Traffic Calming Guide and Policy

City of Courtenay

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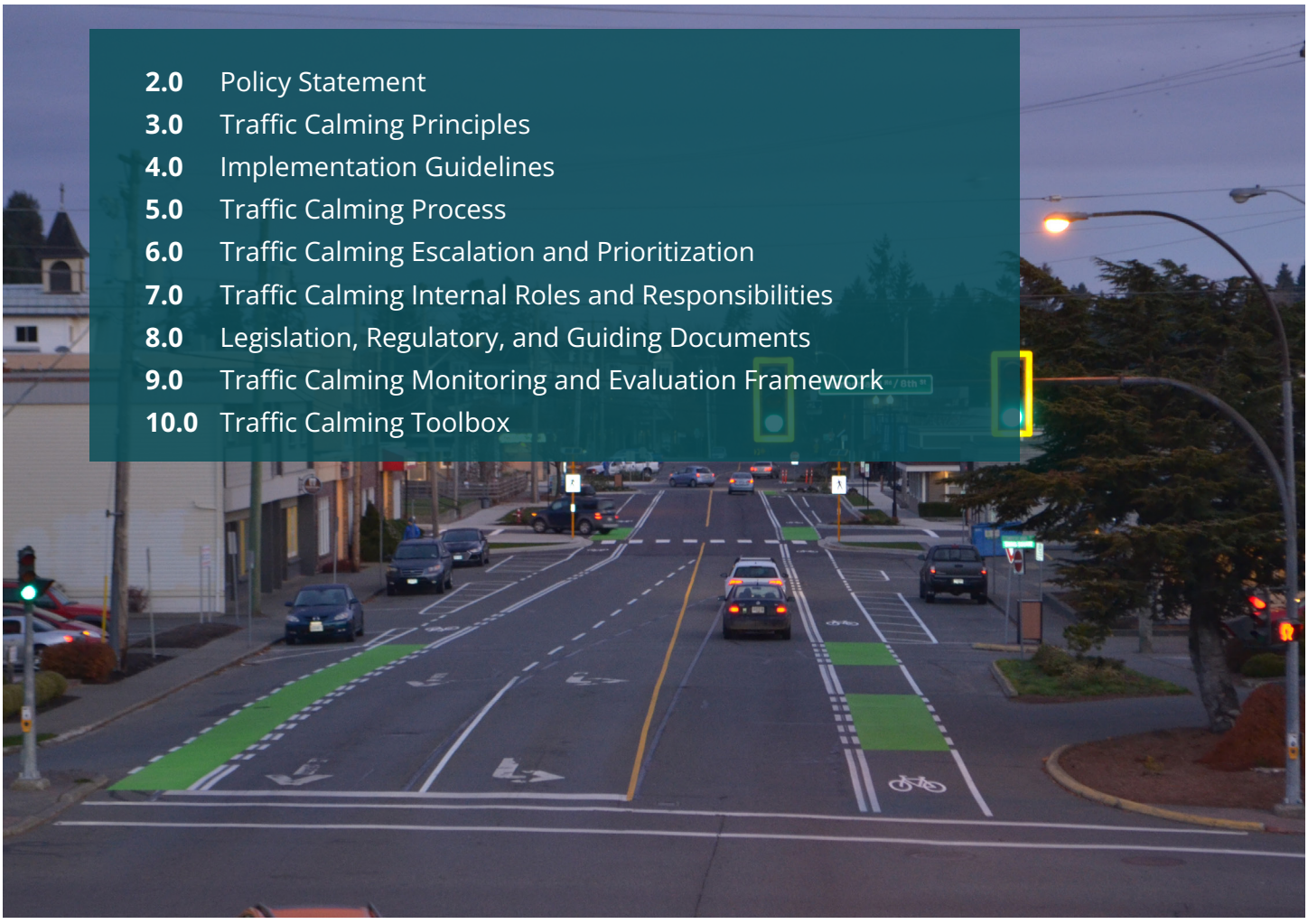
1.0 Introduction

According to Transportation Association of Canada (TAC), traffic calming is the broad term used to describe the process and measures applied by road authorities to address concerns about the behaviour of motor vehicle drivers travelling on streets within their jurisdictions. The purpose of traffic calming is to restore streets to their desired function, achieve a balance between creating a secure neighbourhood and fulfilling mobility requirements. In essence, the prevailing belief is that traffic calming installations should give top priority to public safety.

Courtenay is a vibrant and growing city experiencing an increase in motor traffic volumes, leading to traffic challenges and safety concerns in the community, such as speeding and shortcutting. Acknowledging the emerging traffic issues, the City of Courtenay (the City) recognizes the necessity of establishing a comprehensive Traffic Calming Policy. It is essential for the City to establish a transparent and unambiguous process for planning, evaluating, and implementing traffic calming measures.

This Traffic Calming Guide and Policy Report (the Policy) aims to provide guidance to the City in developing and implementing traffic calming plans and measures. The goal is to ensure enhance the safety of all road users and promote secure and accessible streets for Courtenay residents. The policy comprises the following key chapters:



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2.0 Policy Statement

This traffic calming policy provides combination of physical measures strategically designed to alleviate the adverse impacts of motor vehicle use, alter driver behavior, and improve conditions for non-motorized street users. Infrastructure modifications and improvements will strive to reduce vehicle speed, address excessive traffic volume, and foster improvements to neighbourhood safety, equity, and quality of life.

The objectives of the traffic calming policy are to:

- Enhance the safety of neighbourhoods to enable increased confidence and minimized collision risks for all road users when travelling on streets, especially pedestrians, cyclists, as well as young and elderly individuals.
- Support a deeper dive into traffic safety impacts on equity-deserving groups to achieve calm, safe, and environmentally improved conditions on streets.
- Elevate the livability of neighbourhoods to cultivate calm, peaceful, undisturbed, and attractive environment. This encourages community interaction, supports healthier lifestyles, and contributes to the overall well-being of residents.
- Encourage public participation and community support throughout a streamlined traffic calming implementation process.

3.0 Traffic Calming Principles

The consideration of requests for the traffic calming and the designation of a study area will be guided by the following **traffic calming principles:**

- **Allow emergency and service access.** Traffic calming should not unduly impede the access of emergency, maintenance, operations, and transit services.
- **Facilitate active transportation modes.** Traffic calming should promote, rather than impede, non-motorized and active modes of transportation and be designed to minimize the negative impacts on pedestrian and cycling traffic.
- **Preserve reasonable road accessibility.** Traffic calming should strive to maintain reasonable automobile access to City roads and preserve reasonable access and egress for the neighbourhood.
- **Address the real problem.** Often there is a vast difference between the perceived problem and the actual neighbourhood traffic issues. It is important to have real data to objectively quantify the problem and to develop the right solutions.

4.0 Implementation Guidelines

The following will be taken into consideration when investigating, selecting, and implementing traffic calming measures. This enables a comprehensive evaluation of all alternatives and minimizes potential negative impacts. Adhering to these guidelines not only enhances the effectiveness of traffic calming but also promotes community acceptance and support for the final recommendations.

- Traffic calming will be considered exclusively on local and collector roads. Traffic calming will not be considered for higher classification roads like arterials and highways.
- Traffic calming is limited to two lane roadways or less (one lane of through traffic in each direction) with a posted speed limit not exceeding 50 km/h.
- It is important to evaluate whether an area-wide plan versus a street-specific plan is more suitable. An area wide traffic calming strategy should be considered if a street-specific plan would likely divert traffic onto adjacent streets.
- Prior to implementing traffic calming measures, a thorough examination should be determined whether traffic issues arise from congestion and spill-over effects from adjacent higher-class roadways, such as arterials and highways. If identified as the root cause, addressing and resolving issues on those primary roadways, such as signal timing optimization, should take precedence.
- Traffic calming is not a universal solution to all neighbourhood transportation problems. It should only be considered when there is a demonstrated safety, speed, noise (caused by excessive traffic speed or volume) or short-cutting traffic concern and acceptable alternative measures (e.g., education, enforcement, and other alternative efforts) have been exhausted.

5.0 Traffic Calming Process

The following process is recommended to be employed when submitting a request for traffic calming in Courtenay. The process is structured into three major phases, each containing specific procedures under the respective phase:

- **Phase 1:** Traffic Calming Initiation and Assessment.
- **Phase 2:** Traffic Calming Plan Development.
- **Phase 3:** Traffic Calming Approval, Implementation and Evaluation.

This established and formalized process for examining roads guarantees uniformity and fairness in determining traffic calming measures.

5.1 Traffic Calming Initiation and Assessment

1) Traffic Calming Process Initiation

Residents experiencing traffic-related issues are encouraged to complete a Traffic Calming Request Form (Appendix A) and submit it to the City for an investigation into the need for traffic calming within their neighbourhood. City staff will conduct a primary review to assess whether the identified roadway aligns with the initial screening criteria (Section 6.1, Table 1).

City staff will communicate with residents regarding the alignment of their location with the initial screening criteria. Those whose requests meet these criteria will be provided with details about the traffic calming process. For roadways that do not satisfy the specified criteria, the proponent will be notified that traffic calming is not warranted.

2) Traffic Calming Neighborhood Petition

After it has been determined that the requested location meets the initial screening criteria, the proponent is required to complete and submit a Petition Form (Appendix B) to the City. The focus of the petition is assessing whether there is enough neighbourhood support for traffic calming on the requested roadway.

To proceed the traffic calming process, the petition must obtain support from at least 51% of the residential units, in all single-family or multi-family dwellings, with direct frontage or flankage (the frontage of a property is its front or facing side, while the flankage refers to the side boundaries or edges of a property) onto the section of roadway identified for potential implementation of traffic calming measures. Each residential unit is represented by one signature, regardless of the number of people in the unit. Failure to meet the 51% support level will result in the termination of the process, and residents will be notified.

