TRAFFIC CALMING
DESIGN GUIDELINES

City of Ottawa
Transportation Services Department
Area Traffic Management Branch

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City of Ottawa

Traffic Calming Design Guidelines

April 2019

Part 1 – Ottawa-Specific Design Guidance

Part 2 – Traffic Calming Toolbox

Part 3 – Glossary and Appendices

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1 Introduction (Part 1)

The primary purpose of the City of Ottawa Traffic Calming Design Guidelines (Part 1) is to provide guidance for planning and designing traffic calming for existing streets in Ottawa.

It is intended to supplement the *Canadian Guide to Traffic Calming* and *Geometric Design Guide for Canadian Roads*[1]. with "Ottawa-specific" considerations. It is primarily intended to assist City staff.

It should be emphasized that this document is a guide and should be used in conjunction with other technical / policy guidance combined with sound engineering judgment. These Guidelines are not (and should not be interpreted as) comprehensive street design guidelines. The details of any traffic calming design must comply with all relevant City of Ottawa design and construction standards and specifications.

The guidelines in this document have considered relevant key provincial Acts including the *Accessibility for Ontarians with Disabilities Act* (2005) and the *Highway Traffic Act* (1990). The details of any traffic calming design must also comply with these Acts.

Proponents of traffic calming plans are encouraged to consider other supportive references to supplement knowledge and provide a broader view of traffic calming implications as well as concepts for solving planning and design challenges.

[1] The Transportation Association of Canada authored the Geometric Design Guide for Canadian Roads. The Canadian Guide to Traffic Calming was co-authored by the Transportation Association of Canada and the Institute of Transportation Engineers.

1.1 General Information

Traffic calming refers to measures and street design elements[2] aimed at improving quality of life within existing neighbourhoods by helping achieve a number of supporting elements. This includes improving safety for all street users – particularly for those walking and cycling. Traffic calming is also used as a tool to improve the public realm, helping meet broader policy objectives related to encouraging sustainable modes of travel, and helping create a better sense of "place".

It aims to help achieve these objectives by reducing impacts of motorized vehicles in existing neighbourhoods and supporting safer street environments[3].

When streets and networks exhibit unintended inappropriate driver behaviour such as speeding, this can have a detrimental impact on quality of life within a community, potentially leading to:

- reduced perception of safety and security within a neighbourhood;
- deterrence from walking and cycling;
- decreased interaction between residents within a neighbourhood;
- loss of community identity; and
- increased localized air / noise pollution.

Traditional traffic calming is a reactive approach to mitigating negative impacts of motor traffic on existing streets, such as high travel speeds and volumes. Integrated speed and traffic management is a proactive approach to meeting Complete Streets objectives by designing streets, from the outset, to encourage low speeds and appropriate use. For the purpose of these guidelines, the term "traffic calming" is describing the measures used for both scenarios.

Focus of these Guidelines

The focus of these Guidelines is primarily in reference to traffic calming plans for retrofits to existing streets, but it can also inform integrated speed and traffic management design for new street and network designs[4]. Furthermore, traffic calming in these Guidelines is referred to primarily in terms of its transportation implications and includes both measures and concepts that relate to driver behaviour and vehicle traffic management. Some measures encourage appropriate driving speeds and reduce opportunities for hazardous driving behaviour (e.g. speed humps), while traffic management measures change street access (e.g. turn restrictions).

[2] For the purposes of these Guidelines, "road" generally refers to the shared road surface intended for use by vehicles and bicycles and any features that fall within that surface (e.g. general-purpose travel lanes, on-street parking, on-road bike lanes, median islands, etc.). "Street" refers to the elements in the corridor right-of-way including the road. This could include boulevards, sidewalks, segregated cycling facilities, property frontage, etc.

[3] "The primary purpose of traffic calming is to support the livability and vitality of residential and commercial areas through improvements in non-motorist safety, mobility, and comfort. These objectives are typically achieved by reducing vehicle speeds or volumes on a single street or a street network. Traffic calming measures consist of horizontal, vertical, lane narrowing, roadside, and other features that use self-enforcing physical or psycho-perception means to produce desired effects." [Federal Highway Administration (FHWA), Office of Safety. "Speed Management: Traffic Calming ePrimer", 2017]

[4] It should be noted that the City's *Street Planning Manual for New Neighbourhoods* (under development) is intended to guide new development transportation network and street design context for new neighbourhoods.

Traffic Calming Measure Groups

Traffic calming measures are grouped as follows:

1. ***Communication and Enforcement:*** measures and programs that raise awareness and educate the public
2. ***Minor Adjustment:*** measures that can be implemented with limited intrusion
3. ***Engineering:*** physical measures implemented as permanent changes to the street

Measures and design options from each of these groups can be used in combination with one another in order to create an overall traffic calming plan. Examples are shown in Figure 1.

Figure 1 - Traffic Calming Measure Examples

Considerations to pursue prior to permanent Engineering Traffic Calming Measures

Permanent engineered traffic calming measures can be costly and difficult to modify once implemented. As such, it is recommended that proponents first consider other solutions. For example, opportunities may exist to make changes to the wider network, implement communication solutions, or explore minor adjustments that may result in the desired outcome. These types of solutions can be modified or implemented relatively easily compared to permanent physical changes and could potentially negate the need for permanent physical changes. If these methods are deemed impractical, unaffordable, or do not address the root concerns, then permanent engineered traffic calming measures may be appropriate.

Potential Benefits and Impacts of Traffic Calming

Traffic calming can have significant potential for improving public health. This broadly includes increasing levels of active transportation and physical activity, improving safety, promoting social connections, mitigating health inequities, and adding landscaping that can help reduce hard surface footprints, beautify neighbourhoods, and help create a sense of place. The primary focus of these Guidelines is to identify how traffic calming can reduce negative impacts of motor vehicles, recognizing how this helps accomplish positive impacts to broader public health.

From a transportation and operations perspective, traffic calming can affect the mobility of neighbourhood residents, transit operations, street maintenance, and emergency response activities[5].

[5] It should be noted that different traffic calming designs can present different effects and to varying degree. During design, there should be careful consideration given to context, potential benefits, and impacts when selecting traffic calming measures.

Potential benefits and impacts could include:

- reclaimed excess road space can be used for other purposes (e.g. streetscaping);
- help support a sense of “place”;
- potential diversion of traffic to other nearby local streets;
- changes in noise from vehicle traffic (e.g. related to vehicles traversing different surface treatments, changes in acceleration / deceleration, changes in volumes, etc.);
- increased vehicle travel times;
- accessibility improvements and impacts;
- changes to on-street parking to contribute to a traffic calming plan;
- changes to vehicle lane and cycling facility provisions and capacity; and
- potential sightline and visibility changes.

1.2 Where, When, and How Traffic Calming is Considered in Ottawa

Where: Traffic calming measures can be considered on existing streets and new streets, with careful context consideration (e.g. balancing with other street objectives related to urban design, transit, emergency service, operations, and maintenance, etc.).

When / How: For existing streets, traffic calming measures can be introduced through individual localized projects, following the completion of an appropriate traffic study (see the City’s *Neighoubhood Traffic Calming Study Process*), through a comprehensive street re-design undertaken as part of planned street renewal, or as part of new land use development. For new streets constructed as part of new development, traffic calming measures may be considered through the City’s *development review process* and guided by the City’s *Street Planning Manual for New Neighbourhoods* (under development). Further information about each scenario provided above is provided in ***Appendix A***.

Not all traffic calming measures are appropriate in every situation, and traffic calming should ensure the equitable and consistent treatment of those who use Ottawa’s streets. Proponents should develop a Traffic Calming Plan (TCP), as per guidance in Sections 2 and 3.

Coordination with other Projects

Various City programs and developers may have planned or ongoing projects for streets being considered for traffic calming. It is important to coordinate these efforts to the greatest extent possible to take advantage of opportunities and rationalize competing objectives.

Furthermore, to help guide coordinated efforts, the City’s *Transportation Master Plan* and *Complete Streets Framework* provide a policy foundation for decision-making. In general, they highlight the City’s objectives for implementing a street network that is safe and comfortable for everyone.

2 Traffic Calming Plans (TCPs)

Proponents of street designs that include traffic calming measures (e.g. City or private developers) should consider developing a Traffic Calming Plan (TCP) as described below. Developing a TCP is a planning exercise. Functional designs stemming from TCPs should be informed by other national, provincial, and City design guidelines and standards.

Developing a TCP is intended to ensure that traffic calming installations are sensitive to a range of factors and interests. A TCP should include the following elements:

1. Strategic Approach
2. Study Limits
3. Existing Conditions
4. Public Stakeholder Engagement
5. Traffic Calming Design Concept
6. Monitoring and Evaluation

2.1 Strategic Approach

An overall strategy for how to approach a traffic calming plan should be developed and documented prior to initiation of a project. This strategy should address the following:

1. ***Issue(s) that need to be addressed, target audiences, and equity*** – Develop an understanding of the issues being considered and which issues are intended to be addressed through a traffic calming plan. The identification of issues should consider target audiences and equity[6].
2. ***Overall objectives of the traffic calming project*** – Establish both technical objectives (e.g. reduce speeding, encourage appropriate driver behaviour, etc.) and project goals (e.g. help meet Community Design Plan objectives and strategic policy goals, educate the public about the benefits and impacts of traffic calming, manage public expectations, develop community partnerships, etc.).
3. ***Key deliverables and timelines***
4. ***Available resources / limitations*** – This should determine funding, staff, equipment, community, and other resources (both availability and limitations) needed to address all of the above.

This will allow the proponent and stakeholders to work towards a clearly defined common goal.

[6] "Equity" refers to the fairness of impact (benefits and costs) distribution. [Todd Litman (2002), "*Evaluating Transportation Equity*", World Transport Policy & Practice, Volume 8, No. 2, Summer, pp.50-65.]

2.2 Study Limits

The study limits for a specific project should be developed with consideration of the Strategic Approach. For concerns primarily related to speeding, the study area will generally be more localized to the street segment(s) of concern. For concerns primarily related to traffic management, larger study areas may apply. The definition of these study areas will depend on the appropriate boundary context, general study area size, and the selection of key study segments. Key considerations when defining study limits should include (but are not limited to):

- key street segment(s) of concern;
- traffic data;
- location and context of sensitive land uses near, or adjacent to, streets of interest;
- City policies (e.g. Transportation Master Plan, Official Plan, Community Design Plans, etc.);
- opportunities and limitations such as available resources and partnerships; and
- environmental factors (e.g. geographic features, major streets, key intersections, etc.).

It is recommended that a rationale be prepared for, and referenced within, the study area definition.

2.3 Existing Conditions

It is important to understand the existing conditions where a traffic calming design concept is being considered. For existing streets, this includes developing an understanding of the area land use context, current street and surrounding transportation network operations, and any past and future plans that may impact the subject street(s).

- ***Land Use Context*** – Knowing the context of adjacent and area land uses (past, present, and future) can provide insights into the types of street users on the subject street(s), potential delivery and curbside loading needs, school and park related activity considerations, etc.

- ***Street and Transportation Network Context*** – Developing an understanding of the following can help frame opportunities and constraints for a traffic calming design concept:
    - street user volumes (peak and off-peak);
    - vehicle through traffic volumes;
    - collision history (including all types of street users);
    - vehicle speeds;
    - existing private driveway access context;
    - curbside regulations;
    - pavement marking and signage;
    - active transportation facilities;
    - street designations within the Transportation Master Plan;
    - traffic signals;
    - maintenance class of subject street(s);
    - emergency response operations;
    - lighting; and
    - transit.

2.4 Public and Stakeholder Engagement

The proponent of a traffic calming plan should consider input from stakeholders to the extent necessary to develop the potential impacts of individual traffic calming measures that could be included in an overall design concept. It allows the proponent to develop an understanding of stakeholder priorities, common and competing interests, and evolve design concepts to balance each while meeting project objectives.

The City of Ottawa values public and stakeholder engagement as an important part of the decision-making process. It is intended to ensure decisions are inclusive, meaningful, accountable, and responsive to public and stakeholder perspectives and needs. To help determine elements of meaningful public engagement for a traffic calming plan, proponents can review information on the City's public engagement webpage.

Figure 2 - Public Engagement Examples

The following provides a list of potential stakeholders for consideration. A detailed list is included in ***Appendix B***.

- Area residents and the general public
- Ward Councillors
- Business Improvement Areas and local business owners
- Community associations and interest groups
- Area school boards
- Utilities (Bell, Hydro, Enbridge, etc.)
- City of Ottawa Departments, Advisory Committees, and Ottawa Public Health
- National Capital Commission
- Area educational institutions
- Public interest and advocacy groups

Effective Stakeholder Engagement for a Traffic Calming Plan

After defining the target audiences, as part of the Strategic Approach for a traffic calming plan, it is important to make sure that this audience is effectively reached and engaged appropriately. As per the City of Ottawa *Public Engagement Strategy*, key considerations for effective engagement include (but are not limited to):

- providing sufficient time and notification to allow the target audiences to become informed / educated about the project in order to participate in a meaningful way;
- allowing participation early enough in the process, before a decision or design concept is advanced too far developed to be modified;
- allowing for consideration of equity and inclusion in the engagement strategy; and
- considering input from each of the target audiences equitably.

Public engagement can be sought during the planning and / or design phases of a project.

2.5 Traffic Calming Design Concept

A traffic calming design concept is an illustration and description of the combination of measures (and locations of those measures) intended to achieve the Strategic Approach. It is used to help communicate the form of a potential design option that the general public can understand. Design concepts can be as detailed as necessary in order to achieve the objectives outlined in the Strategic Approach.

Selection of the most appropriate traffic calming measures for any design concept should consider the Strategic Approach while recognizing study area opportunities and constraints. Proponents should consider the following when developing traffic calming design concepts:

- effectiveness in meeting overall City policy or neighbourhood objectives;
- effectiveness in addressing the problem or opportunity;
- transportation system effects (including active transportation, public transit, vehicle traffic, goods movement, emergency response, and street maintenance);
- effects on persons with disabilities and para transit;
- potential changes to noise, vibrations, aesthetics and environmental effects;
- effects on pedestrians, cyclists and vehicle occupants (e.g. comfort, familiarity, etc.);
- effects on traffic safety;
- effects on transportation system efficiency and intersection operations;
- constructability and durability; and
- lifecycle costs (including capital implementation, on-going maintenance costs, and potential renewal).

For specific design considerations that can aid in the development of a traffic calming design concept, refer to Section 3 of these Guidelines.

Additional Planning Tools to Help Develop Traffic Calming Design Concepts

While developing a traffic calming design concept, the following methods can be considered to help assess potential viability and effectiveness. They can also help determine details of final layouts and designs, and provide interested stakeholders and the project team a better understanding of a proposed traffic calming design concept:

- ***"Mock-up" using Temporary Products*** – Proponents can consider implementing temporary products to create "mock-ups" of a design concept along subject streets. This allows for real life testing of proposed design concepts and can inform final design decisions without a binding commitment.
- ***Technical Site Learning Tours*** – Conducting technical site learning tours with different stakeholder groups on streets of interest can help the project team learn more about a particular interest or issue. This can help inform design concepts and final design details. This method helps ensure communication of ideas between the proponent and stakeholders.
- ***Weather Inspections*** – Inspecting the subject location(s) during inclement weather can help provide insight into the potential effects of traffic calming design concepts and potential limitations. For example, observing storm-water run-off and snowbank accumulation can help the project team identify constraints and opportunities for a particular plan. This method helps designers identify existing drainage conditions and vehicle tracking manoeuvers around corners.
- ***Similar Project Review*** – Proponents can gain knowledge regarding the potential of certain elements of a traffic calming design concept by reviewing other similar locations with existing experience with comparable traffic calming measures. This method helps to provide insights without committing to changes to the street(s) of interest.

2.6 Monitoring and Evaluation

Monitoring and evaluation is used to ensure traffic calming designs function as intended and to further knowledge. Key elements to monitoring and evaluation include development of evaluation criteria, data collection, site observations, stakeholder and public feedback, analysis, and recommendations. Furthermore, reporting and public education following the monitoring and evaluation process is important to allow for the effective exchange of knowledge.

Evaluation Criteria

A set of evaluation criteria must be established to help determine the impacts (positive and negative) of a traffic calming plan. A typical set of evaluation criteria may include some of the following general targets:

- ***Effectiveness*** – The degree to which any design element (or combination of design elements) is successful in producing the desired result. An example of effectiveness-based criteria could include establishing acceptable levels of vehicle speed following implementation of the plan.
- ***Cost / Benefit*** – The degree to which the costs of a traffic calming design compare to the value of benefits received. An example of a cost / benefit criteria could be establishing a minimum reduction in 5-year average angle collision rates following the installation of a traffic calming plan (for locations with sufficient enough volume to generate reliable sample sizes).
- ***Stakeholder Feedback*** – The degree to which comments provided by stakeholders in relation to an implemented traffic calming design support the implementation or suggest changes. An example of stakeholder feedback criteria could be the number of similar reported complaints or positive feedback toward a specific element of the traffic calming plan.

- ***Secondary Impacts or Benefits*** - The degree to which a traffic calming design can achieve and create secondary benefits and impacts beyond traffic calming. Examples of this criteria could include establishing the minimum acceptable amount of stormwater diverted from the sewer system (e.g. as with bio-retention measures included within traffic calming measures) or acceptable levels of vibrations and noise level changes.

Proponents should consider consulting with the City's Area Traffic Management Branch staff regarding evaluation criteria prior to initiating monitoring and evaluation.

Monitoring

Monitoring helps determine the effectiveness of a traffic calming design with respect to the established evaluation criteria. Methods may include:

- ***Soliciting and Collecting Stakeholder Feedback*** – Conducting activities that generate stakeholder feedback about a traffic calming design that has been implemented. This could consist of both feedback from the general public or City operations staff. Some examples of feedback that could be solicited include support levels, perceptions, general observations, and comments.
- ***Conducting Site Observations*** – In-person site visits by the proponents of traffic calming projects to observe operations and gain further understanding of context where data and desktop sources may prove insufficient. This may consist of observations of general operations during various weather conditions or special events. It could also include focussing on observations to verify specific comments from stakeholders.
- ***"Before and After" Data Collection*** – Collecting data on subject streets both before changes are made as well as after traffic calming designs are implemented. Examples of "before and after" data collection could include vehicle speeds, street user volumes (includes pedestrians, cyclists, and motor traffic), noise levels, vibration levels, and collision information.

Evaluation and Recommendations

Following the monitoring exercise, observations should be compared with the evaluation criteria thresholds. The proponent can use these results along with qualitative considerations to determine the level of effectiveness of a traffic calming design and potential modifications, where necessary, to address deficiencies or make improvements.

Finally, conclusions should be made with respect to the following decisions:

- Maintaining traffic calming measures in their current state
- Modifying traffic calming measures
- Removing traffic calming measures[7]

[7] The City of Ottawa does not have a specific program established to fund the removal of traffic calming measures. If appropriate, the City may consider removal of traffic calming measures as part of road reconstruction activities.

3 Design Considerations

The following presents a number of considerations to help proponents undertake functional-level traffic calming designs. It includes reference to:

1. Relevant guidelines and manuals;
2. Ottawa-specific design considerations:
    a. General Design Considerations;
    b. Accessibility, Equity, and Inclusion in Traffic Calming Plans;
    c. Active Transportation;
    d. Transit (OC Transpo);
    e. Street Maintenance;
    f. Emergency Response;
    g. “Pinch Points”;
    h. Turning / Corner Radius Design; and
    i. Streetscaping and Traffic Calming.
3. Temporary / Seasonal Traffic Calming Materials; and
4. Consideration of New Innovations and Technology.

3.1 Relevant Guidelines and Manuals

The details of any traffic calming design must comply with all relevant City of Ottawa design and construction standards and specifications. Proponents should also consider the national and provincial design guidance included in Table 1.

Canadian Guide to Traffic Calming Traffic calming design guidance developed at a national level with an updated edition published in 2018.	*Transportation Association of Canada (TAC) / Institute of Transportation Engineering (ITE) Traffic Calming Guide*
Geometric Design Guide for Canadian Roads Design of traffic calming must consider broader street design practices as outlined in this Guide updated in 2017.	*Transportation Association of Canada (TAC)*
Ontario Traffic Manuals *(OTMs)* OTMs provide guidance relating to regulatory and warning signs (Books 5 and 6), pavement markings (Book 11), pedestrian crossing treatments (Book 15) and bicycle facilities (Book 18). These manuals should be used to determine signage and pavement marking plans when designing traffic calming as well as integrating active transportation facilities.	*Ontario Ministry of Transportation (MTO) [Province of Ontario]*

Table 1 - Provincial and National Design References

3.2 Ottawa-Specific Design Considerations

Design considerations in this section are intended to assist proponents of traffic calming plans in their development of functional designs. It includes Ottawa-specific design considerations related to active transportation, accessibility, equity, and inclusion, transit, street maintenance, emergency response, "pinch points", turning / corner radii, and streetscaping. It also includes information on temporary / seasonal traffic calming and consideration of new innovations and technologies in traffic calming. The content in this section reflects the City's current thinking and may evolve as conditions change. All functional designs must conform to City design and construction standards and specifications.

3.2.1 General Design Considerations

The following general guidance should be considered when developing functional-level traffic calming designs:

Balancing local context and city-wide objectives – Designs should prioritize enhancement of vulnerable street user safety and support local activities – particularly in (but not limited to) the following contexts:

- school priority zones - for the purposes of traffic calming considerations, "school priority zones" include any street fronting a school property along with any 300m length of street or pathway links extending from the edge of the school property that connect motorists, transit, pedestrians, or cyclists to a school;
- street segments adjacent to older adult facilities or active parkland – any 300m street segment adjacent to a retirement home, any City facility highly frequented by older adults, or an active park;
- "Traditional Mainstreets" as designated in the City's *Official Plan*;
- "Village Main" streets - defined as any street within both a Design Priority Area and a Village boundary. This information can be viewed in the City's *Official Plan*[8];
- priority active transportation crossings – any active transportation crossing that is on a major pathway or cross-town bikeway[9];
- streets within Design Priority Areas in the urban core; or
- streets that already have a high proportion of existing residential frontage.

Designs should also allow for effective street maintenance, vehicle traffic and transit operations, and emergency response – particularly on citywide thoroughfares. Where local context and citywide objectives do not fully align, significant care should be taken through the design process with respect to more abrupt traffic calming measures such as speed humps speed tables, and speed cushions[10]. On one hand, these measures can be highly effective within an overall traffic calming plan, helping achieve both localized and citywide goals (e.g. support safer routes to a specific school or schools across the city more generally), but they can also potentially have negative effects for various operational activities (e.g. emergency response occurring on a particular street). As such, it is recommended proponents avoid use of speed humps, speed tables, and / or speed cushions on most

[8] This information can be viewed using maps.ottawa.ca by navigating to "More Layers" and then selecting → "Planning" → "Official Plan" → "Village Boundaries" and "Planning" → "Design Priority Areas"
[9] Cross-Town Bikeways are identified in the *Ottawa Cycling Plan* and can be viewed using maps.ottawa.ca by navigating to "More Layers" and then selecting → "Cycling" → "Cycling Plan" → "Cross-town Bikeways"
[10] For the purposes of these Guidelines, speed humps, speed tables and speed cushions are considered more abrupt forms of vertical deflection measures. Speed bumps are typically found in private parking lots, are not considered appropriate on any City streets and are not an option included in the Traffic Calming Toolbox (Part 2). The differences between speed bumps, humps, tables and cushions are illustrated in Appendix C.

arterial and major collector roads (identified in the *Transportation Master Plan*). On arterial and major collector roads that meet the local context criteria described above, proponents should avoid the use of these more abrupt traffic calming measures until all other methods have been explored.

Taking advantage of signalized intersection modifications – Traffic calming designs encroaching on signalized intersections may present opportunities to modernize elements of intersections to meet current standards.

Supporting Urban Design Objectives – Designs should consider *City of Ottawa Urban Design Guidelines* to help ensure traffic calming concept designs are sensitive to area policy considerations. Furthermore, decorative interventions beyond standard details are to be reserved for Design Priority Areas in consultation with the City's Urban Design Branch.

3.2.2 Accessibility, Equity, and Inclusion in Traffic Calming Plans

Traffic calming plans should support street use by all people in an inclusive and equitable manner. The *City's* *Equity and Inclusion Lens Handbook* and *Accessibility Design Standards* provide background and guidance. In terms of planning and implementing traffic calming concept designs, the following are some key considerations:

- ***Consultation*** – Notification and consultation strategies should include a mix of approaches and appropriate deployment timing such that they can reach diverse target audiences.
- ***Planning*** – Functional traffic calming concept plans should be evaluated with an equity and inclusion lens to ensure that project staff and stakeholders understand potential benefits and disadvantages of a plan from various user perspectives.
- ***Detailed Design Elements*** – Any recommended concept that is carried forward to detailed design must adhere to the principles of universal design, the *Accessibility for Ontarians with Disabilities Act (AODA)*, and the City's *Accessibility Design Standards.*
- ***Balancing Competing Interests*** – Traffic calming and accessibility objectives can often be mutually supportive, but some traffic calming measures can introduce unintended barriers from an equity and inclusion perspective. In this regard, proponents need to provide rationale when deviating from the guidance in this document.

The proponent should ensure that they have considered all individuals, groups, and stakeholders that may be affected by the project when developing a traffic calming plan.

General Design Guidance

There are items that may arise as part of traffic calming projects that are especially relevant from an equity, inclusion, and accessibility perspective. Specifically:

- ***Tactile Walking Surface Indicators[11] (TWSIs)*** - Use and placement requires careful consideration when developing a traffic calming plan. In particular, measures that adjust curb placement, introduce (or remove) cycling facility crossing locations, affect traffic signal operations, or bus stops need to be context sensitive and adhere to the City's *Accessibility Design Standards* and City design and construction standards and specifications.
- ***New Traffic Calming Innovations and Technologies*** – Every time a new traffic calming innovation or technology is introduced on public streets that has not been used in the past,

[11] Tactile walking surface indicator (TWSI) is a standardized surface, detectable underfoot or by a long white cane, to assist people with low vision or blindness by alerting or guiding them.

the public needs to familiarize themselves with these measures. Proponents of new traffic calming measures should consider consistency with existing street design as it relates to the intended function from an accessibility perspective.

- ***Accessible Vehicle Roadside Loading / Unloading*** – The introduction of traffic calming measures need to consider the current operations for curbside loading / unloading with regards to accessible vehicles (e.g. Para Transpo vehicles, taxis, vans, etc.)
- ***Crime Prevention through Environmental Design*** – Traffic calming plans should avoid introducing designs that increase potential for criminal danger, eliminate the possibility of casual surveillance, create excessive darkness, or create a general sense of discomfort for vulnerable street users.
- ***Pole, Signage, and Landscaping Placement*** – Poles, signage, and landscaping that support a traffic calming plan cannot be placed in a manner that creates new path-of-travel obstructions that do not adhere to the City's *Accessibility Design Standards*.
- ***Colour Contrasting*** – Colour contrasting can be used to emphasize path-of-travel and presence of hazards for all street users, but particularly those with low vision. Where used, colour contrasting should follow a standardized approach across the City.

3.2.3 Active Transportation

For the purposes of these Guidelines, active transportation refers to walking and cycling. Traffic calming designs should consider the needs of and effects on active transportation in balance with overall project objectives. For example, traffic calming measures such as bulb-outs and mid-block narrowings (see Part 2) can improve conditions for cyclists by calming vehicle traffic. However, they may also unintentionally degrade conditions by forcing cyclists into and out of vehicle travel paths. Another example includes a street that would benefit from a speed hump proposed near a crosswalk, but may benefit more from a raised crosswalk that provides traffic calming and more direct enhancements for pedestrians.

When developing a traffic calming plan, it is important to consider street context in relation to its intended function for those on foot and bike as per the *Ottawa Pedestrian Plan* and *Ottawa Cycling Plan*. This includes a review of cycling route designations (i.e. Local, Spine, or Crosstown bikeway), the appropriate cycling facility for the subject street(s) based on recommendations using the Ottawa Cycling Plan facility selection tool, and stakeholder input.

Tables 2 and 3 include walking and cycling design considerations respectively.

Walking Context	Design Considerations
Desire Lines* for Pedestrian Crossings	• Aim to reduce vehicle speeds in vicinity of pedestrian crossings and locations where there is evidence of high crossing desire lines such as near schools, bus stops, parks, etc.
Urban / Suburban Context Streets	• Provide pedestrians with protection, to the greatest extent possible, from negative effects of adjacent vehicular traffic through traffic calming designs that: ○ reduce vehicle speeds; ○ create lateral buffer space between vehicle travel lanes and adjacent sidewalks. • Support a safe environment conducive of "shared space"[12] for all users of streets without sidewalks to the greatest extent possible

Table 2 - Walking Design Considerations

**For the purposes of these Guidelines, desire lines are pedestrian travel paths with relatively high desirability compared with others nearby, independent of pedestrian facilities provided*

Cycling Context [existing or planned facilities]	**Design Considerations**
Existing or planned dedicated / segregated facilities on Spine and Cross-town Bikeway Routes	• Avoid introducing requirement for cyclists to share space with vehicle traffic when operating speeds are to be above 30 km/h • Enhance cycling environment by calming vehicle traffic and / or buffering cyclists from motorists to greater degree
Existing or planned shared facilities on Spine and Local Routes	• Enhance cycling environment by calming vehicle traffic

Table 3 - Cycling Design Considerations

[12] "Shared space is a design approach that seeks to change the way streets operate by reducing the dominance of motor vehicles, primarily through lower speeds and encouraging drivers to behave more accommodatingly towards pedestrians." [*Local Transport Note 1/11: Shared Space. Department for Transport*.]

3.2.4 Transit (OC Transpo)

Traffic calming designs need to consider the needs of and effects on transit operations in balance with overall project objectives. Guidance, provided in Table 4, has been grouped into three categories based on bus volumes:

- ***All Transit Routes*** - Includes Local, Frequent, Rapid, Connexion, and Para Transpo routes.
  - Traffic calming designs must ensure that transit routes are not significantly compromised, and that all applicable guidance and City practices are followed to that effect.

- ***Regular Transit Routes*** – Includes Local routes where service frequencies are longer than 15 minutes during the peak hour, as well as Para Transpo service.
  - On regular transit routes, passenger discomfort and reductions in transit operation efficiency from road design features should be minimized. Special design consideration should be given to roadways in the vicinity of hospitals or other key medical facilities that are frequently used by Para Transpo.

- ***Frequent Transit Routes*** – Includes Frequent, Rapid, and Connexion routes where service frequencies are 15 minutes or shorter during the peak hour
  - On frequent transit routes, vertical deflection options are not considered appropriate except under special circumstances, which should be identified by the proponent (including the nature of the problem, the benefits that can be achieved by vertical deflection options, why these benefits cannot be achieved by other methods, and how the benefits can outweigh the negative impacts). The rationale should be documented in a memorandum prepared in consultation with the City's OC Transpo and Transportation Planning staff.

Transit Route Type	Design Considerations
All Transit Routes	• Consider turning requirements for buses (can use Transportation Association of Canada templates for A-Bus and B-12 to confirm suitability) • Horizontal deflection: ○ consider opportunities for dual purpose horizontal traffic calming measures such as bulb-outs providing bus stop treatments ○ at bus stops where cycling facilities are present or planned, consult with the *Bus Stops and Bike Lanes – Interaction zone Design Guidelines (under development)* and have OC Transpo staff review designs ○ Maintain a 20m x 1.8m (15m x 1.2m minimum) pad for boarding and alighting when introducing horizontal deflection measures at bus stops ○ avoid introducing new "lay-bys" that force buses to merge with traffic ○ provide sufficient downstream clearance from street parking to bus stops ○ avoid creating situations where buses have a high potential to traverse horizontal deflection measures for standard operating procedures ○ do not reduce lane widths below 3.5m for extended sections of streets or 3.3m wide with 0.5m buffer in constrained circumstances ○ allow traffic calming designs to support unimpeded bus operations 36m in advance (upstream) of the bus stop and 18m beyond (downstream) • Vertical deflection: ○ evaluate other types of traffic calming measures first, prior to vertical deflection. Should this be insufficient to meet objectives, a rationale should be included in project approval documentation (e.g. Roadway Modification Approval (RMA), Report to Committee). ○ avoid vertical deflection measures on high frequency Para-Transpo routes where possible
Regular Transit Routes (longer than 15-minute service frequency)	• Vertical deflection (in consultation with OC Transpo only): ○ do not consider speed humps ○ if other traffic calming measures are insufficient or not feasible, consider speed tables, speed cushions, raised intersections, and raised crossings at least 20m upstream or downstream of bus stops ○ at bus stops, raised intersections or raised crossings may be considered
Frequent Transit Routes (15 minute or shorter service frequency)	• Vertical deflection (in consultation with OC Transpo only): ○ do not consider speed humps, speed tables*, and raised crossings* ○ speed cushions and raised intersections may be considered if other traffic calming measures are insufficient or not feasible; rationale in support of these measures must be provided and approved by City staff *On roads where transit service frequency is longer than 15 minutes outside peak periods, and within context sensitive areas, a wider suite of vertical deflection measures may be considered should other traffic calming measures not be feasible to address concerns; rationale in support of these measures must be provided and approved by City staff

Table 4 - Transit Design Considerations

3.2.5 Street Maintenance

Traffic calming designs need to consider the needs of and effects on street maintenance in balance with the overall project objectives. The City's *Maintenance Quality Standards* (MQS) include minimum requirements for various types of street maintenance. In particular, it sets response times for snow removal as a function of roadway characteristics. As such, some streets experience a higher frequency of snow plowing activities than others. Traffic calming designs that introduce complexity to winter maintenance should be minimized. Proponents should consult with City of Ottawa Road Services staff to determine operational needs and consider inclusions in Table 5.

