NEIGHBORHOOD TRAFFIC MANAGEMENT and CALMING PROGRAM

CITY of NORMAN OKLAHOMA

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INTRODUCTION

One of the most persistent and emotional complaints that the City of Norman receives is speeding on residential streets. Each year, numerous requests are received by City council members and other City administration and staff to "do something" on certain streets where residents have concerns about excessive traffic speeds and/or traffic volumes. Proper street design is essential in encouraging lower speeds. minimizing cut-through traffic and maintaining the integrity of residential neighborhoods. Through the City platting and development process, new subdivisions are being designed to avoid long straight stretches of streets which encourage higher speeds. It is on the long stretches of existing streets that most of the speeding complaints are being generated. This report presents a ***Neighborhood Traffic Management and Calming Program (NTMCP)*** aimed at making existing residential streets safer and more livable. Historically, issues of speeding and cut-through traffic could only be addressed through educational efforts, enhanced police enforcement, and the unwarranted use of regulatory signs; now, however, physical calming devices have been developed for use when education and enforcement endeavors fail.

HISTORICAL RESEARCH

Traffic calming is the combination of policies and implementation measures that help mitigate the negative impacts of poor motor vehicle operations on residential streets and neighborhoods. Although implementation of traffic calming techniques did not begin in the United States until the 1980's, there are examples that have existed for many years in other countries. In Europe and Australia, some of these same techniques even preceded the 1970's. Many of the successful techniques used by these other countries are now into their second and third generations. Their effectiveness has been proven, and many appear to be part of the original street design rather than retrofits.

Traffic calming techniques were developed to reduce speeding problems and heavy flow on residential streets. By making some residential streets more "calm," it makes the neighborhood more livable. Although "livable" in terms of a neighborhood does not have a precise definition. Feeling safe and secure, interacting with neighbors, and experiencing a sense of home and community identification are certainly some of the characteristics. In essence, when citizens call to request a STOP sign to slow traffic on their street, they are requesting the City to make their street more livable.

Research has shown a common theme among cities with traffic calming or management programs: there is no single measure, such as STOP signs or speed humps, for solving all traffic problems. Each location has its own unique set of problems that must be analyzed to identify solutions. For this reason, the City of Norman, like several other communities, has developed an extensive toolbox of traffic management and calming tools for customizing solutions.

DEFINITION OF TRAFFIC CALMING

In its August 1999 report, "Traffic Calming- State of the Practice," the subcommittee on traffic calming of the Institute of Transportation Engineers (ITE) 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 transportation system users.*

In explaining its definition, the ITE subcommittee distinguishes traffic calming from route modification, traffic control devices, and streetscaping. Traffic calming measures rely on the laws of physics rather than human psychology to reduce traffic speed. Route modification measures, such as street closures and tum restrictions, do not change driver behavior (e.g. speed), but simply modify driver routing options. Traffic control devices, notably STOP signs and speed limit signs, are regulatory measures that require enforcement. Street trees, street lighting, striping, and other streetscape elements, while complementary to traffic calming, do not directly compel drivers to slow down. By contrast, engineered traffic calming measures are intended to be self-enforcing.

CLASSIFICATION OF STREETS

City of Norman streets are classified by their function into three major categories: arterial, collector, and local. These categories are defined as follows:

Arterial: These streets provide for through traffic movement over long distances such as across the city with some access to abutting property. These streets are typically the widest and have higher speed limits than other street types. Within the City of Norman, most arterials have a speed limit of 40 mph or higher.

Collector: These streets provide the connection between arterials and local streets. There is often direct access to abutting properties. These streets provide for medium distance trips such as between neighborhoods. They also collect traffic from the local streets and channel it to the arterial system. Within the City of Norman, most collector streets have a speed limit of 25 mph.

Local: These streets provide direct access to the residences and for short distance or local traffic movements. Within the City of Norman, most local streets have a speed limit of 25 mph.

