# Traffic Calming through Engineering

## *High-level approaches to changing the roadways*

### *Introduction*

Speeding in residential areas has been identified by the Hinsdale Community as an important issue. In combating the problem, the police department is challenged to develop a resolution to traffic complaints; a resolution which will produce long-term results and increase the safety of pedestrians, bicyclists, and neighbors. As technology and research in the law enforcement industry increases, more and more empirical data guides the response of police agencies in tackling the traffic problem. The studies today show that the traditional "scarecrow" methods of enforcement are having little impact on slowing vehicles; rather, instituting a ***"Neighborhood Traffic Management"*** program produces the greatest potential for a successful approach, an approach which is currently practiced by the Hinsdale Police Department.

*Neighborhood Traffic Management* is defined as "The combination of physical traffic calming measures, traffic regulations, intersection traffic control, education and enforcement policy designed to accomplish one or more of the objectives of reducing traffic speeds, minimizing cut-through (non-local) traffic and improving neighborhood street safety and livability. Under this concept, municipalities are encouraged to adopt a hierarchial stepped approach to traffic calming which consists of a "4 E" process of Education, Expectations, Enforcement, and Engineering. This approach introduces a conceptual response to addressing problem areas by relating to the root cause of the problem.

In preparation of this summary, several traffic-related documents were reviewed. In particular, the Dupage Mayors and Manager's Conference released their report *"Neighborhood Traffic Management in Dupage County"* in April 2004. This report provided the most credible and relative information about traffic management to this agency's practices. The report includes specific findings from countywide data collection regarding other municipalities' practices and efforts in traffic management, and the ultimate impact on speeding vehicles and residents. In particular, this report highlights "Engineering" initiatives and their potential to produce longer-term solutions to recurring problem areas.

### *Current Practices*

Prior to making changes to engineering of the roadways, municipalities review "Low-level" solutions which are intended to change driver behavior. The Hinsdale Police Department currently utilizes many different low-level educational and enforcement functions in an effort to slow vehicles, which include the use of speed trailers which show drivers their actual speed on a given roadway, Citizen Assisted Radar Programs

(C.A.R.E.), pace car programs, and public awareness campaigns. A recent trend of low-level solutions has been a progression to public awareness campaigns which include the use of simple lawn signs and special speed limit signs which make a personal appeal to the drivers, and convey a more heartfelt message to speeders about the risks they create.

With respect to enforcement, the Hinsdale Police Department has identified areas in which reports of speeding vehicles are consistent. These areas have been assigned to a Selective Enforcement program which requires patrol officers to regularly monitor and enforce speed violations in these areas. Although aggressive speed enforcement programs are perceived by the community as a deterrent for speeding vehicles, studies show that the speed reduction at a particular location dissipates within 3 days of an isolated, "one-time" selective enforcement effort, but can last up to 6 days when enforcement occurs over a period of several consecutive days (Dupage Mayors and Managers Neighborhood Traffic Management Report 2004). As a result, police departments typically have several established permanent Selective Enforcement areas in which regular enforcement is mandated. At the cost of manpower, the problem of speeding in these areas is infinite without the complement of additional educational or engineering measures. The community has a positive perception that the presence of a marked police car is solving the problem, but the fact remains that the results of this response is short-term.

To predicate a long-term solution, structural changes to the roadway (engineering), or high-level solutions, may be considered.

***Photo-enforcement***

The use of automated photographic evidence to help enforce and prosecute traffic violations is becoming more widespread throughout the country as an efficient and less manpower-intensive method of enforcement. Today, such enforcement has been practiced at toll plazas since its first application in 2000, and has also been introduced by the Illinois Commerce Commission at problem railroad-highway grade crossings in Dupage County. A follow-up study has shown that photo-enforcement projects have been successful in reducing violations, and while the initial setup costs can be high, the revenue from violations will conceivably recover installation costs within 3-4 years. The City of Chicago has most recently adopted photo enforcement for stop sign violations at problem locations.

The most prominent limitation of photo enforcement is public acceptance and patience with the practice, which many perceive to trigger constitutional issues of privacy. Public sensitivity is particularly prevalent with photo radar programs which use unmanned photographic equipment for speed enforcement. The Villages of Glen Ellyn and Batavia have made serious attempts to introduce these initiatives, but efforts were conceded to adverse community reaction, principally centered on invasion of privacy issues.