There are three key considerations with respect to traffic calming design and street maintenance:

- Surface Materials
- Clearance Width
- Turning Requirements

Surface Materials

Monolithic surfaces (e.g. asphalt and concrete) are preferred over other surfaces (e.g. interlock or cobblestone) from a maintenance perspective as they have lower potential to sustain damage from freeze / thaw cycles relative to non-monolithic surfaces. Furthermore, non-monolithic surfaces are difficult to maintain in winter conditions due to irregular surface edges that can be damaged and potentially cause damage to maintenance equipment. In addition, the City carries limited inventory of repair materials. Figure 3 illustrates the difference between monolithic and non-monolithic surfaces. Generally, non-monolithic surface materials should only be considered in Design Priority Areas.

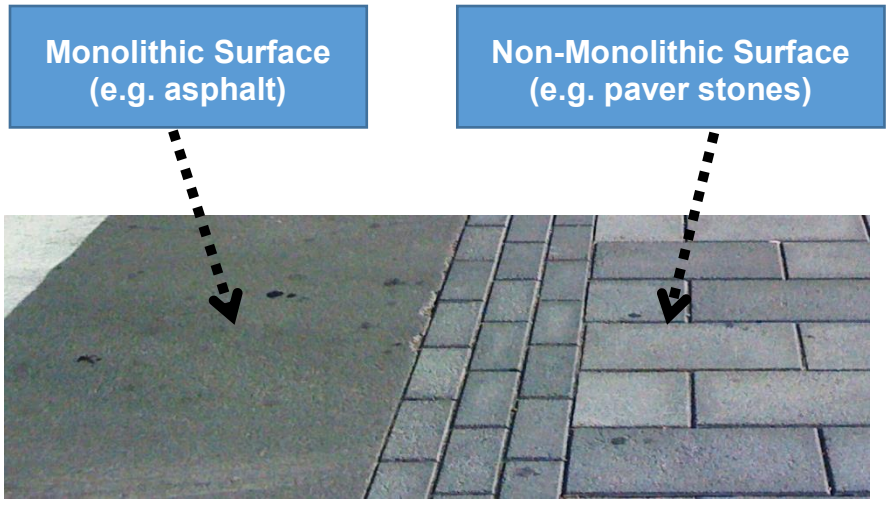


Figure 3 - Monolithic and Non-Monolithic Surfaces

Use of pavement markings should be cognizant of the operations and maintenance implications resulting from the chosen materials. For example, use of low volatile-organic-compound (VOC) pavement paint versus thermoplastic versus other products will have different advantages and disadvantages related to capital costs, visibility, safety (e.g. surface friction), and on-going operating and maintenance costs. Each project that includes pavement markings should be discussed with City staff.

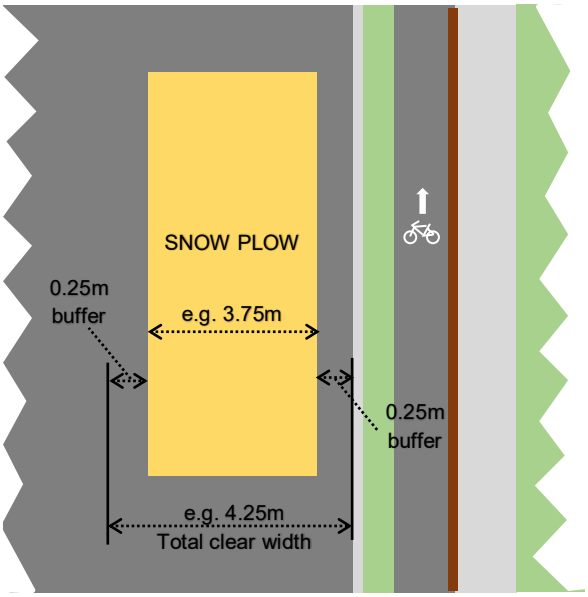
Context Elements	Design Considerations
Surface Materials	• Focus use of non-monolithic materials for traffic calming (e.g. interlock paver stones) in the City's "Design Priority Areas" only, where non-traditional materials and additional resources are accepted to achieve broader design objectives • Have City staff review the use of non-monolithic materials for traffic calming on a case-by-case basis
Clearance Width	• Traffic calming designs should maintain the following standards in locations where no additional maintenance resources are planned: ○ a minimum 1.8m* wide clear widths for sidewalks, cycling facilities (where segregated from vehicle traffic), adjacent sidewalk-cycle track facilities, and multi-use pathways where present; ○ a clear width for roadway surfaces that accommodates a typical width of a snow plow** used on the subject street plus 0.25m buffers on both sides (e.g. a 3.75m wide snow plow width would require 3.75m + 0.25m x 2 = 4.25m clear width).  *2.0m or greater is preferable – particularly for Traditional Mainstreets and other high activity streets where levels of sustainable transportation are (or are intended to be) high **Information regarding typical maintenance vehicles used on specific streets can be obtained from City of Ottawa Road Services staff
Turning Requirements	• Accommodate maintenance and operational vehicle turning requirements

Table 5 - Street Maintenance Design Considerations

Clearance Width

Placement of vertical elements (e.g. poles, signs, landscaping) and abrupt grade changes (e.g. curbs at road edge) should accommodate the City's existing maintenance fleet. As such, traffic calming designs should allow for clearance width[13] on sidewalks and cycling facilities to accommodate a 1.5m wide sidewalk plow with additional 0.15m side clearances on either side (for a total of 1.8m minimum). A 2.0m or greater clear width is preferable – particularly for Traditional Mainstreets and other high activity streets where levels of sustainable transportation are (or are intended to be) high. Furthermore, designs should allow for clearance width on roadway surfaces to accommodate a street plow including full blade. In situations where this is not possible, maintenance planners will incur additional operating costs - the result of requiring specialized equipment. Proponents should review required minimum clearance widths with Road Services staff.

Turning Requirements

Maintenance vehicle turning is challenging where corner curb return radii are small, particularly when the receiving roadway width is narrow and the curb is grade separated from the road surface. While there are no standard turning templates for the City's current maintenance equipment fleet, transportation designers should be cognizant of the implications of their designs in terms of the ability to allow maintenance vehicles to make required turns in an acceptable manner.

3.2.6 Emergency Response

Traffic calming designs need to consider the needs of and effects on emergency response operations in balance with the overall objectives, as per Table 6. Certain traffic calming measures, such as speed humps and other vertical deflection measures, can damage emergency vehicles and equipment during emergency response activities, increase response times and delay delivery of patients to hospitals. In addition, certain horizontal deflection measures can reduce the flexibility of emergency responders to circumvent traffic in response situations. Given the magnitude of emergency response equipment costs, City financial objectives, and emergency response objectives, emergency service operations need to be considered when developing traffic calming plans.

[13] It should be emphasized that "clearance width" referred to here is not the same as "clear zone" – the latter refers to the clear space area beside the edge of the road surface.

Context Elements	Design Considerations
Vertical Deflection Measures	• Avoid introducing speed humps and speed tables on streets designated as a Key Emergency Response Street identified by Fire Services* and hospital routes and feeder streets surrounding hospitals as identified by the Paramedic Services* (See ***Appendix D***)
Centre Medians	• Consider including periodic depressions to allow for emergency response vehicles to navigate around obstructions where queued vehicular traffic is a regular occurrence
Fire Truck Dimensions	• Consider the dimensions of the largest fire truck that will use City roads (Currently, the largest fire truck in the City's fleet is approximately 3.65m wide, extending to 6m wide with outriggers anchored)
Mountable Curbs	• Mountable curb is preferred over barrier curb from an emergency response perspective • Avoid introducing mountable curbs ○ on Key Emergency Response Streets identified by Fire Services (See ***Appendix D***) such that they require emergency response vehicles to traverse them as part of standard operating procedures for through (straight) travel (excludes turns) ○ where emergency vehicles are expected to make turns at higher speeds
Signage Placement	• Avoid signage placement at intersections that fall in the expected path of turning vehicles that are required to encroach the street-side environment (e.g. locations with "tight turns")
Emergency Vehicle Turning	• Consider emergency vehicle turning requirements

Table 6 - Emergency Response Design Considerations

** Key Emergency Response Streets (Appendix D) were established in consultation with City of Ottawa Fire Services and Paramedic Services. This is for the sole purpose of the development of traffic calming plans for City of Ottawa streets and does not reflect any other City policy or objective.*

3.2.7 "Pinch Points"

"Pinch points" are narrowed sections of road surface curb-to-curb widths that are more narrow than typical along subject streets. "Pinch points" can be effective in calming traffic, but also need to be wide enough to allow service operations to function (e.g. City winter maintenance equipment, transit, and emergency response). Planning and design staff should be cognizant of the equipment used in different areas of the City and make sure designs can accommodate acceptable operations. The following was considered in the development of design guidance on "pinch point" widths included in Table 7:

- ***Street Maintenance*** – The City designates each street with a "Maintenance Class" of 1 to 5. This is used to determine standard street maintenance requirements for each class of street with Class 1 streets receiving the highest standard of maintenance and Class 5 the lowest. (Maintenance Class designations for City streets can be found on the City's internal Geo-Ottawa mapping system under "Road Information".) Two-way Maintenance Class 1, 2, and 3 roads are maintained to bare pavement during the winter. This requires a higher level of plowing, clearing, and de-icing than Class 4 and 5 streets. In situations where Class 1, 2, and 3 streets are narrowed significantly at "pinch points" through traffic calming projects, this can limit the ability for the City to maintain the road surface to the approved standards with the current equipment fleet while also allowing for continuous two-way vehicular traffic during plowing activities. The impact to continuous two-way traffic operation is limited on Class 4 and 5 streets given the low frequency of plowing, clearing, reduced pavement maintenance standards (i.e. do not have to clear to bare pavement), and lower typical traffic volumes.
- ***Transit Operations*** – OC Transpo passenger transit operations include bus fleet vehicles operating in mixed traffic. This includes use of standard, articulated, and double-decker buses with widely varying operational frequencies varying from street to street. While some City streets may not have any transit service, others may offer a significant amount of bus service and be an integral part of the City's transit network. Significantly narrowing high capacity transit streets at "pinch points" through traffic calming projects can potentially limit the ability for the City to maintain an acceptable quality of transit service. Impacts to lower volume streets may also exist, but may be less significant.
- ***Emergency Response*** – City fire trucks and paramedic units must be able to operate on all streets in the City. This includes anchoring out-riggers (fire truck stabilizers) on hard surfaces. "Pinch points" introduced through traffic calming projects need to allow fire trucks and paramedic units to maintain this ability.

Street Maintenance Context	Design Considerations
Maintenance Class 4 and 5 Roads	• Consider operational requirements of the typical maintenance vehicles and equipment* used to maintain subject streets being proposed for traffic calming • Avoid introducing curb-to-curb road surface widths that are below: ○ 6m for short two-way street segments with greater than 240 vehicles-per-hour during the busiest hour or 1,000 vehicles-per-day ○ 4m* for short two-way street segments with 240 vehicles-per-hour or less during the busiest hour or 1,000 vehicles-per-day ○ 4m* for single lane streets *Information regarding typical maintenance vehicles used on specific streets can be obtained from City of Ottawa Road Services staff. 4m shall be the default minimum curb-to-curb clear width. However, additional width should be provided in cases where the width of the typical maintenance vehicles used on subject street(s)* + 0.25m maneuvering buffers on either side of the vehicles is greater than 4m.
Maintenance Class 1, 2, and 3 Two-way Roads	• Consider operational requirements of the typical maintenance vehicles and equipment* used to maintain subject streets being proposed for traffic calming • Avoid introducing curb-to-curb road surface widths less than 7.0m on the subject street where two-way travel is permitted • Avoid introducing curb-to-curb road surface widths less than 4.0m at any point on the subject street where one-way travel is permitted *Information regarding typical maintenance vehicles used on specific streets can be obtained from City of Ottawa Road Services staff. 4m shall be the default minimum curb-to-curb clear width. However, additional width should be provided in cases where the width of the typical maintenance vehicles used on subject street(s)* + 0.25m maneuvering buffers on either side of the vehicles is greater than 4m.

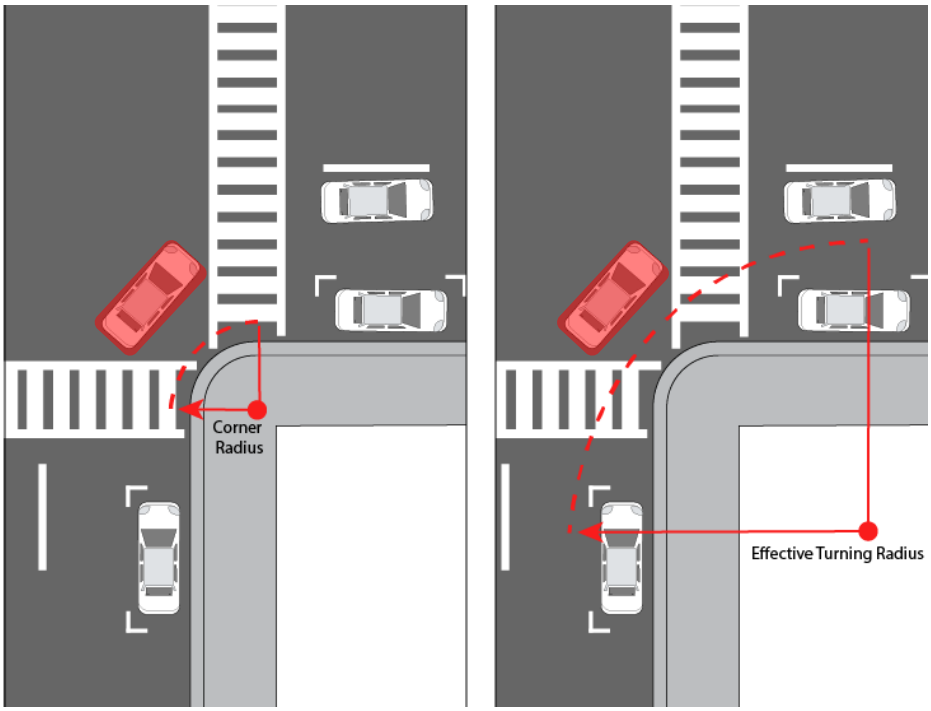
Table 7 - "Pinch Point" Design Considerations

3.2.8 Turning / Corner Radius Design

Intersection and access designs need to accommodate service vehicle turning to an acceptable level. This means ensuring that corner radii designs do not introduce situations where vehicles are required to mount curbing in reasonable scenarios.

- ***Effective Turning Radius*** – Refers to the radius of the inside curve of turning vehicles. This is governed by all the physical elements that create a barrier at the road edge that would physically limit a vehicle's ability to encroach beyond the road edge.
- ***Corner Radius*** – Refers to the radius of a curve along a road edge with full barrier curb – specifically for locations where vehicles need to make turns.

Figure 4 illustrates the difference between effective turning and corner radius.



Source: Geometric Design Guide for Canadian Roads (TAC, 2017)

Figure 4 - Turning Radius (Effective VS Corner)

From a traffic calming perspective, reducing the effective turning radius encourages lower turn speeds, which is positive but may also challenge operations for larger vehicles. Traffic calming designs must balance the need to encourage appropriate driving behaviour with vehicular operational needs. Specifically, designs should consider the operational characteristics of school buses, OC Transpo buses, maintenance equipment, waste management, and emergency response vehicles.

Table 8 provides guidance in terms of the effective radius to consider as a starting point when developing designs for traffic calming plans. It includes various intersection contexts in terms of land use and road designation, as follows:

- **Local** – Streets that provide direct access to adjacent lands
- **Collector** – Streets that serve neighbourhood travel between local and major collector or arterial roads
- **Major Collector / Arterial** – Streets that serve travel through the city in conjunction with other roads

- **Residential** – Adjacent land use is primarily residential
- **Commercial** – Adjacent land use is primarily commercial
- **Industrial** – Adjacent land use is primarily industrial or other

Types of Intersections	Minimum Effective Radius[14]
Residential-Local and Residential-Local	5.0m
Residential-Local and Residential-Collector	5.0m
Residential-Local and Major Collector / Arterial	9.0m
Residential-Collector and Residential-Collector	12.0m*
Residential-Collector and Major Collector / Arterial	12.0m*
Commercial-Local and Commercial-Local	9.0m
Commercial-Local and Commercial-Collector	12.0m*
Commercial-Collector and Commercial-Collector	15.0m**
Commercial-Collector and Major Collector / Arterial (truck route)	15.0m**
Industrial-Local and Industrial-or-Other-Collector	12.0m*
Industrial-Collector and Industrial-or-Other-Collector (truck route)	15.0m**
Industrial-Collector and Major Collector / Arterial (truck route)	15.0m**

Table 8 - Initial Minimum Effective Turning Radii

**The 12m effective turning radius accommodates the single-axel delivery truck and city buses where there is a high probability that these vehicle types will be frequent users.*
***The 15m effective turning radius accommodates the large tractor semi-trailer vehicles (TAC WB-20) where there is a high probability that these vehicle types will be reasonably frequent.*

After selecting appropriate initial effective turning radii, the following physical contexts should be considered, per Table 9, to help determine a target effective turning radius in addition to service vehicle operational considerations:

- ***Unconstrained Context*** - Unconstrained context refers to streets and areas with abundant City right-of-way, a high level of general visibility, limited levels of general street-side activity, and / or high operating speeds (e.g. a suburban street such as Beatrice Drive). In this context, streets using the initial minimum effective turning radius at intersections may be problematic

[14] Where feasible, physical corner radii should not be less than 5m to accommodate winter maintenance operations.

in situations where the speed differential they contribute to (between through and turning traffic) is high. In these situations, traffic calming designs should attempt to reduce this speed differential in advance of the turn.

- ***Constrained Context*** - Constrained context refers to streets and areas with constrained City right-of-way, a low to moderate level of general visibility, and / or low to moderate distances between intersections (e.g. streets in the inner urban area such as Fifth Avenue).

Street Maintenance Context	Design Considerations

All Locations	• Provide the design vehicle* with the ability to make permitted turns
	  ○ into large private accesses and onto intersecting streets as necessary using the area of the road surface intended for vehicular operation
	  ○ without encroaching onto or traversing adjacent street-side features including, but not limited to:
	  ▪ sidewalks and multi-use pathways
	  ▪ separated cycling facilities
	  ▪ bus stop waiting areas
	  ▪ street furniture
	  ▪ streetscaping

Unconstrained Context	• Aim to reduce potential for excessive vehicle speed differential between through and turning vehicles (e.g. introduce measures on the primary street that reduce the operating speeds in advance of the subject turn with the minimum effective turning radius applied)
Constrained Context	• Consider balancing the objectives of service vehicle operation and traffic calming objectives where they compete • Consider design "trade-offs" and document them, where necessary, in project approval documentation (e.g. Roadway Modification Approval [RMA], Report to Committee) to summarize the rationale behind any trade-offs

Table 9 - Physical Context Design Considerations for Turning Radii

** The "design vehicle" for a subject street is considered to be a typical vehicle type permitted to use a subject street that generally requires the largest turning radius or space required to make a right turn at an intersection. This design vehicle is generally selected on a case-by-case basis. However, designs typically initially consider one of a heavy single-unit truck (HSU), tractor semitrailer (WB-20), or passenger car (P) as defined in the Transportation Association of Canada Geometric Design Guide for Canadian Roads.*

Physical Corner Radius Reduction

Physical radius reductions may be considered for any intersection corner where the radius exceeds the minimum effective radius identified in Table 8.

Visual Corner Radius Reduction (Mountable Curbs / Aprons)

Traffic calming designs may consider implementing psychologically tighter effective turning radii where physical corner radius reductions are not feasible. This can be accomplished through use of measures such as mountable curbs or aprons, paint, textured pavement, and / or flex stake bollards. While to lesser degree than non-mountable curbing, this type of configuration can potentially create a traffic calming effect for smaller vehicles, while still allowing larger vehicles to complete the turning movement without difficulty. The design should clearly indicate to pedestrians, cyclists, and visually impaired, that the textured / painted area is not intended as a waiting area or space to reduce crossing distance, since this can create conflicts with large vehicles as they turn. In order to accomplish this, the crosswalks should be extended towards the barrier curb line.

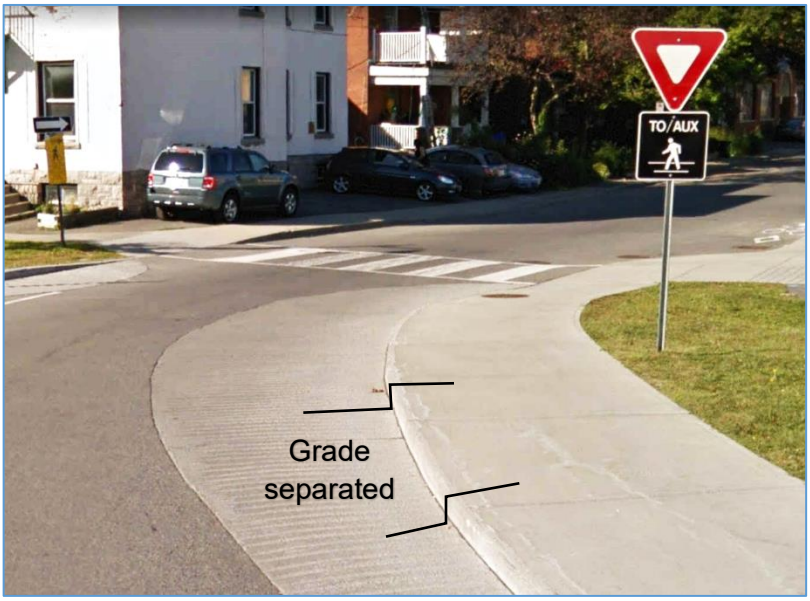


Figure 5 - Visual Curb radius Reduction with Mountable Curb

3.2.9 Streetscaping and Traffic Calming

While some traffic calming designs can introduce new landscaping opportunities, construction of traffic calming measures themselves can be at the detriment of existing landscaping (such as trees) when done within or in close proximity to the root zone - the full breadth of the sub-surface area in which tree roots occupy. Traffic calming designs need to consider any recommendations from an area Public Realm or Community Design plan, and the context of existing landscaping in balance with overall objectives. Proponents should consider guidance provided in the City's *Street Tree Manual for New Neighbourhoods*[15] *and* *Urban Forest Management Plan*. When considering the addition of new landscaping within proposed traffic calming measures, the design guidance in Table 10 should be considered. Where traffic calming in new plans of subdivision include tree planting

[15] The Street Tree Manual for New Neighbourhoods is under development.

within an area containing clay soils, the *Tree Planting in Sensitive Marine Clay Soils Guidelines* will apply.

Streetscaping Context	Design Considerations
New Landscaping	• Select new trees, where applicable, from the City's recommended tree species list • Look at landscaping treatments that require low levels of on-going maintenance, are provided sufficient opportunity to thrive, and /or intercept storm-water run-off • Establish formal partnerships (e.g. with residents associations or business groups) for the care of landscaping treatments where the City does not have sufficient resources to maintain
Hard Surface Plantings	• Take into account best practices in relation to hard surface* plantings: ○ raising the soil bed and landscaping base above the adjacent surfaces (e.g. sidewalk) will provide greater protection from maintenance activities than at-grade plantings ○ providing sufficient offset between the plantings and adjacent sidewalk and road edge to reduce the impacts of street maintenance activities on the health of plantings

Table 10 - Streetscaping Design Considerations

**For the purposes of these Guidelines, hard surface plantings refer to any landscaping implemented within a particular traffic calming measure where the planting is surrounded by hard surface materials that water cannot penetrate*

3.3 Temporary / Seasonal Traffic Calming Materials

NOTE: Recommendation and implementation of temporary / seasonal traffic calming materials on City streets shall only be coordinated by City of Ottawa Traffic Services at this time[16]. All installations of temporary / seasonal traffic calming should adhere to the design considerations outlined in Section 3.2.

In the following situations, it may be appropriate and / or beneficial to consider using temporary or seasonal materials instead of permanent materials to implement traffic calming:

- Where further understanding of the potential of a traffic calming concept and its desirability before investing in permanent construction – allowing for refinement of the final design;
- where an initial capital cost savings for more expensive permanent construction is desired;

[16] City of Ottawa Traffic Services is responsible for operations and maintenance of temporary / seasonal traffic calming materials.

- where gauging community reaction on a concept in reality prior to permanent construction is desired; and
- where flexibility may be of value if there is a need to remove traffic calming measures seasonally.

Possible negative aspects of using temporary or seasonal materials include:

- low relative aesthetic value;
- on-going operational costs and / or additional operational resource requirements;
- requirements for seasonal installation and removal;
- potential to have similar or higher overall costs than permanent measures;
- potentially lower effectiveness than permanent materials; and
- quicker degradation of roadway surfaces (specifically where measures are anchored into existing road surfaces).

For the reasons above, the implementation of measures that required a significant amount of anchors (such as rubber speed humps) are only considered in cases where there are plans for street renewal in the short-term future.

Long-term Use of Temporary / Seasonal Materials

It is possible to use temporary / seasonal materials for traffic calming measures for long-term installations where they are not removed and re-installed regularly. The following should be considered:

- potential impacts to, and appropriate mitigation for (where applicable), any interaction with road maintenance operations; and
- durability and longevity of materials used under varying exposure conditions.

Potential Temporary / Seasonal Product Options

Products that are typically used by City of Ottawa Traffic Services for temporary / seasonal traffic calming include:

- removable rubber products (e.g. curbing, speed humps, tables, cushions);
- removable / flexible posts and bollards;
- pavement markings; and
- temporary speed display boards.

Other potential options do exist (e.g. precast concrete, wood, and / or plastic planters). Use of atypical products need to account for implications to on-going management including impacts to operations, maintenance, and lifecycle renewal. For example, the City has limited capacity to maintain planter boxes within the public right-of-way. As such, partnerships and operational support to maintain plants is essential for their success.

Figure 6 provides some examples to demonstrate how temporary / seasonal materials could potentially be used for traffic calming purposes. ***Part 2 (Traffic Calming Toolbox)*** contains more information on use of temporary / seasonal products for individual traffic calming measures. It should be noted that installation details for prefabricated options may vary depending on the manufacturer, therefore installation manuals should always be consulted when being considered.

EXAMPLE: Flexible Bollard / Removable Bollard used for narrowing travel lanes

EXAMPLE: Planters and Signage used to close a road to vehicular through traffic and repurpose road space

EXAMPLE: Rubber Curb and Temporary Signage used to test a mini-roundabout design

Figure 6 - Examples Displaying Potential use of Temporary / Seasonal Products for Traffic Calming

Pinned Curb

Use of pinned (or pre-cast) curbs to create traffic calming measures can be explored in accordance with the City's *Guidelines for the Application of Pinned Curbs*.

3.4 Consideration of New Innovations and Technology

This section provides guidance on how / when to consider new innovations and technology with respect to traffic calming. ***Part 2 (Traffic Calming Toolbox)*** identifies potential options that can be considered as part of any overall traffic calming plan or broader plan for a street. However, for any particular traffic calming project, the existing suite of measures in the toolbox may be insufficient in meeting project objectives and where new innovations and technologies may be more suitable.

Part 2 (Traffic Calming Toolbox) also includes information on some emerging traffic calming measures that the City has limited or no previous experience with that have demonstrated success.

When to Consider New Innovations and Technology

There are some scenarios where consideration of new traffic calming innovations or technologies may be appropriate. These include (but may not be limited to):

- ***Taking Advantage of Opportunity to support Further Knowledge*** – To help improve the ability for street designs to better meet broader City objectives, the pursuit of higher knowledge where there is limited to no local experience is important. In situations where new design features may have a high probability of success and present low risk, it may be worthwhile to explore.

- ***Toolbox Limitations*** – There may be situations where the current toolbox does not provide any appropriate option to address a specific need or problem.

New innovations or technology should not be considered if they compromise the ability for a project to meet its objectives. Furthermore, they should not be pursued if they introduce a high risk, high event probability scenario (i.e. situations where the potential severity of an unintended conflict event would be high and the probability of that event occurring would also be high).

Pilot Process

Unlike typical traffic calming measures with which the City may have experience, additional processes to what is outlined in Sections 2 and 3 of these Guidelines, need to be incorporated when considering new traffic calming innovations or technologies.

New innovations and technology, particularly those that are anticipated to result in significant effects, should consider being implemented as formalized pilot projects (further information on the Province of Ontario's permission of pilot projects is included in Part 16 of the *Highway Traffic Act*). The purpose of a traffic calming pilot is to test new innovations and technologies, only committing to full approval following an agreed upon test period where the proponents would monitor, evaluate, and make adjustments to the project as necessary. A formal traffic calming pilot project should involve the following key tasks in addition to the steps outlined in these Guidelines:

1. ***Consultation*** – Stakeholders should be educated and consulted on the consideration of new traffic calming innovations and technologies in addition to the project details themselves. This should include soliciting input on evaluation criteria and monitoring needs.
2. ***Feasibility*** – Proponents should liaise with appropriate stakeholders to determine feasibility to construct and maintain as well as who would be responsible for those activities.
3. ***Evaluation Criteria*** – Measurable evaluation criteria (quantitative and / or qualitative) should be developed to help determine success or failure of the project (independent of other features in the overall traffic calming plan), where improvements can be made in the future, and potential applicability to other locations. These criteria should reflect the performance from a traffic calming perspective, broader objectives perspective, and long-term feasibility.
4. ***Public Education*** – Some form of public education, specific to the new type of treatment, should be undertaken to ensure awareness is created and people are provided an opportunity to learn about the new treatment.
5. ***Monitoring and Evaluation*** – Once implemented, monitoring of the project should be done to allow sufficient measurement of each evaluation criterion. Following the monitoring exercise, an evaluation should be done to determine the future of the new innovation or technology based on the results of the evaluation criteria.
6. ***Reporting –*** The results of the pilot should be summarized in a document prepared by the proponent and shared with appropriate City staff and project stakeholders - to be considered in any future update to these Guidelines.

Design Considerations

When developing a design for a new traffic calming treatment, proponents need to consider the general design guidance provided in these Guidelines, stakeholder input obtained through consultation, and the evaluation criteria for the new treatment.

Furthermore, to avoid generating any undesirable confusion, the detailed elements of the design should, to the greatest extent possible, make use of common materials and design elements familiar to the general public. Design consistency helps create common expectations of how to behave for street users. Breaking with consistency in street design can confuse users, which has both positive and negative impacts. The unexpected can lead to undesirable driver behaviour and, in some cases,

may create unclear right-of-way conditions without careful consideration of design specifics. Conversely, confusion in the appropriate context can encourage a higher level of attention from street users and more appropriate driving speeds.

Non-regulatory Pavement Markings and Signage

At times, use of a new type of traffic calming treatment may include or need to be supported by non-traditional pavement markings and / or signage. City of Ottawa Traffic Services are responsible for maintaining all pavement markings and signage on City roadways and are required to meet certain technical requirements for all products used as outlined by provincial guidance documents. As such, any new types of pavement markings and signage options being considered must be vetted by City of Ottawa Traffic Services.

4 Quality Control and State of Repair

It is important that the design, implementation, and maintenance of traffic calming measures support their intended function during the life of their existence. Deterioration, design variations, and inconsistent application can change their effectiveness and may have unintended consequences.

The City has programs and processes in place to help ensure quality design is consistent and sustainable on our roads to the greatest extent possible. These include the following programs:

Design

The City's Quality Management Branch within Infrastructure Services is responsible for developing and maintaining detailed design standards, including those for typical traffic calming measures, which can be found in the *Standard Tender Documents for Unit Price Contracts*. These standards generally include information on typical materials, dimensions, and construction tolerances.

Implementation / Construction

For all City Capital projects, the City's Design and Construction Branch is responsible for construction and post-construction inspection to ensure City standards are adhered to and construction specifications are met. Regardless if built through a City project or a new development, quality post-construction inspections are a key element to making sure the effectiveness of traffic calming measures are as intended and that the same measures across the City are built consistently.

