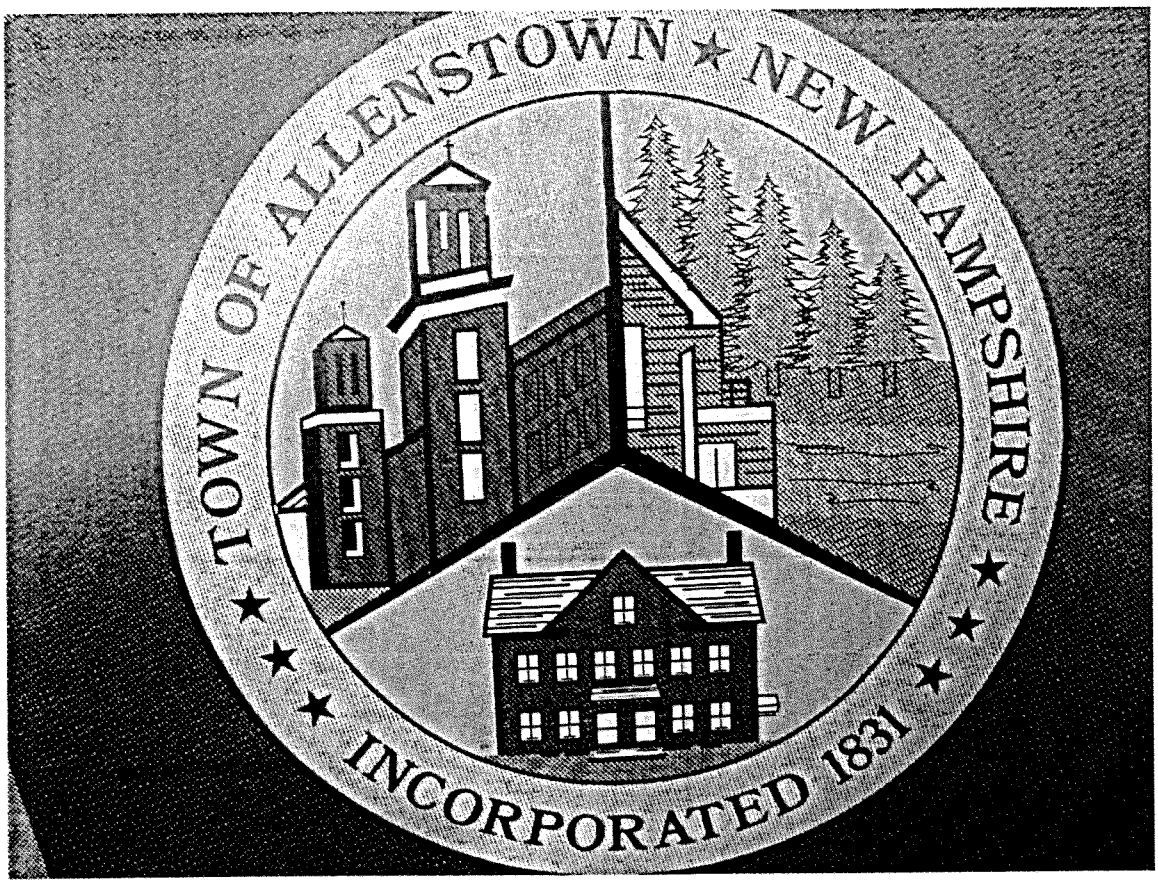
Town of Allenstown

TRAFFIC MANAGEMENT POLICY



TOWN OF ALLENSTOWN
SELECTMEN'S OFFICE
16 SCHOOL STREET
ALLENSTOWN, NH 03275
603-485-4276

CERTIFICATE OF ADOPTION

I hereby certify that the attached Traffic Management Policy was adopted by the Board of Selectmen for the Town of Allenstown in regular session on May 24, 2010.

DIANE M. DEMERS
JUSTICE
MY COMMISSION EXPIRES OCT 7, 2014
OF THE PEACE
NEW HAMPSHIRE

June 7, 2010

Diane Demers
DIANE DEMERS, Town Clerk

Policy Outline

I. Introduction

What is Traffic Calming?

The Town of Allenstown frequently receives requests from its residents about speeding and cut-through traffic in our neighborhoods. Pedestrian safety has become a major concern of area residents and grass root efforts have taken place in the town to promote pedestrian visibility and reduce speeding traffic. As the Town and the surrounding communities continue to grow more traffic on our town streets can be expected, without proper treatment, neighborhood livability will become more adversely affected. For these reasons the Town of Allenstown needs a comprehensive Traffic Management Program.

The term "traffic calming" is defined differently throughout the United States and the world. The Institute of Transportation Engineers, an international educational and scientific association of transportation professionals, defines traffic calming as follows:

> *"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."* [1]

The Town of Allenstown expands this definition to also include consideration of non-physical measures, such as enhanced enforcement.

Multiple Purposes of Traffic Calming

The immediate purpose of traffic calming is to reduce the speed and volume of traffic to acceptable levels. Reductions in traffic speed and volume, however, are just means to other ends such as traffic safety and active street life.[2] Traffic calming is undertaken for many different reasons, including:

- Reducing through traffic
- Reducing truck traffic
- Reducing the occurrence of excessive speeding
- Reducing noise, vibration and air pollution
- Reducing accidents
- Providing safer environment for pedestrians and children
- Reducing crime
- Supporting redevelopment

As discussed later, many different traffic calming tools are available to achieve the above goals.

[1] "ITE Traffic Calming Definition," ITE Journal, Vol. 67, July 1997.

[2] "Traffic Calming, State of Practice," ITE, August 1999.

An Integrated Approach to Traffic Calming

The Town of Allenstown's Traffic Management Program addresses the "too many cars going too fast by my house" syndrome by working closely with residents to identify existing problems, define neighborhood goals, and garner community support. The program relies heavily on community participation and action.

Once a request or complaint regarding a traffic/pedestrian concern is received from a resident, the Town will evaluate the problem and determine whether the concern meets the criteria for taking further action. If it is determined that action is needed, routine solutions or Level 1 actions are considered first. Routine measures consist of low-cost, non-regulatory changes that are often less controversial. These tools include radar speed display units, targeted police enforcement, sign installation, and pavement marking changes.

After reviewing the effectiveness of routine solutions, it may be determined that more assertive measures need to be implemented that include physical alterations. These alterations change the configuration of neighborhood streets, often require engineering design, are higher-cost, and require community acceptance prior to installation. These physical alteration measures consist of physical devices such as speed tables, roundabouts, curb extensions, median islands, and a host of other measures described within this report.

The Town's policy for traffic calming includes opportunity for community involvement. Residents, businesses and property owners will be expected and asked to comment on solutions and alternative concepts as they are presented to the community.