At this time, the State of Illinois legislature does not allow for municipalities to conduct photo-enforcement for speed violations. Photo-enforcement may be conducted only when warranted by the Illinois General Assembly, which currently limits this authority to

three railroad grade crossings in Dupage County, red light violations in the City of Chicago, and the Illinois State Police for speeding in Construction zones.

The Illinois Commerce Commission is introducing a Bill to the House of Representatives in 2006 which would expand the authority for photo enforcement of railroad grade violations to all municipal governments in Illinois.

***Why high-level engineering?***

Traffic experts have identified the most important factor is determining a motorists' speed on a roadway is the driver's perception of the road environment and of what speed it is safe to drive. The National Highway Traffic Safety Administration (NHTSA) relies upon countless studies to conclude that speed limit signs have little impact on the traveling speed of vehicles. Rather, it is the driver's habits, attitudes, and beliefs that set their speed. These principles are used when determining a proper speed limit for a roadway, particularly the 85$^{th}$ percentile speed (the speed that 85% of drivers travel at or below.) When speed limits are set lower than what most drivers consider safe, the net effect is to cause many drivers to ignore those speed limits. As a result, engineers habitually recommend introducing new low-level traffic-calming efforts and modifying roadways rather than speed limits.

High-level traffic calming describes a wide range of road and environment design changes that either make it more difficult for a vehicle to speed, or make drivers believe they should slow down for safety. Although the measures are also intended to make roads easier and safer for pedestrians and bicyclists to use traffic calming measures are particularly effective at reducing speeds in residential areas.

The most common high-level traffic calming measures are:

1. Narrowing the roadway
2. Installing bends and curves in the road
3. Installing road humps or speed tables
4. Marking the road to create an illusion that it is narrowing
5. Adding pedestrian crosswalks that are raised or made from distinctive materials
6. Planting trees and other foliage along roadsides
7. Installing traffic circles and roundabouts
8. Permitting parking on both sides of residential streets

** These measures and their effectiveness are described in detail in Appendix B.

***What criteria should be used when determining proper installation of traffic calming?***

To ensure that traffic calming initiatives are properly applied, there must be an established process for the application and installation of such measures. Installations should only be made in area which have met defined criteria, such as the following:

- Minimum traffic volume ( >100 vehicles per hour)
- Anticipated cut-through traffic (25%)
- 85$^{th}$ Percentile Speed ( > 34mph)
- Minimum length of segment (1,000 feet)
- Resident concurrence by petition (80% on treated streets)
- Width of roadway
- Is this an emergency route?
- Is this a Stage I Priority Snow Plow Route?

Traffic Calming Guidelines at municipalities currently utilizing such measures often establish a matrix which evaluates all of the above criteria. The Village of Downers Grove has developed a "Rating Chart" which assigns point values to each criteria. The rating chart is used to determine what type of traffic calming measures should be considered. (Appendix C)

** It is important for municipalities to recognize that **neighborhood residents react most strongly to reductions in the number and speed of those relatively *few vehicles that exceed the posted speed limits by a large amount.* A statistically significant change in average or mean speed on a given street may not even be perceptible by many residents.**

Example: If the average speed on a given roadway is reduced 5 mph, most residents would not perceive the reduction in average speeds. Rather, residents notice and respond when a vehicle passes at speeds of greater than 12-15 mph over the posted speed limit.

The following complications have been reported by municipalities currently practicing traffic calming engineering:

- Traffic calming measures were often installed in response to the vocal complaints of just a few residents of a neighborhood, when in fact the majority of residents neither concurred that a serious problem existed nor liked the countermeasures implemented.
- Some traffic calming measures modified the roadway environment to the extent that public works functions were disrupted and emergency vehicle accessibility and safety were compromised. Most often, this occurs with speed bumps.
- There often was no strong effort to quantify the extent to which a speeding or cut-through traffic problem really existed before the measure was installed. Likewise, there was often no effort made to assess the success or failure of the traffic calming device after installation (whether it be

actual reduction in vehicle speeds or volumes, or the level of neighborhood satisfaction.)

