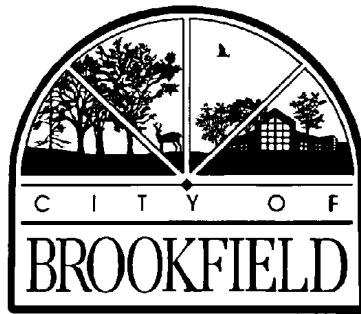


# **City of Brookfield, Wisconsin**

## **Neighborhood Traffic Calming Guidelines**



**July 2008**

**City of Brookfield**

**Neighborhood Traffic Calming Guidelines**



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## Contents

	<u>Page No.</u>
1.0 Introduction .....	1
1.1 Purpose .....	2
1.2 Benefits.....	3
1.3 Public Involvement .....	3
2.0 Neighborhood Traffic Calming Process.....	4
2.1 Identification of Traffic Concern.....	5
2.1.1 City Receives Initial Resident Traffic Concern.....	5
2.1.2 City Determines If Concern is Eligible for Traffic Calming Process .....	5
2.1.3 Initial Advocate/City Meeting.....	6
2.1.4 Advocate Fills Out NTCG FORM.....	6
2.2 Community Data Collection .....	6
2.2.1 Data Collection .....	6
2.2.2 Confirm Area of Potential Effect.....	7
2.3 Determination and Confirmation of Traffic Concerns .....	7
3.0 Alternative Solutions.....	9
3.1 Initial Traffic Management Solutions .....	9
3.1.1 Education .....	9
3.1.2 Enforcement .....	9
3.1.3 Engineering.....	9
3.2 Neighborhood Workshops .....	9
3.2.1 Identification of Issues and Potential Solutions.....	10
3.2.2 Assessment .....	10
3.3 Temporary Measures <u>(Street Continuity Disruptions Only)</u> .....	10
4.0 Recommendations .....	12
4.1 Neighborhood Informational Meeting .....	12
4.2 Balloting.....	12
4.3 Decision.....	12
4.4 Cost Sharing.....	12
5.0 Priority Ranking Process.....	13
5.1 Scoring .....	13
5.1.1 85 <sup>th</sup> Percentile Motor Vehicle Speed.....	13
5.1.2 Significant Motor Vehicle Speed .....	13
5.1.3 Average Daily Traffic Vehicle Volume.....	13

5.1.4 Traffic Composition .....	13
5.1.5 Crash History .....	13
5.1.6 Distance from Park or School .....	14
5.1.7 Critical Location .....	14
5.1.8 Pending Road Construction .....	14
5.1.9 Neighborhood and City Planning .....	14
5.2 Scoring Priority Calculation .....	15
5.3 Formal Review .....	15
5.4 Implementation .....	16
5.5 City Implements Project .....	16
5.6 Traffic Calming Device Construction Costs .....	16
5.7 Maintenance and Evaluation .....	16

## **List of Appendices**

Appendix A Inappropriate Traffic Calming Solutions .....	17
Appendix B Traffic Calming Tool Kit .....	20
Appendix C Neighborhood Traffic Calming Program Application Form .....	29
Appendix D Neighborhood Traffic Calming Program Ballot Traffic Calming Program .....	31
Appendix E Neighborhood Traffic Calming Program Neighborhood Committee Charter .....	33
Appendix F Typical Neighborhood Traffic Calming Device Construction Cost Estimates .....	35

## **List of Figures**

	<u>Page No.</u>
Figure 1.1 City of Brookfield Arterial Roadways .....	1
Figure 2.0.1 Neighborhood Traffic Calming Process .....	4

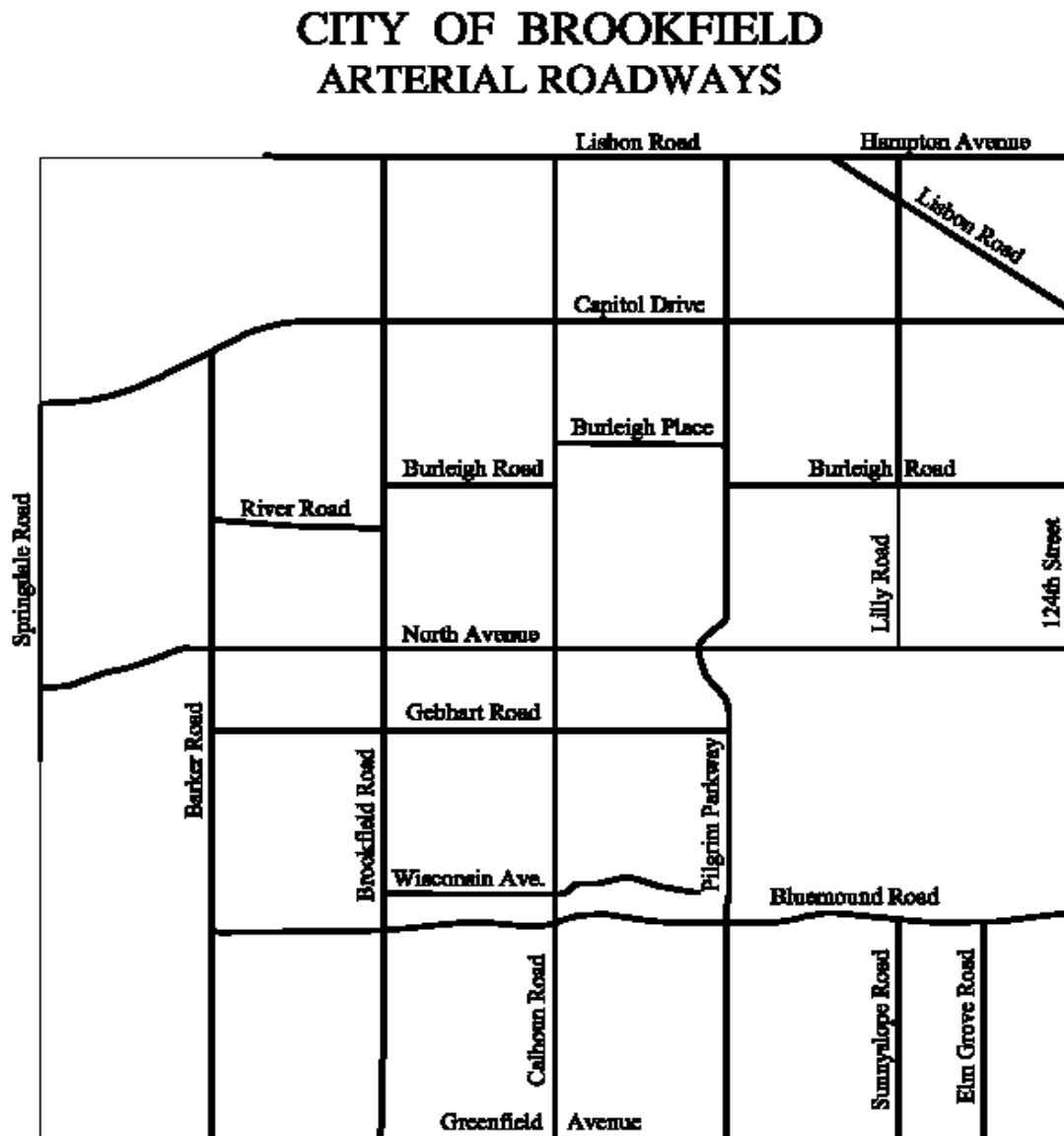
## **List of Tables**

	<u>Page No.</u>
Table 2.3.1 Neighborhood Street Traffic Calming Tresholds .....	8
Table 5.2.1 Project Scoring Criteria .....	15

## 1.0 Introduction

The City of Brookfield Neighborhood Traffic Calming Guidelines (NTCG) are designed to address traffic concerns on the city's residential streets. The City of Brookfield has identified a street classification network of arterial and residential streets, which is shown in Figure 1.1. The plan identifies all arterial streets within the city. Any street not shown as an arterial street is considered to be classified as a neighborhood street. The Brookfield NTCG is intended to address traffic concerns on all neighborhood streets within the City.