3) Data Collection

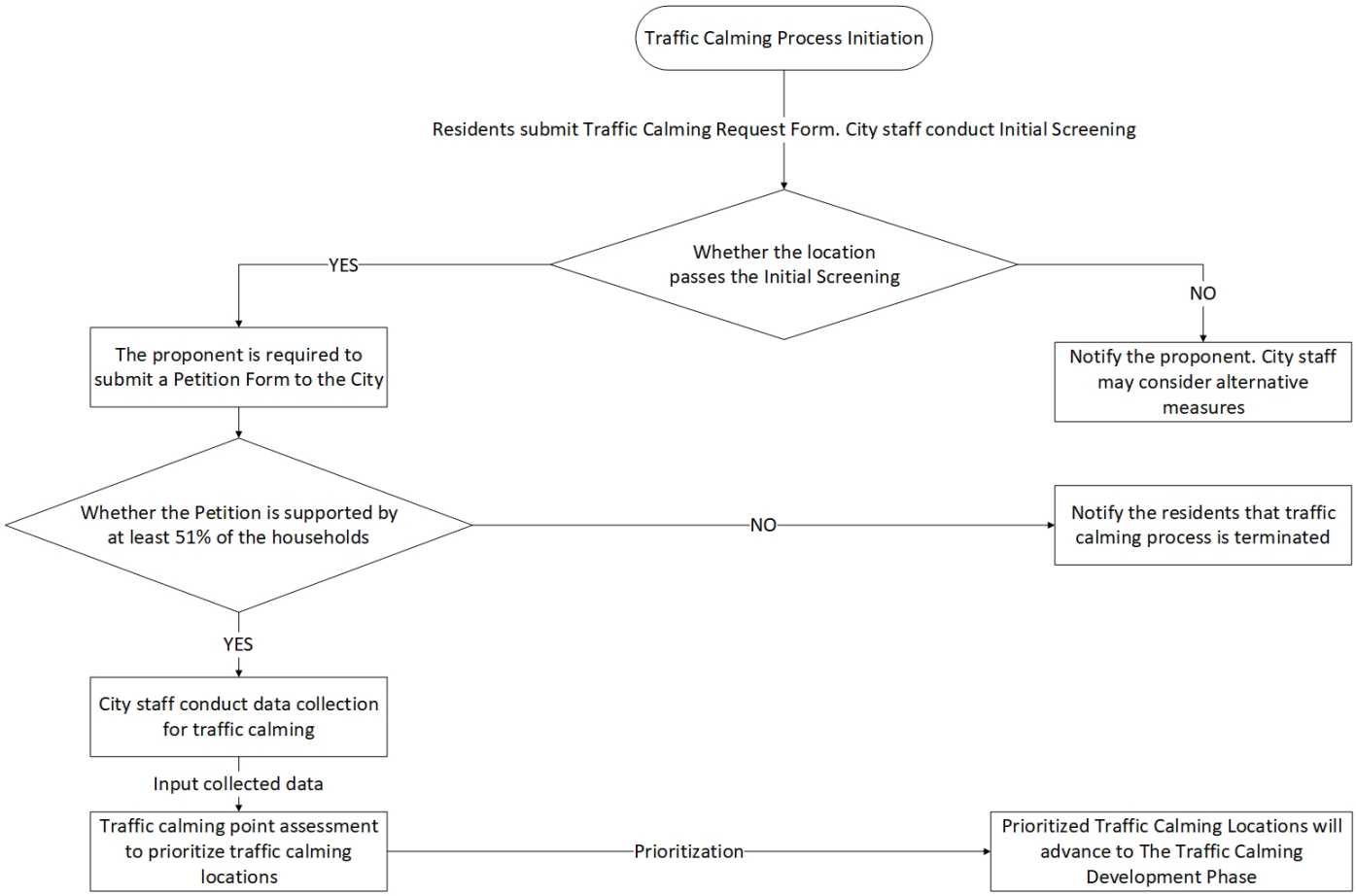
If the requested location meets the initial screening criteria and petition results indicate that there is at least 51% support, data collection will commence when City staff are reasonably able to accommodate the request. City staff will conduct necessary traffic studies to quantify and qualify the traffic concerns within the subject location. The data collection and summarization will lay the basis for the next point assessment step and pertain to speed profiles, motor traffic volume, collision history, vulnerable road user generators, sidewalks, and other site-specific information, as well as the origin/destination study if shortcutting traffic is a concern.

If the implementation of traffic calming could result in undesirable traffic displacement onto parallel roadways, traffic volume data will also be collected for those roadways as deemed necessary by City staff before works are coordinated. The data will be utilized to determine if corrective action is required on parallel streets after comparing the traffic volume 'before' and 'after' specific traffic calming measure is implemented.

4) Traffic Calming Point Assessment

Point assessment (Section 6.2, Table 2) is a screening process focusing on various attributes of a roadway in order to quantify and prioritize its need for traffic calming. Based on the point assessment score, a location will be categorized into one of five levels, ranging from "no action needed" to "high traffic calming priority", "behind priority" (Section 6.2, Table 3). Depending on funding availability, traffic calming locations will be selected based on the point system, prioritizing those with higher scores for construction.

FIGURE 1. TRAFFIC CALMING PROCESS PHASE 1 - TRAFFIC CALMING INITIATION AND ASSESSMENT



5.2 Traffic Calming Development

5) Selection and Design of Traffic Calming Plan

Appropriate traffic calming measures will be selected and determined based on the list of traffic calming measures outlined in Section 10 of this policy. The selection of traffic calming measures will comprehensively consider the collected data combined with site visits, historical information, future maintenance and construction plans, as well as resident feedback.

The City's traffic calming design could include one or more different types of traffic calming techniques. The proposed traffic calming measures will be in accordance with the design guidelines outlined in the Canadian Guide to Neighbourhood Traffic Calming and the engineering judgment and experience of City staff.

6) Traffic Calming Opinions from Key Stakeholders

The preferred design will be presented to emergency, transit, maintenance services and other key stakeholders. Comments from the potentially affected services will be solicited and their feedback regarding possible impacts of the traffic calming design will be encouraged.

The traffic calming design will be appropriately modified based on key stakeholder inputs. In the case that modifications are not able to remedy concerns, the traffic calming process could be discontinued for the roadway(s) under consideration and residents will be notified.

7) Traffic Calming Public Meeting and Public Inputs

Prior to the public meeting, notifications will be appropriately delivered to the public through different means, (e.g., City's website, social media, local newspaper) regarding the meeting date, time, and location.

The public meeting will be hosted by City staff to present the purpose, objectives, and the implementation process of traffic calming in general, as well as the rationale behind the specific traffic calming design.

The meeting will also provide residents and business owners with an important opportunity to get involved in the traffic calming process, learn more about the proposed traffic calming treatments, and to provide their feedback.

Traffic calming contents could also be published online to provide important information and solicit comments from a wider range of residents and business owners.

The City may elect to provide a specific fixed number of public meetings each year where all traffic calming requests would be addressed (e.g., two per year).

8) Traffic Calming Community Support Survey

Based on the comments received from key stakeholders and the public, the preferred traffic calming plan will be appropriately modified. The objective of the community support survey is to determine the level of support for the subject traffic calming plan and to provide another opportunity for the most directly affected residents to oppose any modifications to the road.

The survey canvas area will be defined by City staff and as a minimum, includes all residential units, in single-family or multi-family dwellings, with direct frontage onto the roadway to be implemented with traffic calming measures. Residential units on surrounding roads may also be identified as part of the survey.

The survey will be delivered by mail and may contain the following information:

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

9) Finalize the Preferred Traffic Calming Plan and a Detailed Design

In accordance with established engineering and technical standards, taking into consideration input from stakeholders and the community, and aligning with the objectives and principles outlined in this policy, City staff will finalize the preferred traffic calming plan with a detailed design

In finalizing the preferred plan and design, key factors will be considered and documented, such as:

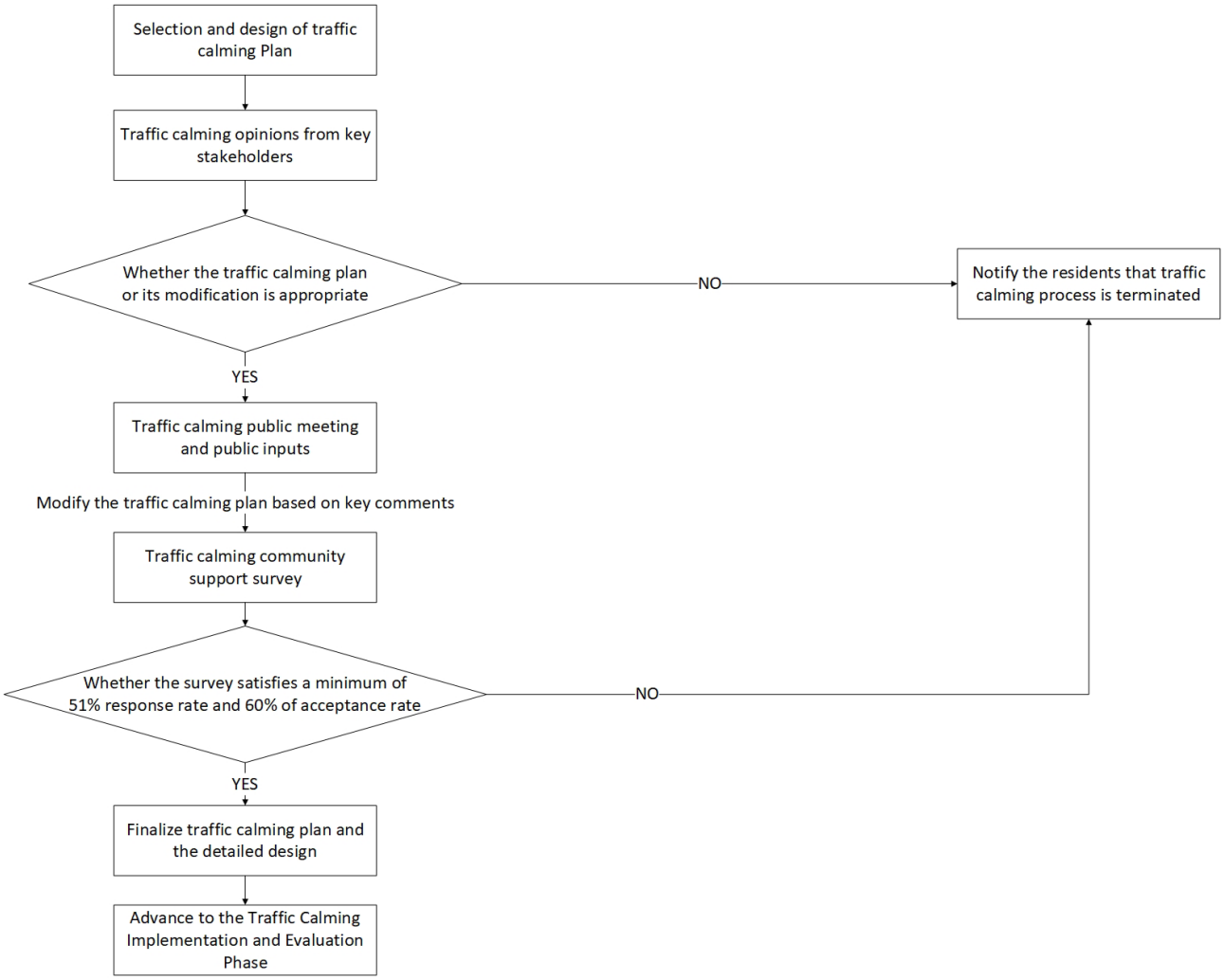
- Objectives, specifically outlining the traffic issues or concerns to be addressed through traffic calming.
- Relevant traffic data, including volumes, speeds, and collision records.
- Surround land use context and urban design principles.
- Design details of the layout, placement, specifications, dimensions, and materials of the chosen traffic calming measure(s).
- In addition, considerations will be given to the various aspects of road design such as geometry, utility placement, landscaping, signage requirement, lighting, and drainage needs.

During the detailed design stage, if limitations are identified which challenge the feasibility of the plan, alternatives will need to be considered. This may include alterations or a re-development of the preferred plan. If significant or major changes to the plan are required due to design constraints, agencies and residents on the mailing list will be consulted and notified of any changes.

If City staff finds the required modifications to create the detailed design result in a significantly different final design from that which was presented to residents as part of the survey, City staff may recommend additional agency consultation, another survey and/or public meeting.

Figure 2 illustrates the process of traffic calming plan development.

FIGURE 2. TRAFFIC CALMING PROCESS PHASE 2 - TRAFFIC CALMING PLAN DEVELOPMENT



5.3 Traffic Calming Approval, Implementation and Evaluation

10) Approval of Council and Resident Notification

If the finalized traffic calming design is such that additional budget or changes to bylaws are required to implement, then a report and recommendation will be submitted to City Council for consideration and approval. In this case, City staff will mail notices to the affected residents to inform them that traffic calming has been either approved or not approved by City Council on the subject roadway.