- In cases where before-and-after studies of specific traffic calming measure implementation have been conducted, the results have necessarily pointed to a reduction in speeding or cut-through traffic volumes. In many cases contradictory results, such as increased in speeds, are noted.
- A domino effect is often created after installing traffic calming measures in one neighborhood as other neighborhoods demand "equal" treatment. Costs can quickly escalate out of control.

***When should high-level traffic calming be considered?***

As traffic calming measures can become expensive, their cost-effectiveness must be determined over the long term. When considering whether or not high-level measures should be initiated, the following principles should be followed:

1. Document traffic complaints thoroughly
2. Obtain accurate data about the roadway relevant the complaint
3. Evaluate existing traffic calming practices in this segment of roadway.
4. Develop a strong support platform from residents in the target area.
5. Review the types of high-level measures and select one appropriate for the locale.
6. ***Ensure that all low-level calming measures have been exhausted.***

Traffic calming measures work best if they are understood and accepted by the public, take into account existing traffic and roadway conditions, review the special requirements of emergency response vehicles, and are reinforced with adequate levels of police enforcement.

***Effectiveness of Traffic Calming Measures***

If decided that a municipality will progress to making traffic-calming modifications to roadways, it is important that a clear understanding is established of what actual benefits can be achieved, such as real reductions in speeds, traffic volume, collisions, or positive effects among residents.

Speed impacts of traffic calming measures depend primarily on geometrics and spacing. Geometrics determine the speeds at which motorists travel through slow points. Spacing determines the extent to which motorists speed up between slow points.

Volume impacts depend on the entire network of which a street is a part, not just on the characteristics of the street itself. The availability of alternative routes and the application of other measures in area-wide schemes may have as large an impact on volumes as do the geometrics and spacing of traffic calming measures.

Collision impacts generally indicate that the number of collisions in the target area are reduced. By slowing traffic, eliminating conflicting movements, and sharpening drivers'

attention, traffic calming may result in fewer collisions. When collisions do occur, they may be less serious due to lower vehicle speeds.

*See the tables on page 7 and 8 which represent the speed, volume, and collision impacts of traffic calming measures.*

Impacts on local residents vary depending on the locale. Empirical data supports that the installation of permanent traffic calming measures may have effects on the property values of neighboring homes; however, two theories exist.

1. **Positive:** The neighborhood may be appealing to others because it is safer for bicyclists and pedestrians.
2. **Negative:** High-level measures stigmatize the street and advertise that this roadway experiences high traffic volumes at greater speeds, an affirmation that traffic is a problem.

Another concern raised by residents is noise level, but studies show that due to lower speeds, noise levels may be reduced.

When making a decision to install a traffic calming measure, it is important to recognize that the response time of emergency vehicles will be delayed. The delay varies and is contingent upon the type measure instituted (hump vs. table), and the type of emergency vehicle which is negotiating the calming measure. (e.g. **1.** An ambulance carrying a patient is delayed by approx. 9.7 seconds per hump; however, the delay for the same ambulance is much less without a patient. **2.** A fire engine may negotiate a 22-foot speed table in 3.0 seconds; however, it will take a ladder truck 13.5 seconds to negotiate the same speed table).

The impacts on the public services department for snow removal should also be considered. Agencies report that snow-plow operators must use caution and diligence at the target locations; however, the overall impact for municipalities with little snow is very minor.

**Table 5.1. Speed Impacts Downstream of Traffic Calming Measures.**

| Sample Measure | Sample Size | 85th Percentile Speed (mph)* | | |
|---|---|---|---|---|
| | | Average After Calming | Average Change After Calming | Percentage Change* |
| 12-foot humps | 179 | 27.4 (4.0) | -7.6 (3.5) | -22 (9) |
| 14-foot humps | 15 | 25.6 (2.1) | -7.7 (2.1) | -23 (6) |
| 22-foot tables | 58 | 30.1 (2.7) | -6.6 (3.2) | -18 (8) |
| Longer tables | 10 | 31.6 (2.8) | -3.2 (2.4) | -9 (7) |
| Raised intersections | 3 | 34.3 (6.0) | -.3 (3.8) | -1 (10) |
| Circles | 45 | 30.3 (4.4) | -3.9 (3.2) | -11 (10) |
| Narrowings | 7 | 32.3 (2.8) | -2.6 (5.5) | -4 (22) |
| One-lane slow points | 5 | 28.6 (3.1) | -4.8 (1.3) | -14 (4) |
| Half closures | 16 | 26.3 (5.2) | -6.0 (5.2) | -19 (11) |
| Diagonal diverters | 7 | 27.9 (5.2) | -1.4 (4.7) | -4 (17) |

*Measures within parentheses represent the standard deviation from the average. This table is summarized from data presented in appendix A.