Figure 1.1 City of Brookfield Arterial Roadways



The following guidelines address the NTCG purpose, how to identify neighborhood traffic concerns, how traffic problem solutions are developed, how traffic calming solutions are implemented, and how the city prioritizes the implementation of recommended solutions. The Neighborhood Traffic Calming Guidelines emphasizes neighborhood involvement in the identification, confirmation, and education of potential neighborhood traffic problems and solutions. The NTCG focuses on traffic calming as a tool that reduces the negative effects of automobile use, alters driver behavior, and improves neighborhood quality of life for residents, pedestrians, and bicyclists on neighborhood streets.

Once a traffic problem is identified and confirmed the Neighborhood Traffic Calming Guidelines uses a three-step method to direct and modify travel behavior through a neighborhood. These measures are categorized into what is commonly called the “3 E’s:”

- Education
- Enforcement
- Engineering

The first step involves education, which is directed at informing neighborhood residents and drivers of speed limits and pedestrian awareness. Enforcement takes another step and involves the use of police patrols to usually issue speeding tickets. The final step, engineering, typically involves construction of traffic calming devices.

The most common solutions suggested by community residents for neighborhood traffic issues are requests for stop signs or children at play signs. Appendix A describes the purpose of stop and children at play signs and why they are inappropriate for use as traffic calming measures.

Traffic calming devices described in the Traffic Calming Tool Kit in Appendix B use physical measures to encourage people to drive more slowly. They create physical and visual cues that induce drivers to travel at slower speeds. Traffic calming measures are typically self-enforcing and do not normally require police enforcement to operate successfully.

Most motorists drive roadways based on what they feel are safe and appropriate speeds. The design of a roadway can encourage slower speeds and reduce cut-through traffic. Narrow streets, avoidance of long straight roadways and street network connectivity all contribute to calming traffic on neighborhood streets. While landscaping does not force a change in driver behavior, it can provide the visual cues that encourage people to drive more slowly. Many of these street design principles including narrow street widths of 26 feet or less have already been employed in the construction of Brookfield’s neighborhood street system.

Typically, traffic-calming measures are targeted to reduce excessive travel speeds, reduce cut-through traffic, and control pedestrian/bicycle conflicts. Physical treatments are used, such as medians, traffic circles, road narrowing, speed tables, and diverters, to alter behavior of drivers when they travel through a neighborhood.

## **1.1 Purpose**

This NTCG report documents the policies and procedures for implementing traffic management measures on existing neighborhood streets in the City of Brookfield. Roadways are typically classified as arterials, collectors and neighborhood (local) streets. This program only applies to

neighborhood streets directly under the City of Brookfield's control and does not apply to arterials or to state or county roadways.

The City of Brookfield NTCG is consistent with the '3E' principals, initially focusing on education, which involves neighborhood action. In some cases education will be combined with police enforcement and less restrictive measures such as the use of radar trailers, signage, or turn restrictions. If traffic concerns persist after education and enforcement measures, a neighborhood may move on to more substantial engineering measures such as speed tables, traffic circles, roadway narrowings, or other even more restrictive measures that limit neighborhood accessibility such as traffic diverters and cul-de-sacs.

## 1.2 Benefits

Traffic calming measures can be used to achieve the following goals:

- Increase neighborhood safety
- Increase neighborhood aesthetics (atmosphere and landscaping) and livability
- Decrease neighborhood traffic intrusion (cut-through traffic)
- Improve traffic efficiency throughout the City
- Increase internal and external connectivity of neighborhood street networks
- Increase diversity of street use (e.g. the street is used not only for motor vehicles travel, but also for pedestrians, bicyclists, etc.)
- Increase pedestrian/bicycle use of streets and sidewalk/pathways
- Improve/enhance neighborhood identity (traffic circles, narrowing's or gateway treatments)

## 1.3 Public Involvement

Involvement of the community is key to a successful neighborhood traffic calming program. Public input and response to the traffic calming program will indicate areas of residential traffic concerns around the City. The input and responses received from local citizens will help the City address and prioritize improvement projects. In the Brookfield NTCG City staff works cooperatively with neighborhood communities to help address existing and potential traffic concerns.



The public will be able to give input and responses.  
Resource: Wisconsin DOT

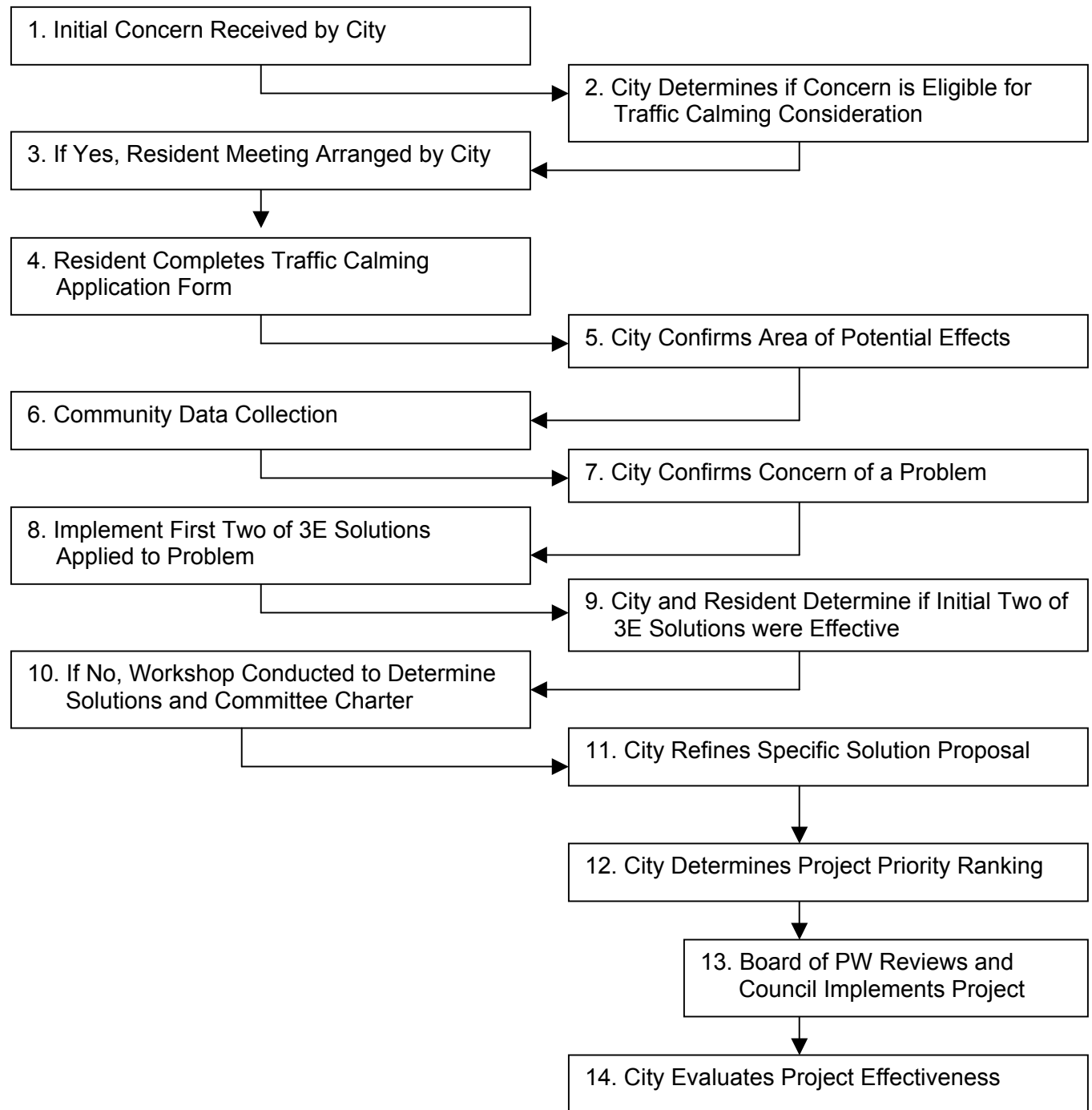
Neighborhood support is crucial to successfully implementing and sustaining traffic management strategies. Therefore, whenever practical, residents, businesses, community groups, and institutions should take the lead in initiating requests for traffic calming projects.

