

Chapter 7: Traffic Calming



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 “livability” of streets for residents and visitors. Enhanced safety is one of the most fundamental benefits of traffic calming. By decreasing the volume and/or reducing the speed of motor vehicles, the number and severity of crashes is greatly diminished.

What techniques are used in traffic calming?

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. Engineering techniques are the focus of this chapter. 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. Volume control attempts to minimize motor-vehicle volumes or cut-through traffic through restricted turns, roadway closures or median barriers. Speed control measures include **passive** concepts such as gateways or streetscapes that change a driver’s perception of a corridor as well as **active** concepts that force a driver to physically alter their travel path and slow down. Certain safety enhancements, such as in-pavement lighting or raised crosswalks, have the additional benefits of raising driver awareness and slowing traffic, and are typically implemented in combination with other traffic calming techniques. Education and enforcement programs should be considered before, and as a complement to, engineering efforts.

What does Traffic Calming do?



Passive traffic calming techniques can include visual prompts that give drivers the perception that they are entering a traffic-calmed area. Examples include streetscaping and/or landscaping, textured/colorized pavement, on-street parking, striped bicycle lanes or variable message signs with speed radar. Passive traffic calming also includes creating a physical environment where the driver slows down as a reaction to changes in the roadway. Examples include narrowed lanes, rumble strips, and on-street parking.

Active traffic calming could include vertical deflection, or raised roadway treatments that force the motorist to slow down, such as speed humps/tables, raised crosswalks, or raised intersections. Active traffic calming could also include horizontal deflection to limit the speed a vehicle can safely travel through an intersection or along a roadway, such as full or mini-roundabouts, chicanes,

or center island medians. Lastly, active traffic calming could also include constrictions, or horizontal extensions that limit vehicle speed by narrowing the travel way such as curb extensions, neck downs, bulb outs, or pedestrian island refuges.

Effective traffic calming strategies often include using more than one measure. Traffic calming decisions should be made using a systematic approach. Measures should be appropriately spaced and any secondary effects of the installations must be considered.

There are several communities in New Jersey that have developed traffic calming programs or implemented traffic calming measures. These include: Hoboken, Maplewood, Fair Lawn, Woodbury, Haddonfield, Camden, Montclair, and Lawrence Township.



Pedestrian refuge in Lawrence Township, NJ. Image: NJDOT

Institute of Traffic Engineers

“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.”

Types of Traffic Calming Measures Best Suited for School Zones

The following describes and illustrates various traffic calming measures which can be employed in and around school zones. In addition to describing the measures, a list of general benefits and drawbacks associated with each measure is also presented. The intent is to provide the reader with a quick indication of what might be expected if this measure is implemented.

Following the descriptions, a matrix provides a concise summary of the traffic calming tools.

Gateway

Description: A signing and/or landscaping treatment to alert motorists they are entering a lower speed environment and they should expect bicyclists and pedestrians. A gateway treatment can be used at entrances to school zones, neighborhoods, commercial areas, town centers, or busy places of activity. Gateways can be as simple as signs and landscaping. They are typically supplemented with other traffic calming measures such as bulb outs, public art and raised crosswalks.

Benefits: Can be visually aesthetic and heighten awareness. Creates a unique image for an area.

Drawbacks: Can require routine maintenance.

Costs: Varies



Gateway to Forest Hill School in Camden, NJ.

Image: VTC

Stationary Radar Sign/ Speed Display Board/ Speed Feedback Sign

Description: Radar signs are interactive signs that draw motorists' attention to their speed and the road's legal speed limit. They work by informing motorists when they are 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.

Benefits: Radar signs have proven to slow down traffic, even years after their initial installation. They are particularly effective on high volume arterials, where physical measures would restrict traffic flow, as well as local roads and in school zones.

Drawbacks: 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



Temporary speed feedback trailer in Jersey City, NJ.