Future Program Updates

The Town of Allenstown's Traffic Management Program is considered a "living document," that is, it will be updated from time to time as new traffic calming techniques are developed and tested. As the Town's neighborhoods gain more experience with traffic calming, procedures may be revised. In addition, traffic calming device installation guidelines will be added as they are developed.

What's included in this Report?

The Town of Allenstown's Neighborhood Traffic Management Program report is divided into the following four chapters:

- *Chapter I. Introduction:* This chapter provides an overview of the Town of Allenstown's Traffic Calming Program.
- *Chapter II. Traffic Calming Toolbox:* Presents descriptions of various Level 1 and Level 2 traffic calming tools.
- *Chapter III. Traffic Calming Impacts:* Provides discussion of travel speed and volume, collision potential, and emergency response impacts.
- *Chapter IV. Implementation Process*: Discusses the Town of Allenstown's integrated and community-driven traffic calming approach.

II. Traffic Calming Toolbox

Application of Tools

The traffic calming toolbox includes a variety of measures that range from a simple solution to a significant change in the physical environment. Each situation is different and selected measures must be appropriate for that specific location. This toolbox displays the different types of traffic calming and their appropriate uses, the limitations, advantages, disadvantages, and the associated costs.

Before committing to any type of measure in response to a resident or neighborhood request, it is important to carefully research the issue and determine if the problem is perceived, or real, through data collection and observation. All factors and conditions that may be contributing to the problem need to be reviewed and evaluated before any type of measure can be recommended. For example, to reduce speeds in a neighborhood, residents may want to consider a speed hump or speed table to slow down traffic if it increased police enforcement or speed regulation signage is proved not to be effective. The installation of a vertical deflection element can be very effective in reducing speed on a residential street but is not a realistic option if the street is classified as an emergency response route. It is important to understand all of the issues associated with each tool and to identify the most appropriate one for a specific circumstance.

It is also important to recognize that certain sets of measures are more effective for problems associated with cut-through traffic than speeding, or pedestrian safety. The measures in the toolbox should be adhered to and used for the purposes recommended.

Table 2.1 provides a general assessment and application criteria for traffic calming measures. Chapter 3 provides more specific detail on each measures effects on traffic speeds, volumes, vehicle collisions, and other quality of life measures.

Level 1 Traffic Calming Tools

Level 1 measures consist of easy-to-implement and low-cost tools, such as neighborhood traffic safety campaigns, radar speed display units, targeted police enforcement, sign installation, and pavement marking changes. Level 1 measures, as discussed in Chapter 3, will always be implemented and tested prior to consideration of more restrictive measures. Level 1 actions primarily consist of education and enforcement tools.

The following pages provide a gallery of potential Level 1 traffic calming measures.

Neighborhood Traffic Education Campaign

Level 1

Description: Neighborhood traffic safety campaigns include: personalized letters, neighborhood flyers, meetings, workshops, specific school programs, and neighborhood speed awareness signs or banners.

Application: The intended benefit of conducting neighborhood traffic safety campaigns is usually to make residents aware of local speed limits and other traffic and safety concerns.

Advantages:

+ Allows residents to discuss views.
+ Identifies issues of concern.
+ Enables staff to see concerns.
+ Reduces speeds temporarily.

Disadvantages:

- Effectiveness may be limited.
- Meetings need to stay focused.
- Potentially time consuming.
- Enforcement still likely required.

Special Considerations:

- Neighborhood traffic safety campaigns can consist of letters and/or flyers.
- Often, neighborhood meetings or workshops are conducted.
- Any meetings or workshops need to stay focused on specific traffic issues.
- Neighborhood speed awareness signs or banners are sometimes used.
- Sometimes only effective over a short duration.

Cost:

Varies

Speed Display Unit

Level 1

Description: The most common form of radar speed display unit is a portable trailer equipped with a radar unit that detects the speed of passing vehicles and displays it on a reader board, often with a speed limit sign next to the display.

Application: The primary benefit of speed display units is to discourage speeding along neighborhood streets.

Advantages:

+ Effective educational tool.
+ Good public relations tool.
+ Encourages speed compliance.
+ Can reduce speeds temporarily.

Disadvantages:

- Not an enforcement tool.
- Ineffective on multi-lane roadways.
- Less effective on high volume streets.
- Subject to vandalism.

Special Considerations:

- Used throughout the town on an ongoing basis.
- The purpose of the units is to remind drivers that they are speeding.
- Encourage compliance with the posted speed limit.
- Usually only effective in reducing speeds when actually being used.
- In longer term (30 days), speeds can decrease by 6% on low volume roads.
- Effect usually negligible on higher volumes streets serving through traffic.
- Some motorists may speed up to try to register a high speed.
- Should not be used in remote areas.

Approximate Cost:

- $250 **per day**.

Higher Visibility Crosswalks

Level 1

Description: Higher visibility crosswalks can be created by using paving blocks or contrasting color concrete, or painting "zebra" stripes in lieu of or between the crosswalk's outer boundary stripes.

Application: The primary benefit of high visibility crosswalks is to increase crosswalk visibility to drivers.

Advantages:

+ More visible than traditional crosswalks.
+ Indicates preferred crossing location.
+ Can slow travel speeds.
+ Can be aesthetically pleasing.

Disadvantages:

- Pedestrians may ignore traffic more.
- Only used at uncontrolled crosswalks.
- Usually require more maintenance than traditional crosswalks.

Special Considerations:

- Higher visibility crosswalks indicate preferred crossing location to pedestrians.
- Pedestrians may place too high a reliance on ability to control driver behavior.
- Specially paved types require more maintenance than traditional crosswalks.
- Should only be used at uncontrolled crosswalks.
- Less expensive, but not as effective as raised crosswalks (Level 2).

Appropriate Cost:

- $1,000 to $5,000 each.

Targeted Police Enforcement

Level 1

Description: The Police Department deploys patrol officers to perform targeted enforcement on residential streets for specified period of time.

Application: The intended benefit of targeted police enforcement is to make drivers aware of local speed limits and to reduce speeds.

Advantages:

+ Visible enforcement very effective.
+ Driver awareness increased.
+ Can be used on short notice.
+ Can reduce speeds temporarily.

Disadvantages:

- Temporary Measure.
- Requires long-term use to be effective.
- Fines lower than enforcement cost.
- Disrupts traffic on high volume streets.

Special Considerations:

- Police enforcement is continually in effect throughout the town.
- Usually used only on neighborhood streets with documented speeding problems.
- Typically only effective while officer is actually monitoring speeds.
- Often helpful in school zones.
- May be used during "learning period" when new devices first implemented.
- Long-term benefits unsubstantiated without regular periodic enforcement.
- Expensive.

