Traffic Calming Toolbox

Littleton Colorado

Traffic Calming Overview

The primary purpose of traffic calming is to **improve the quality of life in communities by reducing motorist speeds and traffic volumes on neighborhood streets.** Traffic calming treatments consist of vertical and horizontal deflection, lane narrowing, and roadside features that use self-enforcing physical means to produce desired effects. A series of traffic calming treatments are needed to effectively reduce speeds along a corridor.

Treatment Overview

Below are traffic calming treatments that are recommended for use by the City of Littleton:

- **Speed cushion** – series of raised areas in roadway, perpendicular to traffic flow, that uses vertical deflection to slow motorists
- **Raised pedestrian crossing** – raised area perpendicular to roadway spanning the full width of the street with a flat top and pavement markings or texture for a crosswalk on the flat portion, using vertical deflection to slow motorists
- **Pedestrian median island** – raised island along centerline of roadway that narrows travel lane width to slow motorists with a center cutout for pedestrians to cross
- **Curb extension** – horizontal extension of curb that narrows roadway travel lane width and tightens turning radii at intersections to reduce speeds of turning motorists
- **Pinch point** – lateral extension of curb into the street or islands on both sides of the street at a midblock location that narrows roadway travel lane width to slow motorists
- **Traffic circle** – raised circular island located in center of an unsignalized intersection with horizontal deflection to force motorists to change their driving path yield to vehicles within the circle
- **Chicane** – alternating curves or lane shifts that force a motorist to steer back and forth instead of traveling a straight path, typically with alternating curb extensions
- **Diagonal diverter** – physical barrier placed diagonally across an intersection, blocking vehicle travel for through movements and adding horizontal deflection to reduce speeds

How To Use This Toolbox

This toolbox summarizes the traffic calming treatments that are deemed appropriate by the city for the varying characteristics that exist along Littleton local streets and neighborhood connectors. Traffic calming is not precluded from installation on higher level street types on a project-by-project basis. The document is intended as a guide for the Neighborhood Traffic Calming Program. This toolbox provides an example image and a description for each traffic calming treatment with considerations for installation, its relative effectiveness at speed reduction, and lists of advantages and disadvantages. Engineering judgement will be incorporated into the considerations of any potential design.

Effectiveness & Implementation Context

The effectiveness of **speed reduction** is provided on a low to high scale:

- Low = Reduction of 1 – 3 MPH
- Moderate = Reduction of 3 – 6 MPH
- High = Reduction over 6 MPH

The appropriate level of average daily **traffic volume** for the roadway is provided on a low to moderate scale with volumes referenced to street types in the Transportation Master Plan (TMP), page 41:

- Low = Volumes associated with Local Street type in the TMP
- Moderate = Volumes associated with Neighborhood Connector type in the TMP

Cost varies widely and depends on many factors, like materials and current construction market, and is noted on a relative scale from low to high:

- Low = under $10,000
- Moderate = $10,000 - $50,000
- High = over $50,000

Street types for possible installation of traffic calming treatments are:

- Local street (Local) - see TMP, page 125
- Neighborhood connector (NC) - see TMP, page 125

This toolbox is intended specifically for providing guidance in applying traffic calming treatments for the above street types. These traffic calming treatments may be applied to project sites on other street types as engineering studies and judgment allow.

Corridor Considerations

Effectively accommodates through travel by **large vehicles**, including delivery trucks, maintenance vehicles, buses, and emergency vehicles

Accommodates bicyclists in **on-street bike lanes** while effectively narrowing travel lanes

Provides for **parking** along corridor with limited loss of spaces at treatment location while effectively narrowing travel lanes

Able to utilize **quick build** materials to effectively reduce speeds

Summary Table

The table below summarizes the key information for the traffic calming treatments described in the toolbox. **Speed reduction** is the anticipated level of reduction in observed speeds as a result of the treatment. **Traffic volume** is the typical level of average daily traffic volume for the roadway being treated. The relative cost of the treatment is listed, as well as the street type from the TMP considered appropriate for installation of the given traffic calming treatment.