To keep the community involved in their requests, the City of Brookfield staff will work with community members and groups on how to gather data related to their traffic concern and in the development of traffic management solutions.

## 2.0 Neighborhood Traffic Calming Process

Figure 2.0.1 illustrates the traffic calming process described in the following guidelines.

**Figure 2.0.1 Neighborhood Traffic Calming Process**





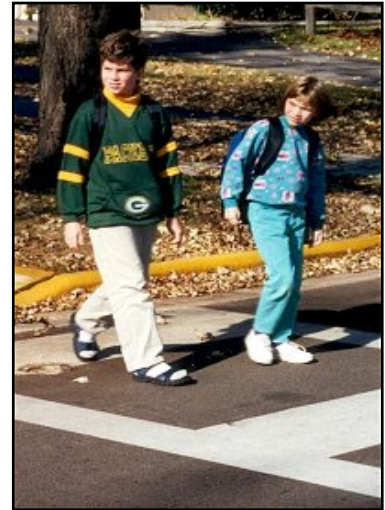
## 2.1 Identification of Traffic Concern

Identifying neighborhood traffic concerns is a four-step process that involves:

1. City receives a concern regarding a traffic problem;
2. City determines if concern is eligible for traffic calming process;
3. If concern is eligible, city has initial meeting with advocate of concern; and
4. Advocate completes NTCG application form

### 2.1.1 City Receives Initial Resident Traffic Concern

The process starts when a resident or community group identifies a traffic concern to a member of the City Public Works engineering staff. This concern can be made through a phone call, letter/e-mail, personal contact, or through an alderperson.



One concern is pedestrian safety.  
Resource: Federal Highway Associations

### 2.1.2 City Determines If Concern is Eligible for Traffic Calming Process

The City engineering staff will determine if the concern focuses on issues pertinent to neighborhood traffic calming guidelines. Typically these concerns include:

- Pedestrian safety or accessibility
- Bicyclist safety or accessibility
- Motor vehicle speeds consistently above the posted speed limit
- Higher traffic volumes than appropriate
- Frequent undesirable/unsafe driver behavior

The City engineering staff will also determine if the street or intersection in concern is applicable for consideration by the Neighborhood Traffic Calming Guidelines. To be eligible for the program, the street must:

- Be a residential neighborhood or collector street under the City of Brookfield's jurisdiction
- Have traffic volumes ranging from 300 to 5,000 vehicles per day
- Have a posted speed limit of 30 mph or less
- Be at least 1,000 feet in length
- Not be cul-de-saced

The City may choose to provide education and enforcement components of traffic calming on streets that are less than 1,000 feet in length or are cul-de-saced. Streets and roadways servicing emergency response vehicles such as fire trucks may have limits to the implementation of certain traffic calming measures. Additional City coordination will be needed for addressing traffic calming on these roadway segments.

### 2.1.3 Initial Advocate/City Meeting

After the City receives a traffic concern and determines it is eligible for the NTCG. City staff will arrange a meeting with the resident or community group that identified the traffic concern.

- The initial goal of the meeting is for the City staff to explain the Neighborhood Traffic Calming Guidelines to provide a clear understanding of the program and its process.
- The second goal of the meeting is to define in detail, with the help of the City staff member, the perceived traffic problem and complete the Neighborhood Traffic Calming Guideline application form. An example application is provided in Appendix C. Information in the application includes but is not limited to:
  - Location(s) where the traffic concerns are experienced
  - The nature of the traffic concern (speeding, high traffic volumes, etc.)
  - The time the traffic concern occurs (morning, weekday, seasonal, etc.)
  - Other information, such as:
    - Weather dependant?
    - Is the traffic concern increasing/decreasing (delays or speed increasing, safety decreasing)?
    - New occurrence or length traffic concerns have been noticed?
- The final goal of the meeting is for the City staff to provide information on how and when the process will continue.



Neighborhood meetings can be used to address traffic concerns

### 2.1.4 Advocate Fills Out NTCG FORM

A completed application must include signatures from at least 50% of the households on the street segment in which the application is referencing. Signatories confirm the traffic concern described in the application exists and warrants evaluation by the Neighborhood Traffic Calming Guidelines. The application is not intended to endorse a particular countermeasure.

## 2.2 Community Data Collection

Upon City receipt of a completed application form the next step in the Neighborhood Traffic Calming Guidelines involves collecting related traffic data to confirm the existence and magnitude of the traffic concern.

### 2.2.1 Data Collection

The neighborhood resident and other community members may be requested to assist in the data collection allowing for neighborhood involvement and growth within the community.

When appropriate, the City staff will train neighborhood representatives to collect street and traffic data to assist in problem identification. These data may include vehicle speeds, volumes, crash history, and pedestrian and bicycle activity. For example, they might conduct a traffic count, speed or license plate study.

The city staff also contacts other stakeholders, including emergency responders and nearby school principals. Emergency response vehicles, school buses, snowplows and street sweepers generally require special consideration in the design of traffic calming measures. These measures can also complement a Safe Routes to School program.



