	○	○	○	○	\$-\$\$



TABLE 2.1: POTENTIAL TRAFFIC CALMING MEASURES



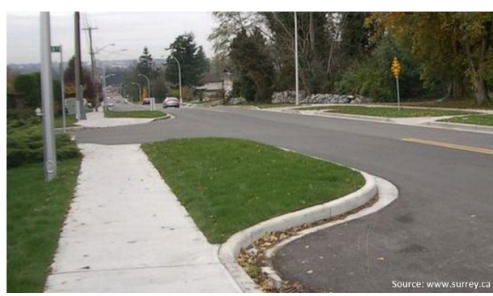
Measure	General Description	Applicable Location	Photo	Potential Benefit				Implementation Consideration					Cost	
				Speed Reduction	Volume Reduction	Conflict Reduction	Environment	Local Vehicle Access	Emergency Vehicle Response	Cycling Use	Traffic Enforcement	Vehicle Parking		Street Maintenance
Traffic Circle/Traffic Button/Mini-Roundabout	A raised island located in the centre of an intersection, which requires vehicles to travel through the intersection in a circular, counter-clockwise direction around the island.	<ul style="list-style-type: none"> Local Roads Collector Roads Type C Arterial Roads 		■	□	■	■	○	○	○	○	○	○	\$-\$\$\$
Curb Radius Reduction	The reconstruction of an intersection corner using a smaller radius for the curb, usually in the 3.0 m to 5.0 m range.	<ul style="list-style-type: none"> Local Roads Collector Roads Type C Arterial Roads 		■	□	□	■	○	○	○	○	○	○	\$\$-\$\$\$
Curb Extension	A horizontal intrusion of the curb into the roadway resulting in a narrower roadway width.	<ul style="list-style-type: none"> Local Roads Collector Roads Type C Arterial Roads 		■	□	□	■	○	○	○	○	●	●	\$\$-\$\$\$



TABLE 2.1: POTENTIAL TRAFFIC CALMING MEASURES

Measure	General Description	Applicable Location	Photo	Potential Benefit				Implementation Consideration					Cost		
				Speed Reduction	Volume Reduction	Conflict Reduction	Environment	Local Vehicle Access	Emergency Vehicle Response	Cycling Use	Traffic Enforcement	Vehicle Parking		Street Maintenance	
Raised Median Island	An island constructed on the centreline of a two-way roadway to reduce the overall width of the adjacent travel lanes.	<ul style="list-style-type: none"> Local Roads Collector Roads Type C Arterial Roads 		■	□	■	□	●	○	○	○	○	●	●	\$\$\$-\$\$\$
Supplemental Measures															
Rumble Strips	Raised buttons, bars or grooves closely spaced at regular intervals on the roadway that create both noise and vibration in a moving vehicle.	<ul style="list-style-type: none"> Rural Roads 		■	□	□	□	○	○	●	○	○	○	●	\$
Speed Display Boards/Driver Feedback Signs/ Portable Messaging Signs	Permanent or temporary signs, often with digital messages, used to advise drivers of excessive speeds or modified road conditions with the intent of making drivers aware of undesired behaviour and increasing their awareness to surroundings.	<ul style="list-style-type: none"> Local Roads Collector Roads Type C Arterial Roads 		■	□	□	□	○	○	○	●	○	●	\$	



TABLE 2.1: POTENTIAL TRAFFIC CALMING MEASURES

Measure	General Description	Applicable Location	Photo	Potential Benefit				Implementation Consideration					Cost	
				Speed Reduction	Volume Reduction	Conflict Reduction	Environment	Local Vehicle Access	Emergency Vehicle Response	Cycling Use	Traffic Enforcement	Vehicle Parking		Street Maintenance
Sidewalk Extension/ Textured Crosswalk	A sidewalk that is continued across a local street intersection at the same elevation of the roadway and a textured and/or patterned surface that contrasts with the adjacent roadway is incorporated.	<ul style="list-style-type: none"> Local Roads Collector Roads 		■	□	■	■	○	○	●	○	○	●	\$-\$\$
Education Campaign	Events, programs, and/or media campaigns intended to raise awareness of road safety issues. Education campaigns can address multiple types of driver awareness, including speeding (other types include impaired driving, distracted driving, seatbelt awareness, aggressive driving, etc.).	<ul style="list-style-type: none"> Local Roads Collector Roads Type C Arterial Roads 		□	□	□	□	○	○	○	○	○	○	\$-\$\$\$
Targeted Enforcement	Specific police enforcement in locations where speed, collision, citation, resident comments, or other sources of information suggest the site is unusually hazardous due to illegal driving practices.	<ul style="list-style-type: none"> Local Roads Collector Roads Type C Arterial Roads 		■	□	□	□	○	○	○	●	○	○	\$-\$\$\$