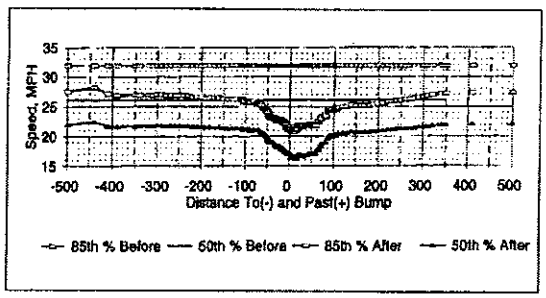



**Figure 5.22. Speed Profile for a 14-foot Hump. (Portland, OR)**

Source: Bureau of Traffic Management, City of Portland, June 1997.

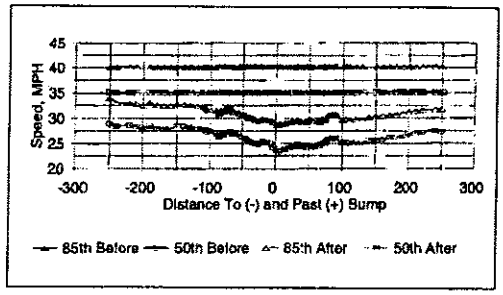



**Figure 5.23. Speed Profile for a 22-foot Table. (Portland, OR)**

Source: Bureau of Traffic Management, City of Portland, June 1997.

**Table 5.2. Volume Impacts of Traffic Calming Measures.**

| Measure | Sample Size | Average Change in Volume* (vehicles per day) | Average Percentage Change in Volume* (vehicles per day) |
|---|---|---|---|
| 12-foot humps | 143 | -355<br>(591) | -18<br>(24) |
| 14-foot humps | 15 | -529<br>(741) | -22<br>(26) |
| 22-foot tables | 46 | -415<br>(649) | -12<br>(20) |
| Circles | 49 | -293<br>(584) | -5<br>(46) |
| Narrowings | 11 | -263<br>(2,178) | -10<br>(51) |
| One-lane slow points | 5 | -392<br>(384) | -20<br>(19) |
| Full closures | 19 | -671<br>(786) | -44<br>(36) |
| Half closures | 53 | -1,611<br>(2,444) | -42<br>(41) |
| Diagonal diverters | 27 | -501<br>(622) | -35<br>(46) |
| Other volume controls | 10 | -1,167<br>(1,781) | -31<br>(36) |

*Measures in parentheses represent the standard deviation from the average.

**Table 5.7. Average Annual Collision Frequencies Before and After Traffic Calming.**

| Traffic Calming Measure | Number of Sites | Average Annual Collisions | | |
|---|---|---|---|---|
| | | Before Calming | After Calming | Percentage Change |
| 12-foot humps | 50 | 2.62 | 2.29 | -13 |
| 14-foot humps | 5 | 4.36 | 2.62 | -40 |
| 22-foot tables | 8 | 6.71 | 3.66 | -45 |
| Circles (without Seattle data) | 17 | 5.89 | 4.24 | -28 |
| Circles (with Seattle data) | 130 | 2.19 | 0.64 | -71 |
| **Overall** | **193** | **2.54** | **1.24** | **-51** |
| Without Seattle data | 80 | 3.83 | 2.86 | -25 |
| Sites with volume data | 55 | 4.43 | 3.22 | -27 |
| Rate adjusted | 55 | 3.36 | 3.22 | -4 |

Source: Unpublished documents supplied by the traffic calming programs.

In an effort to report a uniform status of the effects of traffic calming measures locally, the Dupage Mayors and Managers Conference has developed a forum for sharing of experiences with local traffic calming measures, costs to initiate the measure, and the positive and negative effects on their respective community. The experience at five Dupage municipalities is included in Appendix D.

A generalized assessment of traffic calming measures is depicted in the table below.