Since each city street has an intended purpose related to moving traffic and serving the adjacent land use, the *Neighborhood Traffic Management and Calming Program* must ensure that traffic management measures are compatible with those purposes. Because the installation of calming devices can result, directly or indirectly, in drivers shifting to use an adjacent street as their new route, this is appropriate only if the adjacent street is suitably classified and able to accommodate this traffic. Accordingly, while most traffic management measures in the calming toolbox are appropriate for use on residential local and collector streets, fewer (if any) are appropriate on arterials.

OBJECTIVES

The overall objectives for the *Neighborhood Traffic Management and Calming Program* are:

- To implement measures, either physical or psychological, that will reduce speeding and affect driver behavior to improve the livability and quality of life in residential neighborhoods;

- To preserve and enhance pedestrian and bicycle access to neighborhood destinations;

- To encourage citizen involvement in neighborhood calming and, in the process, provide an opportunity for neighbors to interact and create a positive community atmosphere; and

- To make fair and efficient use of City resources in prioritizing projects to balance the needs of the neighborhood with those of the entire community.

Traffic calming techniques work best when incorporated into a neighborhood traffic management program. Successful programs include good traffic data collection, a thorough planning process, community participation, and local authority support. Because residents should be the initiators of traffic calming requests, they need to be part of the process as much as possible.

NEIGHBORHOOD TRAFFIC CALMING PROCESS

Step 1 – **Reporting the Problem (Initial Contact)**

Upon initial contact made by a resident, property owner, or homeowners association, inquiring about traffic calming in a neighborhood, City staff will send the requester an information packet that describes the traffic calming program, application process, and the criteria used to establish eligibility. In addition, the requestor will receive a copy of a sample written request and an informational brochure.

After reading the information, if residents maintain interest in the program, they must write a formal request and return it to the City. The purpose of this written request is to initiate the *NTMCP* process and to formally request a traffic study be conducted to see if the neighborhood meets the criteria. The written request is not a petition for traffic calming

measures (that comes later in the process). The written request requires a description of the residents' concerns and requires signatures, addresses, and dates from at least four (4) different households in the impacted area that share the same traffic concerns.

Step 2 – **Traffic Study**

Upon receipt of a formal written request from a neighborhood, the City Traffic Control Division will schedule a traffic study in the neighborhood. Traffic studies are usually conducted during the school year unless unique circumstances, as determined by City Traffic Engineering staff, exist. To be eligible to participate in the *NTMCP,* certain speed and traffic volume criteria must be met.

Step 3 – **Pre-Calming Measures**

If the location in question meets the speed and volume criteria, City staff will first suggest possible solutions that do not involve the use of physical controls or impediments on the street. These include:

- Traffic Signing and Pavement Markers – City Traffic Engineering staff will review all traffic signing and pavement markings in the area. If necessary, staff will install additional signing and/or striping.

- Traffic Enforcement Actions – The traffic data study will include raw counts of traffic volumes and vehicle speeds over a 72-hour period and will categorize these numbers into the time of day that they occurred. This data will be forwarded to the Norman Police Department for increased patrol visibility and more strategic enforcement efforts.

- Radar Speed Trailer Deployment – This is a temporary device that is primarily used to educate motorists regarding the fact that they may be exceeding the posted speed limit.

Step 4 – **Follow-up Data Collection**

If one or more of the Pre-Calming Measures is implemented, the City Traffic Control Division will wait three to six months and then collect additional speed/volume data. The new data will be analyzed to determine if the Pre-Calming Measures were successful. If the measures were successful in terms of bringing the numbers below the criteria thresholds, then the process will end at this point. If, on the other hand, the measures were not successful, i.e. the location continues to exceed speed/volume thresholds, City staff will move on to explore more self-enforcing types or traffic calming devices.