Approximate Cost:

- About $75 per hour for officer and equipment.

Narrowing Lanes

Level 1

Description: On this Level 1 type of measure, striping is usually used to created narrow lanes – often about 10 feet wide. The "unused" pavement can be used to stripe bicycle and/or parking lanes.

Application: The primary benefit of narrowing lanes through striping is to slow vehicle speeds.

Advantages:

+ Can be quickly implemented.
+ Slows travel speeds.
+ Improves safety.
+ Can be easily modified.

Disadvantages:

- Increases regular maintenance.
- Not always perceived as effective tool.
- Adds striping to neighborhood streets.
- Increases resurfacing costs.

Special Considerations:

- Narrowed travel lanes provide "friction" and can slow vehicle speeds.
- Can be installed quickly and easily revised over time.
- Designated bicycle lanes and/or parking lanes can be created.
- Adds centerline and edge line striping to neighborhood streets.
- Can be used around curves to "force" vehicles to stay within lanes.
- On curves, raised dots are usually most effective in centerline.

Approximate Cost:

- $1,000 to $3,000 each.

Speed Limit Signage and Reduction

Level 1

Description: 25 mile per hour speed limit signs are installed along neighborhood streets.

Application: The primary benefit of installing speed limit signing is to encourage slower vehicle speeds along residential streets. Signs are only installed along streets where speeding is a problem.

Advantages:

+ Clearly defines legal speed limit.
+ Can reduce speeds if enforced.
+ Usually popular with neighborhood.
+ Low cost installation.

Disadvantages:

- Requires on-going police enforcement.
- Not effective solely by themselves.
- Low speed limits may be unreasonable.
- Adds additional signs in neighborhood.

Special Consideration:

- Should only be used on streets where speeding is documented as a problem.
- Requires police enforcement to remain effective.
- Speed limits lower than 25 mph are not permitted by statute other than school zones.
- Unrealistically low speed limits tend to be disregarded.
- Increases cost of sign maintenance.

Approximate Cost:

- $200 per sign.

Stop Signs

Level 1

Description: Stop signs are either installed on the "side street" where no signs currently exist – or on the "main street" at an intersection where the "side street" already has stop signs.

Application: Stop signs should only be considered when warranted based on established criteria.

Advantages:

+ Requires traffic to stop.
+ Assists pedestrian crossings.
+ May slightly reduce cut-thru traffic.
+ Lowers speeds at stop signs.

Disadvantages:

- May lead to increased mid-block speeds.
- Increases noise and air pollution.
- Can create problems if unwarranted.
- May increase emergency response time.

Special Considerations:

- Stop signs should only be installed if warranted based on established criteria.
- Drivers may not comply with stop signs if installation is unwarranted.
- Mid-block speeds can increase to make up for "lost" time.
- At low volume, unwarranted locations, many drivers will "roll" through.
- Can create safety problems for pedestrians when compliance is poor.
- Stop signs may increase certain types of collisions, e.g., rear-ends.
- Stop signs may reduce other types of collisions, e.g., broad sides.
- May increase emergency response times.
- Increases noise near intersection due to vehicle deceleration and acceleration.

Approximate Cost:

- $200 per sign.

Restricted Movement Signing

Level 1

Description: Turn prohibition signs involve the use of standard "No Left Turn", "No Right Turn", or "Do Not Enter" signs to prevent undesired turning movements onto residential streets. They may include peak period limitations.

Application: The primary benefit of restricted movement signing is to reduce cut-through traffic volumes along residential streets.

Advantages:

+ Redirects traffic to main streets.
+ Reduces cut-through traffic.
+ Can address time-of-day problems.
+ Low cost.

Disadvantages:

- May divert traffic to other streets.
- Require enforcement.
- Adds more signs to neighborhood.
- Usually not effective all day.

Special Considerations:

- Restricted movement signing is best used on major or collector streets.
- Most effective at periphery of a neighborhood to prevent entering traffic.
- Has little or no effect on speeds for through vehicles.
- Turn prohibitions can be used on a trial basis.
- Violation rates are about 50% without enforcement.
- With active enforcement, violation rates are reduced to about 20%.
- Turn restrictions are most effective when limited to peak hours.
- Less effective when applied around-the-clock.
- 24-hour turn restrictions better served with closures than with signing.

Approximate Cost:

- $200 per sign.

Level 2 Traffic Calming Tools

Level 2 or Physical Alterations of neighborhood streets, often require engineering, are higher-cost, and require community acceptance prior to installation. Level 2 measures are only used after standard solutions or Level 1 measures have been implemented and proven ineffective in addressing particular neighborhood traffic needs. Before Level 2 traffic calming actions are constructed, the neighborhood and Town staff must carefully evaluate the benefits and disadvantages of each action.

The following pages provide a gallery of potential Level 2 traffic calming measures. It is often possible to combine elements of various Level 2 actions or to slightly modify treatments.

Combining Traffic Calming Measures

Often, the most effective traffic calming programs use a variety of traffic calming tools. Combinations of traffic claming measures can be used, and are often encouraged, in different neighborhoods and even along the same street. As shown in the toolbox of Level 1 and Level 2 applications, many of the measures complement each other. For instance, speed humps and chokers can be used effectively together, as can traffic circles and curb extensions. Center median islands and chokers are often installed as a set. Raised crosswalks and curb extensions work well together. Many other combinations of traffic calming tools can be effective.

Use of Temporary Measures

Whenever feasible, the Town of Allenstown will install temporary Level 2 traffic calming devices subject to an assessment of impacts and support of the residents. It should be noted that while the use of temporary devices can help determine the resulting travel speed and traffic volume changes, temporary devices are usually not aesthetic. Because of this, there is always the risk that residents will criticize the device's appearance instead of its effectiveness in traffic calming. However, the use of attractive materials, colors and composition can create acceptable temporary devices. For example, planters, which provide greenery as well as access control, can be used as temporary street closures.

Median Island

Level 2

Description: Median islands are raised islands in the center of a street that can be used to narrow lanes for speed control and/or to create a barrier to prohibit left-turns into or from a side street. They can also be used for pedestrian refuges in the middle of a crosswalk.

Application: Median islands are used on wide streets to lower travel speeds and/or to prohibit left-turning movements. They are also often used to provide a mid-point refuge area for crossing pedestrians.

Advantages:

+ Effectively reduces vehicle speeds.
+ Can reduce collision potential.
+ Reduces pedestrian crossing.
+ Opportunity for landscaping.

Disadvantages:

- Could require parking removal.
- May require driveway access.
- Could impact emergency vehicles.
- May divert traffic volumes.

