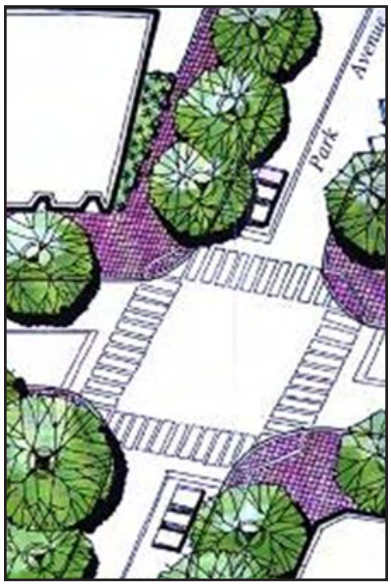
South Central Regional
Council of Governments

TRAFFIC CALMING

Traffic Calming Resource Guide



Prepared by: Fitzgerald & Halliday, Inc.
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Clough Harbor Associates

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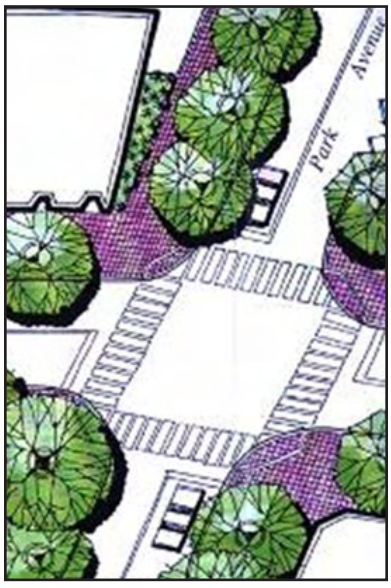
June 2008



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Introduction

The South Central Regional Council of Governments (SCROG) has prepared this Traffic Calming Resource Guide to assist its member communities. The goal of this guide is to be a "go to" resource for each municipality as they plan and implement traffic calming. The guide is presented in a three-ring binder format that can be easily modified as necessary to support the individual municipal traffic calming programs and initiatives.

The materials have been compiled and crafted knowing that their initial use is to cover a broad range of applications and area types. We encourage each municipality to fine tune the materials to support their local policies and specific goals.

The materials presented in this guide include:

- *Definition and History of Traffic Calming*
- A *Toolbox of Traffic Calming Strategies*
- An outline suggesting the *Traffic Calming Study Evaluation Process*
- Pilot project documentation with the SCRCOG regions - Wallingford, CT
- An *Appendix* including:
  - A listing of useful traffic calming resources
  - A glossary of terms
  - Other relevant materials

We hope that you can use these materials to promote safe and attractive streets that maintain or improve the quality of life in your neighborhoods.

Introduction

Definition of Traffic Calming:

The Institute of Transportation Engineers (ITE) definition for traffic calming is:

"Traffic calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior, and improve conditions for non-motorized street users."

By design, traffic calming is a self-enforcing traffic management approach that forces motorists to alter their speed or direction of travel. The purpose of traffic calming is to improve safety, especially for pedestrians and bicyclists, and to improve the environment or "livability" of streets for residents and visitors. Enhanced safety is one of the most fundamental benefits of traffic calming. By decreasing volume and/or reducing speed the number and severity of accidents is greatly diminished.

The objectives of traffic calming include:

- Slow vehicular travel speeds
- Reduce the frequency and severity of collisions
- Reduce the need for police enforcement
- Reduce cut-through motor vehicle travel patterns
- Increase safety for non-motorized street users
- Increase access for all modes
- Enhance the street environment

Traffic calming techniques may include education, enforcement, or engineering – "the three E's" – to shift traffic patterns and/or reduce speeds. Most traffic calming measures focus on engineering changes to alter driver behavior. Traffic calming techniques may include physical changes such as roadway narrowing, speed humps, raised intersections, traffic circles, pavement markings, signage, and others. Education and enforcement efforts should be considered prior to engineering alternatives and as a complement to engineering efforts.

History of Traffic Calming

The Institute of Transportation Engineers, "Traffic Calming: State of the Practice" (Ewing, Reid, 1988) was referenced to compile this history of traffic calming.

Traffic calming began in Europe in the late 1960's as part of a grassroots movement by the residents of the Dutch city of Delft to reclaim their streets. Angry with cut-through traffic, the residents transformed their streets into obstacle courses called "woonerven" or living yards, by placing benches, sandboxes and parking bays jutting into the streets. Woonerven were endorsed by the government in 1976. Soon this idea spread to other areas such as Germany, Sweden, Denmark, England, France, Japan, Israel, Austria, and Switzerland. Realizing the shortcomings of the Woonerven, the Dutch experimented with other treatment types to save on costs and achieve a broader use application. The traffic calming alternative involving humps and other physical measures was endorsed in 1983. Again other nations followed this lead to also achieve reduction in speeds and accidents and a better quality of life for their streets.

Germany began applying neighborhood traffic calming in the late 1970's and this was termed "verkehrsberuhigung" which is translated as traffic calming. Their early experiences showed that calm-

ing individual streets can lead to traffic diversion so they began to consider area-wide traffic calming. Their positive results also prompted other cities to consider area-wide traffic calming programs. Australia has also been a leader in implementing traffic calming measures and is often noted for its use of the modern roundabout.

In the United States, the use of street closures and traffic diverters dates back to the late 1940's/early 1950's and the first area-wide traffic calming planning was conducted by Seattle, Washington in the early 1970's (Stevens Neighborhood). Some of the earliest projects were implemented in Berkeley, California; Eugene, Oregon; Charlotte, North Carolina; Montgomery County, Maryland; and San Jose, California. The first national study of traffic calming was completed around 1980 and subsequent studies have been performed as the field has matured.

There are several trends and lessons from the European and Australian experience as well as the Seattle, Washington project that are very relevant today. These include:

- A shift in types of measures from volume control to speed control
- A shift from simple to diverse programs
- The need to not just consider spots but area-wide treatments
- The need to assess public support for the treatments
- The need to test measures on a temporary basis before installing permanently
- The need to consider emergency services concerns and access
- The need to evaluate before and after studies

The toolbox of calming methods available to planners and engineers continues to grow, and more communities are implementing traffic calming projects. One component receiving increased attention is the importance of education in the overall effort to slow down traffic. Several studies have shown that many of the speeders in a neighborhood are area residents and not outsiders, as previously thought.

New construction methods and materials continue to be developed to improve safety and contribute to an attractive streetscape. Recent research is also investigating what effects traffic calming has on air quality. Certain methods, such as speed humps, that interrupt traffic flow may increase vehicular fuel consumption and exhaust emission rates. The quantification of these environmental impacts may force town planners and engineers to re-examine the balance between calming traffic and environmental concerns, and may, in the future, narrow the available choices within the traffic calming toolbox.

There are several municipalities in Connecticut that have developed traffic calming programs or implemented traffic calming measures. Some of these include: Hartford, West Hartford, Stamford, Mansfield, South Windsor, and Greenwich. The South Western Regional Planning Agency has also prepared a Traffic Calming Toolbox.

Toolbox

The following pages describe and illustrate each of the traffic calming tools included in this resource guide. There is not a single tool to solve all traffic issues and one tool that may work well in one area for a particular issue may not be effective in another situation. Key to successful traffic calming is community acceptance and municipal support/maintenance. Not every tool may be appropriate or acceptable for each municipality.

Traffic calming measures can generally be separated into three groups based on the goal they are trying to achieve: speed control, volume control, and safety enhancement. These three categories are not as distinct as they may seem as speed reduction measures may divert traffic to other streets and efforts to control cut-through traffic may also decrease the speeds of the traffic using the road. Safety enhancement measures are not implemented for the sole purpose of calming traffic rather they are installed to address a safety concern. However, certain safety enhancements have the additional benefit of raising driver awareness and slowing traffic. Effective traffic calming strategies often include using more than one of the tools. Traffic calming should be designed with a systematic approach with appropriate and frequent enough spacing of measures and consideration for secondary effects of the installations.

Speed Control Measures:

- Speed Hump
- Speed Table
- Raised Crosswalk
- Raised Intersection
- Rumble Strip
- Textured and Colored Pavement
- On-Street Parking
- Modern Roundabout
- Traffic Circle
- Narrowed Lane
- Neckdown/Bulb Out/Curb Extension
- Chicane
- Traffic Island/Median
- Landscaping
- Gateway
- Stationary Radar Sign/Speed Display Board
- Pavement Marking
- Signage
- Edge Treatment
- Reduced Corner Radii

Volume Control Measures:

- Roadway Closure
- Diverter
- Turn Restriction
- One-way Street/ Circulation Change

Safety Enhancements:

- In-Pavement Lighting
- Bike Lane

In addition to describing the tools, a list of general pros and cons associated with each tool is also presented. The intent is to provide the reader with a quick indication of what might be expected if this measure is implemented. Again, certain measures may or may not realize their full advantage or drawbacks depending on site specific conditions and circumstances.