Notification of the upcoming traffic calming implementation will be sent to the same mailing list used to deliver the Traffic Calming Community Support Survey and any other stakeholders having requested the notification. The notice could include information about the traffic calming review and decision process for the subject roadway and the following details:

- Copy of the preferred traffic calming plan showing locations and treatments.
- Information about where residents may review the detailed traffic calming design drawings.
- Implementation timeframe of the traffic calming plan.

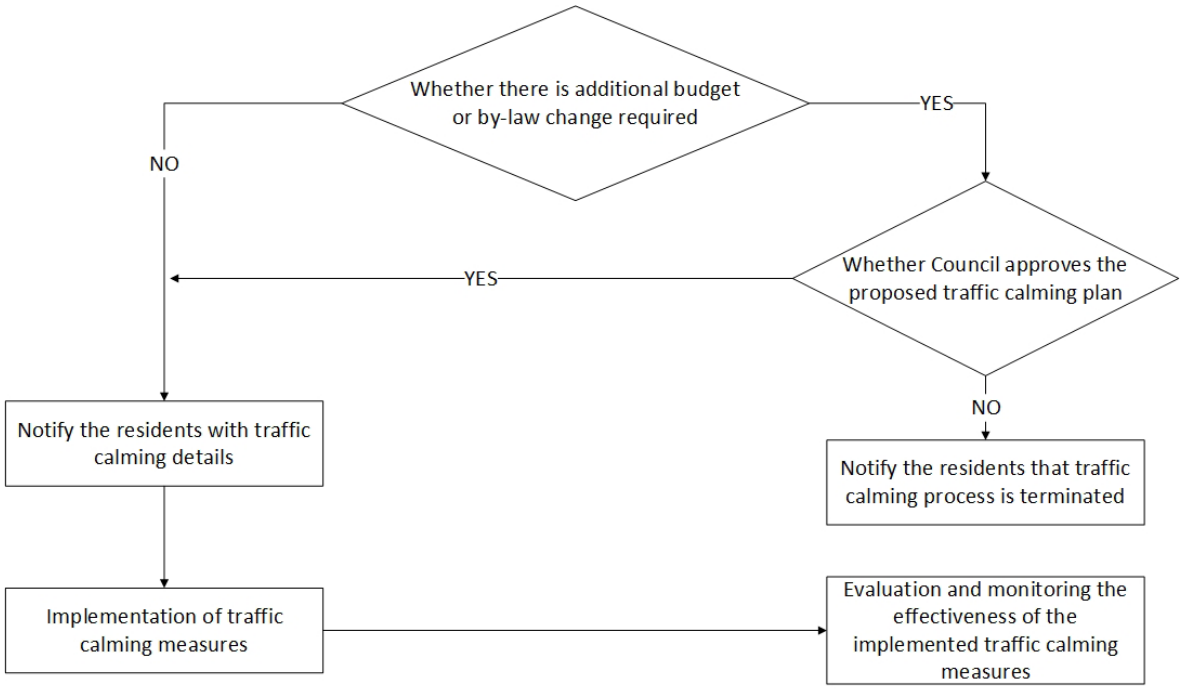
11) Implementation of Traffic Calming

Upon approval and sufficient funding, traffic calming measures will be implemented. Where feasible, City staff may decide whether it is beneficial to phase in the traffic calming plan through the use of temporary or removable traffic calming measures. This will allow time to examine the impact of the measures and their effectiveness before committing funding to permanent treatments.

12) Evaluation and Monitoring

City staff will monitor and evaluate the effectiveness of the utilized traffic calming measures and their impact on the surrounding road network. The evaluation outcomes will be used in recommending similar measures in the future. In addition to evaluating the impacts of the implemented traffic calming measures on the subject roadway, City staff will also analyze whether the traffic calming plan has led to a notable diversion of traffic to neighboring parallel streets. If so, City staff will explore corrective action opportunities to remedy the situation and/or mitigate the impact.

FIGURE 3. TRAFFIC CALMING PROCESS PHASE 3 - TRAFFIC CALMING APPROVAL, IMPLEMENTATION AND EVALUATION



6.0 Traffic Calming Escalation and Prioritization

In Courtenay, a two-step framework is utilized for the escalation and prioritization of traffic calming measures, including initial screening and point assessment.

6.1 Initial Screening

The initial screening step involves a screening process to assess the eligibility of roadways for traffic calming. To pass the initial screening, the analyzed roadway must satisfy all the specified warrants.

TABLE 1. CITY OF COURTENAY TRAFFIC CALMING INITIAL SCREENING WARRANT

Note: The assessed roadway must pass all the criteria to clear the traffic calming initial screening.

Criteria	Pass / Fail
Roadway must be a local or collector, featuring no more than two travel lanes (one lane for each direction).	
Roadway must have a minimum of 500 annual average daily traffic (AADT).	
The posted speed limit shall not be greater than 50 km/h.	
85th percentile speed of the roadway should be greater than the posted speed limit.	
Roadway section should be longer than 150 metres.	
Roadway must be assumed and maintained by the City of Courtenay.	
Zoning should be residential in nature.	
Traffic calming initiatives must not have already been implemented in the past 36 months, and there are no scheduled capital projects within the next 36 months that would address the traffic issues.	
Overall	

6.2 Point Assessment

The second step involves a point assessment to allocate weighted points based on the characteristics of the roadways for traffic calming. The criteria encompass speed, volume, collisions, the presence of generators for vulnerable road users, and the availability of active transportation facilities.

TABLE 2. CITY OF COURTENAY TRAFFIC CALMING POINT ASSESSMENT SYSTEM

Location:				**Data Compiled:**	
Roadway Type		**Local Road**		**Collector Road**	
Feature			**Criteria**	**Maximum Points**	**Total Points**
1	Vehicle Speed	85th Percentile Speed	General speeding - 1 point for every 1 km/h of 85th percentile speed over the posted speed limit*. Excessive Speeding - 5 points for 10% of excessive speeding (10km/h over the posted speed limit) and an additional 5 points for every 5% of excessive speeding.	25	
2	Volume	Annual Average Daily Traffic (AADT)	5 points for every 500 AADT on local roads; 5 points for first 1250 AADT and 5 points for every 750 after on collector roads.	20	
3	Collisions	Collision History	5 points for every collision not involving vulnerable road users within the past 3 years or a longer period. 20 points for every collision involving vulnerable road users (VRU)** within the past 3 years or a longer period.	25	
4	Vulnerable Road User Generators	Pedestrian/ Cyclist Activity	5 points for each pedestrian / cyclist-oriented facility nearby,*** e.g., elderly housing, parks / playgrounds, community or retail centres, churches, libraries, schools, childcare centres, etc.	20	
5	Active Transportation	Presence of Active Transportation Facilities	10 Points for lacking sidewalks on both sides of the roadway with pedestrians; 5 points for lacking sidewalk on one side of the roadway with pedestrians; 10 points for lacking cycling lane for the roadway with cyclists.	10	
Total Score					
Which traffic calming priority category (I to V) does this location belong to? (Refer to Table 3)					**#**

* For roadways that have recently undergone a speed limit reduction (e.g., from 50 km/h to 40 km/h), it is recommended to use the original posted speed limit prior to the reduction. "Recently" denotes a grace period of 6 to 12 months.

** A vulnerable road user refers to an individual who is at a higher risk of traffic injury when travelling on roadways, typically due to a lack of physical protection in the event of a collision. This includes pedestrians, cyclists, children, seniors, and other individuals relying on active transportation modes.

*** Nearby means the facility must have direct connection to subject roadway.

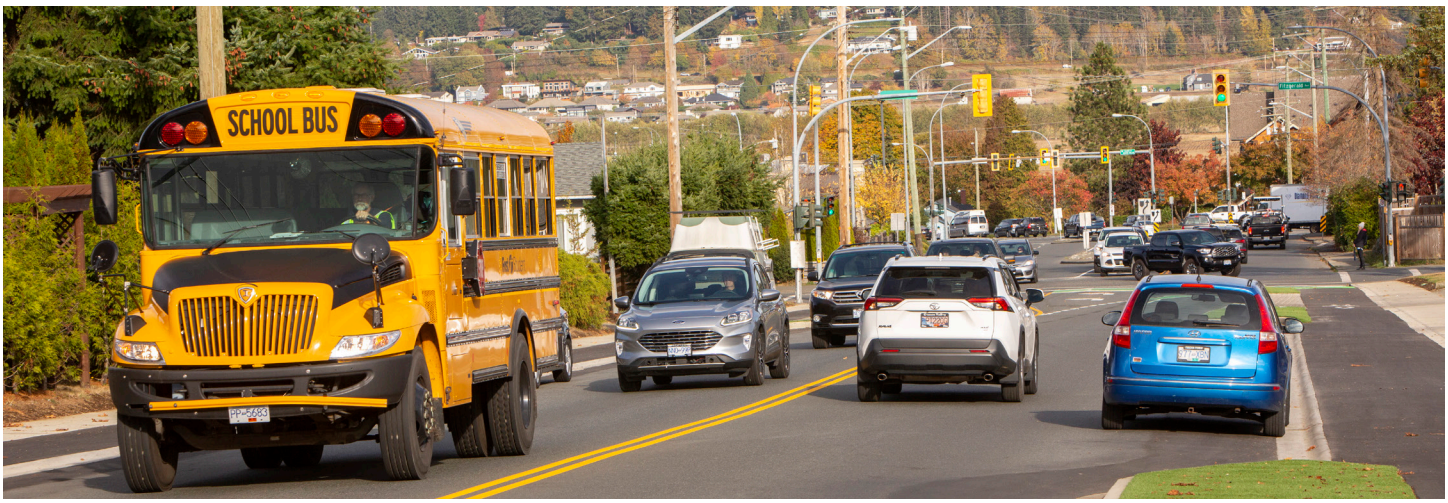
Based on the point assessment scores, the traffic calming locations will be classified into five priority levels, as detailed in Table 3 below.

TABLE 3. City of Courtenay Traffic Calming Point Assessment Priority Categories

Traffic Calming Prioritization Category	Traffic Calming Point Assessment Score*	Recommended Traffic Calming Treatment(s)**
I	0-60	No traffic calming action is needed.
II	61-70	Only simple traffic calming measures without physical alternation of the roadway, i.e., signage and/or pavement markings should be applied.
III	71-80	Low traffic calming priority - only traffic calming treatments with minimal impact on traffic movement and accessibility should be considered.
IV	81-90	Medium traffic calming priority - traffic calming treatments that affect traffic movement and accessibility could be considered.
V	91-100	High traffic calming priority - road safety should take precedence over traffic movement and accessibility. A combination of various traffic calming measures could be explored. Extensive traffic calming measures, such as road closures, could be implemented.

* The priority category score threshold may be updated in the future as needed to effectively reflect the traffic calming needs of various locations across Courtenay as more traffic calming candidates are included in the assessment.

** The specific traffic calming measure(s) to be implemented will be based on the case-by-case analysis of the traffic issues, road characteristics, and context of the assessed location.



7.0 Traffic Calming Internal Roles and Responsibilities

To facilitate the seamless progression of the traffic calming process, it is essential to establish clarity regarding the internal roles and responsibilities within the City. This entails assigning specific roles and responsibilities to different departments within the City across various stages of the traffic calming progress, concerning analysis, decision-making, planning, design, implementation, and monitoring of traffic calming measures.