Radar Sign, used to collect speeds  
Resource: Federal Highway Association

### 2.2.2 Confirm Area of Potential Effect

After the required data is collected, the City will confirm the area of potential effect discussed in the initial resident meeting. Spot-specific concerns will generally relate to a particular intersection or street segment, whereas neighborhood-wide concerns will generally relate to conditions or behaviors affecting the neighborhood street network. The City may elect to treat some spot-specific concerns as neighborhood-wide concerns if it decides that they could be better addressed in the context of the street network system. At the City's discretion, the potentially affected area for a spot-specific concern may be extended to the entire street block. The potentially affected area for a neighborhood-wide concern should generally be a distinct area that is bounded or bisected by major roadways or geographic features. If the traffic concern influence area (but not the specific street being considered) may impact a larger neighborhood area the City will inform residents of the larger neighborhood area of the perceived problem and potential traffic calming alternatives under consideration.

## 2.3 Determination and Confirmation of Traffic Concerns

Once data is collected, City staff will evaluate if the traffic concern voiced by residents actually exists. The evaluation to confirm a traffic problem is based on specific, definable criteria related to:

- **Traffic Speeds**

As motor vehicle speed increases, noise increases and pedestrian and bicyclist safety decreases. Spot speed studies can be conducted by neighborhood representatives with assistance of City staff. If possible, this value should be supplemented by 24-hour data using Nu-metrics counters or multiple tubes capable of calculating vehicle speeds.

Some of the most dangerous traffic safety situations involve infrequent vehicles traveling substantially above the speed limit. Again, this value can be measured by neighborhood residents and supplemented by 24-hour data using Numetrics counters or multiple tubes capable of calculating speed.

- **Daily Traffic Volume Levels**

As motor vehicle volume increases, noise increases and pedestrian and bicyclist access decreases. The local function and feel of a street also diminishes. From studies measuring resident opinions the ideal traffic volume on a local neighborhood street is less than 300 vehicles per day (vpd), residents generally are able to accept volumes up to 800 vpd.

- **Daily Traffic Composition**

Neighborhood traffic should principally involve trips with origins and destinations within that neighborhood and not include trips that are short-cutting through the neighborhood from destinations outside the neighborhood to destinations outside the neighborhood. This value can be measured by license plate surveys during specific traffic concern time periods.

- **Motor Vehicle Crashes**

Residential NTCG areas with high crash frequency locations may indicate a safety concern that could be mitigated through the NTCG program. This data can be provided from City police crash files. Typical collision patterns that are potentially reduced with traffic calming involve right angle intersection crashes or crashes related to speeding.

Table 2.3.1 summarizes the traffic concern characteristic thresholds required for a neighborhood street to be considered for traffic calming considerations. One or more of the five thresholds should be met to proceed with traffic calming measures.

**Table 2.3.1 Neighborhood Street Traffic Calming Thresholds**

<b>Traffic Criteria</b>	<b>Minimum Threshold</b>
* 85 <sup>th</sup> Percentile Speed	Greater than 5 mph over the posted speed limit
* Significant Speeding	10% of traffic at or greater than 10 mph over the posted speed
* Traffic Composition	10% or greater cut-through traffic
* Daily Traffic Volume	Exceeds 800 vpd on neighborhood streets or 1,500 vpd residential collectors
* Crashes	Street or intersection averages more than 2 crashes per year over three year time period

After completing an analysis of the collected data the City will send a letter reporting the results to inform the neighborhood on existing conditions. If the results of the study conclude that the criteria for traffic calming have not been met, the concern cannot be brought back to the City for three years unless something significantly changes existing conditions.

## 3.0 Alternative Solutions

### 3.1 Initial Traffic Management Solutions

Generally it is desirable to address traffic problems with the least restrictive measures possible and move to more costly geometric solutions only after other measures have proven ineffective. Therefore, city staff may choose to implement fairly low cost, undistruptive initial traffic management solutions before proceeding into more formative calming measures. These solutions fall into three categories: education, enforcement, and engineering. The categories are explained below.

#### 3.1.1 Education

The neighborhood can be educated concerning the traffic management problem. This education can include the use of:

- Radar speed trailer
- Brochures/pamphlets describing the problem, including suggestions for what the neighborhood residents can do to improve the situation
- Lawn signs, provided by neighborhood volunteers
- Speed watch programs, staffed by neighborhood volunteers



#### 3.1.2 Enforcement

If police resources are available, regular and random patrol and enforcement activities can address speeding and other traffic control concerns.

#### 3.1.3 Engineering

The city may choose to install enhanced signing or pavement markings to address concerns. Examples of these measures can include:

- Roadway narrowing through pavement marking of medians or bike lanes.
- Increased visibility of pedestrian crossing pavement markings.
- Additional pedestrian crossing signs.
- Appropriate speed limit signs.

### 3.2 Neighborhood Workshops

If the initial measures have not been effective, the project should move into the neighborhood workshop stage. City staff and the district alderpersons should establish a date and location with residents for the workshop. The City should notify residents in the project area through mail of the workshop. Residents should also encourage their neighbors to attend.



### 3.2.1 Identification of Issues and Potential Solutions

The workshop identifies issues and potential solutions. The City helps participants understand the full range of possible measures, their likely effectiveness, and their costs. Participants articulate their goals for their neighborhood and discuss how NTCG tools might help them realize those goals. Concepts or alternatives that should be considered at the workshop are described in:

- Streets and Sidewalks, People and Cars: The Citizens' Guide to Traffic Calming by Dan Burden (April 2000).
- TrafficCalming.org, <http://www.trafficcalming.org>
- Wisconsin Walks, <http://www.wisconsinwalks.org>
- ITE Traffic Calming State of the Practice, <http://www.ite.org/traffic/tcstate.htm#tcsop>

Appendix A of this report also lists typical traffic calming measures, their appropriate application, and their expected effectiveness.

At the workshop, the participants create a project committee of 3 to 10 residents that work with the City to develop a specific NTCG project proposal. The goals, available NTCG tools, and committee charter become the NTCG project action plan. Appendix D contains a draft Neighborhood Traffic Calming Committee Charter.

### 3.2.2 Assessment

The City reviews and refines the specific project proposal. Bicyclist, pedestrian, emergency vehicle, and maintenance needs may influence the placement and design of specific measures. In addition, the project must be feasible and consistent with safety and engineering principles and judgment.

If the size of the project area has changed since the application, the city adjusts the project area and may require that the resident obtain additional signatories to represent 50% of the residents in the larger study area. The City may also adjust the project area if it determines that the proposed measures are likely to cause substantial or undesirable traffic diversions.



Street closure used as a traffic calming measure  
Resource: ITE Traffic Calming

## 3.3 Temporary Measures (Street Continuity Disruptions Only)

In general, temporary traffic calming devices should be avoided. A number of agencies have adopted a policy of installing temporary traffic calming devices to test their effectiveness and the public's acceptance. There are a number of advantages and disadvantages to installing temporary traffic calming devices. Advantages include the cost and the opportunity to field test devices without committing to permanent installations. The disadvantages, however, often

outweigh the advantages. Temporary devices such as traffic circles or curb extensions are generally not as effective as permanent installations as they do not have the same level of visual break created by landscaping. In addition, the installations are usually unattractive and reduce the acceptance and support by the general public or neighborhood residents. Most temporary installations also become attractions for road litter adding to the aesthetic problem. If, for example, a city has never installed traffic circles and the citizens are not familiar with circles, temporary installation using bumper blocks or barrels will be their first, and possibly only, exposure to a circle. It becomes difficult for them to imagine that such a device placed on a permanent basis could enhance their neighborhood. In general, programs and plans should be well thought out and the use of temporary installations avoided unless absolutely necessary. If temporary devices are used, care should be taken to address the issues of aesthetics and effectiveness.

