



**A Framework for Conducting
Sustainable Transportation Assessments
in Neighbourhoods (STANs)**



A Framework for Conducting Sustainable Transportation Assessments in Neighbourhoods (STANs)

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APPENDIX A Stakeholder Interviews

APPENDIX B Literature and Best Practices Review

1 Project Background

1.1 Introduction

To ensure safety on local streets, planners use traffic calming techniques to slow or reduce the volume of vehicles. The traffic calming process has evolved dramatically from its grassroots movement in late 1960s in Europe. In 1998, the Transportation Association of Canada (TAC) published *The Canadian Guide to Neighbourhood Traffic Calming (Canadian Guide)*. Today, many North American municipalities integrate traffic calming into their transportation policies.



Typically, traffic calming initiatives use physical measures such as speed cushions or humps to slow traffic and control its volume. Commonly, vertical deflection measures (speed humps and raised crosswalks) and obstruction measures (diverters and road closures) effectively reduce traffic volumes on local roads or neighbourhood collectors. However, these measures have resulted in two concerns:

- 1) The traffic calming process divides neighbours because the typical solutions (traffic circles, speed humps, road closures, etc.) are generally reactive and deeply unpopular.
- 2) Residents dislike seeing their connections to each other reduced, pedestrian use impeded, and their personal security diminished. Addressing such issues is outside the scope of traditional traffic calming measures.

Due to these problems, some neighbourhoods have revisited their traffic calming plans several times. Thus, the process becomes prolonged and frustrating for all parties. This may cause some residents to take matters into their own hands.

Some solutions fall outside the typical traffic calming process. During a recent study done by Opus in the Greater Vancouver area, the process reached an impasse due to the inflexibility of a municipality's policies. In this community, a street classified as a local road did not have sidewalks although the street provided access to several cross-streets and a recreational community centre. With no sidewalks, the residents did not feel comfortable walking on the road because of its narrow width and the flow of traffic. Speed humps were proposed but rejected.



An obvious solution would have been to install sidewalks. However, municipal policy did not support this unless local residents financed the upgrade. Because few residences fronted the road, the owners of those properties were unwilling to finance sidewalks for the entire neighbourhood. In the short term, no traffic calming measures were implemented.

A solution might have been reached if the municipality allowed some flexibility in its policy. The municipality could have relaxed its requirement for funding sidewalks on local roads. It also might have reviewed the road's classification by considering that it was a distributor to a regional facility.

Additionally, Canadian municipalities are increasingly promoting sustainable transportation by planning for and accommodating travel modes for pedestrians, cyclists, skateboarders, etc. Physical traffic calming measures effectively reduce speeding or shortcutting traffic in neighbourhoods and improve safety for alternative travel modes. But such measures do not typically improve the infrastructure itself.

Therefore, recognizing that Alberta municipalities require strategies to deal with traffic calming, the Centre for Transportation Engineering & Planning (C-TEP), with support from Strathcona County, retained Opus International Consultants (Opus) to establish a framework for a new way of looking at transportation choices at the neighbourhood level.

1.2 Study Process

In developing a new framework to consider the transportation choices for neighbourhoods, Opus developed and organized the study into four major tasks:

- 1) Confirm current issues in neighbourhood traffic in Alberta.
- 2) Conduct a literature and best practices review.
- 3) Develop the framework.

4) Test and finalize the framework.

These tasks are organized into the sections of this report as follows:

- Section 2: Current Issues in Alberta Neighbourhoods
- Section 3: Emerging Practices in Sustainable Neighbourhoods
- Section 4: The STANs Framework

1.3 Sustainable Transportation Assessments for Neighbourhoods

Opus has established a new framework to consider the transportation issues and choices that face today's neighbourhoods. This framework requires:

- An understanding of the current issues in Alberta neighbourhoods
- An awareness of the best practices and current trends in providing sustainable travel modes
- A review of international literature and best practices
- A keen sense of the drawbacks of implementing physical traffic calming measures from firsthand experience.

Opus has identified this framework as the Sustainable Transportation Assessments for Neighbourhoods (STANs). STANs identifies key opportunities for improvement that will increase the liveability and the sustainable transportation choices of a neighbourhood. STANs is a logical evolution of traffic calming. It takes into account that contemporary jurisdictions promote active (i.e. self-propelled) transportation, provide for multiple modes of travel, and are moving away from post-war, auto-centric transportation planning.

STANs has two components of sustainability. First, STANs is environmentally sustainable because it provides solutions that promote carbon-free and active travel modes. Second, it is economically sustainable because STANs correctly identifies the source of complaints to ensure that a traffic calming process is not repeated frequently and is used only if required.

2 Current Issues in Alberta Neighbourhoods

2.1 Overview

To better understand current traffic calming procedures, Opus interviewed the stakeholders in the engineering departments for Strathcona County and the cities of Edmonton, Calgary, and Lethbridge. Summaries of these interviews are found in APPENDIX A. As well, Opus prepared traffic calming plans for several agencies in the Lower BC Mainland. The relevant practices used there are also included in this report.

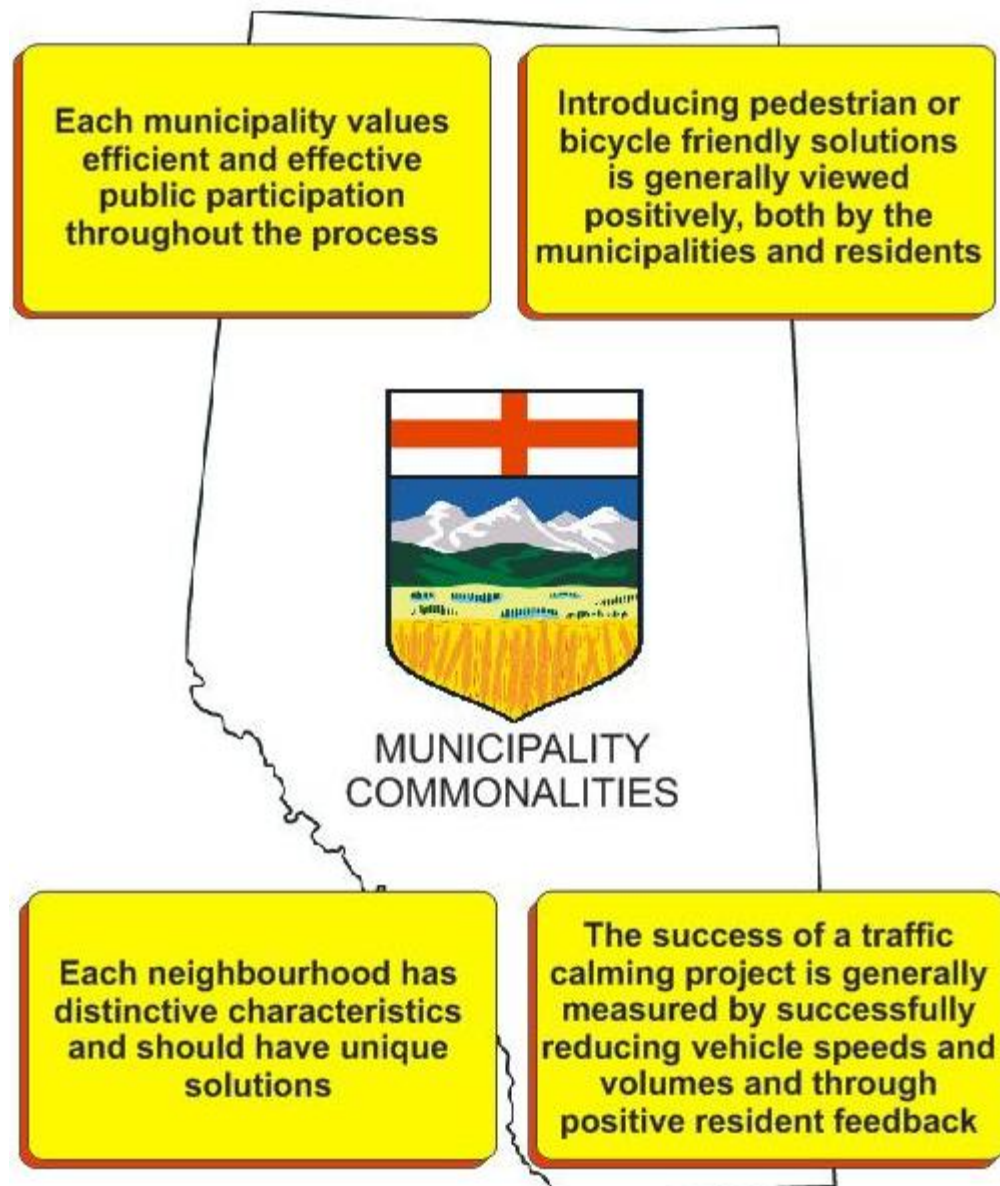


FIGURE 2.1 Commonalities Between Neighbourhoods In Alberta

2.2 Neighbourhood Form

To address neighbourhood problems, it is critical for planners to understand the underlying factors contributing to traffic issues. Therefore, public consultation is an important tool in understanding neighbourhood issues. Consequently, the municipalities use consultation to gather anecdotal data. Edmonton, Calgary and Strathcona County acknowledge the importance of an efficient and effective public consultation process and have formalized guidelines for the process.

The municipalities in this study agreed that the unique physical nature and demographics of each neighbourhood required that any solutions would need to be tailored to suit each neighbourhood's attributes. These attributes included the following:

- Roadway network and geometry – grid, warped parallel, loops and lollipops or mixed, as shown in FIGURE 2.2,
- Traffic volumes and speeds (both actual and perceived),
- Land use and population density,
- Presence of multi-modal travel options,
- Municipality policies,
- Feedback and desires of neighbourhood residents.



FIGURE 2.2 Examples of Various Neighbourhood Street Patterns

Source: Effects on Neighbourhood Street Patterns on Traffic Collision Frequency

2.3 Experience with Physical Traffic Calming Measures

In general, the municipalities found that physical traffic calming measures did reduce speeding and shortcutting traffic. Specifically, road closures and diverters reduced shortcutting traffic. However, many residents became frustrated because such measures reduced the mobility of residents within their neighbourhood. In Calgary, staff noted that neighbourhoods were typically divided between those wanting traffic calmed with those wanting to maintain easy access. Similarly, Edmonton staff noted one or two neighbourhoods were at an impasse because some residents wanted to reduce the traffic while others did not want to limit the access any further.

In general, residents were more likely to express their opinions if proposed traffic calming devices were near their homes. As well, residents' viewpoints differed depending on the residents' personal experiences on the road network. For example, those living on busy local streets may be more inclined to support one particular solution while those living on relatively quiet streets, although they also used the busier streets, may be opposed.

Some municipalities divide larger neighbourhoods into sub-neighbourhoods using the collector roads as dividing lines and develop a separate traffic calming plan for each sub-neighbourhood. Only the residents of the sub-neighbourhood are surveyed for the plan for that sub-neighbourhood. This method would likely improve response rates for larger traffic calming study areas.

All the municipalities agreed that proper installation of physical traffic measures is critical. In Strathcona County, motorists simply drive around poorly installed speed humps. Similarly, poorly installed raised crosswalks enable motorists to travel over them without slowing down. Residents also complained about the noise associated with speed humps.

In line with the Canadian Guide, data was collected to evaluate the success of physical traffic calming measures. While this data provided an accurate assessment of traffic volumes, it does not fully consider the improvements made for the use of pedestrians and cyclists. In Calgary and Strathcona County, some neighbourhoods have had to revisit traffic calming because the measures were ineffective and/or failed to address key underlying issues.

2.4 Support for Sustainable Travel Modes

Municipalities and residents generally view pedestrian and bicycle-friendly solutions to be positive steps forward. Such initiatives support and promote active living and sustainability in Alberta communities. Calgary staff found that cyclist and pedestrian satisfaction and their usage numbers increased when vehicle speeds decreased.

Therefore, an increasing trend within each municipality's transportation plans is the encouragement of pedestrian/bicycle facilities and solutions. These are often applied to traffic calming projects. For example, Calgary's Transportation Master Plan outlines 60-year targets that include increasing walking and cycling mode share of 20-25%. In Edmonton, a three year priority goal is to reduce barriers to different modes of transportation. Reducing the use of cars

will encourage slower moving transportation modes. Consequently, as the number of pedestrians and cyclists increases, vehicle speeds are typically reduced.

2.5 Emergence of New Approaches to Neighbourhood Traffic Management in Alberta

The emphasis of Neighbourhood Traffic Management Plans has changed over the years. The stakeholder interviews provide an excellent insight into the innovative approaches taking place today in Alberta.

Edmonton recognized that wide streets contribute to higher traffic speeds. As a result, Edmonton developed a proactive policy to review collector roads with 14 metre cross-sections. As well, Edmonton developed the *Neighbourhood Renewal Program* to renew and rebuild roads and sidewalks throughout the city. Now, safety and wider roadways are addressed on a neighbourhood-wide basis when Edmonton undertakes road rehabilitation.



FIGURE 2.3 Neighbourhood Renewal

Source: City of Edmonton

Edmonton generally does not initiate traffic calming projects in neighbourhoods where speeding is a problem if shortcutting traffic is not also occurring. If local residents are the main ones found to be speeding, Edmonton considers this to be an enforcement issue. Therefore, Edmonton empowers residents to use corrective methods such as *Pace Cars*, *Safe Speed*

Community Vans and *Volunteer Speed Watch*. If automated enforcement is used, enforcement becomes more affordable and even self-funding.

To control speeds, Calgary is looking at ways to integrate its *Complete Streets* program throughout the city. The program aligns with Calgary's Municipal Development Plan (MDP), which sets out the vision and the policies that will promote sustainable growth. Within Calgary's MDP, Local Area Plans guide projects when decisions are made that relate to land use, urban form, and mobility. By implementing these policies in future projects, Calgary envisions that vehicle speeds can be lowered without traditional traffic calming techniques.