City Council will

- Adopt the policy objectives and ensure sufficient resources are applied to manage traffic calming program.

The **Operational Services Department** plays the central role in traffic calming initiatives, carrying out a range of responsibilities, including:

- Receiving, addressing, and responding to traffic calming requests and petitions .
- Conducting Initial Screenings to identify potential traffic calming locations.
- Performing necessary data collection to assess traffic calming locations.
- Developing the point assessment and prioritization for traffic calming locations.
- Engaging with key stakeholders to gather insights and opinions on proposed traffic calming measures.
- Facilitating public communications and meetings to engage the community, share traffic calming knowledge and information, and gather inputs on proposed traffic calming measures*.
- Conducting surveys to gauge public support for proposed traffic calming measures*.
- Notifying residents of planned traffic calming measures to be implemented*.
- Maintaining the implemented traffic calming measures.
- Conducting ongoing evaluation and monitoring of the effectiveness of implemented traffic calming measures.
- Facilitating collaboration among different City departments and internal and external stakeholders to streamline the traffic calming process effectively.
- Overseeing the development and implementation of asset and risk management plans for all asset classes within the study area for integrated capital renewal plans including drainage needs.

Regarding the implementation of specific traffic calming measures, in general, Operational Services Department assumes responsibility for the traffic calming measures characterized by a temporary nature, without demanding extensive engineering work and resources, or involving significant infrastructure modifications. The specific traffic calming measures implemented by Operational Services could include speed tables, speed cushions, on-street parking, signage, pavement markings, etc.

* It is advisable to establish a Community Working Group, which is led by the Operational Services Department and involving active participation from the Engineering Works Department. This group will be tasked with addressing traffic calming requests and petitions, engaging with the public, conducting and analyzing surveys, and delivering key information to the affected neighborhoods.

The **Infrastructure and Environmental Engineering Services Department** is responsible for the planning, design, and implementation of traffic calming measures:

- Proposing and determining the appropriate traffic calming measures for specific locations.
- Developing and finalizing the traffic calming plan and detailed engineering design for traffic calming locations.
- Constructing and installing the preferred traffic calming measures within neighbourhoods.
- Conducting necessary modifications and renewals to road and drainage facilities on segments where traffic calming measures are to be implemented.

With respect to implementation, in general, Engineering Services Department takes on the responsibility for traffic calming measures characterized by a permanent nature, requiring more extensive engineering work and resources and potentially involving infrastructure modifications. Examples of such traffic calming measures include traffic circles, roundabouts, raised crosswalks, corner extensions, curb bulges, road closures, etc.**

The **Financial Services Department** is responsible for the sound financial management of Courtenay's traffic calming initiatives. This includes formulating the financial plan for traffic calming and related projects, subject to review and approval by the City Council.

The **Courtenay Fire Department** offers informed perspectives on whether the proposed traffic calming measures significantly affect the efficiency and timeliness of their response to emergencies.

The **Legislative and Corporate Services Department** is responsible for the management and administration of City's Traffic Regulation Bylaw enforcement pertaining to matters related to traffic calming.

8.0 Legislation, Regulatory, and Guiding Documents

BC Motor Vehicle Act - [RSBC 1996] CHAPTER 318 (MVA) is the primary legislation that governs road usage, traffic safety, and vehicle operation in BC. While the MVA sets out general rules and regulations, it also provides the legal authority for municipalities to create additional bylaws and regulations to address specific traffic issues such as speeding and road safety concerns. Traffic calming measures concerns physical modifications to roadways and fall under the scope of the traffic bylaw and policy of municipalities. The design and implementation of traffic calming measures in Courtnay will be in accordance with the powers granted by the MVA and consistent with the broader regulations outlined in the MVA to guarantee legal validity and align with the overarching goals of road safety and traffic management.

** Certain permanent traffic measures may be temporarily implemented to conserve budget and resources.

City of Courtenay Traffic Regulation Bylaw (No. 1926, 1996) regulates traffic within the municipality. The Bylaw is divided into different divisions, covering a range of aspects of traffic regulation, encompassing general regulations, traffic control devices, pedestrian traffic, vehicle traffic, bicycle traffic, highway use permits, offence, penalties, and enforcement, etc. The Bylaw also mentions traffic calming and provides a list of devices under the division of traffic calming devices. The implementation of traffic calming in Courtenay will be in accordance with the provisions outlined in the Bylaw to facilitate a harmonized and effective traffic calming strategy and enable a consistent and compliant traffic management within the municipality.

Canadian Guide to Traffic Calming - Second Edition (2018) was published by Transportation Association of Canada (TAC). The Guide presents traffic calming as a method to reduce the speed and/or volume of non-local traffic infiltrating into neighbourhoods. This City of Courtenay Traffic Calming Policy conforms to the fundamental principles, traffic calming measures, introduction and implementation processes, engineering designs and other significant guidelines outlined within the Guide. This can guarantee that the municipality adheres to nationally recognized standards and best practices.

Manual of Uniform Traffic Control Devices for Canada, Sixth Edition (MUTCD) published in 2021 guides the uses of road signs, traffic signals, pavement markings and other devices that inform travellers about road regulations, hazards, and temporary conditions. The design and placement of traffic calming devices in Courtenay will adhere to the relevant guidance in MUTCD, ensuring conformity with prescribed standards for the design, dimensions, and application of such devices.

Manual of Standard Traffic Signs & Pavement Markings (2020) was published by BC Ministry of Transportation and Highways and is in general conformance with the MUTCD and MVA Regulation. The Manual is a document that outlines the polices, specifications, standards, and guidelines for traffic signs utilized in the province. The design and implementation of traffic calming measures in Courtenay will adhere to the Manual guidelines such as design, placement, sign posts and bases, overhead signs, maintenance, sign supply, regulatory signs, warning signs, guide signs, school and pedestrian signs, information signs and pavement markings. This adherence to the Manual enables a standardized and consistent traffic calming policy and strategy in Courtenay.

BC Active Transportation Design Guide – 2019 Edition was developed under the direction of BC Ministry of Transportation and Infrastructure. The Guide is a comprehensive set of planning and engineering guidelines offering recommendations for the planning, selection, design, implementation, and maintenance of active transportation facilities across the province, concerning pedestrian facilities, cycling facilities, multi-use facilities, intersections & crossings and amenities, etc. The Guide emphasizes the importance of designing streets that prioritize the safety and comfort of all road users. The guide underscores the significance of traffic calming as a strategy to facilitate active transportation and offers guidance on the implementation of various traffic calming techniques.

Vision Zero and the Safe System Approach: A Primer for Canada (2023) was published by TAC to establish clear definitions and principles to promote greater understanding of key concepts, and to support the development, identification and sharing of Canadian best practices. Vision Zero is the philosophy that road fatalities and serious injuries can and should be eliminated while providing safe, healthy, and equitable mobility for all road users. Vision Zero and the Safety System Approach involves safe speeds, safe road users, safe vehicles, safe road design, post-crash care and safe land use planning. In alignment with the Vision Zero and Safe System Approach, implementing traffic calming measures in Courtenay could effectively mitigate the underlying causes of local traffic collisions. By cultivating a road environment that is inherently forgiving and places a paramount emphasis on safety, the implementation of traffic calming in Courtenay will help realize the Vision Zero goal of eliminating fatalities and serious injuries in road traffic for the community.

Complete Streets: Making Canada's Roads Safer for All (2009) was released by Government of Canada at the federal level. A set of guidelines on Complete Streets have been developed by different municipalities. Complete Streets are streets for everyone, designed and operated to enable safe access for all users and create better communities for people to move, live, play, work, and shop. As an important concept tied to traffic calming, Complete Streets incorporate many of the key principles and features of traffic calming such as traffic speed and volume reduction, collision mitigation and overall road safety improvement. The goal of implementing complete streets and traffic calming is to establish a well-balanced and multi-modal transportation environment that caters to various modes of transportation, including pedestrians, cyclists, public transit users, and motorists of all ages and abilities, while promoting safe and convenient mobility for all residents and visitors in Courtenay.

9.0 Traffic Calming Monitoring and Evaluation Framework

The City will continue to monitor and examine the traffic calmed area for a few years following implementation of the traffic calming plan by collecting 'before' and 'after' data and information.

The designated Traffic Calming Evaluation Framework (Table 4) serves as a tool for assessing the effectiveness of various traffic calming measures, rather than functioning as a definitive warrant on their success. It is designed to compile records detailing the efficacy of different measures. These evaluation records will serve as important future references, helping to identify which traffic calming measures are more effective in addressing specific traffic calming issues within the context of Courtenay. Meanwhile, the evaluation framework can inform decisions on potential modifications of the implemented traffic calming measures and the need for additional complementary measures or remedies.

In addition, for traffic calming plans that suggest a phased approach with different levels of treatments implemented as required, this monitoring will allow the City to confirm when the volumes and speeds have returned to an acceptable level.

City staff will evaluate the implemented traffic measures based on the following framework as required and as resources allow. It is important to emphasize that the framework offers broad guidance and ought to be tailored and crafted on a case-by-case basis, taking into account the unique characteristics of the traffic calming location and the availability of data.

TABLE 4. CITY OF COURTENAY TRAFFIC CALMING EVALUATION FRAMEWORK

Feature	Criteria	Measurement	Preferred Long Term Effects
Traffic Performance	85th percentile speed change	Whether there is a reduction in vehicle's 85th percentile speed on the subject traffic calmed roadway and the reduction magnitude calculated from the collected speed data. • 'Before' 85th percentile speed: ___ km/h. • 'After' 85th percentile speed: ___ km/h. • 85th percentile speed reduction: ___ km/h ('Before' minus 'After').	Reduced and refined speed profiles, characterized by a lower 85th percentile speed, diminished percentages of high-end speeders, and increased compliance with the posted speed limit will lead to enhanced road safety in the traffic calmed neighbourhood. It is expected to result in a decrease in both the frequency and severity of collisions, contributing to improved safety of all road users, especially pedestrians and cyclists. In the long term, the neighbourhood will enjoy a more enjoyable and livable environment and sustained health improvements through traffic speed reduction.
	High-end speeder percentage change	Whether there is a reduction in the percentage of high-end speeders (i.e., driving more than 10 km/h over the posted speed limit) on the subject traffic calmed roadway and the reduction magnitude calculated from the collected speed data. • 'Before' high-end speeder percentage: ___ %. • 'After' high-end speeder percentage: ___ %. • High-end speeder percentage reduction: ___ % ('Before' minus 'After').	
	Speed limit compliance percentage change	Whether there is an increase in the percentage of drivers complying with the posted speed limit (i.e., driving equal to or below the posted speed limit) on the subject traffic calmed roadway and the increase magnitude calculated from the collected speed data. • 'Before' speed limit compliance percentage: ___ %. • 'After' speed limit compliance percentage: ___ %. • Speed limit compliance increase: ___ % ('After' minus 'Before').	