Also included for each measure is a rough or relative cost[1]. The costs are broken down into ranges low, moderate, and high. Costs can vary significantly depending on materials, design requirements, etc. The costs as presented do not include maintenance of the measures after they are installed. It is recommended that additional cost research be done to confirm and customize costs prior to finalizing any traffic calming plan. The summary Matrix (Table 1) lists the traffic calming tools in the resource guide and provides a brief description of each measure, the issue it's intended to address, what it's best used for and not intended to be used for, an idea of cost (where available), and other commentary regarding the tool. This matrix is a concise summary of the traffic calming tools.

1. Costs best information as of 2008, Spring

Table 1: Traffic Calming Summary Matrix

Measure	Description	Issue	Best For	Not Used For	Costs	Considerations
Speed Hump	Raised area of roadway typically 12 to 22 feet in length	Speed Reduction	• Neighborhood streets	• Arterials, highways, other main roadways	$1,000 - $12,000 each	Can interfere with transit, snow plow, and emergency vehicle operations. Speed humps increase roadway noise and wear on vehicle suspensions. Highly visible warning signage required.
Speed Table	Elongated speed hump 22 feet in length or greater	Speed Reduction	• Neighborhood streets	• Arterials, highways, other main roadways	$2,000 - $15,000 each	Can interfere with transit, snow plow, and emergency vehicle operations. Speed tables increase roadway noise and wear on vehicle suspensions. Highly visible warning signage required.
Raised Crosswalk	Elongated speed hump which features a flat top at the same elevation as adjacent sidewalks	Pedestrian Safety Speed Reduction	• Areas where pedestrian traffic takes priority over vehicular traffic	• Arterials, highways, other main roadways	$2,000 - $15,000 each	Raised crosswalks can decrease pedestrian caution before stepping into roadway.
Raised Intersection	Similar to raised crosswalks, except the entire intersection is at sidewalk grade	Pedestrian Safety Speed Reduction	• Areas with heavy pedestrian traffic, such as shopping areas and college campuses.	• Arterials, highways, other main roadways	$50,000 - $200,000 each	Raised intersections provide a barrier-free crossing for pedestrians and slow all vehicles, including emergency vehicles and transit buses.
Rumble Strip	Raised buttons or grooves closely spaced on the roadway travel lane or shoulder surface to create noise and vibration	Speed Reduction	• Transitions between higher-speed and lower-speed sections of a roadway	• Areas that are highly noise sensitive	$7 - $10/foot	Only effective through the noise and vibration they create. They are not favored in residential areas due to noise impacts.
Textured and Colored Pavement	Used to delineate an area with high pedestrian activity	Pedestrian Safety Speed Reduction	• Areas with heavy pedestrian traffic, such as neighborhood shopping areas and college campuses	• Arterials, highways, other main roadways	Moderate to high	Maintenance and life cycle should be considered when selecting materials. Only certain techniques allowed on state roads with municipal - state agreement.
On-Street Parking	Parallel and angled parking can be used to narrow travel lane width and provide a buffer between motorists and pedestrians	Pedestrian Safety Speed Reduction	• Village environments • Wide roadways	• Arterials, highways, and other main roadways	Low	Angled parking creates more right-of-way impacts than parallel parking, but also accommodates more parked vehicles per block. Drivers have reduced visibility backing out of angled parking spots, posing a greater accident risk.
Modern Roundabout	A modern roundabout is a large raised island in the center of an intersection. All entering traffic circles to the right and yields to vehicles already in the roundabout. Left-turning movements are eliminated. They are used in place of traffic signals at high volume arterials.	Crash Reduction	• Intersections on high volume arterials with a history of high crash rate or long queues • Intersections with more than 4 approaches • Intersections with heavy left-turn volume	• Smaller or low-volume intersections • Intersections with disproportionate volume on approaches	$80,000 - $800,000 each, depending on diameter, right-of-way, number of lanes, landscaping	Modern roundabouts require more right-of-way than traditional intersections. This additional right-of-way may require eliminating existing on-street parking. They require more maintenance than traditional intersections, and are more difficult to navigate for large vehicles such as fire trucks and transit buses.
Traffic Circle	Much smaller than modern roundabouts, traffic circles are installed inside existing intersections and require motorists to slow down to navigate around them.	Speed Reduction	• Neighborhood streets that have a history of high speeds and high crash rates at intersections	• Multi-lane roadways	$6,000 - $12,000 each	Can provide a gateway or neighborhood identity.
Narrowed Lane	Roadway lanes are narrowed from typical cross-sections of 12-15 feet to 11 or fewer feet per lane through the use of painted lane markers, new parking lanes, new bicycle lanes, or relocated curbing.	Speed Reduction	• Minor arterials • Collectors • Local roads	• Heavily traveled or high speed roadways	$1,000 - $10,000/ mile	Narrowing traffic lanes make slower speeds seem more natural to drivers and less of an artificial imposition compared to other physical calming treatments. Adequate width for emergency vehicle access must still be provided.

Measure	Description	Issue	Best For	Not Used For	Costs	Considerations
Neckdown/ Bulb Out/Curb Extension	Briefly narrow the roadway by extending the curb at intersections or mid-block locations	Pedestrian Safety Speed Reduction	• Areas with pedestrian traffic and wider roadway cross-sections • Village environments	• Arterials • Narrow streets	$2,000 - $20,000 each, depending upon size and material	May require eliminating some on-street parking and may hinder street plowing and sweeping operations
Chicane	Sets of two or more alternating curb bulb outs or extensions that narrow and realign the roadway	Speed Reduction and Cut-Through Traffic	• Neighborhood streets that experience high speeds or heavy cut-through traffic volume	• Arterials, highways, other main roadways	$10,000 - $30,000	Concrete chicanes complicate street maintenance and drainage and may require additional right-of-way to construct. Chicanes created through pavement striping are cost-effective and easy to implement. On-street parking can be alternated from side-to-side along the street.
Traffic Islands and Medians	Concrete or landscaped islands and medians slow travel speeds by narrowing lanes and also improve pedestrians accommodation by providing a pedestrian refuge at crossings.	Pedestrian Safety Speed Reduction	• Roadways with wide rights-of-way that would benefit from slower speeds and improved pedestrian safety	• Already narrow roads, or roadways with frequent driveways	Varies depending on length, materials, and right-of-way availability	Islands and medians can provide a visual enhancement or gateway to promote neighborhood identity. They may reduce parking and driveway access and may increase motor vehicle conflicts with bicycles.
Landscaping	The use of plantings such as trees to visually alert drivers to slow down	Speed Reduction	• Residential or village environments		Moderate to high	Maintenance requirements
Gateway	Signage, landscaping, or art that alerts drivers of upcoming village, neighborhood, or danger	Speed Reduction	• Residential or village entrances	• Highways	Varies	An excellent opportunity to add character or identity to a community.
Stationary Radar Sign/ Speed Display Board	Dynamic signs that advise motorists of their speed and the posted speed limit	Speed Reduction	• Any roadway from neighborhood street to limited-access freeway where observed speeds consistently exceed the speed limit - they are particularly popular in school zones.		$5,000 - $15,000 each	Radar signs have proven to slow down traffic, even years after their initial installation. They are particularly effective on high volume arterials and highways, where physical measures would restrict traffic flow.
Pavement Marking	Painted markings or warnings on roadway surface	Speed Reduction	• Areas where signage alone can benefit from additional warning reinforcement		Low	Easily wears off and requires regular maintenance
Signage	Standard or customized signs alerting drivers; often complements other traffic calming tools.	Speed Reduction	• Areas where inadequate signage is present		Low (varies depending on type and amount of signage)	Limited traffic-calming effect when used alone - complements other traffic-calming strategies
Edge Treatment	Raised curb installations signal a lower design speed to drivers	Speed Reduction	• Areas with adequate right-of-way	• Highways or anywhere the curbing would create a hazard.	Moderate to high	Raised curbs allow placing trees and street furniture closer to the roadway, producing an additional calming effect.
Reduced Corner Radii	Corner curb is squared off requiring motorists to slow to navigate a tighter turn with a smaller radius.	Pedestrian Safety Speed Reduction	• Typically used in conjunction with other calming methods in areas with high pedestrian activity.	• Arterials, highways, other main roadways	$2,000 - $20,000	The reduced turning radius can limit truck and bus turning, complicating emergency vehicle, delivery truck, and transit operations. Careful design is required.