Several municipalities are also implementing physical elements of traffic calming in new developments. These consist primarily of curb extensions, traffic circles, or roundabouts. By designing communities with traffic calming in mind from the start, the hope is that new neighbourhoods will be less likely to go through a traffic calming process later.

2.6 Summary

Interviewing stakeholders enabled the study team to better understand the current issues municipalities experience with traffic calming. The respondents provided excellent insights into the innovative approaches taking place today in Alberta today.

A thorough understanding of the underlying traffic issues was required in order to adequately address them. Not all traffic calming related complaints were aimed directly at speeding or shortcutting traffic.

The traffic data collected before and after traffic calming provided an accurate assessment of traffic volumes. However, the data did not account for the improvements that benefited pedestrians and cyclists. Data for pedestrian and cyclist use before and after traffic calming should be confirmed to fully understand the situation. Quantitative before-and-after data is invaluable in helping government leaders make future decisions.

Each municipality shows a profound trend to encourage pedestrian/bicycle use, to design facilities for vulnerable users, and to devise unique solutions within their local transportation plans.

It is clear that a pre-traffic calming process is needed. This process recognizes that Alberta municipalities want to promote active transportation, provide for multiple modes of travel, and avoid post-war, auto-centric transportation planning. Through a better diagnosis of underlying traffic issues in a neighbourhood, the process should identify solutions that will promote safe and desirable conditions for pedestrians and cyclists. These solutions will help to reduce vehicles speeds and shortcutting traffic, and may potentially eliminate the need for a traffic calming study.

3 Emerging Practices in Sustainable Neighbourhoods

Opus conducted a literature review on the leading innovations and sustainable best practices in traffic calming and neighbourhood design.

An overview of the *Canadian Guide* is presented in Section 3.1. A general summary of the literature that was reviewed is in Section 3.2. A complete list of all the literature that was reviewed with the specific summaries of each document is in APPENDIX B.

In reviewing international best practices, “second-generation” traffic calming techniques as currently practiced in Europe have emerged to challenge traditional traffic calming measures. These new traffic calming strategies and their relation to the STANs framework are outlined in Section 3.3.

Finally, this section concludes with a number of innovative Canadian documents as outlined in Section 3.4. These recently published documents will help policy-makers understand the critical success factors that are needed to promote sustainable transportation.

3.1 The *Canadian Guide* to Traffic Calming

The *Canadian Guide* focuses on traffic calming measures used for local and collector streets in established residential areas. It addresses retrofit situations such as traffic calming of existing streets rather than those in new developments.

The *Canadian Guide* takes a flexible approach that recognizes that traffic calming must reflect local conditions. It documents the effectiveness and recommended applications of a wide range of measures. It proposes a step-by-step process to engage the affected communities to planning traffic calming. It describes a wide range of measures and includes the benefits and applicability of each type of measure to help municipalities in choosing appropriate measures for specific neighbourhood traffic problems.

The guide breaks traffic calming measures into four sub-categories as follows:

1. Vertical Deflection. Raised crosswalk, raised intersection, rumble strip, sidewalk extension, speed hump, and textured crosswalk.
2. Horizontal Deflection. Chicane, curb extension, curb radius reduction, on-street parking, raised median island, traffic circle.
3. Obstruction. Directional closure, diverter, full closure, intersection channelization, raised median through intersection, and right-in/right-out island.
4. Signing. Maximum speed sign, right or left turn prohibited sign, one-way sign, stop sign, through traffic prohibited sign, traffic-calmed neighbourhood sign, and yield sign.

Canadian communities use the *Canadian Guide* as the authoritative document for establishing traffic calming procedures. It is an excellent resource for determining which devices work well for each road classification, traffic condition, and budget. However, it was published in 1998 and provides little discussion on the importance of sustainability.

3.2 Literature Review

In current traffic calming policies and procedures, common themes emerged throughout the documentation that Opus reviewed.

1. Traffic calming measures generally combat high speeds, high volumes, and/or shortcutting traffic through neighbourhoods. The intent is to improve the quality of life and liveability of a community by balancing automotive traffic with other street users.
2. Internationally, implementing traffic calming devices is difficult technically, politically and financially.
3. Traffic calming policies should align with other policies, plans, strategies, and programs of the municipality.
4. Most traffic calming projects are chosen based on a ranking system that considers the following variables:
 - Vehicle speeds
 - Traffic volumes
 - Shortcutting volumes
 - Total number of crashes
 - Crash severity
 - Proximity to schools and other pedestrian generators
 - Presence of sidewalks, and social welfare.

In addition, many policies require that a minimum number of residents must approve any design.

5. Although current policies identify the same physical solutions, the policies seldom provide guidance on using the landscape to strengthen the application and enhance the traffic calming improvements.
6. Every neighbourhood is unique. Therefore, it important to get local residents involved and to incorporate their preferences in how their neighbourhood is designed.

The public can get involved in the following ways:

- Public forums
- Mail outs
- Phone interviews
- Social media
- Web surveys, email, and other internet tools.

Participants should strive to meet the long-term health of the neighbourhood rather than the short-term concerns of vocal individuals.

7. Financial initiatives can help reduce the costs of traffic calming projects. These could include citizen initiated programs such as *Volunteer Speed Watch*, partnership programs, or expert commissions.

Some municipalities fund traffic calming initiatives through property taxes while others use local improvement taxes.

8. All road users should be consulted before implementing a design. Involve emergency services, transit, community associations and various municipal departments for their input.

The literature review revealed that traffic calming projects not only provided traffic solutions, but had the potential to create safer, more attractive streets. Nearly all traffic calming devices and initiatives promote green travel options. Increasing the number of pedestrians and bicyclists calms traffic and reduces congestion. If active (self propelled) travel modes are present, installing physical traffic calming devices may be redundant. Implementing bicycle lanes and the *Safe Routes to School* program are widely used to achieve such goals.

3.3 Second Generation Traffic Calming

Building on the experiences and lessons learned from the first traffic calming efforts of the 1970s, the contemporary push to encourage a return to a range of travel modes has caused a second generation of traffic calming measures to emerge.

In general, physical calming devices (speed bumps) decrease the speed of vehicles. However, these solutions do not address the driving environment. Often, drivers will travel at higher speeds because they perceive the road conditions and design permit a higher speed. This perception may come from excellent sight lines and distances, wide road cross-sections, or a lack of non-motorized users sharing the roadway. Unfortunately, motorists may continue to speed or drive aggressively between speed humps.

Experience shows that slower traffic environments occur where physical speed management devices are not needed. Instead, second generation traffic calming tools such as *self-explaining roads*, *naked streets*, and *mental speed bumps* (explained later in this section) limit forward visibility and create an environment in which a driver slows down instinctively. These visual changes to a road bring about more attentive driving, lower speeds, fewer crashes, and a greater tendency to yield to pedestrians.

"When we do traditional traffic calming with speed bumps, we typically expect about a 10% drop in speed. But with no disincentives, the speed was down by almost 50% - down from 57 km/h to under 30 km/h. I could not believe my eyes. All we had done was make a village look more like a village."

—Hans Monderman, former Dutch city planner and inventor of *Naked Streets*

Second generation traffic calming measures recognize the need to accommodate motorists, while at the same time encouraging more sustainable behaviours. Second generation traffic calming strives to balance auto traffic with other travel modes. These improvement opportunities promote:

1. Pedestrian and bicycle facilities.
2. Safe access to key neighbourhood locales such as bus or train stations, parks, schools and local shops.
3. Opportunities for road dieting (reducing the number of dedicated auto travel lanes/width for systemic improvement).
4. Access to transit service.
5. Safe intersections.
6. Additional choices for travel rather than barriers or access restrictions).



Source: Sacramento Best Practice for Complete Streets

When implemented with physical traffic calming devices, second generation measures enhance the traditional devices. This results in greater compliance and public approval. In many cases, second generation tools have been implemented as stand-alone measures and have not required any physical devices.

The following illustrates *second generation* techniques that were developed in international traffic calming projects. Some of these techniques are adapted into the STANs framework.

Naked Streets

At the forefront of “naked street” design is the late, Dutch traffic engineer Hans Monderman. Monderman combined urban design, social science, civil engineering, and psychology into his traffic calming designs.

Monderman believed that in traffic calming affected two different worlds. In the traffic world, vehicles travel in a uniform and predictable manor. In the social world, human interaction occurs in a diverse and unpredictable environment. Historically, highways that connect cities belong in the traffic world while communities belong in the social world. Regrettably, it is common to find neighbourhood streets designed to promote fast and efficient vehicle transport at the expense of a community’s social environment.

Rather than exiling vehicles from communities in an effort to bolster the social environment, Monderman believed motorists should be a part of the social world. With that in mind, Monderman’s primary design challenge was to force motorists to look into the eyes of other users on the road. As the concept developed, it became known as “*naked streets*”.

“By taking away the assumption that one has nothing to fear, or nothing to look for, in an intersection, and replacing it with a system that requires active vigilance, one can arguably reduce the most serious crashes.”

-Tom Vanderbilt, author of *Traffic*

As a concept, *naked streets* refers to removing speed humps, traffic signals, traffic control signs, and other traffic paraphernalia to encourage drivers to take a personal responsibility to navigate a roadway safely. The intent is that motorists will slow down and start communicating with other road users. The concept is that when a road is made less predictable, drivers cannot rely on the usual street systems for security and must start considering other people and the driving environment itself. Faced with this uncertainty, motorists tend to drive with greater care. Drivers must use their own judgment rather than unthinkingly obeying traffic control devices which can sometimes be inappropriate, thereby reducing the driver's confidence in them. The question of who gets priority is deliberately left open to make drivers more cautious. The result is slower traffic, fewer crashes, and shorter trip times.

One of Holland's flagship naked streets projects is in Drachten. In this city, a busy intersection that handles over 22,000 vehicles a day was redesigned without signs to be a more attractive part of the town's public space. As a result, congestion and safety improved. Similar projects led to a significant decrease in traffic mishaps and pedestrian injuries. The original successes in the Netherlands prompted similar projects in Spain, Denmark, Austria, Sweden, the United States. In the UK, the naked street concept is found in London at Kensington High Street and Westminster Abbey.

Implementing naked streets can be a costly endeavour for many municipalities, especially when compared to traditional traffic devices. Yet, the naked streets approach to traffic calming is seen as a positive development by motorists, pedestrian, cyclists, and local businesses. The naked street design is a classic example of a long-term solution.

Mental Speed Bumps

Building on Monderman's concepts of *naked streets*, Australian social innovator and author David Engwicht developed *mental speed bumps*. Engwicht suggests that a child playing on the pavement can be more effective at slowing traffic than a speed hump. He discovered that the speed of traffic on residential streets is governed largely by the degree to which residents have psychologically retreated from their street. Simply reversing this retreat creates *mental speed bumps* in the street.

Engwicht suggests several practical actions can be done by the residents. These include the following:

1. Reclaim the street as a socializing space.
2. Install something intriguing in the street.

3. Minimize car use and encourage slow-moving transportation modes.
4. Create activity space on residents' private land.
5. Create a unique and friendly community environment.
6. Encourage local businesses in the neighbourhood to connect with the street.
7. Use art, furniture, landscaping and design elements to make the street more like a room.



FIGURE 3.1 Street Reclaiming In Calgary

Source: Val Lawton

Engwicht offered practical actions for cities. These included creating social programs that promoted citizen led traffic calming initiatives such as neighbourhood pace cars, neighbourhood traffic treaties, as well as activity nodes and vibrant private spaces. Other initiatives included the following:

1. Remove regulations that prevent street games or social activity in the street.
2. Minimize signage and traffic control devices.
3. Change the street geometry by installing positive, community building infrastructure.
4. Give residents designated areas to create vibrant and intriguing art in the neighbourhood.



For example, Portland Oregon passed special regulations which allow residents to create neighbourhood plazas. These are defined as “publicly owned, outdoor gathering spaces” where the City gives residents the opportunity to contribute to unique and intriguing public spaces that enhance the liveability and aesthetics within their neighbourhood.

Source: 2009 Portland Plan

In addition to public art, pavement art is another effective way to calm traffic by creating intrigue. It can also identify a neighbourhood with its own unique stamp.

In Alberta, the pavement colour should not be white or yellow because these are the standard pavement marking colours in most Alberta municipalities. Bricks, stamped asphalt, or other decorative cobblestones can achieve the same result as coloured pavement. However, care should be taken to ensure that the skid resistance of the pavement is not compromised. Winter snow removal should also be considered.

Complete Streets

Complete streets are roadways which provide access and travel for all users and modes. This includes motorists, public transport, bicyclists, pedestrians and other active transportation modes. In addition, *complete streets* are synonymous with liveable streets, in that they are sustainable, green, safe, attractive and provide easy access to parks, public transport nodes, local shops and markets. *Complete streets* create a sense of place, maximize the exchange of goods and services, and increase opportunities for human interaction.



Complete streets use active modes of transportation and public transit, which decreases the need for automobiles. As well, because more people walk through such a place, their presence creates more surveillance, which decreases the potential for crime. *Complete streets* have also been shown to increase land values for existing neighbourhoods.

Many municipalities are formally recognizing the value of the *complete street* concept. This includes Calgary, which encourages the implementation of *complete streets* in its Transportation Master Plan.

Skinny Streets

Skinny streets reduce generous roadway dimensions in municipal standards by pushing back against policies and standards developed to accommodate the automobile.

In the early 1990's, Dan Burden worked to define ideal street dimensions by examining older, more traditional neighbourhoods which encourage lower speeds and safety for other users by street design. Burden's book, *Street Design Guidelines for Healthy Neighborhoods*, advised that the ideal local street is a skinny street, 26 feet wide (~8 m) that includes parking on both sides, similar to that shown in FIGURE 3.2. By comparison, the majority of municipal street standards require 36-40 foot (11 – 12 m) wide roads. By skinny street standards, 14 m wide collector roads and 10 m wide local roads are excessive in Canadian cities especially if there is no on-street parking.



