

CITY OF NANAIMO

Neighbourhood Traffic Calming Guidelines

FINAL REPORT





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EXECUTIVE SUMMARY

Neighbourhood traffic issues – such as high traffic volumes, short-cutting, and speeding – are a growing concern for many residents in the City of Nanaimo. The City of Nanaimo Traffic Calming Guidelines describe a comprehensive approach to developing traffic calming plans for the City from the initial conceptual development through to the implementation of construction.

The purpose is to address traffic problems appropriately, cost-effectively and successfully, without creating new problems. Primary goals are to create safe communities and increase the livability of neighbourhoods for residents.

When developing a traffic calming process, the following principles must be taken into consideration:

- Community Involvement;
- Identification and quantification of the real problem;
- Use of self-enforcing measures;
- Minimal access restrictions;
- Consideration of impact of other streets; and
- Target group of automobiles and trucks only.

Three traffic calming request types as well as the related processes have been identified for the City of Nanaimo. Each request type has a four stage process that should be followed to address and correct the traffic issues.

- **Basic Traffic Calming Request.** This is the most common request type, with the typical problem identified as speeding. Typically this is a response to a request for a specific traffic calming device, and the problems are limited to a small area without any impact on neighbouring streets. Response measures to these requests tend to be vertical or horizontal deflection or select signage.
- **Localized Traffic Calming Request.** This process is closely related to the Basic Traffic Calming process though it is not as streamlined and straight forward. Due to the possibility of minor overspill, a neighbourhood advisory committee is developed – therefore meetings would be required. Open houses may also be used to show options. Obstruction measures are used in addition to the response methods normally used for the Basic process.
- **Area-wide Traffic Calming Request.** This process is the most complex in that there are more steps within the four stages and community involvement is the



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most significant. Due to traffic issues, such as speeding, short cutting and intersection safety impacting a large portion of a neighbourhood, community involvement is very high through methods such as community surveys and public open houses. The process is typically undertaken in conjunction with an overall local area plan. Response measures to the traffic issues are similar to the localized process.

Traffic calming measures appropriate only for Nanaimo are incorporated in these Guidelines. Each measure has been evaluated and lists the associated benefits and disbenefits and will be prioritized based on each specific location.

- **Vertical deflection.** Measures that alter the road surface in a vertical method can be utilized as a traffic calming measure. The displacement that occurs due to this type of measure forces motorists to reduce their speeds. Speed humps are a commonly used vertical deflection measure.
- **Horizontal deflection.** This type of measure relies on horizontal deflections to calm traffic. A deflected path is created that causes motorists to slow down in order to manoeuvre it safely. Horizontal deflection can also reduce pedestrian crossing distances and deter motorists from short cutting through neighbourhoods. Curb extensions and raised median islands are examples of horizontal deflection measures.
- **Obstruction.** Obstruction is a prohibitive measure that physically blocks a movement or in some cases an entire intersection. These measures are effective at stopping unwanted traffic patterns, yet it can complicate resident access. Regulating movements through intersection channelization is one possible obstruction example, as is a full closure which would only be considered in extreme cases.
- **Signage.** Posting turn-prohibition and lowered speed limit signs is not an entirely effective method of traffic calming. Some signage, such as the "traffic calmed community" signs however, are an important part of a successful traffic calming plan.

The implementation of the traffic calming plan involves consideration of the design to ensure that any changes are appropriate and compatible with the existing network. When the plan is to be implemented it can be done all at once or phased over a period of two or more years. In the case of phasing, priority should be given to safety improvements and low-cost measures, or those that can be implemented in groups. Implementation also involves the choice of whether the device will be temporary or



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permanent. In some cases a trial period may exist with a temporary device that eventually is upgraded to a permanent device.

The final step is ongoing monitoring, to help the City ensure that the plan is successful in that the measure is attaining the desired results. Data before and after should be collected and compared to quantify the results of the various types of traffic calming measures.



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1.0 INTRODUCTION

This document outlines Neighbourhood Traffic Calming Guidelines for the City of Nanaimo. The material in this document provides guidance on a process for developing and implementing traffic calming measures that is tailored to the conditions, needs and values of this community.

The Traffic Calming Guidelines were developed to address concerns that residents, community members, Council members and City staff have regarding traffic on neighbourhood streets. The processes described in the Guidelines are designed to guide the City in preparing and implementing traffic calming plans in Nanaimo that will mitigate the negative impacts of unwanted traffic, while still maintaining the ability of these roads to provide mobility for all road users.

These Guidelines have been developed as a comprehensive 'user's guide' to developing traffic calming plans. The principles, objectives and methodologies within are based on those outlined in the *Canadian Guide to Neighbourhood Traffic Calming* and experience in other municipalities across the Province. Where possible, examples from other communities have been provided to offer additional perspective. A glossary is included in the Appendix to aid readers and users of these Guidelines in applying the concepts within. While the *Guide* is an excellent resource to be used in conjunction with these Guidelines, particularly during the device selection and design phase, supplemental guidelines are provided in the City of Nanaimo Traffic and Highway Installation Design Guidelines.

1.1 Why Traffic Calming?

As in many urban municipalities, neighbourhood traffic is becoming an increasingly important issue for residents and other members of the Nanaimo community. It seems that with increasing congestion on major roads and a general sense of increased urgency in our travel to work, to school and elsewhere, many motorists begin looking for short-cuts along residential streets. And in finding a way to avoid a busy intersection, or a long queue to turn, most of these motorists are often driving faster than the posted speed limits, even near parks and schools. As a result, many residents have become concerned about these issues and the resulting safety for pedestrians, children, cyclists and other motorists on their local streets.

Many municipalities have responded to these growing concerns by implementing traffic calming measures – speed humps, traffic circles, curb extensions and a range of other measures intended to slow, discourage or obstruct unwanted traffic. Although most municipalities have been successful with traffic calming efforts, some



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municipalities have created more problems than they have solved. Typically, this has happened when traffic calming measures have been applied in a piecemeal manner, without an overall plan and without consideration of the implications of traffic calming.

To avoid this situation, Nanaimo City staff, Council and the ICBC Safer Cities Program have come together to develop these Traffic Calming Guidelines ensuring that neighbourhood traffic problems are addressed appropriately, cost-effectively and most important, successfully throughout Nanaimo communities. Recognizing the many benefits and long-term impacts of neighbourhood traffic calming, the City has also developed guidelines for the proactive implementation of traffic calming measures to develop new communities that are safe, livable and complete, right from the very beginning.

1.2 Goals and Objectives for Traffic Calming in Nanaimo

There are two key goals that a traffic calming program will help residents and other Nanaimo community members to achieve:

- **Safety** – Neighbourhood traffic calming can make the streets safer for pedestrians, cyclists, motorists and other road users. Many neighbourhood conflicts are the result of excessive speeds and short-cutting traffic. Case studies in other communities have proven that specific traffic calming devices can reduce speeds and conflicts.
- **Livability** – Neighbourhood traffic calming can help to preserve and enhance the community environment by minimizing the negative impacts of traffic such as noise, pollution and visual intrusion. Landscaped traffic calming devices can aesthetically enhance the streetscape and the overall livability of the community as a result.

The importance of these two goals is already supported by the City's Official Community Plan that states the City will consider traffic calming measures to achieve a safe and quiet atmosphere in neighbourhood areas. The Guidelines follows specific objectives that will help the City achieve these key goals:

- **Reduce vehicle speeds** – Excessive speeds along residential streets create a safety concern due to the presence of local driveway access activity and non-motorized road users, such as pedestrians and cyclists. Traffic calming measures help to decrease vehicle speeds and reduce potential conflicts between vehicles and pedestrians or cyclists. Reduction of vehicle speeds



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also helps to improve the livability of a community by lowering noise and other negative impacts of traffic.

- **Discourage short-cutting traffic** – Residential streets are primarily intended for local access to properties, rather than function as a main road to serve through traffic. Traffic calming measures help to discourage non-local traffic travelling within the neighbourhood, and reduce the level of traffic volumes. Potential conflicts would be reduced and overall safety improved. Livability of the environment would also improve due to the potential reduction of traffic noise and pollution.
- **Reduce conflicts** – Reducing conflicts between road users decreases the likelihood of a collision occurring and the severity of collisions. This improves the safety, particularly for pedestrians, cyclists and other vulnerable road users.
- **Establish an ongoing process to address problems** – Changes to existing conditions such as provision of new roads, reclassification of existing roads, land use, additional development, and other changes may influence overall travel patterns, which may contribute to new traffic problems in the future. The Guidelines establish a set of procedures to address and resolve these neighbourhood issues through the active involvement of community members and municipal agencies.
- **Allocate funds cost-effectively** – Adequate funds are needed to appropriately develop and implement neighbourhood traffic calming plans. The traffic calming process should be an efficient process that includes selection of effective traffic calming measures to minimize costs and deferment of any other planned transportation improvements.

1.3 Context of the Guidelines

Until now, the City has implemented traffic calming in only limited applications, in only a few locations throughout the City. Following only general guidelines statements from the Official Community Plan and other City Planning and Engineering documents, the City has lacked the framework that will allow them to confidently and effectively apply traffic calming solutions at both the planning and retrofit stages of their roadway network.

The guidelines outlined in this document are applicable primarily to roadways of local, neighbourhood collector and minor collector designation. A framework for handling the day-to-day administrative aspects of resident requests for traffic calming, prioritizing these requests and then following through the plan



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development and implementation phases of a neighbourhood plan are described in these Guidelines. This is not to say that traffic calming measures are not applicable or effective for use on roadways of higher orders or to address other community transportation issues such as bicycle or pedestrian safety, commercial revitalization or beautification projects. These types of applications definitely have their place throughout Nanaimo, and while the technical aspects of these Guidelines relating to design and signage considerations will be pertinent, the administrative aspects of these Guidelines and its processes will not apply.



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2.0 DEALING WITH RESIDENT REQUESTS – THE ADMINISTRATIVE PROCESS

The entire traffic calming process can generally be divided into two components – the *administrative* aspects that deal with receiving and prioritizing residents concerns and the *plan development and implementation* component. This section of the Guidelines outlines how requests for traffic calming should be handled and discusses other administrative aspects of the traffic calming program.

2.1 When Traffic Issues Arise – Managing and Prioritizing Resident Requests

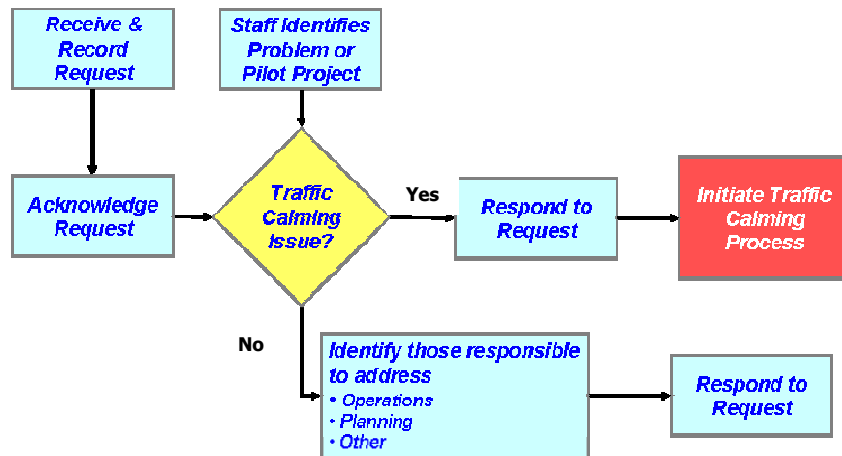
As traffic issues are identified, they will typically be brought to the City's attention through resident letters, phone calls or emails to City staff or Council. Currently, there is a low volume of issues being identified; however, as Nanaimo continues to develop, City staff can expect that the number and severity of issues will inevitably increase. In order to properly prioritize these and future issues, the City will need a clear and consistent process by which to document and monitor arising issues.