2.7 NEIGHBOURHOOD TRAFFIC CALMING STUDY PROCESS

Figure 2.2 illustrates a **process** for considering neighbourhood traffic calming study requests in the Township of Scugog. The process, which involves both public/ stakeholder engagement and technical evaluation tasks, can be distilled into the following seven steps:

Step 1 – Traffic Calming Request

Neighbourhood residents will submit their written request for a Traffic Calming Study to the Township on the prescribed form. The request must specify the subject street and the nature of the traffic concern. The Township will only accept requests from residents living on the subject street. The Mayor and Ward Councillors can also request a study on behalf of their constituents.

Step 2 – Initial Screening

Township staff will conduct an initial screening of the request to determine if the subject street meets the criteria for a Traffic Calming Study per **Table 2.2**. Requests not satisfying these minimum thresholds will be denied, and the process ended. In some locations, the Township may consider non-physical traffic calming measures such as education and enforcement to address resident concerns as an alternative or a first step.

The Township will typically collect the data required to complete the initial screening in the spring, summer, and/or fall season. Requests received in the winter season will be investigated in the spring.

After completing the initial screening, Township staff will notify the original requester whether the location satisfies the minimum thresholds for a Traffic Calming Study and, if so, outline the next steps in the process. If denied, Township staff will provide an explanation as to why the request was refused.