FIGURE 3.2 Skinny Street

Source: Kalamazoo, MI by Dan Burden via the Pedestrian and Bicycle Information Library

The advantage of *skinny streets* is that they reduce the following:

1. Speeding and collisions
2. Maintenance, resurfacing and reconstruction costs
3. Pedestrian crossing distances
4. Impervious surfaces (and therefore storm water capacity)
5. Hot temperatures reflected off the pavement surface, which reduces energy use and the demand for air conditioning in adjacent structures.

Transverse Pavement Markings

Transverse pavement markings consist of a series of painted lines placed within a travel lane across the road. The spacing between the lines gradually decreases as a hazard is approached. The intent is to reduce speeds by providing less space between successive

transverse markings to create the perception that the lane or cross-section is narrowing. They can result in motorists subconsciously lowering their speeds.

Previous applications of transverse markings indicate that they are most effective on the approaches to intersections or potentially hazardous locations. The markings are generally easy and inexpensive to implement, but are less effective in winter months.

Gateway Treatments

Communities often do not adequately define the transition between the high speeds of major roads, such as arterials, and the local roads of a community where speeds should be lower. When the environment does not subconsciously tell a motorist to slow down, average speeds can easily exceed the posted speed limit. To counter that tendency, a *gateway treatment* will clearly indicate that motorists are entering a residential community that expects drivers to travel at an appropriate speed.

A great example is shown in FIGURE 3.3 from the Town of Bibury in the United Kingdom. Here a *gateway treatment* narrowed the road, removed over 40 traffic signs, and constructed an entry way that signals that the motorist had arrived in the community. The scheme reduced both speeding and crashes.



FIGURE 3.3 Gateway Treatment in the Town of Bibury, UK

Source: Better Streets for Stroud District

Vertical elements (including speed limit signs on both sides of the roadway) should always be used to identify and improve the visibility of the gateway to approaching drivers. Drivers will travel at slower speeds when the height of the vertical elements is greater than the overall width of the roadway.

3.4 Canadian Documents that Promote Active and Sustainable Transportation

Many Canadian publications have emerged in recent years that provide guidance in developing sustainable transportation. Two major publications come from professional transportation organizations: the Transportation Association of Canada (TAC) and the Canadian Institute of Transportation Engineers (CITE). Both organizations assist policy-makers in implementing strategies that promote sustainable transportation.

TAC's 2010 release, *Active Transportation Guide: Making It Work in Canadian Communities* provides practical advice regarding active transportation initiatives across Canada. The report stresses that safe and attractive conditions for non-motorized travel are critical to shifting travel away from the automobile in order to achieve the benefits of a less auto-dependent society.

The TAC document also reports that the plans and policies of many Canadian communities over the last decade show stronger support for active transportation. However, communities have achieved mixed success in improving conditions and enhancing participation. Second generation traffic calming initiatives have great potential in the success of implementing these policies.

CITE's *Promoting Sustainable Transportation through Site Design* is primarily tailored for non-residential developments. However, the document outlines principles that can easily be applied to mixed-use and medium-to-high-density residential areas. In particular, the document identifies the growing trend toward students driving or being driven to school. This trend is seen even in students living within walking or cycling distances. The trend is self-fulfilling, as the high volume of cars at school sites in turn leads even more students to driving or being driven to school. This report provides several design recommendations to encourage students to walk or cycle to school.

Finally, communities may wish to ensure their school and playground zones align with the recommendations of Alberta Transportation's *Guidelines for School and Playground Zones and Areas*. These guidelines specify a distinction between a zone and an area. A zone has additional signage that indicates a 30 km/h speed limit, as shown in FIGURE 3.4.



School and Playground Zone Signage

School and Playground Area Signage

FIGURE 3.4 School and Playground Zones and Areas

Source: Alberta Transportation Guidelines for School and Playground Zones and Areas

The Alberta Transportation guide advises that school and playground zones or areas should be designated with great care and thought. Zones or areas should not be used to increase the safety of crossing the roadway. The guidelines offer an objective and quantitative engineering tool to assess the need for a school or playground zone or area, which must be considered along with stakeholder concerns and other factors including sound engineering judgement. Designating school or playground zones and areas should not be used to replace using physical traffic calming features to reduce speeds.

4 The STANs Framework

The STANs framework establishes the policies and procedures used in conducting sustainable transportation assessments.

Traditional traffic calming often uses physical measures to either slow or redirect vehicles on neighbourhood streets. This may not necessarily improve conditions for pedestrians and cyclists. The STANs framework reverses this normal process.

STANs diagnoses a neighbourhood's underlying traffic issues to find the solutions that will improve conditions for pedestrians and cyclists. The resulting mitigations not only help slow and reduce shortcutting traffic but improve the overall health and mobility of the residents in a neighbourhood.

STANs is not intended to replace the traditional traffic calming process. Rather, the framework acts as a front-end of a process to determine the underlying traffic problems and then offers solutions that improve conditions for all road users. In cases where data and anecdotal reports confirm traffic issues, the STANs framework may recommend a traditional traffic calming process and physical measures.

Section 4.1 discusses the perceived and real traffic issues with common examples from traffic calming projects. Section 4.2 provides an overview of the policies and practices that should be in place to help neighbourhood traffic operate efficiently, safely, and reliably. Sections 4.3 – 4.6 outline the STANs framework and provide solutions to typical traffic issues. Section 4.7 evaluates a case study of a recent Alberta traffic calming experience that used the STANs framework, and compares it with the actual results emerging from the traditional process. Section 4.8 suggests the next steps to be taken.

4.1 Underlying Neighbourhood Factors Contributing to Excessive Speed and Volume

When investigated carefully, neighbourhood problems with speeding cars, high traffic volume, or any issue that requires traffic calming, often stem from other issues. A neighbourhood's traffic problems may actually be caused because the neighbourhood lacks human connectivity, has no pedestrian facilities, and/or offers little personal security for pedestrians.

Traditional traffic calming measures does not offer solutions for these underlying issues. However, if these issues are not identified and addressed, the neighbourhood will need to redo its traffic calming plan. If that happens, traffic calming can become very frustrating to the residents.

For that reason, it is a good practice to check whether the following factors are the real causes of excess traffic speed or high traffic volume. The strategies for addressing them are presented later in Section 4.6.

Lack of Pedestrian Facilities and Crossing Opportunities

When neighbourhood residents have no access to pedestrian facilities, neighbourhood complaints may seem to be traffic related. For example, speeding may seem to be an issue, but, in fact, the underlying issue is that the area has no sidewalks.

When pedestrians are forced to walk on the edge of roads, they are exposed to vehicles passing close by. Being close to traffic may give pedestrians the impression that the traffic speed is excessive. Furthermore, when pedestrians fear for their safety, they may decide to use their automobiles instead of walking, even for short trips. This puts more cars on the road and adds to the problem. Furthermore, if the pedestrians are vulnerable users such as school children or seniors, the speeding issue quickly becomes emotionally charged and magnified.

In many cases, neighbourhood speeding can be lowered by providing adequate pedestrian facilities or improving existing ones. Such facilities encourage pedestrians and cyclists to share the street with motorists. Consequently, traffic often slows down on its own. Good pedestrian facilities also encourage more people to use active transportation in their neighbourhood. In turn, this forces drivers to slow down and watch for other road users.

Wide Cross Sections

The design of postwar North American neighbourhoods built neighbourhoods for the automobile, as shown in FIGURE 4.1. As a result, those residential roads have unnecessarily wide lanes that give motorists a false sense of safety especially when traveling at higher speeds. The issue is exacerbated by a lack of on-street parking (which can be an effective traffic calming measure), and the absence of people, trees, and landscaping features that give clear sight lines on the road.



FIGURE 4.1 Wide Cross Section in Calgary

The most effective method of reducing traffic speed on streets with wide cross sections is to retrofit solutions into the road and surrounding environment. These devices give motorists clear reasons to reduce their speed. However, such devices may not be financially viable.

Another strategy is to reduce the effective road width by adding bike lanes. Bike lanes encourage drivers to slow down because drivers must watch for cyclists. Bike lanes also promote a mix of active travel modes. However, such projects typically require complex and costly studies and are not always appropriate.

Wide Corners

An intersection with a large radius corner allows motorists to turn at higher speeds than a corner with a smaller radius. Similar to the wide cross-sections seen in many postwar neighbourhoods, wide-radius street corners are common in older neighbourhoods. Regrettably, when motorists perceive that they can safely navigate a corner at higher speeds, the roadway becomes less safe for pedestrians and cyclists.

Many intersection corners have been oversized. FIGURE 4.2 shows an Alberta street corner where a portion of snow (highlighted in green) has covered useable (but not required) roadway. The snow acts as a temporary solution, creating a smaller radius corner that forces motorists to slow when navigating the corner.



FIGURE 4.2 Wide Corner Illustration During Alberta Winter

When municipalities undertake street reconstruction projects, such as Edmonton's *Neighbourhood Renewal Program*, street corners can be rebuilt with smaller radii. A corner with a smaller radius makes it easier for motorists to locate oncoming pedestrians, cyclists and other vehicles. Retrofits such as curb extensions that extend into the roadway also reduce the crossing distance for pedestrians.

Inappropriate Speed Limits

Depending upon the context in which a speed limit sign is posted, a posted speed limit may not be appropriate, such as that pictured in FIGURE 4.3. This is because when residents complain

about excessive speeding, they hope that lowering the speed limit will cause motorists to slow down. Often, this is not the case.

Without changing the surrounding environment, and/or the perception of regular enforcement, motorists will typically drive at the speeds with which they feel comfortable with little regard for the posted speed limit.



FIGURE 4.3 Environment Promoting Higher Speeds

The ineffectiveness of posting speed limits in some areas was shown in a recent pilot project conducted by Edmonton's Office of Traffic Safety. The project reduced the posted speed limit from 50 km/h to 40 km/h in six residential communities. The goal was to determine how this would affect road safety.

The findings indicated that both operating speeds and mean speeds were reduced. Drivers decreased their speed by approximately 4 km/h compared to drivers in the control communities. Motorists did drive slower in treated communities. However, 65% of the drivers exceeded the 40 km/h speed limit compared to 39% of drivers who exceeded the 50 km/h limit before the study. This indicates a large number of motorists continued to drive the speed at which they felt comfortable.

Speeding is generally perceived at a specific site such as a school or playground zone or area. Typically, such sites have reduced speed limits, either advisory or enforceable by law. But these speed reductions are not always warranted.

Consider that a neighbourhood park may have a posted speed limit of 30 km/h. However, the neighbourhood speed limit is posted at or understood to be 50 km/h. According to Alberta Transportation's *School and Playground Guidelines*, a playground zone posting is warranted if a park has more than 50 m of frontage, abuts a local road, has fully traversable fencing, and has a playground that attracts 16 or more children.

However, a reduced speed limit playground area is not warranted if the park has less than 50 m of frontage, abuts a collector road, is contained by non-traversable fencing, and is surrounded by sidewalks.

Issues on Surrounding Roads

When license plate surveys indicate that traffic is not local, the shortcutting traffic is likely coming from the surrounding road network. For example, congestion on an arterial road may encourage motorists to take shortcuts through an adjacent neighbourhood. This exposes local residents to unwanted, dangerous vehicle flow. Obviously, fixing the congestion on the arterial road would reduce the incentive for motorists to take a shortcut. Such action should always be taken before implementing physical calming measures.

However, in cases where shortcutting traffic persists, an effective strategy is to make the shortcut route less efficient for motorists. Instead of using physical measures to slow or discourage traffic, pedestrians and cyclists should be encouraged to use the roadway. Employing the concepts of *complete streets* and *mental speed bumps*, active transportation on the street will naturally decrease the speed of motorists when they shortcut through a neighbourhood. This lower speed thus reduces the incentive to take a shortcut.

One-time Special Event or Occasionally Repeating Event

On occasion, special events or construction diverts or delays traffic. At such times, traffic may be rerouted through a neighbourhood. The effects can be diverse, wide-ranging, and can aggravate the residents if problems are not identified and corrected promptly.

Municipalities should hold the organizers of sporting or entertainment events accountable for identifying any possible effects of the events. Public authorities should collaborate with the event officials to discuss temporary traffic calming measures that may be needed. This can be ensured to happen by the municipality requiring an event permit that outlines what mitigating measures are anticipated.

The effect on pedestrians should be considered in detail. If a crossing opportunity will be eliminated by road construction, another crossing must be provided. Note that this might also be an opportunity to increase pedestrian facilities by leaving the replacement facility in place after reapplying the old crossing facility.

Relatively Dramatic Increases in Volumes

Recent changes to a neighbourhood can impact traffic flows. For example, a new, high-density, residential development will increase neighbourhood traffic. As part of the development approval process, traffic impact assessments measure the impacts, and provide mitigations if the development makes unacceptable changes to the level-of-service of nearby roads.

However, even if new traffic does not result in a change to the operating conditions of a local street, residents may be bothered by the change. For example, on a local street that carries

200 vehicles per day, an additional 25 trips from a nearby development may add 50 vehicles per day to the road. This increases the volume by 25 percent. The local road would likely still function safely, but some residents may be concerned by the dramatic increase in volume.

These changes can exacerbate existing pedestrian concerns with crossing availability. A relatively dramatic increase in traffic volumes can produce a profoundly negative effect on perceived problems if pedestrian facilities are not satisfactory.

Lack of Neighbourhood Connectivity

Modern *loops and lollipops* and *mixed pattern* neighbourhoods tend to create inadequate pedestrian and cyclist connectivity. In turn, this increases the number of residents who use vehicles to complete trips within their neighbourhood. Adding to that, when the number of vehicles increase on residential roads, the average speed increases. Consequently, with fewer pedestrians and more cars, there is less need to slow down for vulnerable road users.