Treatment	Speed Reduction	Traffic Volume	Cost	Street Type
Speed Cushion	High	Low-Moderate	Low	Local and NC
Raised Pedestrian Crossing	High	Low-Moderate	Moderate	Local and NC
Pedestrian Median Island	Low-Moderate	Low-Moderate	Low-Moderate	Local and NC
Curb Extension	Low-Moderate	Low-Moderate	Moderate	Local and NC
Pinch Point	Low-Moderate	Low	Moderate	Local
Traffic Circle	Moderate	Low	Moderate	Local and NC
Chicane	Moderate	Low	Moderate	Local
Diagonal Diverter	Low	Low	Moderate-High	Local

NC = Neighborhood Connector

A series of traffic calming treatments are always needed to effectively reduce speeds along a corridor. Multiple different types of treatments can be more effective. Not all treatments are appropriate in all situations and each type of treatment along a corridor must be evaluated with regard to Littleton policies and procedures and available budget.

Other Traffic Calming Treatments

In addition to the treatments outlined in this toolbox, other treatments that may be considered with varying effectiveness and implementation context based on site-specific conditions include:

- **Hardened centerline** – curbline or raised island along centerline striping through an intersection to block movements and/or require motorists to make slower, tighter turns
- **Street cross-section changes** – reconfiguration of street width to narrow and/or reduce vehicle travel lanes and provide additional area outside of lanes for parking or pedestrian and bicycle facilities
- **Raised intersection** – flat, raised area covering an entire intersection, including crosswalks, with ramps at all street approaches resulting in traffic calming on both intersecting streets
- **Semi-diverter** – physical barrier blocking vehicle travel in one direction for a short distance, or blocking specific movements at an intersection to reduce traffic volumes

Quick-Build Installation

It may be appropriate to install a quick-build version of a traffic calming treatment under certain circumstances. Examples include:

- When there is a need to verify that the location, configuration, and geometry of a treatment will produce the desired effect (e.g., speed reduction, motorist compliance) before investment in full curb construction.
- When there is not funding available for full curb construction.

Typical materials used in a quick-build traffic calming treatments include flex post delineators, precast concrete or rubber curbing, precast or wood planters, pavement markings, and signage. The number and spacing of flex post delineators should avoid unnecessary visual clutter. See installation examples on page 13.

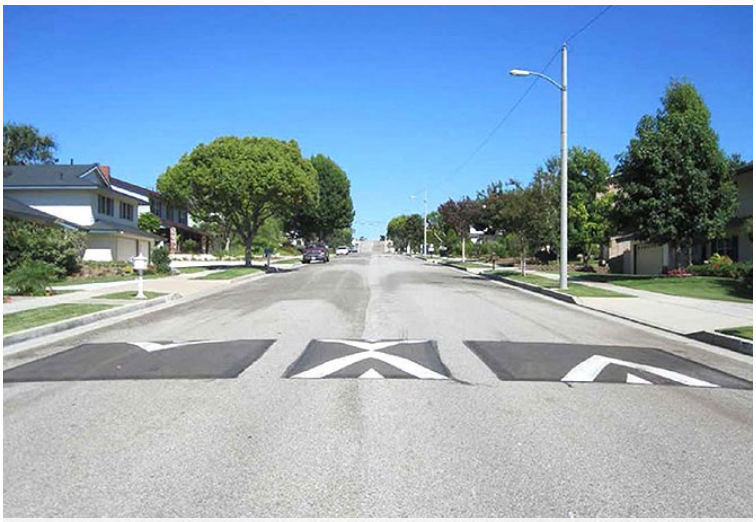
The temporary nature of a quick-build installation will likely limit the effectiveness of the treatment.

What is Not a Traffic Calming Treatment?

Some features or initiatives are commonly mistaken for traffic calming treatments:

- **Additional speed limit signs or other signage** are low-cost elements to add to a roadway, but they are relatively ineffective at changing motorist behavior unless paired with other traffic calming treatments.
- **Rectangular rapid flashing beacons (RRFBs)** are used to highlight the presence of a pedestrian in a crosswalk, requiring vehicles to come to a full stop for crossing pedestrians, but not intended to reduce motorist speed when the beacon is not activated.
- **Stop signs** cannot be considered as a traffic calming treatment. Unwarranted stop signs create hazards for other roadway users due to motorist disregard for them. Stop signs should only be installed to regulate vehicle right-of-way at an intersection when specific criteria established in the Manual of Uniform Traffic Control Devices (MUTCD) are met. The MUTCD specifically states that yield or stop signs should not be used for speed control.
- **Drainage dips** are roadway design features for stormwater management. While drainage dips can influence speed at the location, their purpose, location, and design are to manage drainage, not to reduce motorist speeds. They are part of a larger drainage system and cannot be installed individually for the sole purpose of traffic calming.
- **Police enforcement** is difficult to implement consistently based on limited resources and budget constraints. Enforcement often has only temporary results and cannot be relied upon as a long term solution. Therefore, enforcement is not considered a traffic calming strategy.
- **Pedestrian/bicyclist improvements** may also provide traffic calming by reducing the actual or perceived space for vehicles, but the primary intent of these types of improvements is to improve access, comfort, and safety for bicyclists and pedestrians.

Speed Cushion



Source: FHWA

A series of raised areas in roadway, perpendicular to traffic flow, that uses vertical deflection to slow motorists. Space between each hump allows emergency vehicles with a wider wheel base to pass through at higher speeds while requiring passenger vehicles to pass over at least a portion of the raised pavement.

Speed cushions are only appropriate at mid-block locations and should not be placed on a sharp curve or at driveways. Typical spacing of 250 to 500 feet for multiple cushion installations are needed to achieve speed reduction along a corridor, with closer spacing being more effective in reducing speeds.

Effectiveness & Implementation Context

Speed Reduction: **High**

Traffic Volume: **Low/ Moderate**

Cost: **Low**

Street Type: **Local/ Neighborhood Connector**

Corridor Considerations

Large Vehicles: Yes

On-Street Bike Lanes: Yes

Parking: Yes

Quick Build: Yes

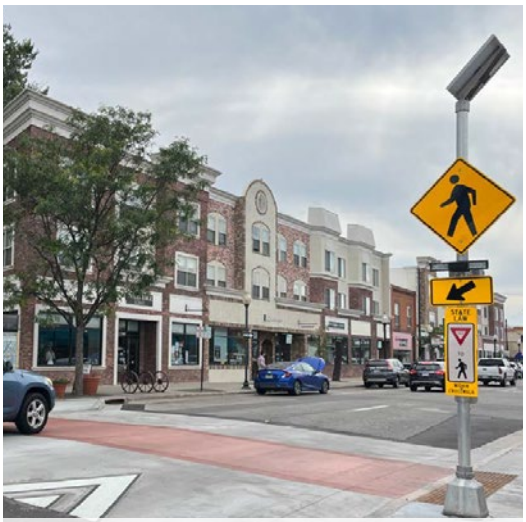
Advantages

- Effectively reduces motorist speeds
- Accommodates emergency vehicles
- May reduce traffic volumes by diverting traffic to other streets due to reduced driver comfort
- Little to no impact on bikes with cushions having a relatively low grade and ability to be placed outside of bike lanes (requires flex posts or other obstruction to prevent motorists from driving into bike lane to get around cushion)

Disadvantages

- Noise levels (vehicles braking while approaching the cushions, suspension noise while passing over the cushions, and acceleration after passing over/between multiple cushions)
- Requires multiple installations for effective speed reduction
- Impacts from snowplows

Raised Pedestrian Crossing



Source: City of Littleton

Raised area perpendicular to roadway with a flat top and pavement markings or texture for a crosswalk on the flat portion, using vertical deflection to slow motorists. They are similar in nature to speed cushions, but without the space between humps and spanning the full width of the street for pedestrians to cross at the same level with the adjacent sidewalk/curb.

Raised pedestrian crossings are appropriate at mid-block locations with frequent pedestrian crossings, to lower motorist speeds where pedestrians enter the street. They may also be placed at an intersection. Rectangular rapid flashing beacons (RRFBs) are commonly paired with raised pedestrian crossings at mid-block locations. Additional traffic calming treatments are needed to achieve speed reduction along a corridor, with a typical spacing of 250 to 500 feet. Careful design is needed for drainage due to obstruction of existing flowlines.