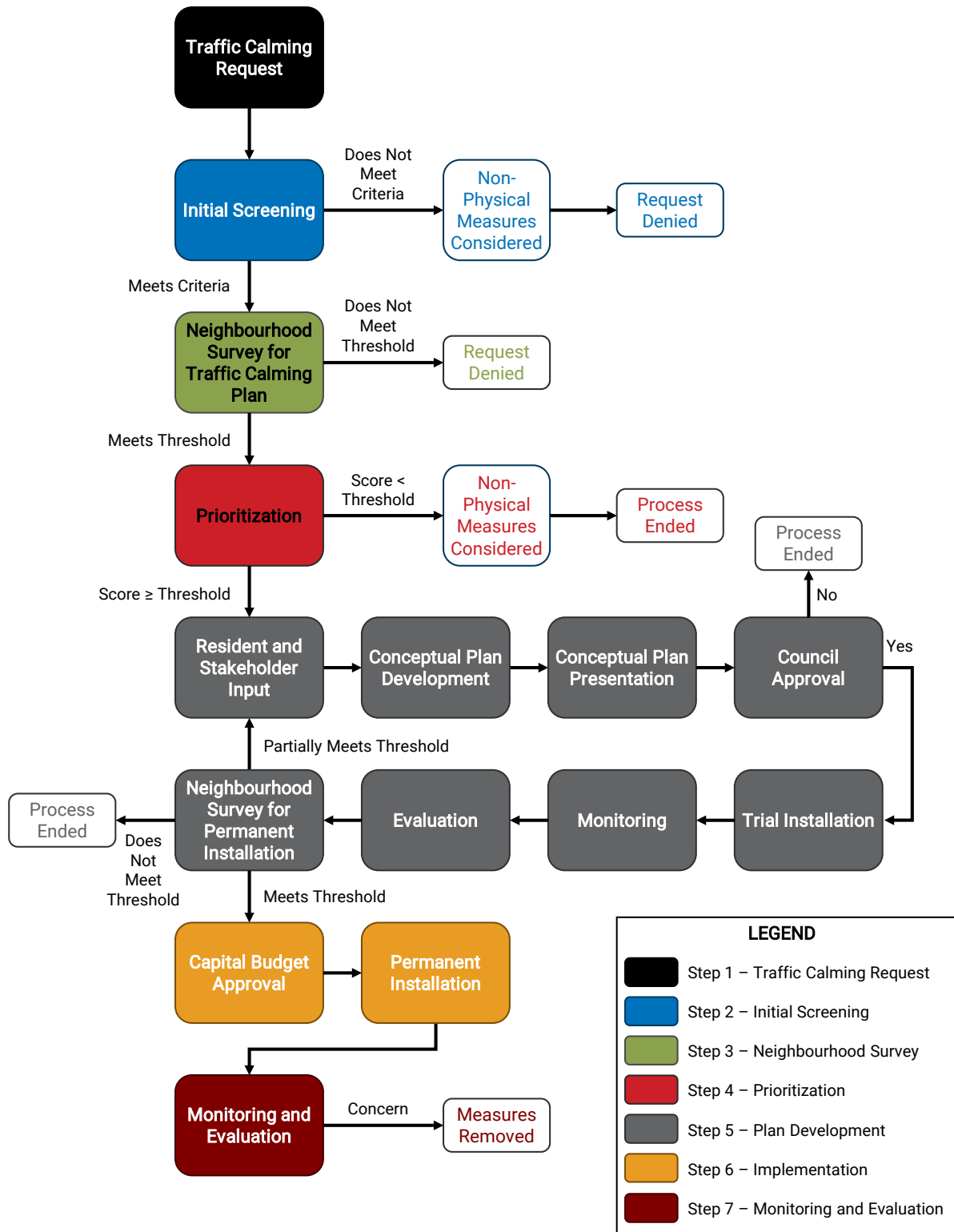


FIGURE 2.2: NEIGHBOURHOOD TRAFFIC CALMING STUDY PROCESS



TABLE 2.2: SCREENING CRITERIA

Criteria	Threshold	Traffic calming may be considered if:
All Criteria Must be Met		
Previously Requested	Within Last Three Years	A prior request for traffic calming has not been denied within the last three years.
Measures Removed	Within Last Three Years	Traffic calming measures have not been removed within the last five years.
Roadway Classification	Local, Collector or Type C Arterial Road	The subject street is designated a Local, Collector, or Type C Arterial road in the Township Official Plan (Schedules C and C-1).
Land Use Designation	Within Settlement Area	The subject street is located within the Port Perry Urban Area, Hamlet, Shoreline, or Residential Cluster designation in the Township Official Plan (Schedules A and A-1).
Speed Limit	≤ 50 km/h	The posted speed limit on the subject street is 50 km/h or less.
Grade	< 8%	The grade of the subject street is less than 8%.
Segment Length	≥ 150 metres	The distance between stop-controlled intersections along the subject street is 150 metres or more.
At Least One Criteria Must be Met for <u>Local</u> Roads		
Operating Speed	≥ 5 km/h above speed limit	The 85 th percentile speed is 5 km/h or more above the posted speed limit.
Shortcutting Traffic	> 30%	The percentage of non-local traffic is more than 30%.
At Least One Criteria Must be Met for <u>Collector and Type C Arterial</u> Roads		
Operating Speed	≥ 10 km/h above posted speed limit	The 85 th percentile speed is 10 km/h or more above the posted speed limit.
Shortcutting Traffic	> 60%	The percentage of non-local traffic is more than 60%.

Notes:

1. The 85th percentile speed is calculated from data collected using automated traffic recorders or other appropriate equipment over several days.
2. The percentage of non-local traffic is estimated by comparing the expected trip generation for an area to the actual volume counts. Alternatively, data will be collected through a license plate trace survey or data collection units with Bluetooth readers.



Step 3 – Neighbourhood Survey

If the subject street satisfies the minimum thresholds, Township staff will survey households within the study area to gauge resident support for developing a Traffic Calming Plan. Key considerations when defining the study area include:

- Subject street (segment(s) of concern);
- Traffic data;
- Location and context of sensitive land uses near, or adjacent to, streets of interest;
- Other Township policies (e.g., Official Plan, Active Transportation and Transportation Master Plans);
- Opportunities and limitations such as available resources and partnerships; and
- Environmental factors (e.g., geographic features, major streets, key intersections).