Special Consideration:

- Median islands, when used to block side street access, may divert traffic.
- In this condition, they may impact emergency response times.
- Median islands may visually enhance the street through landscaping.
- Median islands used for lane narrowing should result in at least 12' lanes.
- Fire departments usually prefer median islands to some other measures.
- Bicyclists prefer not to have travel way narrowed.

Approximate Cost:

- $10,000 to $75,000 each (depending on size).

Gateway

Level 2

Description: Gateway entrance treatments consist of physical and textural changes to streets and are located at key entryways into a neighborhood. They often consist of features, like chokers, that narrow a street in order to reduce the width of the street's right-of-way.

Application: The primary benefit of gateway treatments is speed reduction. They provide visual cues that tell drivers they are entering a local residential area or that the surrounding land uses are changing.

Advantages:

+ Can reduce vehicle speeds.
+ Created identity for neighborhood.
+ Can discourage cut-through traffic.
+ Opportunity for landscaping.

Disadvantages:

- Maintenance and irrigation needs.
- May require removal of parking.
- Can impede truck movements.
- Created physical obstruction.

Special Considerations:

- Gateways have minimal influence on driver's routine behavior.
- Overall speeds and volumes are usually only minimally influenced.
- Gateway treatments make drivers more aware of neighborhood environment.
- Can incorporate neighborhood identification signing and monuments.
- Care should be taken not to restrict pedestrian visibility at adjacent crosswalk.
- Textured pavements could introduce some new noise.

Approximate Cost:

- $10,000 to $20,000 each.

Curb Extension/Bump-Out

Level 2

Description: Curb extensions narrow the street by extending the curbs toward the center of the roadway or by building detached raised islands to allow for drainage and bike lanes passage.

Application: Curb extensions are used to narrow the roadway and to create shorter pedestrian crossings. They also improve sight distance and influence driver behavior by changing the appearance of the street.

Advantages:

+ Better pedestrian visibility.
+ Shorter pedestrian crossing.
+ Can decrease vehicle speeds.
+ Opportunity for landscaping.

Disadvantages:

- Can require removal of parking.
- May create hazard for bicyclists.
- Can create drainage issues.
- Difficult for truck turns to right.

Special Considerations:

- Curb extensions can be installed at intersections or mid-block (see chokers).
- Mid-block checkers are often used with pedestrian crossing treatments.
- Curb extensions should not extend into bicycle lanes.
- Curb extensions at transit stops enhance service.
- No noise or emergency service impacts.
- May require landscape maintenance to preserve sight distances.

Approximate Cost

- $10,000 to $20,000 each.

Choker

Level 2

Description: Chokers are mid-block curb extensions that narrow a street by extending the sidewalk or widening the planting strip. The remaining cross-section can consist of one lane or two narrow lanes.

Application: Chokers are intended to reduce traffic volumes by making the roadway narrow so that only one car at a time can pass through it, or two cars can pass very slowly in opposite directions.

Advantages:

+ Effectively reduces vehicle speeds.
+ Shorter pedestrian crossing.
+ Provides improved sight distance.
+ Opportunity for landscaping.

Disadvantages:

- Can require removal of parking.
- May create hazard for bicyclists.
- Can create drainage issues.
- May impede truck movements.

Special Considerations:

- Chokers can be designed with protected bike lane next to original curb.
- Chokers with exclusive bike lanes can collect debris in bike lane.
- Can impact driveway access.
- Also reduce travel speeds when cross-section reduced substantially.
- Preferred by many emergency response agencies to other measures
- Provide excellent opportunities for landscaping.

Approximate Cost:

- $10,000 each.

Speed Hump

Level 2

Description: Speed humps are asphalt mounts constructed on residential streets. They are usually placed in a series and spaced 300 to 600 feet apart. Speed humps are typically 14 feet long and 3 inches high. Their vertical deflection encourages motorists to reduce speed.

Application: The primary benefit of speed humps is speed control. They work well in conjunction with curb extensions.

Advantages:

+ Effectively reduces vehicle speeds.
+ Does not require parking removal.
+ Can reduce vehicular volumes.
+ Easily tested on temporary basis.

Disadvantages:

- Slows emergency vehicles.
- Increases noise near speed humps.
- May divert traffic to parallel streets.
- Not esthetically pleasing.

Special Considerations:

- Vehicle speeds between humps have been shown to decrease by up to 25%.
- Volumes may decrease of parallel route, without measures, is available.
- Possible increase in traffic noise from braking and accelerating.
- Highest noise increase from buses and trucks.
- Speed humps reduce emergency vehicle response times.
- 3-5 second delay per hump for fire trucks, 10 seconds for ambulances.
- Speed humps require advance-warning signs and object marker at hump.
- Difficult to construct precisely, unless pre-fabricated.

Approximate Cost:

- $5,000 each.

Raised Sidewalk

Level 2

Description: Raised crosswalks are crosswalks constructed 3 to 4 inches above the elevation of the street. They are usually about 22 feet long, with a flat section in the middle and ramps on the ends. Sometimes the flat portion is constructed with brick or other textured materials.

Application: Raised crosswalks are intended to reduce vehicle speeds specifically where a high amount of pedestrians cross the street.

Advantages:

+ Effectively reduces vehicle speeds.
+ Good pedestrian safety treatment.
+ Does not affect access.
+ Flat portion can be textured.

Disadvantages:

- May generate increased noise.
- Can require drainage modifications.
- Only 3 seconds delay for fire trucks.
- Often require signage and markings.

Special Considerations:

- Raised crosswalks are usually 22 feet long, with a 10-foot wide flat section.
- Lower elevation than sidewalk to alert visually impaired it's a crosswalk.
- Careful design is needed due to potential drainage issues.
- Usually preferred by Fire Departments over standard speed hump.
- Work well in combination with curb extensions and curb radius reductions.
- Do not affect access.
- Increases pedestrian visibility and likelihood that driver yields to pedestrian.
- Often referred to speed tables or speed platforms.

Approximate Cost:

- $5,000 to $10,000 each.

Raised Intersection/Speed Table

Level 2

Description: A raised intersection is a flat, raised area covering an entire intersection. There are ramps on all approaches. The plateau is usually about 4" high. Usually, the raised intersection is finished in brick or other textured materials.

Application: Raised intersections are used to reduce through movement speeds and provide safer street crossings for pedestrians.

Advantages:

+ Effectively reduces vehicle speeds.
+ Good pedestrian safety treatment.
+ Can be aesthetically pleasing.
+ Does not affect access.

Disadvantages:

- Expensive to construct and maintain.
- Requires drainage modifications.
- Affects emergency vehicle response.
- May require bollards to define corners.