Traffic Services is responsible for implementing pavement markings and signage to support traffic calming installations[17].

Potential damage to maintenance, emergency response, OC Transpo, and other service vehicles can increase in situations where measures are not constructed properly.

Maintenance

Road Services is responsible for maintaining the physical structure of City streets, including any traffic calming measures on those streets. This primarily includes sweeping, winter maintenance, and spot patching to prevent further deterioration of measures. Winter maintenance equipment used to keep streets clear of snow can sometimes damage these features, accelerating wear and tear. As such, it is important to ensure proper warning signage is in place to help warn equipment operators of their presence.

Lifecycle Renewal

The City's Asset Management Branch is responsible for lifecycle planning with respect to City streets (and by extension, traffic calming measures on those streets) through the Comprehensive Asset Management (CAM) Program. Through this program, the City takes an integrated approach involving planning, finance, engineering, maintenance, and operations to effectively manage existing and new infrastructure.

[17] Some pavement marking and signage for traffic calming installations that are included as part of individual development site applications may be approved through the Development Review process and implemented by developers.

4.1 Consideration of Exceptions

This document provides a set of design "guidelines" which should not be confused with construction standards with which designs must comply. Situations may arise where these guidelines may not be sensitive to the nuance of a unique context. For example, the City may not recommend textured crosswalks built with interlock paver stones outside of Design Priority Areas, but there may be places in the city that fall outside of those areas where such a treatment is needed to be consistent with existing applications in the subject area. In these cases, it may be possible to consider exceptions to the guidelines through:

- a pilot process for new traffic calming innovations or technologies;
- Delegated Authority approval of a roadway modification; or
- a Council decision.

It should be noted that the City's Urban Design Review Panel may undertake additional design review for streets specific to surface materials, furniture, fixtures, and landscape elements within Design Priority Areas where design changes are proposed. This is particularly notable for permanent engineered traffic calming measures within Design Priority Areas.

All exceptions should be documented within the project approval documentation (e.g. Roadway Modification Approval (RMA), Report to Committee).

General Guidelines for Exceptions
Key considerations when exploring exceptions to the content of these Guidelines include (but are not limited to):

- ***Turning, Routing, and Access (selected and critical design vehicles)*** – Exceptions should allow vehicles to perform permitted turns and access land uses where intended.
- ***Maintenance Planning*** – The proponent should determine, in consultation with the City's Road Services, feasibility of maintaining the proposed change.
- ***Street User Volume and Vehicle Speed Characteristics*** – Understanding the context how a street is used can help identify potential risk / likelihood of incident levels associated with a proposed exception and inform decision making.
- ***Visibility and / or Advanced Warning for Street Users*** – When introducing an exception, greater visibility of the location where this exception is proposed can help street users anticipate how to negotiate the location appropriately.
- ***Contingency Options*** – The proponent should identify contingencies for the purposes of making adjustments or potential removal of the traffic calming measures that introduce the exception (in case the initially proposed change does not function as intended).
- ***Key Emergency Response Streets and School Priority Zones*** – Design exceptions should consider impacts to emergency response and activity near schools.
- ***Urban Design Objectives –*** Exceptions should consider broader built environment objectives when proponents of traffic calming are recommending changes within the City's Design Priority Areas. Proponents can refer to the City's *Official Plan*, relevant Community Design Plans, Public Realm Plans, and Urban Design Guidance as necessary for further information.
- ***Use of Temporary / Seasonal Products to Test Exceptions Prior to Permanent Installation –*** It may be advantageous in some situations to test a design exception with temporary measures prior to committing to a permanent installation.
- ***Public Input –*** It may be appropriate to identify consideration of an exception with the public, particularly where access or turning restrictions are proposed to accommodate the exception.

- ***Understanding of Existing Locations with Similar / Related Designs –*** Opportunities for proponents to gain knowledge of proposed changes in an existing location may exist.

4.2 Traffic Control Measures Not Intended for Traffic Calming Purposes

Some traffic control measures should not be used for the sole purpose of traffic calming, including:

- ***Stop Signs*** – Stop signs are intended for intersection control and are generally installed in locations where they meet established warrants (i.e. where specific minimum conditions are met). Historically, when placed in locations where warrants have not been met, they generally have received lower compliance levels than in locations where warrants were met. Placing stop signs in locations where warrants have not been met not only can contribute to eroding the effectiveness of the subject stop sign, but may contribute to lower compliance levels at other stop controlled locations more generally.
- ***Speed Limit Signage in Isolation*** – Research has shown that posted speed limit signage alone may have limited real impacts on driver behaviour without regular enforcement and / or other features to support their intention. Furthermore, that drivers generally choose speeds based on physical cues from the street design and presence of other street users.

Use of these features, need to be considered in the context of an overall traffic calming concept that carefully considers mitigation of unintended potential consequences.

5 Public Education, Future Needs, and Updating these Guidelines

This section discusses the importance of public education and future development of these Guidelines.

The content in these Guidelines is based on consideration of best practices, available research, and stakeholder input, rationalized for the Ottawa context at the time of writing. Over time, practices evolve and new research furthers knowledge. Stakeholder needs, expectations, and understanding of traffic calming evolve. As such, monitoring and evaluation (see Section 2.5), and public education is critical to ensuring traffic calming installations continue to align with City policy objectives and meet public expectations.

Public Education, Reporting, Follow-Up Activities

To help build knowledge for both City staff and the public, results of monitoring and evaluation of traffic calming in Ottawa should be summarized and updated regularly. The City and / or proponent should also explore opportunities to educate stakeholders and the general public with regards to both individual traffic calming measures and traffic calming in general.

Future Needs

There were a number of items discussed as part of the development of this version of the City's *Traffic Calming Design Guidelines* that have been identified for future consideration. While not all are necessarily appropriate to include within any update to these Guidelines, they do support the intent. The items identified for future consideration include:

- ***Street Network Planning -*** The street network context significantly influences a number of items of importance from a traffic calming perspective:
  - the attractiveness of individual streets for transportation purposes;
  - the attractiveness of the various modes of transportation relative to one another; and
  - street user behaviour on individual streets.

  Street network planning guidance will be addressed as part of the Building Better and Smarter Suburbs (BBSS) *Street Planning Manual for New Neighbourhoods* (under development).
- ***Designing for Target Operating Speeds on City Streets -*** 30 km/h operating speeds are often referenced as an appropriate operating speed for local residential streets and is noted in the *Ottawa Pedestrian Plan*. However, there is limited guidance and no industry accepted approach as to how to design City streets to achieve 30 km/h, or any discreet target operating speed in an urban environment at the time these Guidelines were developed. The City's Transportation Services Department will continue to evaluate potential options to include guidance in this regard in a future update to these Guidelines or other documents.
- ***Methods to Prioritize Monitoring and Evaluation Efforts -*** Acknowledging that monitoring and evaluation is an important part of any traffic calming plan, resource limitations may require prioritization of these efforts. Currently, there is no guiding methodology to help determine which traffic calming installations have greater relative need for monitoring and evaluation resources than other projects. As part of future updates to the Traffic Calming Design Guidelines, methodologies will be considered.

Updating the Traffic Calming Design Guidelines

All updates to the City's *Traffic Calming Design Guidelines* are to be approved through Delegated Authority, by the General Manager of Transportation Services. Updating the Guidelines should consider stakeholder input, other technical guidance, and an external peer review of proposed updates as required. Recognizing that traffic calming best practices continue to evolve and change over time, these Guidelines should be recognized as a "living document" and should be updated on a regular basis. A feedback form is provided in ***Appendix E***, for any recommendations on how to improve this document or to provide new information. All changes to these Guidelines will be logged (***Appendix F***).

City of Ottawa
Traffic Calming Design Guidelines
April 2019

Part 2
Traffic Calming Toolbox

PART 2 – Traffic Calming Toolbox

Tables

Introduction (Part 2)

This Toolbox (Part 2 of these Traffic Calming Design Guidelines) supplements the traffic calming measures outlined in the Transportation Association of Canada's (TAC) *Canadian Guide to Traffic Calming*, providing highlights and considerations for the implementation of a variety of traffic calming measures in Ottawa. In general, plans are more effective when a combination of measures in this toolbox are used as opposed to the implementation of single measures in isolation. All functional designs of any measure included in this toolbox must comply with City design and construction standards and specifications. The toolbox includes the following measures:

Communication and Enforcement Measures

- information signage
- speed display devices
- educational campaigns

Minor Adjustment Measures

- pavement markings
  - on-road messaging
  - full-lane transverse bars
- street parking
- vertical centerline treatments

Engineering Measures

- vertical deflection
  - raised crossings
  - raised intersections
  - speed cushions
  - speed humps
  - speed tables
- horizontal deflection
  - chicanes
  - corner tightenings / curb radius reductions
  - mini-roundabouts
  - bulb-outs
  - lane narrowings
  - raised median islands
  - road diets
- surface treatments
  - textured crossings
  - textured surfaces
  - transverse rumble strips
- traffic management
  - vehicular directional closures
  - vehicle diverters
  - on-street plazas / vehicle access closures
  - intersection channelizations

  - raised medians through intersections
  - right-in / right-out islands
- urban design
  - streetscaping
  - gateways

Emerging Measures

- speed kidneys
- creative pavement markings
- shared spaces
- woonerven ("living streets")
- automated speed enforcement

Traffic Calming Measures – Summary of Applicability

Table 1 helps provide proponents of traffic calming plans with a general sense of where various measures in this toolbox may or may not be applicable. Based on the local context criteria (i.e. Traditional Mainstreets, Village Mainstreets, design priority areas, etc.) some measures may or may not be appropriate for certain street classifications (i.e. major collectors, urban arterials, rural arterials). For instance, general design considerations indicate that abrupt traffic calming measures should be avoided on major collectors and arterials. However, in certain circumstances, some measures such as a raised intersection may be appropriate on an urban arterial designated as a traditional mainstreet (as per the Official Plan) because of the local context. For more information on general design considerations, refer to Part 1 of the Traffic Calming Design Guidelines (page 13).

Table 2 highlights measures where the use of temporary or seasonal products can be considered. The measures are divided into two different categories:

1. Measures that can be considered through the City's current Temporary Traffic Calming (TTC) or Safer Roads Ottawa (SRO) programs. In this case, the City can implement and operate temporary or seasonal products on streets that are intended for traffic calming in situations where there is no immediate plan for a permanent solution.
2. Measures that can be installed temporarily during the planning phase to further study and evaluate the potential for permanent installation. These temporary measures would be removed before the planning phase is complete.

NOTE: Recommendation and implementation of temporary / seasonal traffic calming materials on City streets shall only be coordinated by City of Ottawa Traffic Services at this time. All installations of temporary / seasonal traffic calming should adhere to the design considerations outlined in Part 1 of the Traffic Calming Guidelines.

Table 1 - Summary of Traffic Calming Measure Applicability

Measure	Location Applicability ✓ Generally Applicable O Use with Care × Nominal to Low Applicability * Depending on the local context criteria (i.e. Traditional Mainstreets, Village Mainstreets, etc.), the measure indicated may or may not be appropriate for the street classification.		
	Local / Collector Streets	**Major Collector / Urban Arterial Streets**	**Rural Arterial Streets**
Communication and Enforcement			
Information Signage	✓	✓	✓
Speed Display Device	✓	✓	✓
Educational Campaigns	✓	✓	✓
Minor Adjustments			
Full-lane Transverse Bars	✓	O	✓
On-Road Messaging	✓	✓	✓
Street Parking	✓	O	×
Vertical Centreline Treatments	✓	×	✓
Engineering			
Vertical Deflection			
Raised Crossings	✓	×	×
Raised Intersections	✓	×*	×
Speed Cushions	✓	×	×
Speed Humps / Tables	✓	×	×
Horizontal Deflection			
Chicanes (one-way streets)	**Locals Only**	×	×
Chicanes (two-way streets)	✓	×	×
Corner Tightening / Curb Radius Reductions	✓	O	O
Mini-Roundabouts	✓	×	O
Bulb-Outs / Curb Extensions / Neckdowns / Chokers	✓	O*	×
Cycle-Friendly Bulb-Outs	✓	O*	×
Lane Narrowings	✓	O	✓

Measure	Location Applicability ✓ Generally Applicable O Use with Care × Nominal to Low Applicability * Depending on the local context criteria (i.e. Traditional Mainstreets, Village Mainstreets, etc.), the measure indicated may or may not be appropriate for the street classification.		
	Local / Collector Streets	**Major Collector / Urban Arterial Streets**	**Rural Arterial Streets**
Centre Island Narrowings	✓	O	✓
Road Diets	✓	✓	×*
Surface Treatments			
Textured Crossings	✓	O	×*
Textured Surfaces	✓	×	×
Transverse Rumble Strips	O	×	✓
Traffic Management			
Vehicular Directional Closures	✓	×	×
Vehicle Diverters	✓	×	×
On-Street Plazas / Vehicle Access Closures	✓	×	×
Intersection Channelizations	✓	O	O
Raised Medians Through Intersections	✓	O	O
Right-In-Right-Out Islands	✓	O	O
Urban Designs			
Streetscaping	✓	✓	×*
Gateways	✓	✓	✓
Emerging			
Speed Kidneys	✓	×	×
Creative Pavement Markings	✓	×*	×
Shared Spaces	✓	×	×
Woonerven (“Living Streets”)	✓	×	×
Automated Speed Enforcement	✓	✓	✓

Table 2 - Summary of Temporary / Seasonal Products

Temporary / Seasonal Products *measure is listed in more than one category	
City may consider these measures through TTC or SRO programs	• Information Signage • Educational Campaigns • Speed Display Device • Vertical Centreline Treatments • Corner Tightening / Curb Radius Reductions* • Bulb-Outs / Curb Extensions / Neckdowns / Chokers* • Automated Speed Enforcement
These measures could be installed temporarily to further study / evaluate potential permanent installation	• Speed Cushions (limited applications) • Speed Humps / Tables (limited applications) • Chicanes (one-way streets) • Chicanes (two-way streets) • Corner Tightening / Curb Radius Reductions* • Bulb-Outs / Curb Extensions / Neckdowns / Chokers* • Mini-Roundabouts • Cycle-Friendly Bulb-Outs • Street Parking • Lane Narrowings • Centre Island Narrowings • Road Diets • Vehicular Directional Closures • Vehicle Diverters • On-Street Plazas / Vehicle Access Closures • Intersection Channelizations • Raised Medians Through Intersections • Right-In-Right-Out Islands • Streetscaping • Gateways • Speed Kidneys (limited applications) • Creative Pavement Markings • Shared Spaces • Woonerven (“Living Streets”)

Communication and Enforcement Measures

These are measures and programs that raise awareness and educate the public in regard to driving behavior and vulnerable street users.

Information Signage

Information signage can draw attention to the presence of traffic calming or encourage lower vehicle speeds.

Signage can be implemented to educate the public, highlight conditions ahead, and reinforce the presence of regulatory signage.

Pros
- Raise driver awareness of specific issues or conditions
- Low cost
- Can be used on most streets

Cons
- Overuse may reduce effectiveness
- Not self enforcing

Most Beneficial Context
- As complement to a broader traffic calming plan using a combination of traffic calming measures

General Considerations
- Conditions to which the signs refer to should be present so that the sign is credible.
- Avoid overuse of custom signs to indicate conditions where standard signs (OTM or MUTCDC) already exist.

Temporary / Seasonal Installation
- Information signage can be installed using temporary products (e.g. wind signs with weighted support bases)

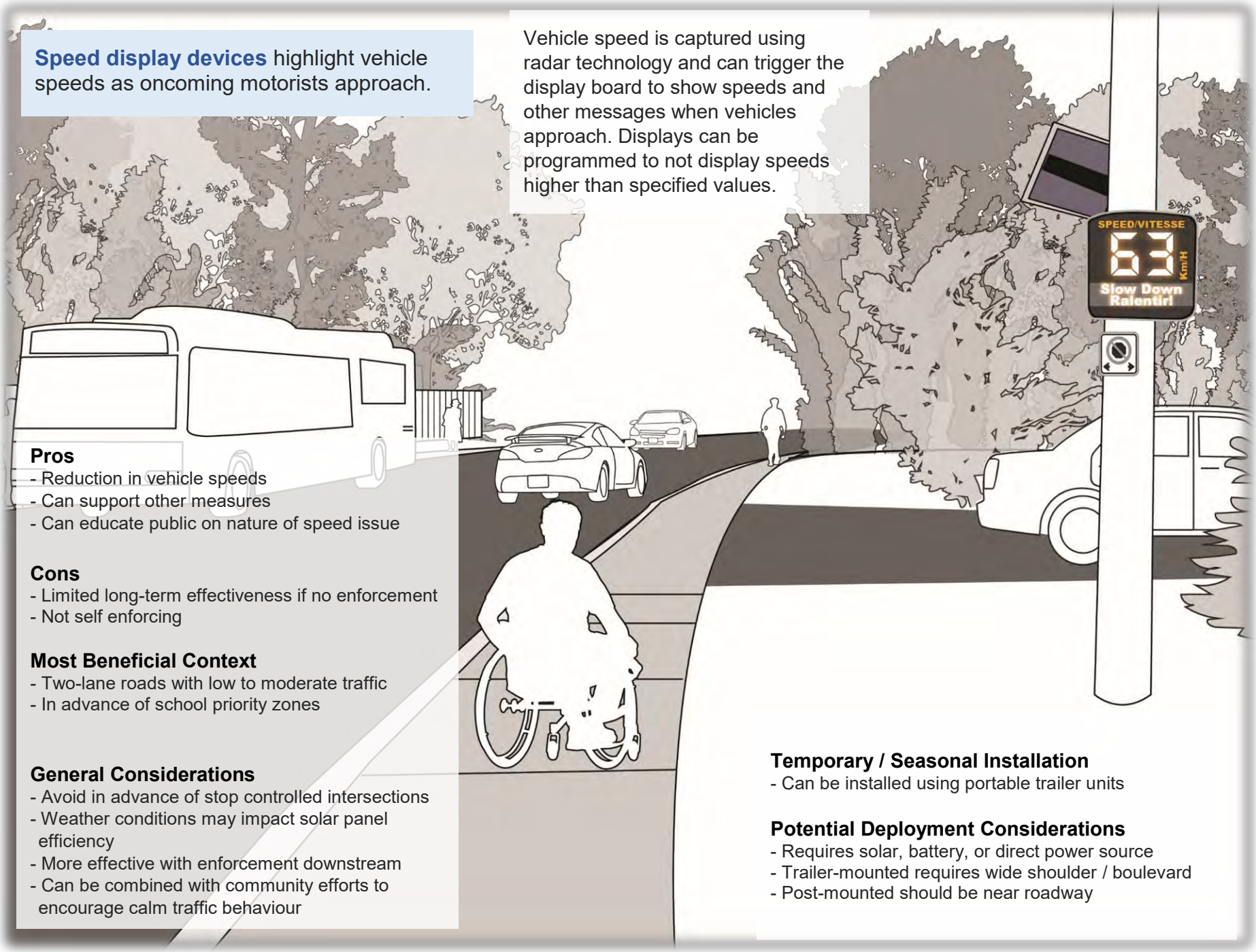
Potential Signage Considerations

- Large signs may draw more attention than standard sizes
- Signage design should conform to OTM guidance, where applicable

Speed Display Devices

Speed display devices highlight vehicle speeds as oncoming motorists approach.

Vehicle speed is captured using radar technology and can trigger the display board to show speeds and other messages when vehicles approach. Displays can be programmed to not display speeds higher than specified values.



Pros
- Reduction in vehicle speeds
- Can support other measures
- Can educate public on nature of speed issue

Cons
- Limited long-term effectiveness if no enforcement
- Not self enforcing

Most Beneficial Context
- Two-lane roads with low to moderate traffic
- In advance of school priority zones

General Considerations
- Avoid in advance of stop controlled intersections
- Weather conditions may impact solar panel efficiency
- More effective with enforcement downstream
- Can be combined with community efforts to encourage calm traffic behaviour

Temporary / Seasonal Installation
- Can be installed using portable trailer units

Potential Deployment Considerations
- Requires solar, battery, or direct power source
- Trailer-mounted requires wide shoulder / boulevard
- Post-mounted should be near roadway

Educational Campaigns

Educational campaigns are initiatives to raise awareness of road safety issues including speeding and aggressive driving.

In some cases, these will be an integral component of an overall strategic road safety program.

Potential Deployment Considerations

- Pre-test campaign message to ensure effectiveness
- Formats can include combination of in-person exchanges, social media, signage, video, audio, print, etc.

Pros

- Increase driver awareness of specific issues

Cons

- Potentially less likely to be effective unless tied to enforcement

Most Beneficial Context

- Targeted to specific issues

General Considerations

- Consider effectiveness, intensity, and duration in communicating with target audiences
- Refer to Safer Roads Ottawa program information
- Consider NHTSA's "Countermeasures That Work"

Temporary / Seasonal Installation

- Education campaigns are temporary in nature, intended to go beyond regular education and communication activities

Minor Adjustment Measures

Pavement Markings

NOTE: The following information applies to each of the pavement marking elements within the “Minor Adjustment Measures” grouping. This includes on-road pavement messaging and full-lane transverse bars. The information below is not repeated on each of the subsequent figures in the following pages.

Potential Advantages

- Can be implemented quickly
- Potentially low cost through use of low VOC paint
- No impact to emergency vehicles, snow plowing, street sweeping, and police enforcement
- Potential reduction in vehicle speeds

Potential Disadvantages

- May be less effective in winter months due to visibility issues created by snow / ice cover
- Not visible from distance
- Effect on speeds may be reduced over time
- Not self-enforcing

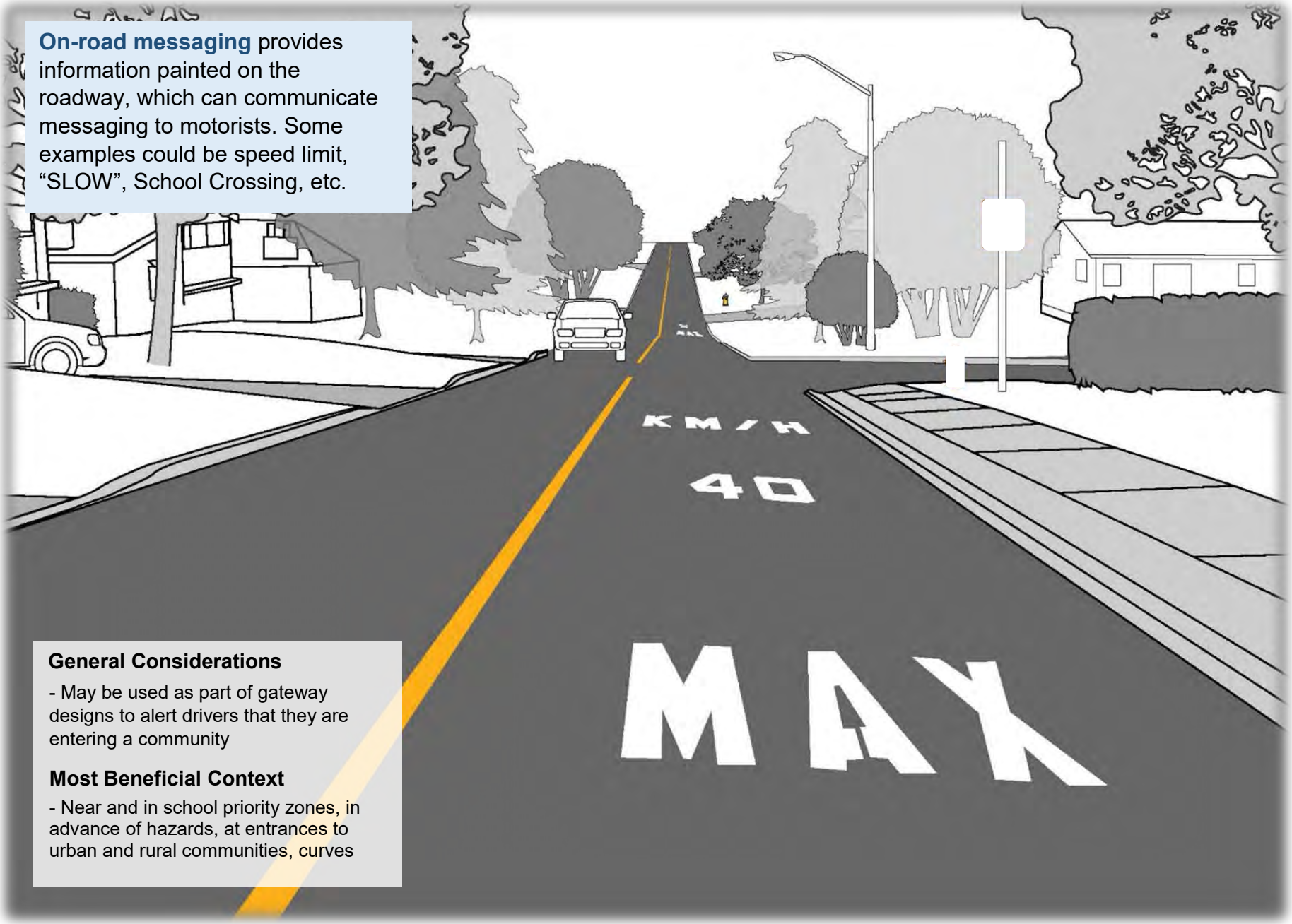
Potential Implementation Considerations

- Pavement markings require regular maintenance; increased repainting costs if placed in the wheel path of vehicles

Universal Considerations

- Avoid overuse so visual effect of the treatment is not diminished
- Text used in on-road pavement messaging must be bilingual

On-Road Messaging (Pavement Markings)



On-road messaging provides information painted on the roadway, which can communicate messaging to motorists. Some examples could be speed limit, “SLOW”, School Crossing, etc.

General Considerations

- May be used as part of gateway designs to alert drivers that they are entering a community

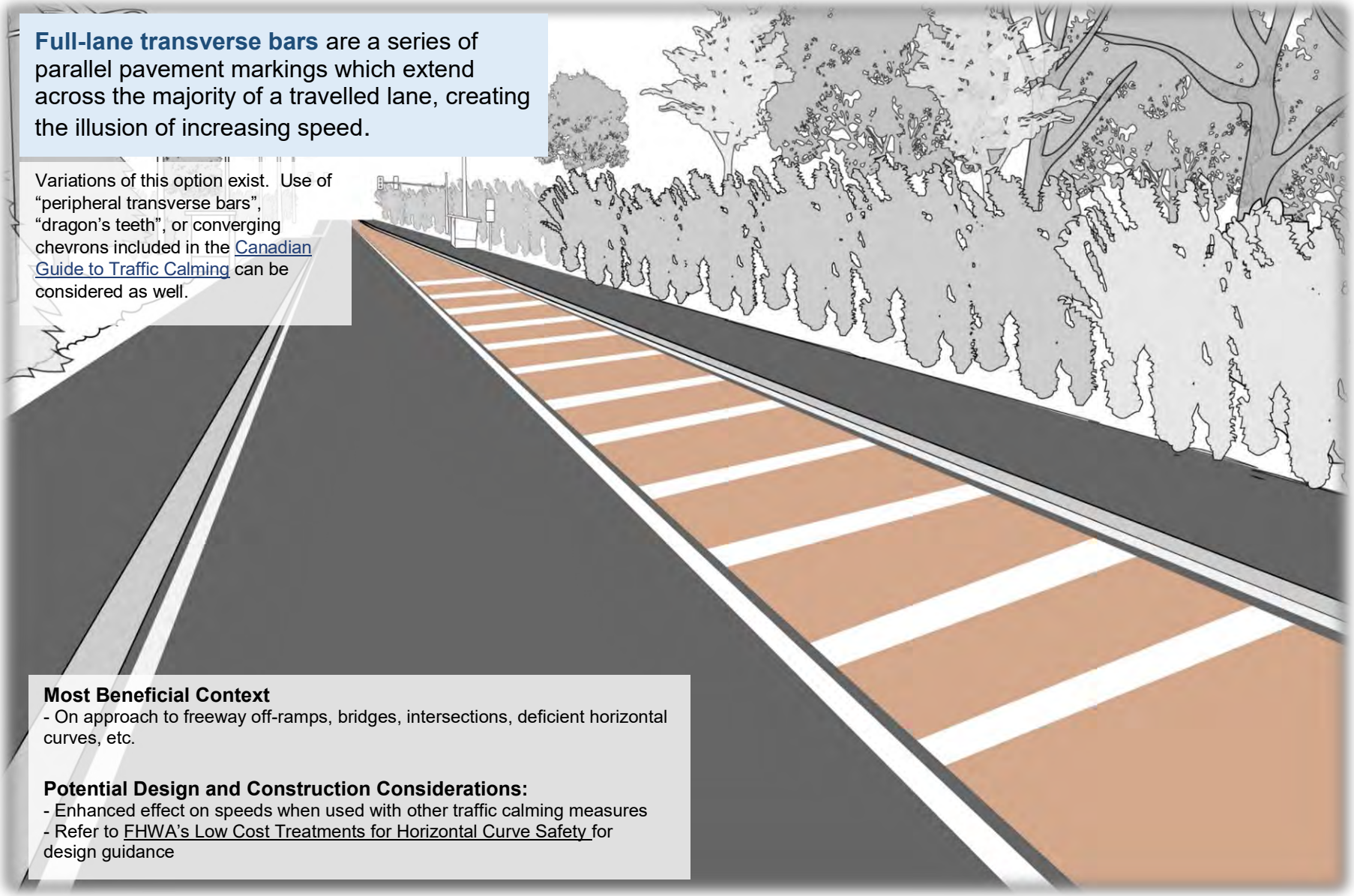
Most Beneficial Context

- Near and in school priority zones, in advance of hazards, at entrances to urban and rural communities, curves

Full-Lane Transverse Bars (Pavement Markings)

Full-lane transverse bars are a series of parallel pavement markings which extend across the majority of a travelled lane, creating the illusion of increasing speed.

Variations of this option exist. Use of "peripheral transverse bars", "dragon's teeth", or converging chevrons included in the Canadian Guide to Traffic Calming can be considered as well.



Most Beneficial Context
- On approach to freeway off-ramps, bridges, intersections, deficient horizontal curves, etc.

Potential Design and Construction Considerations:
- Enhanced effect on speeds when used with other traffic calming measures
- Refer to FHWA's Low Cost Treatments for Horizontal Curve Safety for design guidance

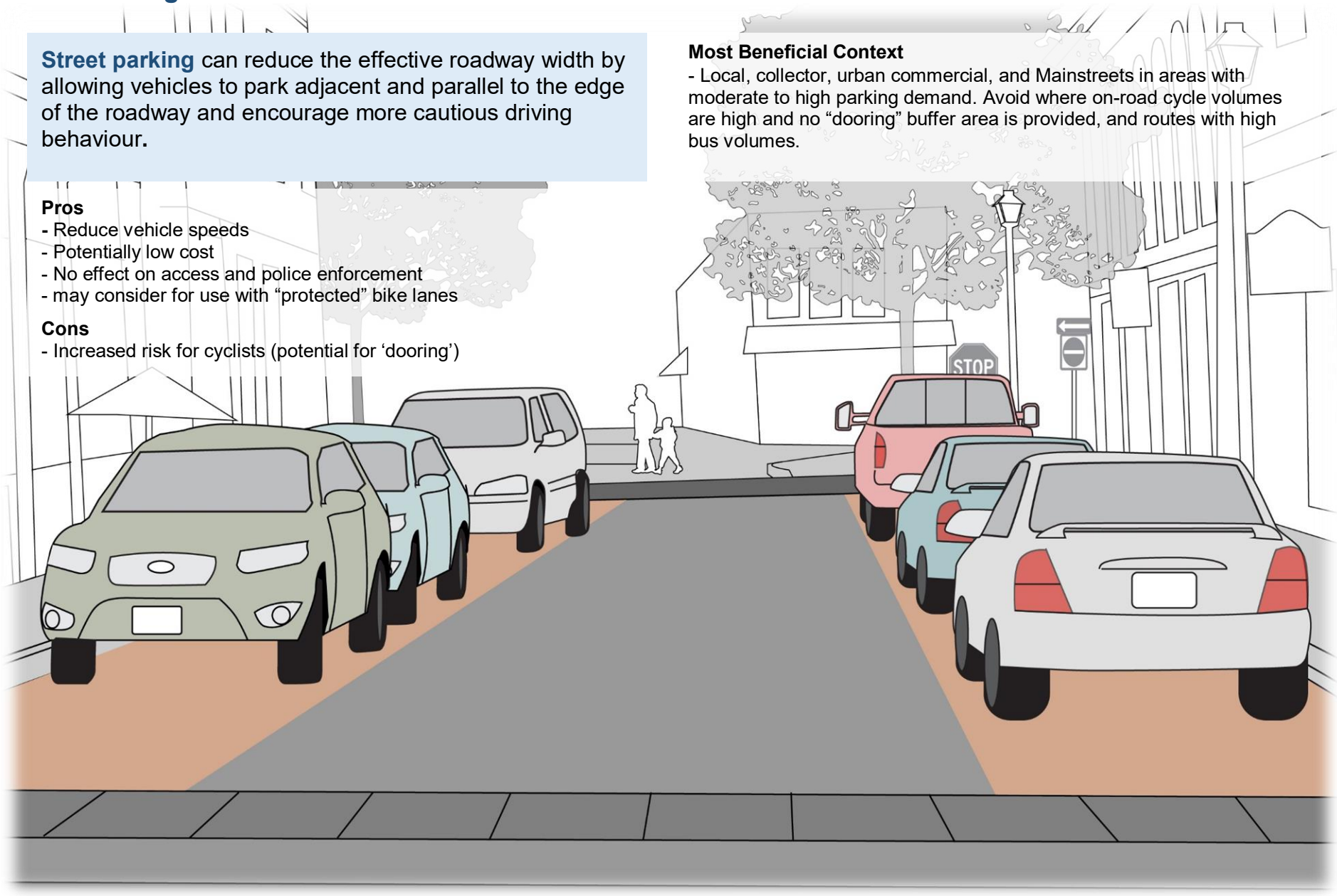
Street Parking

Street parking can reduce the effective roadway width by allowing vehicles to park adjacent and parallel to the edge of the roadway and encourage more cautious driving behaviour.