A systematic process should be defined to handle, address and acknowledge written requests from residents, or business owners, or by City of Nanaimo initiatives regarding traffic problems within a neighbourhood. The process should be fair, prompt and objective, and designed to:

- Be customer service-oriented;
- Ensure that all written requests are processed; and
- Consider all available methods of addressing the traffic-related issues before determining that they can be addressed through traffic calming.

Figure 2.1 outlines the recommended management process for Nanaimo staff to follow when handling incoming traffic-related requests and concerns from the community.

Figure 2.1 – Responding to Resident Requests for Traffic Calming



- **Receive and Record Requests.** Requests should be written in standardized form to ensure clear identification and explanation of the problem(s), perhaps recorded in an electronic database for easy searching. Each written request should include the following key information for onward processing:
 - ✓ Resident's name;
 - ✓ Resident's address;
 - ✓ Contact information (phone, fax, e-mail);
 - ✓ As accurately as possible, the location of the problem (street(s) name, nearest street address, intersection, etc.);
 - ✓ Detailed description of the issue; and
 - ✓ Typical time(s) of occurrence of the issue(s) – peak period(s), night-time only, all day, specific season, weekend/weekday, etc.

Any additional information in regards to the conditions or potential solutions identified by the individual(s) should also be included.

- **Acknowledge Request.** Upon receipt of any traffic calming concern or request from the community, City staff should acknowledge the comments by sending a formal letter to the resident. This letter need only be brief explaining that the City has recorded their concerns and will evaluate them according to the City's traffic calming program guidelines. A brief description

of the traffic calming process or of the criteria that are used for traffic calming could also be included in this letter to help educate the resident.

- **Is it a traffic calming issue?** Each written request received needs to be evaluated carefully to determine whether the issue(s) is best addressed through traffic calming, other forms of neighbourhood traffic management (refer to Section 2.2) or other programs and public agencies (e.g., Operations, Planning, TransLink, Police, ICBC Safer Cities, etc.). For example, residents often identify the lack of sidewalks or transit operations as traffic-related issues. However, both of these concerns are better addressed through other programs or agencies.

Table 2.1 lists some of the common issues typically raised by residents and categorizes them according to whether they are considered traffic calming issues. Some issues may not be clearly identified as a traffic calming issue and would require further discussions with other agencies or departments to determine the appropriate course of action.

Table 2.1 – Examples of Commonly Raised Traffic Issues

Traffic Calming Issues	Non-Traffic Calming Issues
<ul style="list-style-type: none"> • Speeding on neighbourhood streets • Short-cutting on local streets • Intersection safety for pedestrians and cyclists 	<ul style="list-style-type: none"> • Lack of sidewalks or crosswalks • Roadway geometry • Intersection safety • Incompatible land uses • Transit operational issues

Recognizing that every neighbourhood is unique, residents may raise a whole host of other issues. Considering this, it is important that the City be familiar with the scope of issues that can successfully be addressed through the use of traffic calming measures.

- **Identify responsibilities and confirm eligibility.** If a particular issue has been identified as being beyond the scope of traffic calming considerations, it will be important that the City still address the issue. Issues that are not generally considered to be 'traffic calming issues' will usually fall into the scope of one or more other agencies, departments or programs. To avoid the issue being 'lost', City staff should promptly identify the appropriate agency and forward the request to them for action.



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Although some traffic problems will be identified as 'traffic calming issues', eligibility for neighbourhood traffic calming as described in these Guidelines must still be confirmed. Generally, only roads that are classified as neighbourhood or minor collectors or local streets are eligible for neighbourhood traffic calming plans. Arterials, major collectors or roads of higher order are generally not considered by these Guidelines.

- **Collect initial data.** Collection of initial data allows the City to verify the reported problems and quantify the extent and nature of the problem. The data may include (but is not limited to) vehicle speeds, traffic volumes and through-traffic.

Experience in other communities suggests that using thresholds to determine when vehicle speeds, volumes or through-traffic have become 'too high', can help simplify the process of prioritizing projects and can give the City a definite framework for applying traffic calming. The following criteria can be used by the City of Nanaimo to determine if issues warrant the consideration of traffic calming:

- ✓ Traffic volumes exceed 1,000 vehicles per day (on local roads) or 3,000 vehicles per day (on neighbourhood or minor collector roads); and
- ✓ 85th percentile vehicle speeds exceed 7 km/h above the posted speed limit, or, through-traffic exceeds 100 vehicles per hour or 30% of all traffic.

Traffic volumes and vehicle speeds should typically be monitored for a period of at least 48 hours, avoiding holidays, summer vacation, and other significant events where possible that may influence traffic patterns. If the existing traffic conditions do not meet or exceed these criteria, the issue should remain in the City's records, but be placed at a lower priority, for consideration at a later date.

- **Define and Prioritize study areas.** During the course of the process and as new issues arise, written requests for traffic calming will continue to be submitted from residents around the community. When these traffic issues are considered eligible for neighbourhood traffic calming, study areas will need to be defined and multiple requests prioritized.



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To define the appropriate study area, the City will want to examine the type and extent of each issue as well as the existence, type and extent of issues on adjacent streets. Depending on these and other factors, the City may wish to define a study boundary that includes only one or two streets, or an area that encompasses a whole neighbourhood of streets.

Key factors and guidelines that should be considered in defining a study area include:

- ✓ The type and extent of traffic issues;
- ✓ The potential for spillover traffic;
- ✓ Related issues on adjacent streets; and
- ✓ Using the main road system (arterials) and other natural features such as topography, rivers or streams where applicable to define the boundaries.

As study areas are defined, the City will need a means of selecting priority areas in which to develop, conduct and implement traffic calming plans. The evaluation criteria should be equitable and objective. Some of the key factors that may be considered when prioritizing study areas are:

- **Frequency of request locations** – Summarize the number of locations where traffic issues have been identified. Areas with more request locations indicate the significance of the traffic problems (such as speeding and short-cutting traffic) and would be considered higher priority for traffic calming.
- **Accident history** – Identify the number of reported collisions at the request location or area. Relatively higher reported collisions at those locations would be considered higher priority.
- **Pedestrian activity and sidewalk coverage** – Identify sidewalk coverage in key pedestrian zones such as institutional, recreational, and commercial areas, and where moderate to high pedestrian activity exist. Areas with traffic issues and no sidewalks would rate higher than those areas with sidewalk facilities.
- **Location of public facilities** – Identify request locations where they front schools or playgrounds. These areas are used by the vulnerable pedestrian group and would rate higher importance to implement traffic calming.



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- **Difficult road geometry** – In areas where traffic calming issues have been identified and road geometry is known to contribute toward the safety concerns along a residential street, a higher priority may be given.
- **Pending road network improvements** – If capital projects are committed, it may be preferable to delay development of a traffic calming plan until these projects are complete and the road network is stable. Changes to the arterial road system may alter travel patterns, and divert some non-local traffic back to the major road network.
- **Road rehabilitation programs** – General cost savings can be achieved if neighbourhood traffic calming plans are developed simultaneously with scheduled road rehabilitation programs within the same study area. This would apply well for those areas where road rehabilitation projects are planned and scheduled within the next two years.

2.2 Methods of Addressing Neighbourhood Traffic Issues

Upon identifying a neighbourhood traffic issue, most residents will automatically request that traffic calming measures be implemented to resolve it. While traffic calming measures are extremely effective at mitigating some traffic impacts, they may not always be the best method of addressing every issue that could arise in the City of Nanaimo.

For this reason, City staff should be aware of and should consider other methods of addressing neighbourhood traffic issues that are available to them before initiating a formal traffic calming plan. The following alternatives exist and have proven effective under many circumstances. In some cases depending on the severity of traffic issues, the City may wish to consider using one or more of these alternatives in combination.

2.2.1 Awareness, Education and Enforcement

The construction of physical traffic calming devices is only one option of many that may be considered to address neighbourhood traffic issues. In fact, there are three other components – awareness, education and enforcement – that can be particularly effective and should be considered by City staff prior to initiating a full traffic calming study. In fact, the use of physical devices in combination with enhanced awareness, education and enforcement can be the most effective way of addressing neighbourhood traffic issues. Each of these three components is discussed below.



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- **Awareness.** In some communities, enhancing motorists' *awareness* has had a significant impact on driving behaviour. In particular, where neighbourhood traffic issues are known to be associated with local residents (e.g., speeding on local streets and cul-de-sacs), increasing awareness of the broader community's concerns can help to discourage undesirable driving behaviour.

In some areas of the Lower Mainland residents have elected to do this by forming neighbourhood traffic committees that focus on increasing their neighbours' awareness of driving behaviour, through the use of gentle reminders on lawn signs, the spread of information through school newsletters or even getting involved with local police force Speed Watch programs where volunteers set up speed-monitoring stations in the neighbourhood to show motorists what speed they are driving.

In Nanaimo, similar types of programs are already in use such as the 'Show us a Sign' campaign sponsored by Nanaimo Safer City and BC Autoplan Brokers whereby residents were encouraged to plant bright yellow lawn signs during September to remind motorists to watch their speed as children return back to school. City staff may wish to encourage further neighbourhood involvement of this type as a way of working *with* communities as a whole to identify and address traffic issues.

- **Education.** For some neighbourhood traffic concerns, embarking upon a community education campaign may prove to be an effective means of control. There are already many public education initiatives available to citizens through the RCMP and ICBC that are related to traffic and road safety. For some areas, targeted educational campaigns may be undertaken to educate drivers on certain traffic rules such as the proper use of crosswalks or roundabouts.

The City may wish to further this avenue of addressing traffic problems before they even develop through the use of local education programs targeted at neighbourhood traffic safety. City staff could work together with ICBC and the local RCMP to develop such materials that could be distributed to local communities through volunteer groups, schools or neighbourhood traffic committees as described above.

The City has already taken a step in this direction by working with the Safer City program to implement community initiatives for a variety of issues including the following:



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- ✓ **Safer School Travel** – assists Parent Advisory Councils to identify road safety issues, develop measures, and implement a School Road Safety Plan at their individual schools. This will be introduced to School District #68 in the fall of 2004.
- ✓ **Speed Watch** – a community-driven program that raises awareness of speed.
- ✓ **Citizens on Patrol (COP's)** – a citizen's group that volunteers for a variety of safety issues.

While each of these programs is designed to address a different aspect of making Nanaimo a safer city, additional programs or expansion of those above may be used to more directly target the issue neighbourhood traffic.

- **Enforcement.** In those areas where neighbourhood traffic issues are associated with external traffic (e.g., short-cutting through neighbourhoods), enforcement may be a preferred alternative to installing traffic calming devices. Enforcement may also be preferred to awareness and education campaigns, which are often targeted to neighbourhood residents rather than those who may actually be short-cutting through those communities. Although enforcement is not encouraged to be used as a specific traffic calming measure, there are some neighbourhood traffic concerns that do not fall into the scope of traffic calming because they are actually enforcement concerns that should be handled by other departments or agencies.

Neighbourhood groups may want to work with City staff and the RCMP to identify those locations where short-cutting and speeding are perceived to be problems and to develop an enforcement strategy to discourage undesirable driver behaviour. The City may facilitate discussions among the interested parties.

It must be recognized that there are two key issues associated with enforcement. First, the cost of enforcement is relatively high and the police may simply not have the resources to commit the level of enforcement desired by neighbourhood residents. Instead, the police may only be able to provide short-term enforcement at locations of significant problems. Secondly, enforcement is not a permanent solution. Enforcement campaigns may deter motorists from speeding and/or short-cutting for a short time during and after the program. However, it is likely that, in the absence of an ongoing enforcement program, undesirable driver behaviour will recur.



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2.2.2 Surrounding Network Improvements

In many communities, undesirable traffic patterns such as short-cutting and speeding may arise as a result of excessive delay, congestion or difficult turns that exist on the arterial road network. In many cases, motorists seek out alternative routes or 'short-cuts' on residential streets to avoid these types of problems.