Feature	Criteria	Measurement	Preferred Long Term Effects
Traffic Performance	Traffic volume change (subject roadway)	Whether there is a reduction in motor vehicle volume (daily or specific hours of the day) on the subject traffic calmed roadway and the reduction magnitude calculated from the collected volume data. • 'Before' traffic volume: ___. • 'After' traffic volume: ___. • Traffic volume reduction: ___ ('Before' minus 'After').	Reducing traffic volume and deterring shortcutting can enhance road safety by minimizing motor traffic exposures in the neighborhood. It not only lessens the negative environmental impacts of motor traffic but also promotes active transportation in the long-term, contributing to the improved health and well-being of the community. Furthermore, it makes streets more accessible to people of all ages and abilities, fostering a safer and inclusive community.
	Traffic volume change (adjacent street)	Whether there is a significant increase in motor vehicle volume (daily or specific hours of the day) on the adjacent roadway. If that is the case, the implemented traffic calming measures may have triggered a traffic displacement effect, leading to an increase in traffic on the surrounding roadways. • 'Before' traffic volume: ___. • 'After' traffic volume: ___. • Traffic volume change: ___ ('Before' minus 'After').	
	Shortcutting traffic percentage change	Whether there is a reduction in shortcutting traffic percentage on the subject traffic calmed roadway and the reduction magnitude calculated from the collected volume data. • 'Before' shortcutting traffic percentage: ___ % • 'After' shortcutting traffic percentage: ___ % • Shortcutting traffic percentage reduction: ___ % ('Before' minus 'After').	

Feature	Criteria	Measurement	Preferred Long Term Effects
Traffic Safety	Collisions involving motor vehicles only	Whether there is a reduction in motor vehicle collisions on the subject traffic calmed roadway and the number of collisions reduced in a specific period (e.g., yearly, 3 years, 5 years). • 'Before' motor vehicle collision frequency: ___. • 'After' motor vehicle collision frequency: ___. • Motor vehicle collision frequency reduction: ___ ('Before' minus 'After').	The decrease in road collisions, particularly those involving VRUs, directly correlates with the enhancement of traffic safety in the neighborhood due to traffic calming measures. This, in turn, establishes an environment more friendly to active transportation. These benefits collectively contribute to the long-term well-being and improved quality of life for residents in the community.
	Collisions involving vulnerable road user (VRU)	Whether there is a reduction in vehicle-VRU collisions on the subject traffic calmed roadway and the number of collisions reduced in a specific period (e.g., yearly, 3 years, 5 years). • 'Before' vehicle-VRU collision frequency: ___. • 'After' vehicle-VRU collision frequency: ___. • Vehicle-VRU collision frequency reduction: ___ ('Before' minus 'After').	

Feature	Criteria	Measurement	Preferred Long Term Effects
People Friendly and Liveable Community	Environmental impacts & public health impacts	Whether the survey residents perceive an overall improvement in community livability and quality of life subsequent to the implementation of traffic calming measures.	The survey results are considered preferable if they indicate a perceived improvement in the neighborhood attributed to traffic calming measures, including: • Enhancement in livability and quality of life. • Improvement in traffic safety. • Decrease in traffic noise level. • Improvement in air quality with reduced traffic pollution. • A more friendly environment for active transportation. • A greater preference for alternative transportation modes other than motor vehicles.
		Whether the surveyed residents agree that they feel safer in terms of traffic safety following the implementation of the specified traffic calming measure.	
		Whether the surveyed residents agree that the implemented traffic calming measure has helped decrease the traffic noise level within the community.	
		Whether the surveyed residents perceive that the air qualify (e.g., less gasoline smells) is improved following the implementation of traffic calming.	
		Whether the surveyed residents agree that the community has a more friendly environment for active transportation, e.g., walking and cycling, after the implementation of traffic calming measures.	
		Whether the surveyed residents express a greater preference for alternative transportation modes, such as walking, cycling, and public transportation, after the implementation of traffic calming measures.	

10.0 Traffic Calming Toolbox

The traffic calming toolbox of the City encompasses a wide range of broadly applied and proven traffic calming measures in five categories, horizontal deflection, vertical deflection, roadway narrowing, obstruction, and signage and pavement markings. The City will carefully assess, choose, and implement appropriate traffic calming measures for specific traffic calming locations. Specifications regarding each traffic calming measure incorporated in the toolbox can be found in Appendix C.

TABLE 5. CITY OF COURTENAY TRAFFIC CALMING TOOLBOX

TRAFFIC CALMING MEASURES	POTENTIAL INFLUENCES				
	Speed Reduction	**Volume Reduction**	**Collision Reduction**	**Traffic Movement Disruption**	**Cost Per Measure**
1. HORIZONTAL DEFLECTION					
Chicane	●	◖	○	◖	Medium-High
Lateral Shift	●	○	○	◖	High
Traffic Circle	●	◖	●	●	Medium-High
Mini Roundabout	●	○	●	●	High
Corner Extension	◖	○	○	◖	Medium-High
2. VERTICAL DEFLECTION					
Speed Table	●	◖	●	●	Low
Speed Cushion	●	◖	●	◖	Low
Speed Kidney	●	○	○	◖	Low-Medium
Raised Crosswalk	●	◖	●	◖	Low-Medium
Raised Intersection	◖	○	●	◖	High
3. ROADWAY NARROWING					
Curb Bulge	●	○	○	◖	Medium-High
Raised Median Island	●	○	○	◖	High
Lane Narrowing	◖	○	○	◖	Low
On-Street Parking	◖	◖	○	◖	Low

TRAFFIC CALMING MEASURES	POTENTIAL INFLUENCES				
	Speed Reduction	**Volume Reduction**	**Collision Reduction**	**Traffic Movement Disruption**	**Cost Per Measure**
4. OBSTRUCTION					
Half Street Closure	◖	●	●	●	Low-High
Diagonal Diverter	◖	●	●	●	Medium
Median Barrier & Forced Right-In/Right-Out Island	○	●	●	●	Low-High
Intersection	○	●	●	●	High
5. SIGNAGE AND PAVEMENT MARKING (SHOULD BE SUPPLEMENTED WITH ENFORCEMENT)					
Traffic Calming Sign	◖	○	○	○	Low
Pavement Treatment and Marking	◖	○	○	○	Low
Speed Display Device	◖	○	○	○	Low-Medium
	● **Major Reduction**			● **Major Disruption**	
	◖ **Minor Reduction**			◖ **Minor Disruption**	
	○ **Neglectable Impact**				

Note: The effects of traffic calming measures outlined in this table serve as broad guidelines. The actual impact of each traffic calming measure at a particular location may vary based on distinct characteristics and contextual factors. It is advisable to conduct case-specific analyses to assess the influence of traffic calming measures when implementing them.

The Traffic Movement Disruption column considers pedestrian and cyclist movement, emergency response, and roadway maintenance.

Road gradient should not exceed 6% for traffic calming measures to be applicable.

APPENDIX A – Traffic Calming Request Form

CITY OF COURTENAY TRAFFIC CALMING REQUEST FORM

The goal of traffic calming is to make our streets safer for people to bike, walk and drive. Traffic calming makes physical changes to the roadway, such as horizontal shifts (curb extensions, chicanes) and vertical shifts (raised crosswalks and intersections). It helps reduce speeding and enhances the quality of life by making the street more comfortable for all users. If you would like to get more information about traffic calming in Courtenay, such as a more detailed description of traffic calming and the various tools and techniques available, please visit our website at www.courtenay.ca. For questions, please call: Tel: 250-338-1525, Fax: 250-338-1526 or email: operations@courtenay.ca.

Traffic Calming Request Form Directions: Please fill out this form, then mail to the City of Courtenay, Operational Services. This form can also be filled out online by going to the traffic calming section of our website at operations@courtenay.ca. By using this form, you could help us discover, review, and address the traffic issues or concerns you are having within your neighbourhood. We will then gather necessary data such as speed and volume. If your request passes the City's initial review, we will proceed the traffic calming process for the specific location.

City staff will evaluate the implemented traffic measures based on the following framework as required and as resources allow. It is important to emphasize that the framework offers broad guidance and ought to be tailored and crafted on a case-by-case basis, taking into account the unique characteristics of the traffic calming location and the availability of data.

1. Please provide your contact information. The contact person will be kept informed of the status of the traffic calming.

Full Name:	Street Address:
Email Address:	Phone: Day: Night: Cell:

2. Please specify the street location that concerns you most regarding traffic problems. (_____between_____and_____)

3. At what time of day is your concerns most noticeable?

4. Please check applicable item(s) that aligns with your concerns on the specified street:

[ ] Speeding [ ] Traffic Volume [ ] Cut-through Traffic [ ] Oversize Vehicles

[ ] Collision Concerns [ ] Aggressive Driver/Driving Behaviour

[ ] Bicycle Safety [ ] Pedestrian Safety [ ] Children & Elder Safety

[ ] Noise [ ] Air Pollution

[ ] Other:_____

Brief Description of Concerns:

5. Are you aware of others who live on the same street in your neighbourhood who share your concerns?

6. Any perceived risks and hazards to pedestrians, cyclists, residents or property as the result of the traffic problem?

7. Please use this space to provide additional information that you feel will be helpful. It may be useful to draw a picture (or provide a photo) to more clearly identify the issues you would like to see addressed.

8. Is a petition attached: [ ] Yes [ ] No

Please return completed form to:

City of Courtenay, Operational Services

Address:	1000 Piercy Avenue, Courtenay, BC, V9N 3E6
Phone:	250-338-1525
Fax:	250-338-1526
Email:	operations@courtenay.ca

APPENDIX B – Traffic Calming Petition Form

CITY OF COURTENAY TRAFFIC CALMING PETITION LETTER

Please read before signing petition

The City of Courtenay has supplied this petition to a concerned resident who is interested in initiating a traffic calming review at the following location:

_____

street name and extends (from/to)

To initiate a review of whether or not the above-noted street warrants traffic calming, a petition, indicating the community support, is required. The City of Courtenay has provided the attached copy of the traffic calming petition and the City's Traffic Calming Policy to the resident initiating the request for a review. The focus of the petition is to determine if there is enough support from adjacent residents for City staff to proceed the traffic calming process on the above-noted roadway.

By signing this petition,

- You agree to have traffic calming measure(s) installed in front your residence/business if deemed the most appropriate solution for the investigated traffic problems.
- Your signature here counts as a "yes" vote.
- You will have additional opportunities in the future to voice your opinions on the City's proposed traffic calming measure(s) through our Public Meeting & Public Inputs and Community Support Survey process.

#	Print Name	Sign (agree to statements above)	Address (only one signature is required per unit)	Contact (phone/email address)

Please return completed form to:

City of Courtenay, Operational Services

Address: 1000 Piercy Avenue,
Courtenay, BC, V9N 3E6

Phone: 250-338-1525

Fax: 250-338-1526

Email: operations@courtenay.ca

APPENDIX C – Traffic Calming Toolbox

Traffic Calming Toolbox

1. Horizontal Deflection

Chicane

A chicane is a series of alternating curves or lane shifts that are located in a position to force a motorist to steer back and forth out of a straight travel path. The purpose of a chicane is to discourage shortcutting or through traffic can reduce overall speeds by forcing the lateral shifting of vehicles through the chicane. The chicane curves can be created with a curb extension that alternates from one side of the street to the other.

Figure 1. Sample Application of Chicane[1, 2]

The potential application effects of chicanes include:

- **Vehicle Speed:** Slow traffic by encouraging a motorist to moderate vehicle speed through a series of horizontal deflections; amount of speed reduction (or the final speed) depends on the length of the alignment shift, as well as the volume and distribution of traffic.
- **Traffic Volume:** Minor traffic diversion effect from the street.
- **Collision Reduction:** Not directly contribute to collision reduction.
- **Active Transportation:** Narrow the travel way and force cyclists and motor vehicles to share travel lane. No impact on the pedestrian movement.
- **Emergency Services:** Minor negative impact on emergency services by slowing down response time.
- **Road Maintenance:** May create minor constraints and challenges for snow plowing and removal, street sweeping, and drainage elements.