Measure	Description	Issue	Best For	Not Used For	Costs	Considerations
Roadway Closure	The most extreme form of traffic diversion, roadway closures interrupt the traffic grid pattern by creating dead-end or cul-de-sac street segments.	Cut-Through Traffic	• Neighborhood streets where all other calming attempts have failed	• Arterials, highways, other main roadways, transit routes, and anywhere street continuity is desired	Low, varies depending on materials, landscaping	Street closures divert all through traffic onto other nearby roadways in the network.
Diverter	Several types of diverters, such as semi-diverters and diagonal diverters, may be used to restrict traffic flow and discourage cut-through traffic	Cut-Through Traffic	• Neighborhood streets that experience high cut-through traffic volume	• Arterials, highways, other main roadways and transit routes	$15,000 - $45,000	Diverters reduce through traffic without preventing pedestrian access. They can also be designed to allow bicycle traffic.
Turn Restriction	Restricting certain turns at intersections to influence travel patterns	Cut-Through Traffic	• Low-volume turning movement	• High-volume intersections and turning movements	Low	Can be difficult to enforce
One-way Street/ Circulation Change	Used to reduce traffic volume on specific roads within a network. Strategies include changing one or more segments of two-way roads to one-way and restricting certain turning movements at intersections.	Cut-Through Traffic	• Low volume neighborhoods with comprehensive grid network • High cut-through neighborhoods	• Isolated higher-volume arterials • Transit routes or major emergency response routes	Varies - relatively low	Circulation changes will have secondary impacts on adjacent roadways that must be considered.
In-pavement Lighting	Crosswalk with embedded lights along its length that is activated by a pedestrian	Pedestrian Safety	• High pedestrian activity areas • School campuses • Transit centers	• Rural or highway settings	$35,000	Snow-covered roads can cover lights and/or activation sensors.
Bike Lane	Designating a portion of the roadway cross-section exclusively for bicycle use	Speed Control	• Urban arterials • Collectors • Local roads	• Highways	Low	Requires regular paint maintenance

1. Speed Control Measures

Vertical Deflection

Speed Hump

Description:

Speed humps are raised areas of roadway deflecting both the wheels and frame of traversing vehicles. They are typically 12-, 14-, or 22- feet long and are usually found on neighborhood streets, not on major roadways or primary emergency vehicle routes. The speed hump should terminate before the gutter pan, so as to not interfere with proper storm water drainage.

Image source: www.saferoutesinfo.org

Pros:

- Speed reduction
- Relatively low-cost
- Easy to test

Cons:

- Increased roadway noise
- Maintenance costs
- Required signage costs and aesthetics
- Slower emergency vehicle response times
- Extra care required when snowplowing

Costs:

$1,000 - $12,000 each

Speed Table

Description:

Speed tables are raised areas of roadway, including crosswalks that are higher than the surrounding roadway approaches. Like speed humps, they deflect both the wheels and frame of traversing vehicles. They are typically 22-feet long or longer.

Costs:

$2,000 - $15,000 each

Pros:

- Speed reduction
- Relatively low-cost
- Easy to test

Image source: www.trafficlogix.com

Cons:

- Increased roadway noise
- Maintenance costs
- Required signage costs
- Slower emergency vehicle response times
- Not as effective as speed humps in slowing traffic.

Speed Control Measures

Vertical Deflection

Raised Crosswalk

Image source: www.pedbikeimages.org

Description:

Raised crosswalks are elongated speed humps that feature a flat top at the same elevation as the adjacent sidewalks. They can be found at intersections or mid block, and should only be used in high pedestrian travel areas.

Pros:

- Speed reduction
- Increase visibility of and for pedestrians

Cons:

- Noise
- Maintenance
- Need for signage

Costs:

Moderate ($2,000 - $15,000 each)

Raised Intersection

Description:

Raised intersections are raised areas of roadway, including crosswalks that are higher than the surrounding roadway approaches. Like speed humps, they deflect both the wheels and frame of traversing vehicles. For a raised intersection, the entire intersection is at sidewalk grade.

Pros:

- Speed reduction at locations with vehicle-vehicle and vehicle-pedestrian conflicts
- Improved safety

Cons:

- Increased roadway noise
- Maintenance costs
- Required signage costs and aesthetics
- Slower emergency vehicle response times

Costs:

Raised intersections - $50,000 - $200,000 each

Image source: unknown

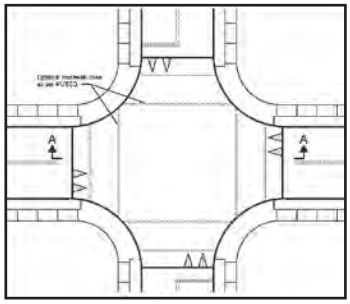


Image source: Delaware DOT Traffic Calming Manual

Speed Control Measures

Horizontal Deflection

Rumble Strip

Description:

Rumble strips are raised buttons or grooves closely spaced on roadway surface to create noise and vibration. They are typically installed to alert drivers of an upcoming curve or speed change. They are also commonly placed in shoulders of freeway to alert drivers who veer off the road.

Image source: Federal Highway Administration

Pros:

Rumble strips are a permanent method to alert motorists they are entering an area with high pedestrian activity or other safety concerns. They do not require any additional right of way and their installation does not disrupt existing traffic patterns. They are inexpensive.

Cons:

Rumble strips are effective only through the noise and vibration they create. This same noise and vibration are their biggest detraction, particularly in residential areas. Drivers can more easily ignore rumble strips than other calming methods that vertically or horizontally deflect vehicles. Without adequate signage, rumble strips could startle motorists, potentially creating a hazardous condition. They also require increased maintenance; particularly during roadway re-paving.

Costs:

$7 - $10/foot

Textured and Colored Pavement

Description:

Paving materials such as brick, cobbles, or concrete pavers can be used to identify a traffic-calmed area. The variety of color and texture signal to drivers that they are traveling in a pedestrian centric zone. Some projects include colored and textured pavement along the entire calmed roadway, while others limit the special pavement to the edges of calmed areas to announce entry into a new area where through traffic is not the priority.

Bricks or blocks are sometimes also used to provide the same traffic calming benefits as rumble strips, delineating crosswalks and pedestrian zones.

Pros:

Textured pavements attract the driver's attention visually, audibly, and physically and are ideal for residential and neighborhood shopping areas. They are permanent and effective and can add to the aesthetic identity of a neighborhood.

Cons:

Some materials, particularly cobblestones, present a hazardous riding surface to bicyclists. Loose or uneven installations of paving stones pose a tripping hazard to pedestrians and should be regularly inspected, increasing maintenance costs over ordinary asphalt or concrete pavement.

Costs:

Moderate to High. Costs vary depending on materials used and size of paving area.

Image source:
www.students.bucknell.edu/projects/trafficcalming/Library.html

Speed Control Measures

Horizontal Deflection

On-street parking: Parallel & Angled Parking

Description:

On-street parking, both parallel and angled, helps to narrow roadways and calm traffic. The proximity of parked vehicles and necessity to watch for exiting vehicles and opening doors slows traffic. Angled parking can accommodate more cars per block than parallel parking.

Pros:

On-street parking creates a buffer between pedestrians and motorists, improving the walking environment. On-street parking in business districts is generally welcomed.

Cons:

On-street parking impedes traffic flow. Angle parking creates more right-of-way impacts. Drivers have reduced visibility backing out of angled parking spots, posing a greater risk to bicyclists. If angled parking is selected, back in/head out parking is preferred to provide better visibility when exiting a parking space, reducing the danger to motorists and bicyclists.

Source: Houston-Galveston Area Council

Costs:

Generally low with adequate roadway width.

Modern Roundabout

Description:

A modern roundabout is a raised island in the center of an intersection. Roundabouts are used on higher volume arterial streets to allocate right-of-way between competing movements and provide a cost-effective alternative to traffic signals.

Pros:

They can reduce vehicle queues and improve safety at intersections with high crash rates.

Cons:

Compared to traditional intersections, modern roundabouts require more right of way, increasing the crossing distance for pedestrians and possibly making it more difficult for large vehicles, such as fire trucks and transit buses, to negotiate. Converting an existing traditional intersection may require eliminating nearby on-street parking and, especially if landscaped, require more maintenance than traditional intersections.

Image source: City of Yakima, WA

Costs:

$80,000 - $800,000 each, depending on diameter, right-of-way, number of lanes, landscaping

Speed Control Measures

Horizontal Deflection

Traffic Circle

Description:

Another variation used in residential traffic calming is the traffic circle, which is used more to slow driving speeds approaching intersections with high crash rates than to improve traffic flow (as with a modern roundabout). Motorists must reduce speed to maneuver around the circle, which helps reduce the frequency and severity of crashes.

Image source: www.mrsc.org/Publications/mrnews/mrnews0305.aspx

Pros:

Permanent installation forces reduced speeds at subject intersection. Flexible installation allows retrofit to existing junction intersections, without costly roadway re-alignment. Can provide gateway or identity to a neighborhood.

Cons:

A single roundabout used in isolation will not significantly calm traffic. A coordinated system of multiple traffic circles or other calming measures is required. Motorists may ignore painted traffic circles, and drive right over them. Raised traffic circles may interfere with snow plowing operations.

Costs:

$6,000 - $12,000 each

Narrowed Lanes

Description:

Studies have shown that wider travel lanes allow for faster vehicular travel speeds. Conversely, drivers naturally go more slowly when navigating narrow travel lanes, providing a more subtle calming effect than other physical calming methods. However, narrow lanes also slow emergency vehicle response times. One solution is to visually narrow lanes using paint, while leaving a several foot shoulder that emergency vehicles can utilize – effectively providing a narrow lane for motorists and a wider lane for emergency vehicles. Lanes can also be physically narrowed by providing on-street parking on one, or both, sides or by adding bollards, planters, or bike lanes. Without other provisions for bicyclists, the narrower road may increase motor vehicle/bicycle conflicts. Narrowing traffic lanes differs from other road treatments by making slower speeds seem more natural to drivers and less of an artificial imposition, as opposed to other physical treatments that compel lower speeds or restrict route choice.