By providing better pedestrian and cyclist facilities, the travel mode will split and gradually shift away from the automobile thus reducing vehicle speeds within the neighbourhood.

4.2 Prerequisites for STANs Success

To help promote healthy, vibrant neighbourhoods, a municipality develops and enacts specific policies and practices to provide a variety of transportation options. The effective use of the STANs method encourages these policies to be engaged and pursued. This section discusses these policies and their role in reducing traditional traffic calming.

Items A, B and C are required for STANs to be undertaken properly. It is strongly recommended that items D, E and F also be implemented.

A. Road Classification Scheme

The roadway classification process should be conducted community-wide must be done by beginning STANs. This ensures that the overall network connectivity makes sense and that through traffic is carried on appropriate streets.

As outlined in the *Geometric Design Guide for Canadian Roads* (TAC, 1999), road classification groups roads into systems according to the type of service each road provides. This classification assists in establishing the geometric design features for each road group to be consistent with the short and long term operational needs of that group. The classification also establishes a road hierarchy that provides for a range in function, from access to mobility.

For example, local roads provide local traffic with access to private land uses and/or residences, but also permit through movement as a minor function, if at all. On the other hand, arterial roads are designed for through movement but allow some access to local roads.

Many post-war neighbourhoods are characterized by local roads that have no direct access to an arterial. Instead, collectors within the community provide the only access to arterials. In contrast, the historic development of older urban areas led to open-grid street systems where local streets, collectors and arterials all form part of the grid. Refer back to FIGURE 2.2 on page 5.

Road systems operate most efficiently and safely when each class of road serves its intended purpose. With a range of characteristics established for each classification (i.e. road width, capacity, etc.), comparisons can be made between actual and intended purposes to accurately assess a road's safety and operational performance.

A community should review its roadway classification proactively on a regular basis to ensure that the classifications are up to date. For example, a road that connects two arterials might be classified as a local road. However, over time, as the parallel arterials grew congested, local road traffic increased and started carrying more through traffic. If the road width, adjacent land use, and access frequency are appropriate, the municipality could upgrade the local roadway's classification. However, if the width, land use, and access are not compatible, the road may become a candidate for traffic calming.

B. School and Playground Zones

All speed limits need to be justified and supported technically prior to starting STANs.

With high volumes of children, schools and playgrounds are prime sites to monitor for high vehicle speeds and volumes. Accordingly, municipalities should review their school and playground zones to ensure they align with Alberta Transportation's *Guidelines for School and Playground Zones and Areas* (Alberta Transportation, 2007).

The guide allows local conditions to determine the appropriate treatment for a playground zone or area that uses fully or partially non-traversable fencing. That said, Alberta Transportation recommendations for warning signs still should be implemented. The concern is that when speed limit signs are posted, the drivers do not perceive danger and become so complacent that they will not reduce their speed in the area.

Rather than reducing the speed limit, the Alberta Transportation *Guideline* offers several options to increase safety around schools and playground areas. This includes adding sidewalks and non-traversable fencing.

FIGURE 4.4 shows both an appropriate and a poor location for a school zone. The appropriate location has no fencing, with students likely be present in or near the roadway, and with the school entrance near the street. In contrast, the poor location is fenced, has no entrance that fronts the adjacent collector road, and with the hill being a barrier to children coming near the roadway.



FIGURE 4.4 Appropriate and Poor School Zone Locations

C. Arterial & Collector Road Review

It is required that adjacent arterial and collector roads as well as operations at all signalized intersections on those roads be reviewed before commencing STANs.

The *Canadian Guide* recommends that before planners develop a traffic calming plan, they examine the traffic on adjacent arterial and collector roads. This is done to determine if problems in the arterial and collector roads are contributing to traffic concerns in the neighbourhood. For example, a congested arterial road can encourage traffic to take a shortcut through an adjacent neighbourhood. When motorists reroute to nearby streets, they subject local residents to unwanted and dangerous vehicle flows. Therefore, addressing the arterial's congestion will help reduce motorists' motivation to shortcut and alleviate the issue.

In general, when the surrounding road network operates effectively, shortcutting traffic and other traffic calming complaints diminish.

D. Safe Routes to Schools/Traffic Management Plan for Pick-up and Drop-off

Schools share common safety concerns. These include high volumes of vehicles in proximity to the school, lack of sidewalks, and inadequate controls to facilitate pedestrian movement. In particular, there is a growing trend of students driving or being driven to school even those within walking or cycling distance. This increases safety concerns because more cars are traveling to the schools. In turn, this leads to even more students being driven to school. To curb this, students need to be encouraged to walk to school. It is also important that parents trust that their children can do so safely.

ITE's *Promoting Sustainable Transportation through Site Design* advises that every municipality should develop a plan that shows students the safe routes to walk and cycle between home and school, a Safe Routes to School plan. Such plans promote walking and

cycling as a sustainable way to get students to and from school. To further improve pedestrian safety as children travel to school, curb extensions can be constructed at school crossings. Better lighting, pavement, and other improvements also will encourage students to walk to school.

Safe Routes to School information should be provided to each parent to clearly identify the locations of crossing guards. The commitment of a municipality to fund engineering improvements as specified in a Safe Routes to Schools plan is important and can significantly increase the attractiveness and safety of these routes.

Many concerns identified during the consultation in Safe Routes to Schools and traffic calming processes stem from congestion and unsafe driver behaviour during pick-up and drop-off times. Students who walk to school reduce the number of vehicles, but some problems may persist. Municipalities should work with school districts to address these issues with engineering, enforcement and educational efforts. This will improve the likelihood of success of both *Safe Routes to School* and the STANs process.

E. Multi-Modal Plans

Communities use multi-modal plans – plans promoting the use of multiple travel modes, i.e. walking, cycling, transit, etc. – to establish their transportation vision. These plans are usually developed in conjunction with official community plans. Essentially an evolution of traditional transportation master plans, these documents inform strategic and fiscal planning officials of needs in future transportation infrastructure. These plans involve extensive consultation with community residents and stakeholders and result in policies that establish active transportation.

F. Active Transportation Policies

Active transportation policies promote the use and provision of self-propelled (sustainable) modes of transportation (i.e. walking, cycling, etc.) with facilities both on and off the street.

More people now recognize the high costs associated with a sedentary lifestyle. Therefore, jurisdictions are promoting more transportation alternatives to the automobile. In particular, sustainable travel modes promote a healthier and fitter population. Such policies may also provide a more integrated active recreation system for residents and tourists. In addition, using the automobile less often helps reduce commuting congestion, travel costs, and benefits the environment.

Active transportation policies direct funding into facilities for active modes, establish targets for items such as travel mode splits, and set minimum design requirements for infrastructure such as sidewalks. Having such policies in place helps support the recommendations of the STANs Framework that are likely to follow. The *Promoting Sustainable Transportation through Site Design* (ITE, 2004) guidelines require that traffic impact assessments include multiple travel modes.

4.3 Framework

The STANs framework is a straightforward process. It determines the contributing factors of a particular traffic issue by collecting and reviewing traffic and active transportation data, consulting with the public, and visiting a site when appropriate. In response to that information, STANs provide a range of solutions that limit conventional traffic calming by physical measures. In some cases, for example, where speeding is confirmed by data to be mostly the result of unwanted shortcutting traffic, a traditional traffic calming process may be warranted.

FIGURE 4.5 illustrates the components of the STANs framework. Key steps of the framework are discussed in the following sections.

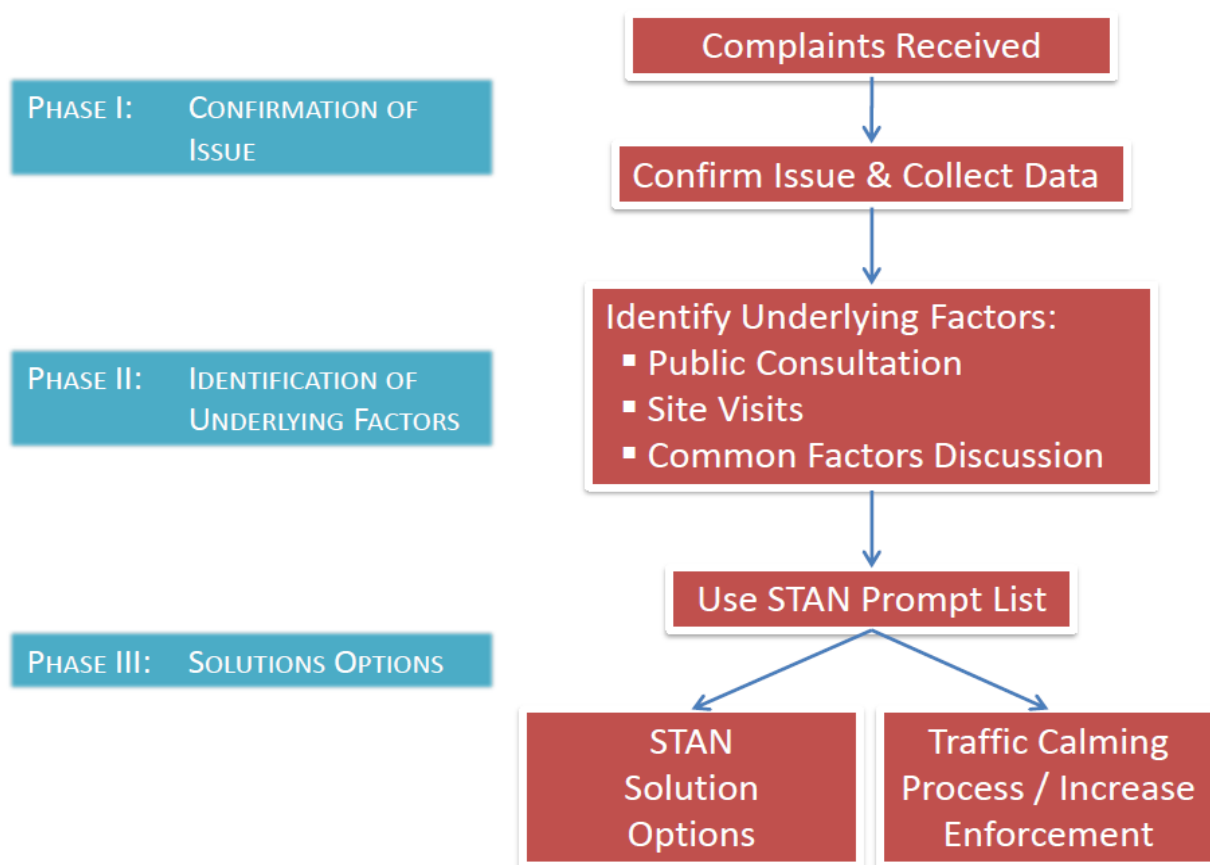


FIGURE 4.5 STANs Framework

4.4 Phase I: Confirmation of Issue

Phase I of STANs is similar to a traditional traffic calming study. That is, written requests for traffic calming are received with sufficient information to thoroughly describe the problems or issues.

The *Canadian Guide* recommends a formal initiation policy to ensure that requests are addressed consistently and objectively if a reactive approach is used. Municipalities should consider creating alternative complaint forms to address initial queries in the STANs framework. During the municipality's validation process and with its discretion, the issue can be handled either through the STANs framework or with a traditional traffic calming study if the initial STANs queries prompt such action.

Traffic data should be collected to confirm the complaint(s). In addition, it is helpful to conduct pedestrian and cyclist counts to not only confirm the existing issue but to compare pre and post mitigation results for use by policy makers who may have to promote or defend their decisions.

The *Canadian Guide* provides a detailed methodology for collecting data and should be consulted in lieu of a policy. The following provides an overview of collecting data for the most common complaints: speeding and shortcutting traffic.

Speeding

Spot speed studies determine the speed distribution of a traffic stream at a specific location. A number of methods can gather speed data: a stopwatch, radar, and pneumatic road tubes. Road tubes is the most accurate and widely used method.

Agencies often have different definitions of what constitutes speeding. Most determine that speeding is an issue using 85th percentile speeds (the speed at which 85 percentile of traffic is travelling at or below). Typically, vehicle speeds are problematic when the 85th percentile speed exceeds the maximum legal speed. As previously mentioned in the recommended Prerequisites for STANs success (Section 4.2), speed limits must be justified and technically supported.

Shortcutting Traffic

Municipalities should have a policy that clearly defines shortcutting traffic. As an example, such a policy might specify that if shortcutting volumes either exceed 100 vehicles per hour or comprise more than 30% of the total traffic volume, mitigation measures are required. Definitions of shortcutting should also be unique to each road classification such as local and collector roads.

In a neighbourhood that has only one or two entry points (e.g. a lollipop configuration) a license plate survey can measure the volume of shortcutting traffic. However, in a traditional grid network area, measuring shortcutting traffic volume can be more difficult and complex. In that

case, for local streets, the expected traffic volumes may be estimated based on fronting land use using ITE's *Trip Generation Rate Manual*, and compared with measured volumes.

However, note that ITE data is based on suburban rates. Therefore, it may be necessary to make adjustments in areas with high pedestrian activity or public transit usage. Census Canada data has information on mode split for commuting to work.

Proper data collection helps confirm whether a reported traffic issue is either valid or perceived. In the next phase of the framework, underlying causes for both types of traffic issues are discussed.

As mentioned previously, often the underlying causes point to neither a speeding nor shortcutting traffic issue. While the STANs framework provides solutions for both validated and perceived traffic issues, a traditional traffic calming process may be warranted in cases where data confirms a traffic issue.

4.5 Phase II: Identification of Underlying Factors

Phase II of the STANs framework can begin after a traffic issue has been identified and measured. This second phase identifies the issue's underlying cause(s). Besides analyzing the data collected in Phase I, two additional strategies help determine these causes: a public consultation and a site visit to the problem location.

Public Consultation

Communities should encourage consultation and communication between local residents, third party consultants, community associations, other municipal departments and any other key stakeholders. Doing so encourages communities to work as a team to solve a common problem by sharing individual knowledge and experience. Community consultation should shift away from working in "silos" to a system of collaboration throughout.