In these types of cases, the City should aim to address the root of the problem first, before considering traffic calming of any sort within the affected neighbourhood. To do so, City staff should ensure they properly investigate all traffic concerns that may relate back to main street problems before deciding how to proceed. Section 2.1 included information and a suggested process for how City staff should manage resident concerns, including a process by which each complaint is investigated.

If it has been determined that the root of the problem is actually congestion or delay on the arterial road network, City staff should take action to find alternative methods of addressing the issues where possible. In some cases, re-timing or coordination of traffic signals on main streets may be enough to mitigate short-cutting behaviour. In other cases, solving main street congestion may not be so simple, and City staff may still initiate a traffic calming plan. However, these situations are a great opportunity for City staff to involve and consult with neighbourhood residents on larger-scale and longer-term planning projects throughout the City.

2.3 Funding for Neighbourhood Traffic Calming

The City's current financial resources to fund traffic calming programs are through the City's general tax revenues. This approach is generally accepted by most communities as a fair and equitable method for funding neighbourhood traffic calming, as traffic calming is funded in a way that is similar to other road and transportation improvements throughout Nanaimo.

The allocation of funding for neighbourhood traffic calming plans should accommodate both planning and implementation so that measures can be installed within a relatively short timeframe following Council approval of the final strategies. The basic rationale for this practice is that most other road and transportation improvements are typically funded in this way and, often, the traffic problems experienced in a neighbourhood are the result of City- or region-wide traffic issues and are not necessarily specifically tied to a particular community alone.



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3.0 THE TRAFFIC CALMING PROCESS

When traffic calming measures have not been implemented as part of a neighbourhood's original concept, residents may request that devices such as traffic circles and curb extensions be retrofitted to address undesirable traffic patterns. This is the most common condition under which traffic calming is implemented within a neighbourhood and the process of doing so requires careful consideration, consultation and planning.

This section of the Traffic Calming Guidelines deals with how a traffic calming plan may be developed for an existing street or neighbourhood in the City of Nanaimo. A full understanding of key traffic calming principles and the necessary steps to develop a successful plan are essential and are discussed in detail to follow.

3.1 Principles of Traffic Calming

There are several general principles that the City should follow when developing a traffic calming strategy for any of its neighbourhoods. The application of these principles will help to ensure that a thorough and objective process is followed, and that appropriate traffic calming measures are selected to meet the needs of the community and minimize the negative impacts of traffic in the area.

- **Involve the community.** Residents, business operators, and others who live and work in a community must have input in the identification of traffic problems and the selection of traffic calming measures. Involving the community builds support for traffic calming, and enhances the credibility of the resulting recommended measures. It also minimizes the potential influence of special interest groups who might otherwise unduly influence the outcome. If the community is not adequately involved, residents and others in the community might oppose the traffic calming measures — regardless of their technical merit — because they feel that they were not properly consulted, or that the recommended measures do not recognize the unique circumstances of their neighbourhood.
- **Identify the real problem.** Frequently, the perceived nature of a traffic problem is substantially different from the real problem. In some cases, the difference is so great that a solution intended to eliminate the perceived problem might make the real problem worse. For example, residents often mention 'traffic volume' and 'speeding' as problems on their streets, but in many cases the problem is one or the other. It is important to identify the real problem, so as to select the appropriate measure. If the real problem is speeding, for

example, a measure that significantly reduces the traffic volume on a street might inadvertently encourage speeding if fewer cars remain on the street to slow traffic.

- **Quantify the problem.** Some problems are more significant than other problems. Some problems are all-day problems, whereas other problems occur only at certain times, in certain seasons, or in certain directions. Some reported problems are not really problems that can be addressed by traffic calming. For example, two or three speeders a day would not be addressed through traffic calming. In order to ensure that appropriate traffic calming measures are implemented, it is essential that the extent of each problem be quantified. This means collecting data, including traffic volumes and speeds, accident data, counts of pedestrians and cyclists, measures of delay and other data as appropriate.
- **Use self-enforcing measures** — those that maintain a 24-hour presence, and do not require police enforcement to be effective. For example, traffic circles should generally be used instead of four-way stops, speed humps should be used instead of speed restrictions, and directional closures and diverters should be used instead of turn prohibitions. Measures that can be circumvented — such as a turn prohibition or a directional closure — should be used only at intersections with major roads, where visibility and the presence of traffic will discourage motorists from circumventing these measures.
- **Minimize access restrictions.** Generally, residents and other members of the community will be more supportive of traffic calming measures that do not restrict their own access into and out of a neighbourhood. Diverters, barriers, and closures restrict access for people who live or work on a particular street, and support for such measures is directly related to the severity of traffic problems. Where problems can be addressed with other traffic calming measures that are not as restrictive to access, these should be considered instead, or residents should at least be given a choice of measures.
- **Consider effects on other streets.** In considering measures to resolve a traffic problem in one location, the City should also consider any potential effects the proposed measures may have on adjacent streets. These effects might be caused by traffic diverting to other streets, motorists who speed up further down a street from a traffic calming measure, or changes in turning movements that increase delays at an intersection. If these effects are not considered in advance, a traffic calming measure might fail to solve a problem and at the same



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time create new problems or exacerbate existing problems elsewhere in the neighbourhood.

- **Target automobiles and trucks only.** The purpose of implementing traffic calming measures is to affect automobiles and trucks, not other modes. Consequently, traffic calming devices should be designed to permit transit buses, cyclists, and pedestrians to pass through, while obstructing automobiles and trucks. Similarly, traffic calming devices should be located and designed to minimize impacts on emergency and service vehicles and maintain accepted response time targets.

3.2 Developing a Traffic Calming Plan

The process of developing traffic calming plans is typically dependent on the size of the neighbourhood, as well as on the scope of traffic-related issues. However, the principles that guide the development of those plans remain consistent. While most activities involved in preparing a plan will remain the same regardless of the scale of the study, the scope of each task as well as the extent of community involvement can be tailored to suit the neighbourhood being reviewed.

To date, the City of Nanaimo has implemented traffic calming measures in only a few locations and only in limited applications. Although resident requests for traffic calming continue, the overall demand for traffic calming within the City is relatively low at this time and a relatively streamlined development process is likely sufficient to deal with existing problems. As the community continues to develop and new issues arise, however, City staff can expect that the number of requests for traffic calming as well as the severity and scope of issues will increase. It should also be expected that consequently a more involved process, with more consultation may become necessary to appropriately address neighbourhood traffic concerns in the future.

Because of the stage that Nanaimo is currently at in regards to their traffic calming program, the ability to select between a basic process, localized process and broader, more involved process will be important. The Nanaimo Traffic Calming Guidelines therefore will discuss three different processes for developing traffic calming plans.

The main difference between the traffic calming processes is the size and extent of the problem. The table below illustrates the difference between the three processes and thereby identifies the response measures that could be implemented for a given situation.

	Traffic Calming		
	Basic Traffic Calming Request	Localized Area Traffic Calming Request	Area-wide Traffic Calming Request
Typical Issue	<ul style="list-style-type: none"> • Speeding 	<ul style="list-style-type: none"> • Speeding • Short cutting 	<ul style="list-style-type: none"> • Speeding • Short cutting • Intersection safety (peds/cyclists)
Impact Area	<ul style="list-style-type: none"> • Limited to subject street(s) 	<ul style="list-style-type: none"> • Minor adjacent overspill to neighbouring street 	<ul style="list-style-type: none"> • Overspill to adjacent street(s)
Frequency of Request	<ul style="list-style-type: none"> • Frequent 	<ul style="list-style-type: none"> • Infrequent 	<ul style="list-style-type: none"> • Only in conjunction with local area planning process
Typical Response Measures	<ul style="list-style-type: none"> • Vertical deflection • Horizontal deflection • Select signage • Enforcement and speed watch 	<ul style="list-style-type: none"> • Vertical deflection • Horizontal deflection • Obstruction • Signage 	<ul style="list-style-type: none"> • Vertical deflection • Horizontal deflection • Obstruction • Signage

The next three sections discuss in-depth the Basic, Localized Area and Area-wide Traffic Calming Requests.

3.2.1 Basic Traffic Calming Request

The *Canadian Guide to Neighbourhood Traffic Calming* describes a four stage process for developing traffic calming plans as well as a comprehensive community consultation process. These are:

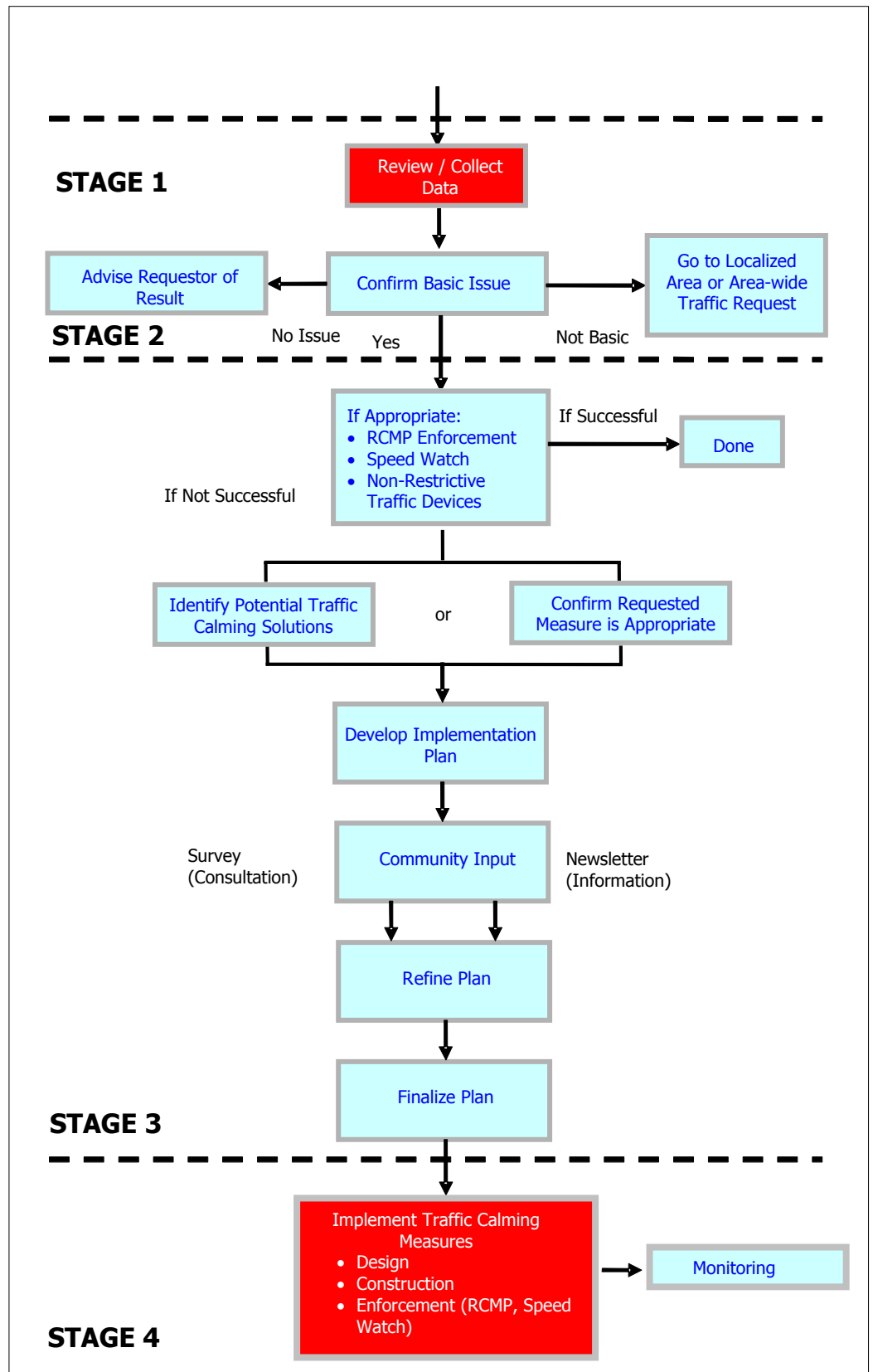
- Stage 1 – Study Initiation
- Stage 2 – Identify Problems
- Stage 3 – Plan Development
- Stage 4 – Plan Implementation

The basic traffic calming request is the most usual and frequent type of request. **Figure 3.1** illustrates the streamlined process undertaken to deal with basic traffic calming requests. A description of each stage is described thereafter.