Effectiveness & Implementation Context

Speed Reduction: **High**

Traffic Volume: **Low/ Moderate**

Cost: **Moderate**

Street Type: **Local/ Neighborhood Connector**

Corridor Considerations

Large Vehicles	On-Street Bike Lanes	Parking	Quick Build
Yes	Yes	Yes	No

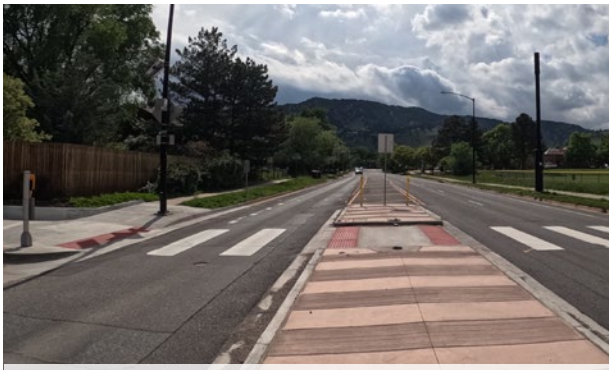
Advantages

- Effectively reduces motorist speeds
- Improves pedestrian safety, facilitates crossings with improved motorist yield compliance, and increases pedestrian visibility
- May reduce traffic volumes by diverting traffic to other streets due to reduced driver comfort
- Low impact on bike mobility with raised area extending across bike lanes

Disadvantages

- Small delay for emergency vehicles (less than 10 seconds)
- Noise levels (vehicles braking while approaching the cushions, suspension noise while passing over the cushions, and acceleration after passing over)
- Requires multiple installations of this treatment or combined with other treatments for effective speed reduction
- Impacts from snowplows
- Potential for higher costs if substantial drainage connections are required

Pedestrian Median Island



Source: DEA

Raised island located along centerline of the roadway with a center cutout for pedestrians to cross. Islands narrow the lane width and reduce pedestrian crossing distance. Pedestrian median islands are effective in reducing speeds when travel lanes are narrowed to 10 feet or less. The use of pedestrian median islands as opposed to curb extensions may avoid the need to relocate drainage or bike lanes.

Median islands may be located at mid-block locations or intersections and can be designed in conjunction with raised pedestrian crossings and/or curb extensions to increase the likelihood of reducing motorist speeds and to improve pedestrian visibility. However, additional width provided for unprotected on-street bikes lanes will reduce effectiveness of speed reduction.

Effectiveness & Implementation Context

Speed Reduction:	Traffic Volume:	Cost:	Street Type:
Low/ Moderate	**Low/ Moderate**	**Low/ Moderate**	**Local/ Neighborhood Connector**

Corridor Considerations

Large Vehicles	On-Street Bike Lanes	Parking	Quick Build
Yes	Yes	Yes	Yes

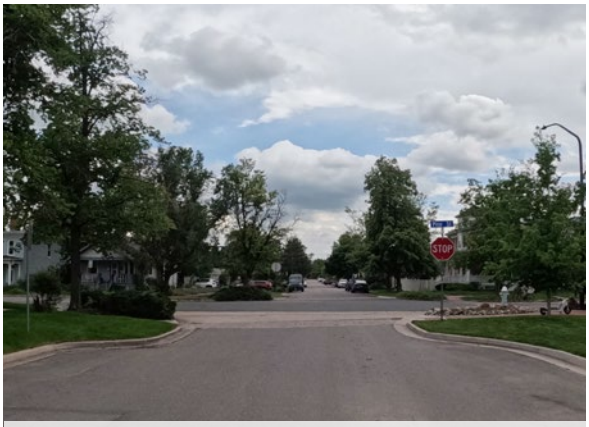
Advantages

- Reduces motorist speeds with narrowed width
- No impact on bike mobility with width provided for bike lanes
- Accommodates emergency vehicles
- Reduces pedestrian crossing distance and increases pedestrian visibility
- Enhances appearance when landscaped

Disadvantages

- No significant reduction in motorist speeds beyond the median island area (unless multiple installations of treatments)
- Potential for higher costs (if utility relocations, drainage modifications needed)
- Impacts on-street parking at median island
- May impact access to properties at median island
- Impacts from snow storage
- Quick-build installation with flex posts can add undesirable visual clutter

Curb Extension



Source: DEA

Horizontal extension of curb that narrows roadway travel lane width and tightens turning radii at intersections to reduce speeds of turning motorists. Curb extensions can reduce speeds on approaches that are not stop-controlled and reduce crossing distances and improve pedestrian visibility.