For Local roads, the study area will typically include households with direct frontage on the subject street. For Collector and Type C Arterial roads, the study area will include households with direct frontage plus Local roads linking to the subject street, recognizing these roads typically serve a broader neighbourhood. In all cases, the Township may adjust the study area to capture potentially impacted households on other streets, especially if shortcutting traffic is the primary concern and traffic diversion is a possible outcome.

Each household within the study area will be issued one survey regardless of the number of residents. A minimum survey response rate of 25% (participation rate) is required with a minimum of 51% of respondents in favour of pursuing a Traffic Calming Plan (support rate). Requests not attaining these thresholds will be denied, and the process ended. The Township will also not entertain a new request for a Traffic Calming Study on the subject street for a period of at least three years. Township staff will inform study area households of the survey results and next steps.

Step 4 – Prioritization

Requests that meet the thresholds for neighbourhood support will be assessed against other eligible locations to determine relative priority for a Traffic Calming Plan.

The point system shown in **Table 2.3** provides the basis for ranking requests, with projects achieving the highest scores given top priority. The maximum score, calculated by summing the individual criteria points, is 100 points based on this methodology. The “Resident Support” score is based on the survey results from Step 3.



TABLE 2.3: PRIORITIZATION CRITERIA

Criteria	Point Criteria	Maximum Points
Collision History	1 point for each qualifying collision ¹ over the last three years	15
Operating Speed	1 point for each 1% of vehicles observed: <ul style="list-style-type: none"> 5 km/h or more over the posted speed limit for Local roads 10% or more over the posted speed limit for Collector and Type C Arterial roads 	15
Shortcutting Traffic	5 points for each 10% increment in share above: <ul style="list-style-type: none"> 30% for Local roads 60% for Collector and Type C Arterial roads 	15
Total Traffic Volume ²	1 point for each: <ul style="list-style-type: none"> 50 vehicles over 500 vehicles per day <u>OR</u> 5 vehicles over 100 vehicles per hour in the peak hour for Local roads 50 vehicles over 2,000 vehicles per day for Collector and Type C Arterial roads 	10
Pedestrian Generators	5 points for each designated pedestrian generator (i.e., school, recreation centre, park, senior's home or centre, daycare, etc.) within the study area	10
Sidewalks	5 points if there are: <ul style="list-style-type: none"> No sidewalks on Local Roads Sidewalks on one side only of Collector and Type C Arterial roads 	5
Cycling Facilities	5 points if there are designated cycling facilities on the subject street	5
Resident Support ³	¼ point for each 1% of respondents on the subject street voting in favour of a Traffic Calming Plan	25
Total Maximum Points (After Neighbourhood Survey)		100

Notes:

- Includes all collisions along the subject street except for collisions occurring at intersections with arterial roads.
- Traffic volumes used in the evaluation are two-way average daily volumes over a 24-hour period.
- If the minimum 25% response rate is not achieved, community support is deemed insufficient and 0 points are assigned. Physical traffic calming measures will not be considered in this case. Points awarded based on the percentage of "yes" votes compared to total eligible votes received through the neighbourhood survey in Step 3.



In case of a tie, priority will be determined using a risk-based approach, considering the relative safety benefit of installing traffic calming in competing locations. Priority will typically be given to streets that serve more vulnerable users such as seniors and children. If still tied, the lower cost project will receive priority since the investment in traffic calming would generate greater benefit per dollar spent.

Locations attaining the minimum score of 50 points will be added to the [List of Potential Traffic Calming Plans](#) for future implementation consideration. Locations not attaining the minimum score will be deemed ineligible for a Traffic Calming Plan. For these locations, the Township may consider more passive forms of traffic calming such as education and enforcement.

Step 5 – Plan Development

Township staff will initiate development of a Traffic Calming Plan for the subject street in priority order according to the [List of Potential Traffic Calming Plans](#) and available staff and budget resources. The toolkit of measures contained in **Table 2.1** will be referenced in selecting and designing traffic calming treatments. Data collected during prior steps, in addition to site visits, historical information, future maintenance and construction plans, and participant feedback, will be taken into consideration in preparing the plan.