For proposals that involve street continuity disruptions (diverters, cul-de-sacs, etc.), the City should implement trial temporary traffic calming measures that simulate the proposal that is being proposed by the neighborhood. The trial measures should be implemented during the non-winter months for the duration of at least four months. Examples of trial implementations include:

- Using concrete barriers or barricades for diverters.
- Using barrels for cul-de-sacs.
- Using barrels or delineators for turn restrictions.

Trial installations help neighbors understand the potential effectiveness of the measures and their effect on traffic patterns.

## **4.0 Recommendations**

### **4.1 Neighborhood Informational Meeting**

Depending on the participation levels at the neighborhood workshop, neighbors or City staff may feel it is necessary to hold a neighborhood informational meeting to display the project plans and answer questions regarding the proposal. If this is necessary, it should be held prior to the balloting process described in section 4.2 below.

### **4.2 Balloting**

If the project is feasible and meets criteria, the City mails one ballot to each household, business, institution, and nonresident property owner in the project area. A sample ballot is included in Appendix E. Each household, business, and nonresident property owner in the project study area receives one vote per address.

### **4.3 Decision**

To pass the balloting, at least 33 percent of the ballots must be returned to the city within four weeks of the mailing and at least 67 percent of those ballots must be marked in favor of the project. If the project passes, it moves to the implementation stage.

If the project does not pass, the process stops. A typed record of comments (names omitted) received on the ballots is made available for review. At the City's discretion, the project committee may revise the proposed project for a second balloting without restarting the process. To avoid creating a nuisance to the neighborhood, if the revised project does not pass the second balloting, the NTCG program will not consider the issue again for a period of at least three years unless conditions substantial change.

### **4.4 Cost Sharing**

Most communities have limited funds to implement neighborhood traffic calming devices. The City of Brookfield Board of Public Works may request that the Council set aside an annual amount of funds for neighborhood traffic calming implementation. The projects that have been identified through the NTCG process for implementation are ranked by priority as described in Section 5.0 of these guidelines. Depending on city budget constraints and the construction cost of the ranked projects the city may not be able to implement all of the traffic calming projects in a single fiscal year. In such cases resident assessment districts, or neighborhood donations may be used to implement a lower priority project scheduled for subsequent year implementation. If an advocate group volunteers to pay for the project it automatically goes to the top of the city priority list of the following year.



## **5.0 Priority Ranking Process**

### **5.1 Scoring**

Because of limited resources, the City may not be able to implement all traffic calming project proposed by the NTCG. The NTCG scoring system allows the city to prioritize traffic calming projects based on the following neighborhood street and land use characteristics. These characteristics include the initial set of traffic calming guideline thresholds plus additional land use and city planning related considerations

- Traffic speeds
- Daily traffic volumes levels
- Daily traffic composition
- Motor vehicle crashes
- Proximity to schools and parks
- Critical locations
- Pending Road Construction
- Relationship to neighborhood and city plans

#### **5.1.1 85<sup>th</sup> Percentile Motor Vehicle Speed**

The point value for this criterion is equal to the 85<sup>th</sup> percentile motor vehicle speed (in miles per hour) measured on the subject street, minus 25.

#### **5.1.2 Significant Motor Vehicle Speed**

The point value for this criterion is the percentage of traffic that is traveling at least 10 mph above the speed limit.

#### **5.1.3 Average Daily Traffic Vehicle Volume**

The point value for this criterion is equal to the average daily traffic vehicle volume (in vpd) divided by 1,000, and rounded to the nearest whole number. If possible, the motor vehicle volume should be measured over a 48-hour period.

#### **5.1.4 Traffic Composition**

The point value for this criterion is equal to the percent of through traffic exceeding 10 percent of the total traffic on a specific neighborhood street.

#### **5.1.5 Crash History**

The point value for this criteria is the number of crashes that have occurred at this location over the last three years excluding non-correctable crashes such as those involving deer, snow/ice pavement conditions, driver health related seizures, or motorists operating a vehicle under the influence.

### **5.1.6 Distance from Park or School**

Motor vehicle noise can have an adverse impact on parks and schools. In addition, these facilities typically attract pedestrians and bicyclists, especially children. Bicycle and pedestrian volumes (or demand) are typically the highest on streets adjacent to these facilities and decrease as the distance from the facility increases.<sup>1</sup>

The point value for this criterion is equal to one one-hundredth of the difference of 1,000 and the linear street or sidewalk walking distance between the subject street and the nearest park or school. The minimum point value is 0. Other pedestrian-oriented facilities (such as the library or pool) may also be considered for this criterion. For example, if the problem area on the subject street is 400 feet away from a park, the point value associated to this distance will be  $(1,000 - 400) \times 0.01 = 6$ .

### **5.1.7 Critical Location**

Certain intersections or street segments have the potential for acute conflict between motorized and non-motorized traffic. These “critical locations” may include:

- Multiuse trail crossings.
- Intersections where the minor street is marked as a bicycle route.
- Intersections staffed by a school crossing guard.
- Streets or intersections with high bicycle or pedestrian volumes.
- Streets or intersections with high (unmet) bicycle or pedestrian demand.
- Streets or intersections within a school zone.

A project that improves conditions for bicyclists or pedestrians at a critical location may receive up to 10 points for this criterion, depending on the extent of both the need and the improvement.

### **5.1.8 Pending Road Construction**

Traffic calming measures can be easily implemented at little additional cost when roadway plans are prepared for reconstruction. When residential streets are planned for reconstruction, the City may seek to capitalize on this opportunity and encourage the implementation of traffic calming measures as part of the reconstruction project. To acknowledge this criteria and opportunity, up to 10 points is awarded to the scoring.

### **5.1.9 Neighborhood and City Planning**

Neighborhood-wide projects typically require extra effort and produce more comprehensive traffic management solutions. To acknowledge this effort, the City may award 5 points to a neighborhood-wide project for this criterion. This is a subjective measure.

The score for a neighborhood-wide project is the average of scores for individual project elements rounded up to the next whole number. The addition of 5 points reduces the penalty incurred by individual project elements that score lower than the overall project average but as a

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<sup>1</sup> Current pedestrian and bicycle volumes can be a poor indicator of actual pedestrian and bicycle travel demand if roadway and traffic conditions discourage these modes.

system provide a positive synergistic enhancement to calming the neighborhood street network problem.

## 5.2 Scoring Priority Calculation

Table 1 summarizes the scoring criteria, which are explained in the following subsections. The proposed project's score is the sum of the point values for each of the criteria. Projects with a score of 15.0 or more are eligible for physical traffic calming measures.

**Table 5.2.1 Project Scoring Criteria**

<b>Criterion</b>	<b>Point Formula</b>
85 <sup>th</sup> Percentile vehicle speed	85 <sup>th</sup> Percentile motor vehicle speed (in mph) - 25
Excessive motor vehicle speed	Percent of traffic traveling at least 10 mph over speed limit
Motor vehicle volume	Average daily motor vehicle volume (in vpd) / 1000
Distance from school or park	(1,000 - linear distance to nearest school or park in ft)/100
Critical location	Up to 10 points
Crash history	Number of crashes in last 3 years
Pending road construction	Up to 10 points
Traffic composition	Percent of daily through traffic exceeding 10%
Neighborhood planning	5 points

This score is used to prioritize the projects under implementation consideration. The project is placed on the NTCG project list, and its score is compared to other projects that have been proposed but not yet implemented. If the project receives a high score that places it near the top of proposed projects, the process continues. If an advocate group volunteers to pay for the project it automatically goes to the top of the city priority list of the following year. Unimplemented projects remain on the NTCG list for three years. Every three years, the advocate is notified and may submit a new application to keep the project on the list for an additional three years.