Lateral Shift

A lateral shift is a realignment of an otherwise straight street that causes travel lanes to shift in one direction. Lateral shifts can be created by pavement markings or curb extensions. This effect can also be achieved with the use of a central island. A lateral shift forces drivers to negotiate the alignment and increase drivers' awareness to reduce vehicle speeds. To be noted, chicanes can be treated as a variation of a lateral shift that shifts alignment more than once.

[1] Traffic Calming Fact Sheets - Chicane (ite.org)

[2] Module 3: Toolbox of Individual Traffic Calming Measures Part 1 | FHWA (dot.gov)

Figure 2. Sample Application of Lateral Shift[3]

The potential application effects of lateral shifts include:

- **Vehicle Speed:** Slow traffic by encouraging drivers to reduce speed through the horizontal deflection. The amount of speed reduction (or the final speed) depends on the length of the alignment shift, as well as the volume and distribution of traffic.
- **Traffic Volume:** Negligible traffic diversion effect from the street.
- **Collision Reduction:** Not directly contribute to collision reduction.
- **Active Transportation:** The shift may have a negative impact on the movement of cyclists. There is no impact on pedestrian movement.
- **Emergency Services:** Minor negative impact on emergency services by slowing down response time.
- **Road Maintenance:** May create minor constraints and challenges for snow plowing and removal, street sweeping, and drainage elements.

Traffic Circle

A traffic circle is a raised island, placed within an unsignalized intersection, around which traffic circulates in a counterclockwise direction. A circle forces a motorist to use reduced speed when entering and passing through an intersection, whether the vehicle path is straight through or involves a turn onto an intersecting street. A traffic circle can have stop signs or yield signs on the intersection approaches. The primary benefit of a traffic circle is an expected reduction in the number of angle and turning collisions. An additional benefit is that it can slow high-speed traffic at the intersection. A traffic circle can simply be a painted area, but it is most effective when it is defined by a raised curb and landscaped to further reduce the open feel of a street. A traffic circle can be landscaped with ground cover, flowers, and street trees.

[3] Module 3: Toolbox of Individual Traffic Calming Measures Part 1 I FHWA (dot.gov)

Figure 3. Sample Application of Traffic Circle[4]

The potential application effects of traffic circles include:

- **Vehicle Speed:** Slow traffic entering and passing the traffic circle.
- **Traffic Volume:** Could reduce traffic volume on a street especially when placed in series.
- **Collision Reduction:** Can help reduce vehicle-vehicle conflicts at intersections.
- **Active Transportation:** May force motor vehicle into pedestrian crossing area. Cyclists and motor vehicles may be forced to share travel lane within the traffic circle.
- **Emergency services:** Emergency response could be delayed by the traffic circle when passing through the traffic circle.
- **Road Maintenance:** Can create minor constraints and challenges for snow plowing, snow removal and street sweeping.

Mini Roundabout

A roundabout is an intersection design that contrasts with designs that require traffic signal control or stop control. A roundabout is often used as a replacement for a signalized intersection. It requires approaching motorists yield to motorists already in the roundabout and slow down to a speed that allows them to comfortably maneuver around.

Roundabouts are also expected to help reduce the number of angle and turning collisions. A mini roundabout, sometimes called traffic button, is appropriate at the intersection of lower classification streets (i.e., collector and local streets) for traffic calming purposes. A traffic button is a raised island, placed within an unsignalized intersection, around which traffic circulates. The center island of a traffic button is usually fully traversable.

[4] City of Courtenay

Figure 4. Sample Application of Mini-Roundabout[5, 6]

The potential application effects of mini roundabouts include:

- **Vehicle Speed:** Slow traffic entering and passing the roundabout.
- **Traffic Volume:** Negligible traffic diversion from the street when applied as a single traffic calming treatment.
- **Collision Reduction:** Can help reduce vehicle-vehicle conflicts at intersections.
- **Active Transportation:** May force motor vehicle into pedestrian crossing area. Cyclists and motor vehicles may have to share travel lane within the roundabout.
- **Emergency Services:** Negligible effect on emergency response time as islands are traversable. It is important to design mini roundabouts to accommodate the turning radius of the Fire Department's largest piece of apparatus (Tower 12), as shown on the following page.
- **Road Maintenance:** Can create minor constraints and challenges for snow plowing, snow removal and street sweeping.

Corner Extension

A curb extension is a horizontal extension of the sidewalk into the street resulting in a narrower roadway section and reduced turning radius. This device may be used at intersection corners (a curb extension located midblock is called a curb bulge). Its primary purpose is to "pedestrianize" an intersection and slow down right-turning vehicles.

[5] Traffic Calming Fact Sheets - Mini Roundabout / Small Modern Roundabout (ite.org)

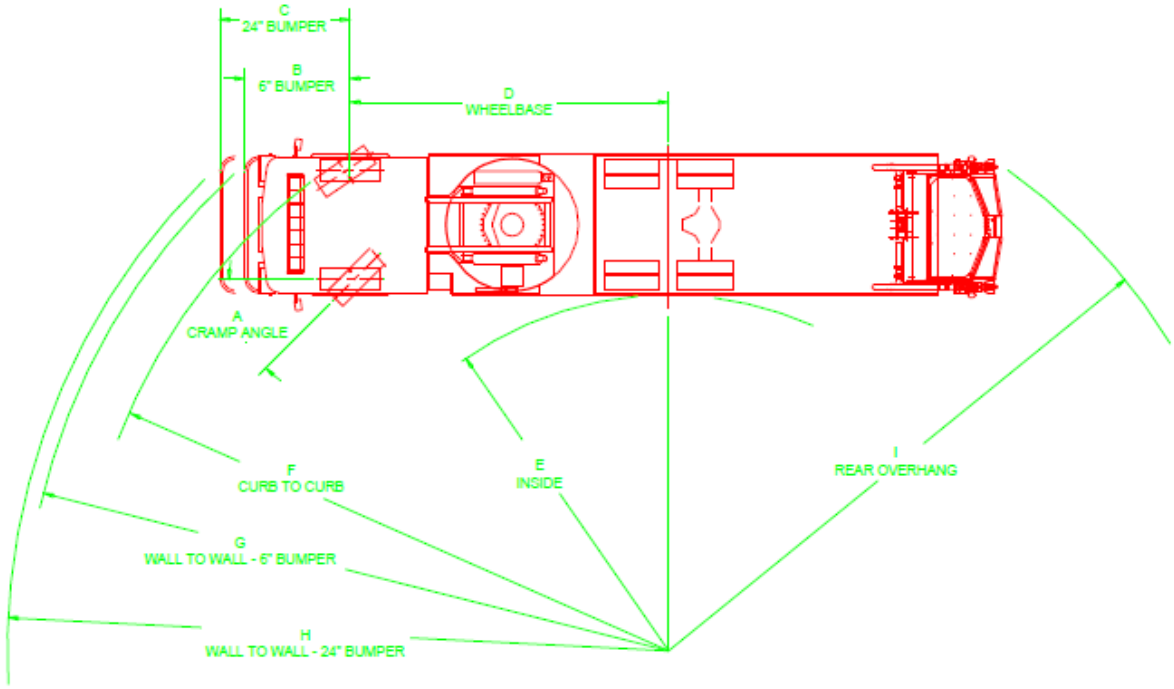
[6] City of Courtenay

CTB-1510 TURNING RADIUS DATA

Aerial Tower - 236" Wheel Base

Components

Chassis Sutphen 2011 Aerial Tower



Parameters

A	Cramp Angle (maximum)	42 deg. 425 Tires
B	Front Overhang 6" Bumper	76"
C	Front Overhang 24" Bumper	94"
D	Wheelbase	236"

Calculated Results

E	Inside Turning Radius	20'-11"
F	Curb to Curb	34'-4"
G	Wall to Wall 6" Bumper	39'-3"
H	Wall to Wall 24" Bumper	40'-3"
I	Rear Overhang Swing	35'

Cramp Angle may vary due to vehicle configuration.
Curb to Curb based on a 9" curb

Figure 5. Sample Application of Curb Extension[7]

The potential application effects of corner extensions include:

- **Vehicle Speed:** Can slow traffic by funneling through narrower street opening. The shorter curb radius can also help slow turning vehicles.
- **Traffic Volume:** Has negligible effect on traffic volumes.
- **Collision Reduction:** Not directly contribute to collision reduction.
- **Active Transportation:** Enhance pedestrian mobility and safety by shortening crossing distance, providing additional queuing space, and improving line-of-sight. May impede cyclists and should not extend into a bicycle lane.
- **Emergency Services:** Sufficient width is required to allow for continued easy flow of emergency vehicles. Shortened curb radius may require emergency vehicle turning at intersection to swing across centerline.
- **Road Maintenance:** Can create constraints and challenges for snow plowing, snow removal, and street sweeping. Relocation of curbing and pedestrian queuing area may require relocation of drainage features.

2. Vertical Deflection

Traffic calming measures, such as speed humps, speed tables, speed cushions, raised crosswalks, and raised intersections, are designed to reduce vehicle speeds and enhance safety for pedestrians and cyclists in residential and urban areas. These features alter road geometry to encourage drivers to slow down and pay closer attention to their surroundings. However, it is important to note that if a road has a gradient exceeding 6%, vertical deflection measures will not be installed. This condition ensures that emergency response vehicles can navigate the area safely and efficiently, preventing potential delays in critical situations.

Speed Hump / Speed Table

A speed hump is an elongated mound in the roadway pavement surface extending across the travel way at a right angle to the traffic flow. At typical travel speeds along a residential street or in a small commercial business district, a speed hump produces sufficient discomfort to a motorist driving above the speed hump design speed to discourage speeding. It encourages the motorist to travel at a slow speed both upstream and downstream of as well as over the speed hump. Speed humps should be used for local roads facing excessive short cutting and/or speeding.

[7] Module 3: Toolbox of Individual Traffic Calming Measures Part 2 | FHWA (dot.gov)

Figure 6. Sample Application of Speed Hump [8, 9]

A speed table is a raised area placed across the roadway designed to physically limit the speed at which a vehicle can traverse it. Like a speed hump, it extends across the travel way. Unlike a speed hump, a speed table has a long enough flat top, typically 3 metres to accommodate the entire wheelbase of most passenger cars. The longer longitudinal depth in the direction of travel enables comfortable and safe vehicle operating speeds that are faster than for a speed hump. It is worth noting that when a speed table is designated as a crosswalk through the use of striping, it is known as a raised crosswalk.

Figure 7. Sample Application of Speed Table[10, 11]

The potential application effects of speed humps and tables include:

- **Vehicle Speed:** Speed humps and tables can help reduce vehicle speed effectively.
- **Traffic Volume:** As single installation, there is minor traffic diversion from the street. A series of speed humps and/or speed tables could be more effective in reducing traffic volume.
- **Collision Reduction:** Demonstrated overall effectiveness in reducing collisions.
- **Active Transportation:** Not directly correlated to pedestrian movement. Negative impact on the movement of cyclists especially when travelling at high speeds.
- **Emergency Services:** Negative impact on emergency services by significantly slowing down response time and impacting the comfort of patients being transported. It is important to highlight that speed humps/tables are typically not approved by the City's emergency services.
- **Road Maintenance:** Can create constraints and challenges for street sweeping, snow plowing and snow removal. Drainage elements needs to be properly designed to avoid flooding.