The Township will engage residents and stakeholders in developing the Traffic Calming Plan through the following consultation and design process:

- Task 1.** Consult with residents and stakeholders to confirm neighbourhood traffic issues, note potential implementation challenges, and identify candidate traffic calming measures.
- Task 2.** Prepare conceptual Traffic Calming Plan (options) taking into consideration resident and stakeholder input.
- Task 3.** Present conceptual Traffic Calming Plan (options) to residents, incorporate feedback received, and finalize the proposed plan (options).
- Task 4.** Present recommended Traffic Calming Plan to Township Council for approval and seek authorization to implement the plan on a trial basis using temporary/seasonal measures, subject to available funding. If the plan is not approved, the Township will not entertain a new request for a Traffic Calming Study on the subject street for a period of at least three years. In certain circumstances, the Township may prefer to move forward with permanent installation without a trial application.



- Task 5.** Install approved Traffic Calming Plan on a trial basis using temporary/seasonal materials (typically) for a period of 12 to 18 months. The temporary measures can be reused for other locations. Township staff will inform study area households of the intention to install the traffic calming measures prior to implementation.
- Task 6.** Monitor effectiveness of trial installation and make minor refinements if needed during the evaluation period. The modifications should not alter the intent or key features of the approved Traffic Calming Plan unless a significant operational and/or safety concern arises following implementation.
- Task 7.** Evaluate the success of the trial installation and identify potential refinements if the approved Traffic Calming Plan is being considered for permanent installation.
- Task 8.** Survey residents to gauge support for making the Traffic Calming Plan permanent. Any significant refinements being considered will be noted in the survey.

Plans meeting the minimum response rate of 25% of all eligible households (participation rate), with a minimum of 51% of respondents in agreement (support rate), will be added to the [List of Approved Traffic Calming Plans](#) and will proceed to permanent installation subject to budget approval (Step 6). Plans not meeting the minimum participation rate may be resurveyed once. Plans satisfying the participation rate but not attaining the minimum support rate may return to Task 1 for additional consultation and refinement once. Subsequent iterations not meeting both minimum thresholds will be denied, the process ended, and the temporary/seasonal measures removed. In any case where the process is stopped or measures removed, the Township will not entertain a new request for a Traffic Calming Study on the subject street for a period of at least three years.

Township staff will inform study area households of the survey results and next steps.

Step 6 – Implementation

As part of annual Capital Budget preparation, Township staff may propose permanent traffic calming installation locations. The locations will be selected from the [List of Approved Traffic Calming Plans](#) based on relative priority and included in the Capital Budget request presented to Township Council with preliminary high-level budget estimates.



Upon budget approval, Township staff will implement the approved Traffic Calming Plan with permanent materials, subject to available resources. If required prior to installation, Township staff will oversee preparation of detailed design and construction tender documents. Township staff will also inform study area households of the intention to install the traffic calming measures prior to implementation.

Step 7 – Monitoring and Evaluation

Township staff will continue to monitor the subject street (and entire study area as required) after implementation of the permanent installation to ensure the approved Traffic Calming Plan is functioning as designed. The monitoring process will also identify any unintended impacts on the surrounding road network and the need for potential refinements.

The scope of the post-implementation evaluation(s) should be consistent with the investigations conducted prior to installation. Potential studies may include speed surveys (to assess change in vehicle speeds), traffic counts (to determine changes in volumes) and/or origin-destination surveys (to estimate the volume of traffic diverting to adjacent streets).

Implementation of the approved Traffic Calming Plan should not result in transference of traffic from the subject street to adjacent Local, Collector, or Type C Arterial roads. If post-implementation evaluation studies indicate traffic volumes have increased 15% (with a minimum of 150 vehicles) on a parallel or adjacent street due to the traffic calming measures, the Township will explore corrective action to remedy the situation and/or minimize the impact.