Curb extensions are effective in reducing speeds for turning motorists and for through traffic when travel lanes are narrowed to 10 feet or less. Turning analysis should be completed to make sure a design vehicle can negotiate turns at the intersection. Corner radii provided for large vehicles and additional roadway width provided for bike lanes will reduce effectiveness of speed reduction.

Effectiveness & Implementation Context

Speed Reduction:	Traffic Volume:	Cost:	Street Type:
Low/ Moderate	**Low/ Moderate**	**Moderate**	**Local/ Neighborhood Connector**

Corridor Considerations

Large Vehicles	On-Street Bike Lanes	Parking	Quick Build
✓ Yes	✓ Yes	✓ Yes	✓ Yes

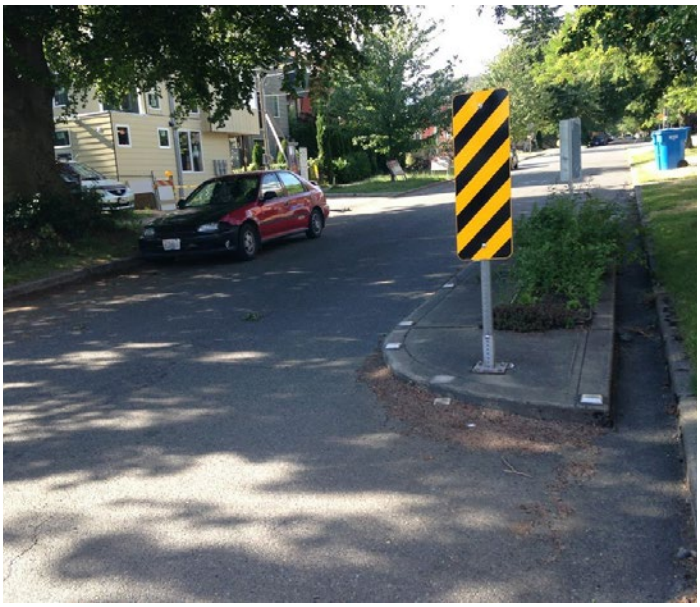
Advantages

- Reduces motorist speeds through curb extension area with narrowed width and turning radii
- No impact on bike mobility with width provided for bike lanes
- Accommodates emergency vehicles
- Reduces pedestrian crossing distance and increases pedestrian visibility at intersection
- Enhances appearance when landscaped

Disadvantages

- No significant reduction in motorist speeds beyond the curb extension area (unless multiple installations of treatments)
- Potential for higher costs (if utility relocations, drainage modifications needed)
- Impacts on-street parking at curb extension
- Can make right turns by large vehicles more difficult
- Quick-build installation with flex posts can add undesirable visual clutter

Pinch Point



Narrowing of roadway with lateral extension of the curb into the street or islands on both sides of the street at a midblock location. Edge islands can leave area along the curb line open for bike lanes and/or existing drainage. In some cases, travel width may be reduced to force motorists to a single lane to take turns to pass through pinch point. This treatment may be combined with a mid-block crosswalk to reduce crossing distances and improve pedestrian visibility.

Pinch points are effective in reducing speeds when travel lanes are narrowed to 10 feet or less and they are most effective on local streets when traffic flow is restricted to one lane through the pinch point. The length of a pinch point can vary depending on the location of driveways and curbside parking.

Effectiveness & Implementation Context

Speed Reduction:	Traffic Volume:	Cost:	Street Type:
Low/ Moderate	**Low**	**Moderate**	**Local**

Corridor Considerations

Large Vehicles	On-Street Bike Lanes	Parking	Quick Build
Yes	Yes	Yes	Yes

Advantages

- Reduces motorist speeds with lanes narrowed to 10 feet or less
- No impact on bike mobility with bike lanes located outside the pinch point (along the curb line)
- Accommodates emergency vehicles
- Reduces pedestrian crossing distance and increases pedestrian visibility when paired with a mid-block crosswalk
- Enhances appearance when landscaped

Disadvantages

- Potential for higher costs (if utility relocations, drainage modifications needed)
- Impacts on-street parking at and approaching pinch point
- Quick-build installation with flex posts can add undesirable visual clutter

Traffic Circle

Source: DEA

Raised circular island located in the center of an unsignalized intersection. All traffic must negotiate around the circle in a counterclockwise direction. Yield signs are located on each approach and motorists must yield to vehicles within the circle. Speed reduction is largely dependent on the design of the approach lanes and the size of the traffic circle, creating a deflection that causes motorists to change their driving path. Without proper deflection, motorists will be able to pass through the circle without lowering their speed.