Pros:

Travel speeds are typically higher on four-lane roadways than on two-lane roads. Excess right-of-way can be shifted to providing wider sidewalks, bicycle lanes, or on-street parking. Narrowing the number of travel lanes also facilitates additional calming methods such as neck downs and mid-block bulb outs. Simple roadway restriping to achieve roadway narrowing is inexpensive.

Cons:

Reducing the number of travel lanes reduces the overall capacity of the roadway possibly increasing congestion and reducing the vehicular level of service (LOS).

Costs:

$1,000 - $10,000/mile

Speed Control Measures

Horizontal Deflection

Neckdown/Bulb Out/Curb Extension


Image source: www.cpsafepathways.com

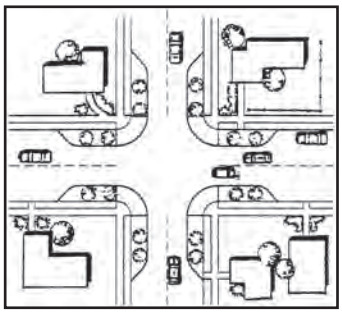


Image source: Delaware DOT

Description:

Neckdowns or bulb outs narrow the roadway by extending the curb at key intersections and mid-block locations.

Pros:

Neckdowns and bulb outs slow traffic, reduce turning speeds, and increase pedestrian safety by reducing crossing distance. They shift the focus of the street towards creating a walkable environment.

Cons:

- Relatively high initial costs
- Loss of on-street parking
- Increased maintenance costs
- Complicates plowing and street sweeping operations
- Can hinder drainage

Costs:

$2,000 - $20,000 each, depending upon size and material

Chicane

Description:

Common in Europe, chicanes are a set of two or more alternating curb bulbs or extensions that narrow and realign the roadway for short segments. Since the street is no longer straight, drivers must slow down to negotiate the roadway. Two-way traffic and full access for larger vehicles and emergency services can be maintained. A chicane effect can be created using various methods, including concrete curbs, landscaped areas or alternating diagonal and parallel parking.


Image source: Fitzgerald & Halliday, Inc.

Pros:

By creating a slalom effect, chicanes reduce vehicle speeds and discourage cut-through traffic. These methods can improve the appearance and function of the street and provide opportunity for parking.

Cons:

Concrete chicanes complicate street maintenance and storm water drainage and can hinder emergency vehicle and bus operations. They may require additional right of way to construct as well and if designed incorrectly could encourage motorists to attempt to navigate them at high rates of speed.

Costs:

$10,000 - $30,000 (paint versus physical diverter)

Speed Control Measures

Horizontal Deflection

Traffic Islands and Medians

Image source: City of Ann Arbor, MI

Image source: www.trafficcalming.org/centerislandnarrowrings.html

Description:

Concrete or landscaped islands typically located down the center of a roadway or at a roadway entrance.

Pros:

Landscaped or concrete traffic islands and medians can reduce speeds by narrowing drivable travel lane widths. They can improve pedestrian accommodation by providing a mid-block pedestrian refuge at crossings. They complement improved crosswalks and reduce pedestrian crossing width. They can be used to provide a visual enhancement or gateway to promote neighborhood identity.

Cons:

Traffic islands and medians may reduce parking and driveway access, and also the narrower road may increase motor vehicle/bicycle conflicts.

Costs:

Varies depending on length, materials and right-of-way availability.

Landscaping

Description:

Landscaping is used in conjunction with other traffic calming measures such as roadway narrowing, traffic islands, and sidewalk improvements to improve the pedestrian environment, define pedestrian and vehicle areas, and provide horizontal separation between motor vehicles and pedestrians.

Pros:

Landscaping increases motorists' awareness and can help define a neighborhood identity. Its installation is long term and increases the quality of life of a community.

Image source: Fitzgerald & Halliday, Inc.

Cons:

Depending on the design, the installation and maintenance costs can be high. Right-of-way impacts may be significant as well.

Costs:

Moderate to high - varies depending on scale and materials/plantings

Speed Control Measures

Gateways

Image source: Fitzgerald & Halliday, Inc.

Description:

A signing and/or landscaping treatment to alert motorists they are entering a special area can be used at entrances to neighborhoods, commercial areas, town centers, or busy places of activity. Gateways are typically supplemented with other traffic calming measures.

Pros:

Can be visually aesthetic and heighten awareness.

Cons:

Generally expensive and can require routine maintenance.

Costs:

Varies

Stationary Radar Signs/Speed Display Board

Image source: en.wikipedia.org/wiki/radar_speed_sign

Image source: Plymouth, MA Police Dept.

Description:

Radar signs are interactive signs that draw motorists' attention to their speed and the road's legal speed limit. They work by alerting motorists when they're exceeding the speed limit. They can be used in residential areas, school zones, construction zones, or other safety zones.

Radar signs can be permanently mounted on signposts or temporary installations using self-contained trailers.

Pros:

Radar signs have proven to slow down traffic, even years after their initial installation. They are particularly effective on high volume arterials and highways, where physical measures would restrict traffic flow.

Cons:

Radar signs do not slow traffic as much as physical measures. Motorists' compliance is voluntary. Enforcement is still necessary.

Costs:

$5,000 - $15,000 each

◆ Speed Control Measures

Pavement Markings/Stencils

Description:

Pavement markings are another means to alert or inform a motorist of a condition or a potential situation. Painted lines and symbols need to be selected and placed in accordance with the Manual on Uniform Traffic Control Devices (MUTCD). Some examples include: The word "SLOW" can be painted on a travel lane to encourage motorists to drive slowly and painted white edgelines can be used to visually narrow streets. Crosswalks can be used to alert motorists of pedestrian activity. Pavement markings are also used in conjunction with signs and other measures.

Pros:

Low cost and easy to install. Can increase awareness.

Image source: www.saferoutesinfo.org

Cons:

Requires regular maintenance and may not be consider visually aesthetic. Not visible with snow covered roads.

Costs:

Low

Signage

Description:

Traffic signs can be used to alert or inform motorists of a condition or a potential situation. Signs need to be selected and placed in accordance with the Manual on Uniform Traffic Control Devices (MUTCD). Speed limit signs, pedestrian/bicycle/school crossing signs, and in-street pedestrian crossing signs have been used by municipalities to warn motorists of high pedestrian activity, and can help to reduce speeds. Signs are also used in conjunction with other measures such as pavement markings.

Image source: Fitzgerald & Halliday, Inc.

Pros:

- Low cost
- Increases awareness

Cons:

Can be considered to clutter the roadway especially on a residential street. In-street signs may get hit or may need to be removed at night and placed back during the day. Overall effectiveness can vary.

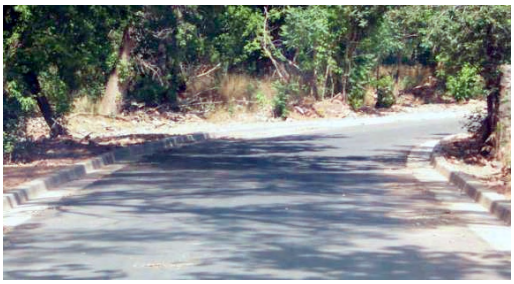
Costs:

Varies, depending on type and amount of signage

◆ Speed Control Measures

Edge Treatment

Source: Washington State Transportation Improvement Board



Source: FHWA

Description:

Edge treatments, such as raised curbs, provide uniform cross sections with identifiable edges along an entire corridor. They often signal a lower design speed to drivers. Raised curbs also allow placing roadside objects such as trees and street furniture closer to the roadway, producing a traffic calming effect.

Where curbs are impractical, pavement markings or changes in pavement texture may be used to create a similar effect.

Pros:

Edge treatments define a corridor, increasing awareness. These treatments can also visually "narrow" a roadway.

Cons:

- Potential right-of-way impacts
- Potential drainage impacts and costs to accommodate

Costs:

Moderate to high (varies)

Reduced Corner Radii

Description:

This calming method is used at intersections to make turning movements tighter. It typically is used in conjunction with other calming techniques like neck downs and raised crosswalks. This effectively slows turning vehicles and increases pedestrian safety. The reduced radius, however, also can limit truck and bus turning – negatively impacting both emergency vehicles and transit operations.

Pros:

- Slows turning vehicles
- Promotes pedestrian safety
- Improves motor vehicle and pedestrian sight distances
- Shortens crossing distance

Cons:

- Impacts truck/bus turning
- Slows emergency vehicles and large transit vehicles

• Costs:

$2,000 - $20,000

Image sources:
Safe Routes to School Guide
www.saferoutesinfo.org

2. Volume Control Measures

Roadway Closure

Source: www.pedbikeimages.org

Description:

Full-street closures retroactively installed to previously open streets are often reserved for locations where all other calming attempts have failed. They may be located adjacent to intersections, creating cul-de-sacs and dead ends, or located mid block, creating two stub streets. These closures completely close the street to through-traffic, usually leaving only pathways open for bicyclists and pedestrians.