Pros
- Reduce vehicle speeds
- Potentially low cost
- No effect on access and police enforcement
- may consider for use with “protected” bike lanes

Cons
- Increased risk for cyclists (potential for ‘dooring’)

Most Beneficial Context
- Local, collector, urban commercial, and Mainstreets in areas with moderate to high parking demand. Avoid where on-road cycle volumes are high and no “dooring” buffer area is provided, and routes with high bus volumes.



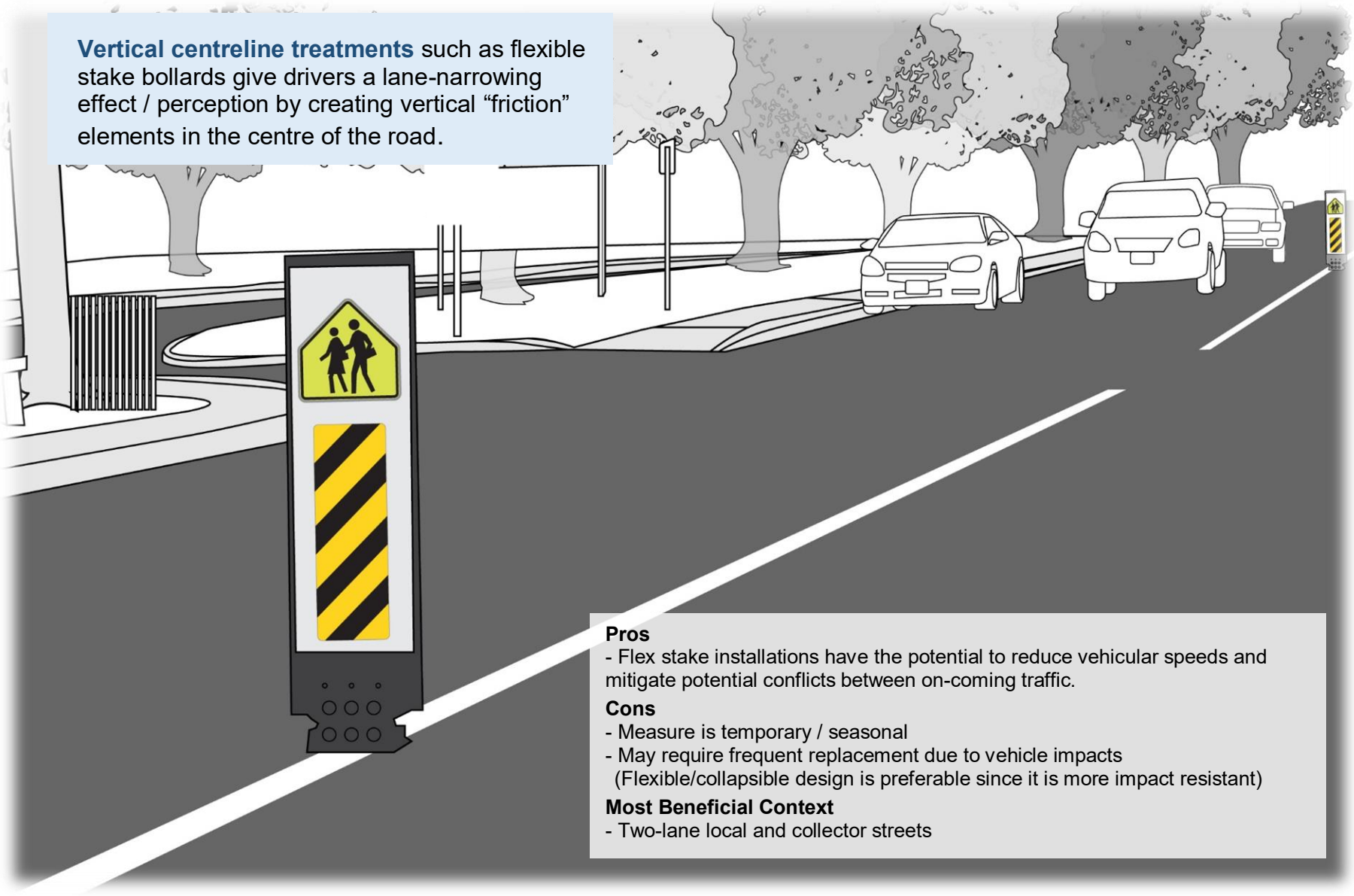
Street Parking

Universal Considerations

- Should not be implemented on two-way streets with stretches where it would create sustained roadway widths that are insufficient for two-way operation
- Evaluate broader area parking supply and demand
- Effectiveness impacted by parking occupancy levels (i.e. higher occupancy translates to greater effectiveness)
- Identify changes to locations where persons with accessible parking permits can park (this includes all curbside space signed with no-parking)
- Take into account the City's Traffic and Parking By-Law requirements
- Alternating on-street parking bays between the two sides of a roadway can introduce lateral shifts to driving lanes which encourages low travel speeds
- The benefits and disadvantages of reduced visibility need to be balanced when using street parking for traffic calming purposes
- Street parking adjacent to bike lanes (on-road or curbside protected) should offer "dooring" buffers such that car doors do not swing open into dedicated cycling facilities
- "Flex spaces" can be implemented (typically on Mainstreets) in space of permanent, dedicated street parking areas. These spaces would be multi-purposed and could be used for a variety of activities, including parking.

Vertical Centreline Treatments

Vertical centreline treatments such as flexible stake bollards give drivers a lane-narrowing effect / perception by creating vertical “friction” elements in the centre of the road.



Pros
- Flex stake installations have the potential to reduce vehicular speeds and mitigate potential conflicts between on-coming traffic.

Cons
- Measure is temporary / seasonal
- May require frequent replacement due to vehicle impacts (Flexible/collapsible design is preferable since it is more impact resistant)

Most Beneficial Context
- Two-lane local and collector streets

Vertical Centerline Treatments

Potential Deployment Considerations:

- Are installed on a temporary / seasonal basis
- All proposals need to be managed by City of Ottawa Traffic Services due to on-going operations and maintenance considerations

Universal Considerations:

- Avoid at locations where it may block driveways or cross street access, as well as where it may interfere with transit operations
- Can be used to separate conflicting movements
- Requires identification of ongoing funding for installation / removal due to seasonal nature of measures
- Deployment requires assignment of staff to coordinate deployment and monitor inventory

Engineering Measures

Core information for all Vertical Deflection Measures

NOTE: The following information applies to each of the vertical deflection elements within the "Engineering Measures" grouping and is not repeated in the information specific to each traffic calming measure. This includes raised crossings, raised intersections, speed humps, speed tables and speed cushions.

Potential Advantages

- Potential reduction in vehicle speeds
- Self enforcing
- Specifically in the case of raised crossings and raised intersections:
  - Improve proportion of drivers yielding to pedestrians by increasing visibility and emphasizing their priority
  - Increased comfort of pedestrians due to reduced accumulation of rain or snow within the crossings
  - Reinforces the stop condition if present, or in the case of signalized intersections, the need to slow down and watch for pedestrians

Potential Disadvantages

- May impact emergency response activities
- May present difficulties for persons with disabilities
- May cause discomfort to transit users and drivers, and increase travel time
- May result in a false sense of security if placed in isolation and if road design does not encourage reduced speeds beyond the placed measures
- May exacerbate ponding if drainage paths to catch basins become blocked
- Specifically in the case of raised crossings and raised intersections:
  - May be difficult for pedestrians with vision loss to differentiate curb from roadway (can be mitigated with design elements such as tactile indicators)

Potential Design and Construction Considerations

- Colour and / or texture contrasted material from adjacent road surfaces may increase effectiveness, but should be limited to Design Priority Areas
- Consider implications to snow plowing activities
- May be combined with curb extensions to provide additional effectiveness
- Surface treatments should be skid resistant, particularly on inclines
- The roadway approaches to, and departures from, the raised element are appropriately ramped in consideration of vehicle types and desired speed
- Design measures with sinusoidal or flat-topped profiles
- Specifically in the case of speed humps, speed tables and speed cushions:
    - series of measures is more effective than single installations (spacing of 60 m to 250 m depending on desired speed - closer spacing for lower speed)
    - Consideration should be given to extending or not extending measures into adjacent on-road cycling lanes
        - Extending measures into cycling lanes can dis-incentivize motorists from entering cycling lanes to avoid measures
        - Not extending measures into cycling lanes can provide more comfortable operating conditions for cycling if the potential for motorist encroachment into the cycling lanes is mitigated (e.g. through use of flex stake bollards)

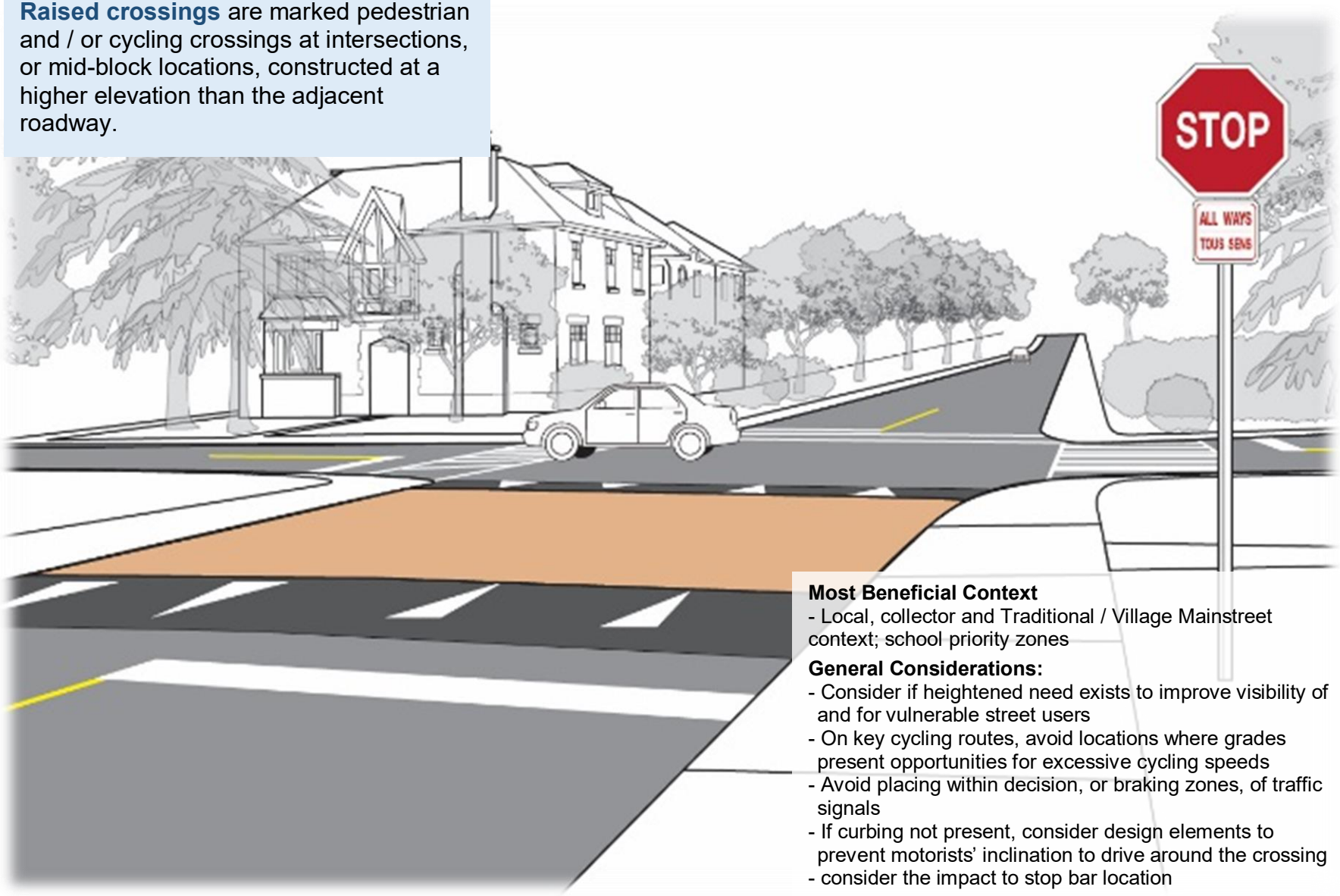
Universal Considerations

(Refer to Part 1 of Guide for additional information)

- Avoid on key emergency response and high frequency bus routes
- Avoid locations with previous vibration concerns
- Consider proximity of adjacent buildings and soil conditions and the potential for new measures to increase vibration levels
- Avoid street segments with steep grades or sharp curves
- Take into account potential negative environmental effects in planning phase - specifically localized noise and vibration levels
- Negative effects on snow plowing / removal
    - Snow clearing times may be increased
    - Residual snow build-up may accumulate on down slopes
    - Icing can be a problem if snow is not properly removed

Raised Crossings (Vertical Deflection)

Raised crossings are marked pedestrian and / or cycling crossings at intersections, or mid-block locations, constructed at a higher elevation than the adjacent roadway.



Most Beneficial Context
- Local, collector and Traditional / Village Mainstreet context; school priority zones

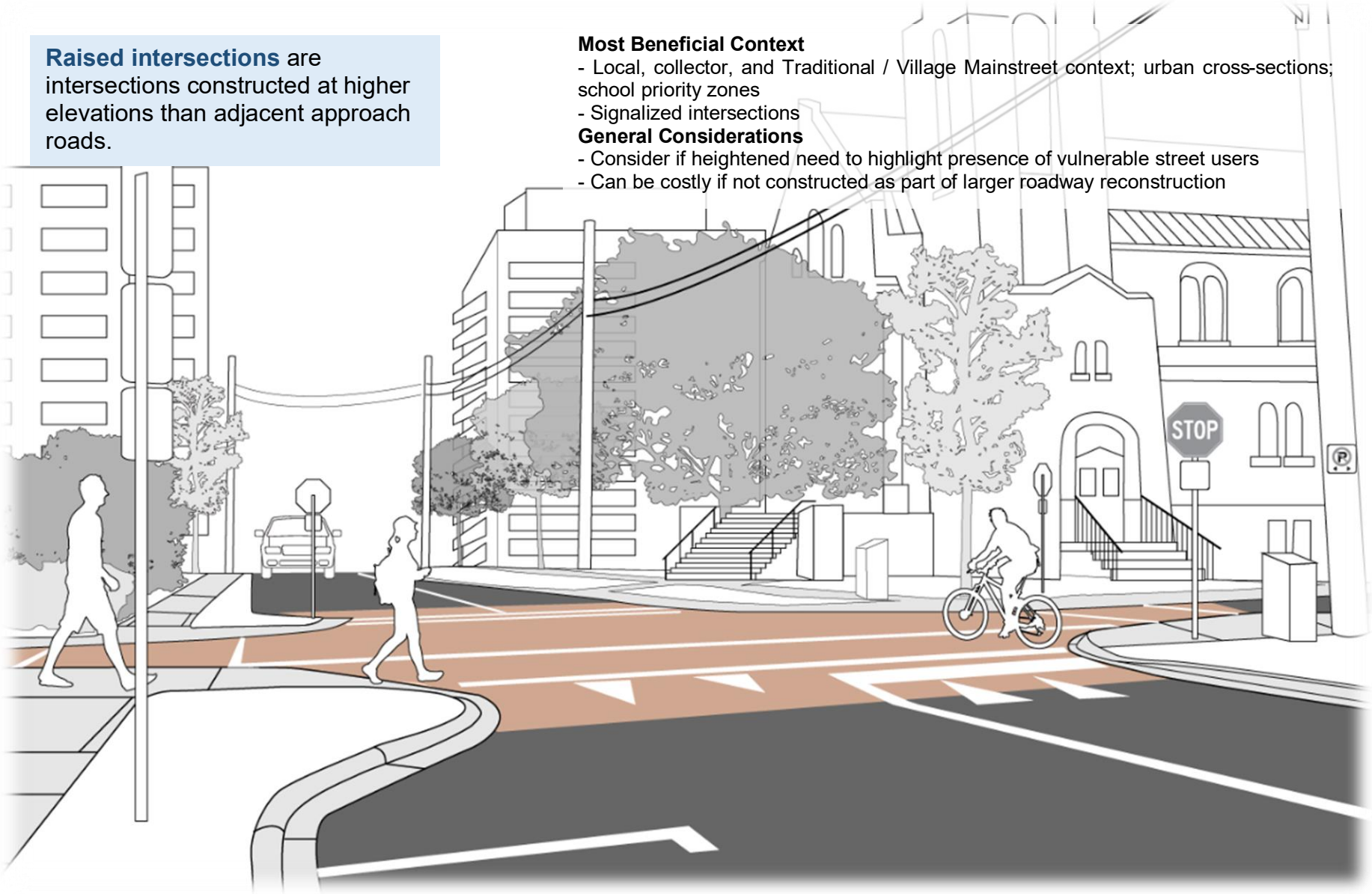
General Considerations:
- Consider if heightened need exists to improve visibility of and for vulnerable street users
- On key cycling routes, avoid locations where grades present opportunities for excessive cycling speeds
- Avoid placing within decision, or braking zones, of traffic signals
- If curbing not present, consider design elements to prevent motorists' inclination to drive around the crossing
- consider the impact to stop bar location

Raised Intersections (Vertical Deflection)

Raised intersections are intersections constructed at higher elevations than adjacent approach roads.

Most Beneficial Context
- Local, collector, and Traditional / Village Mainstreet context; urban cross-sections; school priority zones
- Signalized intersections

General Considerations
- Consider if heightened need to highlight presence of vulnerable street users
- Can be costly if not constructed as part of larger roadway reconstruction

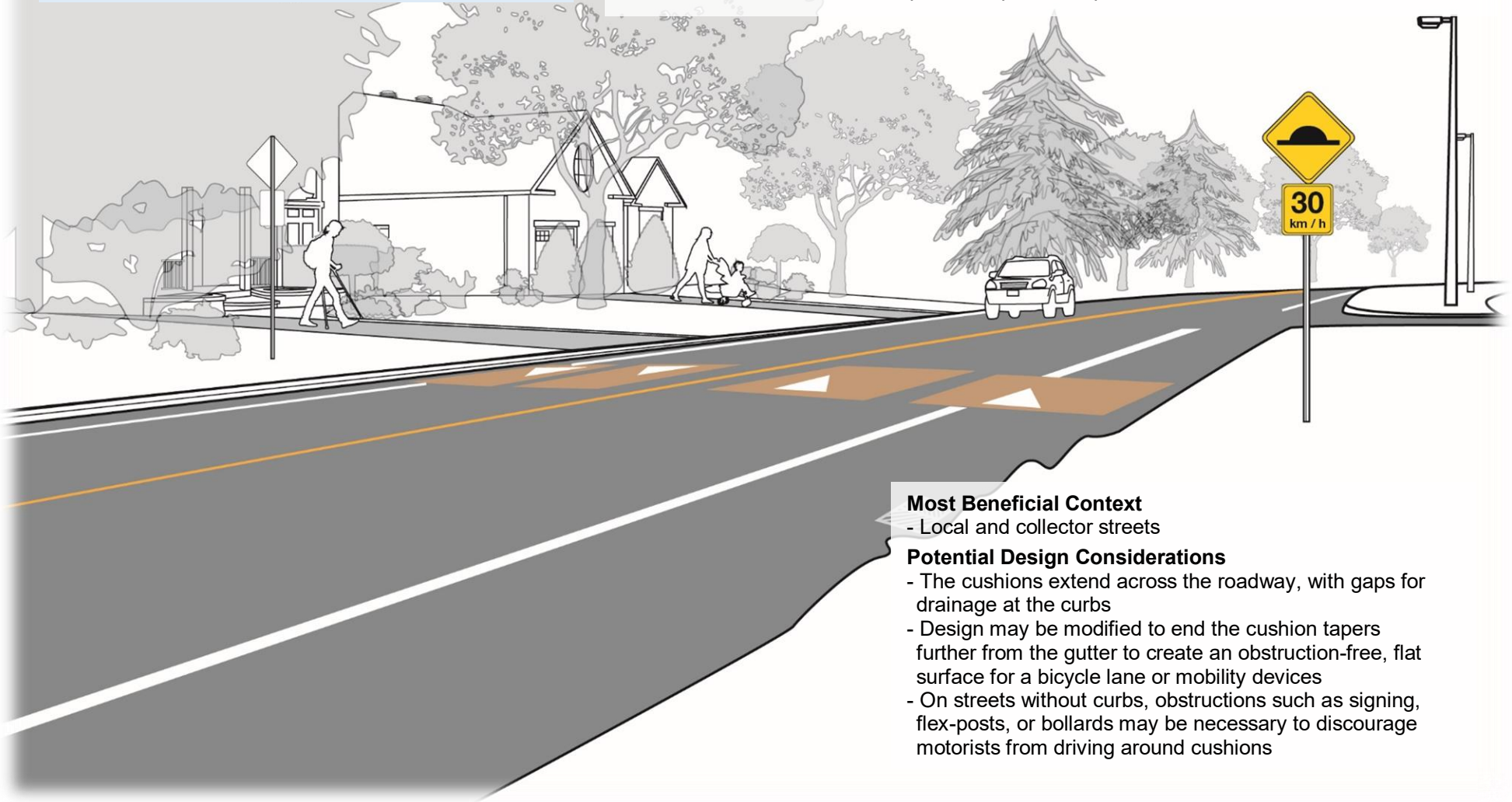


Speed Cushions (Vertical Deflection)

Speed cushions are raised areas, similar to speed humps, but not covering the entire width of the road. They are designed to allow large vehicles to “straddle” the cushions, while smaller vehicles are vertically deflected.

Pros
- Some types of vehicles and buses, can pass with limited vertical deflection

Cons
- May slightly affect emergency response time (but less than other vertical deflection measures such as speed humps)
- More difficult to construct compared to speed humps



Most Beneficial Context
- Local and collector streets

Potential Design Considerations
- The cushions extend across the roadway, with gaps for drainage at the curbs
- Design may be modified to end the cushion tapers further from the gutter to create an obstruction-free, flat surface for a bicycle lane or mobility devices
- On streets without curbs, obstructions such as signing, flex-posts, or bollards may be necessary to discourage motorists from driving around cushions

Speed Cushions

Universal Considerations

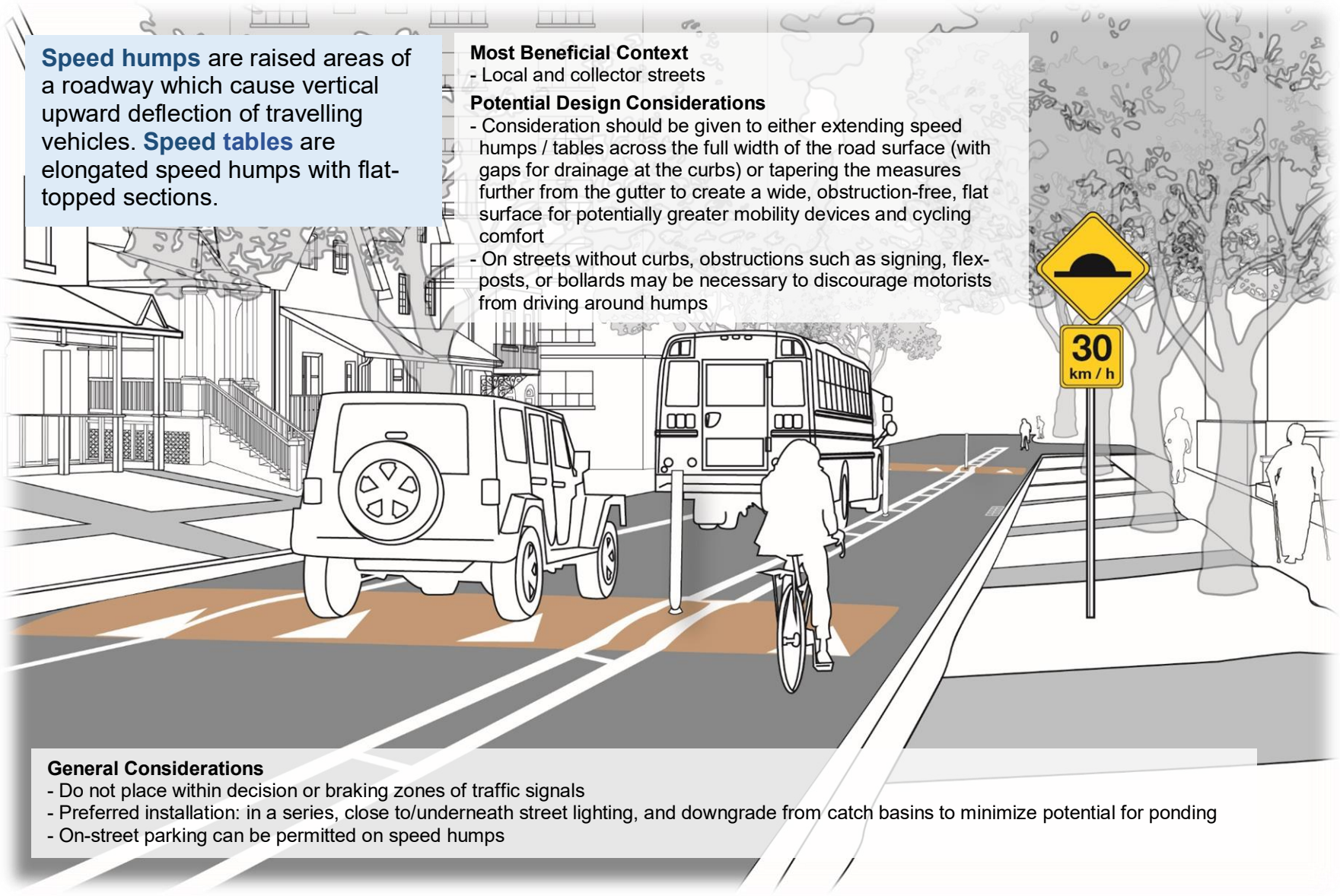
- Balance objectives of limiting traffic from avoiding the measures and cycling and mobility device comfort at the roadside when determining the width of the measure
- Do not place within decision or braking zones of traffic signals
- Offers potential alternative to speed humps and tables on key emergency response streets
- Snow removal may be more difficult than with other vertical deflection measures
- On-street parking can be permitted on speed cushions
- There are different configurations (size and total number of individual cushions)
- They may not always be feasible on all streets depending on available road surface width

Speed Humps and Speed Tables (Vertical Deflection)

Speed humps are raised areas of a roadway which cause vertical upward deflection of travelling vehicles. **Speed tables** are elongated speed humps with flat-topped sections.

Most Beneficial Context
- Local and collector streets

Potential Design Considerations
- Consideration should be given to either extending speed humps / tables across the full width of the road surface (with gaps for drainage at the curbs) or tapering the measures further from the gutter to create a wide, obstruction-free, flat surface for potentially greater mobility devices and cycling comfort
- On streets without curbs, obstructions such as signing, flex-posts, or bollards may be necessary to discourage motorists from driving around humps



General Considerations
- Do not place within decision or braking zones of traffic signals
- Preferred installation: in a series, close to/underneath street lighting, and downgrade from catch basins to minimize potential for ponding
- On-street parking can be permitted on speed humps

Core information for all Horizontal Deflection Measures

NOTE: The following information applies to each of the horizontal deflection elements within the "Engineering Measures" grouping. This includes chicanes, corner tightenings (or curb radius reductions), mini-roundabouts, bulb-outs (also called curb extensions, neckdowns, and chokers), lane narrowings, centre island narrowings, and road diets. [The information below is not repeated on each of the subsequent figures in the following pages.]

Potential Advantages

- Reduces vehicle speeds
- Potential for improved street appearance with consideration of landscaping and other aesthetic options to be placed on / within the measures
- No significant impacts on emergency services, provided guidance in Part 1 of the Traffic Calming Design Guide is adhered to
- Can provide additional snow storage in winter
- No impact to vehicular access

Potential Disadvantages

- May force motorists and vulnerable street users inadvertently into a shared space without providing a designated exclusive space for vulnerable street users

Potential Design and Construction Considerations

- May change the nature of pedestrian-vehicle conflicts due to changes in visibility
- Avoid at driveways where excessive grades exist
- Take into account vehicle turning requirements
- Be aware of general street and winter maintenance implications
- May result in traffic signal and intersection adjustments to meet AODA requirements
- Examine implications to drainage
- May result in changes to street parking provisions
- Review implications to emergency response activities

Universal Considerations

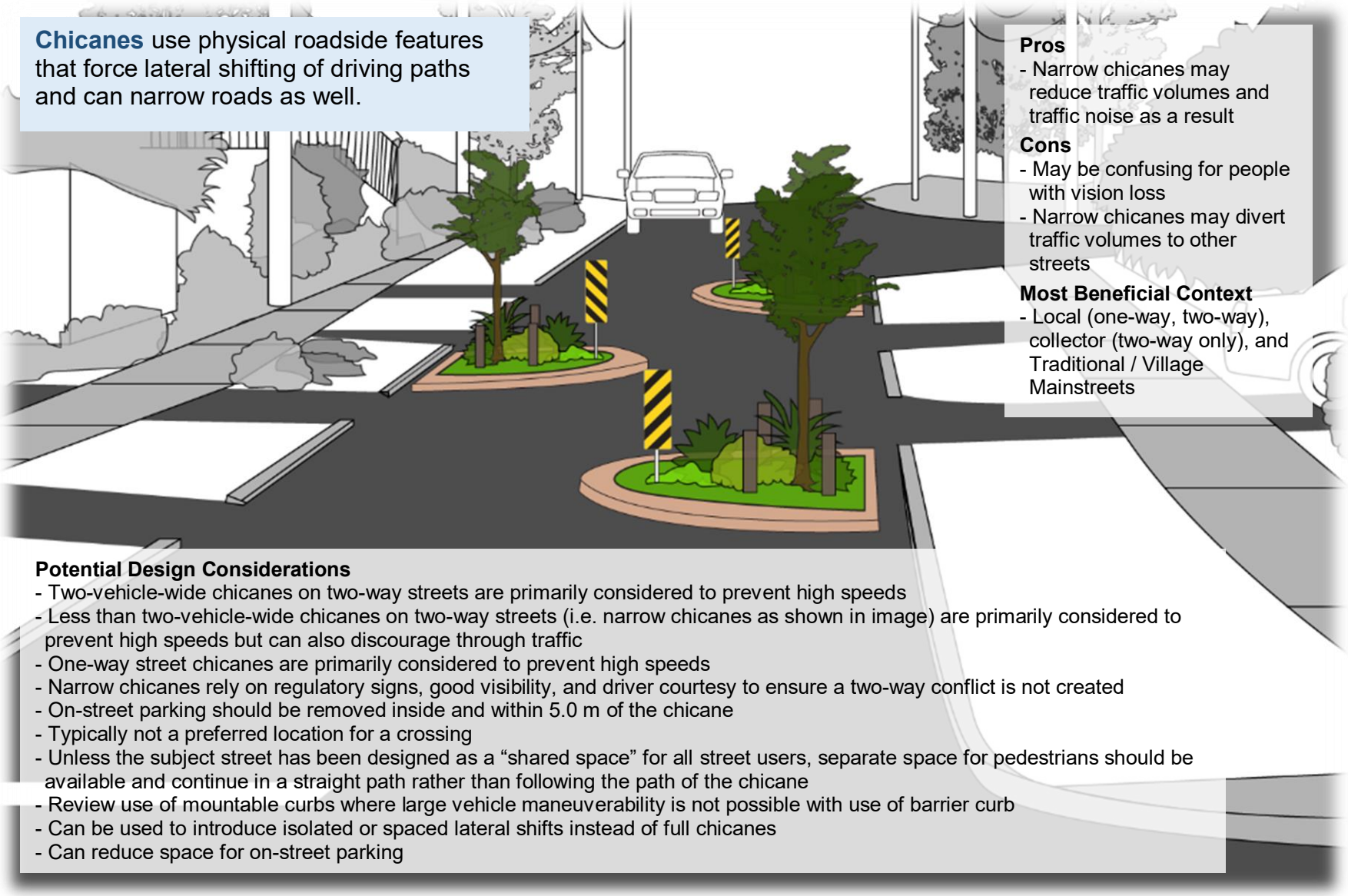
- Should be designed to avoid creating bus stops that are effectively “lay-by” areas, such that buses would be required to merge with through traffic following a stop
- Contrasting vertical elements (e.g. landscaping, street furniture, bollards) placed within measures can be considered to draw attention to the horizontal elements, in addition to regulatory signage.
- Care must be taken to ensure traffic calming measures create a sufficient level of challenge that motorists need to negotiate at low travel speeds while not being hazardous
- Mountable curbs can be an option
- Street maintenance activities should be reviewed (Refer to Part 1 of the Guide for more detail)
- Should examine using physical space created by measures to provide storm-water bio-retention facilities (or bio-swales), street furniture, landscaping, public space, bike parking, snow storage, and other amenities
- Modifications to on-street parking may be required
- Seasonal “Streetside Spots” can be considered which offer traffic calming benefits similar to a bulb-out with landscaping features installed (this would require determination of on-going maintenance and storage considerations)

Temporary / Seasonal Installation

- Temporary products can be used to simulate the presence of permanent horizontal deflection measures (Refer to Part 1 of the Guide for more detail)
- May not be as effective as permanent installations as they may not have the same level of visual and perceived impact created by permanent features

Chicanes (Horizontal Deflection)

Chicanes use physical roadside features that force lateral shifting of driving paths and can narrow roads as well.