Special Considerations:

- Raised intersections usually used in urban areas.
- Make entire intersections more pedestrian-friendly.
- Work well with curb extensions and textured crosswalks.
- Often part of an area wide traffic calming scheme involving both streets.
- Expensive.
- Special signing often required.

Approximate Cost:

- $25,000 to $50,000 each.

Mini-Roundabout

Level 2

Description: Mini-roundabouts are raised circular islands in an intersection. They are typically landscaped with ground cover and/or street trees. Mini-roundabouts require drivers to slow down to a speed that allows them to comfortably maneuver around the circle in a counterclockwise direction.

Application: The primary benefit of a mini-roundabout is speed control and reduction in angle and turning collisions.

Advantages:

+ Effectively reduces vehicle speeds.
+ Reduces collision potential.
+ Provides better side-street access.
+ Opportunity for landscaping.

Disadvantages:

- Parking removal required.
- Can increase bike/auto conflicts.
- Can impede emergency vehicles.
- Can restrict large vehicle access.

Special Considerations:

- Mini-roundabouts are best used in a series or with other devices.
- About 30 feet of curbside parking must be prohibited in advance of roundabout.
- Buses can maneuver around roundabouts at slow speeds.
- Noise impacts are minimal.
- If well-maintained, traffic circles can be attractive.
- However, there are also a lot of signs and pavement markings required.
- May require utility relocation and right-of-way access.
- Mini-roundabouts are less effective at T-intersections and offset intersections.

Approximate Cost:

- $15,000 to $25,000 each.

Roundabout

Level 2

Description: Roundabouts are raised circular islands in an intersection. They are typically landscaped with ground cover and/or street trees. Roundabouts require drivers to slow down to a speed that allows them to comfortably maneuver around the circle in a counterclockwise direction. Roundabouts are used to control major intersections with relatively high volumes and speeds.

Application: The primary benefit of a roundabout is to reduce speeds approaching the intersection and a reduction in angle and turning collisions.

Advantages:

+ Effectively reduces vehicle speeds.
+ Reduces collision potential.
+ Provides better side-street access.
+ Opportunity for landscaping.
+ Less expensive to operate than a traffic signal.
+ Minimize queuing at the approach to an intersection.

Disadvantages:

- Parking removal required.
- Can increase bike/auto conflicts.
- Can impede emergency vehicles.
- Can restrict large vehicle access.

Special Considerations:

- Roundabouts are best used in a series or with other devices.
- Curbside parking must be prohibited in advance of roundabout.
- Buses can maneuver around roundabouts at slow speeds.
- Noise impacts are minimal.
- If well-maintained, roundabouts can be attractive.
- However, there are also a lot of signs and pavement markings required.
- May require utility relocation and right-of-way access.

Approximate Cost:

- $300,000 to $400,000

Traffic Signal

Level 2

Description: Signalization of major intersections will regulate traffic through bust intersections and directly impact traffic flow and speeds.

Application: The primary benefit is to reduce the volume and severity of collisions at high traffic volume intersections.

Advantages:

+ Effectively reduces vehicle speeds.
+ Low impact to emergency vehicles.
+ Can discourage through traffic.
+ Can reduce severity of traffic collisions.

Disadvantages:

- Parking removal may be required.
- May direct traffic to other streets.
- Maintenance responsibility.
- May intensify queuing at approach to an intersection.
- Fairly expensive.

Special Considerations:

- Improvement may also discourage some cut-through traffic.
- No significant impedance to fire and transit service.
- May require road re-alignment for turning lanes.
- Possible to vary traffic control with timed signalization.

Approximate Cost:

- $150,000 to $1,000,000 each.

Intersection Channelization

Level 2

Description: Providing channelization at three-legged intersections forces previous straight-through movements to make slower turning maneuvers.

Application: The primary benefit of realigning intersections is to slow traffic down. Can also be used to redirect traffic to another facility or to provide neighborhood gateway.

Advantages:

+ Effectively reduces vehicle speeds.
+ Low impact to emergency vehicles.
+ Can discourage through traffic.
+ Opportunity for landscaping.

Disadvantages:

- Parking removal required.
- May direct traffic to other street(s).
- Maintenance responsibility.
- Fairly expensive.

Special Considerations:

- Intersection channelization slows traffic down near the intersection.
- Improvement may also discourage some cut-through traffic.
- No significant impedance to fire and transit service.
- Provide landscaping opportunities and potential gateway treatments.
- Can require drainage modifications.
- Possible to vary traffic control with stop signs on one or all three legs.

Approximate Cost:

- $15,000 to $20,000 each.

Chicane

Level 2

Description: A chicane is a series of two or more staggered curb extensions on alternating sides of a roadway. Horizontal deflection influences motorists to reduce speed through the serpentine roadway.

Application: The primarily benefit of chicanes is speed control without a significant impact to emergency vehicle mobility.

Advantages:

+ Effectively reduces vehicle speeds.
+ Low impact on emergency vehicles.
+ Does not restrict resident access.
+ Opportunity for landscaping.

Disadvantages:

- Significant parking loss.
- Increased maintenance.
- May require right-of-way.
- Expensive.

Special Considerations:

- Chicanes cannot usually be used where right-of-way is limited.
- May require removal of substantial amounts of on-street parking.
- Alternatively, on-street parking can be used to create a chicane.
- Most effective conflicts with pedestrians and bicyclists.
- Chicanes provide landscaping opportunities.
- Most residents would have their driveways affected by type of installation.
- No expected noise impacts.

Approximate Cost:

- $20,000 to $40,000 each.

Restricted Movement Barrier

Level 2

Description: Restricted movement barriers are raised islands that prevent certain movements at an intersection. They are often landscaped.

Application: The primary benefit of restricted movement barriers is to reduce cut-through traffic levels. They also provide pedestrian refuge areas for street crossings.

Advantages:

+ Redirects traffic to other streets.
+ Reduces cut-through traffic.
+ Provides pedestrian refuge area.
+ Opportunity for landscaping.

Disadvantages:

- Redirects traffic to other streets.
- Will increase trip lengths.
- May impact emergency response.
- Creates physical obstruction.

Special Considerations:

- Barriers have little or no affect on speeds for through vehicles.
- Should not be used on critical emergency response routes.
- Reduces number of potential conflict points for turning vehicles.
- Possibility for landscaping.
- Many variations are possible, including prohibiting turns to/from main street.
- Design needs to consider drainage needs.
- Usually require signing.

Approximate Cost:

- $5,000 each.

Entrance Barrier

Level 2

Description: Entrance barriers are curb extensions or barriers that restrict movements into a street. They are constructed to approximately the center of the street, effectively obstructing one direction of traffic. Entrance barriers create a one-way segment at the intersection, while maintaining two-way traffic for the rest of the block.

Application: The primary benefit of entrance barriers is traffic volume reduction.