In general, the basic process for developing traffic calming plans should be followed when:

- The scope of identified issues is confined to the subject street(s);
- Specific issues affect only specific locations; and/or
- There is no potential for spillover traffic as a result of implementing traffic calming devices.

Figure 3.1 - Basic Traffic Calming Request





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Stage 1 – Initiate the Study

This stage involves the start-up of a review that is typically initiated by a request for a specific traffic calming device. Support for the request is assumed as the request is addressing a localized issue, and is being requested by the local resident(s). A typical issue for a Basic Traffic Calming study would be speeding on a local street.

Stage 2 – Confirm Local Issue

Additional data may need to be collected to verify the nature and magnitude of reported problems, and to ensure that the real problems are addressed. If the issue does not affect many streets (for example speeding) then the basic traffic calming process should be used. However, if the problem or the potential solution affects a larger area or whole neighbourhood then the localized area or area-wide traffic calming process should be used.

Stage 3 – Develop Plans

This stage of the process will focus on determining whether the requested traffic calming measure is an appropriate response and/or identifying potential traffic calming solutions and combining them together to develop a proposed plan for residents and community members to review. The outcome of this stage of the process is a recommended traffic calming plan.

- **Identify potential traffic calming measures** and the benefits and impacts associated with each measure. In most cases this will involve responding to a specific request. Other times this will be recommending measures that are standard and easy to implement.
- **Develop implementation plan.** It may not be feasible for the potential traffic calming measures to be immediately implemented. Possible options to consider would be to piggy back this work on any upcoming capital projects, re-prioritize rehabilitation work to include the considered project area, or to prepare budget justifications for future years. This step involves the recognition of funding that may be available.
- **Community input.** The method to involve the community should be kept simple. Newsletters would be appropriate for notifying residents of the proposed installation of simple solutions, such as the installation of signage. If there is a choice of an option or the possibility for opposition, then the public should be consulted. For instance, a mail survey can be used if speed



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humps are being considered for a neighbourhood. It is important to make clear to the residents that there will still be an opportunity to refine and improve the plan if there are any significant outstanding concerns.

- **Refine plan.** Following the community input, minor refinements can be made to the traffic calming plan. If major changes to the plan are required, the community survey may need to be repeated.
- **Finalize the Plan.** The plan must be finalized to the form by which it will be implemented.

Stage 4 – Implementation

The last stage of the process involves the design and implementation of the approved traffic calming plan. Continued monitoring must also be carried out once implementation has been completed. This stage of the process is discussed in Section 5.4 of the Guidelines.

3.2.2 Localized Area Traffic Calming Request

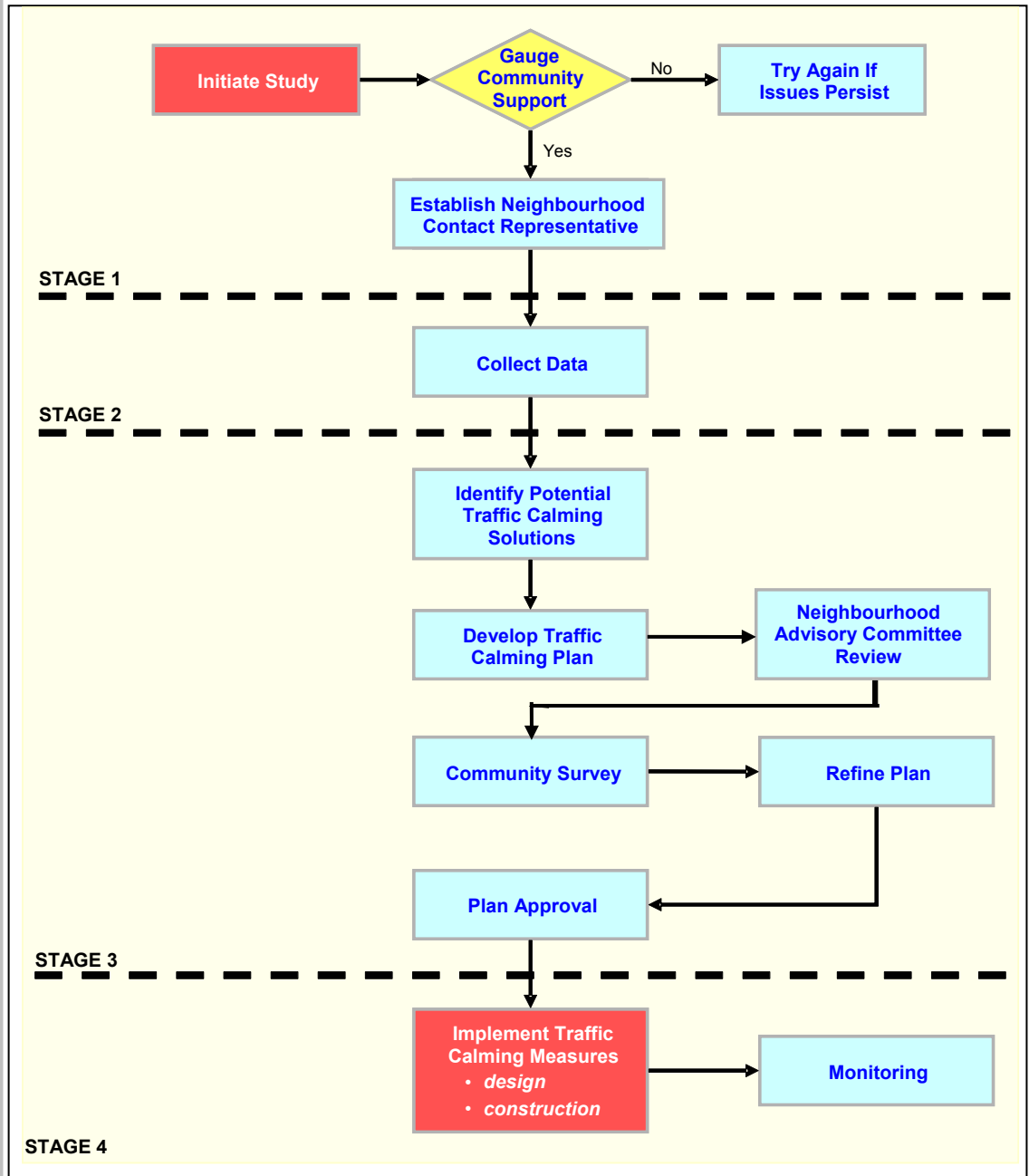
As discussed, there may be situations in Nanaimo where traffic calming should address issues on a slightly larger scale. This includes circumstances where the problem area includes more than a single street and the potential solutions affect more than one street. In these cases, the same basic steps must be taken in order to develop a traffic calming plan, however different levels of community consultation are required.

Figure 3.2 illustrates a second process that addresses the need to consider the possibility of minor overspill effects. As with the basic traffic calming situation, public consultation is an important part of this process. Input and feedback from residents would typically be obtained through mailed surveys and feedback forms as opposed to larger-scale public events.

In general, the localized process for developing traffic calming plans should be followed when:

- The scope of identified issues is confined to only a few streets;
- The number and severity of traffic issues is important to the community, but relatively 'small' in scale; and/or
- There is spillover traffic as a result of implementing traffic calming devices.

Figure 3.2: The Localized Traffic Calming Process



As can be noted, the localized traffic calming process still includes four key stages – initiate the study, identify neighbourhood traffic issues, develop the plan and implementation.



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Key differences between localized and the basic and area-wide traffic calming solutions include:

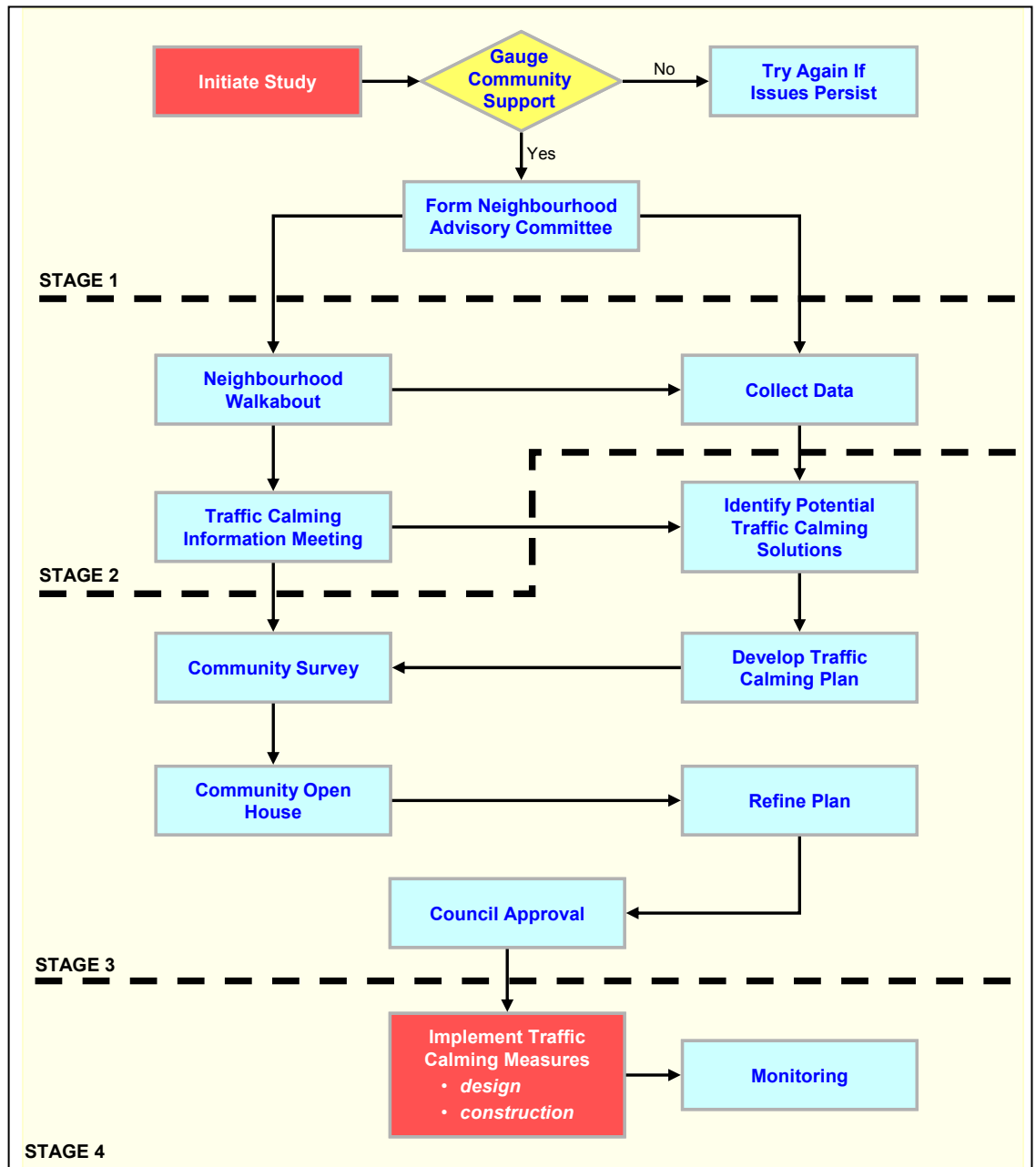
- **Issues identification.** Localized issues are typically speed issues that are easy-to-understand issues. As the localized issues are relatively larger and could involve other issues, care needs to be taken to obtain the neighbourhood's input in terms of scope and support.
- **Neighbourhood Advisory Committee.** This committee is made up of residents in the problem area as well as residents in potential spill-over areas. This committee is needed to allow neighbourhood concerns to be voiced in a balanced manner.
- **Community involvement.** In the localized process, there is more involvement with the community regarding information and updates as compared to the basic process. Communication can be provided via mailed newsletters and recorded messages on an InfoLine that residents can call and access. As the scope of this process is still much smaller than the area-wide process thereby affecting a small number of people, efforts are typically better spent on producing informative newsletters etc. as opposed to elaborate open houses and community meetings. This is not to say that a public event couldn't be added to the process if it seems appropriate.
- **Schedule.** Some differences to the Basic process are that there is more community involvement (such as committee meetings), more solution identification, and therefore a longer process requiring more staff resources than the Basic process.