In certain instances, the Township may wish to remove permanent traffic calming installations determined through post-implementation evaluation to be ineffective or causing a safety risk, or that have created unplanned consequences that cannot be rectified. Residents can also request removal, with a petition signed by a majority of residents directly fronting the subject street required to initiate the process. The Traffic Calming Plan must be installed for at least three years before residents can initiate the removal process. If the measures are removed, residents of the subject street must wait at least three years before submitting a new request.

If the Township receives a request to remove one traffic calming measure within an overall Traffic Calming Plan, all measures may be considered for removal. While it may be possible in certain circumstances to remove only one traffic calming measure, in most cases, the entire plan will need to remain to be effective.

Township staff will notify study area households of any intended action and may consult with potentially impacted residents and stakeholders prior to making any



changes. On occasion, the Township may also survey households to obtain their views prior to acting. If removal is the preferred course of action, Township staff will prepare a report to Township Council seeking approval to return the subject street to its prior configuration and notify affected residents by mail and on its website if authorized.

2.8 USE OF REGULATORY SIGNS FOR TRAFFIC CALMING PURPOSES

The Township will not consider the use of regulatory signs for the sole purpose of traffic calming as stated in Section 5.6 of the Active Transportation and Transportation Master Plans. Traffic control devices in this category include:

2.8.1 ALL-WAY STOP SIGNS

The Township is commonly requested to install an all-way stop to discourage excessive speeding and/or traffic infiltration on neighbourhood streets. While this may be appropriate in select instances, all-way stop control is generally not intended for this purpose, as noted in the *Canadian Guide to Traffic Calming*.

Using all-way stops indiscriminately can lead to increased driver frustration, greater speeding between intersections, increased noise from vehicle acceleration, increased emissions from vehicles forced to stop and idle, and/or reduced compliance with all-way stop control at the subject location and in general. Even when justified, all-way stops can increase the risk of certain collision types, most notably rear-ends.

Previous studies have demonstrated the limited effectiveness of all-way stop control as a traffic calming measure to reduce vehicle operating speeds. Drivers quickly accelerate back to previous operating speeds after being forced to stop at unwarranted stop signs thereby defeating the purpose.

The Township uses the warrants and criteria specified in the **All-Way Stop Warrant Policy** in considering the installation of all-way stop control. These warrants consider vehicle and pedestrian volumes, vehicle split (percent of vehicles on the major street versus the minor street) as well as collision history.

2.8.2 SPEED REDUCTION AND MOVEMENT RESTRICTION SIGNS

Regulatory signs intended to reduce vehicle speeds (i.e., speed limits, Community Safety Zones) or restrict movement (i.e., turn prohibitions, one-way) often require enforcement to ensure driver compliance and effectiveness. For this reason, the *Canadian Guide to Traffic Calming* recommends using these signs only to supplement and reinforce desired driver behaviour and not as traffic calming measures on their own.



3 ROUNDABOUT FEASIBILITY POLICY

3.1 PURPOSE

The **Roundabout Feasibility Policy** is to aid the Township in assessing intersections for feasibility of potential roundabout installation. The policy is intended for use on existing and future streets in Scugog.

3.2 BACKGROUND

Roundabouts are becoming a more prominent form of intersection traffic control in Canada. A type of circular intersection, vehicles entering a roundabout must yield to traffic circulating counter-clockwise around the central island, minimizing potential conflict points, and reducing vehicle speeds. The Township currently features one roundabout at North Street/Water Street and Old Rail Lane in Port Perry.

Roundabouts have been proven to reduce the frequency and severity of collisions when compared to stop controlled and signalized intersections due to fewer conflict points, lower entering and circulating speeds, and deflection on entry. Roundabouts also often operate with lower delays and shorter queues than other forms of intersection control at lower traffic volumes.

From an access management perspective, roundabouts can be used to facilitate safer and more efficient turning movements at intersections and driveways, provided access is not permitted directly into the circulatory roadway. Roundabouts also provide U-turn opportunities at safer locations, eliminating the need for more difficult midblock left-turns and the number of full movement access points along a roadway corridor.

The Transportation Association of Canada (TAC) *Canadian Roundabout Design Guide*⁵ provides information and guidance related to the planning, design, construction, operation, maintenance, and safety of roundabouts in Canada.