Advantages:

+ Reduces cut-through traffic.
+ More self-enforcing than signs.
+ Shorter pedestrian crossings.
+ Opportunity for landscaping.

Disadvantages:

- May divert traffic to other streets.
- Con increase trip lengths.
- Potential parking removal.
- Maintenance responsibility.

Special Considerations:

- Restrict movements into street while allowing resident access within block.
- Potential use must consider how residents will gain access.
- In emergency situations, emergency vehicles can gain access.
- But, required maneuver may increase emergency response times.
- Can be provided on opposite intersection corners.
- Bicycles are typically permitted to travel through in both directions.
- Entrance barriers can be nicely landscaped.
- In effect at all times, even when cut-through volumes may be low.

Approximate Cost:

- $15,000 to $20,000 each.

One-way Streets

Level 2

Description: This measure converts a segment of a two-way street to one-way operations.

Application: The primary benefit of two-way to one-way street conversions is reduction in cut-through traffic.

Advantages:

+ Redirects traffic to other streets.
+ Reduces cut-through traffic.
+ Improved safety with one-way.
+ Emergency services can bypass.

Disadvantages:

- Can encourage increased speeds.
- Redirects traffic to other streets.
- Will increase trip lengths.
- Requires signage.

Special Considerations:

- Restrict movements into street while allowing resident access within block.
- Potential use must consider how residents will gain access.
- Bicycles are typically permitted to travel through in both directions.
- In effect at all times, even when cut-through traffic volumes may be low.
- Can be accomplished with just signing and pavement markings.
- Possible to landscape channelizing islands, but maintenance required.
- Often used in combination with other one-way street conversions.

Approximate Cost:

- $5,000 each.

Diagonal Diverter

Level 2

Description: Diagonal diverters are raised areas placed diagonally across a four-legged intersection. They prohibit through movements by creating two "L" shaped intersections.

Application: The primary benefit of diagonal diverters is reduction in traffic volumes. These type of diverters also minimally decrease speeds near the intersection.

Advantages:

+ Reduces cut-through traffic.
+ Self-enforcing.
+ Reduces collision potential.
+ Opportunity for landscaping.

Disadvantages:

- Redirects traffic to other streets.
- May increase trip lengths.
- Can impede emergency vehicles.
- Always in effect.

Special Considerations:

- Diagonal diverters can be designed to allow emergency vehicle access.
- Can be designed to allow pedestrian and bicycle access.
- They may shift problems elsewhere unless strategic program developed.
- Provide advantage over complete street closure as circulation less impacted.
- Can be attractively landscaped.
- Has little or no effect on speeds for local traffic.

Approximate Cost:

- $15,000 to $35,000 each.

Street Closure

Level 2

Description: Full street closures are barriers placed across a street to completely close the street to through-traffic, usually leaving only sidewalks open. Sometimes called cul-de-sacs or dead-ends.

Application: Cul-de-sacs and street closures are intended to change traffic patterns. They are very effective at reducing cut-through and general traffic volumes.

Advantages:

+ Reduces cut-through traffic.
+ Reduces speeding near device.
+ Self-enforcing.
+ Opportunity for landscaping.

Disadvantages:

- Directs traffic to other streets.
- Increases trip lengths.
- Affects emergency response time.
- May lose some on-street parking.

Special Considerations:

- Cul-de-sacs/street closures typically used after other measures have failed.
- Often used in sets to make travel circuitous – typically staggered.
- Require strategic pattern of devices to not shift problem elsewhere.
- Can be placed at an intersection or mid-block.
- Not used on major emergency response routes or transit routes.
- May be designed to allow emergency vehicle access.
- Usually designed with small opening to allow bicyclists and pedestrians.
- Often consist of landscaping.

Approximate Cost:

- $20,000 to $35,000 each.

Lane Reduction

Level 2

Description: Lane reductions (Road Diets) are often conversions of four-lane undivided roads into three lanes (two through lanes and a center turn lane). The fourth lane may be converted to bicycle lanes, sidewalks, and/or on-street parking.

Application: Lane reductions are intended to reduce vehicle speeds and vehicle interactions during lane changes by allowing only two travel lanes and a center turn lane.

Advantages:

+ Reduces speeds.
+ Reduces severity of collisions.
+ Shorter pedestrian crossing.
+ May increase on street parking.
+ Can allow for bike lane.

Disadvantages:

- May divert traffic to other streets.
- May increase the percentage of angle collisions.
- Speed reductions not as effective as other more restrictive measures.

Special Considerations:

- Fourth lane can be used for on street parking, bike lanes, or pedestrian access.
- Lane reductions have a higher percentage of angle crashes.
- Costs can be low to moderate.

Approximate Cost:

- Varies.

Lane Additions

Level 2

Description: Lane additions are often conversions of two-lane undivided roads into three lanes or more lanes. Designed with the movement of traffic as the highest priority.

Application: Lane additions are intended to alleviate traffic congestion by allowing turn lanes or additional travel lanes.

Advantages:

+ Reduces traffic congestion.
+ May reduce the number of volumes.

Disadvantages:

- May increase the amount of traffic vehicular crashes.
- May reduce on street parking.
- May impede vehicle turning movements.
- Less pedestrian friendly at crossings.

Special Considerations:

- Although it may reduce traffic congestion, traffic volumes will be expected to increase over time as traffic circulation deviates from surrounding streets that were once used for cut through traffic.
- Turning lanes may reduce the number of collisions.
- May be costly if drainage improvements, utility relocation and right-of-way access is required.
- Not pedestrian friendly, as street becomes longer to cross.
- Traffic moving at a faster rate may increase the number of collisions.

Approximate Cost:

- Varies.

3. Traffic Calming Impacts

This chapter describes impacts of different types of traffic calming measures. Using qualitative and quantitative data available from before-and-after studies, the ability of various Level 2 or physical alteration devices to reduce travel speeds, cut-through traffic volumes, and collision potential are discussed. In addition, traffic calming measures' impact on emergency responsiveness is presented. Level 1 or standard solution impacts are not discussed since very few before-and-after studies have been conducted on these types of traffic calming improvements.

Travel Speeds

One of the primary goals of traffic calming is to reduce travel speeds on residential streets. In traffic engineering, speed distributions are typically represented by 85th percentile speeds since it is generally felt that at least 85% of the drivers operate at speeds which are reasonable and prudent for the conditions pertaining in each situation. Most of the speed data available from before-and-after studies of traffic calming are 85th percentile speeds.

Table 3.1 summarizes the speed impacts of various traffic calming measures. The data shown in the table is based on the results of hundreds of before-and-after studies.