Step 5 – **Presentation of Specific Traffic Calming Plan**

If the results of the traffic studies continue to indicate that the neighborhood meets the *NTMCP* criteria, a meeting with residents in the neighborhood will be held by City staff. At this meeting, City staff will discuss the *NTMCP* process, give a summary about traffic calming devices used previously in the City of Norman or in other communities, show the results of the traffic studies, present a Specific Traffic Calming Plan for the neighborhood, and solicit residents' input for modifications to the plan. Although residents not living directly on a potentially "calmed" street may not be eligible to vote on a support petition for a

traffic calming project, they may have an interest and should be invited to this neighborhood meeting where the traffic calming plan is presented and discussed.

Step 6 – **Petition Process**

After the public meeting, and with the original or modified Specific Traffic Calming Plan agreed upon, City staff will prepare a petition to be signed by residents and/or business owners adjacent to and surrounding the street being "calmed." A map showing the location of the traffic calming measures and the petition boundary area will also be included. This petition must document that at least 60% of all households and/or businesses within the petition boundary area support the Specific Traffic Calming Plan. All properties within the affected area must be accounted for (either with a signature in support of the plan or without a signature in opposition to the plan) or by written statement by circulator why a specific property was not represented. **Only one signature per household is allowed**. The petition must be completed and returned to the City within one (1) year from the date the neighborhood coordinator received it, or it will expire.

In the event 60% support is not achieved, but some form of traffic calming is still desired, then City staff may develop a passive traffic calming plan as long as an attempt was made to secure the required number of signatures. A reasonable attempt is defined as at least 10% of the required number of signatures. This plan could include elements such as radar speed feedback speed limit signs and/or roadway striping modifications. This plan can be implemented without a completed petition.

Petition Eligibility

Generally, residences either fronting or otherwise directly adjacent to the street containing the proposed calming devices will be eligible to sign the calming support petition. Recognizing that every neighborhood is configured differently and that the impact of a calming project is more direct for those residents along the corridor itself, City staff will look for opportunities, such as including residents on intersecting cul-de-sacs, to expand the voting area allowed on the support petition. For a device placed in an intersection, such as a traffic circle, residences within a 300' radius of such device will also be eligible to sign. Signers can be either the property owner or his/her agent. Renters can sign but with the understanding that the property owner could possibly reverse his/her tenant's vote. City staff will make reasonable efforts to find and contact local property owners during the verification process but will accept the renter's signature if proof of residency via utility record or other official document can be verified. The signature of any official representative of a business, church, school, homeowner's association clubhouse, etc. will be accepted for non-residential petitioners. Only valid petitioners, as described above, will be allowed to register petition support. 60% of eligible petitioners is necessary to support a calming project containing physical calming devices.

Step 7 – **Implementation and Funding**

Having verified the signatures on the petition, City staff will finalize traffic calming plans, prepare cost estimates, and enter into an agreement with a contractor to perform the work. Upon completion of work, City crews will install striping and signing, as necessary. Traffic calming projects are funded primarily from public funding; however, when public funds are not available, private funding is a possibility. Any private funding must be collected on a volunteer basis and presented to the City of Norman prior to construction.

Step 8 – **Follow-up Evaluation**

When construction of a traffic calming project is complete, the City Traffic Control Division will conduct a final traffic study to evaluate the effectiveness of the calming device(s). Additionally, City staff will send out a Feedback Survey to neighborhood residents as part of the evaluation process.

Step 9 – **Landscaping**

Landscaping of areas created by traffic calming, if needed, will be the responsibility of the neighborhood involved. City staff will prepare a Landscaping Agreement setting forth requirements and guidelines for the homeowner's association, or other neighborhood group, accepting responsibility for the landscaping and its future maintenance. Connections for utility services (e.g. water and power) may be provided in the construction phase of the project to facilitate maintenance efforts, but metering of utilities shall be initiated and paid for by the neighborhood group responsible for landscaping and its maintenance in compliance with City of Norman regulations and permits.

QUALIFYING CRITERIA

To qualify for the *Neighborhood Traffic Management and Calming Program,* a neighborhood residential street must meet the following minimum criteria:

- 85th Percentile Speed of vehicles > 8 mph over posted speed limit and
- Average Daily Traffic (ADT) > 600 vehicles/day (vpd).