Image: The RBA Group



Permanent speed feedback sign in front of an elementary school in Delanco, NJ. Image: NJDOT

Pavement Marking/Stencil

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. Bicycle lanes can be striped and on-street parking can be delineated. Pavement markings are also used in conjunction with signs and other measures.

Benefits: Low cost and easy to install. Can increase motorist awareness of pedestrians and bicyclists.

Drawbacks: Requires regular maintenance. Not visible with snow-covered roads.

Costs: Low



SLOW SCHOOL ZONE pavement marking in Ridgewood, NJ.
Image: The RBA Group

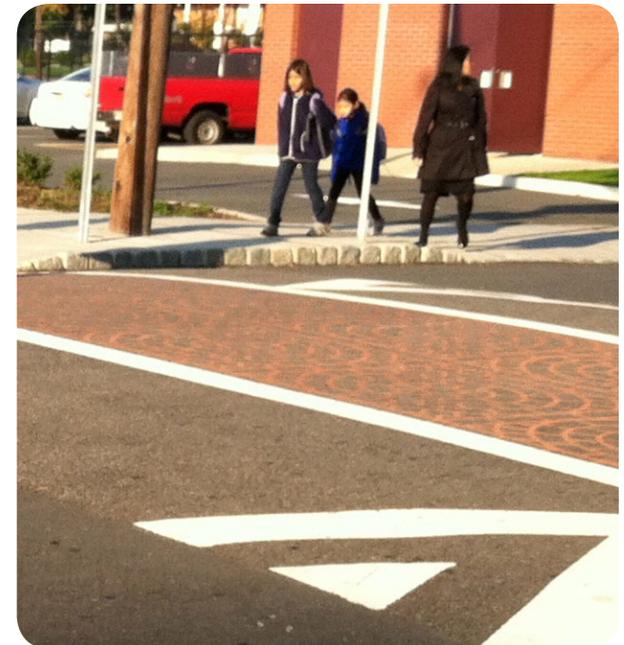
Textured and Colored Pavement

Description: Paving materials such as brick, cobbles, stamped concrete or concrete pavers can be used to delineate separate space for pedestrians or bicyclists. 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. However, limiting the special pavement to edges, such as on-street parking lanes or center line is preferred. Stamped concrete or concrete pavers are preferred to bricks or blocks for pedestrian zones or bicycle paths because they offer a smoother travel surface. Striping may still be necessary to maximize visibility for motorists in inclement weather or darkness.

Benefits: 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.

Drawbacks: Some materials, particularly cobblestones, present a hazardous riding surface to bicyclists and may be uncomfortable for pedestrians, especially those in wheelchairs. 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: Low to Moderate. Costs vary depending on materials used and size of paving area.



Textured crosswalk in Montclair, NJ.
Image: The RBA Group

Landscaping

Description: Landscaping defines pedestrian and vehicle areas, reduces the visual width of the roadway, and provides a more pleasant street environment for all. Landscaping can include trees, bushes and/or planters which can be planted in the buffer area between the sidewalk and the street. Landscaping is often used in conjunction with other traffic calming measures such as roadway narrowing, traffic islands, and sidewalk improvements.

Benefits: 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.

Drawbacks: Depending on the design, the installation and maintenance costs can be high. Maintenance costs can be minimized by choosing appropriate plants and providing adequate space for them to grow.

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



Landscaped buffer in Jersey City, NJ. Image: The RBA Group

Rumble Strips

Description: Rumble strips are raised buttons or grooves closely spaced on the 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 the shoulders of freeways to alert drivers who might veer or drift off the road. They are also placed in the centerline area to alert drivers who may be drifting into oncoming traffic.

Benefits: 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.

Drawbacks: 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



Rumble strips in Newark, NJ. Image: The RBA Group

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.

Benefits: Can be low cost. Increases awareness.

Drawbacks: Can clutter the roadway especially on residential streets. 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.