Remaining tasks not mentioned above should be undertaken as previously described in the basic traffic calming process.

3.2.3 Area-wide Traffic Calming Request

Figure 3.3 below highlights an integrated traffic calming process that should be followed when developing an area-wide traffic calming plan in the City of Nanaimo. This process includes a high level of community consultation as well as the fundamental technical tasks required to develop a successful traffic calming plan.

Figure 3.3 – The Area Wide Traffic Calming Process



In general, this process for developing traffic calming plans should be followed when:

- The scope of identified issues extends beyond a few streets, or affects traffic movement throughout an entire neighbourhood;



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- There is potential for spillover traffic as a result of implementing traffic calming devices;
- There is opportunity for economies of scale by addressing several smaller issues together in one broader area;
- There is the opportunity to combine the process with an overall Local Area Plan that addresses planning issues beyond traffic issues; and
- Neighbourhood traffic issues are highly controversial.

Stage 1 – Initiate the Study

The primary objective of this stage of the process is to initiate the study and gauge community support for the development of a plan. The following key tasks should be undertaken at this stage of the process:

- **Gauge community support.** The City's first step should be to canvass the broader community early in the process to determine whether there is support for the preparation of a traffic calming plan. This is a critical stage in the traffic calming process, as it can determine early on whether the whole community shares similar concerns and whether they want to consider traffic calming measures.

To determine the community's opinions early in the process, it is recommended that the City develop a newsletter/questionnaire to be distributed to all residents in the neighbourhood that describes:

- ✓ The study area for the plan
- ✓ The traffic-related issues that have been identified by members of the community or City staff
- ✓ Some background on traffic calming in general and some potential measures that could be implemented
- ✓ The process that will be followed to develop a plan if the community chooses to proceed

If two-thirds of the respondents wish to proceed with a traffic calming plan, then the preparation of the plan can move forward to Stage 2. If this level of support is not achieved, City staff will want to respond by sending a letter to all residents outlining the results of the survey and confirming that a traffic calming plan will not be undertaken without community support.



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To encourage a maximum response to this type of questionnaire City staff may wish to consider using some or all of the following strategies to make returning of the questionnaires as easy as possible:

- ✓ Providing multiple ways of returning the questionnaires including a mailing address, a fax number, or a local drop off location
 - ✓ Providing an email address
 - ✓ Providing postage-paid envelopes or survey cards
- **Select a traffic calming consultant.** The City may wish to work with a traffic calming consultant to develop some of their traffic calming plans.
 - **Establish a neighbourhood advisory committee.** It is generally recommended to form a neighbourhood advisory committee to assist the City and planning team throughout the traffic calming process. The Committee is typically comprised of 5 to 10 resident volunteers who will provide their input with identifying and quantifying issues, data collection activities, development and refinement of the traffic calming plan, and act as community liaisons for the rest of the neighbourhood. The Committee is usually formed by circulating a request to the neighbourhood for volunteers at the outset of the study; members should be selected to represent the widest cross section of the neighbourhood as possible.

Stage 2 – Identify Neighbourhood Traffic Issues

The primary objective of this stage of the process is to identify all traffic issues that are of concern to residents of the neighbourhood. Prior to developing a plan, it is essential that a clear and comprehensive list of traffic issues be compiled from every source available. This may include resident complaints, letters to City council in addition to the input solicited during the activities typically undertaken at this stage of the study. While it is difficult to ensure that every single issue is identified early on, every effort is made at this stage of the process to ensure that residents are given the opportunity to inform City staff and consultants of the issues that concern them most.

Activities typically undertaken at this stage of study include:

- **A neighbourhood walkabout.** In addition to publicizing the traffic calming study, a neighbourhood walkabout is an effective means of gathering input



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from residents and community members. Typically held on a weekend, a 2-3 hour walkabout allows City staff and consultants to walk through the neighbourhood with residents to discuss traffic issues first-hand. It is advisable not to discuss potential solutions at this stage – this discussion is best left until after data is collected and more is known about specific problems.

- **Data collection.** Additional data will need to be collected to verify the nature and magnitude of reported problems, and to ensure that the real problems are addressed. These data include reported collisions, pedestrian activity, vehicle speeds (85th percentile) and traffic volumes, and other data relevant to the reported problem. Where possible, traffic data should be collected using automatic counters, for a minimum of 48 hours and collected during times when problems are reported to occur. Similarly, manual traffic data collection (such as intersection traffic counts and/or licence plate traces) should be conducted at times when problems are reported to occur.

Existing data may already be available from a variety of sources for many locations throughout the City. These may include 24-hour traffic counts, intersection counts, pedestrian counts, and accident reports. For those locations without data, additional information will need to be collected (such as speed data and vehicle classification counts). Detailed information regarding the level and standard of data collection that is typically required for traffic calming studies is included in **Appendix B**.

All traffic data should be summarized over a number of different time periods to help determine the extent of the problem. For example, volumes and 85th percentile speeds should be determined for peak hours, peak periods, daytime, overnight and 24-hour periods. By examining the patterns that exist for each of these periods, it is possible to conclude whether the reported issue is consistent throughout the day, or only present during a certain time, or in a certain direction. This will help City staff and consultants gain a better understanding of the issues and therefore, develop a better plan to address them.

- **Traffic calming information meeting.** At this stage of the study it is often useful to hold a public event known as an 'information meeting'. This event would present general information about traffic calming and allow residents the opportunity to learn more about the process. A questionnaire giving residents the opportunity to provide feedback as well as to indicate what types of traffic calming measures they prefer could be distributed.



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Stage 3 – Develop Plans

This stage of the process will focus on identifying potential traffic calming solutions and combining them together to develop one or more proposed plans for residents and community members to review. The outcome of this stage of the process is a recommended traffic calming plan based on the community's preferred options, and that is approved by City council.

- **Identify potential traffic calming measures** and the benefits and impacts associated with each measure. In many cases, more than one measure will be appropriate in addressing a particular issue. Decisions on which measure to select may depend on potential impacts, geometry (grade, visibility, width), interaction with other proposed devices, cost or community preference. It is also important at this point to identify whether supplementary programs of awareness or education can be part of the solution.
- **Develop preliminary plans.** The potential measures identified to resolve traffic problems should now be combined into a preliminary traffic calming plan. With input from the Neighbourhood Advisory Committee, City staff and key stakeholders, potential measures should be combined into one traffic calming plan – with options for specific locations as necessary, or two separate plans. Options should be considered where two or more measures would be equally effective – in this case, neighbourhood preference would determine the preferred option, based on the relative advantages and disadvantages of each. Options should also be considered where a specific measure might be controversial. This permits residents and other who might oppose the specific measure to indicate support for the entire plan without supporting the specific measure. In the case of providing more than one overall plan, experience has shown that no more than two plans should be offered to the community for consideration, in order to avoid splitting the community's vote among too many choices and ending up with no clear preference.
- **Community survey.** The purpose of the community survey is to determine the level of support for the proposed traffic calming plan(s) and to select optional measures. Words such as 'ballot' and 'vote' should be avoided when describing the community survey. It is important that residents and other community members understand that this is a survey intended to measure community support for the proposed traffic calming plan, and is not a binding referendum. Consequently, it is important to explain that following the



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survey, there will still be an opportunity to refine and improve the plan if there are any significant outstanding concerns.

The proposed traffic calming plan(s) should be explained clearly, in non-technical language and with as much visual material as possible. The survey should include maps of the neighbourhood, illustrating the plan and options, and sketches of various traffic calming measures. Where appropriate, background information should be included describing the nature of specific problems (such as observed volumes on specific streets).

The survey should ask residents directly if they support the proposed traffic calming plan(s) with the option for one of three responses. They should be asked to indicate whether they 1) support the plan, 2) do not support the plan or 3) if they feel neutral. The 'neutral' choice is important. Some people might hesitate to actively support a plan, but might not want to condemn it either with a response of 'do not support'. A third option allows them to say in effect, "I do not care strongly one way or the other". Without the 'neutral' option, the number of persons who do not support a plan might appear to be significantly higher than the actual number, and might make it difficult to identify those who have legitimate concerns with the plan. It is also recommended that the City inform residents that a non-response will be considered a 'neutral' response.

The survey should be distributed to every residence (property owners and tenants) in the neighbourhood. One response is permitted per address. To maximize response rates, convenient locations in the neighbourhood should be designated for people to drop off their completed questionnaires in addition to providing a fax number, mailing address and email address. Locations in the community may include schools, stores or community centres.

In reviewing the results of a neighbourhood survey, the key question is what is the minimum level of support necessary to proceed to Council with a proposed traffic calming plan? Although the minimum level could be set as low as 50% plus one, it is recommended that to ensure solid support for a plan and minimum opposition, a higher level of support be required – a minimum of 67% of respondents. As well, it is recommended that an upper limit be established for the 'do not support' responses. Ideally, no more than 20% of respondents should not support a traffic calming plan. Typically, many respondents who do not support a plan do so because of a single concern. In reviewing the questionnaire responses, it is often possible to make minor changes to a plan that would result in higher levels of support.



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If the required level of support is not achieved, a community meeting should be held to identify outstanding concerns and refine the plan to resolve them. If all significant concerns can be successfully resolved in this manner, the plan could then be submitted to Council for approval. If there is uncertainty as to whether a refined plan has sufficient support in the community, a second survey should be undertaken – either of the entire neighbourhood or of just the parts of the neighbourhood where there are outstanding concerns.

- **Community open house.** Prior to the deadline for returning community surveys, an open house should be held to provide residents and other community members with the opportunity to ask questions about the proposed traffic calming plan and to review background information. The open house is also a great opportunity for residents to drop off their completed questionnaires.
- **Refine plan.** Following the community questionnaire, minor refinements can be made to the traffic calming plan in order to address outstanding issues as identified in the survey responses. If major changes to the plan are required, the community survey should be repeated (or a similar means of gauging community support).
- **Approval.** The refined traffic calming plan should now be presented to Council for approval and allocation of funding. Results of the community survey can be used to show Council the level of support within the community. It may also be desirable to invite members of the public and representatives of the Residents Advisory Committee to voice their support for the traffic calming plan.

The last stage of the process involves the design and implementation of the approved traffic calming plan. This stage of the process is discussed in Section 5.0 of the Guidelines.



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4.0 TRAFFIC CALMING MEASURES

The *Canadian Guide to Neighbourhood Traffic Calming* identifies over 25 different traffic calming measures that have been used to mitigate the impacts of neighbourhood traffic throughout Canadian municipalities. While each of these measures has proven effective in other municipalities, it is important that the City's Traffic Calming Guidelines recommend the use of only those devices that are suitable and appropriate for use in the context of Nanaimo communities.

This section of the Guidelines describes the traffic calming measures that are available for use in Nanaimo as well as their impacts and applicability.