If the number of reported speed-related accidents in 3-year period > 5 accidents, this can be used as a substitute criterion in lieu of either the speed or volume requirement. It is important to recognize that special circumstances, including lack of sidewalks or proximity to parks or schools, in some neighborhoods may justify lower qualifying thresholds. These neighborhoods may be considered for the more permanent, self-enforcing type devices, but still must meet the following minimum criteria:

- 85th Percentile Speed of vehicles > 7 mph over posted speed limit and
- Average Daily Traffic (ADT) > 500 vehicles/day (vpd).

NOTE: **85th Percentile Speed** is that speed below which 85% of all traffic units travel. It is an accepted principle that most drivers on a roadway select safe and proper speeds based on roadway and traffic conditions. For determining a speeding problem on a specific roadway, the 85th percentile speed is often used because it is on the high end of a "normal" bell curve distribution. Typically, recorded speeds above the 85th percentile occur much less frequently than the speeds below it because the highest speeds are often erroneous readings or the result of a few drivers who are either unperceptive of roadway conditions or irresponsible. The generally accepted traffic engineering practice is to set speed limits at the nearest increment to the 85th percentile speed unless other considerations such as collisions and real dangers not perceivable by drivers may indicate the need for a lower speed limit. Since speed limits are generally set using the 85th percentile, it is expected that 15% of the vehicles will exceed the speed limit on a regular basis.

EXCLUDED ROUTES

The use of certain traffic calming devices will be restricted on public transit and arterial routes. Devices such as speed humps will not be used on these routes.

On routes designated as "emergency routes" by emergency responders such as the Fire Department and ambulance services, only "drive around" type traffic calming devices, such as traffic circles, offset (divided) speed tables, or speed cushions will be allowed. These routes are those on which calming devices would delay emergency responders from meeting their targeted response times.

PRIORITIZATION OF PROJECTS

To prioritize projects competing for traffic calming dollars, points are assigned based on the following point system:

No. of mph that qualifying 85th Percentile Speed is over posted speed limit:

- 8 to 10 mph = 6 points
- 10 to 12 mph = 7 points
- 12 to 14 mph = 8 points
- 14 to 15 mph = 9 points
- >15 mph = 10 points

If no. of mph that the 95th Percentile Speed is over posted speed limit:

- >15 mph = 5 points

Average Daily Traffic (ADT):

- 600 to 900 vpd = 3 points
- 900 to 1,100 vpd = 4 points
- 1,100 to 1,500 vpd = 5 points
- >1,500 vpd = 6 points

No. of reported speed-related accidents (last 3-year period):

- 0 to 1 = 1 point
- 2 to 3 = 2 points
- 4 to 5 = 3 points
- 6 to 10 = 5 points
- >10 = 7 points

Pedestrian generators (only 1 category per project):

- School in petition area = 4 points
- Hospital in petition area = 3 points
- Park/non-home day care on street = 2 points
- Other (Church, commercial, etc.) on street = 1 point
- No sidewalks on either side of street = 2 points (max.)
- Overwhelming neighborhood petition support > 90% = 1 point

Competing projects are ranked according to their sums of the above assigned points. Projects not funded may be considered for the next funding cycle, but they will have to undergo the prioritization process again.

IMPACTS OF TRAFFIC CALMING DEVICES

Overall Effectiveness:

The physical actions of calming devices are almost always successful (to varying degrees) by forcing traffic to behave in an intended fashion. In most cases, these devices can achieve the desired result by taking advantage of a one-time capital expenditure with low ongoing maintenance costs.

Effect on Emergency Vehicle Response Times:

Creating bumps, dips, and sharp curves is precisely the objective sought by traffic calming devices and, of course, these maneuvers can negatively impact emergency vehicles response times. It is believed; however, that these delays are minimal and, in most situations, can be tolerated. Quantitatively, research shows that both vertical and horizontal displacement devices can delay ambulances and fire trucks between 2 and 10 seconds per device. It is important in the engineering of these devices that locations and sizes of these types of devices be carefully considered to mitigate such delays. Where applicable, "test" runs of emergency vehicles will be made before installation of permanent devices.