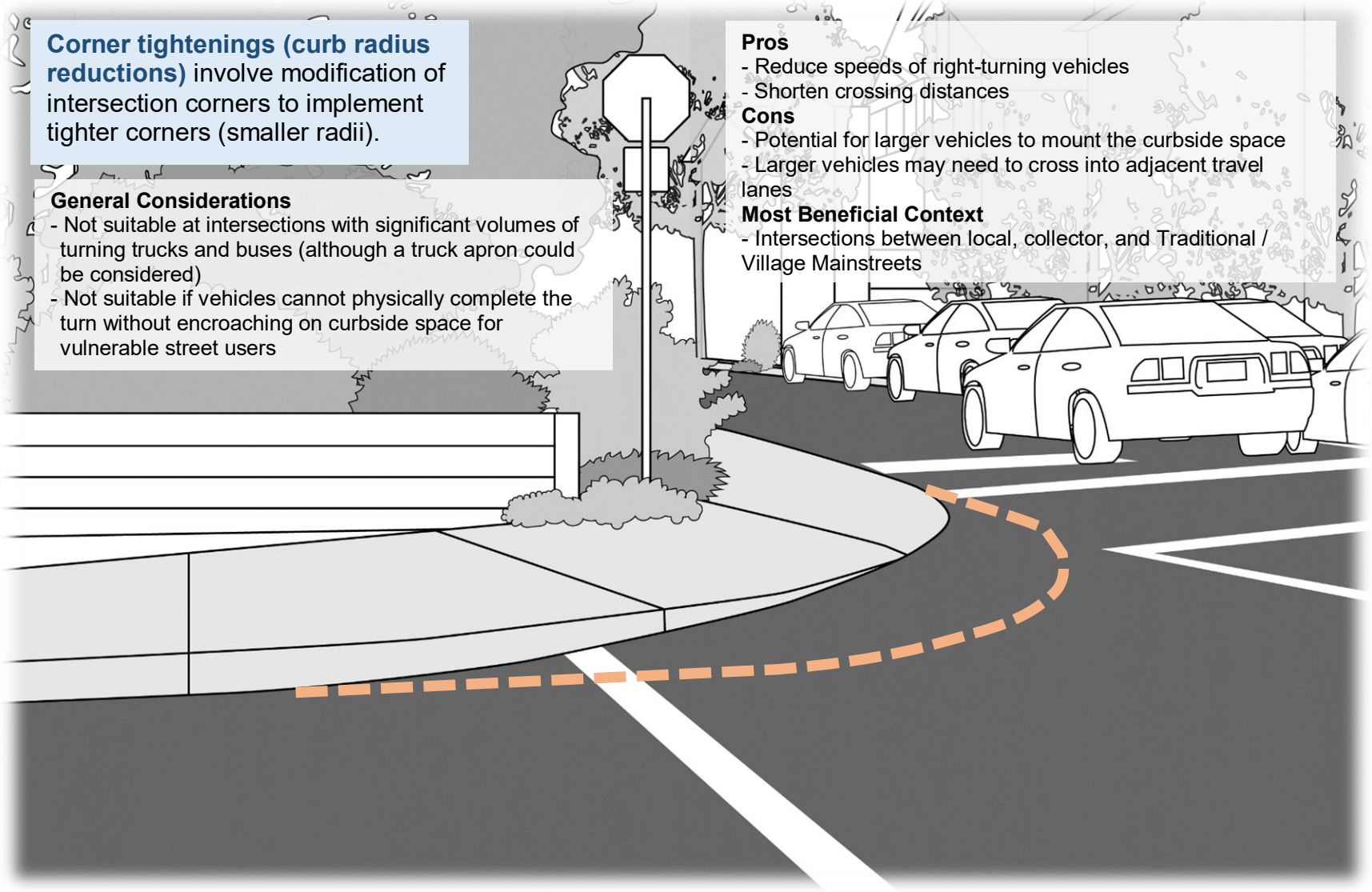
Pros
- Narrow chicanes may reduce traffic volumes and traffic noise as a result

Cons
- May be confusing for people with vision loss
- Narrow chicanes may divert traffic volumes to other streets

Most Beneficial Context
- Local (one-way, two-way), collector (two-way only), and Traditional / Village Mainstreets

Potential Design Considerations
- Two-vehicle-wide chicanes on two-way streets are primarily considered to prevent high speeds
- Less than two-vehicle-wide chicanes on two-way streets (i.e. narrow chicanes as shown in image) are primarily considered to prevent high speeds but can also discourage through traffic
- One-way street chicanes are primarily considered to prevent high speeds
- Narrow chicanes rely on regulatory signs, good visibility, and driver courtesy to ensure a two-way conflict is not created
- On-street parking should be removed inside and within 5.0 m of the chicane
- Typically not a preferred location for a crossing
- Unless the subject street has been designed as a “shared space” for all street users, separate space for pedestrians should be available and continue in a straight path rather than following the path of the chicane
- Review use of mountable curbs where large vehicle maneuverability is not possible with use of barrier curb
- Can be used to introduce isolated or spaced lateral shifts instead of full chicanes
- Can reduce space for on-street parking

Corner Tightenings / Curb Radius Reductions (Horizontal Deflection)



Corner tightenings (curb radius reductions) involve modification of intersection corners to implement tighter corners (smaller radii).

General Considerations
- Not suitable at intersections with significant volumes of turning trucks and buses (although a truck apron could be considered)
- Not suitable if vehicles cannot physically complete the turn without encroaching on curbside space for vulnerable street users

Pros
- Reduce speeds of right-turning vehicles
- Shorten crossing distances

Cons
- Potential for larger vehicles to mount the curbside space
- Larger vehicles may need to cross into adjacent travel lanes

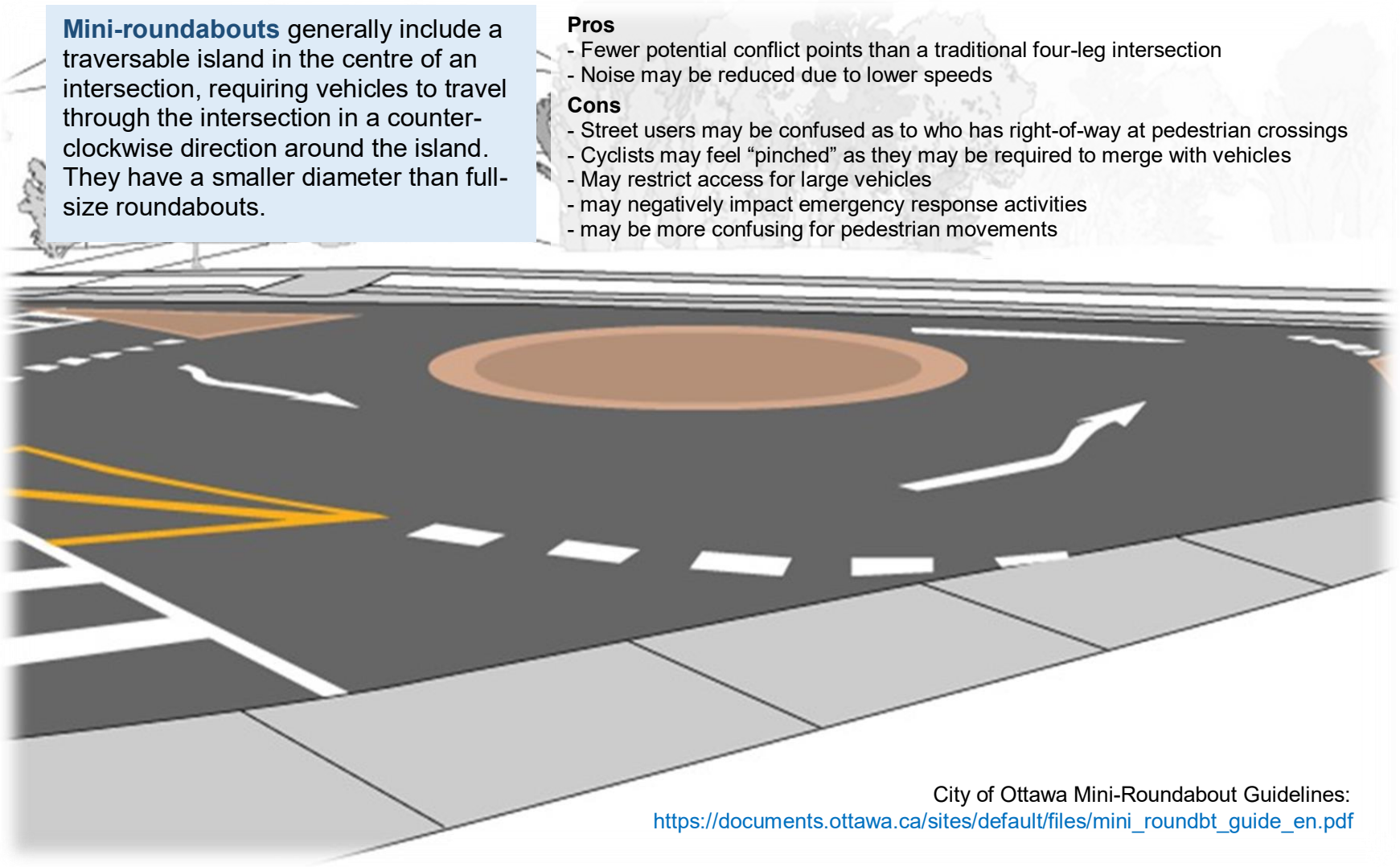
Most Beneficial Context
- Intersections between local, collector, and Traditional / Village Mainstreets

Mini-Roundabouts (Horizontal Deflection)

Mini-roundabouts generally include a traversable island in the centre of an intersection, requiring vehicles to travel through the intersection in a counter-clockwise direction around the island. They have a smaller diameter than full-size roundabouts.

Pros
- Fewer potential conflict points than a traditional four-leg intersection
- Noise may be reduced due to lower speeds

Cons
- Street users may be confused as to who has right-of-way at pedestrian crossings
- Cyclists may feel “pinched” as they may be required to merge with vehicles
- May restrict access for large vehicles
- may negatively impact emergency response activities
- may be more confusing for pedestrian movements



City of Ottawa Mini-Roundabout Guidelines:
https://documents.ottawa.ca/sites/default/files/mini_roundbt_guide_en.pdf

Mini-Roundabouts

Most Beneficial Context

- Local and collector street intersections with low posted speed limits

Potential Design and Construction Considerations

- May require removal of some on-street parking
- Maximum two traffic lanes (one in each direction)
- Most effective when used in a series
- Avoid intersections where volumes do not offer regular gaps to allow for street users to pass through the intersection

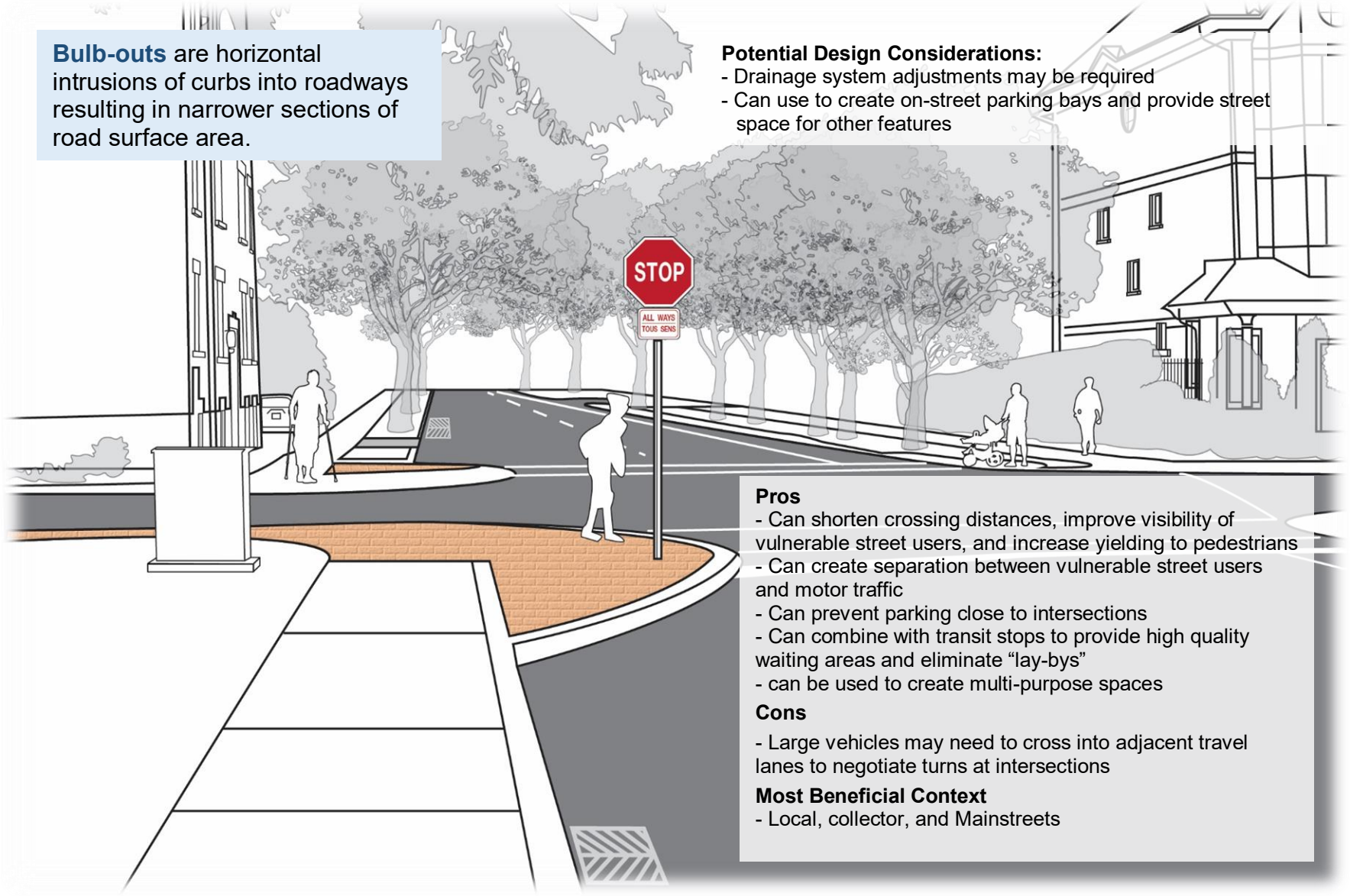
Universal Considerations

- Design guidance for Ottawa specific locations is available through City of Ottawa Traffic Services (approved in September 2017)
- Other design references may refer to “traffic circles” or “traffic buttons” which are similar in nature and intent.
- The design features of mini-roundabouts are preferred by the City of Ottawa.

Bulb-Outs / Curb Extensions / Neckdowns / Narrowings / Chokers (Horizontal Deflection)

Bulb-outs are horizontal intrusions of curbs into roadways resulting in narrower sections of road surface area.

Potential Design Considerations:
- Drainage system adjustments may be required
- Can use to create on-street parking bays and provide street space for other features



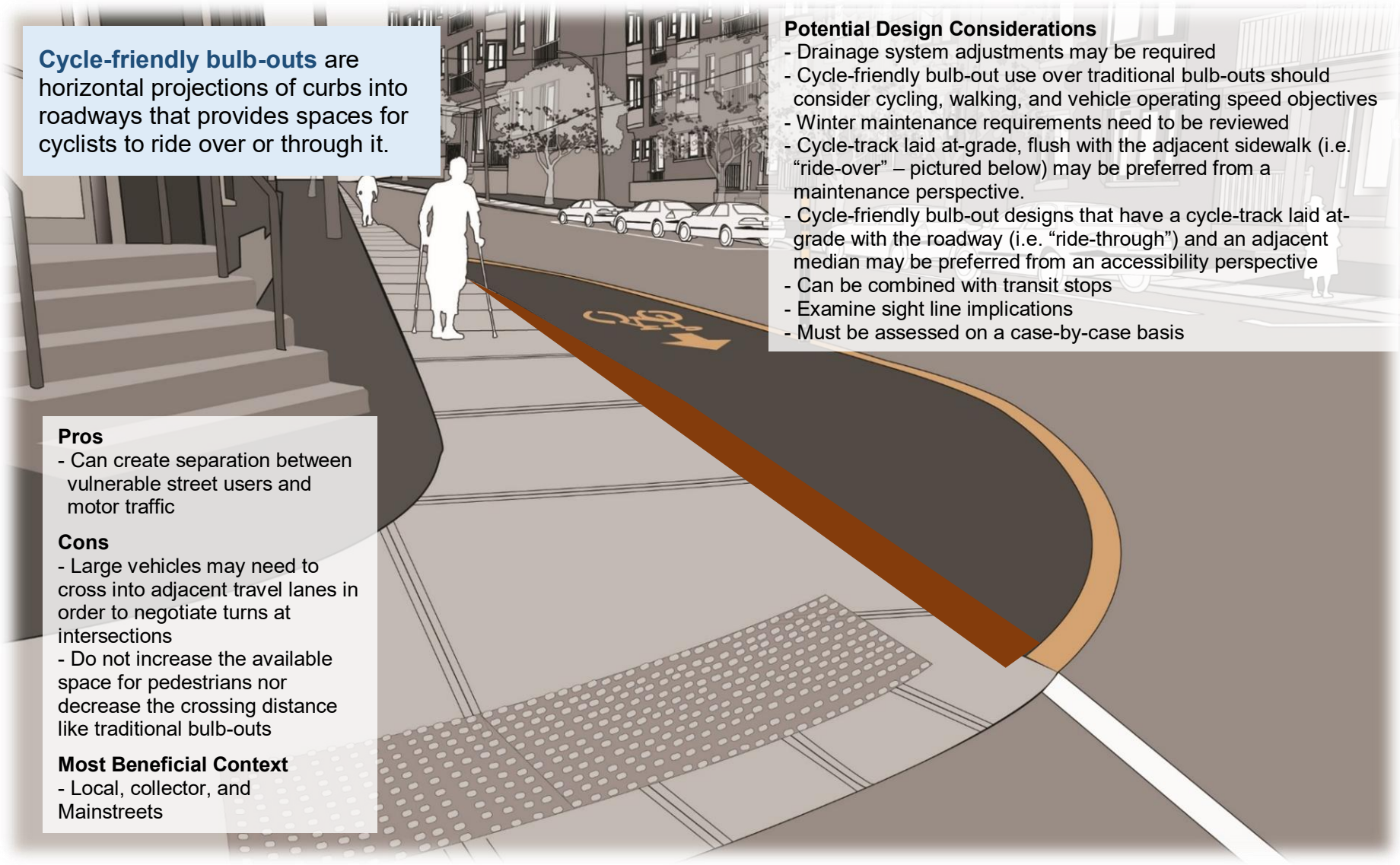
Pros
- Can shorten crossing distances, improve visibility of vulnerable street users, and increase yielding to pedestrians
- Can create separation between vulnerable street users and motor traffic
- Can prevent parking close to intersections
- Can combine with transit stops to provide high quality waiting areas and eliminate “lay-bys”
- can be used to create multi-purpose spaces

Cons
- Large vehicles may need to cross into adjacent travel lanes to negotiate turns at intersections

Most Beneficial Context
- Local, collector, and Mainstreets

Cycle-Friendly Bulb-Outs (Horizontal Deflection)

Cycle-friendly bulb-outs are horizontal projections of curbs into roadways that provides spaces for cyclists to ride over or through it.



Potential Design Considerations
- Drainage system adjustments may be required
- Cycle-friendly bulb-out use over traditional bulb-outs should consider cycling, walking, and vehicle operating speed objectives
- Winter maintenance requirements need to be reviewed
- Cycle-track laid at-grade, flush with the adjacent sidewalk (i.e. “ride-over” – pictured below) may be preferred from a maintenance perspective.
- Cycle-friendly bulb-out designs that have a cycle-track laid at-grade with the roadway (i.e. “ride-through”) and an adjacent median may be preferred from an accessibility perspective
- Can be combined with transit stops
- Examine sight line implications
- Must be assessed on a case-by-case basis

Pros
- Can create separation between vulnerable street users and motor traffic

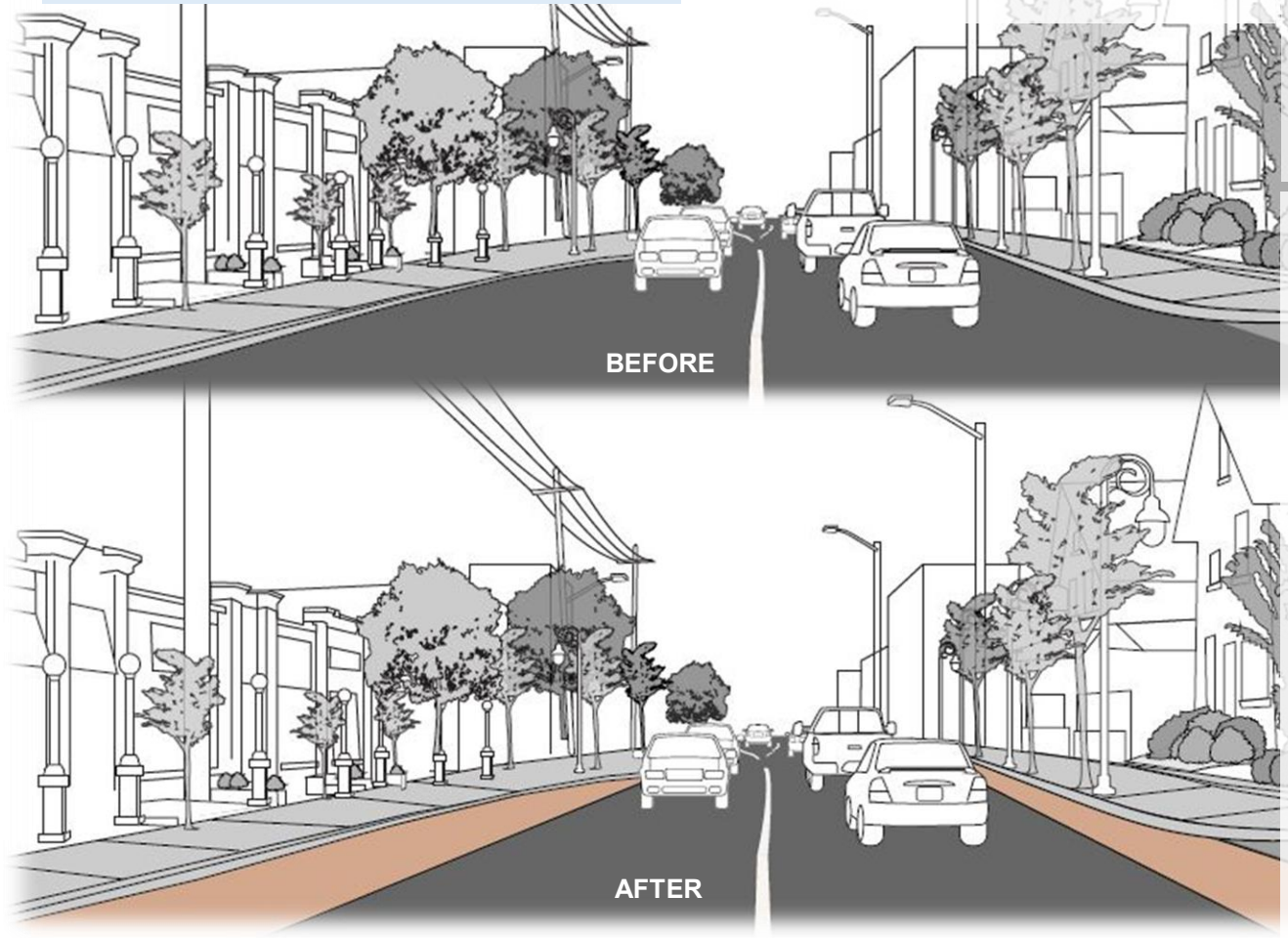
Cons
- Large vehicles may need to cross into adjacent travel lanes in order to negotiate turns at intersections
- Do not increase the available space for pedestrians nor decrease the crossing distance like traditional bulb-outs

Most Beneficial Context
- Local, collector, and Mainstreets

Lane Narrowings (Horizontal Deflection)

Lane narrowing involves reducing lane widths with the intent of encouraging lower speeds.

The intention is for drivers to perceive the roadway to be less comfortable at high speeds due to the lack of adjacent buffer space from other objects.



Potential Design Considerations

- Lane narrowings flanked by adjacent physical features tend to provide better results than pavement markings alone
- Review sight line implications

Pros

- Road surface gained from lane narrowings can be redistributed for other uses
- Can reduce crossing distances for active modes of transportation

Cons

- Cyclists can feel “squeezed” closer to vehicles if no dedicated facility provided

Most Beneficial Context

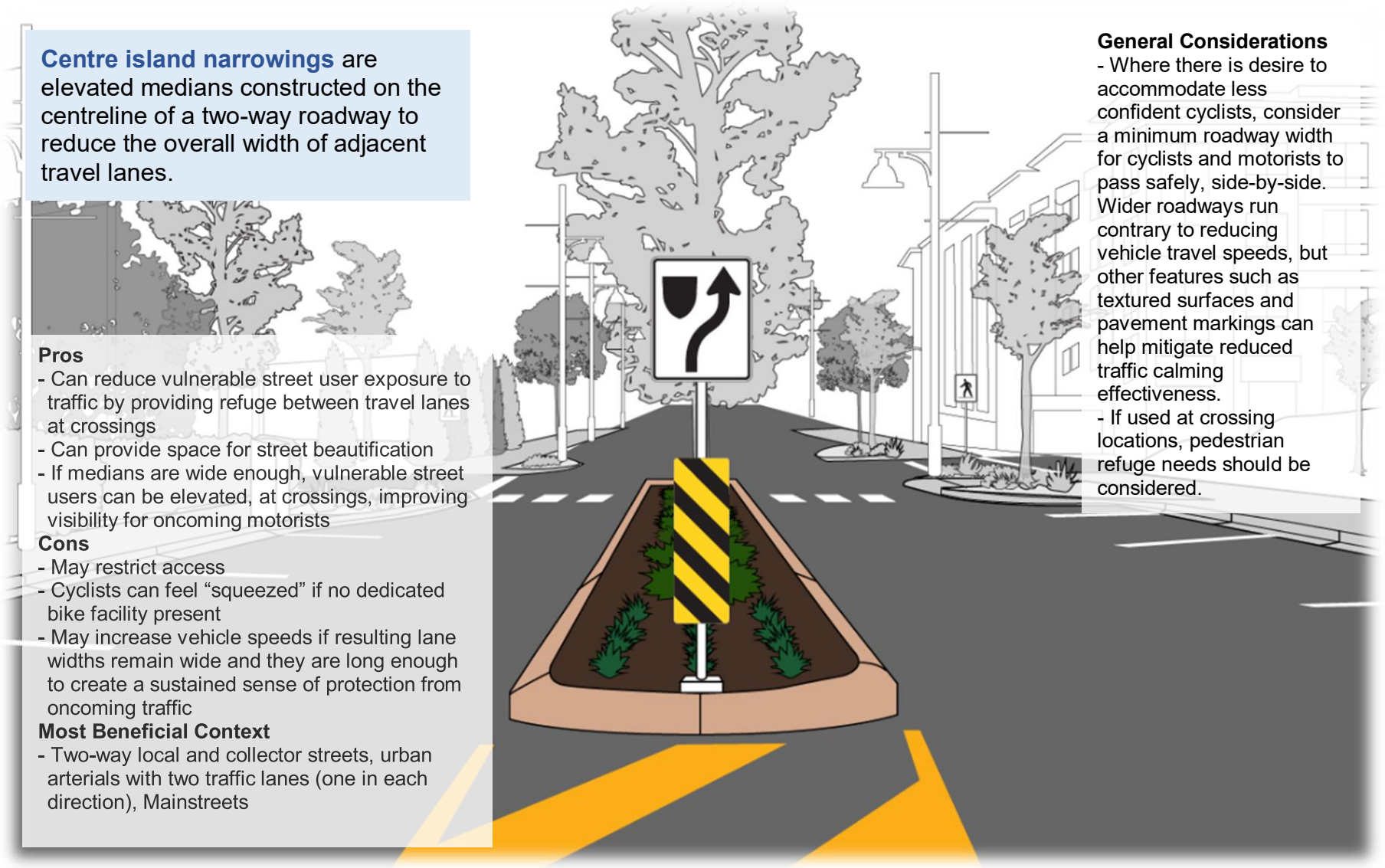
- Any street where reduced speeds and additional space for other uses is desirable
- Mainstreets

General Considerations

- Avoid excessive inconsistency in application to avoid creating levels of confusion above what may be beneficial from a traffic calming perspective

Centre Island Narrowings (Horizontal Deflection)

Centre island narrowings are elevated medians constructed on the centreline of a two-way roadway to reduce the overall width of adjacent travel lanes.