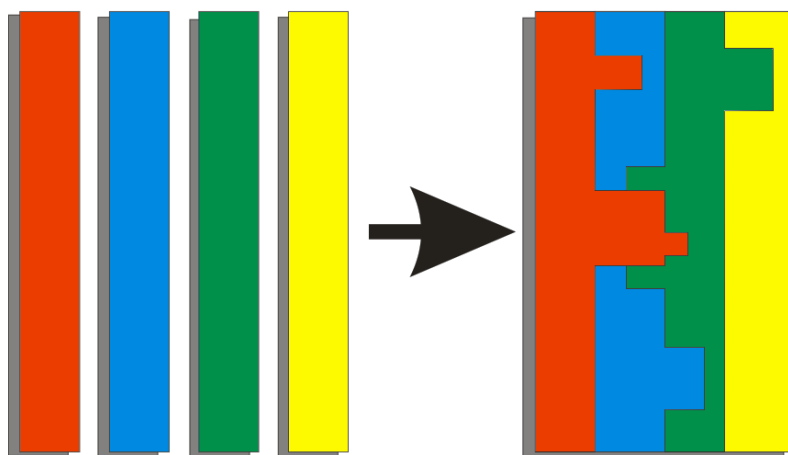


FIGURE 4.6 Shift From Silos To Collaboration

STANs encourages every stakeholder to provide unique insights into an issue. Residents are particularly valuable because they have detailed background information on traffic problems in their neighbourhood. They have observed their neighbourhood traffic over extended periods and can identify safety and operational issues that may not be discernable from a site visit or by examining data. Therefore, it is critical to conduct surveys and meet with residents to fully understand the issues, concerns, and values of the neighbourhood.

Residents will often express an issue in terms of their preferred solution. This can mislead the consultation and lead away from understanding an issue's underlying factors. Therefore, asking specific, predetermined questions will keep the focus on what is causing the problem(s). Residents must be reassured that once the underlying factors have been determined, they will be instrumental in developing the solutions. Municipalities differ on the level of decision making the public has for traffic calming projects. Sometimes citizens are engaged at the beginning of the process and work together with municipal staff to craft a solution. Others are more prescriptive and provide two or three acceptable solutions and ask residents to choose.

In cases where heated debate occurs over a proposed solution, STANs tries to build consensus so that the community works towards a solution that everyone can live with. For instance, two residents enter the process: one wants to close a road while the other wants to get home as quickly as possible. As it stands at the point, neither will get his/her preferred solution. However, the first resident concedes that the goal is really to get traffic to slow down near the school. Then, the other resident admits that a few speed humps would be acceptable as long as the plan didn't result in any diversions. With those concessions made, the two are more likely to find common ground.

STANs recommends the public be consulted using techniques that allow for conversation and meaningful dialogue between stakeholders. Techniques might include appreciative inquiry, deliberative forums, kitchen table meetings or the use of charrettes.

Surveys are useful to measure the approval of a specific traffic calming measures. But such surveys will likely not represent a true random sample. This is because those who are motivated to find a website to complete the survey likely have stronger opinions about the traffic calming.

While public consultation is the ideal forum to understand fundamental neighbourhood issues, the right questions need to be asked to reach those issues. Some of the important questions to be asked include the following:

- What is the worst time of day for traffic volumes?
- If speeding is a problem, what location concerns most residents about safety issues?
- How does every safety issue and perceived issue affect how residents travel in their neighbourhood?
- Which locations do residents identify as the most important to fix?

Site Visits

The *Canadian Guide* recommends conducting a “walkabout” tour with all stakeholders through the affected neighbourhood to discuss transportation issues and observe on-site conditions. Not only does a site visit provide invaluable insight into the issues at hand, but it can create a positive perception of the study in the community.

Aerial photographs can be useful to evaluate traffic patterns or confirm the configuration of vehicle and bike lanes. However, such photos provide limited value in considering the experiences of pedestrians or cyclists. Therefore, a site visit is essential to the STANs process because it gives the study team an opportunity to evaluate the neighbourhood’s human experiences. By evaluating the neighbourhood’s psychology, personal safety issues can be more easily and accurately identified.

For example, residents want to upgrade an existing, stop-controlled intersection to a four way stop. However, a traffic engineer determines the upgrade is not warranted based on the existing traffic volumes. Then, during a site visit, the engineer observes sight issues that would warrant additional control. Upon returning to the office, the engineer finds the intersection is a good candidate to retrofit to a modern roundabout because intersecting volumes are similar and there is a large volume of left turns from the major road.

4.6 Phase III: Solution Options

Phase III of the STANs framework determines the potential mitigation measures of the traffic issue identified in the second phase whether related to speeding or shortcutting traffic.

Where traffic and anecdotal data confirm the presence of a speeding or shortcutting traffic issue, a traditional traffic calming process or additional enforcement may ultimately be recommended. However, by focusing on improving conditions for pedestrians and cyclists, there may be locations where neighbourhoods can tolerate some traffic issues if it is safe for all travel modes.

Phase III uses a list of questions to ascertain the factors associated with the traffic issue. Each question is answered *yes* or *no*.

A neighbourhood that answers *yes* to four or more questions will be a candidate for greater enforcement or a traditional traffic calming process.

For each question answered *no*, Phase III presents a series of potential mitigation measures to improve facilities for non-motorized road users.

STANs Framework – Prompt List

Query	YES	NO
1. Are sufficient pedestrian facilities provided?	<input type="checkbox"/>	<input type="checkbox"/>
2. Are all posted speed limits appropriate within the neighbourhood?	<input type="checkbox"/>	<input type="checkbox"/>
3. Are road widths appropriate for their respective road classification? (i.e. traffic volume, parking requirements and contemporary standards)	<input type="checkbox"/>	<input type="checkbox"/>
4. Are sufficient crossing facilities available and appropriate for pedestrians and cyclists?	<input type="checkbox"/>	<input type="checkbox"/>
5. Are safety concerns perceived, but not supported with evidence of a strong pattern of collisions or identifiable engineering design or maintenance issues.	<input type="checkbox"/>	<input type="checkbox"/>
6. Is shortcutting traffic resulting from poor operating conditions on arterial and collector roads surrounding the neighbourhood?	<input type="checkbox"/>	<input type="checkbox"/>

1. Pedestrian facilities are NOT provided:

Solutions for insufficient pedestrian facilities include:

- Ensure that sidewalks or other pedestrian facilities are installed on key corridors. Key corridors are defined as routes fronting schools, safe routes to school, routes fronting pedestrian generators, etc.
- Provide pedestrian links (i.e. pathways)
- Initiate a *Safe Routes to School* process, if one has not been completed as a recommended prerequisite
- Improve the design of existing pedestrian facilities. That is, provide curb and gutter, construct boulevards, allow on-street parking where possible to provide a buffer, and landscape.

2. Speed limits are NOT appropriate in their context:

Where speed limits are inappropriate, the following strategies should be considered to mitigate the need to reduce speed:

- Conduct a speed study to ensure speed limits are appropriate for their surroundings
- Ensure school and playground zones and areas comply with the Alberta Transportation Guidelines, if one has not been completed as a recommended prerequisite
- Install a non-traversable fence surrounding roadside parks and playgrounds
- Install sidewalks surrounding parks and playgrounds.

3. Road width is NOT appropriate for its respective classification:

STANs recommends that the following short-term solutions be implemented where road widths do not reflect their classification:

- Curb extensions (see Canadian Guide)
- On-street parking (see Canadian Guide).
- Transverse pavement markings
- Additional bicycle facilities, such as painted on-street lanes
- Road dieting (see *The Safety Benefits of Road Diets*, ICBC 2009).

STANs recommends the following longer term sustainable measures as presented in Section 3.2 of this report:

- Improve or add landscaping
- Design narrower streets during neighbourhood renewal
- Add a neighbourhood gateway feature
- Paint streets.

4. *Crossing facilities for pedestrians and cyclists are NOT available, sufficient, or appropriate:*

When crossing facilities for pedestrians and cyclists are either not available or inappropriate, the problem should be reviewed on-site in conjunction with the TAC *Pedestrian Crossing Manual Guide*. Additionally, the following measures may be considered:

- Install curb extensions (see Canadian Guide)
- Construct median island refuges
- Reduce curb radii at intersection corners (see Canadian Guide)
- Provide driveway letdown treatment (see Canadian Guide)
- Improve visibility of pedestrians waiting at a crosswalk by restricting parking ahead of the crosswalk or by trimming shrubbery.

5. *Collision histories at a neighbourhood location point to a safety-related issue:*

When the collision history in a neighbourhood location has documented a pattern of collisions, or an operational or engineering issue, STANs recommends that a Traffic Operations and Safety Review be conducted at the appropriate locations.

Traffic calming measures such as curb extensions may be the ultimate solution to these collision patterns. However, conducting this review may also identify alternate solutions such as improving sight distance, or modifying traffic control.

6. *Poor operating conditions on arterial and collector roads surrounding the neighbourhood are NOT the principle cause for shortcutting traffic:*

Section 4.1 outlines a number of issues that can lead to reports of shortcutting traffic in a neighbourhood. For underlying issues such as entertainment or sport events, municipalities should hold the event organizers accountable for the following:

- Identify probable effects of the event and collaborate with local authorities to plan temporary traffic calming measures or traffic management as needed
- Identify how pedestrians and cyclists will be affected in detail and develop mitigation measures in collaboration with local authorities.

7. Initiate a Traffic Calming Study or Increase Enforcement

When four or more of the STANs Phase III queries are answered yes, typically, the response is to increase enforcement, or implement physical traffic calming measures, or both.

The decision to implement traffic calming or enforcement depends on many factors. If the issue is dealing with shortcutting traffic by itself, enforcement is not appropriate. In other cases, the decision should be to support policy and values of the neighbourhood with an understanding of the short and long term costs of both approaches.

In addition to traditional bylaw and police enforcement, the following strategies empower residents to enforce speed limits in their own neighbourhood:

- Neighbourhood Pace Car
- Volunteer Speed Watch
- Neighbourhood Street Reclaiming.

4.7 Desktop Review Exercise

To test the STANs framework's applicability, the project team worked with Strathcona County staff to examine an existing traffic calmed area. This exercise reviewed the suitability and robustness of the solutions identified for this area through the STANs framework. A workshop was conducted on May 18, 2011, with Opus project team members teleconferencing with County staff. Following a general discussion of the STANs framework, the exercise examined the traffic calming experience in the County's Mills Haven neighbourhood.

Background

Main Boulevard serves as a collector road in the Mills Haven neighbourhood in Sherwood Park in Strathcona County. The road travels through a 1970s era subdivision, and is largely fronted by single-family homes. Three schools are located on the street, as well as commercial nodes at each end of the study corridor where the road meets arterial roads. In response to concerns over the condition of the road's asphalt surface, high traffic volumes, vehicle speeds and pedestrian safety, a traffic calming process was initiated.

Phase I – Confirmation of Issue

In line with STANs recommendations, data was collected to help confirm traffic issues. As well, a license plate survey revealed approximately 15 percent of traffic was short cutting through the neighbourhood. This is slightly higher than would be expected for a collector road. Several speed surveys were also undertaken with no significant issues revealed.

It was noted that the County did not have a Safe Routes to School program in place, which is a recommended pre-requisite STANs policy. Strathcona County is also in the process of finalizing a review of its school and playground zones and areas, another recommended pre-requisite.

Phase II – Identification of Underlying Factors

The discussion of underlying factors in Section 4.1 was reviewed. In general, Strathcona County was effective in determining the underlying issues in resident complaints through a comprehensive public consultation process. A lack of adequate pedestrian facilities was revealed. The existing 0.95m wide monolithic sidewalk was seen as narrow, and with the adjacent roll-over curb, exposed to traffic on Main Boulevard. While residents complained of speeding, County staff felt this perception was in part due to the proximity of pedestrians to traffic.

The relatively wide cross-section of the road was also identified as contributing to elevated (though not excessive) vehicle speeds. Traffic operations on surrounding arterial roads were not felt to contribute to excessive shortcutting traffic on the study corridor.

Phase III – Solution Options

The STANs Phase III prompt list was used to compare solution options put forward by the STANs framework and those implemented in the Mills Haven neighbourhood. Generally, the STANs framework recommended solutions that were implemented as part of the Main Boulevard traffic calming process. For instance, improved pedestrian facilities (i.e. wider sidewalk, physical separation from roadway, shorter crossings) and a narrowing of the road width were both implemented.

The STANs framework also suggested several potential mitigations not adopted by the County. The addition of painted on-street bike lanes to Main Boulevard was not considered viable, as the County does not currently have any on-street bike lanes, or a bicycle master plan. The County is considering undertaking a Safe Routes to School study. The County acknowledges that residents are still expressing some concern over the safe access of schools throughout the region.

Discussion

It was acknowledged that the Mills Haven traffic calming experience was positive. Residents generally approve of the process and the resulting solutions. The STANs framework was seen

to be effective in both recommending viable solutions, with many implemented by the County, and identifying potential policy gaps. These policy gaps may ultimately lead to revisiting the study corridor.

Through discussion with the County, it was also determined that the STANs framework process could be considered when planning for and implementing new neighbourhoods. Minor changes to the framework were made to accommodate this.

4.8 Next Steps and Possible Further Work

To maximize the value of this study, C-TEP can consider the following follow-up actions:

Circulate Study Deliverables to Municipalities and Road Agencies

The benefits of the new knowledge provided by this study will come through sharing of the report deliverables to municipalities, road agencies and the industry in general. This includes posting it to C-TEP's website. Online availability will be a valuable and practical tool to the international communities looking at innovative ways to provide their communities with sustainable transportation solutions.