**Table 3.4. Generalized Assessment of Traffic Calming Measures. (Phoenix, AZ)**

| Traffic Management Device | Traffic Reduction | Speed Reduction | Noise and Pollution | Safety | Traffic Access Restrictions | Emergency Vehicle Access | Maintenance Problems | Level of Violation | Cost |
|---|---|---|---|---|---|---|---|---|---|
| Speed Humps | Possible | Limited | Increase Noise | No Documented Problems | None | Minor Problems | None | Not Applicable | Low |
| STOP Signs | Unlikely | None | Increase | Unclear | None | No Problems | None | Potentially High | Low |
| NO LEFT/RIGHT TURN Signs | Yes | None | Decrease | Improved | No Turn(s) | No Problems | Vandalism | Potentially High | Low |
| One-Way Street | Yes | None | Decrease | Improved | One Direction | One Direction | None | Low | Low |
| Chokers | Unlikely | Minor | No Change | Improved For Pedestrians | None | No Problems | Trucks Hit Curbs | Not Applicable | Moderate |
| Traffic Circle | Possible | Likely | No Change | Unclear | None | Some Constraint | Vandalism | Low | Moderate |
| Median Barrier | Yes | None | Decrease | Improved | Right Turn Only | Minor Constraint | None | Low | Moderate |
| Forced Turn Channelization | Yes | Possible | Decrease | Improved | Some | Minor Constraint | Vandalism | Potentially High | Moderate |
| Semi-Diverter | Yes | Likely | Decrease | Improved | One Direction | Minor Constraint | Vandalism | Potentially High | Moderate |
| Diagonal Diverters | Yes | Likely | Decrease | Improved | Thru Traffic | Some Constraint | Vandalism | Low | Moderate |
| Cul-de-Sac | Yes | Likely | Decrease | Improved | Total | Some Constraint | Vandalism | Low | High |

Source: Street Transportation Division, City of Phoenix, AZ.

***Recommendations***

Upon completing a comprehensive review of Neighborhood Traffic Management research from the Institute for Traffic Engineers, Dupage Mayors and Managers Report, and various other traffic engineering sources, I conducted a review of the traffic calming practices in the Village of Hinsdale and explored the potential for implementing "high-level" practices of making engineering changes to the roads.

When reviewing the existing practices, the Hinsdale Police Department already promotes and participates in many of the existing law enforcement educational and driver awareness programs. Due to past village-wide commitments to reducing traffic speeds on residential roadways, specialized equipment such as the speed trailer, STEALTH radar, Laser, and hand-held radar unit had been acquired. Each patrol vehicle is equipped with a multi-directional and multi-functional radar unit which also increases enforcement efforts on all streets. Additionally, conceptualized programs such as the PACE Car program and C.A.R.E. (Citizen Assisted Radar Enforcement) have recently been instituted which solicit the community's assistance in slowing vehicles. When these low-level solutions are not successful, only then should the municipality progress to high-level solution initiatives.

In consideration of installing traffic calming measures such as humps or speed tables, it is important to first identify the true nature and extent of the problem in the target area. When data is collected from a covert radar unit, such as the STEALTH, it most accurately depicts the true speeds and volumes of vehicles passing a given area. In the past 36 months, the STEALTH unit has been deployed in dozens of locations in response to traffic complaints. Although the recorded 85$^{th}$ percentile speeds were higher in some areas (particularly the selective enforcement locations), they have not reached levels which would warrant a high-level response nor meet the criteria of a high level response, particularly when reviewing the criteria that other municipalities have met to warrant its installation. Analyses of stop data and selective enforcement activity show that police presence is regular in areas targeted for additional enforcement; however, the violation frequency is not unique from many other village roadways which share similar characteristics and roadway conditions.

To recommended an action plan to further increase traffic calming initiatives, I would identify the following items to be instituted in the next 12 months:

- Increase public awareness campaigns:

    - ✓ Many municipalities have used unique signage, particularly temporary mobile signage, to attract both public and driver's attention to the community's commitment of obeying speed limits. I would like to advance our current campaigns to include a program of signage, either temporary or permanent, to increase visibility. Examples:

    - Downers Grove used fluorescent green "Kid alert" signs which are mobilized between different target locations. The signs are highly visible, made of plastic, and effective in capturing the attention of drivers while appeasing the residents along the roadway.
    - Subscribe to a campaign such as "Stay Alive – Drive 25" which replaces the village's speed limit signage with a sign that reminds drivers to drive the speed limit.