[8] Traffic Calming Fact Sheets - Speed Hump (ite.org)

[9] City of Courtenay

[10] Traffic Calming Fact Sheets - Speed Table/Raised Crosswalks (ite.org)

[11] Module 3: Toolbox of Individual Traffic Calming Measures Part 2 | FHWA (dot.gov)

Speed Cushion

A speed cushion consists of two or more raised areas placed laterally across a roadway. The height and length of the raised areas are comparable to the dimensions of a speed hump. The primary difference is that a speed cushion has gaps (often referred to as "cutouts") between the raised areas to enable a vehicle with a wide track (e.g., a large emergency vehicle, some trucks, some buses) to pass through the feature without any vertical deflection. A speed cushion is often a preferred alternative to a speed hump on a primary emergency response route or on a transit route with frequent service. The cutouts in the speed cushions are also positioned such that a passenger vehicle cannot pass it without travelling over a portion of the raised pavement. Installation of speed cushions should be limited to commercial areas, parks, and school zones.

Figure 8. Sample Application of Speed Cushion[12]

The potential application effects of speed cushions include:

- **Vehicle Speed:** Speed cushions can help reduce vehicle speeds effectively.
- **Traffic Volume:** As single installation, there is minor traffic diversion from the street. A series of speed cushions could be effective in reducing traffic volume.
- **Collision Reduction:** Demonstrated overall effectiveness in reducing collisions.
- **Active Transportation:** Not directly correlated to pedestrian movement. No significant impact on the movement of cyclists as they can pass through the speed cushion gaps.
- **Emergency Services:** Compared to speed humps, speed cushions are more friendly to firetrucks as larger vehicles can straddle the cushions. Speed cushions can still pose challenges for police cars and ambulances, as their vehicles are narrower and require them to slow down when crossing them.
- **Road Maintenance:** Can create constraints and challenges for street sweeping, snow plowing and snow removal. Drainage elements needs to be properly designed to avoid flooding.

[12] Module 3: Toolbox of Individual Traffic Calming Measures Part 2 | FHWA (dot.gov)

Raised Crosswalk

A raised crosswalk is a variation of a flat-topped speed table. A raised crosswalk is marked and signed as a pedestrian crossing. The height of a raised crosswalk is typically 7.5-15.0 cm above the street level, and it is common for a raised crosswalk to be level with the street curb. This height increases the visibility of a pedestrian in a crosswalk to a motorist and it also improves the line of sight for a pedestrian toward an oncoming vehicle. The 3-metre flat top on a typical speed table conforms to a desired crosswalk width. A raised crosswalk can improve pedestrian safety by decreasing motorist speed at the crossing.

Figure 10. Sample Application of Raised Crosswalk[14, 15]

The potential application effects of raised crosswalks include:

- **Vehicle Speed:** Like speed table, raised crosswalks can help reduce vehicle speed effectively.
- **Traffic Volume:** As single installation, there is minor traffic diversion from the street. A series of raised crosswalks could be more effective in reducing traffic volume.
- **Collision Reduction:** Could be effective in reducing vehicle-pedestrian/cyclist collisions.
- **Active Transportation:** Pedestrian movement and safety improved because vehicle speed is lowered at crosswalk, pedestrian in a raised crosswalk is more visible to an oncoming motorist and pedestrian has an elevated view of oncoming traffic. Cyclists are not anticipated to be affected.
- **Emergency Services:** Negative impact on emergency services by slowing down response time and impacting the comfort of patients being transported.
- **Road Maintenance:** Can create constraints and challenges for street sweeping, snow plowing and snow removal. Drainage elements needs to be properly designed to avoid flooding.

[14] City of Courtenay

[15] Module 3: Toolbox of Individual Traffic Calming Measures Part 2 | FHWA (dot.gov)

Raised Intersection

A raised intersection a flat, raised area covering the entire intersection with ramps on all approaches. A raised intersection reinforces the need for a motorist to drive cautiously and be wary of crossing pedestrians. A raised intersection typically rises to sidewalk level. It is essentially a speed table that covers an entire intersection, including the crosswalks. A raised intersection is especially applicable in a dense urban area, with the advantage of calming two streets at once. A typical installation is at a signal-controlled or all-way stop-controlled intersection with a large volume of street-crossing pedestrians.

Figure 11. Sample Application of Raised Intersection[16, 17]

The potential application effects of raised intersections include:

- **Vehicle Speed:** Can help reduce the speed of vehicles driving through intersection.
- **Traffic volume:** There is negligible impact on traffic volume.
- **Collision Reduction:** Could be effective in reducing vehicle-pedestrian/cyclist collisions.
- **Active Transportation:** Crossing pedestrians and cyclists' safety is improved.
- **Emergency Services:** May have a minor negative effect on emergency service response time.
- **Road Maintenance:** Negligible impact on street sweeping, snow plowing or snow removal. But may cause the need to relocate drainage elements.

[16] Traffic Calming Fact Sheets - Raised Intersection (ite.org)

[17] Module 3: Toolbox of Individual Traffic Calming Measures Part 2 | FHWA (dot.gov)

3. Roadway Narrowing

Curb Bulge (Choker)

A curb bulge is the narrowing of a roadway through the use of curb extensions or roadside islands. It can be created by a pair of curb extensions at a midblock location that narrows the street by widening the sidewalk or planting strip at that location. This narrowing is intended to discourage motorist speeding and to reduce vehicle speeds in general.

A curb bulge can be combined with on-street parking to create a protected parking bay. Landscaping on a curb bulge can make the traffic calming feature attractive and can make it more visible to the motorist. In addition, a curb bulge may be a good location to place a midblock crosswalk (either level with the roadway or as a raised crosswalk) because it shortens the distance pedestrian walking on the travel way.

Figure 12. Sample Application of Curb Bulge[18, 19]

The potential application effects of curb bulges include:

- **Vehicle Speed:** Slow traffic by providing a narrower street.
- **Traffic Volume:** Has negligible effect on traffic volumes.
- **Collision Reduction:** Not directly contribute to collision reduction.
- **Active Transportation:** Shorten crossing distance for pedestrians which could improve pedestrian safety. May reduce travel way width and force cyclists and motor vehicles to share the same travel lane.
- **Emergency Services:** Negligible impact on emergency service response.
- **Road Maintenance:** Can create some constraints and challenges for snow plowing, snow removal, street sweeping and drainage elements.

[18] Traffic Calming Fact Sheets - Choker (ite.org)
[19] City of Courtenay

Raised Median Island

A median island is a raised island located along the street centerline that narrows the travel lanes to encourage a motorist to slow. A median island is most effective when it is defined by a raised curb and landscaped to further reduce the open feel of a street. A raised median island can often be treated as a pedestrian refuge island if a cut in the island is provided along a marked crosswalk. When placed at or near to the entrance of a neighborhood, a median island provides a visual cue to motorists about the preferred vehicle speed and if a median island has a monument sign or textured pavement on either side, it can serve as a gateway or entry feature.

Figure 13. Sample Application of Median Island (Mid-Block – Left, Neighbourhood Entrance – Middle, With Crosswalk – Right)[20, 21]

The potential application effects of raised median islands include:

- **Vehicle Speed:** Can slow traffic by narrowing roadway width.
- **Traffic Volume:** Has negligible effect on traffic volumes.
- **Collision Reduction:** Not directly contribute to collision reduction.
- **Active Transportation:** Can shorten crossing distance for pedestrians and serve as pedestrian refuge island. May force cyclists to share travel lane with motor vehicles.
- **Emergency Services:** Sufficient roadway width is required; otherwise, emergency vehicles could be obstructed.
- **Road Maintenance:** Can create some constraints and challenges for snow plowing, snow removal, and street sweeping.

[20] Module 3: Toolbox of Individual Traffic Calming Measures Part 3 | FHWA (dot.gov)
[21] City of Courtenay

Lane Narrowing

Lane narrowing is the process of reducing lane widths using pavement markings or other features, for example, bicycle lanes, street beautification programs, pavement texture, delineators. The intention is for drivers to perceive the roadway to be less comfortable at higher speeds due to the narrowing of the lanes and ultimately reduce operating speeds.

Figure 14. Sample Application of Lane Narrowing[22, 23]

The potential application effects of lane narrowing include:

- **Vehicle Speed:** Can help slow traffic by reducing travel lane width.
- **Traffic Volume:** Has negligible effect on traffic volumes.
- **Collision Reduction:** Not directly contribute to collision reduction.
- **Active Transportation:** No impact on pedestrians. May force cyclists to share travel lane with motor vehicles.
- **Emergency Services:** Negligible impact on emergency service response.
- **Road Maintenance:** Negligible impact on roadway maintenance operations.

On-Street Parking

On-street parking can effectively narrow the roadway travel lanes by adding side friction to the traffic flow, which can help reduce speeds and short-cutting traffic. On-street parking can be allowed on one or both sides of a roadway (parking zones can also be strategically located on alternate sides of a roadway to create a chicane effect). Whether on-street parking can be an appropriate traffic calming measure is a direct function of its actual or potential usage (i.e., parking demand). It is worth noting that angled parking is not appropriate as a traffic calming measure, due to the increased potential for conflicts.

[22] Countermeasures | FHWA (dot.gov)
[23] City of Courtenay

Figure 15. Sample Application of On-Street Parking[24]

The potential application effects of on-street parking include:

- **Vehicle Speed:** Slow traffic by reducing effective travel lane width. The speed reduction effect depends on the utilization of on-street parking.
- **Traffic Volume:** Has a minor effect in reducing traffic volumes.
- **Collision Reduction:** Not directly contribute to collision reduction.
- **Active Transportation:** Overall negative impacts on pedestrians and cyclists. The visibility of pedestrians walking around parked vehicle and crossing the street could be reduced. The hazard of cyclists riding around opened car doors could also be a problem.
- **Emergency Services:** Parked cars, particularly lining both sides of a narrow street, can pose challenges for the fire department when extending the tower from the firetruck's bed.
- **Road Maintenance:** Can create some constraints and challenges for roadway maintenance operations because parked vehicles may obstruct street sweeping, catch basin cleaning, and snow removal.

[24] Module 3: Toolbox of Individual Traffic Calming Measures Part 3 | FHWA (dot.gov)

4. Obstruction

Half Street Closure (Directional Closure)

A half street closure is a physical barrier that blocks vehicle travel in one direction (i.e., creates a one-way street) for a short distance on an otherwise two-way street. A half closure can block either traffic entering the side street (i.e., the traffic calmed street) or exiting the side street, depending on its placement. The traffic movement that is obstructed by the half closure is rerouted along an alternative path. A half closure is designed to deter illegal maneuvers around the measure. A typical application has the half closure extend to the street centerline, leaving a relatively tight opening for a wrong-way motorist. In some applications, bicyclist and pedestrian traffic can be accommodated through the closure on a path built behind the vehicle barrier.

Figure 16. Sample Application of Half Street Closure[25, 26]

The potential application effects of half street closures include:

- **Vehicle Speed:** Reduce traffic speed due to the narrowed pavement width through road closure.
- **Traffic Volume:** All traffic in one direction is prevented from using the street and is diverted to parallel streets.
- **Collision Reduction:** Could be effective in reducing vehicle-pedestrian/cyclist collisions by mitigating exposures.
- **Active Transportation:** The safety and mobility of pedestrians and cyclists improves with the restriction of motor vehicle access.
- **Emergency Services:** There could be a minor negative impact on emergency vehicles. Emergency response vehicles can maneuver around a half closure when responding to an emergency providing sufficient road width is maintained.
- **Road Maintenance:** May complicate road maintenance, but in general, maintenance vehicles can maneuver around a half closure.