Provide Training to Municipality Staff and Other Stakeholders

To properly describe the STANs framework, training can be arranged for a municipality's staff, the road agencies, and the other stakeholders in the industry. This would include a detailed summary of the best practices and literature review, the Lessons Learned from interviews with Alberta municipalities, and several examples of how to use the STANs framework.

Adapt the Framework to Current Policies and Standards

The STANs framework was developed using language appropriate for municipal policies and can easily be adopted by any municipality. It is designed to address the unique characteristics of any neighbourhood and can be tailored to meet the specific needs of any community. Municipal road agencies should be encouraged to review the framework for compatibility with their own practices. Existing policies can refer to the STANs framework as supplementary guidance, or they can be adopted in whole or in part into existing practices.

APPENDIX A
STAKEHOLDER INTERVIEWS

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Strathcona County

Complaints from residents are generally about speeding, shortcutting traffic, stunting, and playground zones that are too long.

The engineering department completes a detailed analysis of speeds, collisions and complaints on the roads in question, including collector streets.

They advise that for this particular municipality, there are many homes with single garages and small driveways, thus on-street parking is heavily used. For any traffic calming measure, they generally require removal of parking. This is unacceptable to the residents.

Strathcona County uses only traffic calming measures that are outlined in the TAC Guideline. They advise that roundabouts, curb extensions and especially speed humps have worked to lower speeds and shortcutting traffic. They also advise that raised crosswalks have not worked, primarily due to improper installation and cars do not have to slow down to travel over them. Extreme speed bumps have been removed due to increased noise and improper installation that allowed cars to move around them.

They have taken several approaches to solutions that include the following:

- Showed the community the problems and a list of solutions and had the community rank the solutions. Both the problems and solutions were determined by the County.
- Showed no information to the community and let the public give their idea of the problems.

Strathcona County opposes using pilot programs. Strathcona County also does not have community associations but policy makers think such organizations would help.

City of Edmonton

Edmonton advised that it has a limited budget for traffic calming initiatives. Although there is no formal policy in place, there is a speed management program in place. It uses a number of measures including a speed reduction pilot program in several communities (reduced speed limits to 40km/h), neighbourhood pace cars, safe speed community vans, speed watch program and roadside memorials.

Edmonton staff indicated that collector roads with 14 metre cross-sections are addressed in a *Neighbourhood Renewal Program*. The *Neighbourhood Renewal Program* focuses on renewing and rebuilding of roads and sidewalks throughout the city. Safety issues and wider roadways are pro-actively addressed on a neighbourhood-wide basis when the city does a road rehabilitation.

Edmonton generally does not implement traffic calming projects where speeding is a problem in neighbourhoods and where shortcutting traffic is not an issue. That is, if only local residents are speeding, it is an enforcement issue. The city takes an innovative approach by empowering residents to use community-based enforcement methods such as *PACE Cars*, *Safe Speed Community Vans* and *Volunteer Speed Watch*. Automated enforcement is also used.

Permanent measures are dealt with by the Transportation Engineering department. As well, there is no formal way the public bring concerns to the city. Generally, the public contacts the city by phone, either through 3-1-1 or the Traffic Safety Department directly who redirects the caller to the appropriate department based on their concerns. Each situation is validated by analyzing traffic speeds, traffic volumes, shortcutting via license plate studies, collisions, number of vulnerable pedestrians and driver behaviours. The City does look at a more holistic approach that considers safety, liveability, access for all road users, bike lanes, and reducing road widths.

Edmonton's experience shows that communities seem to be divided. That is, half of the residents want traffic calmed while the other half want easier access in and out of their neighbourhood.

Edmonton advises the best speed reduction methods are curb extensions (cyclists complain), sharrows, raised intersection (transit complains). The best shortcutting reductions come from closure and diverters.

The city advises that the least successful initiatives are curb extensions, signs, one-way collector streets, local-traffic-only signs and stop signs/signals. Edmonton reported that the result of a road diet was very poor and have not implemented any further road diets since that effort.

City of Calgary

The City of Calgary has an official Traffic Calming Policy bounded by law. It has been revised twice and will release a new edition this year.

Calgary advises that a common problem is that residents identify problems that, in actuality, do not exist once engineers complete an analysis. There is a small, vocal, minority of people who care only about their own problem.

The challenge Calgary has in the existing road network is controlling speeds. The Complete Streets Initiative hopes to change this. Calgary does look at surrounding streets. However, Calgary officials have advised that residents, regardless of any findings, want to see traffic calming measures implemented. It is also important to use applications on what the road was designed for, not for its current operations.

There is an informal process in place, since 2004, where the city reviews traffic calming installations with no resident consultation.

What has and has not worked well depends highly on the construction. Vertical deflection works very well in volume reduction (8-25%), speed reduction, high end speed reduction. These devices are also reasonably priced. Any calming change to reduce speeds has increased pedestrian/cyclist volume. Curb extensions and traffic circles have improved pedestrian/cyclist experience also. Depending on the resources of the city, Calgary also recommends a consultant be retained which is more efficient and more likely to convince a community that their interests are being addressed.

Street closures have not been used heavily because there is significant opposition to this type of traffic calming. Heterogeneous communities cause problems.

City of Lethbridge

Lethbridge does not have any formal policy. However, one of the objectives in the Transportation Master Plan study (currently ongoing) is to formulate traffic calming policies.

The city engages the public through web contact, mail, email, and telephone. Public and special interest groups (e.g. bike clubs) are engaged in public open houses and stakeholder workshops as part of specific project needs. The public is generally involved in developing the traffic calming options.

To validate resident complaints, the City completes site visits that include data collection of continuous counts, continuous spot speed measurements, and site line reviews.

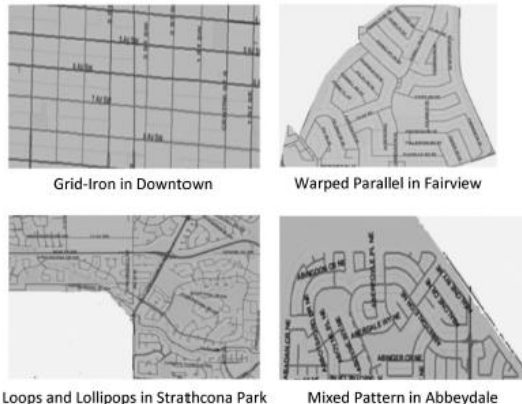
Lethbridge currently uses reduced speed limits, bike lanes, stop signs, pedestrian crossing facilities and roundabouts as traffic calming measures. It is currently considering curb extensions.

Lethbridge would consider pilot trials in the future, but have yet to initiate such a project. The city has partnered with carpool.ca and has established Park And Ride programs to reduce the number of vehicles on the roads. Implementing bicycle lanes and pathways is outlined in the Bikeway and Pathways Master Plan and supports traffic calming.

Lethbridge measures success informally. It is a success if residents no longer offer negative comments/complaints once traffic calming measures have been put in place.

APPENDIX B
LITERATURE AND BEST PRACTICES REVIEW

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Ref No. 1	TITLE: Effects of Neighbourhood Street Patterns on Traffic Collision Frequency
AUTHOR: Shakil Rifaat, Richard Tay, Alex Perez, Alex de Barros	
YEAR: 2009	PUBLISHER: Journal of Transportation Safety & Security
TYPE: Literature Review	
<p>SUMMARY: The main objective of this study was to identify the effect of street patterns on crashes in the community areas of Calgary, Canada. The street pattern in each community was classified using a scheme that was adapted from a similar scheme developed by Southworth and Ben-Joseph (2003). The authors classified street patterns into five categories: grid-iron, fragmented parallel, wrapped parallel, loops and lollipops, lollipops on a stick and mixed patterns.</p> <div style="text-align: center;">  <p>Grid-Iron in Downtown Warped Parallel in Fairview</p> <p>Loops and Lollipops in Strathcona Park Mixed Pattern in Abbeydale</p> </div> <p>Compared with the Gridiron pattern, all the irregular patterns improved safety. The largest reduction in crashes was exhibited by the Warped Parallel followed by Loops And Lollipops. Although the Mixed Street pattern also improved safety, the effect was not statistically significant. These results indicated that roads that had less connectivity, frequent curves, and presence of loops were safer than traditional straight roads in a Gridiron pattern</p> <p>The study also showed that commercial and industrial land uses had an increase in crash frequency.</p> <p>Consistent with previous studies (Colon & Cutter, 1983; McCarthy, 1991, 1993, 1994; McCarthy & Oesterle, 1987), this study found that an increase in the number of liquor stores in the community was associated with an increase in the number of crashes.</p> <p>One interesting finding is that an increase in the number of train stations tend to increase the crash risk in the community although the effect is only marginally significant. A train station presents a unique traffic environment that is likely to involve added road intersections, railroad crossings, and interactions between vehicular traffic and non-motorized road users.</p> <p>The current study did not include vehicle crashes on several main roads, including collector and arterial roads, due to boundary problems. This approach may influence the results in favour of limited-access roads. Because the study analyzed only traffic safety within a community area in a city, care should be exercised when generalizing the result, especially when analyzing traffic safety city-wide or at a regional level.</p>	

Ref No. 2	TITLE: Green Guide for Roads (Working Template)
AUTHOR: Urban Transportation Council,	
YEAR: 2009	PUBLISHER: Transportation Association of Canada
TYPE: Literature Review	
<p>SUMMARY: The Green Guide for Roads Task Force established and developed a set of self-evaluation performance measurement criteria. The criteria incorporate sustainable/green principles and environmental stewardship guidelines that may be applied to all aspects of a roadway over its lifecycle. It provides guidance on roadway planning, design, construction, commissioning, maintenance and operation, and life cycle assessment activities. Further, it addresses the full functional hierarchy of roads in both urban and rural settings. The intent is to promote sustainable growth and alternative multi-modal transportation solutions within the corridor, in addition to safe, long lasting roadway infrastructure and green construction principles.</p> <p>Some related goals of the guide are as follows:</p> <ul style="list-style-type: none"> • Promote roads that connect and integrate communities rather than divide them, provide spatial structure for the community and a place for social and economic interaction. • Prioritize Green travel options while not comprising the road's planned function or road safety. • Prioritize Green Vehicle Street Parking (including converting parking spaces to allow multiple bicycle parking opportunities) • Encourage active modes of transportation through the provision of safe, convenient and desirable amenities (benches, water fountains, wayfinding, etc). • Promote sustainable transportation by facilitating the mobility and accessibility for all road users including pedestrians, cyclists, transit riders and motorized vehicles by providing a safe, efficient, comfortable and attractive transportation corridor. • Develop a sustainable transportation plan that identifies needs and priorities by mode and that is appropriate to the road context. • Design roads to meet long term travel needs. • Promote walking with pedestrian amenities. Sidewalks should be as gentle and barrier-free as possible with gentle cross-slopes and surface transitions. • Promote bicycle transportation by increasing cyclist safety and comfort by separating bicycle traffic from motorized traffic. • Establish or improve bicycle facilities and infrastructure that would likely result in a modal shift from motorized means. • Promote transit by increasing transit efficiency, accessibility, safety, equitability and level of service. • Provide dedicated transit facilities (ex:HOV lanes) and yellow light delays for transit (signal preemption). • Ensure off street loading along transit routes and include alternative transit solutions such as Rideshare as part of transit. • Use landscaping to enhance the quality and health of the natural environment, the character of the built environment and contribute to the quality of Life. Promote long term landscape features that are constructible, sustainable and cost effective. • Employ traffic calming measures (i.e.: narrower travel pavement widths, speed bumps/tables, landscaped bulb-outs, etc.) to design comfortable and safe walking environments that encourage alternate, active modes of transportation. 	

Ref No. 3	TITLE: Canadian Guide to Neighbourhood Traffic Calming
AUTHOR: Transportation Association of Canada & Canadian Institute of Transportation Engineers	
YEAR: 1999	PUBLISHER: Transportation Association of Canada & Canadian Institute of Transportation Engineers
TYPE: Literature Review	
<p>SUMMARY: This guide focuses on traffic calming measures for local and collector streets in established residential areas. It mainly addresses retrofit situations (i.e. traffic calming on existing streets) rather than streets in new developments. It takes a flexible approach that recognizes traffic calming needs to reflect local conditions. The guide documents the effectiveness and recommended application of a wide range of traffic calming measures. It proposes a systematic process to involve affected communities to develop traffic calming plans.</p> <p>The guide contains four chapters:</p> <ul style="list-style-type: none"> • Introduction to Traffic Calming: Defines traffic calming, explains its role in transportation planning and neighbourhood planning, and identifies issues related to designing and implementing traffic calming plans. • Community Involvement in the Traffic Calming Process: Outlines a recommended process to involve the community in a traffic calming plan. • Applicability and Effectiveness of Traffic Calming Measures: Describes a wide range of traffic calming measures and includes tables that identify the benefits and application of each type of measure. These tables assist users of this Guide to select appropriate and effective measures in addressing specific neighbourhood traffic problems. • Design Guidelines for Traffic Calming Measures: Provides design-related guidelines for traffic calming measures. 	

Ref No. 4	TITLE: The Corporation of Delta's Neighbourhood Traffic Calming Policy & Procedures
AUTHOR: Tim Murphy	
YEAR: 2003	PUBLISHER: Corporation of Delta
TYPE: Literature Review	
<p>SUMMARY: This policy defined Traffic Calming as the combination of mainly physical measures to reduce the negative effects of motor vehicle use, alter driver behaviour, and improve conditions for non-motorized road users. Traffic calming can be installed either as a retrofit to an existing neighbourhood or as a design feature in newly constructed neighbourhoods.</p> <p>The goals of traffic calming include:</p> <ul style="list-style-type: none">• Improve the quality of life.• Incorporate the preferences and requirements of residents.• Create safer streets.• Create attractive streets.• Promote pedestrian, cycle and transit use. <p>Traffic calming measures may include:</p> <ul style="list-style-type: none">• Vertical changes in the road (speed humps, speed bumps, speed tables, raised intersections).• Lateral changes in the road (chicanes, offset intersections, lateral shifts, traffic circles).• Constrictions (narrowings, pinch points, islands, parking).• Narrow pavement widths.• Entrance features (gates, signs, narrowings, surface treatments).• Route changes (road closures, partial road closures, diverters, turn restrictions).	