## 5.3 Formal Review

The Board of Public Works reviews the project and makes a recommendation to the City Council. This review includes the project score, the project action plan, the proposed measures, the results of any temporary installations (if applicable), and the results of the balloting.

During the annual budget process, the Council determines whether to fund and implement the project.

## **5.4 Implementation**

City staff directs implementation of the permanent measures approved by the Council.

Many traffic management measures include landscaping. The City may add trees as part of the project. Other vegetation may be included if a volunteer or organization commits to its maintenance.

## **5.5 City Implements Project**

Potential project funding sources can include calming program funds identified in the Public Works Department street improvement budget, resident assessment districts, or neighborhood donations. After securing funding, the city public works department has the project installed, either using city forces or by enlisting the services of consultants and contractors.

## **5.6 Traffic Calming Device Construction Costs**

The cost to construct traffic calming devices is normally relative small with most devices costing less than \$10,000. Appendix F lists the cost estimates of selected typical calming devices. It is noted that depending on the neighborhood street length or study impact area street network several devices may need to be constructed as a part of a system of calming devices increasing the total cost to effectively calm traffic.

## **5.7 Maintenance and Evaluation**

The City Public Works Department maintains the traffic management measures, and the City Parks, Recreation and Forestry Department maintains any trees in the right-of-way. If other landscaping is not maintained by the volunteers, it will be removed at the discretion of the City.

The city collects traffic data one year after implementation. The data should include motor vehicle speeds, motor vehicle volume, crash rates, and pedestrian and bicycle usage. This data can then be used to determine the 'success' of the project and in the implementation of future traffic calming projects.

## **Appendix A**

### **Inappropriate Traffic Calming Solutions**

# Inappropriate Traffic Calming Solutions

The most common request by residents of a community to reduce speeding, and cut-through traffic in residential neighborhoods is to install 'Stop' or 'Children at Play' signs on their neighborhood streets.

## Stop Signs

Because a stop sign causes a substantial inconvenience it should only be used where warranted. A stop sign is a valuable and effective traffic control device when used under appropriate conditions. They are meant to help drivers and pedestrians at an intersection decide who has right-of-way. National studies have shown:

1. that crashes can increase at intersections where stop signs are installed even though they are not warranted.
2. that speeds can actually increase between stop signs by 3 to 5 mph, particularly when they are used inappropriately.
3. compliance at inappropriate stop sign locations is poor, resulting in a false sense of security and accidents involving motorists and pedestrians expecting cross traffic to stop.
4. the proliferation of stop signs at inappropriate locations creates a lack of respect for stop signs that are warranted.

Stop signs can be used for two-way or four-way stop conditions. According to the Manual of Uniform Traffic Control Devices stop signs are used for:

## Two-Way Stop Signs

- Where a local street enters a through street: or
- Where a safe approach speed is less than 10 mph due to permanent visibility conditions – such as buildings, trees, shrubs or terrain: or
- Where crash history indicates three or more reported crashes in a 12 month period, and the crashes could have been avoided by the use of a stop sign; or
- Where circumstances and crash history indicate that observing the normal right-of-way rule could still be hazardous, resulting in crashes.

## Four-Way Stop Signs

- Where traffic signals are needed; four-way or all-way stops may be used as an interim measure; or
- On local streets, where there has been an average of five or more reported crashes per year and these crashes would likely have been prevented by an all-way stop; or

- Where the number of vehicles entering an intersection averages at least 500 vehicles per hour for any eight hours of the day, and the combined vehicular and pedestrian volumes on the minor street averages at least 200 per hour for the same eight hours.

### **Children at Play Signs**

Signs are used to guide and direct motorists. Unnecessary signs can confuse, distract and irritate motorists. Studies have shown that Children at Play signs normally have no effect on driver behavior. The MUTCD discourages the use Children at Play Signs. The Children at Play sign is unclear and unnecessary. It suggests to a driver that:

- if no such sign is present on another street, children will not be playing there, therefore it is OK to speed or be less careful.
- other drivers might wonder what time of day will children be present or are they always present?
- when no children are seen by a driver in many cases they will assume the sign is not pertinent anymore.
- It gives parents and children a false sense of safety.
- It can give children the impression that it's OK to play in the street.

Almost all neighborhood streets have children, which would require signs to be placed on all streets adding to sign proliferation problems if implemented.

Specific warning signs are recommended in the MUTCD for school zones and pedestrian crossing locations where they clearly serve a purpose.

## **Appendix B**

### **Traffic Calming Tool Kit**



## **B.01 Traffic Calming and Traffic Management**

There are two basic elements involved in Neighborhood Traffic Calming Guidelines. They are classified as traffic calming and traffic management. Both elements use physical devices to change driver behavior. Traffic calming measures affect driver characteristics by slowing traffic speeds and/or discouraging through traffic from using neighborhood streets. In comparison, traffic management measures change street system use patterns by diverting traffic to arterial streets and balance neighborhood street system use.

Many neighborhood residents consider traffic calming to involve the installation of stop signs or 'Children at Play' signs. Studies have shown that, in most cases, these devices actually have no effect or in some cases can increase traffic speeds within neighborhoods and provide a false sense of safety.

Traffic calming measures are physical devices that change driver behavior. Traffic calming measures can be used to mitigate traffic safety problems or reduce speeding and cut-through traffic problems. For this report, traffic calming measures are organized into the following categories:

### **Traffic Calming Measures**

1. Vertical deflection speed control devices
2. Horizontal deflection speed control devices
3. Gateways and intersection treatments
4. Reduced corner radii

Traffic management measures physically alter accessibility so that existing traffic patterns are required to change. These measures are quite extreme because they change route patterns, may increase emergency vehicle response times, affect local municipal service routes and potentially increase traffic volumes on adjacent neighborhood streets. The following are examples of traffic management measures:

### **Traffic Management Measures**

1. Intersection turn restrictions
2. Intersection traffic diverters
3. Partial street closures
4. Full street closures

These measures should be implemented only as a last resort. If they are implemented, residents on all affected neighborhood streets should be part of the decision process.

## **B.02 Traffic Calming Measures**

### **B.02.1 Vertical Deflection Speed Control**

A vertical deflection speed control device causes drivers to slow down by requiring them to drive over a roadway obstruction.

**Speed Humps** are elongated, parabolic humps constructed across a street, perpendicular to the flow of traffic. They are usually 3 to 4 inches high and 12 to 14 feet wide. Their elongated design allows travel speeds in the range of 15 to 20 miles per hour. Often their height tapers toward the edge of the curb or shoulder to allow water to drain along the gutter and permit bicycles to travel over them unimpeded. Speed humps should not be confused with the abrupt speed bumps that are often found in retail parking lots.