Pros
- Can reduce vulnerable street user exposure to traffic by providing refuge between travel lanes at crossings
- Can provide space for street beautification
- If medians are wide enough, vulnerable street users can be elevated, at crossings, improving visibility for oncoming motorists

Cons
- May restrict access
- Cyclists can feel “squeezed” if no dedicated bike facility present
- May increase vehicle speeds if resulting lane widths remain wide and they are long enough to create a sustained sense of protection from oncoming traffic

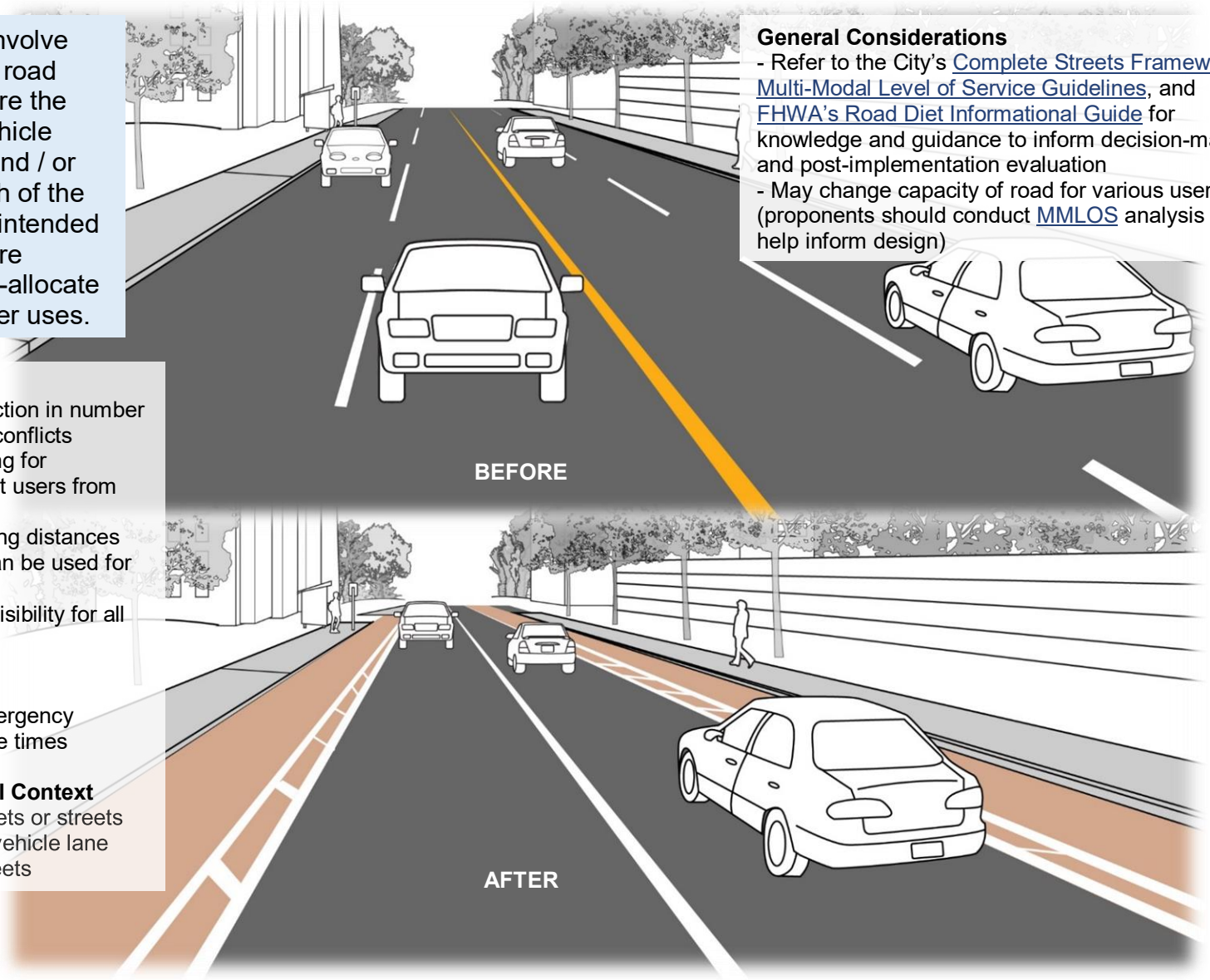
Most Beneficial Context
- Two-way local and collector streets, urban arterials with two traffic lanes (one in each direction), Mainstreets

General Considerations
- Where there is desire to accommodate less confident cyclists, consider a minimum roadway width for cyclists and motorists to pass safely, side-by-side. Wider roadways run contrary to reducing vehicle travel speeds, but other features such as textured surfaces and pavement markings can help mitigate reduced traffic calming effectiveness.
- If used at crossing locations, pedestrian refuge needs should be considered.

Road Diets (Horizontal Deflection)

Road diets involve reconfiguring road surfaces where the number of vehicle travel lanes and / or effective width of the road surface intended for vehicles are reduced to re-allocate space for other uses.

General Considerations
- Refer to the City's Complete Streets Framework, Multi-Modal Level of Service Guidelines, and FHWA's Road Diet Informational Guide for knowledge and guidance to inform decision-making and post-implementation evaluation
- May change capacity of road for various users (proponents should conduct MMLOS analysis to help inform design)



Pros
- Potential reduction in number and severity of conflicts
- Create buffering for vulnerable street users from motor traffic
- Reduce crossing distances
- Extra space can be used for other purposes
- May improve visibility for all street users

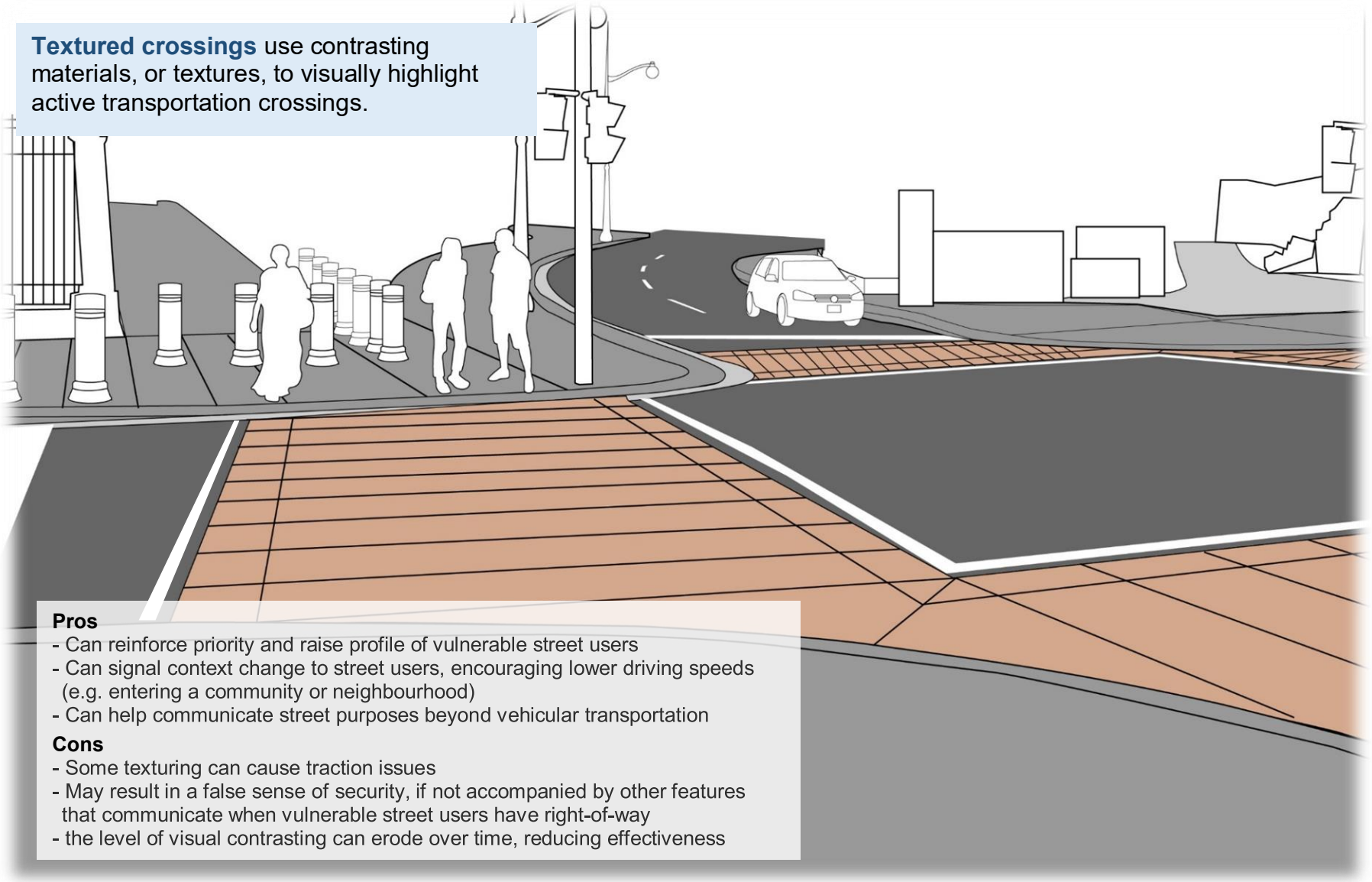
Cons
- May affect emergency vehicle response times

Most Beneficial Context
- Multi-lane streets or streets with excessive vehicle lane widths, Mainstreets

Surface Treatments

Textured Crossings

Textured crossings use contrasting materials, or textures, to visually highlight active transportation crossings.



Pros
- Can reinforce priority and raise profile of vulnerable street users
- Can signal context change to street users, encouraging lower driving speeds (e.g. entering a community or neighbourhood)
- Can help communicate street purposes beyond vehicular transportation

Cons
- Some texturing can cause traction issues
- May result in a false sense of security, if not accompanied by other features that communicate when vulnerable street users have right-of-way
- the level of visual contrasting can erode over time, reducing effectiveness

Textured Crossings

Most Beneficial Context

- Mainstreets

Universal Considerations

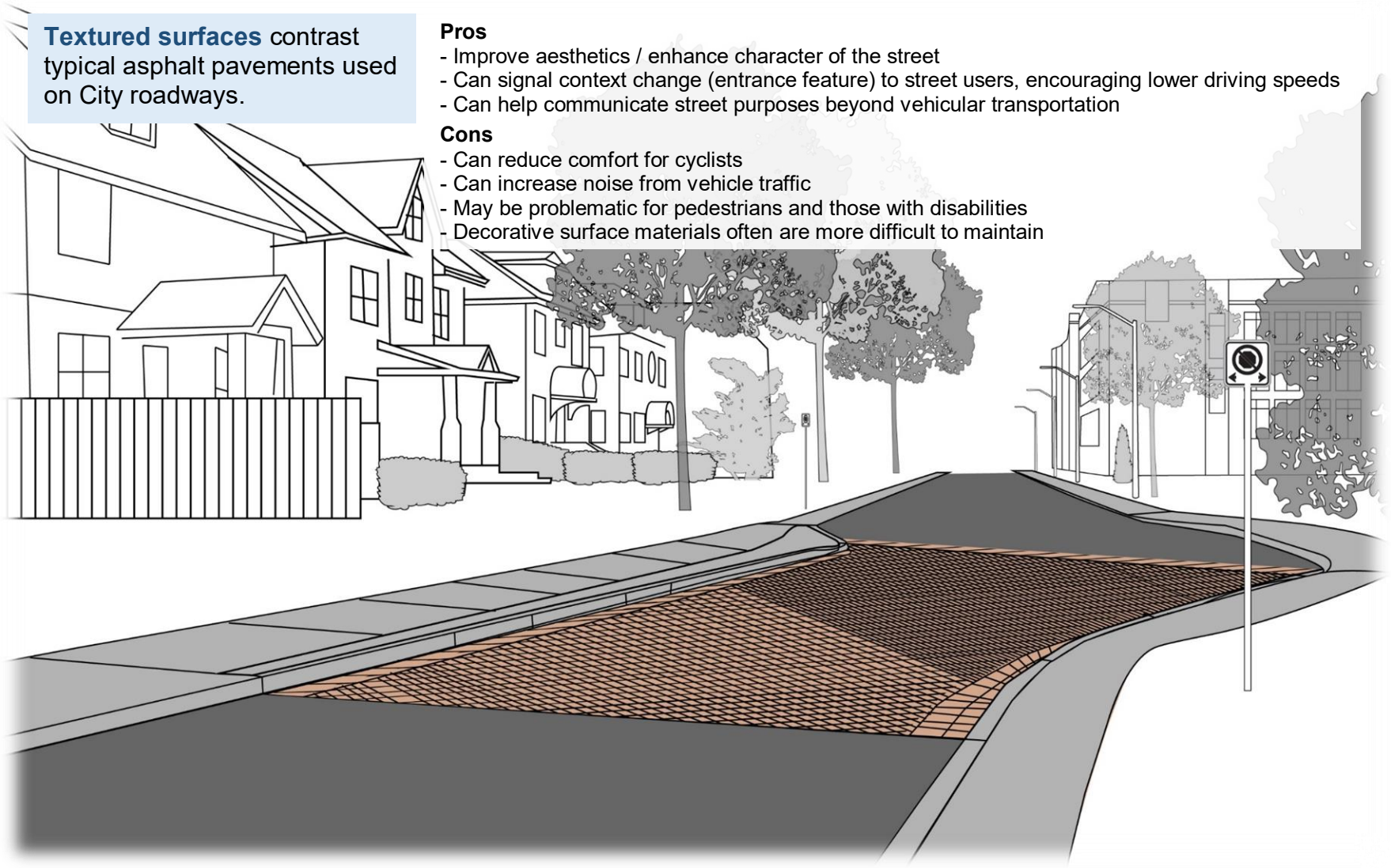
- Ideally limited to crossing locations in the City's *Design Priority Areas*
- Stamped concrete or concrete pavers can be used to achieve different colours and shapes to unify and enhance the character of special areas of the City
- If not properly installed, materials used may settle differently from the adjacent roadway surface and could require additional maintenance beyond typical efforts
- May be less effective in winter conditions
- City standard inventory materials should be considered, to allow for efficient on-going maintenance

Textured Surfaces

Textured surfaces contrast typical asphalt pavements used on City roadways.

Pros
- Improve aesthetics / enhance character of the street
- Can signal context change (entrance feature) to street users, encouraging lower driving speeds
- Can help communicate street purposes beyond vehicular transportation

Cons
- Can reduce comfort for cyclists
- Can increase noise from vehicle traffic
- May be problematic for pedestrians and those with disabilities
- Decorative surface materials often are more difficult to maintain



Textured Surfaces

Universal Considerations

- Consider limiting use to streets that fall within the City's *Design Priority Areas*
- If not properly installed, materials used may settle differently from the adjacent roadway surface and could require additional maintenance beyond typical efforts
- May be less effective in winter conditions
- City standard inventory materials should be considered, to allow for efficient on-going maintenance
- Can consider using textured surfaces to narrow travel lanes or create truck aprons
- Typically used as gateway or entrance features

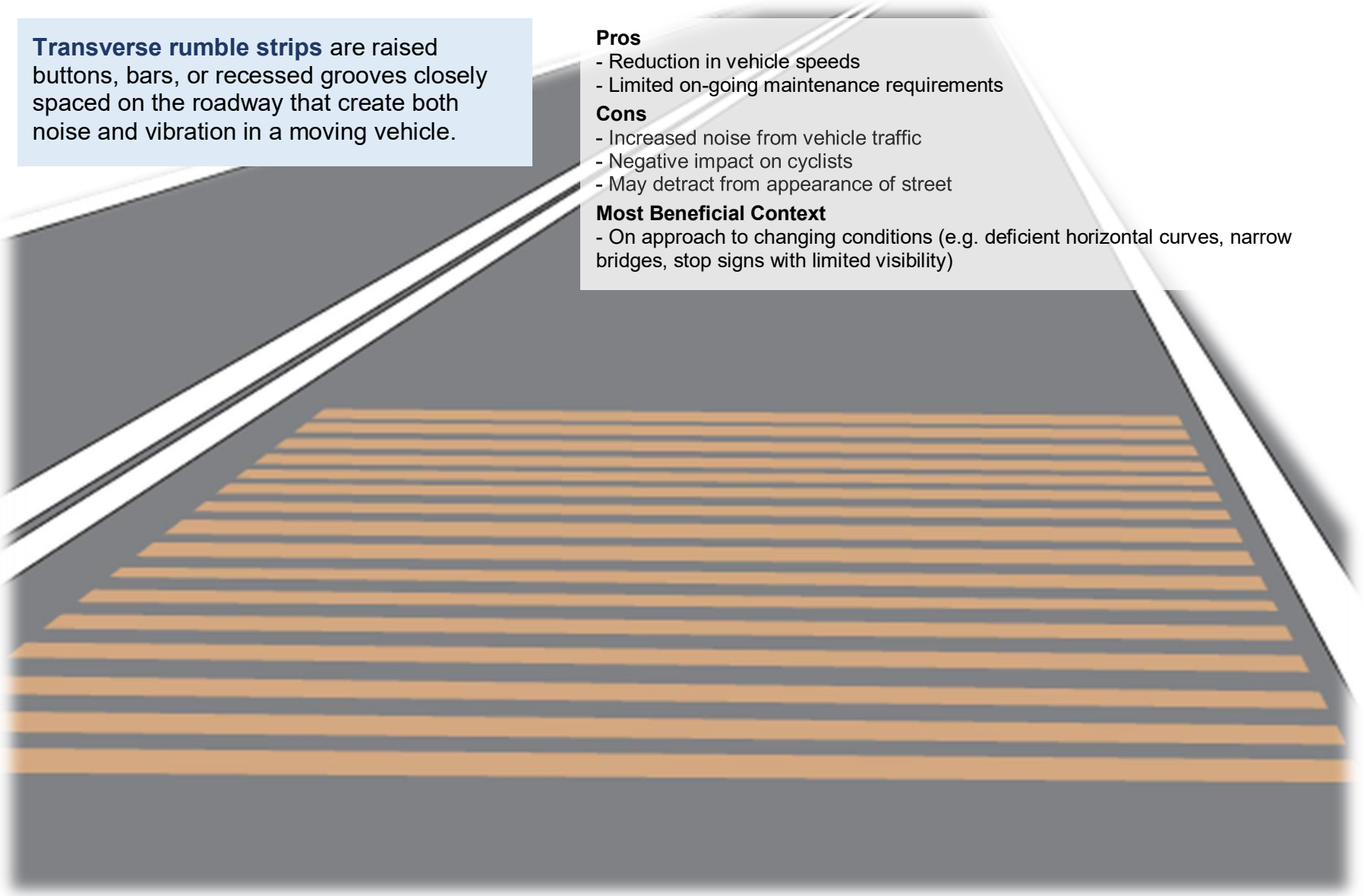
Transverse Rumble Strips

Transverse rumble strips are raised buttons, bars, or recessed grooves closely spaced on the roadway that create both noise and vibration in a moving vehicle.

Pros
- Reduction in vehicle speeds
- Limited on-going maintenance requirements

Cons
- Increased noise from vehicle traffic
- Negative impact on cyclists
- May detract from appearance of street

Most Beneficial Context
- On approach to changing conditions (e.g. deficient horizontal curves, narrow bridges, stop signs with limited visibility)



Transverse Rumble Strips

Universal Considerations

- Consider recessed strips (i.e. that recess into the asphalt) to avoid damage by snowplows
- Should not be used as a stand-alone speed control device
- Avoid within 200 m radius of residential areas and in areas with high volumes of cyclists

Core information for all Traffic Management

NOTE: The following information applies to each of the traffic management elements within the "Engineering Measures" grouping. This includes vehicular directional closures, vehicle diverters, on-street plazas, vehicle access closures, intersection channelization, raised medians through intersections, and right-in / right-out islands. The information below is not repeated on each of the subsequent figures in the following pages.

Potential Advantages

- Reduce vehicle speeds
- May reduce vehicle volumes
- May encourage higher levels of sustainable modes of travel by reducing attractiveness of travel by car

Potential Disadvantages

- Impacts vehicular access and may divert traffic to other streets inappropriately
- May affect service operations such as garbage collection, school bus, and road maintenance
- May complicate navigation for people with vision loss
- May increase travel time by car

Potential Design and Construction Considerations

- Active transportation access can be accommodated in designs

Universal Considerations

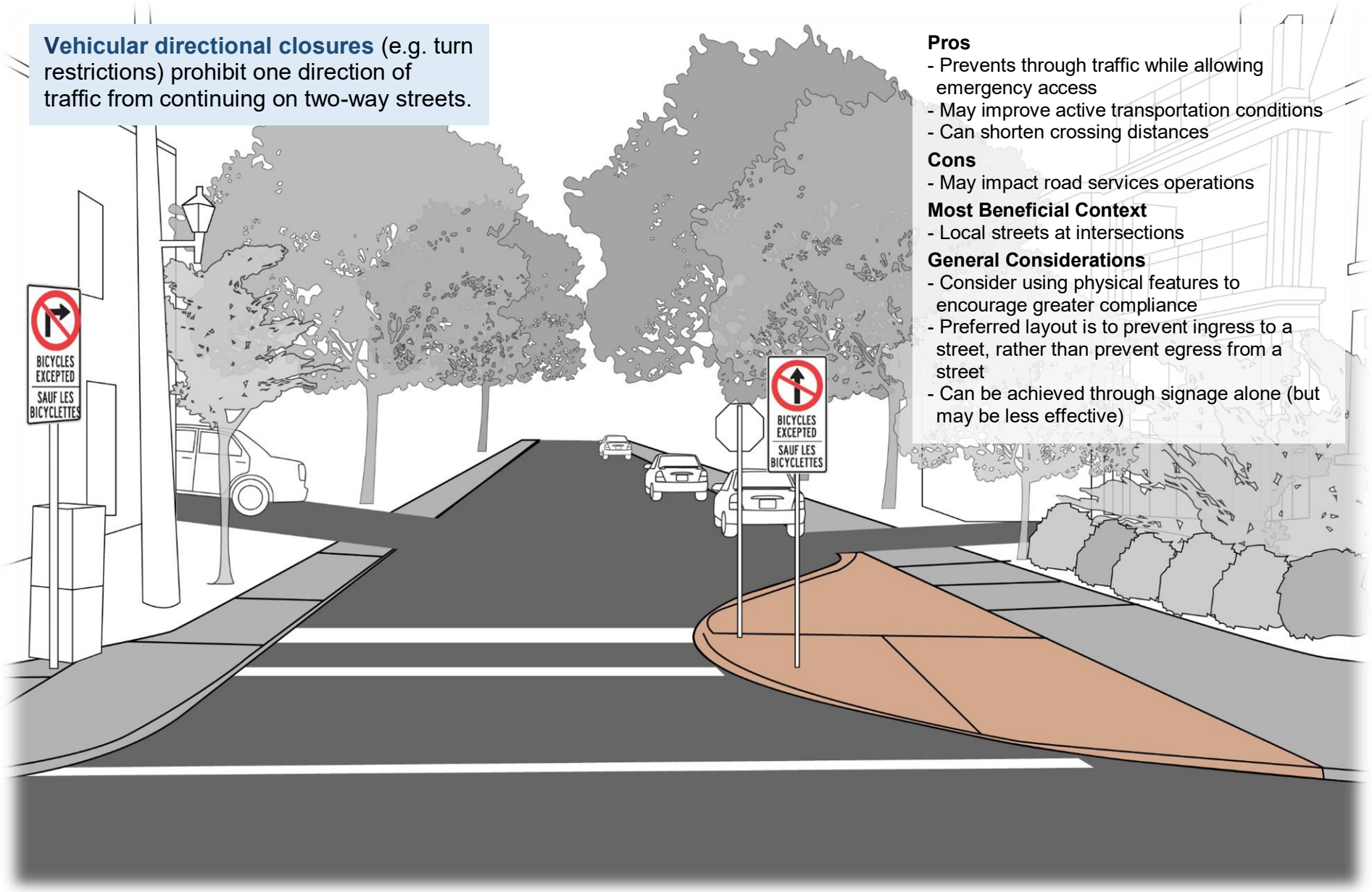
- Contrasting vertical elements placed within measures should be evaluated to draw attention to their presence, in addition to regulatory signage
- Street maintenance activities should be considered (Refer to Part 1 of the Guide for more detail)
- Take into account the possibility of using physical space created by measures to provide storm-water bio-retention facilities (or bio-swales), street furniture, landscaping, public space, bike parking, snow storage, and other features
- Modifications to on-street parking may be required
- Street drainage needs to be reviewed
- Evaluate emergency vehicle access requirements

Temporary / Seasonal Installation

- Temporary products can be used to simulate the presence of permanent measures (Refer to Part 1 of the Guide for more detail)
- May not be as effective as permanent installations, as they may not have the same level of visual and perceived impact created by permanent features

Vehicular Directional Closures (Traffic Management)

Vehicular directional closures (e.g. turn restrictions) prohibit one direction of traffic from continuing on two-way streets.



Pros
- Prevents through traffic while allowing emergency access
- May improve active transportation conditions
- Can shorten crossing distances

Cons
- May impact road services operations

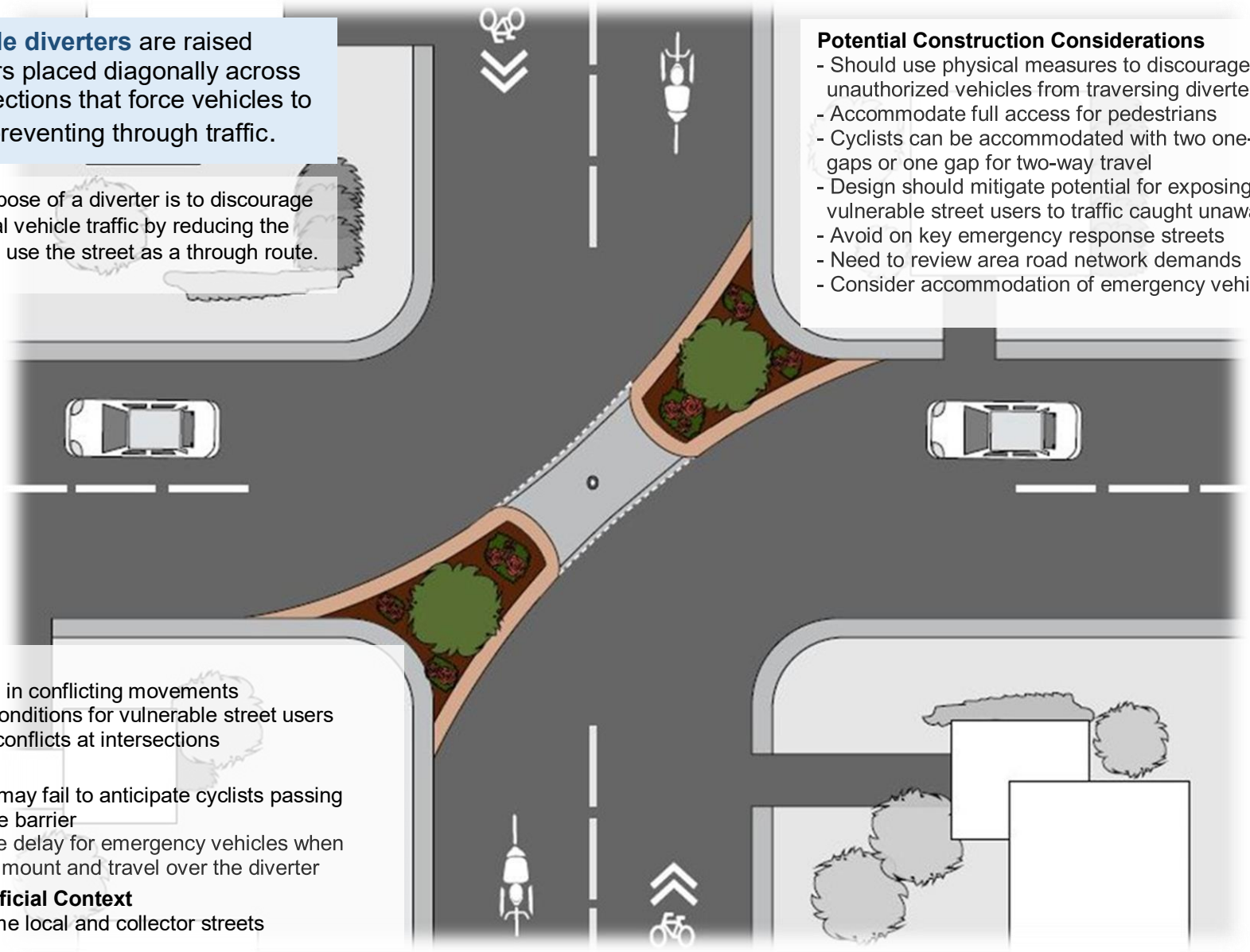
Most Beneficial Context
- Local streets at intersections

General Considerations
- Consider using physical features to encourage greater compliance
- Preferred layout is to prevent ingress to a street, rather than prevent egress from a street
- Can be achieved through signage alone (but may be less effective)

Vehicle Diverters (Traffic Management)

Vehicle diverters are raised barriers placed diagonally across intersections that force vehicles to turn, preventing through traffic.

The purpose of a diverter is to discourage non-local vehicle traffic by reducing the ability to use the street as a through route.



Potential Construction Considerations
- Should use physical measures to discourage unauthorized vehicles from traversing diverter
- Accommodate full access for pedestrians
- Cyclists can be accommodated with two one-way gaps or one gap for two-way travel
- Design should mitigate potential for exposing vulnerable street users to traffic caught unaware
- Avoid on key emergency response streets
- Need to review area road network demands
- Consider accommodation of emergency vehicles

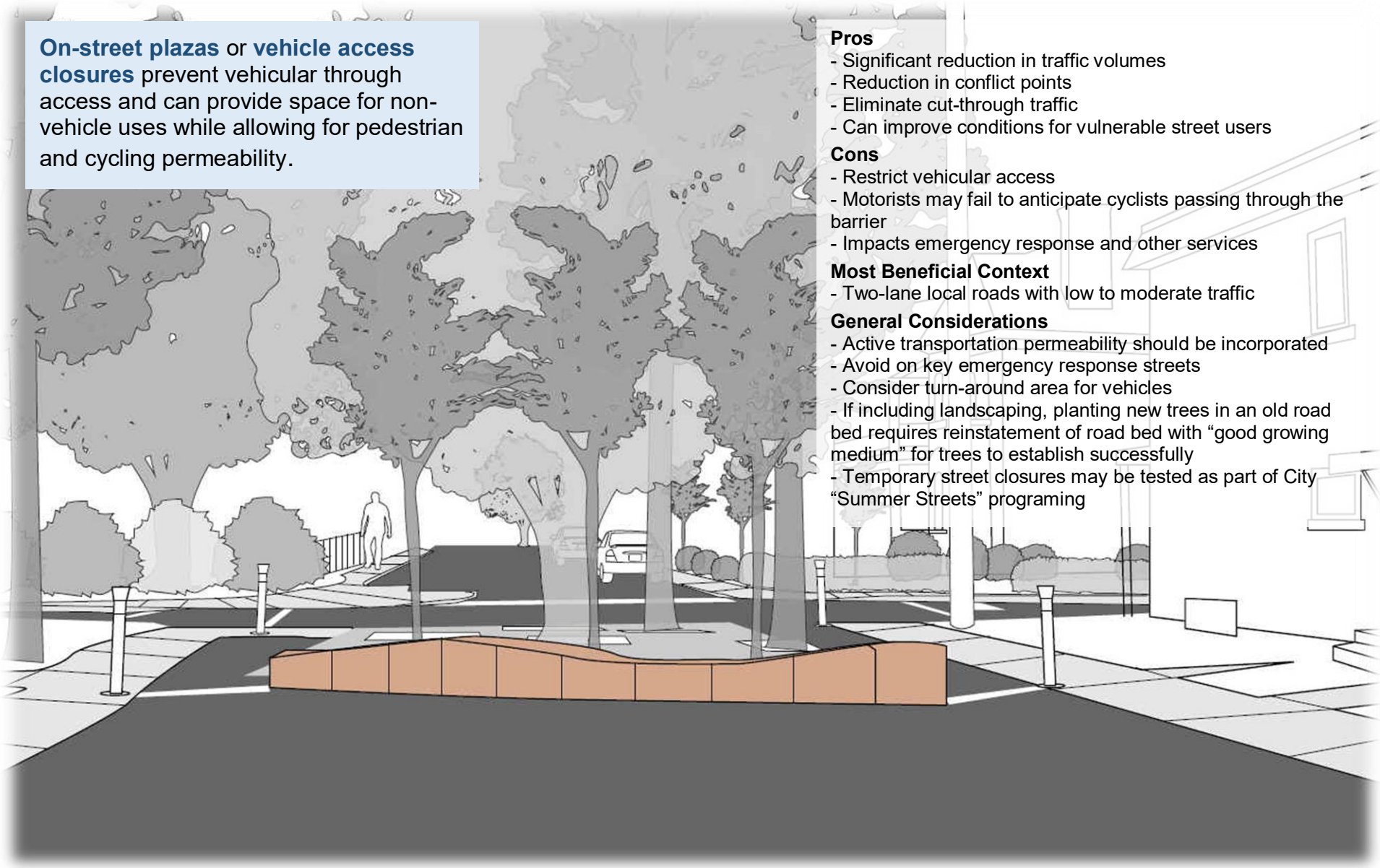
Pros
- Reduction in conflicting movements
- Improve conditions for vulnerable street users
- Reduces conflicts at intersections

Cons
- Motorists may fail to anticipate cyclists passing through the barrier
- May cause delay for emergency vehicles when slowing to mount and travel over the diverter

Most Beneficial Context
- Low-volume local and collector streets

On-Street Plazas and Vehicle Access Closures (Traffic Management)

On-street plazas or **vehicle access closures** prevent vehicular through access and can provide space for non-vehicle uses while allowing for pedestrian and cycling permeability.