Ref No. 5	TITLE: City of Calgary's Traffic Calming Policy
AUTHOR: Urban Systems Limited	
YEAR: 2007	PUBLISHER: The City of Calgary
TYPE: Literature Review	
<p>SUMMARY: This Traffic Calming Policy provides clear direction on the types of traffic calming measures and appropriate circumstances for their use considered in Calgary, .</p> <p>This report identifies a process for responding to traffic issues so that communities with the most severe traffic issues will be dealt with on a priority basis.</p> <p>The report highlights some of the resources available to help individuals and community groups address their own traffic issues. Some of the initiatives include a speeding awareness program, portable educational signs, trip reduction programs, and plain language publications that address frequently asked traffic questions.</p> <p>Objectives to achieve the goals of improving safety and liveability include: reduce vehicle speeds, discourage through traffic on local streets, minimize conflicts between street users and enhance the neighbourhood environment.</p>	

Ref No. 6	TITLE: Traffic Calming in Three European Cities: Lessons from Zurich, Vienna and Munich
AUTHOR: Andrew Nash	
YEAR: 2004	PUBLISHER: SPUR Newsletter, pg. 3 WEBSITE: http://www.spur.org/publications/library/article/trafficcalminginthreeeuropeancities09012004
TYPE: Literature Review	
<p>SUMMARY: This article offers lessons from three European cities: Zurich, Vienna and Munich. It discusses integrating traffic calming into transportation plans, gaining public support for traffic calming, properly funding traffic calming, implementing traffic calming concurrently with other projects, and traffic calming on arterial roads, squares, and parking.</p> <p>It states that modern traffic calming has been well integrated into the general transportation planning process in many cities. It is no longer an idea on the periphery of traffic planning, but is viewed as a way to help meet traffic-reduction goals.</p> <p>Because adequate funding is not always available for traffic calming in most cities, funding shortages have forced cities to implement less than ideal techniques and have reduced their ability to implement programs that are more comprehensive. Therefore, cities are searching for less expensive ways to implement traffic calming and are linking traffic calming with other better-funded programs like street resurfacing.</p> <p>Implementing traffic calming can be difficult technically, politically, and financially, but most cities are working closely with the community to implement traffic-calming projects. The cities work proactively using partnership programs, citizen involvement, and expert commissions. This process has led to compromises on the policy and project level (e.g. using underground parking to replace parking that was removed to implement traffic calming), but has enabled many programs to progress. Finally, a new generation of projects is challenging the traffic-engineering orthodoxy.</p>	

Ref No. 7	TITLE: Promoting Sustainable Transportation Through Site Design
AUTHOR: Canadian Institute of Transportation Engineers	
YEAR: 2004 PUBLISHER: Institute of Transportation Engineers	
TYPE: Literature Review	
<p>SUMMARY: This report recommends site design practices that can be applied through the land development process to promote more sustainable modes of passenger transportation such as walking, cycling, and transit. Its primary purpose is to assist policy makers and professionals involved in the preparation, review, and approval of non-residential development proposals (e.g. office, retail, recreational, industrial and institutional) to identify and incorporate features that make sites more accessible to travel modes other than the single-occupant vehicle (SOV). With that proviso, many of the guidelines could be applied in the design of mixed use and medium to high-density residential sites.</p> <p>The report also identifies a range of supporting policies and actions that agencies can implement to create an atmosphere that promotes sustainable transportation through site design.</p> <p>The most effective urban structure from a transit perspective is one of nodes and corridors (Blais, 1995). This form of development facilitates walking, cycling and ridesharing because destinations are more centralized and connected.</p> <p>Municipalities can help to achieve a denser, more compact, mixed-use urban form by the following:</p> <ol style="list-style-type: none"> 1. Encourage clustering of compatible and complementary land uses such as office, retail and residential to facilitate live-work relationships and maximize the use of existing infrastructure (e.g. residential and office uses tend to have different traffic peaks). 2. Require development densities that support a level of transit service that is sustainable, viable, and competitive with automobile travel times. <p>According to the Canadian Transit Association (CUTA, 1993), "for each kilometre of route being considered in a residential area, at least 2,100 people should live in the catchment area of a proposed new route (within a 450 m walk of the route).</p> <p>Similarly, "For each kilometre of a new route in an industrial area, at least 750 people should work in the catchment area of a proposed new route."</p> <p>These figures equate to a minimum development density of approximately 25 people per hectare for residential development and 8 employees per hectare for industrial development.</p> <ol style="list-style-type: none"> 3. Introduce maximum building setbacks into zoning by-laws or ordinances so parking is located behind buildings rather than between the buildings and streets. 4. Reduce the amount of space required for traffic lanes and parking making more land available for productive development and/or other right-of-way uses. 5. Discourage auto-oriented developments, such as drive-through restaurants and large-format retail with expansive parking areas, along key transit corridors and areas designated for higher density uses. 6. Provide levels of transit service that allow people to conveniently live, work, shop, and recreate in an area without having to rely on an automobile for travel needs. 7. Educate citizens and community members on the benefits of active living in compact urban form to offset negative perceptions associate with "high-density development." <p>There is a growing trend toward students, even those living within reasonable walking or cycling distances, driving or being driven to school. This may be partly due to the fact that community designs have made it difficult for students to walk to school (houses back onto arterials, internal streets are</p>	

discontinuous or circuitous), and that many parents and school administrators view walking and cycling as unsafe due to traffic volumes, speeds, or personal security concerns. With this trend, safety concerns have arisen due to the high volume of cars at the site. Even if a site is designed to allow for high volumes of drop-offs, the high volume on the adjacent street presents safety and environmental issues. Site developers must work with school administrators and boards to develop a comprehensive approach to school transportation including a well-designed site for pedestrians, cyclists, buses and essential cars. Recognizing the need to accommodate auto users while at the same time encouraging more sustainable behaviours for school trips, the following measures should be considered:

- Locate vehicle drop-off facilities (on street or off street) away from main entrances and other high activity areas (such as playgrounds or playing fields). In all cases, school bus pick-up/drop-off facilities should be closest to building entrances. On-street parking restrictions may be required to manage parent pick-up and drop-off activity to avoid safety and congestion problems. In no case should a pick-up/drop-off area or its access drives compromise the directness and safety of pedestrian routes between the surrounding neighbourhood and the school entrances (See Passenger Pick-Up and Drop-Off Areas).
- Ensure that pedestrian crossings are clearly delineated and located in the most likely areas of demand, since students will typically cross where it is most convenient. Vertical (speed humps, raised crosswalks) and horizontal traffic calming measures (curb extensions) may help to improve pedestrian safety (See Internal Transportation Network Configuration and Pedestrian and Cyclist Routes).
- Provide school crossing guards at high pedestrian/vehicle volume crossing locations. In some cases, traffic control signals or intersection pedestrian signals may be warranted to protect crossing children. Provision of any traffic control devices would be subject to local guidelines, including the Manual on Uniform Traffic Control Devices (See Internal Transportation Network Configuration).
- Provide/develop a plan showing safe routes for walking and cycling between homes in the area and school. "Safe routes to school" information should be provided to each parent, with the locations of crossing guards clearly identified.
- Locate bike racks in highly visible and weather-protected areas, such as an overhang outside a lobby or classroom. Provide a sufficient number of spaces to accommodate demand (See Bicycle Racks and Storage).
- Provide access to surrounding communities from all directions. For example, a small park or greenway between two houses could be used to provide access to surrounding streets (See Internal Transportation Network Configuration and Pedestrian and Cyclist Routes).
- Provide transit passes to students who are not bussed to school but come from farther distance.
- Provide minimal on-site parking for students to discourage auto use. This may require a parking management strategy whereby students are only allowed to drive to school when walking, cycling, transit, or school bus options are not feasible or available.

Ref No. 8	TITLE: Traffic Calming State of Practice
AUTHOR: Federal Highway Administration & Institute of Transportation Engineers	
YEAR: 1999	PUBLISHER: Federal Highway Administration & Institute of Transportation Engineers
TYPE: Literature Review	
<p>SUMMARY: The United States guide to Traffic Calming includes the following chapters:</p> <ul style="list-style-type: none"> • Introduction. • Brief History of Traffic Calming. • Toolbox of Traffic Calming Measures. • Engineering and Aesthetic Issues. • Traffic Calming Impacts. • Legal Authority and Liability. • Emergency Response and Other Agency Concerns. • Warrants, Project Selection Procedures and Public Involvement. • Beyond Residential Traffic Calming. • Traffic Calming in New Developments. <p>The guide advises that traffic calming boils down to two things:</p> <ul style="list-style-type: none"> • Identify the nature and extent of traffic related problems on a given street or in a given area. • Select and implement cost-effective measures for solving identified problems. <p>If shortcutting traffic is the problem (as determined by traffic counts), the guide suggests one set of measures. If speeding is the problem (as determined by speed measurements), it suggests another set.</p> <p>Lessons from Seattle:</p> <ul style="list-style-type: none"> • Test complex area-wide treatments before implementing them permanently. • Assess public support for the treatment. • Conduct before-and-after studies of traffic impacts. • Include traffic accidents among the impacts studies. • Work with emergency services to address their concerns. • Select the most conservative design that will do the job. 	

Ref No. 9	TITLE: Pedestrian Information Centre	
AUTHOR: http://walkinginfo.org		
YEAR:	PUBLISHER:	
TYPE: Literature Review		
<p>SUMMARY: Information is given on specific types of traffic calming measures includes chokers, crossing islands (refuge islands), chicanes, mini-circles, vertical devices (speed hump, speed table, raised intersections, raised pedestrian crossings, gateways, landscaping, specific paving treatments, serpentine design (winding streets), and shared streets/green streets.</p> <p>For each measure the purpose, design and implementation considerations, and an estimated cost (typically a range) are provided.</p>		

Ref No. 10	TITLE: LEED for Neighbourhood Development http://www.usgbc.org/DisplayPage.aspx?CMSPageID=148	
AUTHOR: LEED, US Green Building Council		
YEAR:	PUBLISHER:	
TYPE: Literature Review		
<p>SUMMARY: The LEED for Neighbourhood Development Rating System integrates the principles of smart growth, urbanism, and green building into the first national system for neighbourhood design. LEED certification provides independent, third-party verification that a development's location and design meet accepted high levels of environmentally responsible, sustainable development. LEED for Neighbourhood Development extends the benefits of LEED beyond the building footprint into the neighbourhood it serves.</p> <p>The rating scorecard includes neighbourhood pattern and design, which includes sub-categories like walkable streets, reduced parking footprint, transit facilities.</p>		

Ref No. 11	TITLE: City of Portland Traffic Calming Policies
AUTHOR: City of Portland	
YEAR:	PUBLISHER: City of Portland
TYPE: Literature Review	
<p>SUMMARY: The Mission of the Traffic Calming Program is to improve community safety and to preserve and enhance City of Portland neighbourhoods by working with residents and businesses to design and implement solutions to the negative impacts created by automobile traffic on neighbourhood streets. The following are a list of some of the City's traffic calming policies:</p> <ol style="list-style-type: none"> 1. Through traffic should be encouraged to use higher classification arterials, as designated in the arterial streets classifications and policies; 2. A combination of education, enforcement, and engineering methods should be employed. Traffic calming devices should be planned and designed in keeping with sound engineering and planning practices; 3. Emergency vehicle access should be accommodated in keeping within the existing Fire Bureau response standards. If current emergency vehicle access does not meet the existing response standard, traffic calming efforts should not further degrade the response time; 4. Transit service access, safety, and scheduling should not be significantly impacted; 5. Reasonable automobile access should be maintained. Pedestrian, bicycle, and transit access should be encouraged and enhanced wherever possible and within budget limitations. Projects should be coordinated with the Bicycle and Pedestrian programs where appropriate; 6. Parking removal should be considered on a project-by-project basis. Parking needs of residents should be balanced with the equally important functions of traffic, emergency vehicle access, transit, bicycle, and pedestrian movement; 7. The procedures shall provide for submittal of project proposals; project evaluation and selection; citizen participation; communication of any test results and specific findings to project area residents and affected neighbourhood organizations before installation of permanent traffic calming devices; and appropriate Council review. <p>The Traffic Calming Program encompasses three types of projects:</p> <ol style="list-style-type: none"> 1. Neighbourhood Collector Street projects – streets primarily residential, no physical diversion, intended to make streets safer by reducing speeds; 2. Complex Local Service Street projects – issues relating to speeding and excessive shortcutting traffic, either diversionary (away from project street to arterial street), which requires monitoring to ensure traffic isn't shifted to other Locals, and nondiversionary, where traffic is not physically forced off the street. 3. Simple Local Service Street projects – speeding on local streets, either of two options: streamlined speed bump project or a residential speed bump purchase project. 	