The TAC *Canadian Roundabout Design Guide* describes three basic types of roundabouts recommended for use in Canada:

- **Mini-Roundabouts** – Small in size and characterized by a fully traversable central island and splitter islands to allow large vehicles to manoeuvre through the intersection without travelling around the island. Distinct from neighbourhood traffic circles because of the splitter islands, mini-roundabouts are commonly used in low-

⁵ Transportation Association of Canada. *Canadian Roundabout Design Guide*. January 2017.



speed urban environments and locations where roadway right-of-way constraints cannot accommodate a typical single-lane roundabout.

- **Single Lane Roundabouts** – Characterized by single-lane entries, and one circulatory lane. Compared to a mini-roundabout, the central island diameter is much larger and the island is non-traversable. The overall size of the roundabout is dependent on the design vehicle chosen. The geometric design often includes a non-traversable central island with a mountable truck apron (if required to accommodate the wheel tracking of large vehicles), raised splitter islands, and crosswalks.
- **Multilane Roundabouts** – Characterized by at least one entry with two or more lanes and in some case the roundabouts may have a different number of lanes on one or more approaches. The circulatory roadway is wider to accommodate vehicles operating side-by-side and may have higher entry, circulating and exit speeds. The geometric design typically includes a non-traversable central island with mountable truck apron if required, raised splitter islands, and crosswalks.

Since each intersection presents unique opportunities and challenges, it is important to understand the perceived advantages and disadvantages of roundabouts when considering implementation. **Table 3.1** summarizes the key factors influencing the decision to install a roundabout.

3.3 APPLICATION

The Township may consider the use of roundabouts for intersection traffic control in:

- Existing locations where a traffic control change is warranted, capital improvements are being considered, or safety or capacity issues have been identified; or
- Development areas where a new intersection is planned on:
 - Arterial and/or Collector roads that warrant or may warrant traffic control signals or all-way stop control; and
 - Local roads where traffic calming or development staging is required.

Attachment A provides a **Roundabout Screening Tool** for completing an initial assessment of the merit of implementing a modern roundabout at a specific intersection in comparison to other forms of traffic control or road improvements, such as auxiliary lanes, traffic control signals, and all-way stop control. The tool is intended to assist the Township in deciding whether to proceed with a more detailed Intersection Control Study to further investigate the feasibility of installing a roundabout. Use of this screening tool should be supplemented with the criteria and guidance provided in the *TAC Canadian Roundabout Design Guide*.



TABLE 3.1: ADVANTAGES AND DISADVANTAGES OF ROUNDABOUTS

Criteria	Consideration
Advantages	
Safety	<ul style="list-style-type: none"> Reduces frequency and severity of collisions when compared to stop controlled and signalized intersections due to a reduction in: <ul style="list-style-type: none"> Conflict Points – All vehicles travel in the same direction, eliminating right-angle and left-turn conflicts, thus decreasing probability of collision. Entering and circulating speed – Geometric design requires vehicles to enter at lower speeds thus lowering collision severity. Angle of impact – Angle of entry into a roundabout is deflected thus decreasing angle of impact and reducing or eliminating more severe right-angle and head-on collisions.
Operational	<ul style="list-style-type: none"> Operates with lower delays and shorter queues than other forms of intersection control. Facilitates improved gap acceptance through lower vehicle speeds, resulting in higher operational capacity.
Traffic Management	<ul style="list-style-type: none"> Influences the driver through geometric design to moderate vehicle speeds in a more natural way compared to abrupt stopping and starting caused by other traffic control devices. Conveys a change in environment between rural and urban areas and encourage traffic to slow down, making roundabouts effective as gateway treatments.
Access	<ul style="list-style-type: none"> Facilitates safer and more efficient turning movements at intersections and driveways, provided access is not permitted directly into the circulatory roadway. Provides U-turn opportunities at safer locations, eliminating the need for more difficult midblock left-turns and the number of full movement access points along a roadway corridor.
Environmental Sustainability	<ul style="list-style-type: none"> Reduces fuel consumption and vehicle emissions by reducing delays and idling time. Consumes less energy than traffic signals and require little maintenance. Minimizes carbon footprint, enhances sustainability, and reduces life-cycle costs of operation.