**Speed Tables** follow the same principles and are similar design as speed humps except they have a flat top that is sometimes easier to construct and can also serve as a pedestrian crosswalk connection to parks or schools located in residential neighborhoods.

**Speed Cushions** are similar to speed humps and tables but has a width of 8 feet when measured in the direction perpendicular to traffic flow. The cushions are positioned in the center of each travel lane. Passenger cars must travel over the cushion and therefore are required to reduce speed, but vehicles with wide wheelbases such as trucks and emergency vehicles are able to straddle the cushion maintaining their travel speed.



There are some considerations with speed humps and other vertical control devices. Generally, to be effective they must be installed as a series or system with specific spacing requirements of not more than 300 feet apart. Speed hump spacing and width have been shown to reduce traffic speeds. For example, a 12-foot speed hump spaced at 200 to 250 feet have been shown to reduce 85<sup>th</sup> percentile traffic speeds to 20 mph. In comparisons, a 400 to 450 foot spacing has been shown to result in speeds of 25 mph and an 800 to 850 foot spacing has resulted in speeds of 30 mph.



Studies have also shown the following typical 85<sup>th</sup> percentile speed relationships to speed hump width:

- 12 ft. speed hump .....15 to 20 mph
- 14 ft. speed hump .....18 to 23 mph
- 22 ft. speed table ..... 25 to 30 mph

-Source: Victoria Transport Policy Institute, TDM Encyclopedia, May 27, 2003, [www.vtpi.org](http://www.vtpi.org)

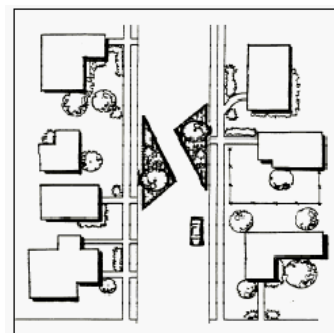
Speed humps or tables should not be used on sharp grades or curves. Grades should generally be less than 6 percent. Curves should have a radius greater than 400 feet with an angle of 60 degrees or less. Extra consideration should be given to street drainage, emergency vehicles, snow plowing and street sweeping equipment limitations. Also speed humps and tables should

be properly designed with tight profile tolerances to provide the correct 'ride' and not create undue driver discomfort. ITE has a new publication on the design of speed humps.

### B.03 Horizontal Deflection Speed Control

A horizontal deflection speed control device causes drivers to slow down by requiring them to drive around a roadway obstruction.

**Single-lane Slow Points** sometimes called a 'choker', is a narrowing of the pavement that reduces the street width to one lane. This is typically accomplished by realigning the edge of pavement or adding landscape areas along the edge of the street they effectively create pinch points along the street. Slow points can be installed at midblock locations or used at intersections creating a gateway effect for an entering street.



Slow points require opposing motorists to yield to each other as they approach the slow point. In order to function effectively, the width of the traveled way cannot be wide enough for two cars to pass, generally 16 feet or less.

**A Chicane** horizontally diverts traffic through alternating roadside islands from the left to the right. A similar application to a chicane is an angled two-lane slow point. Chicanes can be subtle or quite restrictive depending on the design and angles (tapers) used. Shifting a travel lane will decrease speeds if the taper is not so gradual that motorists can comfortably maintain their speed. For traffic calming, the taper lengths may be as little as half of those typically used in a standard design.

Similar to a chicane, traffic can also be horizontally diverted by shifting parking from one side to the other when there is only roadway width for parking on one side of a street or by building landscaped islands in the center of a street, which also serve as a roadway narrowing.



Example of chicane  
Resource: ITE Procedures and Warrants

There are several considerations for chicanes and slow points. They should be used only on low-volume, low-speed residential streets. Emergency response providers and sanitation collectors should be consulted before setting the widths. Chicanes and slow points may reduce the availability of on-street parking.

If landscape islands are installed, good visibility should be maintained by planting only low shrubs or trees with high canopies. Also, design efforts should be made to ensure bicycle safety and mobility are not diminished.



Roadway narrowings reduce the width of the traveled way and, by doing so; increase the driver's desire to travel at a slower speed.

**Bulb-outs** create a roadway narrowing at a street intersection. In many ways, they are a gateway or threshold treatment. Bulb-outs often are coupled with a median island to further reduce the available width of the traveled way. One advantage of placing bulb-outs near intersections is that they reduce the crossing distance for pedestrians. Also, they prevent on-street parking near the intersection, which can increase the intersection sight distance if appropriate landscaping is used.



**Two-Lane Slow Points** are similar to the single-lane slow point where the street is narrowed yet two lanes are maintained. It differs from the angled two-lane slow point in that there is no horizontal deflection introduced into the travel lane alignment. Sometimes a median is used to further constrict the traveled way. If the travel lane widths are unchanged at the location of the slow point, it will have a minimal effect on speed.

There are several considerations with road narrowing measures. If a parking lane is provided, and there are periods of the day when there are few parked cars, the visual effect of roadway narrowing will be minimized. For this reason, it is desirable to have several bulb-outs into the parking lane to physically reduce roadway width during times when there are no parked cars. As with the other traffic calming measures, road narrowings must consider roadway drainage, bicycle, bus, emergency service and truck design vehicles.

**Neighborhood Traffic Circles** are circles placed directly in the center of an intersection. Traffic circles do not have stop sign controls. A neighborhood traffic circle differs from a modern roundabout in that its main purpose is not to keep traffic moving but to slow traffic.

(Note: Roundabouts are an effective intersection treatment for collectors and arterials, but not for residential streets.) Much like horizontal deflection speed control devices, Neighborhood Traffic Circles reduce vehicle speeds by forcing motorists to maneuver around them. Drivers desiring to make a left turn are directed to go on the far side of the circle (3/4 of the way around the circle) prior to making the turn. Signs should be installed directing motorists to proceed around the right side of the circle before making a right turn off of the circle. Neighborhood traffic circles are commonly landscaped with bushes, flowers, or grass, most often at locations where neighbors have agreed to maintain the plants. In locations where landscaping is not feasible, traffic circles can be enhanced through special pavement materials.





## B.04 Gateways/Intersection Treatments

A gateway is a geometric change in the roadway that signals a change in environment from a higher speed arterial or collector street to a lower speed residential area. Gateways often place a high emphasis on aesthetics and are frequently used in addition to distinctive signing to identify neighborhoods. Gateways may be a combination of roadway narrowings, bulb-outs, medians, signing, archways, roundabouts, or other treatments. Gateways should send a clear message to drivers that their environment has changed. Many gateway and intersection treatments have been discussed in the preceding paragraphs such as, raised pedestrian crossings, narrowings, and bulb-outs positioned at intersections. Gateway treatments can also include the use of traffic circles, distinctive arches or public art at street entrances to neighborhoods.



Center Island Narrowing, also called a *Gateway*  
Resource: ITE Toolbox of Traffic Calming Measures

## B.05 Traffic Management Measures

As mentioned previously, traffic management measures physically alter the street so that traffic patterns cannot remain the same. They tend to have much more pronounced traffic effects, both positive and negative. Careful planning with all potentially affected neighborhoods should take place before implementing a measure that will alter traffic patterns.