In-Street Stop for Pedestrians Sign with SCHOOL plaque mounted above the sign in Glen Ridge, NJ.
Image: The RBA Group

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. Visually narrowing travel lanes using paint while leaving a several foot shoulder that emergency vehicles or cyclists can utilize, effectively provides a narrow lane for motorists and a wider lane for emergency vehicles and law enforcement. Lanes can also be physically narrowed by providing on-street parking on one, or both, sides or by adding bollards, planters, or bike lanes. Narrowing traffic lanes makes 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.

Benefits: Excess right-of-way can be shifted to providing wider sidewalks, bicycle lanes, or on-street parking. Simple roadway restriping to achieve roadway narrowing is inexpensive.

Drawbacks: Without other provisions for bicyclists, the narrower road may increase motor vehicle/bicycle conflicts.

Costs: Varies depending on method of narrowing the roadway.



Narrowing the travel lanes on River Road in Hudson County, NJ allowed room for bike lanes. Image: NJ.com

Hoboken's Traffic Calming Toolkit

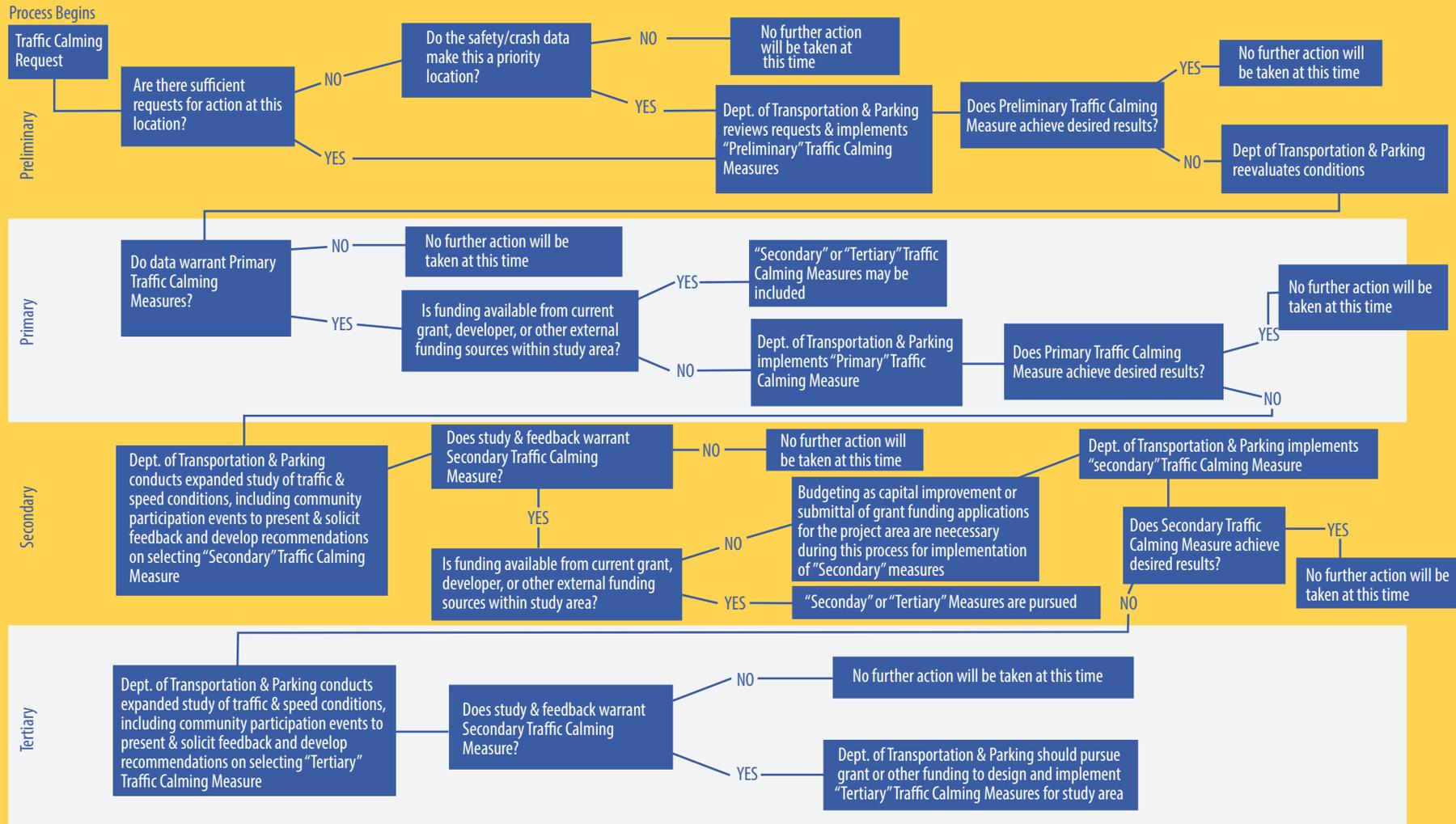
In 2011, the City of Hoboken prepared a Traffic Calming Toolkit to provide residents and community leaders with information about the City's Traffic Calming Policy, to highlight common traffic calming measures, and to explain the protocol used in selecting the most appropriate measures for each application. For more on the City's Traffic Calming Program, visit www.hobokennj.org/departments/transportation-parking/traffic-calming-toolkit/.