Ref No. 12	TITLE: City of Albany Traffic Neighbourhood Traffic Calming Program
AUTHOR: City of Albany	
YEAR: 2001	PUBLISHER: City of Albany, Oregon
TYPE: Literature Review	
<p>SUMMARY: The initial steps of the a traffic calming program include the following:</p> <ul style="list-style-type: none"> • Citizens with a concern about traffic in their neighbourhood who contact the City are requested to complete an application/checklist. • The City confirms that the issue is suitable for NTCP (i.e. parking or stop signs do not necessarily belong to NTCP). • Once suitability is determined, applicant performs a preliminary data collection (volume and speed counts). It is the responsibility of the applicant to collect the data. (Applicants are provided information on how to collect link and turning movement counts, as well as the opportunity to borrow the APD's radar gun for speed counts!). <p>If at least fifty-one percent of the adjacent property owners are willing to participate in the cost of the device, the problem meets the minimum requirements, and the plan receives both neighbourhood and Traffic Safety Commission approval. The traffic calming device is installed according to City standards.</p> <p>In cases where the problem does not meet the minimum standards established in this program, the City will work with the applicant to see if the problem can be corrected through education or enforcement. If requirements are met, the project will be ranked according to average speed, volume, and proximity to schools and sidewalks. Only the top five projects remain active. Projects queued remain so for up to two years. If they have not entered the top five they are re-evaluated.</p> <p>Once a project is active, a majority of property owners (51%) must agree that a project is necessary and that they will participate in the cost of the construction of the project. Costs vary depending on the classification of the project roadway.</p> <p>City then develops a Traffic Calming Plan. Representative from the neighbourhood, Traffic Safety Commission, and the Albany Fire Department will also be included on the Plan team. Plan includes the type of device, location, construction schedule, maintenance responsibility and estimated project costs.</p> <p>City may implement a test device for more radical measures (traffic circles) before moving to the neighbourhood survey. The survey intent is to ensure adjacent neighbours know of the proposal, and provide an updated sense of costs. A majority must agree with the device installation. Once approved, the TCP is forwarded to the Traffic Safety Commission for review and approval. Pending approval, the TCP is executed and two sets of data are collected (two months and six months, subsequent) to determine impacts and effectiveness. Results are shared with the neighbourhood.</p> <p>Typical constructed mitigation measures and education/enforcement mitigation measures are: chicanes, chokers (pinch point, curb extensions and in medians), traffic circles, diverters, entry treatments, humps, intersection realignment, one way streets, pavement textures/pavement markings, parking on-street, part time traffic restrictions, road closures, signs, neighbourhood flyers, public awareness/traffic watch and speed trailers.</p>	

Ref No. 13	TITLE: Mental Speed Bumps: The smarter way to tame traffic
AUTHOR: David Engwicht	
YEAR: 2005	PUBLISHER: Envirobook
TYPE: Literature Review	
<p>SUMMARY: <i>Mental Speed Bumps: The smarter way to tame traffic</i> explains the full array of mental speed bumps and how they automatically slow drivers. The book contains practical, down-to-earth ideas for residents, parents, health professionals and city planners.</p> <p>Working on different sides of the world, in different cultural settings, Hans Monderman and David Engwicht both stumbled onto a radical new way to tame neighbourhood traffic.</p> <p>Monderman, a traffic engineer working in Holland, discovered that removing all traffic signs, speed humps, line markings, and traffic lights dramatically reduced traffic speeds and actually made streets safer. The lack of signs and traffic control devices created a 'mental speed bump' that slowed motorists without them being aware that they had slowed down. This new approach to street design has been applied in over 30 cities and villages in Europe.</p> <p>David Engwicht, a social inventor working in Australia, noticed that a child playing on the sidewalk can be more effective at slowing traffic than a speed hump. He found that the speed of traffic on residential streets is governed, to a large extent, by the degree to which residents have psychologically retreated from their street. Simply reversing this retreat creates mental speed bumps in the street.</p> <p>The following practical actions for residents are suggested:</p> <ul style="list-style-type: none"> • Reclaim their street as a socializing space. • Install something intriguing in the street. • Reduce car use to a minimum and use slow-moving transportation modes. • Create activity nodes on your private land. • Create a unique and friendly community environment. • Encourage existing local businesses to connect with the street. • Encourage new local businesses in the neighbourhood. • Use art, furniture, landscaping and design elements to make the street more like a room. <p>The following practical actions for cities are suggested as well: Creating social programs such as do it yourself traffic calming procedures for residents, neighbourhood pace car programs, neighbourhood traffic treaty's and encouraging residents to create activity nodes and vibrant private spaces.</p> <p>Other initiatives include removing regulations that prevent street games or social activity in the street. Minimize signage and traffic control devices. Give the residents designated areas in which they can create vibrant and intriguing art in the neighbourhood. Change the geometry of the street by installing positive, community building infrastructure. Focus on making the street look more like an outdoor living room where social life in the street will increase.</p>	

Ref No. 14	TITLE: Project for Public Spaces: Placemaking for Communities http://www.pps.org/articles/livememtraffic/
AUTHOR:	
YEAR:	PUBLISHER:
TYPE: Literature Review	
<p>SUMMARY: "We shape our public spaces, thereafter, our public spaces shape us." – adapted from Winston Churchill.</p> <p>"What attracts people, it would appear, is other people." – William H. Whyte.</p> <p>Developed in Europe, traffic calming (a direct translation of the German "verkehrsberuhigung") is a system of design and management strategies that aim to balance traffic on streets with other uses. It is founded on the idea that streets should help create and preserve a sense of place, that their purpose is for people to walk, stroll, look, gaze, meet, play, shop and even work alongside cars – but not be dominated by them.</p> <p>The tools of traffic calming take a different approach from treating the street only as a conduit for vehicles passing through at the greatest possible speed. They include techniques designed to lessen the impact of motor vehicle traffic by slowing it down, or literally "calming" it. This helps build human-scale places and an environment that is friendly to people on foot.</p> <p>Besides its power to improve the livability of a place, the beauty of traffic calming is that it can be applied inexpensively and flexibly. The strategies outlined in The Traffic Calming Toolbox are employed by painting lines, colors and patterns; using planters, bollards and other removable barriers; eliminating or adding parking; or installing sidewalk extensions or similar structures with temporary materials.</p> <p>All of these techniques provide an opportunity to test devices, combinations and locations and then fine-tune the approach according to the results. Traffic calming, along with other small-scale improvements, can enhance a place immediately, while being tested and refined to meet long-term needs. When funds are available, the right combination of devices can be transformed into permanent improvements and extended over a broader area.</p> <p>Regardless of what traffic-calming action is undertaken, the benefit to a community is greater when the technical improvements are strengthened by visual enhancements like trees, flowers and other amenities.</p> <p>The Traffic Calming Toolbox includes diagonal parking, changing one-way streets to two-way streets, widening sidewalks/narrowing streets and traffic lanes, bulbs, chockers, neckdowns, chicanes, roundabouts, traffic circles, raised medians, tight corner curbs, diverters, road humps, speed tables, speed cushions, rumble strips and other surface treatment.</p>	

Ref No. 15	TITLE: Reinventing Transportation Planning as Community Development http://www.streetfilms.org/gary-toth-draft/		
AUTHOR: Clarence Eckerson & Gary Toth			
YEAR: 2008	PUBLISHER: StreetFilms.org		
TYPE: Literature Review			
<p>SUMMARY: For thirty-four years, Mr. Toth worked for the New Jersey Department of Transportation (NJDOT). He become known for his collaboration and facilitation skills, and was one of the architects who transformed the NJDOT to a stakeholder inclusive process helping the state become a national leader in Context Sensitive Solutions (CSS).</p> <p>Mr. Toth has written, "A Citizen's Guide to Better Streets," which is designed to help every person and advocacy in a community better understand the behind-the-scenes processes that occur when dealing with transportation departments and how to better prepare and speak their language. He shares some of his views and advice in this very important interview.</p> <p>Toth defines level of service as: a qualitative measure describing operational conditions within a traffic stream and motorists' perceptions of those conditions. The scale runs from A (nearly complete freedom to operate a vehicle. Smooth traffic flow) to F (an over abundance of vehicles/gridlock/stop-and-go traffic). This system was developed for the interstate system. It doesn't make sense for streets.</p> <p>Suggests having the community decide how they want their street designed (i.e. with shops and high pedestrian activity vs. free flowing, non-congested streets).</p> <p>Gary advises that all of the land use decisions in America, whether neighbourhoods, suburbs or downtown-like areas are all under the control of the local jurisdictions. These jurisdictions got caught up in the same auto-prioritized thinking as the traffic engineers. The emerging number of malls that were located miles away from residential communities spawned the need for bigger roadways. This was fuelled by the fact that people wanted to live in a quiet street and so col-de-sac-like streets were created that disconnected the residences even more. Thus, all the cars in each community had to funnel into the state highway (or arterial roads). The state highways, which were meant only for state-to-state traffic, were now being used by local traffic. With the increasing traffic, traffic engineers were forced to widen the roadways. Then, the triple-hit came when the residents of the communities did not want local shops in their communities.</p>			

Ref No. 16	TITLE: Using endemic road features to create self-explaining roads and reduce vehicles speeds
AUTHOR: Samuel G. Charltona, Hamish W. Mackieb, Peter H. Baasb, Karen Hayc, Miguel Menezec, Claire Dixon	
YEAR: 2010	PUBLISHER: Traffic & Road Safety Research Group, University of Waikato
TYPE: Literature Review	
<p>SUMMARY: This paper describes a project undertaken to establish a self-explaining roads (SER) design programme on existing streets in an urban area.</p> <p>The methodology developed a process to identify functional road categories and designs based on endemic road characteristics taken from functional exemplars in the study area.</p> <p>The study area was divided into two sections: one received SER treatments designed to maximize visual differences between road categories, while a matched control area remained untreated for comparison.</p> <p>The SER design for local roads included increased landscaping and community islands to limit forward visibility, and removed road markings to create a visually distinct road environment. In comparison, roads categorized as collectors received increased delineation, added cycle lanes, and improved pedestrian amenities. Speed data collected 3 months after implementation showed a significant reduction in vehicle speeds on local roads and increased homogeneity of speeds on both local and collector roads.</p> <p>The objective speed data, combined with residents' speed choice ratings, indicated that the project was successful in creating two different road categories.</p>	

Ref No. 17	TITLE: Traffic Calming Techniques (Experience and Practical Advice With 80 Case Studies)
AUTHOR: Institute of Highways and Transportation	
YEAR: 2005	PUBLISHER: Institute of Highways and Transportation
TYPE: Literature Review	
<p>SUMMARY: This report outlines the design and implementation of traffic calming measures, presents several techniques for traffic calming, and reviews the lessons learned from the experience of 80 case studies. Some of the techniques describe include:</p> <ul style="list-style-type: none"> • Vertical and Horizontal Deflections. • Traffic Management and Control. • Traffic Signs, Road Markings and Lighting. • Zone (or Area-Wide) Treatments. • Enforcement Activity. • Community Involvement. • The Needs of Special User Groups. <p>The emphasis today has moved strongly towards considering the total road (or street) environment and the way it can accommodate and assist the varying needs of people in safe and attractive ways. Traffic Calming in Practice (TCiP) was produced by experienced practitioners to present a publication that described the basic techniques. The document illustrated them using more than 80 case studies to show how they were being used in real-life situations. The case studies were supported by a commentary on how effective they were in practice. The first edition of TCiP sold out quickly and a subsequent reprint was also sold out indicating the wide demand for such a book.</p> <p>In 1994, the term “traffic calming” was relatively new and not widely understood outside professional circles. Today it is much better known and is now accompanied by many other terms such as Urban Safety Management, Area Safety Zones, Quiet Lanes, Home Zones and other ways of describing either the objectives of traffic control, or the measures used to achieve them.</p> <p>Concerns remain about the speed of vehicles, the volume of traffic and the environmental impacts caused by motor vehicles moving past places in which people live and work and alongside the footways on which they walk.</p>	

Ref No. 18	TITLE: Local Transportation Note on Traffic Calming
AUTHOR: United Kingdom's Department of Transport	
YEAR: 2007	PUBLISHER: United Kingdom's Department of Transport
TYPE: Literature Review	
<p>SUMMARY: This Local Transport Note (LTN) summarizes the research commissioned by the Department for Transport (DfT, formerly the DTLR, DETR and DoT) and the research from external sources to provide advice on the use of modern traffic calming measures. It covers relevant legislation and the design, effectiveness and installation (including signing and lighting) of measures. This LTN does not cover issues such as driver education or speed limit enforcement.</p> <p>The document provides information relating to consultation, emergency service vehicles and buses, vulnerable road users and the following traffic calming tools:</p> <ul style="list-style-type: none">• Road humps.• Rumble devices and overrun areas.• Narrowing and chicanes.• Gateways and entry treatments.• Roundabouts.• Vehicle activated devices.	

Ref No. 19	TITLE: Active Transportation – Making It Work In Canadian Communities
AUTHOR: Transportation Association of Canada	
YEAR: 2010	PUBLISHER: Transportation Association of Canada
TYPE: Literature Review	
<p>SUMMARY: This study assists Canadian local, regional, provincial and federal governments in understanding critical factors for the successful implementation of active transportation strategies. The report is intended to provide advice to Canadian communities on all aspects of active transportation strategies and initiatives. These include the following:</p> <ul style="list-style-type: none"> • Actions ranging from policy to design to programs. • Strategies that work and those that have not been so successful. • The nuance of different Canadian contexts such as rural or suburban communities. <p>The practical advice, generated from a wide-array of governments municipalities, consultants, active transportation champions, and other interest groups from across the country were compiled. Reoccurring trends and/or key achievements were then summarised in this document. Many Canadian cases studies are highlighted that have succeeded in promoting and achieving active transportation in their respective communities.</p> <p>This document advises that the plans and policies of many Canadian communities have provided stronger support for active modes over the last decade. However, communities have achieved mixed success in taking action to improve conditions and enhance participation. It was noted that there is little advice available on how to move from progressive policy that supports active transportation to actually installing infrastructure to change the environment.</p> <p>TAC has identified several ways to improve streets, intersections, pathways/multi-use trails, end-of-trip facilities and the three Es (engineering, enforcement and education). One notable mention from this report is the fact that safe and attractive conditions for walking, cycling, and other non motorized forms of travel are critical to shifting demand away from the automobile and to achieving the social, environmental, and economic benefits of a less auto-dependent society.</p> <p>Observed challenges were also identified. These include: funding, lack of data, land use, diversity in cycling culture, weather, physical geography, institutional issues, perception and urban design.</p> <p>The documents also identified some key partnerships that can greatly accelerate progress. These include: within and between governments, health services, schools, accessibility stakeholders, transit agencies, and community events.</p>	