Loss of Parking:

It is often necessary to prohibit on-street parking in the immediate vicinity of certain traffic calming devices to accommodate the realigned vehicle path. In these cases, the adjacent residents should be aware that a loss of on-street parking in front of their residences may occur.

Aesthetic Impacts:

While some traffic calming devices can have favorable aesthetic impacts and enhance neighborhoods when beautifully landscaped, others can be, by their nature, somewhat unsightly. Some devices, e.g. speed humps, most often pose no opportunity for the incorporation of aesthetics and could have negative visual impacts. In fact, virtually all traffic calming actions require signs, striping, and/or reflective devices which may be construed as aesthetically non-pleasing to residents. In the end; however, most residents feel this is a minor trade-off for the calming benefits they are receiving.

REMOVAL OF TRAFFIC CALMING DEVICES

Devices installed for the purpose of calming traffic in residential areas may be removed or significantly modified only when **all** of the following criteria have been met:

- At least 75% of the residents and/or property owners (one signature per residence) living within 600' of the devices in question must agree, by petition, to remove it;

- The calming device must have been in place twelve months or longer before being considered for removal;

- The City Transportation Engineer, or his designee, agrees that its removal will not affect the overall effectiveness of the calming efforts in the neighborhood; and

- Funding, either from City or private residential sources, must be available to restore or modify the device.

DESCRIPTION OF TRAFFIC MANAGEMENT AND CALMING TOOLS

1. ***Police Presence in Neighborhood*** (see Figure 1)
   Positioning of a police vehicle on a street as a visible means of enforcement to discourage speeding.

2. ***Police Enforcement*** (see Figure 2)
   At the request of the Traffic Control Division, the Norman Police Department deploys a radar enforcement unit to issue citations in a neighborhood during certain strategic times to discourage speeding.

3. ***Radar Trailer*** (see Figure 3)
   A non-enforcing, temporary measure to increase driver awareness about speeding in which a portable radar speed meter mounted beside a street measures vehicle speeds and displays speed on a board.

4. ***Neighborhood Radar Monitoring*** (see Figure 4)
   A hand-held radar gun is made available, with instructions provided by City staff, to certain trained residents to determine the number of speeding vehicles and who is speeding in the neighborhood.

5. ***Automated Speed Enforcement*** (see Figure 5)
   Street installation of a camera and radar determines if a vehicle is exceeding the speed limit, takes a picture of vehicle's license plate, and a ticket is mailed to the vehicle owner.

6. ***Gateway*** (see Figure 6)
   A special entrance feature to a neighborhood that narrows a street at its entrance and includes a sign and landscaping, and sometimes a median and a change of pavement texture.

7. ***Striping Narrow Lanes*** (see Figure 7)
   A measure by which pavement striping is used to create lanes as narrow as 10 feet wide to give drivers a feel of a narrower street that should not lend itself to high speeds.

8. ***Choker/Choker Island*** (see Figure 8)
   A modification of an existing curb section (or a standalone landscape strip beside the existing curb) that "chokes" or reduces the street width at an intersection, mid-block, or other street segment to slow down traffic.

9. ***Angled Slow Points*** (see Figure 9)

A modification of an existing curb section that is used in conjunction with another one, slightly offset, on the opposite side of the street to create a narrow, angled path that makes oncoming traffic want to yield and thus slow down.

10. ***Divided Angled Slow Points*** (see Figure 10)

Modification of an existing curb section that is used in conjunction with another one, slightly offset, on the opposite side of the street, and with a center island, to create a narrow, angled path that slows down vehicles.

11. ***Neckdowns (Curb Bulb-outs)*** (see Figure 11)

A modification of existing curbs at intersections that reduces street width to slow down traffic and shortens pedestrian crossing distances.

12. ***Center Island Median*** (see Figure 12)

A curbed standalone strip, usually landscaped, placed in the middle of a street as an "island" that divides traffic into narrower lanes to slow down the vehicles.