Closure methods include landscaped islands, decorative walls, steel posts, bollards or planters, or any other means that leave an opening narrower than an automobile. The barrier can be designed to maintain emergency vehicle access.

Within a grid of neighborhood streets, a series of closures are often used to make vehicular travel through neighborhoods more circuitous to discourage cut-through patterns.

In some high crime areas, full streets closures have also been implemented to prevent "cruising" or illegal activities.

Pros:

Closures eliminate cut-through traffic from neighborhoods and effectively convert through streets into extremely low volume dead end roads. Their installation can also be used as an opportunity to introduce additional landscaping and aesthetic improvements to public right of way within a neighborhood.

Cons:

Street closures require strong community support since they restrict access for neighborhood residents. Any nearby land owners opposed to the closure could initiate a protracted legal fight.

Closing a few streets within a neighborhood network may divert a significant amount of traffic to nearby parallel streets or to adjacent neighborhoods.

Street closures only reduce vehicle speeds in the immediate vicinity of the closed block. Parallel roadways without closures can suffer both higher travel speeds and increased traffic volumes.

Costs:

Low, varies depending on materials, landscaping, etc.

Source: FHWA

◆ Volume Control Measures

Diverters

Description:

Several types of diverters can be used to channelize or restrict traffic flow at intersections. They are used to prevent through movements and interrupt the traffic grid. **Diagonal diverters** prevent through movements while allowing right-turn movements from two of the approaches and left turn movements from the other two approaches. **Star diverters** prevent through movements, while allowing right turns from all four intersection approaches. **Island diverters** prevent through movements from two approaches, while allowing cross-traffic to proceed straight. And **semi-diverters** can either prevent in or out traffic for a single approach, changing a two-way road to one way.

Pros:

Diverters limit access and reduce through traffic, without preserving pedestrian access. They can also be designed to favor bicycle travel, creating quiet, efficient bicycle boulevards through neighborhoods.

Cons:

Diverters may create frustration for motorists confused by the irregular traffic pattern. They may impede transit and emergency vehicle operations, though certain design features can be included to maintain access for authorized vehicles. The shift in traffic patterns can have unintended consequences, sending more traffic to other nearby residential streets.

Costs:

$15,000 - $45,000

Turn Restrictions

Description:

Restricting certain turns at intersections to influence travel patterns

Pros:

- Low cost
- Reduces cut-through traffic

Cons:

- Inconveniences residents of streets
- Can create circuitous traffic patterns
- Can be hard to enforce

Costs:

Low

Speed Control Measures

One-way Streets/Circulation Changes

Description:

Changing one or more roadways or segments of roadways from two-way to one-way to alter travel patterns within neighborhoods or villages.

Image source: www.pedbikeimages.org

Pros:

- Prevents some cut-through patterns
- Relatively inexpensive
- Can increase level of service at intersections by removing some traffic movements
- Can free up roadway width for on-street parking

Cons:

- Creates more circuitous travel routes for valid destinations within neighborhoods
- Creates inconveniences to residents of neighborhood
- Can be confusing
- Shift some traffic volume to other streets
- Often controversial

Costs:

Low

3. Safety Enhancements

In-Pavement Lighting

Description:

In-pavement lights are being used at crosswalks to alert motorists to the presence of a pedestrian crossing or preparing to cross the street. The amber lights are embedded in the pavement on both sides of the crosswalk and oriented to face oncoming traffic. When the pedestrian activates the system, either by using a push-button or through detection from an automated device, the lights begin to flash at a constant rate, warning the motorist that a pedestrian is in the vicinity of the crosswalk ahead.

Pros:

- Increases driver awareness of upcoming crossing
- Particularly effective near school campuses or transit hubs with heavy concentrations of pedestrian activity after dark.

Cons:

- Cost vs. traditional crosswalk

Image source: www.walkinginfo.org/pedsmart/tlite.htm

- Design must take into account snow removal
- In-pavement light fixtures and automatic sensors can be covered temporarily by snow or other debris.

Costs:

Approximately $35,000

Bike Lanes

Description:

Designating a portion of the existing roadway cross-section exclusively for bicycle use.

Pros:

- Slows speed
- Provides for bicycle access

Cons:

- Reduces roadway capacity
- If not designed well, can create safety concerns

Costs:

Low

Image source: Fitzgerald & Halliday, Inc.

Traffic Calming Process

Any successful traffic calming study and implementation process involves public participation and significant local coordination to develop reasonable solutions that address neighborhood concerns regarding traffic safety and flow. The following describes a general but systematic approach for a traffic calming study process. Each municipality should develop a traffic calming program which includes policy and process that is tailored to their community's specific requirements, characteristics, goals, funding, and municipal resources. Community involvement and approval is one of the most important aspects of a traffic calming study process and the ultimate success and acceptance of the project.

Prior to establishing a municipal traffic calming program the following items should be addressed.

Traffic Calming Program Coordinator: Each municipality should select a person to manage all requests for traffic calming measures and to be the point of contact for residents. This will help to ensure the process is implemented efficiently and consistently. Typically the coordinator is a municipal traffic engineer or transportation planner. The role and interaction with the municipal legal traffic authority should also be considered.

Local Traffic Calming Advisory Committee: A traffic calming advisory committee can also be established to assist in the review of applications and prioritizing of projects. If formed, the committee should include the appropriate municipal representatives (i.e. engineer, public works, emergency response, planning etc.) and one or more citizens.

Funding: Each municipality needs to consider how their traffic calming program will be funded. Funding is also needed for maintenance of the traffic calming measures/devices after installation. The conduct of traffic calming studies and the construction of projects can be costly and each municipality should be aware of the potential costs.

Additional Resources: Some municipalities may need to consider contracting services to assist the Traffic Calming Coordinator with evaluating the data and participating in the neighborhood outreach activities and studies.

Figure 1 illustrates the four basic steps that form the framework for conducting a traffic calming project. The basic steps for processing and implementing traffic calming requests include:

1. Initiate a Study
2. Develop a Plan
3. Funding, Design, and Approvals
4. Installation and Evaluatation

The *Process* of a Traffic Calming Project...

1. Initiate a Study

Study Request Form Submitted with Petition

Contact Resident to Verify/Discuss

Municipal Criteria, Policies, and General Principles

ConnDOT Input

Town Officials Input

Supplement any Existing Data

Determine Eligibility

State Road

NO

Consider Education, Enforcement or More Traditional Traffic Safety Improvements

YES

Conduct **Community Meeting** to Define Problems/Goals

Move Forward with Traffic Calming Project?

NO

YES

2. Develop a Plan

Collect and Analyze Traffic Data

Review TOOLBOX and Complete Initial Screening of Traffic Calming Measures

Conduct **Community Workshop** to Further Screen/Refine Options

Meet with Abutters Directly Affected by Plan

Review with Emergency, Transit Providers and Bike/Ped Interests

Develop Draft Recommended Traffic Calming Plan

Conduct **Public Meeting** to Present Draft Traffic Calming Plan and Finalize

NO CONCENSUS

YES CONCENSUS

STOP

END PROCESS

FINALIZE PLAN

3. Funding, Design, and Approvals

Rank/Prioritize Project

Identify & Secure Funding

$ $ $

NO FUNDING

YES FUNDING

Hold Project

Design - Both Temporary and Permanent Measures

Obtain Approvals and Permits

4. Installation and Evaluation

Install Temporary Traffic Calming Measures

NO

Install Permanent Measures

YES

Collect Data and Monitor Conditions

Conduct Post-Construction Evaluation

Conduct **Public Meeting** to Consider Permanent Measure

Modify if Necessary

Public Input

NO

YES

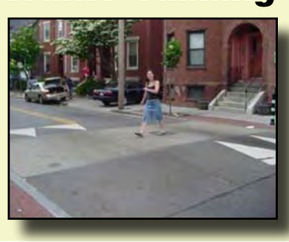
Remove Temporary Traffic Calming Measures

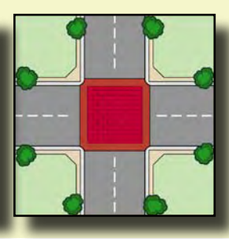
Modify if Needed and Install Permanent Measures

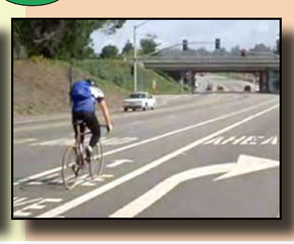
Plan/Program Regular Maintenance

Figure 1: The Process of a Traffic Calming Project

Traffic Calming can WORK!