4.1 Not All Traffic Calming Devices are Created Equal

It is important that the City recognizes that not all traffic calming measures are created equal – they each have significant benefits and various disbenefits. Each type of traffic calming device relies on a different mechanism to influence motorist behaviour, making them more effective for certain types of problems than others. It is also important that a balance of effectiveness, mobility and access be considered when choosing traffic calming measures. Tables 3.2 and 3.3 in the *Canadian Guide to Traffic Calming* outline the impacts and applicability of each device, and can be used as an additional resource.

In general, all traffic calming devices can be placed into one of the following categories:

- **Vertical Deflection Measures.** These traffic calming measures rely on a vertical deflection of the road surface to physically impact driver behaviour. Vertical measures include devices such as speed humps and raised crosswalks. In general, the 'jolt' or displacement inflicted on a passing vehicle forces the motorist to slow down. The greatest benefit of vertical measures is their ability to slow motorists down, however they also have some effectiveness at deterring short-cutters.
- **Horizontal Deflection Measures.** As the name would suggest, this category of traffic calming measures relies on a horizontal deflection to influence motorists. Devices in this category include curb extensions and raised median islands. By forcing a motorist to deflect horizontally, these types of measures require that a motorist slow down in order to navigate the deflected path. While most horizontal measures benefit pedestrians by

shortening the crossing distance on a roadway, if used properly, they can also be effective at slowing vehicle speeds and deterring short-cutters.

- **Obstruction Measures.** These measures are the most prohibitive of all measures and work by physically blocking a particular movement or even a whole intersection. Full closures and diverters are examples of obstruction measures; while extremely effective at preventing undesirable traffic movements their disadvantage is that they severely restrict resident access as well.
- **Signage.** In some communities, familiar types of signage are used as traffic calming devices. While posting a turn-prohibition or a lowered speed limit might seem like the obvious solution to some residents, it has been found that signs are typically not very effective traffic calming solutions and are generally not recommended on their own to address neighbourhood issues. Some signage, such as the “traffic calmed community” signs however, are an important part of a successful traffic calming plan.

4.2 Traffic Calming Measures to be considered in Nanaimo

Following discussions with emergency services such as the Fire Department and City staff including representatives from Engineering, Operations and Maintenance, the following traffic calming measures have been selected for consideration in Nanaimo communities. They have been chosen because of their effectiveness and also to minimize negative impacts on City and emergency service operations. While each of these measures is available for use, careful consideration of effectiveness, impacts and community preference must be made. For example, when developing a plan in Nanaimo, staff must ensure that Fire Department response time targets can still be met.

Table 4.1 summarizes those measures that are available for use in the City of Nanaimo. The type of measure is displayed as it relates to the class of the road and other considerations. The road classification is broken down into three levels being local roads, neighbourhood and minor collectors. Other considerations are emergency response and transit routes.

Emergency response considerations include impacts of measures on direct routes from the fire and ambulance service stations to neighbourhoods. Although direct routes have not been formally identified, there is a need to do so and therefore consultation must be conducted with the emergency services. Delays due to traffic



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calming measures can be serious and detrimental to the well-being of citizens requiring these services.



The discussion that follows highlights the advantages and disadvantages of each traffic calming measure listed in **Table 4.1**.

Table 4.1 – Traffic Calming Measures for Consideration in Nanaimo

Type of Measure	Road Classification			Other Considerations	
	Local Roads	Neighbourhood Collector	Minor Collector	Emergency Response Routes	Transit Routes
Vertical Deflection					
1. Speed Hump	✓	✓	X	X	X
2. Raised Crosswalk	✓	✓	X	X	X
3. Sidewalk Extension	✓	✓	✓	✓	✓
4. Textured Crosswalk	✓	✓	✓	✓	✓
Horizontal Deflection					
1. 1-Lane Chicane	✓	X	X	X	X
2. Curb Extension	✓	✓	✓	✓	✓
3. Curb Radius Reduction	✓	✓	✓	✓	✓
4. On-Street Parking	✓	✓	✓	✓	✓
5. Raised Median Island	✓	✓	✓	✓	✓
6. Traffic Circle	✓	✓	X	X	X
7. Road Diets	✓	✓	✓	✓	✓
Obstruction					
1. Directional Closure	✓	X	X	X	X
2. Intersection Channelization	✓	✓	✓	✓	✓
3. Raised Median Through an Intersection	✓	✓	✓	✓	✓
4. Right-in/Right-out Island	✓	X	X	X	X
Signage					
1. Maximum Speed	✓	✓	✓	✓	✓
2. Right (Left) Turn Prohibited	✓	✓	✓	✓	✓
3. One-Way	✓	✓	✓	✓	✓
4. Stop	✓	✓	✓	✓	✓
5. Traffic Calmed Neighbourhood	✓	✓	✓	✓	✓
6. Yield	✓	✓	✓	✓	✓
✓ May be considered X Will not be considered					

4.2.1 Vertical Deflection Measures

Traffic calming measures that cause a vertical deflection of the vehicle and are considered for use in the City of Nanaimo are briefly described below.

Speed Humps	Examples
<p>Description: Speed humps are not the same as speed bumps that are used in parking lots. Speed humps may be 4m or 7m long for local and collector roads respectively, approx. 3 inches high (see City of Nanaimo Traffic and Highway Installation Guidelines for the installation process for these devices). At moderate vehicle speeds, speed humps gently rock a car, whereas at higher speeds, there is more of a jolt.</p> <p>Applicability: Recommended for use on local roads and neighbourhood collectors.</p> <p>Benefits: The result is that motorists will slow down to approximately 35km/hr travelling over the speed hump. They do not impact on-street parking or bicycles. Depending on the availability of alternate routes, traffic volumes may be reduced.</p> <p>Disbenefits: May reduce response times by 1 to 10 seconds per hump. Potential for increased noise due to braking and acceleration. Increases time needed for street sweeping and snow removal. Interferes with pavement overlays. Traffic may be diverted to parallel routes without traffic calming measures. To be used only where other devices are not suitable or sufficient.</p>	 

Raised Crosswalks

Examples

Description: A raised crosswalk is essentially a speed hump combined with a crosswalk.

Applicability: Recommended for use on local roads and neighbourhood collectors.

Benefits: This device provides the same benefits as a speed hump in slowing vehicles but also improves pedestrian safety by increasing the visibility of the crosswalk, and conveying a message that pedestrians have priority at the crossing.

Disbenefits: Same as for speed humps.



Sidewalk Extension

Examples

Description: A sidewalk extensions is where the materials of a sidewalk are extended across an access to highlight the pedestrian environment.

Applicability: A sidewalk extension is intended primarily for use on local streets, but is acceptable on neighbourhood and minor collectors as well.

Benefits: Aids pedestrians by visually indicating that the sidewalk has priority over vehicles approaching on the roadway.

Disbenefits: Snow clearing time increased in the case of raised sidewalk.



Textured Crosswalk

Examples

Description: The application of a special treatment to a crosswalk – such as coloured pavement, paving stones etc. – to enhance the crossing.

Applicability: May be considered on locals, neighbourhood and minor collectors.

Benefits: Heightens visibility of crossing. Improves driver's awareness through noise and vibration. Enhances appearance of street.



Disbenefits: Increases time to street sweep if deep grooves are present. Increases noise levels. When rough or pronounced grooves are parallel to direction of travel, traction and stability problems are created for seniors, the disabled, wheelchairs, bicycles and motorcycles. Can be costly to construct and maintain.

4.2.2 Horizontal Deflection Measures

This section describes traffic calming measures that cause a horizontal deflection of vehicles. These types of measures discourage short-cutting or through traffic to varying degrees and may also reduce vehicle speeds, reduce conflicts and enhance the neighbourhood environment.

One-lane Chicanes

Examples

Description: Discourage speeding by requiring motorists to weave around two offset extensions of the curbs and to yield to oncoming traffic. They are generally designed to accommodate surface drainage along the gutter, and can incorporate landscaping.

Applicability: Chicanes will only be considered on local roads in Nanaimo.



Benefits: One-lane chicanes have proven to be somewhat effective at reducing vehicle volumes.

Disbenefits: Chicanes are used in only limited applications where driveway spacing and on-street parking can allow for the installation of the chicane. Typically, they are not used where there is heavy on-street parking. Increase time for snow removal. Street sweeping and cleaning of drainage gutter must be done manually. Traffic may be diverted to parallel routes without traffic calming measures.



Curb Extensions

Examples

Description: A curb extension is basically a bulge of the curb that can be located at intersections or at mid-block locations, and can be used alone or in combination with a raised crosswalk and/or a median island.

Applicability: In Nanaimo, curb extensions may be considered on local roads, neighbourhood and minor collectors.



Benefits: Curb extensions improve pedestrian safety by reducing the crossing distance, and by improving visibility for both approaching motorists and waiting pedestrians. In addition, curb extensions on one or both sides of the roadway may also help to reduce vehicle speeds. For this purpose, curb extensions may be built on either urban or rural roadway cross sections.

Disbenefits: May be difficult for large vehicles to turn causing them to cross into adjacent or oncoming travel lanes. Cost and time of snow removal may increase.

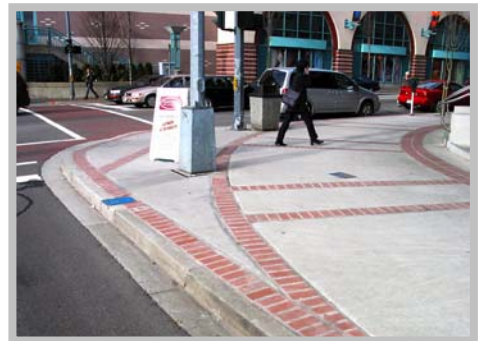
Curb Radius Reduction

Examples

Description: This is the reconstruction of an intersection corner to a smaller radius.

Applicability: Curb radius reduction may be considered on local roads, neighbourhood and minor collectors.

Benefits: This measure effectively slows down right-turning vehicle speeds by making the corner 'tighter' with a smaller radius. A corner radius reduction may also improve pedestrian safety to a certain degree by shortening the crossing distance.



Disbenefits: Large vehicles must be considered and curb radius reductions are discouraged on transit routes. There is the potential for rear-end collisions due to right turning vehicles rapidly decelerating.

On-Street Parking

Examples

Description: The use of on-street parking is a practical way of decreasing the effective road width, similar to the effect of a curb extension.

Applicability: This type of measure is applicable on most classes of road, but may not be that effective on rural cross-sections, unless obstructions are placed at the roadside to prevent vehicles from parking too far off of the roadway. In addition, continuous on-street parking along longer streets without intermediate passing opportunities may be inappropriate.



Benefits: The primary benefit of allowing on-street parking as a traffic calming measure is the reduction in vehicle speeds due to the narrowed travel space. Also the parked cars act as a buffer between traffic and pedestrians.

Disbenefits: There is reduced visibility of and for pedestrians crossing the street. Opened car doors can hit or create an obstacle for cyclists. Parked vehicles are an obstruction to street sweeping and snow clearing operations.

Raised Median Islands

Examples

Description: Raised median island are raised concrete or asphalt islands installed in the centre of a road.

Applicability: Raised median islands may be considered on local roads, neighbourhood and minor collector roads.

Benefits: These devices are particularly useful at unsignalized crosswalks as they increase motorists' awareness of the crosswalk and permit pedestrians to cross half the road at a time. Raised median islands can be combined with curb extensions and/or raised crosswalks to further improve pedestrian safety. Travel lanes are narrowed.

Disbenefits: There is a reduction of on-street parking and driveway access. Snow removal costs are increased.



Traffic Circles

Examples

Description: A circular or other shaped raised island placed in the middle of an intersection in place of stop signs, signals or other controls. They should not be confused with another, larger scale control known as the modern roundabout.

Applicability: In Nanaimo, traffic circles will be considered on local roads and neighbourhood collectors where traffic volumes are balanced. They should not be used on industrial collector or arterial roads, even where these roads intersect local residential streets.