[25] City of Courtenay

[26] Module 3: Toolbox of Individual Traffic Calming Measures Part 3 | FHWA (dot.gov)

Diagonal Diverter

A diagonal diverter is a physical barrier placed diagonally across a four-legged intersection. The barrier creates two unconnected intersections. Traffic approaching the intersection is restricted to one receiving leg, rather than three. A strategically placed diagonal diverter can reduce traffic volume by preventing straight-through traffic movements at an intersection. A cutout, gap, or channel can be provided in the diagonal diverter to allow at-grade cyclist movement between all four legs of the intersection. Pedestrians can and should be accommodated bypass-throughs or walkways across or through the diverter.

Figure 18. Sample Application of Diagonal Diverter[27, 28]

The potential application effects of diagonal diverters include:

- **Vehicle Speed:** Forces motorist to slow to negotiate the diversion curve.
- **Traffic Volume:** Forces all traffic that otherwise could pass straight through the intersection to divert to another path.
- **Collision Reduction:** Could be effective in reducing collisions by obstruct short-cutting or through traffic.
- **Active Transportation:** Benefit pedestrian and cyclist movements by reducing vehicle volume and speed.
- **Emergency Services:** Emergency vehicles' accessibility and response time are negatively affected.
- **Road Maintenance:** Road maintenance routes could be blocked and subject to change.

Median Barrier / Forced Right-In/Right Out Island

Median barrier and forced turn island are two variations of physical turn restrictions at an intersection that can be used to eliminate specific traffic flows (in particular, cut-through traffic) from entering or exiting a side (minor) street.

[27] Module 3: Toolbox of Individual Traffic Calming Measures Part 3 | FHWA (dot.gov)
[28] Traffic Calming Fact Sheets - Diagonal Diverter (ite.org)

- A median barrier is a raised island placed through an intersection, along the centerline of a roadway (often the higher-order roadway), preventing a motorist from traveling straight through the intersection on the side street. A median barrier can be designed to allow turns to and from the main street, while preventing through traffic from the side street from crossing the main roadway. Depending on its design, a median barrier can also reduce vehicle speed on the main street through lane narrowing. Gaps between median barriers may be used to accommodate pedestrians and cyclists.

Figure 19. Sample Application of Median Barrier[29]

- A forced turn island is a raised island that blocks certain movements on approaches to an intersection. It can force a motorist to turn right from the side street (by blocking left-turn and through movements). A forced turn island is a raised traffic island, typically triangular in shape, placed at the mouth of an intersection. It channels traffic to the right and blocks left and through movements.

Figure 20. Sample Application of Forced Turn Island[30, 31]

[29] Module 3: Toolbox of Individual Traffic Calming Measures Part 3 | FHWA (dot.gov)
[30] Module 3: Toolbox of Individual Traffic Calming Measures Part 3 | FHWA (dot.gov)
[31] Forced Turn Islands (sanantonio.gov)

The potential application effects of median barriers and forced turn islands include:

- **Vehicle Speed:** Not expected to reduce vehicle speed directly.
- **Traffic Volume:** Can help reduce short-cutting and through traffic volume onto the minor street.
- **Collision Reduction:** Could be effective in reducing vehicle-pedestrian/cyclist collisions by obstructing shortcutting and through traffic and reducing conflict points.
- **Active Transportation:** Benefit pedestrian and cyclist movements by reducing vehicle volume.
- **Emergency Services:** Restricts emergency vehicles from passing straight through or turning left from the minor street and from turning left into the minor street. Emergency vehicles' accessibility and response time is negatively affected.
- **Road Maintenance:** Road maintenance routes could be blocked and subject to change.

Intersection

Intersection channelization is the use of raised islands or bollards located in an intersection to obstruct specific traffic movements and physically direct traffic through an intersection. Intersection channelization can improve pedestrian crossing safety by reducing crossing distances and providing refuge areas. Bicycles are typically permitted to make all movements, including those which motor vehicles are prevented from making.

Figure 21. Sample Application of Intersection Channelization[32, 33]

The potential application effects of intersection channelization include:

- **Vehicle speed:** Not expected to reduce vehicle speed directly.
- **Traffic Volume:** Can help reduce short-cutting and through traffic volume onto the minor street.
- **Collision Reduction:** Could be effective in reducing vehicle-pedestrian/cyclist collisions by obstructing shortcutting and through traffic and reducing conflict points.
- **Active Transportation:** Benefit pedestrian and cyclist movements by reducing vehicle volume. Reduce the crossing distance and provide refuge areas for pedestrians.
- **Emergency Services:** Restricts emergency vehicles from proceeding in the closed direction at an intersection. Emergency vehicles' accessibility and response time is negatively affected.
- **Road Maintenance:** Road maintenance routes could be blocked and subject to change.

[32] Neighbourhood Traffic Concerns | City of Edmonton

[33] Traffic-calming Measures (nacto.org)

5. Signage & Pavement Marking

It should be noted that signage and pavement markings are not physical measures and are not considered traffic calming measures. However, they can be used in conjunction with physical measures to help drivers understand the purpose of the measures and to encourage them to drive more slowly.

Traffic Calming Neighbourhood Sign

Signs delivering the information of entering the neighbourhood and driving slowly is intended to serve as a reminder to motorists that they are entering a residential area where the residents are concerned about the safety and integrity of their neighbourhood. Motorists are advised to disengage the highway driving mode and exercise caution as they approach a residential area and should be mindful of the potential presence of pedestrians and other active transportation users.

Figure 22. Sample Application of Traffic Calming Neighbourhood Signs[34, 35]

The potential application effects of neighbourhood signs include:

- **Vehicle Speed:** The impact of neighbourhood signs on speed reduction may be limited without being used in conjunction with other physical traffic calming measures.
- **Traffic Volume:** Negligible effect on traffic volumes.
- **Collision Reduction:** Not directly contribute to collision reduction.
- **Active Transportation:** Not directly correlated to pedestrian and cyclist movements.
- **Emergency Services:** Minimal impact on emergency vehicle response.
- **Road Maintenance:** Minimal impact on road maintenance.

[34] A91jv0dnl_1ocb1x5_4po.tmp (midland.ca)
[35] Microsoft Word - 2005-10-17-Final Nanaimo TC Guidelines.doc

Pavement Treatment and Marking

The on-road pavement markings often provide information that would typically be communicated to drivers through posted signage but are instead painted on the roadway to provide a larger image directly in the driver's line of sight. These markings may be used as a gateway to alert drivers they are entering a school zone, school crossing, or traffic calmed neighbourhood. The pavement markings can be in various forms, including:

- Transverse lane markings. Transverse pavement markings usually consist of transverse bars or chevrons. The transverse bars are typically spaced to give drivers the perception that they are speeding up. This perception encourages drivers to be aware of their speeds and to slow down. Lane markings can also be used as a way to alert drivers that they are entering a different area such as a community. The most common lane markings include:
    - **Dragon's Teeth.** Dragon's teeth are a series of triangular pavement markings along the edge of the travelled lanes. They may be painted with increasing size to give the impression of roadway narrowing. They provide a visual change of the roadway.
    - **Transverse Bars.** Transverse bars are a series of parallel pavement markings which extend across the majority of the travelled lane width or only appear along the edge of the lane. The series of markings may be placed closer together with distance to create the illusion that a vehicle's speed is increasing, to alert the driver of the need to reduce speed.
    - **Converging Chevrons.** The converging chevron pavement marking pattern involves installing a series of white chevrons on the road surface. The spacing width of the chevrons and the space between them decreases as the driver travels through the pattern. This pattern creates the illusion that the vehicle is traveling faster than the vehicle's actual speed and that the road is narrowing, which causes the driver to slow down.

Figure 23. Sample Application of Transverse Lane Markings (Dragon Teeth – Left[36], Transverse Bars[37] – Middle, Converging Chevrons[38] – Right)

- **Surface Treatments.** Coloured surface dressings or textured surfaces are common speed management treatments and are often used in conjunction with other traffic-calming measures to emphasize the presence of traffic-calming features. Surface treatments can be done with pavement markings or textured pavement. Figure 24.

Figure 24. Sample Application of Surface Treatments[39, 40, 41]

- **Rumble Strips.** Rumble strips are grooves placed in the roadway surface that transmit sound and vibration to alert drivers to changing conditions. Many municipalities have used temporary rumble strips, which consist of strips of durable tape, rather than permanent installation. Traverse rumble strips can be placed perpendicular to the direction of traffic and used to alert drivers of a change in upcoming conditions and the need for stopping or reducing speed. Rumble strips are particularly used in rural roads as opposed to urban roads as they can cause a noise issue.

[36] Dragon teeth | Pavement graffiti (meganix.net)
[37] Pavement Markings: Transverse Lane Markings | Center for Transportation Research and Education (iastate.edu)
[38] Ruidoso Traffic Calming Guide (bhinc.com)
[39] European-style traffic-calming treatment used in Dexter, Iowa | Download Scientific Diagram (researchgate.net)
[40] Traffic Calming Devices I Pavement Surface Coatings
[41] Bringing Awareness To 30 km/hr Speed Limit With: SCHOOL ZONE SYMBOLS AND TEXTS - Sutton Road Marking

Figure 25. Sample Application of Rumble Strips[42, 43]

The potential application effects of pavement treatment and markings include:

- **Vehicle Speed:** The impact of pavement treatment and marking on speed reduction may be limited without being used in conjunction with other physical traffic calming measures.
- **Traffic Volume:** Negligible effect on traffic volumes.
- **Collision Reduction:** Not directly contribute to collision reduction.
- **Active Transportation:** Not directly correlated to pedestrian and cyclist movements.
- **Emergency Services:** Minimal impact on emergency vehicle response.
- **Road Maintenance:** Minimal impact on road maintenance. But road treatment and markings need regular maintenance and could be less effective in winter months due to snow/ice cover.

Speed Display Device

A speed display device is a pole-mounted device equipped with radar speed detector and an LED display. The devices can detect the speed of an approaching vehicle and display it back to the driver. The objective of the speed display device is to improve road safety by making drivers aware of their speed, evoking voluntary speed compliance.

Speed display devices are most effective on single lane roads and can be used upstream of staffed speed enforcement.

[42] Transverse Rumble Strips: Another Tool for Rural Road Safety? | Crossroads (mntransportationresearch.org)
[43] Rumble Strips: safety-enhancing and winter-proof | SWARCO

Figure 26. Sample Application of Speed Display Devices[44, 45]

The potential application effects of speed display devices include:

- **Vehicle Speed:** Can be considered as an effective way of reducing vehicle speed. But the efficacy may diminish over time without being used in conjunction with other physical traffic calming measures.
- **Traffic volume:** Negligible effect of traffic volumes.
- **Collision Reduction:** Not directly contribute to collision reduction.
- **Active Transportation:** Not directly correlated to pedestrian and cyclist movements.
- **Emergency Services:** Little effect on emergency vehicle response.
- **Road Maintenance:** No impact on road maintenance.

[44] Radar Speed Signs - Kalitec

[45] Smile for the speed board: New additions to calm traffic in Fernie - The Free Press

City of Courtenay