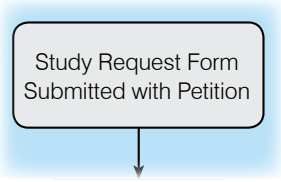




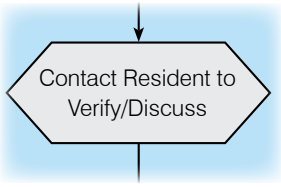
Traffic Calming Process

Initiate a Study

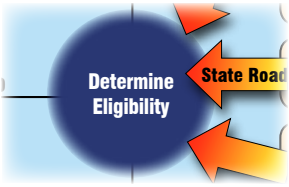
A recognized traffic safety issue is the foundation for conducting a traffic calming study. Typically, the initial awareness of a problem comes from a citizen's complaint. If a traffic safety issue is significant, residents should have a means to alert municipal staff and to request a traffic calming study.



Study Request Form: A resident/neighborhood group, local official or municipal employee should formally submit a study request form. A generic request form is provided in the Appendix of this manual. The intent of the form is to provide contact information and details on the traffic problem. A resident (or municipal employee) signature is required to initiate the study process. Additionally, a municipality could require the form to have multiple signatures or include a petition signed by a certain percentage (50-75%) of the street/neighborhood property owners in order to initiate a study.



Contact Resident: The Traffic Calming Program Coordinator should telephone the applicant to verify the information on the application and gain any additional insight into the problem. The Coordinator should inform the resident of the next steps and when the evaluation will be complete. It may be prudent for the Coordinator to meet the resident/applicant at the site to discuss the problems. This will also enable the coordinator to photograph the site. The Coordinator should also review/determine the initial study area. In addition, a letter should be sent to the resident informing them that their application has been received and is being reviewed for eligibility to initiate a study.



Determine Eligibility: First, the Traffic Calming Program Coordinator will need to perform an initial screening of the application to see if it meets **eligibility criteria**. Eligibility criteria will need to be established by each municipality. In general the criteria can be based on roadway classification, land use, speed limit and average daily traffic (ADT) volume. Example eligibility criteria is shown below:

Roadway functional classification and land use: Traffic calming measures will be considered on the following roadway types:

- Local residential streets (two lane and not including cul-de-sacs)
- Collector streets with predominately residential uses (two lane)
- Arterial roads – within downtown or school districts and /or with posted speeds of 40 mph or less (typically two lane)

Speeds and Accident History: Traffic calming measures will be considered when:

- The 85th percentile speed exceeds the posted speed limit by more than 10 mph.
- Accident data shows a high incident of accidents that appear to be related to excessive speeds.
- The Average Daily Traffic (ADT) volume exceeds X, XXX vehicles per day or the peak hour volume is greater than XXX vehicle per hour.

◆ Traffic Calming Process

Speed, accident, and volume data may not be known at this time, therefore the decision to move forward may need to be based on street functional classification and land use only. A traffic calming study may also be initiated because of an identified public safety issue.

If the study request does not meet the criteria; or if enforcement and education efforts have not been attempted; then these should be considered.

> *An example of an enforcement effort would be to have a police officer or radar trailer monitor speeds in the area. The neighborhood could also consider establishing a "watch dog" group.*

Additional Existing Data - The Coordinator should try to supplement the request with any available existing data. Additional data may include crash reports from the police department, existing traffic volume data, and speed monitoring data.

If the application and existing resources are void of any data to support or supply initial documentation of the problem, the Coordinator may decide at this time to collect actual field data. Any data collection (traffic, pedestrian counts, etc.) should be performed in accordance with standard traffic engineering methods and municipal procedures.

State Roads - The Coordinator also needs to determine if the study roadway or any adjacent roadways (in the case of diverting traffic) are state owned or operated roadways. If the roadway is a state road then the Connecticut Department of Transportation (ConnDOT) input and approval is needed. The Coordinator should contact ConnDOT at this point to receive feedback. Traffic calming measures installed on state roads may require a legal agreement with ConnDOT and the Municipality.

> *Typically traffic calming measures are not suited for state roads as they tend to be roadways with higher classifications and speeds and are designed as a means to serve through traffic. Also, traffic calming may not be suitable on roads (state or local) that carry a significant amount of truck traffic or are transit, major school bus, or emergency service routes*.

Meet with Municipal Officials - After additional data has been assembled, the Coordinator should conduct a meeting with the Local Traffic Calming Advisory Committee and/or appropriate municipal officials (Police, Department of Public Works, etc) to discuss the project and evaluate its potential to move forward in the process.

Contact Resident/Applicant - If it is determined that the process should not move forward, the Coordinator should document this and inform the resident/applicant. Additional education or enforcement measures could be considered as well as more traditional traffic engineering safety improvements. The Coordinator should also inform the resident/applicant of when it would be appropriate to re-submit an application. A one to two year wait period is typical.

<u>Conduct Community Meeting</u> – If it is determined that the project should move forward, the first step is to inform the applicant and to arrange a neighborhood meeting. The goal of this meeting is to define the concerns and study goals (what is the problem and what are we trying to achieve?). It is important that the residents and municipal staff have the opportunity to express their

perspectives on the traffic problems and to hear the views and experiences of their neighbors. This meeting will enable a shared definition of the problem to de developed. The Coordinator should prepare a summary of the meeting and document the statements and problems. The summary should also include a general list of items the residents are in general agreement on and those they are not.

The neighborhood meeting should be held at a convenient place and time (typically early in the evening). The meeting should be attended by the Traffic Calming Program Coordinator and other appropriate municipal staff. The Coordinator should have a large base map of the area and photographs to reference the site and facilitate discussion. The meeting should also offer comment cards or other opportunity for written input. A short summary of the meeting purpose and agenda should be prepared as a handout.

Evaluation: At this point, based on input from the neighborhood meeting, the municipality needs to decide if the process should move to the Plan Development stage. The decision should be based on a general agreement on the traffic concern/problem and on the need to take action. This can be determined in several ways:

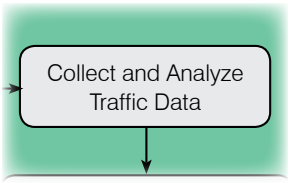
- Via a post card survey sent to all neighborhood residents
- A show of hands at the neighborhood meeting – would you like us to work with you to develop a plan to address this problem – and would you like us to do nothing.
- A petition generated by the applicant with neighborhood signatures stating the request to develop a plan.
- Other

Typically a show of hands at the neighborhood meeting is the quickest and least expensive way to aid in the decision making. It does not provide written documentation but gives indication if the neighborhood supports moving forward to develop a traffic calming plan. There will be subsequent opportunities for the neighborhood to comment in the plan development process. If there appears to be general consensus (about 75%), the process should move forward to the plan development stage. Moving to this stage does not guarantee that a project will be implemented; rather it commits to exploring traffic calming options to alleviate the concerns. If there is not consensus to develop a plan, additional education or enforcement could be considered or the process ended. The outcome needs to be conveyed in writing by the Traffic Calming Program Coordinator to the applicant. An outline of the next steps should also be included. If the process is not moving forward, an option for re-applying at a future date (typically one to two years) should be offered.

Traffic Calming Process

Develop a Plan

After the project has been initiated and the traffic problems, concerns, and goals defined, the next step is to explore options and develop a reasonable and acceptable solution. The following outlines steps to develop the plan.



Collect and Analyze Traffic Data: As a supplement to the data supplied by the applicant, and as necessary to supplement any existing data, the Coordinator should arrange/perform the necessary data collection. The data collected can also be used to document the "before traffic calming" condition. The appropriate type of data to be collected and the data collection times need to be determined with input from a traffic engineer. Traffic volume and speeds are generally the basis of a traffic calming study request.

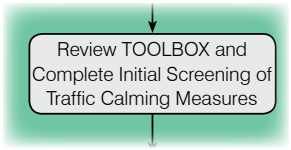
> *The 85th percentile speed is defined as the speed at or below which 85 percent of the motorists on a street are traveling. This is often considered the upper limit of a reasonable speed for the prevailing conditions. Generally speed becomes a concern when the 85th percentile speed exceeds the posted speed limit by 10 miles per hour (MPH) or more.*

Table 2 is a brief summary of data types and methods. Depending on the problem, other types of data may be needed. All traffic data should be collected according to standard traffic engineering practices and in accordance with any municipal procedures.

Table 2: Traffic Data Studies

Traffic Study	Use of Data	Method to Collect
Traffic Volume	To determine directional hourly volumes and Average Daily Traffic (ADT) volume over a period of several days or during peak hours	ATR counter Turning movement counts (TMCs)
Traffic Speed	To determine 85th percentile speed	ATR counters or radar
Accident Data	To determine the magnitude and trends of safety issues	Local or State accident records
Crash Reports	To determine causes of accidents	Police reports
Origin-Destination Survey	To determine amount of local traffic vs. through traffic	License plate survey or pull over interview.
Pedestrian/Bicycle Survey	Determine location, volume, and frequency of activity	Visual observation
Vehicle Classification Counts	Determine percentage of trucks and buses	ATR counter
Physical Conditions Inventory	To determine travel lane width, presence of sidewalks, parking, posted speed limit, land use, etc	Visual observation

Traffic Calming Process



Review Toolbox: The Traffic Calming Program Coordinator with input from the Local Traffic Advisory Committee should review the Traffic Calming Toolbox (as presented earlier in this document) to perform an initial screening of potential traffic calming measures. Using screening mechanisms such as the spreadsheet shown in Figure 2, the Traffic Calming Coordinator should identify what measures might be appropriate and might not be appropriate to address the defined concerns/problems.