13. ***Chicane (Serpentine)*** (see Figure 13)

Long realignment modifications of street curbs that alternate from one side of the street to the other, creating S-shaped curves that discourage speeding to navigate.

14. ***Traffic Circle*** (see Figure 14)

A circular, raised island, usually landscaped, placed in an intersection to prevent speeding through the intersection by impeding straight through movements and forcing drivers to slow down to go around it.

15. ***Raised Crosswalk*** (see Figure 15)

A raised plateau of roadway, usually installed at street intersections, that vertically deflect vehicles causing traffic to slow down and enhances pedestrian safety.

16. ***Rumble Strips*** (see Figure 16)

"Dots" or rough strips glued to pavement, causing tires to "rumble", that alert drivers to heighten their awareness by slowing down.

17. ***Speed Humps*** (see Figure 17)

14' long parabolic shaped mounds of paving or prefabricated material placed across a roadway that cause a vertical shift in a crossing vehicle resulting in its driver slowing down.

18. ***Speed Tables*** (see Figure 18)

22' long raised mounds of paving or prefabricated material, consisting of a flat middle section and parabolic end sections, placed across a roadway that causes a vertical shift in a crossing vehicle resulting in its driver slowing down.

19. ***Speed Cushions*** (see Figure 19)

10' long mounded sections of prefabricated material placed across the roadway and spaced approximately 3' apart that cause a vertical shift in a crossing vehicle resulting in its driver slowing down.

20. ***Turn Restriction Barrier*** (see Figure 20)

A physical barrier constructed in the form of a concrete median barrier, closely spaced row of flexible delineator posts, or simply delineators glued to the pavement surface that is installed to prevent vehicles from making certain movements in and out of residential streets.

21. ***Diagonal Diverter*** (see Figure 21)

A physical barrier between diagonally opposite corners of a four-legged intersection, thus creating two unconnected L-shaped intersections for the purpose of reducing speeds and diverting traffic elsewhere.

22. ***Half Closure (Semi-Diverter)*** (see Figure 22)

A partial street closing effectuated by a significant curb extension or bulb-out at an intersection that physically prevents a straight through movement of traffic across the intersecting street.

23. ***Mid-Block Road Closure*** (see Figure 23)

Back-to-back cul-de-sacs created by closing a street mid-block using a landscaped area for the purpose of reducing speeds and eliminating the through traffic.

24. ***Complete Road Closure*** (see Figure 24)

A street closure created by a landscaped area at the end of a block, formed as a cul-de-sac for turn-around purposes, to prevent cut-through traffic and to virtually eliminate speeding on the closed street.

25. ***Offset (Divided) Speed Table*** (see Figure 25)

A pair of 22' long raised mounds of paving, separated so that emergency vehicles can go around them, each consisting of a flat middle section with parabolic end sections and placed in opposite direction lanes to cause a vertical shift in a crossing vehicle resulting in its driver slowing down.

Figure 1

Police Presence in Neighborhood	
Advantages	**Disadvantages**
Shows an enforcement presence	City resources needed to deploy units
Drivers may slow down fearing enforcement	Residents quickly realize that mere presence of police does not result in speeding citations

Figure 2

Police Enforcement	
Advantages	**Disadvantages**
Visible enforcement reduces speeding	Benefits are usually short term
Driver awareness about speeding is increased	
Enforcement flexible - any time of day	
Effect can be quick	

Figure 3

Radar Trailer	
Advantages	**Disadvantages**
An effective public relations and educational tool	Not an enforcement tool
Usually effective where radar trailer is located	Benefits are usually short term

Figure 4

Neighborhood Radar Monitoring	
Advantages	**Disadvantages**
Effect on speeders limited to sight distance of radar gun	Not an enforcement tool
An effective public relations and educational tool	Requires training
Neighbors feel they are part of the solution	
Possibility of long-term effects as residents interact with each other	