Traffic circles are most effective in reducing speeds along a corridor when several are used in a series. They should not be used on corridors with on-street bike lanes due to safety concerns of mixing vehicles and bicyclists within the relatively small space of traffic circle. Turning analysis should be completed to make sure a design vehicle can negotiate the circle. A mountable curb apron may be used to accommodate large vehicles.

Effectiveness & Implementation Context

Speed Reduction: **Moderate**

Traffic Volume: **Low**

Cost: **Moderate**

Street Type: **Local/ Neighborhood Connector**

Corridor Considerations

Large Vehicles: Yes

On-Street Bike Lanes: No

Parking: Yes

Quick Build: Yes

Advantages

- Reduces motorist speeds
- Improves safety with reduced conflict points
- Accommodates emergency vehicles
- May reduce traffic volumes by diverting traffic to other streets due to reduced driver comfort
- Enhances appearance when landscaped

Disadvantages

- Not recommended on streets with on-street bike lanes
- Potential for higher costs (if right-of-way, utility relocations, drainage modifications needed)
- Require directional ramps which may move crosswalks further away from intersection and increase construction impact area
- Impacts from snowplows
- Quick-build installation with flex posts can add undesirable visual clutter

Chicane

Source: DEA

Alternating curves or lane shifts that force a motorist to steer back and forth instead of traveling a straight path. These are typically created with alternating curb extensions. The installation can be difficult with the spacing of driveways and intersections.

Speed reduction is dependent on the extent of the horizontal deflection and lane width. Chicanes are effective in reducing speeds when travel lanes are narrowed to 10 feet or less with substantial shift in travel path. Designs with minimal lane shifts may still allow higher speeds by motorists cutting straight paths across the center line. To discourage this behavior, a raised median or hardened centerline may be installed so that motorists cannot veer into the opposing lane as easily, improving the effectiveness of the lateral shift.

Effectiveness & Implementation Context

Speed Reduction:	Traffic Volume:	Cost:	Street Type:
Moderate	**Low**	**Moderate**	**Local**

Corridor Considerations

Large Vehicles	On-Street Bike Lanes	Parking	Quick Build
No	No	No	Yes

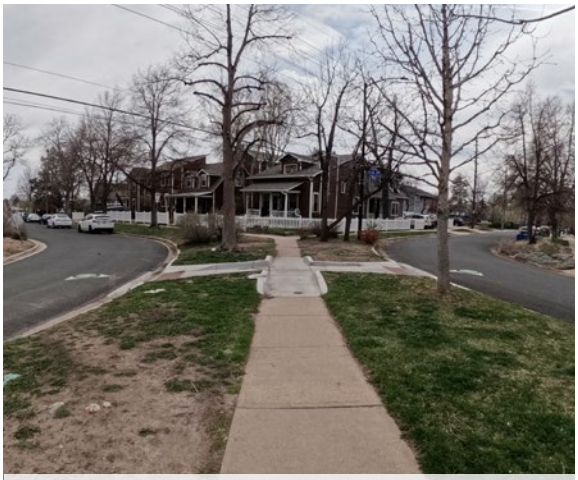
Advantages

- Reduces motorist speeds with traffic shift and lanes narrowed to 10 feet or less
- Accommodates emergency vehicles
- May reduce traffic volumes by diverting traffic to other streets due to reduced driver comfort
- Enhances appearance when landscaped

Disadvantages

- Not recommended on streets with bike lanes
- Potential for higher costs (if utility relocations, drainage modifications needed)
- Requires extensive parking restrictions with impacts to on-street parking at and approaching chicane
- May impact access to properties at curb extensions and within chicane
- Quick-build installation with flex posts can add undesirable visual clutter

Diagonal Diverter



Source: DEA

Physical barrier placed diagonally across an intersection, blocking vehicle travel for through movements with horizontal deflection encouraging motorists to reduce their speed. Design may include provisions for diverter to remain passable for pedestrians and bicyclists. Barriers may consist of landscaped islands, planters, flex posts, or other vertical obstructions. The turning space needed for large vehicles like delivery trucks and school buses should be considered closely in the diverter design.