Hoboken's Traffic Calming Decision Making Process

- Step 1** Department of Transportation and Parking reviews traffic calming requests and conducts data collection and evaluation.
- Step 2** If poor conditions are found, the Department of Transportation and Parking will consider implementation of "Preliminary" (*enforcement operations, general education campaigns, repainting pavement markings, lane narrowing striping, signs*) or "Primary" (*changes to speed limits, informational signs, bike lanes*) Traffic Calming measures.
- Step 3** If after further evaluation poor conditions continue to persist, the Department of Transportation and Parking will conduct an expanded study of traffic and speed conditions, including community participation events, to present and solicit feedback and develop recommendations for "Secondary" (*changes to lane and/or parking configurations, speed humps, mini roundabouts*) Traffic Calming measures. Budgeting as capital improvement or submittal of grant funding applications for the project area is necessary during this process for implementation of "Secondary" measures.
- Step 4** If the above efforts do not result in desirable results, the Department of Transportation and Parking will pursue grants or other funding sources to design and implement "Tertiary" (*raised crosswalks, curb extensions, chicanes*) Traffic Calming measures for the project area.

The following flow chart below represents the steps in the City's traffic calming decision making process.

Hoboken's Traffic Calming Toolkit



Speed Humps

Description: Speed humps are rounded, raised areas across the roadway that cause vehicles to reduce speeds. They are usually found on neighborhood streets (low-volume), not on major roadways or primary emergency vehicle routes. Speed humps should terminate before the gutter pan, so as to not interfere with proper storm water drainage. They are sometimes broken up to allow a clear path for bicyclists, and include signage and paint markings so that they are visible.

Benefits: Speed reduction. Relatively low-cost. Easy to test.

Drawbacks: Increased roadway noise. Increased maintenance costs. Requires additional costs for signage. Extra care is required when snowplowing.

Costs: Varies depending on material (\$1,000 - \$12,000 each)



Speed hump in front of an elementary school in West Orange, NJ. Image: The RBA Group

Raised Crosswalks

Description: Raised crosswalks are elongated speed humps that feature a marked crosswalk at the same elevation as the adjacent sidewalks. Crosswalk markings or contrasting crosswalk materials (pictured) show this element is also a crosswalk. As both a marked crosswalk and a traffic calming element, raised crosswalks provide a superior safety advantage to pedestrians. They can be found at intersections or mid-block and should only be used in high pedestrian travel areas. They are most appropriate on streets with only moderate traffic (<10,000 trips/day). This type of facility is particularly effective where heavily used trails cross roadways.