Figure 2: Traffic Calming Evaluation Matrix (partial)

Traffic Calming/ Roadway Safety Strategies	Description	Advantages	Disadvantages	Reduce Speeds	Increase Roadway Safety	Increase Pedestrian Mobility	Reduce Cut-Through Traffic	Emergency Access Impacts	Noise Impacts	Cost	Overall Feasibility
Speed Hump	Raised area of roadway deflecting both the wheels and frame of traversing vehicle. (Typically 12,14 or 22 feet long)	Slows traffic, increases awareness, permanent.	Noise, maintenance, need for signage.	●	●	●	●	●	●	M	1
Raised Crosswalk	Elongated speed hump with flat section where pedestrians cross	Slows traffic, increases awareness, permanent.	Noise, cost, maintenance, need for signage.	●	●	●	●	●	●	M	1
Median Barrier	Elevated median constructed on the centerline of the roadway to reduce width of travel lanes.	Reduces pedestrian exposure, creates landscaping potential, reduces conflicts.	Restricts turns from driveway and alters local travel patterns, cost, right-of-way, maintenance.	●	●	●	●	●	●	H	3
Traffic Island	Raised, often landscaped, area between traffic lanes to control and channelize vehicle turning movements.	Increases awareness, provides pedestrian refuge when crossing, permanent.	Right-of-way impacts, cost, maintenance.	●	●	●	●	●	●	M	1
Traffic Circle	Raised, often landscaped, island in center of intersection requiring vehicles to travel counter-clockwise around island.	Good gateway. Minimizes traffic movement conflicts (no left turns), creates landscaping area, permanent.	Right-of-way impacts, cost, maintenance.	●	●	●	●	●	●	M	2

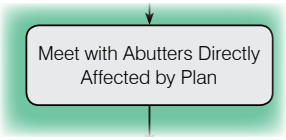
Legend

- ● **Benefit**
- ● **No benefit or impact (neutral)**
- ● **Some impact (but can be designed to minimize impacts)**
- ● **Negative effect or concern**

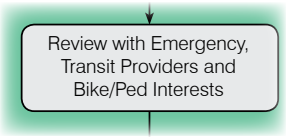
1 = Most Appropriate
2 = Somewhat Appropriate
3 = Not Appropriate

Conduct Community Workshop: Through coordination with the Applicant, the Traffic Calming Program Coordinator should arrange a neighborhood workshop. The purpose of this workshop is to review the concern/problem, present the results of the traffic data and analysis, inform the neighborhood of traffic calming tools and select tools to consider for implementation. This meeting will help to develop a list of traffic calming measures to consider as the plan is developed with insight from the neighbors on what is acceptable to them and what is not. If time allows, this workshop can be used to break into small working groups and ask attendees to develop their own ideas about a traffic calming plan. Once

reconvened as a larger group, each group can share their ideas. Consistency in ideas allows the Coordinator to develop a draft plan that is most likely to have broad support by the neighborhood.

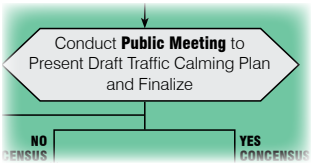


Meet with Key Abutters Impacted by the Plan: The specific placement of traffic calming measures may have localized impacts to abutters. Independent meetings with these abutters is recommended to fine tune placement of measures and/or design. It is particularly important to meet with impacted abutters who have not attended the community meetings.



Review with Emergency & Transit Providers and Bike/Pedestrian Interests – If the street(s) are emergency access, bicycle, major school bus or transit routes then coordination with the appropriate agency is needed to determine what measures from the initial screen list are feasible and how best traffic calming can be integrated. Unfortunately, some traffic calming measure work against the interests of emergency response and bicyclists. Fine tuning design and/or placement might allow for a compromise that meets the interests of all stakeholders.

Develop/Revise Plan – Based on input from the community and the Local Traffic Calming Advisory Committee (or municipal staff), the Traffic Calming Program Coordinator should develop a draft plan to present to the community. The draft plan should include a written and graphic description. The draft plan should reflect the consensus reached to date.



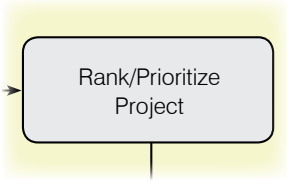
Conduct Public Meeting –A public meeting should be conducted to present the draft plan and receive feedback. Ideally, the meeting should have an "open house" portion where residents/attendees can view the plan and ask questions in an informal, comfortable setting. A formal presentation of the plan should follow with a question and answer and comment period. The goal of this meeting is to obtain concurrence on the traffic calming measures and locations. If there is not consensus on the plan or to install traffic calming measures, then revisions should be considered or the process should end. Consensus can be measured in several ways including formal post card surveys, petitions or an informal vote (raise of hands) at the neighborhood meeting. Design and implementation of the traffic calming measures should only occur if there is consensus or a minimum of 75 percent of the participants or residents in favor. The neighborhood or municipality could also elect to try the traffic calming measure on a temporary basis.

Finalize Plan –The Traffic Calming Program Coordinator should incorporate the comments received from the neighborhood meeting and finalize the traffic calming plan. If substantial changes are required to finalize the plan, additional public meetings may be needed.

Traffic Calming Process

Funding and Design

After consensus has been reached on a plan, the Traffic Calming Program Coordinator needs to determine a project cost and schedule and identify any design needs.



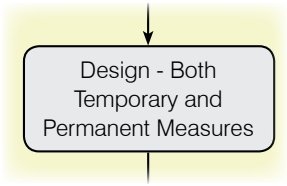
Rank/Prioritize Projects: Sufficient funding and construction scheduling may not be available to complete all of the traffic calming projects requested. A project ranking system should be developed by each municipality. A "first come, first serve" approach may be used or a more formal scoring system could be developed to aid in prioritizing projects. Table 3 is an example:

Table 3: Project Scoring

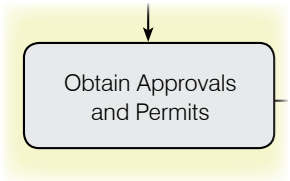
Criteria	Points	Basis
Speed (85th Percentile)	0 to 30	10 points for every 5 MPH over posted speed limit
Volume	0 to 25	5 points for every 1,000
Crashes	0 to 15	1 point for every accident within the last 3 years
No Sidewalks	0 to 10	5 points if no continuous sidewalk, 5 points if heavy pedestrian activity
School crossing	0 to 5	5 points if children must cross street to get to school
Pedestrian generators	0 to 10	5 points for each public facility (park, community center, school)
Study request date	0 to 5	5 points if the neighborhood has been waiting 1 or more years

Identify Funding Sources: Each municipality will need to identify the funding source to construct the traffic calming project. It is possible that some projects might have to wait for funding to become available for construction. Funding could come from the municipality's capital improvement program or from a fund specially created for traffic calming. Private funding may also be an option.

If a project is elected to be installed first as a temporary measure, funding should be secured to remove the measure at the conclusion of the test period and/or construct the permanent solution.



Prepare Design: The level and cost of the design effort will depend on the traffic calming measures selected. Some measures such as traffic circles will require the production of design plans. Municipalities should consider establishing a set of traffic calming design details for speed humps, speed tables, chicanes, bump outs, and traffic circles to aid in the customized design effort.

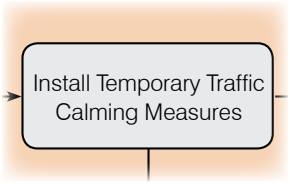


Obtain Permits/Approvals: The Traffic Calming Program Coordinator should obtain any necessary local or state permits or approvals to construct the traffic calming measure. Coordination at the state level (if the measure is to be installed on a state road) should happen early in the study initiation phase and occur periodically through the plan development and design.

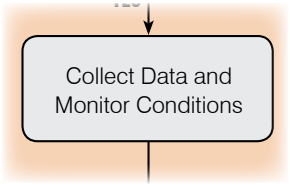
Traffic Calming Process

Installation and Evaluation

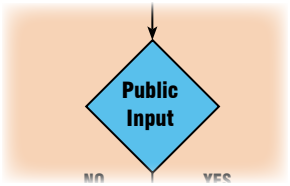
Once the traffic calming measure plan has been approved and designed, it can then be installed on a temporary or permanent basis.



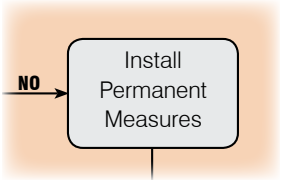
Install Temporary Measure: If traffic flow or roadway conditions are to be significantly altered or if there is desire from the neighborhood to test a traffic calming measure, the traffic calming measure could be installed on a temporary basis. To the extent feasible, the temporary measures should be similar to the permanent ones. Temporary installations provide municipalities with the ability to evaluate the effectiveness of the measure and to remove it easily if desired. It's important that the effectiveness of a certain measure not be overshadowed by it's appearance in temporary form, as many temporary measures are not as attractive as permanent measures.