The primary goal of a diagonal diverter is volume reduction. Due to concerns regarding impacts to emergency response and street network connectivity, the location and design of diagonal diverters should consider traffic diversion patterns and potential impacts to surrounding roadway netowrk.

Effectiveness & Implementation Context

Speed Reduction:	Traffic Volume:	Cost:	Street Type:
Low	**Low**	**Moderate/ High**	**Local**

Corridor Considerations

Large Vehicles	On-Street Bike Lanes	Parking	Quick Build
No	Yes	Yes	Yes

Advantages

- Improves safety with reduced conflict points
- Reduces traffic volumes (with diversion to other streets)
- Enhances appearance when landscaped

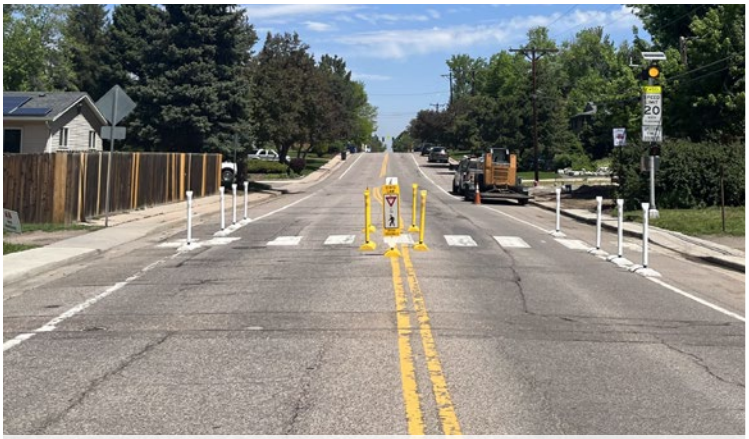
Disadvantages

- Impacts to emergency response (can be designed to allow emergency vehicles access with breakaway delineators, mountable curb, gates, etc.)
- No significant reduction in motorist speeds beyond the approach to diverter
- May increase travel distance and time for adjacent residents for some trip patterns
- Potential for higher costs (if right-of-way, utility relocations, drainage modifications needed)
- Quick-build installation with flex posts can add undesirable visual clutter

Quick-Build Installation Examples

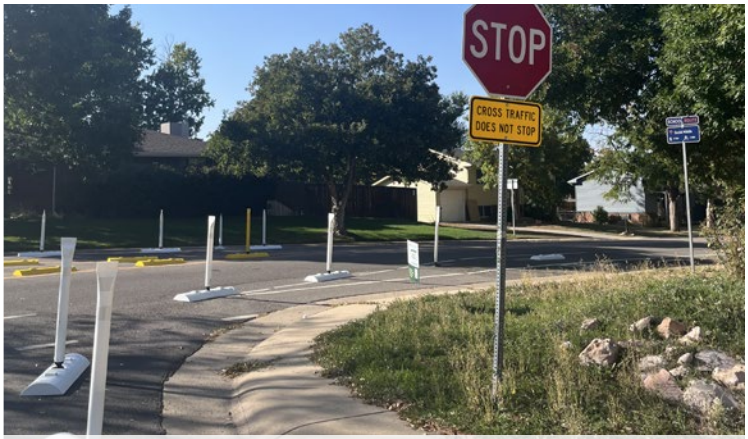
It may be appropriate to install a quick-build version of a traffic calming treatment when there is a need for traffic calming but funding is not available for full curb construction. Below are examples of quick-build installations for several of the treatments included in the toolbox.