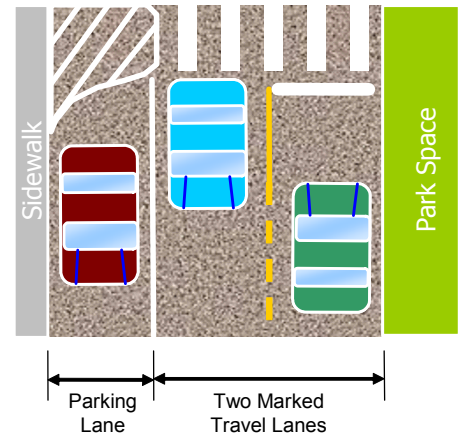
Benefits: Traffic circles have proven to reduce intersection collisions and are also very effective at slowing vehicles, particularly when used in series with other traffic circles or devices such as speed humps. Traffic circles help to reduce traffic volumes



Disbenefits: The narrowed travel lane can increase bicycle/vehicle conflicts. Fire trucks cannot manoeuvre a traffic circle if vehicles are parked near it. Time for snow removal is increased. Landscaping on the traffic island could obstruct driver sight distance.

Road Diets Examples

Description: A new technique used to better define road space for various users and to encourage motorists to slow down. In many cases, wide local and collector streets do not have pavement markings (other than a centre line in the case of collectors) to clearly indicate where motorists should drive. Road diets involve the addition of pavement markings to define driving space, parking space, and, in some cases, bicycle facilities.



Applicability: Road diets may be considered on local roads, neighbourhood or minor collectors.

Benefits: Clearer definition of driving space can induce drivers to reduce their speed. Better definition of road space also benefits cyclists and pedestrians.

4.2.3 Obstruction Measures

Traffic calming measures that obstruct specific vehicle movements are typically implemented at intersections, but may also be applied at some mid-block locations. The primary benefit of obstruction measures for traffic calming is that they effectively calm traffic behaviour without compromising bicycle or pedestrian movements. Although these types of measures are very effective at discouraging short-cutting and through traffic to varying extents, they are considered for use only when horizontal or vertical deflection measures are not effective or appropriate.

Directional Closures

Examples

Description: A directional closure is a curb extension or other barrier that extends into the roadway, approximately as far as the centreline. This device obstructs one side of the roadway and effectively prohibits vehicles travelling in that direction from entering.



Applicability: These devices may only be considered on local roads.

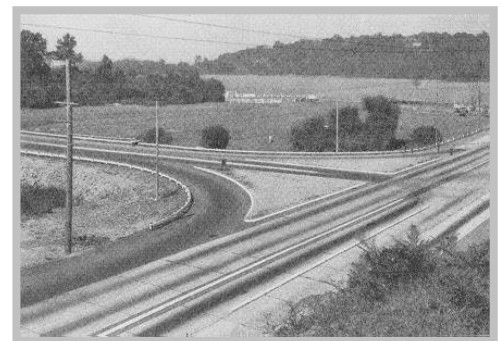
Benefits: Directional closures are especially useful for controlling non-compliance of one-way road sections and are compatible with other modes such as bicycles. At all directional closures, bicycles are permitted to travel in both directions through the unobstructed side of the road however some directional closures have a pathway built through the device specifically for bicycles.

Disbenefits: May restrict access. Can complicate street sweeping, snow removal and garbage collection routes. Traffic may be diverted to parallel routes without traffic calming measures.

Intersection Channelization

Examples

Description: A channelization is when concrete medians are used to delineate specific movements at or through an intersection.



Applicability: These devices may be considered for use on local roads, neighbourhood and minor collectors.

Benefits: Channelization improves pedestrian safety by providing refuge areas, which reduces the crossing distances and is particularly effective at prohibiting certain vehicle movements.

Disbenefits: May restrict access. Thereby increasing resident trip length. Can complicate street sweeping, snow removal and garbage collection routes.

Raised Median Through Intersection

Examples

Description: These devices are used on the centrelines of two- and four-lane roadways to prevent left-turn and through movements to and from intersecting streets. Access for bicycles is typically provided.

Applicability: May be considered on local roads, neighbourhood and minor collectors.



Benefits: This type of device is especially effective at preventing short-cutting and through traffic while providing some secondary pedestrian safety benefits. Possible reduction in number of collisions.

Disbenefits: May restrict access for residents. Can obstruct emergency response vehicles in median cannot be circumvented. Traffic may be diverted to parallel routes without traffic calming measures. Can complicate street sweeping, snow removal and garbage collection routes.

Right-In / Right-Out Island

Examples

Description: A raised triangular island located on an intersection approach to limit the side street to right turn in and out movements.

Applicability: These devices may be considered for use on local roads.



Benefits: Similar to a raised median through an intersection, this device is used primarily to restrict movements to and from an intersection roadway.

Disbenefits: May restrict access. Traffic may be diverted to parallel routes without traffic calming measures. Can complicate street sweeping, snow removal and garbage collection routes.

4.2.4 Signage

Signage is used to regulate traffic movements and not calm traffic as a primary function. The use of signage without accompanying physical traffic calming devices should be avoided where possible, as this can create an enforcement problem and, as a result, can be costly in terms of police resources. There is, however, one type of signage that can and should be used to complement the physical devices installed through a traffic calming plan.

Traffic Calmed Community Signs

Examples

Description: used to notify motorists and other road users that they are about to enter a neighbourhood that has been 'calmed' by the installation of various traffic calming measures. Although this signage alone does not have any significant impacts on driver behaviour, it aims to make the motorist aware of the conditions they are about to enter and could potentially act as a 'deterrent' for motorists looking for a short-cut.



Applicability: Can and should be used on all traffic calmed streets.

Benefits: Alerts motorists to the presence of traffic calming devices in the neighbourhood. Raises awareness of traffic issues.

Disbenefits: No effect on vehicle access or police enforcement.

Information signage

Examples

Description: May also be used to raise awareness about neighbourhood traffic issues and to complement certain traffic calming measures. Although signage may help to increase the awareness of motorists to undesirable driving behaviour, it will not generally have any significant impacts on speeding or short-cutting.

4.3 Traffic Calming Measures for use in New Communities

Because the City of Nanaimo is still developing, City staff wished to recognize in their Guidelines, the use of traffic calming measures at the planning and design stage. While the focus of the Guidelines lie on addressing traffic issues that arise after a neighbourhood is built, there is a changing attitude in many municipalities that recognizes the benefit of including traffic calming measures from the beginning, to help prevent undesirable traffic patterns from developing in the future. Integrating traffic calming measures with original neighbourhood designs will not only impact travel patterns, but in general will help to create a friendly, comfortable and safe walking and cycling environment.

In general, the use of traffic calming at this stage of development should be less restrictive and should focus more on providing that safe and defined environment for all road users. Given these considerations, the following discussion highlights those traffic calming measures that would be suitable for integration with a new community. To recognize the benefits of doing so, the City may wish to ultimately refine their existing road standards to include some of these measures.

- **Textured crosswalks.** This type of device is included in the Guidelines for consideration of local roads, neighbourhood and minor collectors. While on its own, it may not have significant influence on changing motorist behaviour, as part of a new community, it could help set the standard for highly-visible pedestrian crossings. By selecting a specific treatment for use on crosswalks, the use of this measure may also contribute to the specific character of a particular neighbourhood within the City.
- **Curb extensions.** Many municipalities have already incorporated the use of curb extensions into their current standards for local and collector roadways. In Nanaimo, City staff may wish to make the same consideration for new communities. Curb extensions at intersections or mid-block locations will enhance pedestrian crossings and help define the start and end of on-street parking areas. In addition to providing a larger area for waiting pedestrians, incorporating curb extensions will also allow for the creation of an enhanced pedestrian environment where street furniture, landscaping or bus stops could be designed to make use of the space atop curb extensions.
- **On-street parking.** While already a consideration in most roadway standards, Nanaimo planners and designers should consider the use of on-street parking for its inherent traffic calming benefits as well. Well-placed areas of on-street parking can help to narrow the effective road width and

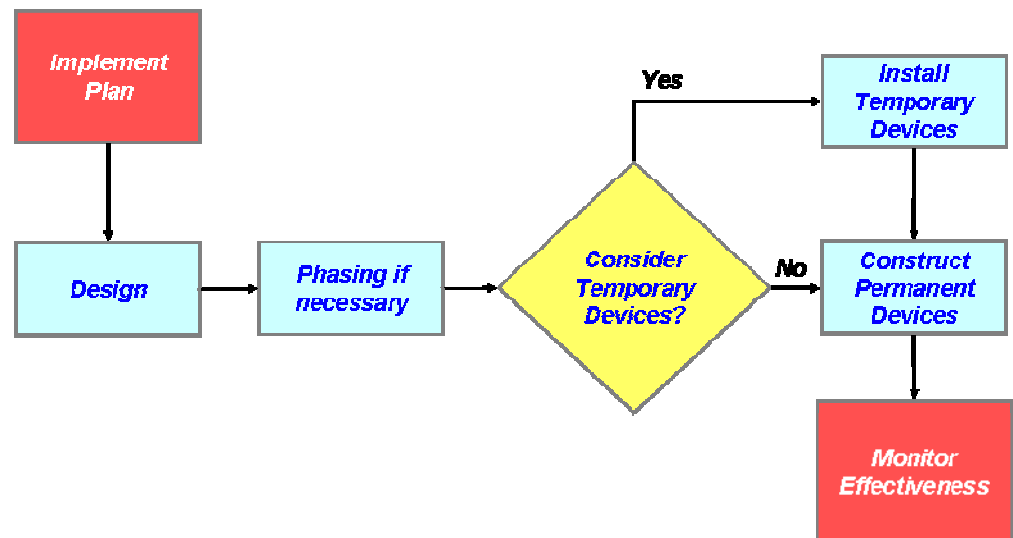
naturally introduce a deflection to passing motorists. When considering the placement of on-street parking, City staff should consider these effects and use them to their advantage in controlling motorist behaviour as well.

- **Raised median islands.** This type of device can also be seamlessly integrated with a new community for the traffic calming reasons discussed elsewhere in these Guidelines, but also for the benefit of enhancing the community. Placing raised median islands at the entrances to a neighbourhood can help create a 'gateway' effect that defines the start of the neighbourhood. The surface of the islands could be used for landscaping, public art or community signage, enhancing the aesthetics and providing visual clues to entering motorists. Similar to the effects of road diets and skinny streets, the visual indication that a motorist is entering a defined area or neighbourhood can have a significant impact on their speed of travel through the area. In addition, this type of entry feature can help the City define the unique nature and character of its individual communities.
- **Traffic circles.** Instead of providing standard intersection control devices in residential neighbourhoods, City planners and designers may wish to consider the use of traffic circles in new communities. Reducing the risk of certain types of collisions, traffic circles could be a new 'safer' standard for new communities, setting a standard of aesthetically landscaped control devices as opposed to stop signs and yield signs that inevitably become subject to non-compliance issues.
- **Road diets or skinny streets.** More of a design consideration than a traffic calming device, road diets and skinny streets applications are ideal for use in new communities. The basic premise of providing narrowed travel lanes and highly defined road space for automobiles, bicycles and pedestrians has a significant effect on the speed and nature of vehicle traffic on the street. In some communities, narrowed lanes of as little as 3.0 m have been used in combination with bicycle lanes, meandering or multi-use pathways, and on-street parking to create a defined roadscape that is visually varied. In creating this type of environment, City planners can avoid the creation of wide, un-delineated roadways where the motorist can see from end-to-end, making it easier to drive fast. Road diets and skinny streets are suitable applications for downtown areas and residential neighbourhoods, but should be avoided where there are higher proportions of large vehicles that must use the street. In combination with some of the other measures described above, traffic calming measures can be easily integrated to create interesting and comfortable neighbourhood for all road users.