Benefits: Speed reduction. Increase visibility of and for pedestrians.

Drawbacks: Noise. Maintenance. Need for signage

Costs: Moderate (\$2,000 - \$15,000 each)



Raised crosswalk at Somerville School in Ridgewood, NJ. Image: The RBA Group

Raised Intersections

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. The entire intersection is at sidewalk grade, putting pedestrians and vehicles on the same plane.

Benefits: Speed reduction. Improved safety. Reduction in cut-through traffic. The gentle ramps that lead to the intersection are designed to avoid damage to large vehicles and emergency response vehicles.

Drawbacks: Increased roadway noise. Higher maintenance costs. Required signage costs and aesthetics.

Costs: High (\$50,000 - \$200,000 each)



Raised intersection, Haddonfield, NJ. Image: VTC

Mini Roundabouts / Mini Traffic Circles

Description: Another variation used in residential traffic calming is the mini traffic circle, which is a raised circular islands constructed in the center of residential or minor street or intersections. These are generally not intended for use where one or both streets are arterial streets. Motorists must reduce speed to maneuver around the circle, which helps reduce the frequency and severity of crashes. Mini-circles are commonly landscaped, most often at locations where the neighborhood has agreed to maintain the plants. In locations where landscaping is not feasible, traffic circles can be enhanced through specific pavement materials. Mini-circles are an intersection improvement as well as a traffic-calming device and can take the place of stop or yield signs.

Benefits: Slows traffic. Reduces cut-through traffic. Can provide a gateway or identity to a neighborhood. Does not alter the path of pedestrians or bicyclists.

Drawbacks: In some cases, design techniques may be employed to mitigate impacts on emergency access, for example, by providing mountable curbs or aprons at the edges of traffic circles or medians. A single roundabout used in isolation will not significantly calm traffic. A coordinated system of multiple traffic circles or other calming measures is preferred.

Costs: \$6,000 - \$12,000 each



Mini traffic circle in Westfield, NJ. Image: The RBA Group

Chicanes

Description: A chicane is a set of two or more alternating curb extensions or islands 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.

Benefits: 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.

Drawbacks: Concrete chicanes complicate street maintenance and storm water drainage. Must be able to maintain required clearances for emergency vehicle and bus access.

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



Roadway with a chicane. Image: VTC

Curb Extensions / Bulb Outs

Description: Curb extensions or bulb outs narrow the roadway by extending the curb at key intersections and mid-block locations.

Benefits: Slows traffic. Reduces turning speeds. Increases pedestrian safety by reducing crossing distance and increasing pedestrian visibility. Can be lengthened to create landscaped areas or transit stops.

Drawbacks: Relatively high initial costs. Potential 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



Curb extension in front of the middle school in Maplewood, NJ. Image: The RBA Group

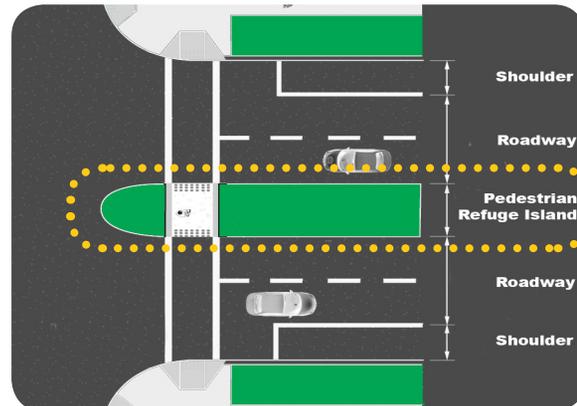
Pedestrian Refuge Islands

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

Benefits: 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.