Figure 5

Automated Speed Enforcement	
Advantages	**Disadvantages**
Very effective once public is award of the automated enforcement	Residents may not like the "Big Brother is Watching You" feeling
Cost effective—private companies will install and maintain equipment	May be some legal concerns

Figure 6

Gateway	
Advantages	**Disadvantages**
Creates an identity to a neighborhood	Increased maintenance costs
Creates added streetscape area for landscaping or monuments	Can impede legitimate truck movements
Discourages truck entry	

Figure 7

Striping Narrow Lanes	
Advantages	**Disadvantages**
Changes can be quickly implemented	Increases regular maintenance
Striping can be easily modified	Residents don't perceive as a speed control tool
Speeds decreased and safety improved by positively guiding drivers	

Figure 8

Choker / Choker Island	
Advantages	**Disadvantages**
Slight slowing is normal result	Potential object for motorists to run into
Shorter pedestrian crossing distances	May impede bicycle mobility and safety
Creates added streetscape area for landscaping	Can impede legitimate truck movements
Can discourage truck entry	May require drainage modifications

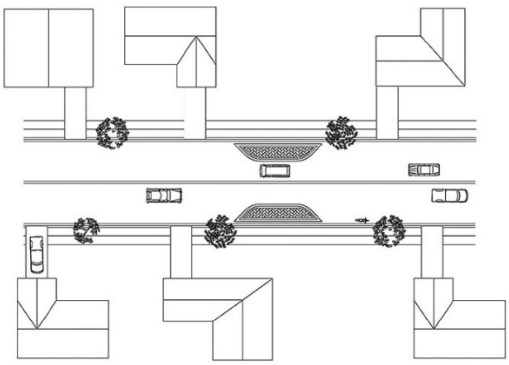

Figure 9

Angled Slow Points	
Advantages	**Disadvantages**
Reduces vehicle speeds	Loss of on-street parking
No significant impedance to emergency vehicles	Regular landscaping maintenance needed
Creates added streetscape area for landscaping	Potential for head-on collisions

Figure 10

Divided Angled Slow Points	
Advantages	**Disadvantages**
Reduces vehicle speeds	Loss of on-street parking
No significant impedance to emergency vehicles	Regular landscaping maintenance needed

Figure 11

Neckdowns (Curb Bulb-Outs)	
Advantages	**Disadvantages**
May be aesthetically pleasing if landscaped	Increased landscaping maintenance
Shorter pedestrian crossing distances	Landscaping could cause sight triangle issues

Figure 12

Center Island Median	
Advantages	**Disadvantages**
Reduces opportunities for head-on collisions	Loss of on-street parking
May be aesthetically pleasing if landscaped	Can restrict certain convenient turns

Figure 13

Chicane (Serpentine)	
Advantages	**Disadvantages**
Reduces vehicle speeds	Increased landscaping maintenance
May reduce through traffic volumes	Significant loss of on-street parking
	Emergency vehicles mildly effected

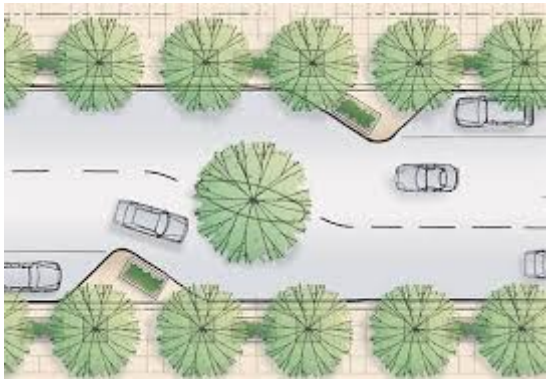

Figure 14

Traffic Circle	
Advantages	**Disadvantages**
Noticeable reduction of speeds	May increase crashes until drivers get used to it
Aesthetically pleasing when landscaped	Pedestrians/bicyclists must adjust to change of crossing patterns

Figure 15

Raised Crosswalk	
Advantages	**Disadvantages**
Effective speed reduction	Can affect emergency vehicle response time
Can be aesthetically pleasing	Regular maintenance needed
Improves pedestrian safety	Could cause drainage problems