**Traffic Diverters** are islands built at an intersection that prevents certain through and/or turning movements. Diverters are a very severe traffic management measure because they change traffic patterns and the transportation system by restricting movements. Traffic diverters greatly affect people living in the neighborhood and should be considered only when less restrictive measures are not appropriate.

There are several types of diverters: diagonal, forced turn, and star. A diagonal diverter breaks up cut-through movements and forces right or left turns in certain directions. A forced turn diverter mandates a certain traffic movement, typically through the placement of channelization or roadway closures. The most frequent applications of this are right-in/right-out islands and left-turn in only islands. A star diverter is a star placed in the center of the intersection that forces right turns from every approach.



Right-in/Right-out Diverter

Source: Dan Burden



Left-in Only Diverter

Source: ITE Pedestrian Council

There are many implications that should be considered before constructing any type of diverter. Less restrictive measures should be considered first. Neighborhood traffic patterns must be evaluated to see how the diverter will affect other adjacent streets, and a diverter should have very strong neighborhood support before it is implemented. Diverters should be designed to allow full movements by bicycles and pedestrians. Finally, diverters disrupt the transportation system, which may affect emergency response times to portions of the neighborhood. For this reason, emergency response providers must be involved in the design process.



**Partial Street Closures** use a semi-diverter to physically prevent vehicles from entering a street at an intersection. A partial street closure could involve closing one direction of a two-way street. As mentioned, partial street closures at the entrance to a neighborhood must consider the traffic flow pattern of the surrounding streets, as these streets will probably experience increased traffic volumes. Partial street closure design should incorporate full (two-way) access for bicyclists and pedestrians. A partial street closure provides better emergency access than a full closure.

## B.06 Comparison of Devices

As mentioned, various treatments accomplish different objectives. Table B.06.1 illustrates the likely effects from the application of different treatments. The table is derived from the City of Las Vegas Neighborhood Traffic Management Program Manual.

**Table B.06.1 Effects of Traffic Calming Applications**

<b>Traffic Calming Treatment</b>	<b>Vehicle Volume</b>	<b>Vehicle Speed</b>	<b>Noise</b>	<b>Vehicle Conflicts</b>	<b>Traffic Diverted to Other Residential Streets</b>	<b>Ped/Bike Safety</b>	<b>Emergency Vehicle Access</b>	<b><i>Recommended For</i></b>
Chicanes/Slow Points	↓	↓	↓	↓	↑	↓	↓	Residential Streets
Narrowings	↓	↓	↓	↑	↓	↑	↓	Residential/Collector Streets
Crossing Islands								Collector Streets
Bulb-outs		↓		↑ <sup>2</sup>	↑	↓	↓	Residential / Collector Streets
Diverter	↓	↓	↓	↓	↑	↑	↓	Residential Streets
Gateways/Thresholds	↓	↓		↓		↑	↓	Residential / Collector Streets
Partial Turn Diverter/				↓	↑	↑	↓	Residential/Arterial Streets
Speed Humps/Tables/Cushions	↓	↓	↑		↑	↑	↓	Residential Streets
Neighborhood Traffic Circle		↓	↓	↓		↑ <sup>3</sup>	↓	Residential/Collector Streets

Table B.06.2 illustrates the effectiveness of several traffic calming measures in reducing traffic volumes. Table B.06.3 illustrates the effectiveness of several traffic calming measures in reducing traffic speeds. Table B.06.4 illustrates the effectiveness of several traffic calming measures in reducing traffic crashes.

<sup>2</sup> Vehicle conflicts may increase for turning movements of large trucks.

<sup>3</sup> Ped safety may decrease if motorists are swerving around circles instead of slowing down.

**Table B.06.2 Average Volume Reduction**

Calming/Control Measure	Percent Change
12-ft humps	-18
14-ft humps	-22
22-ft table	-12
Neighborhood traffic circles	-5
Narrowings	-10
One-lane slow points	-20

Source: Victoria Transport Policy Institute TDM Encyclopedia, May 27, 2003, [www.vtpi.org](http://www.vtpi.org).

**Table B.06.3 85<sup>th</sup> Percentile Speed Reduction**

Calming/Control Measure	Percent Change
12-ft humps	-22
14-ft humps	-23
22-ft table	-18
Raised intersections	-1
Neighborhood traffic circles	-11

Source: Victoria Transport Policy Institute TDM Encyclopedia, May 27, 2003, [www.vtpi.org](http://www.vtpi.org).

**Table B.06.4 Safety Impacts  
Average Number of Crashes**

Calming Measure	Before	After	% Change
12 ft. humps	2.7	2.4	-11%
14 ft. humps	4.4	2.6	-41%
22 ft. tables	6.7	3.7	-45%
Traffic circles	2.2	0.6	-73%
All Measures	2.6	1.3	-50



**Appendix C**  
**Neighborhood Traffic Calming Program**  
**Application Form**

**City of Brookfield**  
**Neighborhood Traffic Calming Program**  
**Application Form**

**Contact Name** \_\_\_\_\_

**Address** \_\_\_\_\_

**Phone Number** \_\_\_\_\_

**Email** \_\_\_\_\_

**Date** \_\_\_\_\_

**Location of Traffic Concern** \_\_\_\_\_

**Boundaries (from where to where)** \_\_\_\_\_

**Description of Concern (please include the following)**

- Specific location(s) where the concern is experienced
- The nature of the concern (speeding, high traffic volumes, other)
- The times during the year, week and day when the concern is experienced
- Other information (weather dependent, is it a new occurrence, has it been growing?)

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**Appendix D**  
**Neighborhood Traffic Calming Program**  
**Ballot Traffic Calming Program**

**City of Brookfield**  
**Neighborhood Traffic Calming Program**  
**BALLOT**

**Family or Business Name** \_\_\_\_\_

**Check One:**                      Owner \_\_\_\_                      Renter \_\_\_\_

**Address** \_\_\_\_\_

**Phone Number** \_\_\_\_\_

**Date** \_\_\_\_\_

(name and address will be kept confidential)

**Description of measure being proposed** (Drawing attached)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**We support the proposed traffic calming measure** \_\_\_\_\_

**We oppose the proposed traffic calming measure** \_\_\_\_\_

**Comments:**

\_\_\_\_\_

\_\_\_\_\_

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**Return to** \_\_\_\_\_ **by** \_\_\_\_\_

**Appendix E**  
**Neighborhood Traffic Calming Program**  
**Neighborhood Committee Charter**

**City of Brookfield**  
**Neighborhood Traffic Calming Committee Charter**

**Committee Name:** \_\_\_\_\_

**Neighborhood Area Represents:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Committee Goals:**

\_\_\_\_\_

\_\_\_\_\_

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**Anticipated Activities to be Conducted by the Committee:**

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**Appendix F**  
**Typical Neighborhood Traffic Calming Device**  
**Construction Cost Estimates**

## Typical Traffic Calming Device Construction Costs Estimates

<b><u>Device</u></b>	<b><u>Typical Cost</u></b>
* Speed Humps	\$2,000
* Speed Tables	\$2,500
* Traffic Circles	\$3,500 to \$15,000
* Gateway Treatments	\$3,500 to \$15,000
* Bulbouts	\$7,000 to \$10,000
* Diagonal Diverters	\$85,000
* Full Closures	\$120,000

Note: All costs estimated using 2008 dollars.