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

Costs: Varies depending on length, materials and right-of-way availability (\$4,000 - \$30,000)



Pedestrian refuge island. Image: The RBA Group

Roadway Closures

Description: The most extreme form of traffic diversion, a permanent roadway closure interrupts the traffic grid pattern by creating dead-end or cul-de-sac street segments. A street closure is accomplished by installing a physical barrier that blocks a street to motor vehicle traffic and provides some means for vehicles to turn around. Full street closures should be used only in the rarest of circumstances. Neighborhoods with cul-de-sac streets require extensive out-of-the-way travel, which is not a mere convenience issue, but has serious implications for impacts on other streets. If a street closure is done, it should always allow for the free through movement of all pedestrians, including wheelchair users, and bicyclists. Local emergency services should be consulted when planning a roadway closure.

Benefits: This treatment works very well where all other calming attempts have failed.

Drawbacks: Street closures divert all through traffic onto other nearby roadways in the network.

Costs: High (\$30,000 - \$100,000), varies depending on materials, landscaping



This permanent roadway closure in Ocean City, NJ preserves bicycle and pedestrian access. Image: The RBA Group

Diverters

Description: Several types of diverters, such as semi-diverters and diagonal diverters, may be used to restrict traffic flow and discourage cut-through traffic. Diagonal diverters, also called turning movement diverters, can be installed at the intersection of a neighborhood street with a major street or collector to prevent cut-through traffic. They prevent straight-through movements and allow right turns only into and out of the neighborhood.

Benefits: Diverters reduce through traffic without preventing pedestrian access. They can also be designed to allow bicycle and emergency vehicle traffic.

Drawbacks: Do not work well on arterials, highways, other main roadways and transit routes.

Costs: \$15,000 - \$45,000, depending on the type of diverter and the need to accommodate drainage



This landscaped median along Haven Avenue in Ocean City, NJ allows right turns only for motor vehicles. Image: The RBA Group

Turn Restrictions

Description: This treatment uses signage to restrict certain turns at intersections to influence travel patterns. For example, a “No Left Turn” sign at an intersection is intended to prevent left turns. This measure is applicable on streets where cut-through traffic exists. This method can be tailored to be applicable during the most problematic times by defining a time period for the restriction.

Benefits: Low cost.

Drawbacks: This treatment does not work well for high-volume intersections with many turning movements, because it is difficult to enforce.

Costs: Low



Turning right on red is restricted during school hours at this intersection. Image: The RBA Group

Temporary Circulation Changes (Street Closures and One-Way Streets)

Description: Temporary street closures during student arrival and departure times can improve the efficiency and safety of the drop off and pick up of students at school. Temporary closures eliminate motor vehicles in areas congested with pedestrians, bicyclists, and perhaps buses. Another similar technique is to designate a street as one-way during arrival and departure time. Signs are essential for this method.

Benefits: Work well at densely developed neighborhood schools.

Drawbacks: This treatment may create traffic problems on other streets.

Costs: Low



Temporary roadway closure in front of the Bullock School in Montclair, NJ. Image: The RBA Group

Summary Matrix: Traffic Calming Measures for School Zones

This summary matrix lists the traffic calming measures described in this chapter and provides a brief description of each measure, the issue it is intended to address, what it is best used for and not intended to be used for, an idea of cost (where available), and other considerations regarding the measure.

Measure	Description	Issue	Best For	Not Used For	Costs	Considerations
Gateway	A signing and/or landscaping treatment to alert motorists they are entering a special area. Gateways are typically supplemented with other traffic calming measures.	Speed Reduction	Entrances to school zones, neighborhoods, commercial areas, town centers, or busy places of activity.	Isolated higher-volume arterials and highways	Varies	Generally expensive and can require routine maintenance.
Stationary Radar Sign / Speed Display Board / Speed Feedback Sign	Radar signs are interactive signs that draw motorists' attention to their speed and the road's legal speed limit. They work by informing 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.	Speed Reduction	High volume and high speed arterials and highways; Residential areas, school zones, construction zones, or other safety zones	Streets where speeding is not a concern	\$5,000 - \$15,000 each	Radar signs do not slow traffic as much as physical measures. Motorists' compliance is voluntary. Enforcement is still necessary.
Pavement Marking/ Stencil	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.	Speed Reduction	Roadways with wide rights-of-way that would benefit from slower speeds and improved pedestrian safety	Isolated higher-volume arterials and highways	Low	Pavement markings are typically used in conjunction with signs and other measures. Require regular maintenance and may not be consider visually aesthetic. Not visible with snow-covered roads.
Textured and Colored Pavement	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. Bricks or blocks are sometimes also used to provide the same traffic calming benefits as rumble strips, delineating crosswalks and pedestrian zones.	Speed Reduction	Residential and neighborhood shopping areas	Isolated higher-volume arterials and highways	Moderate to High. Costs vary depending on materials used and size of paving area.	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.