Pedestrian Median Island



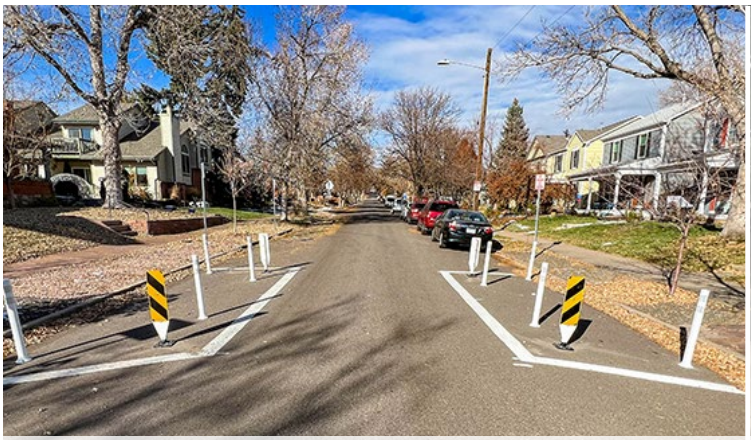
Source: City of Littleton

Curb Extension



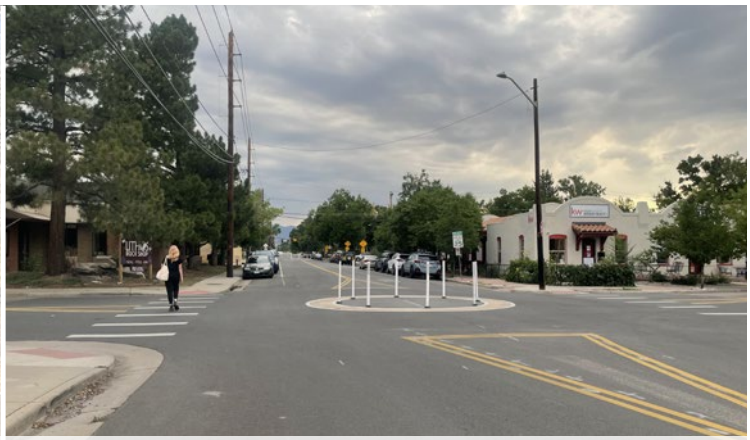
Source: City of Littleton

Pinch Point



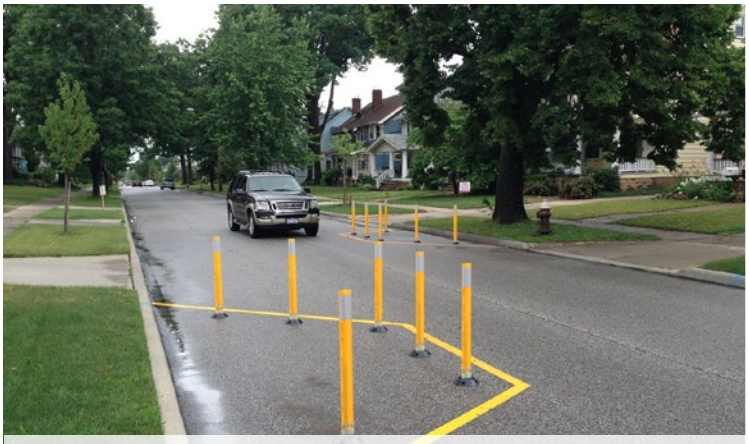
Source: City and County of Denver

Traffic Circle



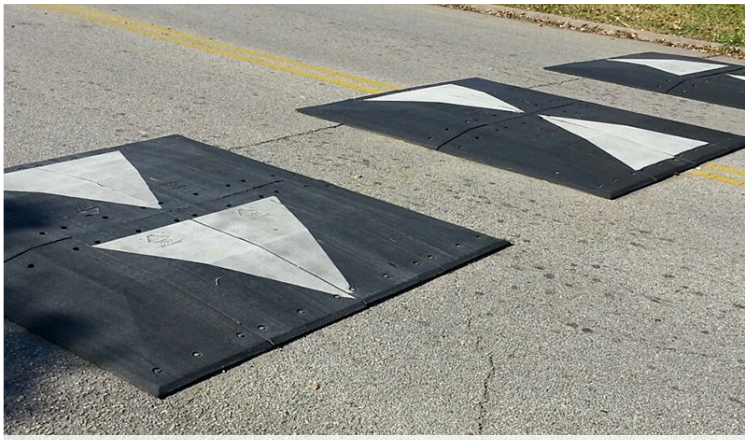
Source: DEA

Chicane



Source: Cleveland.com

Speed Cushion



Source: Traffic Logix