TABLE 3.1: ADVANTAGES AND DISADVANTAGES OF ROUNDABOUTS

Criteria	Consideration
Aesthetics	<ul style="list-style-type: none"> Provides the potential for landscaping opportunities within the central island to create a sense of place within the community or as a gateway feature to enhance and define an area.
Economic	<ul style="list-style-type: none"> Requires less maintenance than traffic control signals, offers time and fuel savings to users, provides societal cost savings through less severe and fewer collisions, and alleviates the need for auxiliary turn lanes.
Disadvantages	
Spatial Requirements	<ul style="list-style-type: none"> Shape may require more property beyond the limits of a typical road allowance compared to a conventional stop-controlled or signalized intersection.
Construction Costs	<ul style="list-style-type: none"> Higher initial construction costs may cause due to a larger intersection footprint, complexity in traffic management, the need to build the ultimate configuration, greater property acquisition, and degree of landscaping.
Constructability	<ul style="list-style-type: none"> Retrofitting to install a roundabout may require a longer construction period and present greater complexity for traffic management and construction staging.
Operational	<ul style="list-style-type: none"> Approach volumes and traffic patterns may adversely influence roundabout capacity. There may be operational challenges for roundabouts with unequal approach volumes. Increased delay may occur when located along a corridor with traffic signal progression as they interrupt flow and coordinated timing.
Accessibility	<ul style="list-style-type: none"> Pedestrians with vision impairment or mobility challenges may experience challenges. Large roundabouts can create discomfort for cyclists while in the circulatory roadway or significant delay if they are directed to a multi-use path around the circumference.
Public Education	<ul style="list-style-type: none"> In communities where roundabouts are not a common form of intersection control, new installations may require public education and outreach prior to implementation.



ATTACHMENT A

ROUNDBABOUT SCREENING TOOL

The **Roundabout Screening Tool** provides a preliminary assessment of the merit of implementing a modern roundabout at an intersection in comparison to other forms of traffic control or road improvements, such as auxiliary lanes, traffic control signals, and all-way stop control. The tool is intended to assist the Township in deciding whether to proceed with a more detailed Intersection Control Study to further investigate the feasibility of installing a roundabout. The checklist is based on the Region of Waterloo *Roundabout Feasibility Initial Screening Tool*.

1. **Project Name/File Number**

2. **Intersection Location** – Street/road names, distances from major intersections, etc.

3. **Brief Description of Intersection** – Number of legs, lanes on each leg, total AADT, AADT on each road, etc. Attach or sketch diagram showing existing and horizon year turning movements.



4. Are there any operational problems currently being experienced at this location?

5. Is it a new intersection or is it a retrofit of an existing intersection? If existing, what is the existing traffic control?

6. Is the intersection located within a corridor that is scheduled for improvements in the Capital Program? What are the ultimate cross-sections of the approach roads?

7. If existing, what is the collision history of the intersection over the past five years? Is there a collision problem that needs to be addressed?



8. Are persons with disabilities frequent users of this intersection?

9. What traditional road improvements are proposed for this intersection? (e.g., traffic signals, all-way stop, auxiliary lanes, etc.). Please attach a sketch of the traditional road improvements.

10. If traffic control signals are being considered, are warrants met for the horizon year?

11. What size of roundabout should be considered for this intersection?



Estimate the 20-Year Life Cycle Cost:

10-Year AADT: _____

Injury Collision Cost (ICC)¹: _____

Discount Rate (i): _____

TABLE A.1: 20-YEAR LIFE CYCLE COST COMPARISON

Cost Item	Other Traffic Control	Roundabout
Implementation Cost ²	\$	\$
Injury Collision Cost (Present Value) ³	\$	\$
Total Life Cycle Cost	\$	\$

Notes:

1. Follow the procedures documented in the *Highway Safety Manual* to estimate the ICC.
2. Implementation Cost = Sum of costs for construction, property, utility relocations, illumination, engineering (20%), contingency (20%) and maintenance (5%)
3. Present Value of 20 Year Injury Collision Cost = Expected annual collision frequency x ICC $((1 + i)^{20} - 1) / i(1+i)^{20}$

Conclusions and Recommendations