Pros
- Significant reduction in traffic volumes
- Reduction in conflict points
- Eliminate cut-through traffic
- Can improve conditions for vulnerable street users

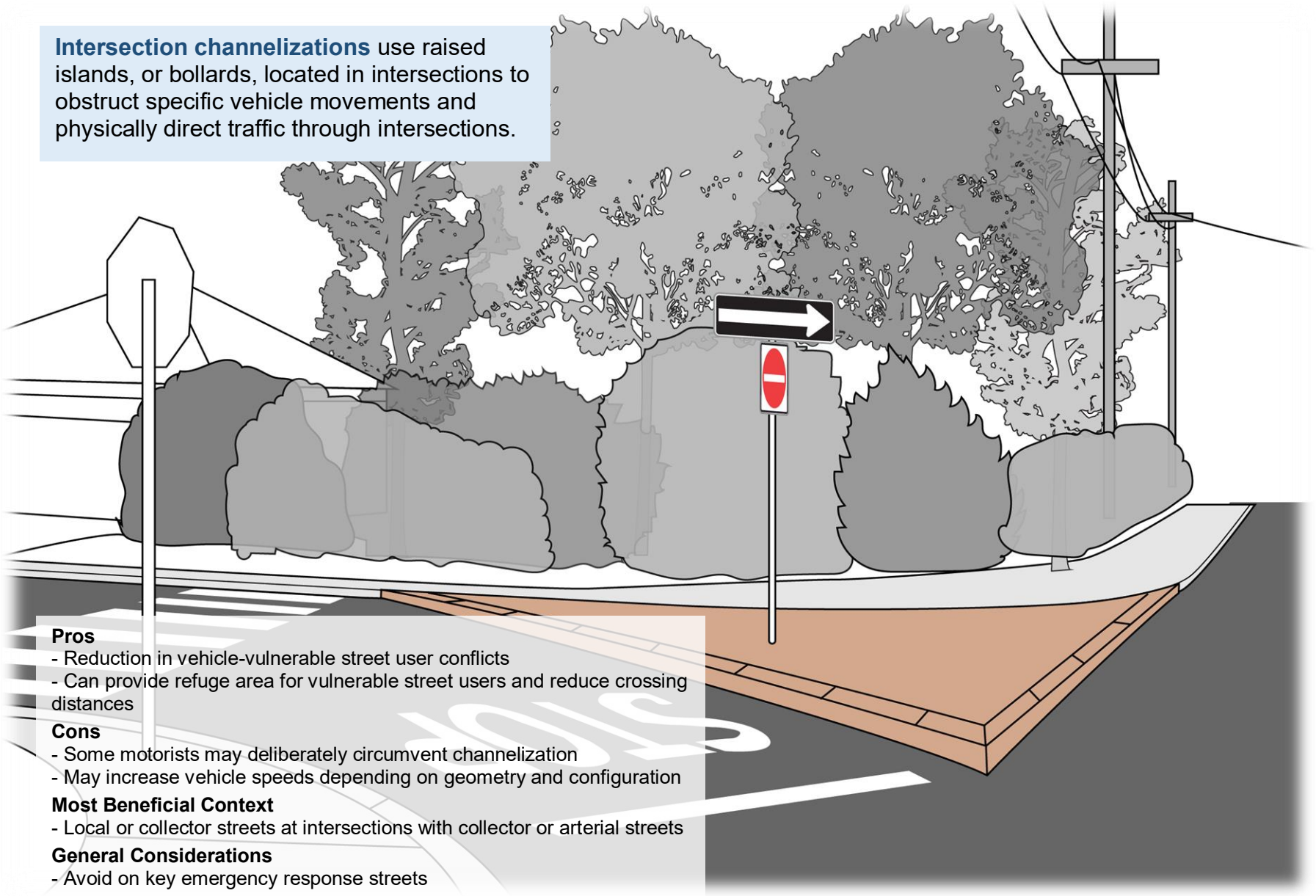
Cons
- Restrict vehicular access
- Motorists may fail to anticipate cyclists passing through the barrier
- Impacts emergency response and other services

Most Beneficial Context
- Two-lane local roads with low to moderate traffic

General Considerations
- Active transportation permeability should be incorporated
- Avoid on key emergency response streets
- Consider turn-around area for vehicles
- If including landscaping, planting new trees in an old road bed requires reinstatement of road bed with “good growing medium” for trees to establish successfully
- Temporary street closures may be tested as part of City “Summer Streets” programing

Intersection Channelizations (Traffic Management)

Intersection channelizations use raised islands, or bollards, located in intersections to obstruct specific vehicle movements and physically direct traffic through intersections.



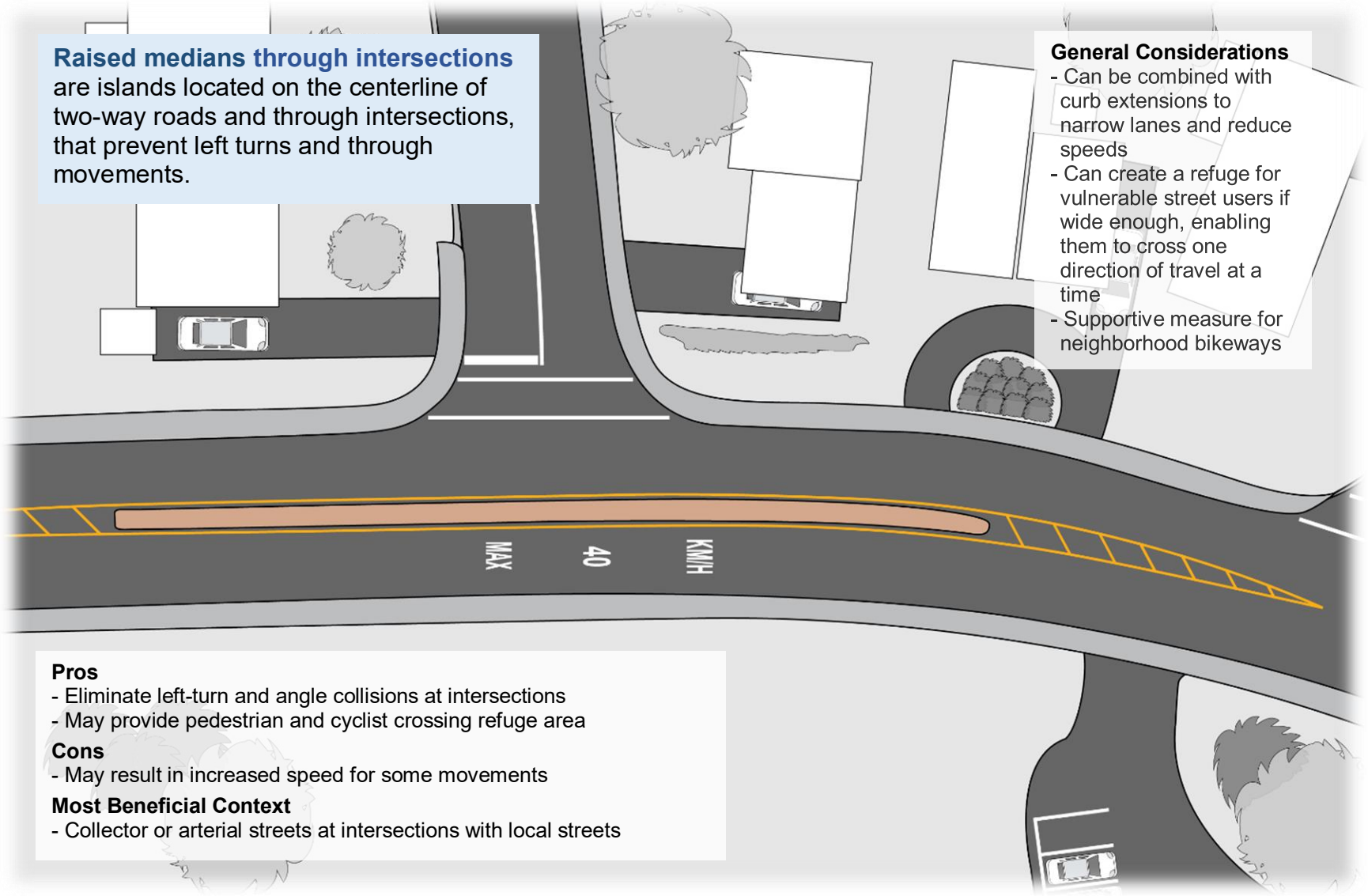
Pros
- Reduction in vehicle-vulnerable street user conflicts
- Can provide refuge area for vulnerable street users and reduce crossing distances

Cons
- Some motorists may deliberately circumvent channelization
- May increase vehicle speeds depending on geometry and configuration

Most Beneficial Context
- Local or collector streets at intersections with collector or arterial streets

General Considerations
- Avoid on key emergency response streets

Raised Medians through Intersections (Traffic Management)



Raised medians through intersections are islands located on the centerline of two-way roads and through intersections, that prevent left turns and through movements.

General Considerations
- Can be combined with curb extensions to narrow lanes and reduce speeds
- Can create a refuge for vulnerable street users if wide enough, enabling them to cross one direction of travel at a time
- Supportive measure for neighborhood bikeways

Pros
- Eliminate left-turn and angle collisions at intersections
- May provide pedestrian and cyclist crossing refuge area

Cons
- May result in increased speed for some movements

Most Beneficial Context
- Collector or arterial streets at intersections with local streets

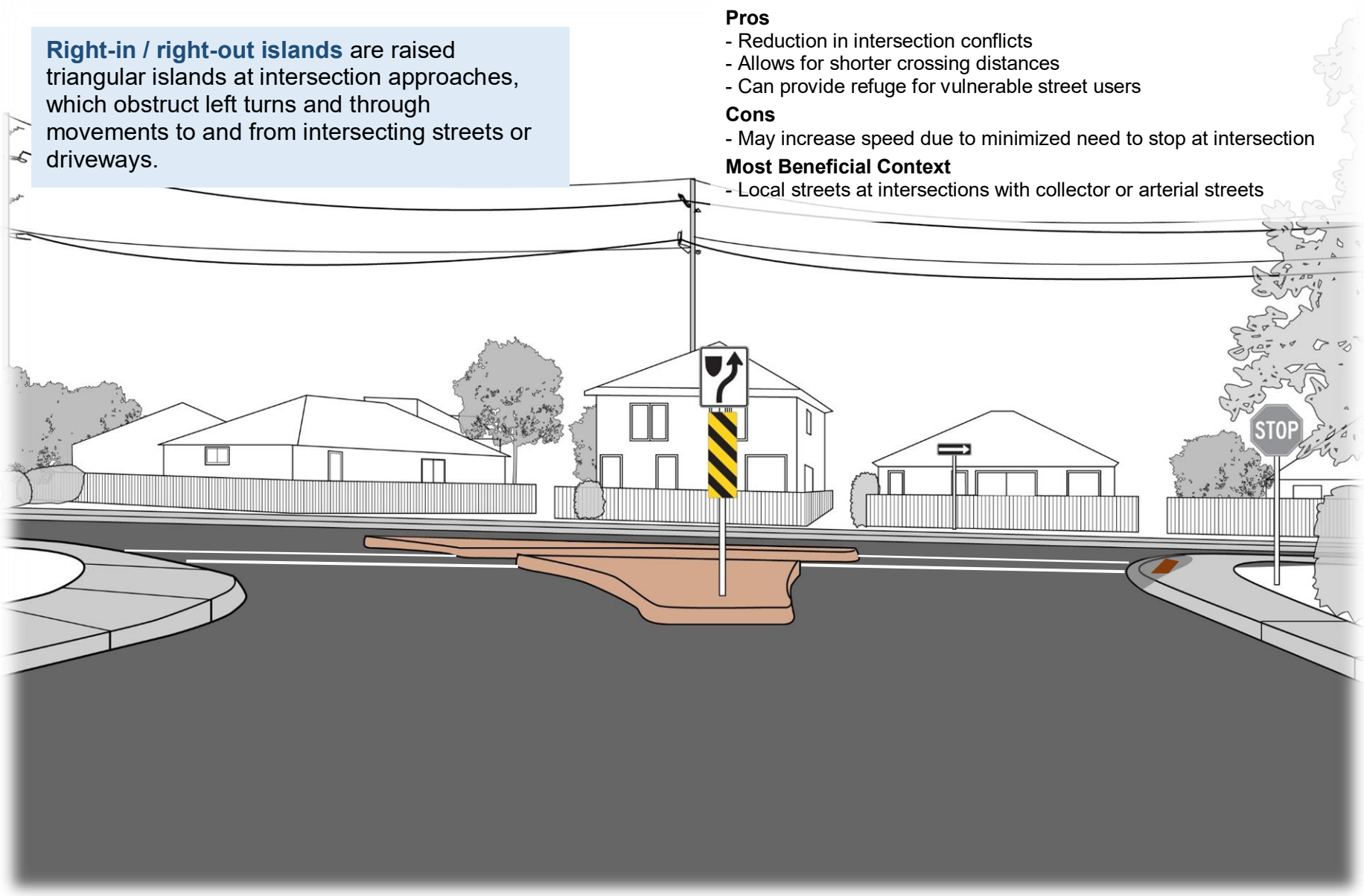
Right-in / Right-Out Islands (Traffic Management)

Right-in / right-out islands are raised triangular islands at intersection approaches, which obstruct left turns and through movements to and from intersecting streets or driveways.

Pros
- Reduction in intersection conflicts
- Allows for shorter crossing distances
- Can provide refuge for vulnerable street users

Cons
- May increase speed due to minimized need to stop at intersection

Most Beneficial Context
- Local streets at intersections with collector or arterial streets



Urban Design

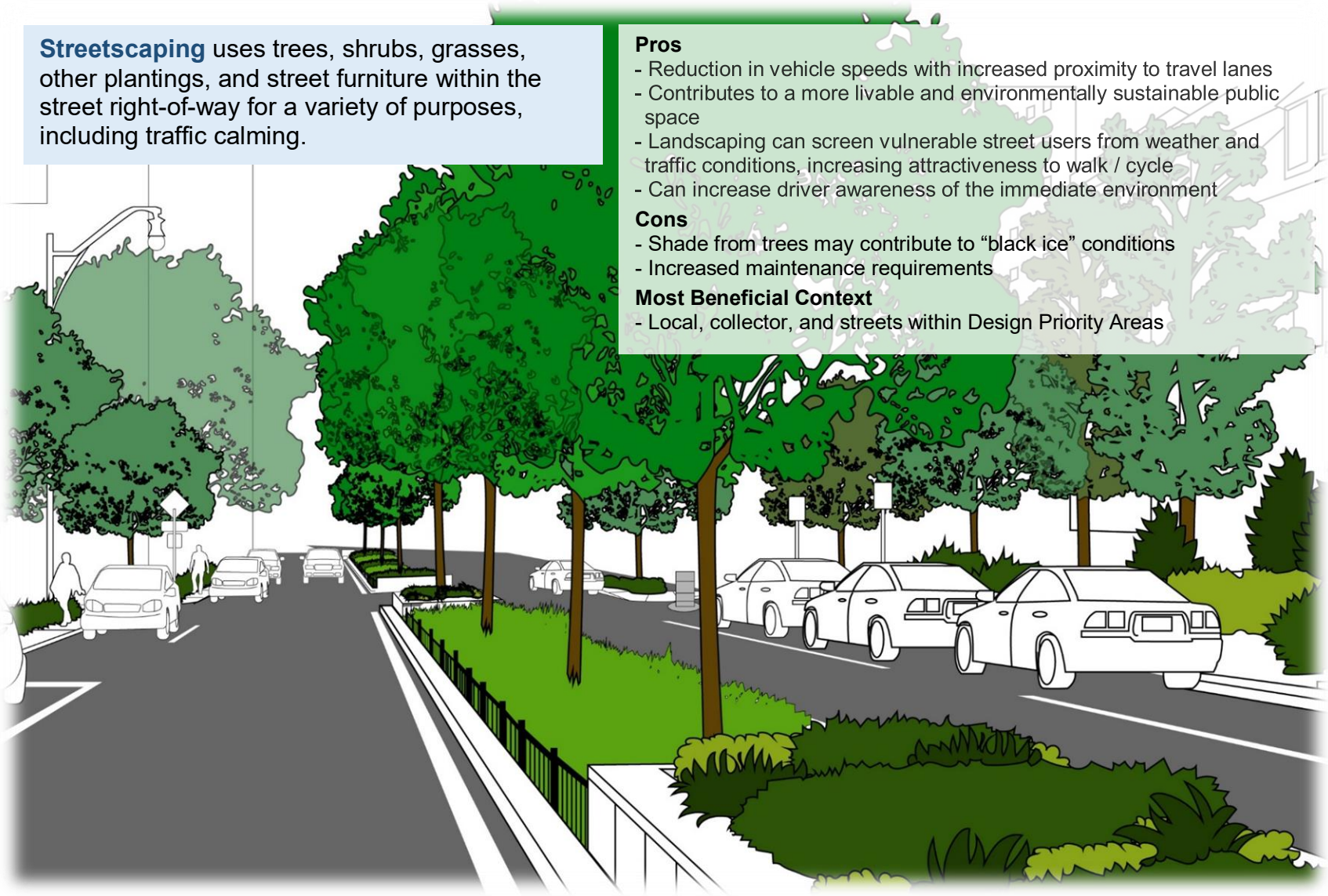
Streetscaping

Streetscaping uses trees, shrubs, grasses, other plantings, and street furniture within the street right-of-way for a variety of purposes, including traffic calming.

Pros
- Reduction in vehicle speeds with increased proximity to travel lanes
- Contributes to a more livable and environmentally sustainable public space
- Landscaping can screen vulnerable street users from weather and traffic conditions, increasing attractiveness to walk / cycle
- Can increase driver awareness of the immediate environment

Cons
- Shade from trees may contribute to “black ice” conditions
- Increased maintenance requirements

Most Beneficial Context
- Local, collector, and streets within Design Priority Areas



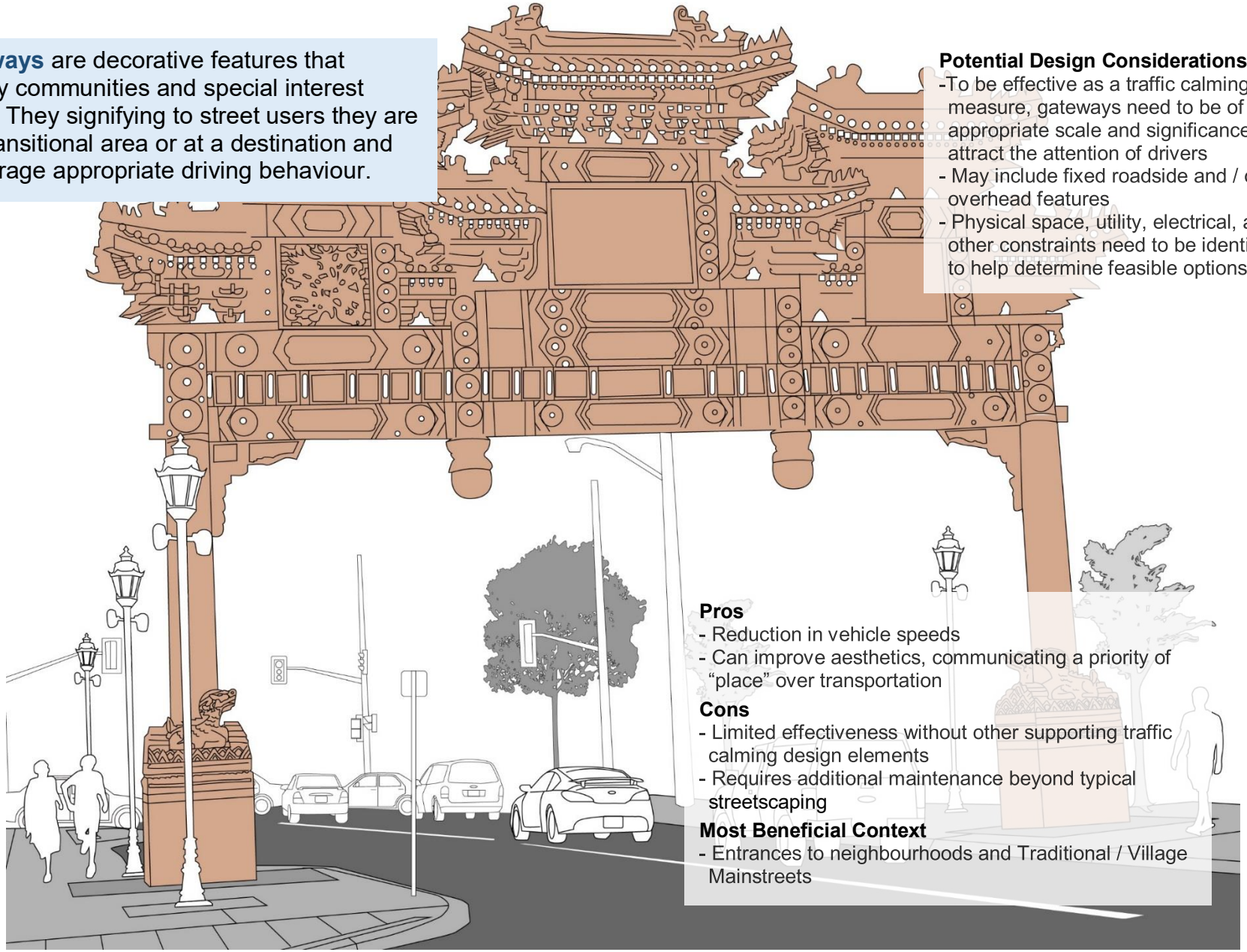
Streetscaping

Potential Implementation Considerations

- Special attention should be given to the root system and the characteristics of the tree at maturity
- Effects on access for all street users should be examined
- Any proposed plant material should be reviewed for appropriate installation, aesthetics, safety, cost, and maintainability
- Refer to City Street Tree Manual for guidance
- Be aware of implications to sight lines

Gateways

Gateways are decorative features that identify communities and special interest areas. They signifying to street users they are in a transitional area or at a destination and encourage appropriate driving behaviour.



Potential Design Considerations:

-To be effective as a traffic calming measure, gateways need to be of an appropriate scale and significance to attract the attention of drivers
- May include fixed roadside and / or overhead features
- Physical space, utility, electrical, and other constraints need to be identified to help determine feasible options

Pros

- Reduction in vehicle speeds
- Can improve aesthetics, communicating a priority of "place" over transportation

Cons

- Limited effectiveness without other supporting traffic calming design elements
- Requires additional maintenance beyond typical streetscaping

Most Beneficial Context

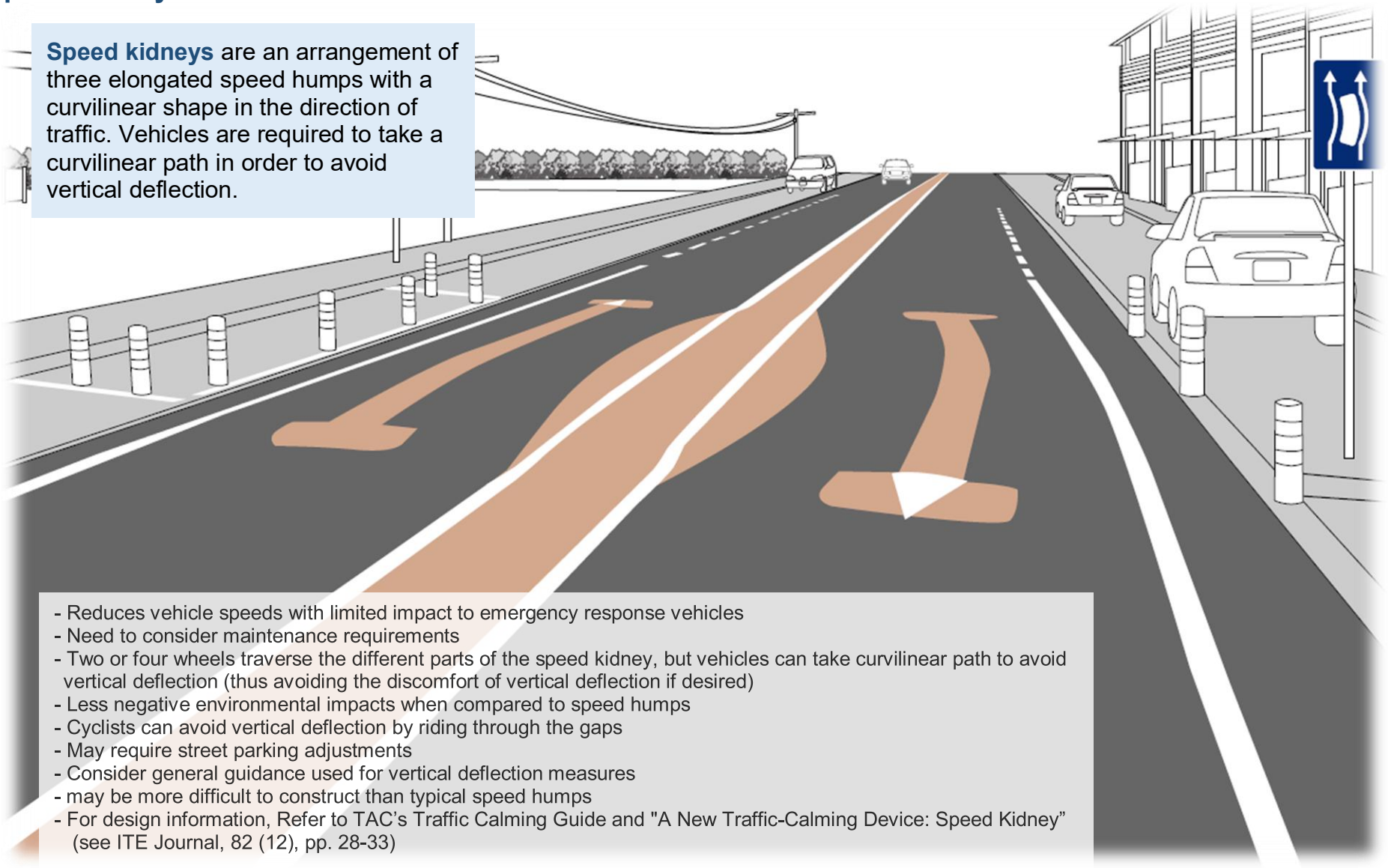
- Entrances to neighbourhoods and Traditional / Village Mainstreets

Emerging Measures

Emerging Measures are traffic calming measures the City has limited or no previous experience with that have shown success. Section 3.4 of Part 1 of this Guide outline when to consider new innovations and technology (e.g. emerging measures), potential pilot process activities, and design considerations.

Speed Kidneys

Speed kidneys are an arrangement of three elongated speed humps with a curvilinear shape in the direction of traffic. Vehicles are required to take a curvilinear path in order to avoid vertical deflection.



- Reduces vehicle speeds with limited impact to emergency response vehicles
- Need to consider maintenance requirements
- Two or four wheels traverse the different parts of the speed kidney, but vehicles can take curvilinear path to avoid vertical deflection (thus avoiding the discomfort of vertical deflection if desired)
- Less negative environmental impacts when compared to speed humps
- Cyclists can avoid vertical deflection by riding through the gaps
- May require street parking adjustments
- Consider general guidance used for vertical deflection measures
- may be more difficult to construct than typical speed humps
- For design information, Refer to TAC's Traffic Calming Guide and "A New Traffic-Calming Device: Speed Kidney" (see ITE Journal, 82 (12), pp. 28-33)

Creative Pavement Markings

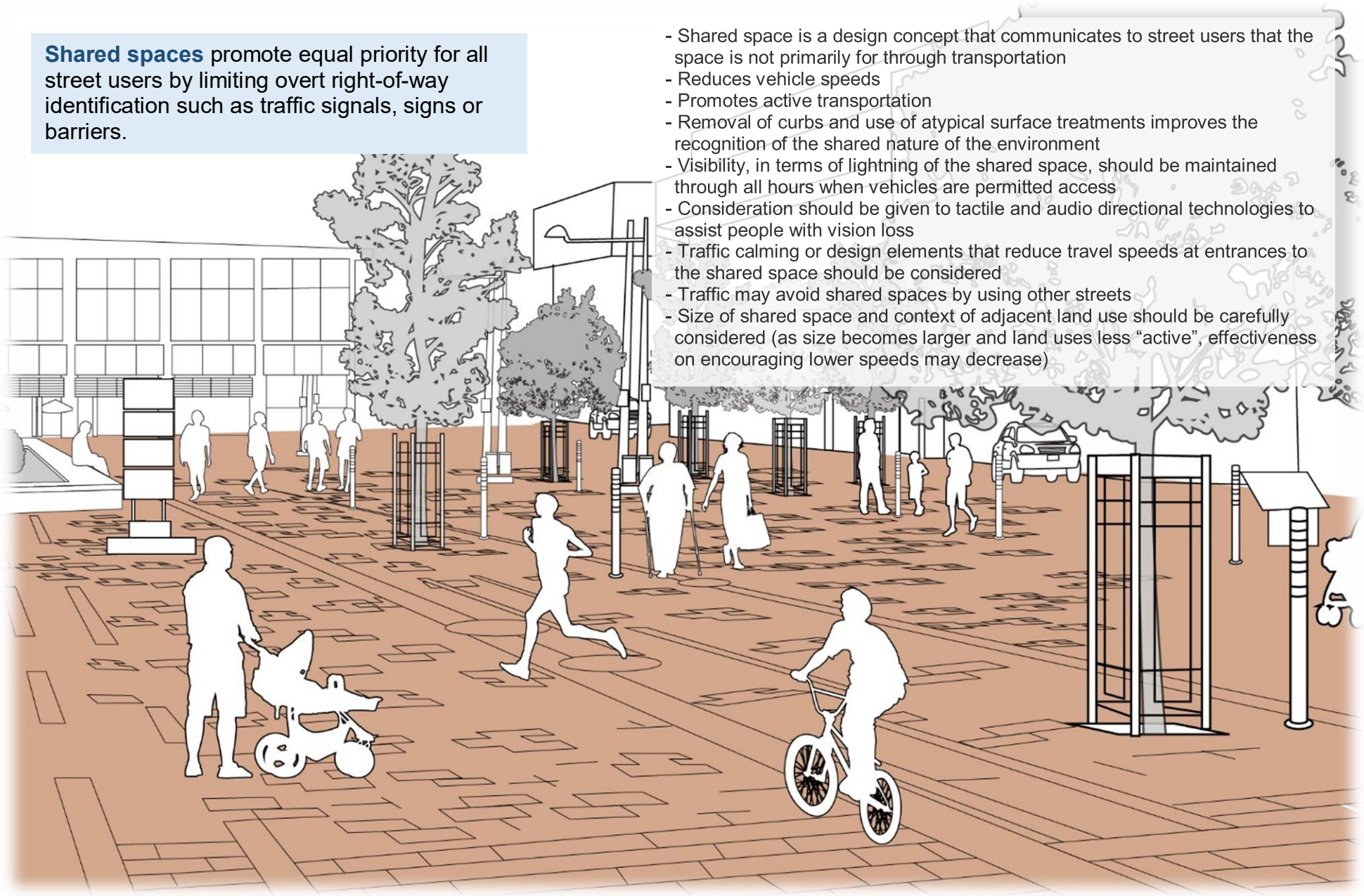
Creative pavement markings can be used to communicate a different use or purpose for specific areas of a road surface or the whole street.

- A plan for on-going operations and maintenance is a very important consideration
- Low cost method for re-purposing street space
- Can communicate non-transportation functions of streets
- Can be championed by communities
- Non-standard roadway pavement markings require prior approval of the road authority to avoid potential errors in messaging or design

Shared Spaces

Shared spaces promote equal priority for all street users by limiting overt right-of-way identification such as traffic signals, signs or barriers.