Table 3.1 Speed Impacts Downstream of Traffic Calming Measures

Sample Measure	Sample Size	85th Percentile			Percentage Change*
		Avg. Before Calming	Avg. After Calming	Change After Calming	
Speed hump	179	35.0	27.4 (4.0)	-7.6 (3.5)	-22 (9)
Raised Crosswalk	58	36.7	30.1 (2.7)	-6.6 (3.2)	-18 (8)
Raised Intersection	3	34.6	34.3 (6.0)	-0.3 (3.8)	-1 (10)
Roundabout	45	34.2	30.3 (4.4)	-3.9 (3.2)	-11 (10)
Narrowing	7	34.9	32.3 (2.8)	-2.6 (5.5)	-4 (22)
Entrance Barrier	16	32.3	26.3 (5.2)	-6.0 (5.2)	-19 (11)
Diagonal Diverter	7	29.3	27.9 (5.2)	-1.4 (4.7)	-4 (17)

*Measures within parentheses represent the standard deviation from the average.
Source: "Traffic Calming, State of the Practice," ITE, August 1999.

As shown in Table 3.1, speed humps have the greatest impact on 85th percentile speeds, reducing them by an average of more than seven miles per hour (mph), or 20%. Raised intersections and roundabouts have the least impact.

It should be noted that the speed impacts of traffic calming measures rely not only on the geometries of the device, but the spacing between successive devices. Previous studies indicated that speeds increase about 0.5 to 1.0 mph for every 100 feet of separation for speed hump spacing up to 1,000 feet.

Traffic Volumes

Another primary goal of traffic calming is to reduce cut-through volumes on residential streets. Traffic volume impacts are much more complex and site-specific as compared to speed impact because of the availability of alternative routes and split of traffic between localized trips (that need to travel along the traffic calmed location) and through traffic (which can often take another route).

Although traffic volume changes are difficult to assess, based on previous studies, two measures of impact are summarized in Table 3.2. The table provides information on average percentage change in daily traffic under treatment. The results shown in Table 3.2 should be viewed as representative only.

Table 3.2 Volume Impacts of Traffic Calming Measures

Sample Measure	Sample Size	Average Percent Change in Volume* (vehicles per day)
Speed hump	143	-18 (24)
Raised Crosswalk	46	-12 (20)
Roundabout	49	-5 (46)
Narrowing	11	-10 (51)
Entrance Barrier	53	-42 (41)
Diagonal Diverter	27	-35 (46)
Full Closure	19	-44 (36)

*Measures with parentheses represent the standard deviation from the average.
Source: "Traffic Calming, State of the Practice," ITE, August 1999

Traffic volume changes are usually the greatest when roadway closure devices are used, such as entrance barriers, diagonal diverters and cul-de-sacs. Of Level 2 measures, roundabouts typically have the least effect in reducing traffic volumes.

It should also be pointed out that while implementation of certain traffic calming devices can reduce traffic volumes along the intended route, they may also increase traffic volumes along nearby residential streets. This potential impact should be considered before deciding on which traffic-calming tools are to be implemented.

Collisions

By slowing traffic, eliminating conflicting movements, and increasing drivers' attention, traffic calming can result in fewer collisions. And, due to lower speeds, they are often less serious when collisions do occur.

Table 3.3 compares before-and-after collision frequencies for various Level 2 traffic calming measures. As shown, several traffic-calming devices reduce the potential for collisions. Roundabouts are very effective as they lower the number of potential vehicle conflict points (since no left-turn or straight-through movements are allowed).

Table 3.3 Average Annual Collision Frequencies Before and After Traffic Calming

Sample Measure	Sample Size	Average Annual Collisions		
		Before Calming	After Calming	Percentage Change
Speed hump	50	2.62	2.29	-13
Raised Crosswalk	8	6.71	3.66	-45
Roundabouts	130	2.19	0.64	-71

Source: Unpublished documents supplied by traffic calming programs.

Many traffic-calming measures not only reduce the potential for collisions between two or more vehicles, but also between vehicles and pedestrians or between vehicles and bicyclists. Several treatments improve the sight distance between these modes, and/or provide safe refuge areas for crossing non-motorized users. On the other hand, some measures that reduce travel lane widths could increase the potential for conflicts between vehicles and bicyclists.

Emergency Responsiveness

Any traffic calming tools that are effective due to their ability to physically control traffic could also negatively impact several classes of emergency vehicles. The Town of Allenstown and its residents place a very high priority on minimizing emergency response times.

Several localities have performed controlled tests of speed humps, raised crosswalks, and roundabouts to see how much delay they produce. Table 3.4 presents the test results.

Table 3.4 Emergency Response Time Study Results

Community	Measure	Delay at Slow Point (seconds)
Austin, Texas	12 –foot speed hump	2.8 – Fire Engine 3.0 – Ladder Truck 2.3 – Ambulance 9.7 – Ambulance with patient
Berkeley, California	12 –foot speed hump 22 –foot raised crosswalk	10.7 – Fire Engine 9.2 – Ladder Truck 3.0 – Fire Engine 13.5 – Ladder Truck
Boulder, Colorado	12 –foot speed hump 25 –foot roundabout	2.8 – Fire Engine 7.5 – Fire Engine
Montgomery Co., Maryland	12 –foot speed hump 18 –foot roundabout	2.8 – Ladder Truck 3.8 – Ambulance 4.2 – Fire Truck 7.3 – Pumper Truck 5.4 – Ladder Truck 3.2 – Ambulance 5.0 – Fire Truck 7.0 – Pumper Truck
Portland, Oregon	14 –foot speed hump 22 –foot raised crosswalk 16-24 –foot roundabout	5.2 – Fire Engine 2.9 – Custom Rescue Vehicle 6.6 – Ladder Truck 3.0 – Fire Engine 0.3 – Custom Rescue Vehicle 3.0 – Ladder Truck 6.1 – Fire Engine 3.1 – Custom Rescue Vehicle 8.4 – Ladder Truck

*Assumes a 35-mph response cruising speed.
Source: "Traffic Calming, State of Practice," ITE, August 1999.

As shown in Table 3.4, regardless of the traffic calming measure or fire-rescue vehicle, the delay per traffic calming measure is nearly always under 10 seconds. Roundabouts appear to create longer delays than speed humps, but speed humps have a greater probability of damage to fire-rescue vehicles and injury to patients in ambulances. Finally, speed tables, because they are longer, create shorter delays than speed humps.

Consideration of traffic calming devices will always include a review of possible negative impacts, including emergency response times.

4. Implementation Process

The Town of Allenstown's Neighborhood Traffic Management Program is based on substantial community participation. Because residents are expected to be the primary initiators of traffic calming requests and must live day-to-day with the resulting actions, the Town includes neighborhood participation throughout the process. Development of successful traffic management programs depends on strong interaction between the community and Town staff.