5.0 BRINGING THE PLAN TO LIFE – THE IMPLEMENTATION PROCESS

Once a traffic calming plan has been developed and approved by City council, the process of design, implementation and monitoring will begin. This is the fourth and final stage of the traffic calming process and the following sections of the Guidelines outline the key tasks and considerations. **Figure 5.1** illustrates this final stage of the traffic calming process.

Figure 5.1 – The Implementation Process



5.1 Traffic Calming Design Considerations

To ensure that traffic calming measures are constructed properly, designs should be prepared for most devices based on accurate survey information to ensure that design vehicles can be accommodated and that drainage effects are considered. The *Canadian Guide to Neighbourhood Traffic Calming* provides information regarding the standard design details for each device included in these Guidelines. Supplementary design guidelines and installation guidance can be found in the City's Traffic and Highway Installation Design Guidelines. Guidance on the data collection and monitoring procedures can be seen in Appendix B.

It is usually not necessary to prepare designs for individual speed humps and raised crosswalks – instead, a standard design can be used and a map prepared illustrating the exact location of speed humps and raised crosswalks.

In the case of traffic calming measures included at the planning and development stage, all measures should be designed to conform to the mentioned standards as

well as the City's current standards for the roadway or neighbourhood in question. The City may wish to amend their current guidelines to reflect the use of certain traffic calming measures as part of a new community.

5.2 Phasing

Desirably, traffic calming plans should be implemented all at once. However, in some cases it may not be possible or desirable to implement all traffic calming measures at the same time, and instead implementation might be phased over a period of two or more years. If implementation is to be phased, priorities for implementation should be determined using the following criteria:

- ✓ **Safety improvements should be given priority.** These might include traffic calming measures to reduce vehicle speeds and reduce conflicts at intersections, as well as pedestrian and bicycle facility improvements.
- ✓ **Low-cost measures should be given priority.** Generally, it is preferable to implement several low-cost measures rather than on higher-cost measure. Low-cost measures might include signage, pavement markings, speed humps and crosswalks for example.
- ✓ **Measures should be implemented in groups.** For example, measures on two parallel local streets should be implemented at the same time, so as to avoid diverting traffic from the streets with a measure to the street without any measures.
- ✓ **Measures that can be combined with other scheduled projects may take priority.** In many cases, the construction of traffic calming measure could easily be integrated with other maintenance or rehabilitation projects already planned. If this is the case, portions of an approved traffic calming plan could be implemented with another project to take advantage of available resources and funding opportunities.

5.3 Not Cast in Stone – The Case for Using Temporary Measures

It is important that City staff and residents alike understand that traffic calming plans when first implemented are not cast in stone. Where possible, the City may wish to install traffic calming devices on a temporary basis at first. After a period of six months to a year, if it has been determined that a device has achieved the intended results, it should then be constructed on a permanent basis. This process of using temporary measures avoids the risk of removing or modifying a permanent

installation that was constructed at a much higher cost than a temporary installation. It also provides an opportunity to alter the geometrics of a device or make other changes prior to permanent installation.

Some devices, such as speed humps, would typically not be installed temporarily as the cost for a temporary speed hump can run higher than constructing it permanently and removing it if necessary. Devices such as traffic circles, curb extensions, and median islands can easily be constructed temporarily with re-useable rubber curbing or median barrier.

While many communities choose to install devices temporarily, others choose to go straight to permanent installation for reasons of politics, schedule or cost. The City of Nanaimo will want to decide on a case-by-case basis if temporary installations will be used.

5.4 Ensuring a Successful Plan – The Monitoring Process

Whether the City decides to use temporary measures or not, it will be important that they still undertake a monitoring program. This will allow the City to ensure that the plan is achieving the intended result, and if not, give the opportunity for City staff to make further refinements to the measures.

Data collected during the preparation of the traffic calming plan represents 'before' data. Following implementation of the plan, 'after' data should be collected at the same locations and in the same conditions in order to determine whether the desired results have been achieved. Data should be collected at other locations where new problems are identified, and data collected through the municipality's annual data collection program should be reviewed to identify potential problems which might arise as a result of changes in travel patterns.

In addition to ensuring that traffic conditions have improved, the results from a monitoring program will also allow the City to quantify the types of results achieved through the use of various types of traffic calming measures.



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APPENDIX A

Glossary



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GLOSSARY

Chicane	A series of curb extensions on alternating sides of a roadway, which narrow the roadway and require drivers to steer from one side of the roadway to the other to the other to travel through the chicane. Typically, a series of at least three curb extensions is used.
Curb Extension	A horizontal intrusion of the curb into the roadway resulting in a narrower section of roadway.
Curb Radius Reduction	The reconstruction of an intersection corner using a smaller radius, usually in the 3.0 m to 5.0 m range.
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 traffic circle requires that the vehicle be steered or deflected horizontally from its straight path to manoeuvre past the circle.
Device	A physical feature of the roadway, constructed for the purpose of affecting the movement of motor vehicles, bicycles and / or pedestrians.
Directional Closure	A curb extension or vertical barrier extending to approximately the centerline of a roadway, effectively obstructing (prohibiting) one direction of traffic.
Divert	To redirect traffic, typically through the use of physical obstructions in the roadway and / or regulatory signs.
Geometry	When referring to roadway design, geometry refers to the physical characteristics and dimensions of parts of the roadway.
Intersection Channelization	Raised islands located in an intersection, used to obstruct specific traffic movements and physically direct traffic through an intersection.
Measure	A physical device, regulation or action which affects the movement of motor vehicles, bicycles and / or pedestrians.
On-Street Parking	The reduction of the roadway width available for vehicle movements by allowing motor vehicles to park adjacent and parallel to the curb.
Raised Crosswalk	A marked pedestrian crosswalk at an intersection or mid-block location constructed at a higher elevation than the adjacent roadway.
Raised Median Island	An elevated median constructed on the centreline of a two-way roadway to reduce the overall width of the adjacent travel lanes.



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Raised Median Through Intersection	An elevated median located on the centreline of a two-way roadway through an intersection, which prevents left turns and through movements to and from the intersecting roadway.
Retrofit	The reconstruction of a roadway or other transportation facility with physical improvements to the existing design.
Right-in / Right-out Island	A raised triangular island at an intersection approach which obstructs left turns and through movements to and from the intersecting street or driveway.
Roundabout	Similar to a traffic circle. Roundabouts are typically used on arterial and collector streets, and are distinguished by Yield signs and raised median islands on all approaches, and in some cases, flare of the entry approach to two or more lanes.
Self-enforcing	A traffic calming measure which does not require police enforcement in order to be effective. A speed hump is self-enforcing, for example, whereas a posted maximum legal vehicle speed is not self-enforcing.
Short-cutting	Traffic which is travelling through a neighbourhood to bypass congestion on the arterial street network, or to make use of a more direct route.
Sidewalk Extension	A sidewalk is continued across a local street intersection. For a "raised" sidewalk extension, it is continued at its original elevation, with the local roadway raised to the level of the sidewalk at the intersection. For an "unraised" sidewalk extension, the sidewalk is lowered to the level of the roadway.
Speed Hump	A raised area of a roadway, which deflects both the wheels and frame of a traversing vehicle.
Stakeholder	An individual or organization with an interest in transportation issues in a neighbourhood or specific location. Examples of stakeholders include residents associations, a chamber of commerce, a local transit agency, cycling advocates, an agency assisting disabled persons, and school boards.
Streetscaping	A means of enhancing the street 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, way-finding and orientation, aesthetic quality and interest along an urban street.
Textured Crosswalk	A crosswalk incorporating a textured and / or patterned surface which contrasts with the adjacent roadway.
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.
Traffic Circle	A raised island located in the centre of an intersection, which requires vehicles to travel through the intersection in a counter-clockwise direction around the island.



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APPENDIX B
Data Collection Guidelines

B DATA COLLECTION GUIDELINES

This section provides an overview of data collection and monitoring needs, as part of the Neighbourhood traffic calming process.

B.1 Data Collection Activities

Data are needed at three different stages of the neighbourhood traffic calming process, as described below:

- **Determining priorities** – In order to determine neighbourhood priorities for developing traffic calming plans, data needs include traffic calming requests, collision data, sidewalk inventories, roadway geometry (topographic mapping) as well as scheduling for other City of Nanaimo programs. These data should be collected on an annual basis for the purpose of updating priorities.
- **Preparing plans** – During the preparation of a neighbourhood plan, data are collected to verify reported problems, and to determine the extent and nature of a problem. These data may include (but are not limited to) traffic volumes, speeds and classifications, intersection counts, parking utilization, licence plate traces and pedestrian and bicycle volumes. New data are typically collected only in locations where problems are reported and where data are not already available.
- **Monitoring** – Following the implementation of a neighbourhood traffic calming plan, data may be collected to monitor the performance of the measures, and to identify any new problems. Data collected during the preparation of a traffic calming plan represents 'before data. Following implementation of the plan, 'after' data should be collected at the same locations and in the same conditions as 'before' data. Data should also be collected at other locations where new problems are identified, and data collected through the municipality's annual data collection program should be reviewed to identify potential problems which might arise as a result of changes in travel patterns.

B.2 Types of Data

As part of the development of neighbourhood traffic calming plans, three principal types of data are typically collected as follows:

- **Traffic volumes** – Traffic volume data provide an indication of total traffic travelling along the neighbourhood streets during a given period (e.g., 24-hour

or peak period). The primary purpose of collecting traffic volume data is, not only to provide an indication of the overall number of vehicles, but also to identify the extent of non-local traffic (which may be supported with through traffic surveys).

- **Travel speeds** – The travel speed data provides a means of assessing the degree to which speeding is a problem along a particular street. Speed studies are ideally conducted over a minimum 24-hour period using automatic traffic recorders. The primary measure of interest with respect to speed is referred to as the 85th percentile. In other words, if 85% of the drivers along a particular street are driving at or below the posted speed, this is generally within an acceptable range. In this circumstance, one would conclude that the identified problem might be attributed to a few speeding drivers in which traffic calming would not be the appropriate solution. However, if the 85th percentile speed is more than the posted speed plus 7 km/h, traffic calming measures could be very effective in reducing speeds.
- **Through traffic** – The proportion of through traffic simply refers to the amount of traffic along a neighbourhood street that is not generated by the immediate land uses. Through traffic patterns can be determined through various sources such as intersection counts and licence plate surveys. Since through traffic can often be the source of speeding vehicles within a community, and in the absence of alternative roads to divert non-local traffic, traffic calming solutions may be concentrated on addressing driver behaviour within the neighbourhood.

B.3 Methods of Collection

This section provides guidance for conducting specific data collection activities. These guidelines are intended to ensure that data are appropriate for traffic calming study purposes, are meaningful, and are collected in the most cost-effective manner.

- Traffic volume and speed data should be collected for a minimum 24-hour period, and desirably for 48 or 72 hours. This ensures that no time periods are overlooked when problems might occur, and avoids the need to repeat data collection activities if residents indicate that data were not collected at the time that problems occur.
- Traffic volume and speed data are best recorded through the use of automatic counters, ideally one that can also record speeds. Radar guns are not an effective tool for collecting speed data, as observers are often visible to



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motorists, and can bias results by selecting only lead vehicles in platoons. Speeds should be recorded in mid-block locations, as far from intersections as possible.

- Intersection movements can only be recorded manually — automatic counters are not useful for this purpose. Intersection counts should be undertaken during time periods when problems are reported to occur, and for a minimum of two hours at a time. If problem time periods are not known, intersection counts should be undertaken for a total of six hours — two hours during the a.m. peak period (typically 7:00 to 9:00 a.m.), two hours in the midday (typically 11:30 a.m. to 1:30 p.m.), and three hours in the evening (typically 4:00 to 6:00 p.m.). Observers should also record pedestrian and cyclist volumes.
- Licence plate traces should only be conducted in areas with a small number of access points, so that through traffic can be conclusively identified. A minimum 90-minute time period is required, which results in one hour's worth of useful data. The cost of conducting licence plate traces can be reduced by using volunteers from the community.