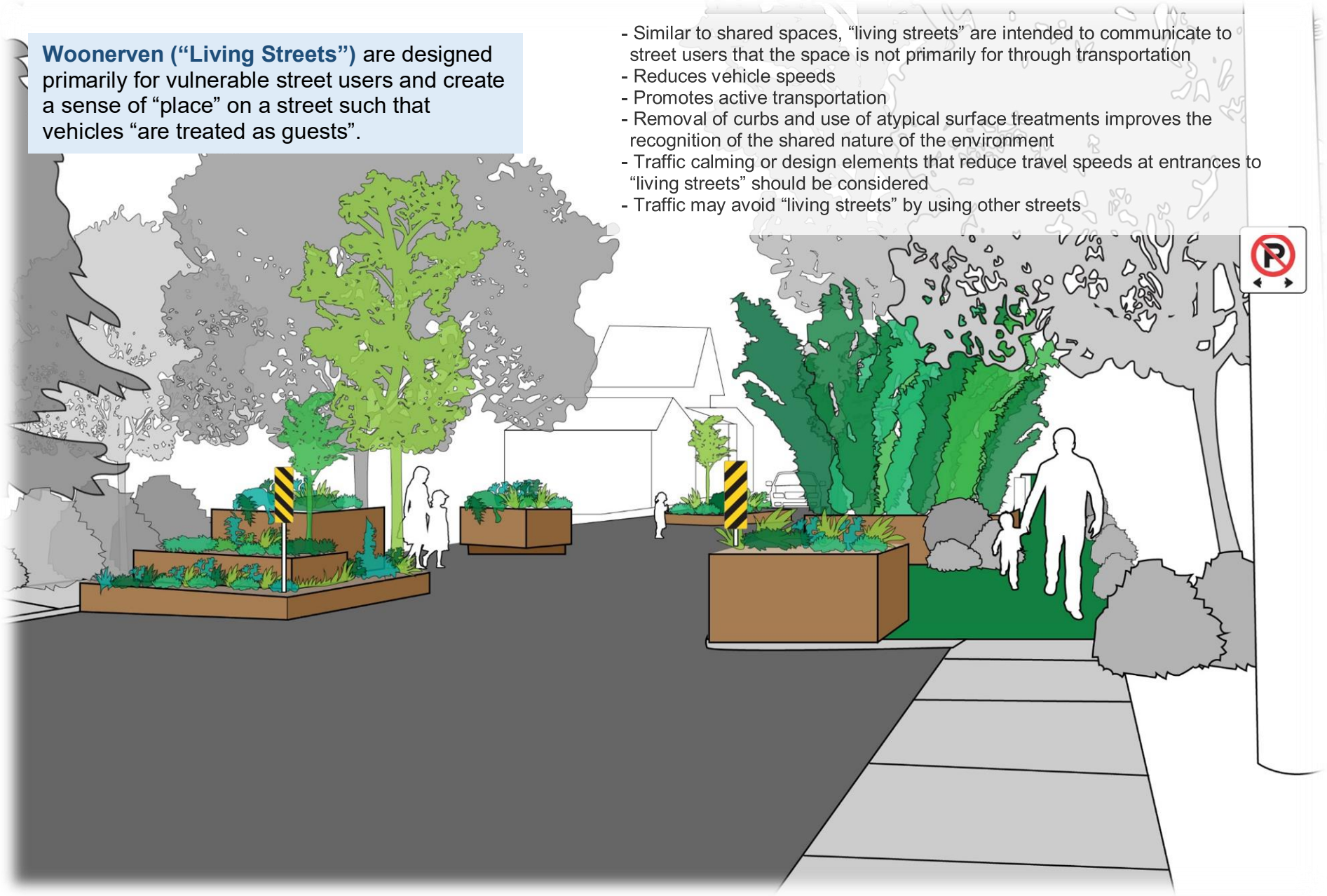
- Shared space is a design concept that communicates to street users that the space is not primarily for through transportation
- Reduces vehicle speeds
- Promotes active transportation
- Removal of curbs and use of atypical surface treatments improves the recognition of the shared nature of the environment
- Visibility, in terms of lightning of the shared space, should be maintained through all hours when vehicles are permitted access
- Consideration should be given to tactile and audio directional technologies to assist people with vision loss
- Traffic calming or design elements that reduce travel speeds at entrances to the shared space should be considered
- Traffic may avoid shared spaces by using other streets
- Size of shared space and context of adjacent land use should be carefully considered (as size becomes larger and land uses less “active”, effectiveness on encouraging lower speeds may decrease)



Woonerven ("Living Streets")

Woonerven ("Living Streets") are designed primarily for vulnerable street users and create a sense of "place" on a street such that vehicles "are treated as guests".

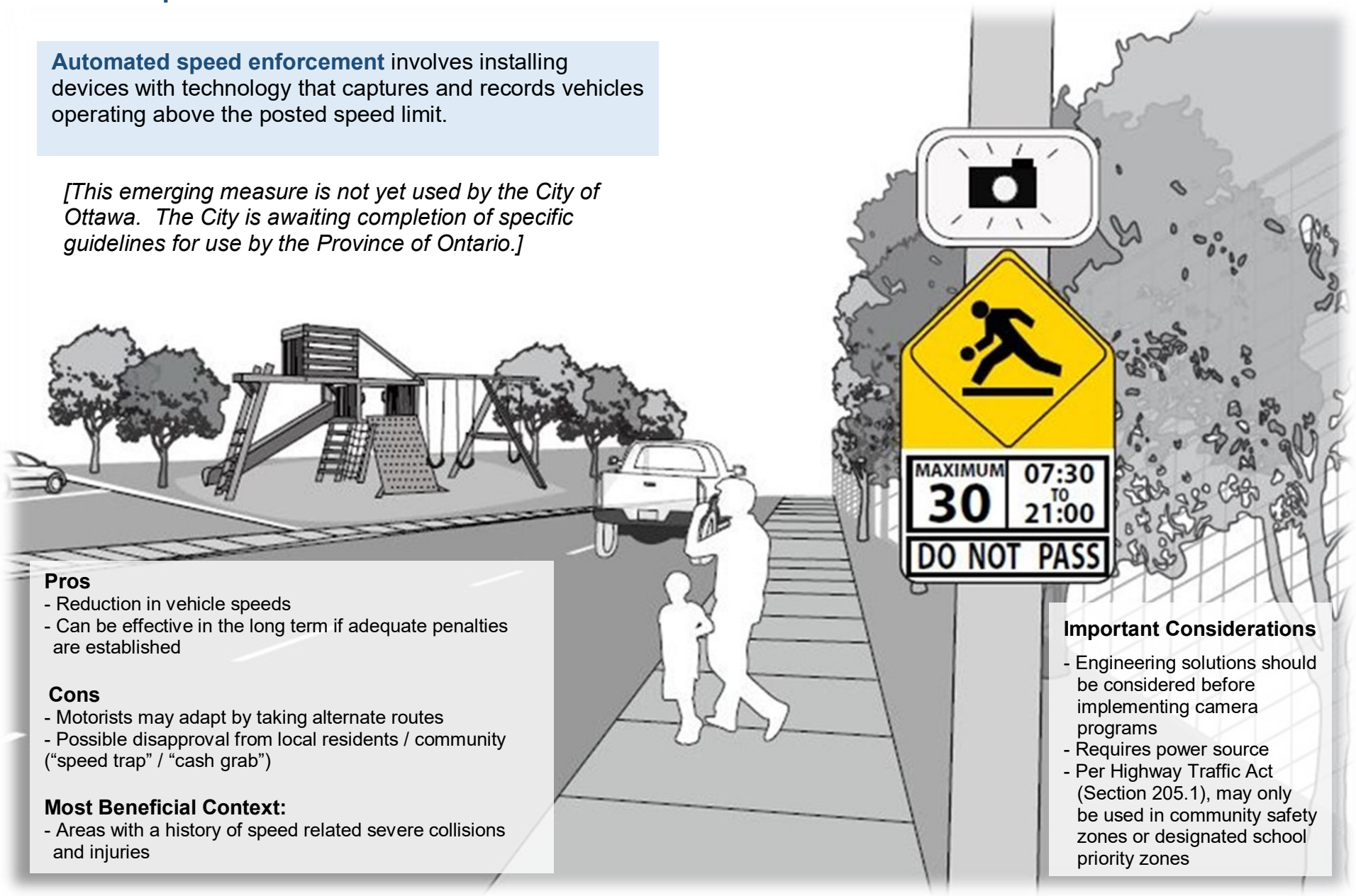
- Similar to shared spaces, "living streets" are intended to communicate to street users that the space is not primarily for through transportation
- Reduces vehicle speeds
- Promotes active transportation
- Removal of curbs and use of atypical surface treatments improves the recognition of the shared nature of the environment
- Traffic calming or design elements that reduce travel speeds at entrances to "living streets" should be considered
- Traffic may avoid "living streets" by using other streets



Automated Speed Enforcement

Automated speed enforcement involves installing devices with technology that captures and records vehicles operating above the posted speed limit.

[This emerging measure is not yet used by the City of Ottawa. The City is awaiting completion of specific guidelines for use by the Province of Ontario.]



Pros
- Reduction in vehicle speeds
- Can be effective in the long term if adequate penalties are established

Cons
- Motorists may adapt by taking alternate routes
- Possible disapproval from local residents / community ("speed trap" / "cash grab")

Most Beneficial Context:
- Areas with a history of speed related severe collisions and injuries

Important Considerations
- Engineering solutions should be considered before implementing camera programs
- Requires power source
- Per Highway Traffic Act (Section 205.1), may only be used in community safety zones or designated school priority zones

City of Ottawa
Traffic Calming Design Guidelines
April 2019

Part 3
Glossary and Appendices

Glossary

Accessibility - Refers to the design of products, devices, services, or environments for people who experience disabilities. (Accessibility Ontario)

Active Transportation – Any form of human-powered transportation is considered active transportation, including walking and cycling.

Arterial Roads – Roads that serve vehicle through travel between points not directly served by the road itself and limited direct vehicle access is provided to only major parcels of adjacent lands. (City of Ottawa, Official Plan)

Collector Roads – Roads that serve neighbourhood vehicle travel to and from major collector or arterial roads and usually provides direct vehicle access to adjacent lands. (City of Ottawa Official Plan)

Deflection – A vertical and / or horizontal change in the course or path of a vehicle as the result of a physical feature of a roadway. For example, a speed hump deflects the wheels, suspension and chassis of a vehicle in a vertical direction. A bulb-out requires that the vehicle be steered or deflected horizontally from its straight path to maneuver past the bulb-out. (Canadian Guide to Traffic Calming)

Design Priority Areas - Are special "people places" within the city and are areas to direct growth, protect and enhance character, achieve sustainability, and focus coordinated urban design efforts. (City of Ottawa Official Plan)

Equity - Treating everyone fairly by acknowledging their unique situation and addressing systemic barriers. The aim of equity is to ensure that everyone has access to equal results and benefits. (Equity and Inclusion Lens Handbook)

Inclusion - Acknowledging and valuing people's differences so as to enrich social planning, decision making and quality of life for everyone. In an inclusive city, we all have a sense of belonging, acceptance and recognition as valued and contributing members of society. (Equity and Inclusion Lens Handbook)

Local Roads - Roads that provide direct access to adjacent lands and serve neighbourhood travel to and from collector or arterial roads. (City of Ottawa Official Plan)

Mainstreet - A commercial street with strong pedestrian orientation, accessible to the adjacent community and containing a mix of uses (stores, community facilities, apartments, etc.). (City of Ottawa Official Plan)

Mainstreet, Traditional – Generally developed prior to 1945, typically set within a tightly knit urban fabric, with buildings that are often small-scale, with narrow frontages and set close to and addressing the street, resulting in a more pedestrian-oriented and transit friendly environment. They generally have a four-lane cross-section, on-street parking or the potential to provide for it, and limited on-site parking. Land uses are often mixed, with commercial uses at the street level and residential uses on the upper levels. (City of Ottawa Official Plan)

Mainstreet, Village – The Mainstreet character area is the commercial spine in the Village. This area supports non-residential and mixed-use development focussing on pedestrian-oriented uses. (City of Ottawa Official Plan)

Major Collector Roads - Roads that serve neighbourhood travel between collector and arterial roads and may provide direct access to adjacent lands. (City of Ottawa Official Plan)

Measure - A physical device, regulation, or action which affects the movement of motor vehicles, bicycles and / or pedestrians. (Canadian Guide to Traffic Calming)

Road - "Road" generally refers to the shared road surface intended for use by vehicles and bicycles and any features that fall within that surface (e.g. general purpose travel lanes, on-street parking, on-road bike lanes, median islands, etc.).

Sensitive Land Use – Describes buildings, amenity areas, or outdoor spaces where routine or normal activities occurring at reasonably expected times would experience one or more *adverse effects* from contaminant discharges generated by a nearby *major facility*. Sensitive land uses may be a part of the natural or built environment. Examples may include, but are not limited to: residences, day care centres, and educational and health facilities. (Provincial Policy Statement).

Speed - The 85th percentile speed of all vehicles passing along a roadway during a specified time period is typically regarded as the representative speed of traffic. The 85th percentile speed is the speed exceeded by the fastest 15% of vehicles. When the 85th percentile speed exceeds the maximum legal vehicle speed, this is generally considered as indicating a speeding problem. (Canadian Guide to Traffic Calming)

Street - Refers to the elements in the corridor right-of-way including the road. This could include boulevards, sidewalks, segregated cycling facilities, property frontage, etc.

Streetscaping - A means of enhancing the environment for all users of the right-of-way, and a means of modifying motorists behaviour, through the use of physical features which provide protection, coherence, security, convenience, community identity, wayfinding and orientation, aesthetic quality and interest along an urban street. (Canadian Guide to Traffic Calming)

Through Traffic – Traffic which travels through a neighbourhood, and does not originate from, nor is destined to, a location within the neighbourhood. (Canadian Guide to Traffic Calming)

Traffic Calming - The combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behaviour and improve conditions for non-motorized street users. (Canadian Guide to Traffic Calming)

Traffic Calming Concept - An illustration and description of the combination of measures (and locations of those measures) intended to achieve the Strategic Approach of a traffic calming plan.

Traffic Calming Plan – Includes all the elements that lead to a recommended traffic calming concept for implementation.

Traffic Management – The change in traffic routing or flow within a neighbourhood street system through a combination of measures which alter route options and driver behaviour. (Canadian Guide to Traffic Calming)

Volume – When referring to traffic, volume is a measure of the number of vehicles which travel along a section of roadway or made a particular movement during a specific time period. Most often, traffic volumes are indicated as vehicles per hour during the peak hour, or vehicles per 24-hour period. (Canadian Guide to Traffic Calming)

Vulnerable Road User – A term applied to those most at risk in traffic (i.e. those not protected by an outside shield) including pedestrians, cyclists, and motorcyclists. Vulnerable road users may also include children, the elderly, and persons with disabilities.

Appendix A
Traffic Calming Implementation Options

Traffic Calming Implementation Options

In Ottawa, traffic calming measures can be implemented primarily through three mechanisms:

1. New Development
2. Road Reconstruction Projects
3. Neighbourhood Traffic Calming Program (stand-alone projects)

New Development

Traffic calming can be implemented as part of land development activities through the City's development approval process, particularly through the Plan of Subdivision and Site Plan Control processes. Given new development can change travel demand on the transportation network, the City's development application process requires developers to investigate the potential need for changes to the street network (including consideration of traffic calming measures). The purpose of this is to both ensure that the new development context aims to achieve City policy objectives while also mitigating anticipated negative impacts of introducing the new development. This may include identifying traffic calming opportunities on existing roads and identifying, planning, and constructing traffic calming measures on new roads (e.g. road network internal to new subdivisions or future planned roads). Further guidance on traffic calming in new neighbourhoods can be found in the forthcoming Building Better and Smarter Suburbs document, *Street Planning Manual for New Neighbourhoods*.

Transportation Impact Assessments (TIAs) for New Development Proposals

As part of the development application process, developers are required to submit a Transportation Impact Assessment (TIA) per the City's TIA Guidelines. It is within this assessment where proposed changes to the transportation network (which may include traffic calming) to be undertaken by a developer are identified. Traffic calming may also be identified and required as a condition of plan of subdivision or site plan control.

Road Reconstruction Projects

An internal process has been established where Transportation Planning proactively provides recommendations for speed management measures to be considered, when suitable, as part of the overall scoping process for City integrated road, water and sewer renewal projects. This will help address speed management as part of an integrated street design and reduce the potential need for costly localized traffic calming retrofits later. Speed management recommendations will be based on the existing operational characteristics, constraints, and context of each street, and consultations with the Ward Councillor and community as required.

The key advantages are the potential for cost savings and reduced impact of construction on communities through packaging of projects into fewer construction activities (e.g. minimizing throwaway, such as replacing construction before the end of its lifecycle). This approach provides an opportunity to potentially achieve lower prices for traffic calming features through economies of scale. This approach also follows the primary principles of the City's Complete Streets framework, as traffic calming measures are just one tool to help achieve the goals of this policy.

The Neighbourhood Traffic Calming (NTC) Study Process to address Community Traffic Concerns (Existing Streets)

The *Neighbourhood Traffic Calming Study Process* establishes a consistent approach to addressing requests for permanent traffic calming and traffic management on existing streets, helping meet Transportation Master Plan (TMP) objectives related to reducing the impact of motor traffic in neighbourhoods. The NTC Program screens and prioritizes potential projects to ensure the most critical issues are addressed first. Traffic studies are initiated in order of problem severity and engage residents in developing traffic calming solutions. This process is reserved for addressing requests for traffic calming on streets that cannot benefit from roadway modifications through other City programs.

City Resource Limitations

Given limited resources for street retrofits done outside of full road reconstruction, more economical options such as “Communication” and “Minor Adjustment” options are often considered prior to permanent “Engineering” options, given the latter is often implemented at a higher cost.

Appendix B
Potential Traffic Calming Stakeholders

Potential Traffic Calming Stakeholders

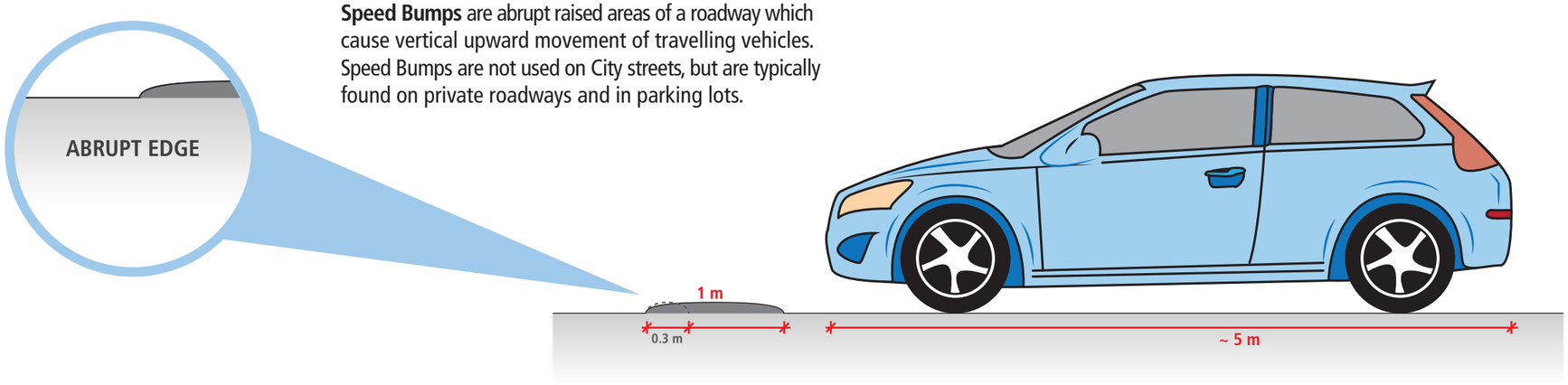
The following presents a list of potential stakeholders that should be considered when developing a traffic calming plan:

- Area residents
- General public
- Ward Councilors
- Business Improvement Areas and local business owners
- Community associations and interest groups
- Area educational institutions:
    - Ottawa-Carleton District School Board
    - French Catholic School Board – Central & Eastern Ontario (CECCE)
    - French Public School Board – Eastern Ontario (CEPEO)Ottawa Catholic School Board
    - University of Ottawa
    - Carleton University
    - Algonquin College
    - La Cité Collegial
- City of Ottawa Service Areas / Departments / Branches / Advisory Committees
    - Accessibility Office
    - Emergency Services (Paramedic, Fire)
    - By-law Services
    - Road Operations and Maintenance
    - Transit Services
    - Traffic Services
    - Transportation Planning
    - Right-of-Way, Heritage, and Urban Design
    - Asset Management
    - Ottawa Police Services
    - Parks, Forestry, and Stormwater Services
    - Ottawa Public Health
    - Accessibility Advisory Committee
- Utilities
    - Bell
    - Hydro
    - Enbridge
- National Capital Commission

Appendix C

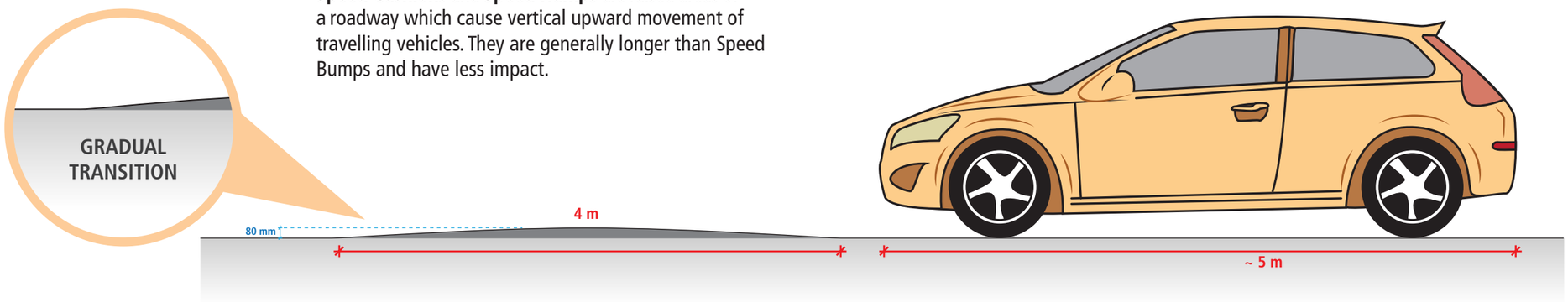
Comparison of Various Forms of Vertical Deflection Traffic Calming

Speed Bump



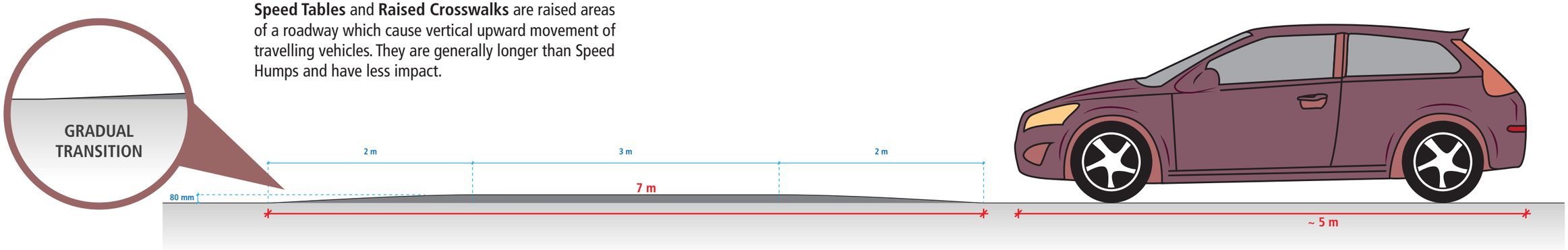
Speed Bumps are abrupt raised areas of a roadway which cause vertical upward movement of travelling vehicles. Speed Bumps are not used on City streets, but are typically found on private roadways and in parking lots.

Speed Cushion / Hump



Speed Cushions and **Speed Humps** are raised areas of a roadway which cause vertical upward movement of travelling vehicles. They are generally longer than Speed Bumps and have less impact.

Speed Table / Raised Crosswalk



Speed Tables and **Raised Crosswalks** are raised areas of a roadway which cause vertical upward movement of travelling vehicles. They are generally longer than Speed Humps and have less impact.

Appendix D

Key Emergency Response Streets Identified by Fire and Paramedic Services

Appendix D – Key Emergency Response Streets Identified by Fire and Paramedic Services

The key emergency response streets (illustrated on the following pages) were established in consultation with City of Ottawa Fire Services and Paramedic Services. These maps are for the sole purpose of the development of traffic calming plans for City of Ottawa streets and do not reflect any other City policy or objective.

NOTE: This map was created in consultation with City of Ottawa Fire Services. It is for the sole purpose of the development of traffic calming concepts for City of Ottawa streets and does not reflect any other City policy or objective.

REMARQUE : Cette carte indique les rues qui composent le réseau de voirie primaire dans lequel ont lieu des activités d'intervention en cas d'urgence à Ottawa. La mise en place de mesures d'atténuation de la circulation doivent être prises en compte lors du déroulement de ces activités. On peut consulter la terminologie portant sur cette carte dans les Lignes directrices sur la conception des mesures de modération de la circulation.

KEY EMERGENCY RESPONSE STREETS IDENTIFIED BY FIRE SERVICES - URBAN / RÉSEAU PRIMAIRE D'INTERVENTION EN CAS D'URGENCE - URBAIN

47 Fire Station (#) / Caserne de pompiers (#)

Ward Boundary / Limite du quartier

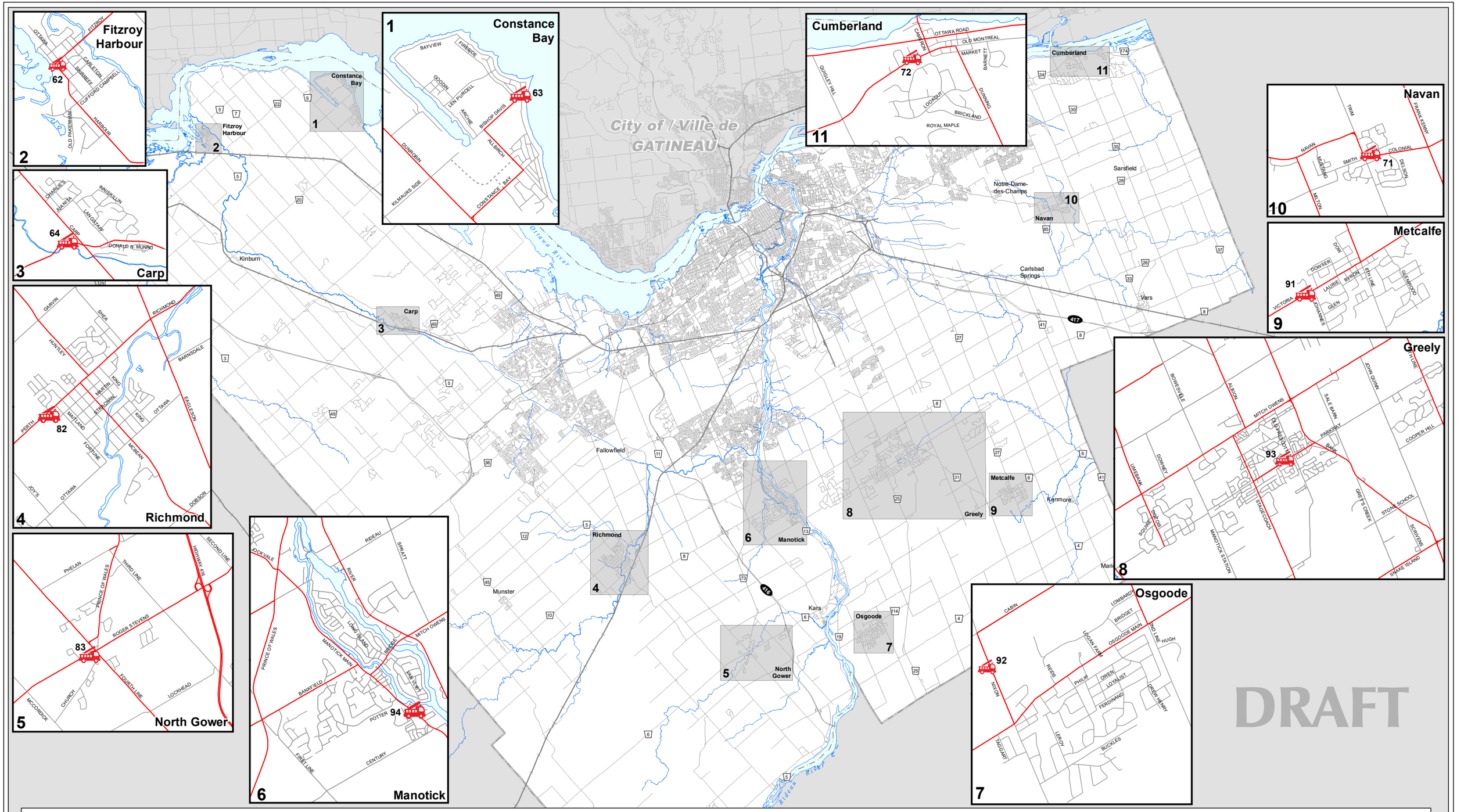
Key Emergency Response Street Segment / Tronçon de rue du réseau primaire d'intervention en cas d'urgence

Other Streets / Autres rues

Ottawa

1 0.5 0 1 2 3 km

Prepared by: Planning, Infrastructure and Economic Development Department, GIS and Data Management
Préparé par: Services de la planification, de l'infrastructure et du développement économique, SIG et Gestion des données



KEY EMERGENCY RESPONSE STREETS IDENTIFIED BY FIRE SERVICES - VILLAGES / RUES CLÉS DU RÉSEAU D'INTERVENTION D'URGENCE DÉTERMINÉES PAR LE SERVICE DES INCENDIES - VILLAGES

92 Fire Station (#) / Caserne de pompiers (#)

Key Emergency Response Street Segment / Rues clés du réseau d'intervention d'urgence

Other Streets / Autres rues

NOTE: This map was created in consultation with City of Ottawa Fire Services. It is for the sole purpose of the development of traffic calming concepts for City of Ottawa streets and does not reflect any other City policy or objective.

REMARQUE : La présente carte a été créée en consultation avec le Service des incendies de la Ville d'Ottawa. Elle vise uniquement à l'élaboration de concepts de modération de la circulation pour les rues d'Ottawa et ne reflète aucune autre politique ni aucun autre objectif municipal.

Ottawa

2.5 1.25 0 2.5 5 7.5 km

Prepared by: Planning, Infrastructure and Economic Development Department, GIS and Data Management
Préparé par: Services de la planification, de l'infrastructure et du développement économique, SIG et Gestion des données

NOTE: This map was created in consultation with City of Ottawa Paramedic Services. It is for the sole purpose of the development of traffic calming concepts for City of Ottawa streets and does not reflect any other City policy or objective.
REMARQUE : La présente carte a été créée en consultation avec les Services paramédic de la Ville d'Ottawa. Elle vise uniquement à l'élaboration de concepts de modération de la circulation pour les rues d'Ottawa et ne reflète aucune autre politique ni aucun autre objectif municipal.

Rivière des Outaouais / Ottawa River

Ottawa Hospital - Civic Campus / Hôpital d'Ottawa - Campus Civic

Hôpital Montfort Hospital

Children's Hospital of Eastern Ontario Centre hospitalier pour enfants de l'est de l'Ontario

Ottawa Hospital - General Campus / Hôpital d'Ottawa - Campus Général

Queensway-Carleton Hospital / Hôpital Queensway-Carleton

WELLINGTON, CHURCHILL, KIRKWOOD, ISLAND PARK, HOLLAND, PARKDALE, SCOTT, PRESTON, BRONSON, LYON, KENT, ELGIN, LAURIER, RIDEAU, KING EDWARD, MANN, BEECHWOOD, HEMLOCK, MCARTHUR, VANIER, MONTREAL, ST LAURENT, AVIATION, BLAIR, ROCKCLIFFE, COVENTRY, OGILVIE, REGIONAL ROAD 174, CYRVILLE, CARLING, MAITLAND, PINECREST, HIGHWAY 417, WOODROFFE, RICHMOND, BASELINE, HIGHWAY 416, CEDARVIEW, GREENBANK, MERIVALE, MEADOWLANDS, WEST HUNT CLUB, FISHER, PRINCE OF WALES, BANK, MAIN, RIVERSIDE, SMYTH, HERON, AIRPORT, RUSSELL, WALKLEY, CONROY, HAWTHORNE, RAMSAYVILLE, ANDERSON, INNES

13, 12, 15, 14, 11, 7, 17, 16, 2, 8, 18, 9, 10

KEY EMERGENCY RESPONSE STREETS IDENTIFIED BY OTTAWA PARAMEDIC SERVICES / RUES CLÉS DU RÉSEAU D'INTERVENTION D'URGENCE DÉTERMINÉES PAR LES SERVICES PARAMÉDIC D'OTTAWA

- Hospital / Hôpital
- Ward Boundary / Limite du quartier
- Key Emergency Response Street Segment / Rues clés du réseau d'intervention d'urgence
- Other Streets / Autres rues

Ottawa

1 0.5 0 1 2 3 km

Prepared by: Planning, Infrastructure and Economic Development Department, GIS and Data Management
Préparé par: Services de la planification, de l'infrastructure et du développement économique, SIG et Gestion des données

Appendix E
Traffic Calming Design Guidelines Feedback Form

Traffic Calming Design Guidelines Feedback Form

The City of Ottawa would like to receive comments and information related to any proposed changes to these Traffic Calming Design Guidelines. Please include section referencing, revised wording and reasons for proposed changes.

Submit to:

City of Ottawa
Area Traffic Management Branch
110 Laurier Av. West, 1st Floor Client Service Centre
Ottawa, Ontario
K1P 1J1
atm-gcl@ottawa.ca

Submitted by:

Name:	
Date:	*(dd/mmm/yyyy):*
Submitter profile: *(choose one of the following)*	
• Ottawa Resident	*Neighbourhood / Street Name:*
• City of Ottawa Staff	*Department / Service Area / Branch:*
• Other	*Specify (group name, association, etc.):*

Proposed Changes and Rationale (1,500 word limit)**:**

Appendix F

Log of Changes to the Traffic Calming Design Guidelines

Log of Changes to the Traffic Calming Design Guide

A log of changes to the Traffic Calming Design Guidelines are included below:

Date	Changes
April 25, 2018	• Completed draft for final quality control review
June 1, 2018	• Final Draft Traffic Calming Design Guidelines completed
March 8, 2019	• Final Draft Traffic Calming Design Guidelines updated to address technical comments on the June 2018 Final Draft document
April 29, 2019	• Traffic Calming Design Guidelines finalized