Figure 16

Rumble Strips	
Advantages	**Disadvantages**
Driver's attention alerted to heighten safety	High noise level for adjacent residents
Slight speed reduction	Regular maintenance needed
Low-cost installation	

Figure 17

Speed Humps	
Advantages	**Disadvantages**
Effective speed reduction	Affects emergency vehicle response time
Can shift cut-through traffic elsewhere	Jars vehicles
	May be increased noise

Figure 18

Speed Tables	
Advantages	**Disadvantages**
Effective speed reduction	Affects emergency vehicle response time
Can shift cut-through traffic elsewhere	Jars vehicles
	May be increased noise

Figure 19

Speed Cushions	
Advantages	**Disadvantages**
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	May be increased noise

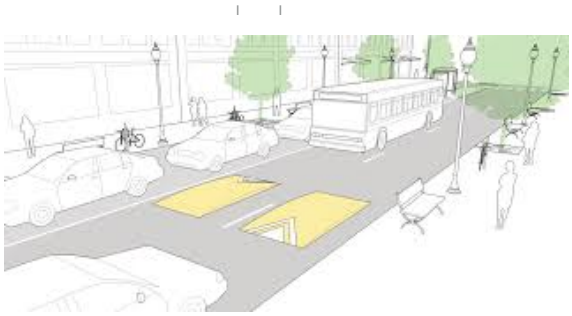

Figure 20

Turn Restriction Barrier	
Advantages	**Disadvantages**
Intersections safer by reducing number of conflicting movements	Little speed reduction
Can reduce traffic volumes and crashes	Gives residents fewer turning options

Figure 21

Diagonal Diverter	
Advantages	**Disadvantages**
Reduces speeds and volumes	Can shift problems elsewhere
Reduces crashes by reducing number of conflicting movements	Gives residents fewer path options
Has less impact on traffic circulation than complete street closure	

Figure 22

Half Closure (Semi-Diverter)	
Advantages	**Disadvantages**
Reduces cut-through traffic	Increased landscaping maintenance
May reduce traffic speeds	Easy to go around, especially at night

Figure 23

Mid-Block Road Closure	
Advantages	**Disadvantages**
Eliminates cut-through traffic	Can shift volume of problems elsewhere
Reduces speeds in vicinity of closure	Increased landscaping maintenance
	Impedes emergency access
	Loss of on-street parking

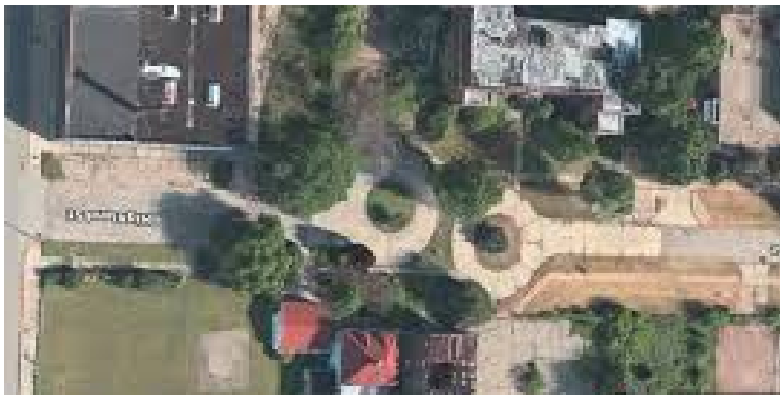

Figure 24

Complete Road Closure	
Advantages	**Disadvantages**
Eliminates speeding traffic	Impedes emergency access
Effective volume reduction	Gives residents fewer path options
Can be aesthetically pleasing when landscaped	Can shift volume problems elsewhere
Safe for children	

Figure 25

Offset (Divided) Speed Table	
Advantages	**Disadvantages**
Effective speed reduction	Jars vehicles
Can shift cut-through traffic elsewhere	May be increased noise
Minimal delay for emergency vehicles	
Emergency vehicles can go around tables