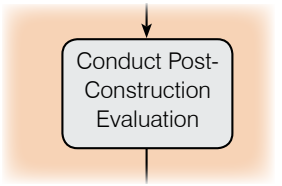
Monitor Conditions: When a temporary measure is installed, it should be monitored over a pre-determined test period to determine its effectiveness and neighborhood acceptance. A test period should last between 6 and 12 months. Near the end of the testing period, additional data should be collected (speed and volume as necessary) to determine if benefits are being achieved. It may be necessary to monitor adjacent streets to determine if the problem has shifted.



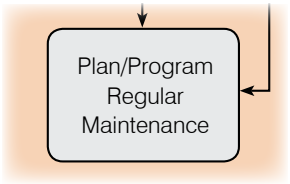
Conduct Public Meeting: Following the testing period, the Local Traffic Calming Coordinator should arrange a public meeting to solicit feedback on the traffic calming measure and to determine if the neighborhood supports installing a permanent measure or prefers the measure to be removed and not replaced. Modifications to the temporary measure can also be considered for the permanent solution.



Install Permanent Measure: A permanent measure can be installed either after the test period for a temporary measure or as an initial installation. As traffic calming continues to grow and traffic calming measures are implemented in other areas of the municipality a temporary measure with a test period may not be needed.



Conduct Post-Construction Evaluation: The municipality may decide to monitor the conditions of a traffic calming measure after it is permanently installed. This collection of data will assist to document how a problem has been changed. Any permanent installation should be in place for at least 6 months before data is collected for evaluation. If necessary the municipality can modify the installed traffic calming measure. If the municipality receives complaints regarding the traffic calming measures these should be documented and addressed.



Maintenance: The municipality should plan and program regular maintenance for all traffic calming measures installed.

South Central Regional Council of Governments (SCRCOG) Traffic Calming Study Pilot Project – North Elm Street, Wallingford, CT

Executive Summary

Introduction

A pilot project was performed as part of the SCRCOG regional traffic calming study. The purpose of this pilot project was to highlight the traffic calming study process developed as part of this Traffic Calming Tools Resource Guide. The SCRCOG region member communities were offered the opportunity to submit an application for consulting services to help develop a traffic calming study for a road in their town/city. The Town of Wallingford's application was selected. The Town of Wallingford requested assistance with a traffic calming study on North Elm Street between Curtis Avenue and Christian Street. Adjacent land use in the study area includes residential and Choate Rosemary Hall school (Choate). Choate is constructing a new dorm on North Elm Street across from Curtis Avenue. As a result of this project Choate requested the Town install stop signs on North Elm Street at Curtis Avenue. The Town responded that they would like to consider other options to slow down traffic and improve pedestrian crossings in the vicinity.

The purpose of this traffic calming study is to provide a "complete" street that accommodates traffic flow and provides pedestrian crossings in a safe environment.

The following is a summary of the steps undertaken for this study. A full report for the traffic calming pilot study is on file at SCRCOG.

Project Initiation

The consultant team initiated the study with a meeting with the Town to gather input and information. The Town supplied accident history and traffic count information. Initial field observations and meetings were conducted with the Town of Wallingford Engineering Department and Police Department as well as Choate Rose Mary Hall School.

Existing Conditions/Data Collection

To better understand traffic and pedestrian operations in the study area, information was collected on traffic volumes (daily, peak hour, and intersection turning movement counts), pedestrian volumes (at key cross walks), traffic speeds (85^{th} percentile), and accident data (latest three years available). Visual observations of existing roadway signing, pavement markings, and pedestrian activity were also performed. Information was also collected on the adjacent land uses.

Community Involvement:

An initial community meeting was held at the Wallingford Town Hall from 6:30 PM to 8:30PM. The consulting team gave a brief presentation that described the study team, study purpose, existing conditions, and traffic claming toolbox summary. It was also explained that the purpose of this first community meeting was to solicit input on issues and concerns in the study area and to identify opportunities to address the problems. The attendees were divided into three subsets for small group discussions on the issues and ideas for addressing them. After the discussion each group summarized its findings.

The project team, including members from the Town, met with members of the Choate Student Council as a means to reach out to key stakeholders/ pedestrians. A brief presentation and work group session similar to the first community meeting was conducted as part of one of the regular student council meetings.

Additional meetings were held with the Town staff (Engineering, Police, Public Works, Electrical Division and the Mayor) and Choate School administration to solicit feedback on preliminary options. A meeting with the fire department/emergency services was not conducted as vertical deflection options (raised crosswalks, speed bumps) were no longer being considered for short-term options.

A second community meeting was conducted at Town Hall to discuss the progress on the North Elm Street Traffic Calming Study and to present the study options. The consultant team gave a brief presentation outlining the issues and options. Following the presentation, a discussion took place regarding what options the community liked and other things to consider.

The study process and options for the Town to consider as it moves forward with funding, approvals, and design were summarized in a formal report prepared for SCRCOG and the Town of Wallingford. The options were presented for short-term and long-term considerations and options for Choate to consider (such as education) were also included.

This study process generally followed the Traffic Calming Project Process flowchart provided in this guide. The Development of a Plan phase was conducted using extensive community outreach. As experienced in this pilot project, the community outreach and stakeholder meetings need to be tailored to the community concerns and project circumstances.

Resources

Traffic Calming Resources/Other Websites:

Institute of Traffic Engineers (ITE) Traffic Calming Library: http://www.ite.org/traffic/
Federal Highway Administration (FHWA) 'Lesson 11' on Traffic Calming: http://safety.fhwa.dot.gov/ped_bike/univcourse/swless11.htm
Federal Highway Administration (FHWA) 'Lesson 20' on Traffic Calming: http://www.tfhrc.gov/safety/pedbike/pubs/05085/chapt20.htm
Federal Highway Administration (FHWA) Designing Sidewalks and Trails for Access: http://www.fhwa.dot.gov/environment/sidewalk2/
National Center for Safe Routes to School: http://www.saferoutesinfo.org/
Florida Traffic and Bicycle Safety Program – Safe Routes to School: http://www.dcp.ufl.edu/centers/trafficsafetyed/html_safe-ways.html
National Highway Traffic Safety Administration's Safe Routes to School guide: http://www.nhtsa.dot.gov/people/injury/pedbimot/bike/Safe-Routes-2002/
Victoria Transport Policy Institute Online TDM Encyclopedia – Traffic Calming http://www.vtpi.org/tdm/tdm4.htm
Municipal Research and Services Center of Washington (State) Traffic Calming Newsletter: http://mrsc.org/Publications/mrnews/mrnews0305.aspx
TrafficCalming.Org's types of traffic calming measures: http://www.trafficcalming.org/measures2.html
TrafficCalming.Org's list of traffic calming references: http://www.trafficcalming.org/references.html
Pennsylvania's Neighborhood Traffic Calming Resource (Bucknell University): http://www.students.bucknell.edu/projects/trafficcalming/
Route 50 Corridor Coalition (Virginia) Information on Traffic Calming: http://www.route50.org/trafclm.html
San Francisco Municipal Transportation Agency (SFMTA) Traffic Calming/Livable Streets website: http://www.sfmta.com/cms/ocalm/13563.html
Henrico County (Virginia) Traffic Calming Website: http://www.co.henrico.va.us/works/traffic/trafficcalming.html
Traffic Calming Guidelines for Norwalk, CT Department of Public Works: http://calmtraffic.org/TrafficCalmingGuidelines.htm
Wikipedia Entry for Traffic Calming: http://en.wikipedia.org/wiki/Traffic_calming

Request for Traffic Calming Study Form

Introduction:
The purpose of this form is to initiate a municipal traffic calming review. It must be completed by a resident (or neighborhood group member). This request will be processed according to procedures in (**Municipal Code/ SCROG Traffic Calming Resource Guide**). Please print clearly. If you have questions regarding this form, please contact XXXX at (203) – XXX – XXXX.

1. Roadway Information:
Indicate the **name(s) of the street (s)** for which the study is being requested and the **limits of the study area** (*i.e. Brown Street from First Avenue to Second Road*).

a. Street Name(s): _____

Limits: From:_____ To: _____

b. Traffic Concern - describe the problem:

c. Description of desired improvement/traffic calming measure:

2. Resident Contact Information - a contact person ***must*** be indicated to process the request.

Name of Resident:_____

Neighborhood Group: _____

Address: _____

Daytime phone #: _____ E-mail: _____

I consent to be the laison/contact person for this traffic calming study request. I understand that completing this form does not guarantee the traffic calming measure will be installed as the (Municipality) will need to consider its merit with respect to safety, costs, emergency access, maintenance and neighborhood acceptance, etc.

Signature:_____

Please attach any additional information/evidence to support the request and mail to:

XXXXXXXXXXX
XXXXXXXXXXX
XXXXXXXXXXX