One of the intents of the program is to provide a clear structure for addressing traffic concerns in the Town's neighborhoods. Traffic concerns may exist throughout an entire neighborhood, or may be specific to a particular street, segment of roadway, or at a spot location. The Town's implementation process of traffic calming solutions will require community support to be successful. The process allows implementation of traffic calming tools in a timely manner in conditions where problems could be addressed with fairly routine solutions. The six step process, as shown in Figure 4.1, outlined by the Town allows for the opportunity to seek routine solutions to problems identified with minimum fanfare as well as more costly solutions including regulatory changes and physical characteristics changes that will require public input and one or more votes by the Board of Selectmen.

Community Identification of the Problem and Step 1 and 2
The traffic calming process beings once a traffic request or complaint has been submitted to the Board of Selectmen. The Police Department and/or Highway Department will evaluate the situation. The Police Department or Highway Department will document the neighborhood concern, conduct a field investigation, and collect data, as appropriate (e.g., traffic volumes, collision data, travel speeds, etc.). If no problem has been identified Town staff will submit a report to the Board of Selectmen and/or complainant. If Town staff determines that the neighborhood's identified problem can be easily reduced or alleviated with a routine solution (Level 1: e.g., easily implementable and low cast tools, non-regulatory changes), the Town will program implementation of the most appropriate improvement(s). Once these changes have been implemented, results will be monitored.

Step 3 or Standard Solution Implementation Process
If it is determined that routine solutions will not work for the problem identified then a Level 1 – Standard Solution may be recommended. These solutions may include a stop sign, traffic signal, speed limit change, a change in on street parking, increased visibility of crosswalks, etc. A neighborhood informational meeting will be held to present the alternatives suggested to rectify the traffic problem and draw support for a corrective action. A public hearing and vote by the Board of Selectmen will be recommended in support of the action. Once the action is approved, the Town will undertake the design either with Town staff or a consultant. Another neighborhood meeting will be held to review final design. Action will be implemented and results will be monitored for effectiveness.

Step 4 or Traffic Calming Solution Implementation Process for Minor and Neighborhood Streets

In certain instances routine and standard solutions may be proven to be ineffective and may not be the most practical. Town staff may recommend traffic calming Level 2 measures that may include curb extensions, speed tables, roundabouts, refuge islands, etc. Town staff will hold a neighborhood meeting to present alternative concepts and then report to Board of Selectmen. The Boards role will be to review the neighborhood to be impacted and on a case-by-case basis define the affected area from which project support must be received. A petition from the affected area must have 60% support of business owners and residents for the project to proceed. Only one petition signature will be granted per business or household.

Once a 60% supportive petition is received by the Town, a public hearing will be scheduled and the Board of Selectmen will be asked for approval to proceed with the project. If the Board of Selectmen grants approval, a design will be developed by staff or a consultant. A preliminary plan will be developed and a trial installation of the measure will be undertaken to determine its effectiveness. A letter and ballot will then be sent to residents, businesses, and property owners. To determine if the project should proceed, a one-third response rate must be received by the Town for the ballot to be considered valid and a 60% positive vote of the ballots received is required for the project to move forward. If the ballot yields positive results then a final public hearing will be held, followed by a Board of Selectmen decision and funding appropriation.

Once the project has final approval and the project funding is in place, the final design work can be completed. The final design will be presented at a neighborhood meeting before construction begins. After a traffic calming measure is constructed, it will be monitored closely to ensure that the measure is effective.

Step 5 or Traffic Calming Solution Implementations Process for Arterial and Collector Streets

Arterial and collector streets have a greater impact on the general public as they help to move high volumes of traffic throughout the Town. Traffic calming measures along these major routes need to have the support of the entire community and not just the property owners and residents adjacent to the street since it can greatly disrupt traffic patterns throughout the Town. Due to the potential for differing objectives between abutters and through travelers it would not be possible to define the impacted area to petition or ballot so the process is somewhat different from the Step 4 process.

Town staff will hold a neighborhood meeting to present alternative concepts and make recommendations to the Board of Selectmen. A public hearing will be scheduled and a recommendation forwarded to the Board of Selectmen for their review and decision. If the Board of Selectmen grants approval and necessary funding then the project design will be completed. Staff will then review the final design with direct abutters. A final public hearing will be held by the Board of Selectmen prior to bidding and construction of the project. After completion the project will be monitored for its effectiveness.

Step 6 or Public Safety Override and New Development Process
Under certain situations, Town staff will initiate a safety or operational investigation that may require action. This might occur where a series of accidents have taken place at a busy intersection or a significant increase in traffic volumes or speeding has occurred. Town staff will examine toolbox solutions and will make appropriate recommendations. A neighborhood informational meeting will be held to present alternative concepts developed by staff. A public hearing will be scheduled by the Board of Selectmen and a final decision made as to whether the project should proceed. If the Board of Selectmen grants approval then a final design will be developed and a neighborhood meeting will be held to review the design before the measure is constructed.

Funding Considerations
Funding for the implementation of a traffic-calming plan should be considered throughout the plan development process. The level of funding available may limit the traffic calming measures that can be considered. It must be reiterated that traffic calming devices can be costly. If the Town intends to proceed with a traffic management program, serious consideration needs to be given to providing capital budget funds for design and construction. If the recommendations included in this policy report are adopted by the Board of Selectmen, it needs to be recognized that significant staff resources will be required to manage and implement the design and community participation aspects of the process. If a neighborhood wants to implement a more extensive plan than what Town staff and Board of Selectmen believe are to resolve the identified problem(s), then the Board of Selectmen may need to approve the plan and either appropriate additional funds and/or seek financial participation by the neighborhood making the request.

Removal Costs and Procedure
In certain cases the neighborhood may request that traffic-calming measures be removed. If the request for the removal of the measure happened within the first five years of installation then the neighborhood will be expected to take primary responsibility in the cost of removal as may be determined by the Board of Selectmen. The process for the request must include a petition from the affected area and must have 60% support of business owners and residents for the request to proceed. Once a 60% supportive petition is received by the Town, a public hearing will be scheduled and the Board of Selectmen will be asked for approval to proceed with funding and removal. If the Board of Selectmen grants approval, a letter and ballot will then be sent to residents, businesses, and property owners. To determine if the removal process should proceed, a one-third-response rate must be received by the Town for the ballot to be considered valid and a 60% positive vote of the ballots received is required for the project to move forward. If the ballot yields positive results then a final public hearing will be held, followed by a Board of Selectmen decision and responsibility of payment of costs for removal.

If the installation has been installed for over 5 years then the neighborhood will not be expected to share in the costs of removal. However, the steps for removal will be the same as listed above.