Measure	Description	Issue	Best For	Not Used For	Costs	Considerations
Landscaping	Landscaping defines pedestrian and vehicle areas, reduces the visual width of the roadway, and provides a more pleasant street environment for all. Landscaping can include trees, bushes and/or planters which can be planted in the buffer area between the sidewalk and the street. Landscaping is often used in conjunction with other traffic calming measures.	Pedestrian Safety Speed Reduction	Residential and neighborhood shopping areas	Isolated higher-volume arterials and highways	Moderate to high - varies depending on scale and materials/plantings	Depending on the design, the installation and maintenance costs can be high. Right-of-way impacts may be significant as well.
Rumble Strip	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.	Speed Reduction	Isolated higher-volume arterials and highways; Areas with high pedestrian activity and safety concerns	Residential areas; Bicycle paths / lanes	\$7 - \$10/foot	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.
Signage	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.	Speed Reduction	All types of roadways (in moderation)	–	Varies, depending on type and amount of signage	Signs are also used in conjunction with other measures such as pavement markings. 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.
Narrowed Lane	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.	Speed Reduction	All types of roadways	–	Varies depending on method of narrowing the roadway. Low if striping only.	Excess right-of-way can be shifted to providing wider sidewalks, bicycle lanes, or on-street parking. Simple roadway restriping to achieve roadway narrowing is inexpensive.

Measure	Description	Issue	Best For	Not Used For	Costs	Considerations
Speed Hump	Speed humps are rounded raised areas across the roadway that causes vehicles to reduce speeds.	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.
Raised Crosswalk	Raised crosswalks are elongated speed humps that feature a marked crosswalk at the same elevation as the adjacent sidewalks. Crosswalk markings or contrasting crosswalk materials (pictured) show this element is also a crosswalk.	Pedestrian Safety; Speed Reduction	Areas where pedestrian traffic takes priority over vehicular traffic	Arterials, highways, other main roadways	\$2,000 - \$15,000 each	As both a marked crosswalk and a traffic calming element, raised crosswalks provide a superior safety advantage to pedestrians.
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.
Mini Roundabout	Motorists must reduce speed to maneuver around the circle, which helps reduce speeds and the frequency of crashes.	Speed Reduction	Neighborhood streets that have a history of high speeds and high crash rates at intersections	Intersections with disproportionate volume on approaches	\$6,000 - \$12,000 each	Can provide a gateway or neighborhood identity.
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.
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.

Measure	Description	Issue	Best For	Not Used For	Costs	Considerations
Pedestrian Refuge Island	Concrete or landscaped islands and medians slow travel speeds by narrowing lanes and also improve pedestrian 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.
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, and 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.
Temporary Circulation Changes	Temporary street closures during student arrival and departure times can improve the efficiency and safety of the drop off and pick up of students at school. Temporary street closures eliminate motor vehicles in areas congested with pedestrians, bicyclists, and perhaps buses.	Cut-Through Traffic; Congestion during school arrival/dismissal	Low volume neighborhoods with comprehensive grid network; High cut-through neighborhoods	Isolated higher-volume arterials; Transit routes or major emergency response routes	Low	Circulation changes will have secondary impacts on adjacent roadways that must be considered.