- Develop a formalized Traffic Calming Handbook that identifies specific criteria for implementing all police department efforts in reducing vehicular speeds, including the use of the speed trailer, STEALTH Radar, and Selective Enforcement. Should a reported traffic problem show that additional engineering modifications may be needed, the criteria can be reviewed to determine whether or not a recommendation should be made at that time.

One of the most redundant conclusions reflected in all studies dictates that engineering modifications should only be made when they are appropriate and warranted. Particular attention has been stressed when it comes to residential perception of speeding problems, and often times high-level solutions are implemented when they truly are not warranted.

I am convinced that the most effective response from the Hinsdale Police Department that will achieve residential satisfaction is to continue to promote high visibility driver awareness, enforcement in selective enforcement locations, and increase public awareness campaigns. In consideration of the costs of high-level traffic calming devices, this recommendation is likely to yield a much greater impact on the community as a whole than the expense of only one speed table, which only affects one target locations. It must be recognized that once the transition to high-level traffic calming is initiated, many other requests will follow and will burden the Village with scrutiny in its traffic calming expense allocation.

# APPENDIX A

# APPENDIX A: **Summary of Traffic Calming Measures**

*This appendix includes a summary of traffic calming measures currently instituted in municipalities nationwide. Commonly used measures such as speed humps, speed tables, traffic circles, and chokers are presented in greater detail.*

## Speed Humps

Speed humps are rounded raised areas placed across the road. They are also referred to as road humps and undulations. ITE (Institute for Traffic Engineers) guidelines for the application of speed humps is 12 feet in length, 3 to 4 inches high, and parabolic in shape. The design speed for a speed hump is 15-20mph. It is usually designed with a taper on each side to allow unimpeded drainage between the hump and curb. Additionally, the 12-foot length guarantees that a passenger vehicle cannot straddle a hump, thereby reducing the likelihood of bottoming out.

Advantage:

- Speed hump are rated the most effective in reducing vehicle speeds
- Lower costs than other measures

Disadvantage:

- Appearance is poor, sometimes detracting from property value
- Liability of damage to personal vehicles

In light of liability concerns, most communities now limit the height of speed humps to 3 to 3.5 inches.

**AVERAGE COST: Approx. $2,500 per speed hump**

## Speed Tables

Speed tables are flat-topped speed humps often constructed with brick or other textured materials on the flat section. Speed tables are typically long enough for the entire wheelbase of a passenger car to rest on top. Their long flat fields, plus ramps that are sometimes more gently sloped than speed humps, give speed tables higher design speeds than humps. The brick or other textured materials improve appearance of speed tables, draw attention to them, and may enhance safety and speed reduction.

The most common speed table is 3-4 inches high and 22 feet long in the direction of travel, with 6-foot ramps at the ends and a 10-foot field on top. It has an 85$^{th}$ percentile speed of 25-30mph, is less jarring than the standard 12-foot hump, and is considered to

be better proportioned for aesthetics. Some municipalities target the placement of the speed tables in so that they may also serve as raised pedestrian crosswalks.

Advantage:

- Softer appearance than speed humps while achieving similar results
- Can be used to accentuate pedestrian crosswalks
- More widely approved by emergency response vehicles

Disadvantages:

- Cost is higher than that of a speed hump
- Vehicles may pass at higher speeds than speed bumps (described as too gentle)

**AVERAGE COST: Approx. $10,000 per speed table**

## Traffic Circles

Traffic circles are raised islands, placed in intersections, around which traffic circulates. They are sometimes known as intersection islands. They are usually circular in shape and landscaped in their center islands, though not always. They are typically controlled by Yield signs on all approaches.

Circles prevent drivers from speeding through intersections by impeding the straight-through movement and forcing drivers to slow down to yield. Drivers must first turn to the right, then to the left as they pass the circle, and then back to the right again after clearing the circle.

Advantages:

- Pleasurable appearance to residents and motorists.
- Requires motorists to slow at intersections and may reduce collisions at intersections

Disadvantages:

- Costs may be much greater than speed tables or humps due to the size of the features, use of concrete rather than asphalt, need for landscaping, and frequent need for new curb lines at corners.
- Inability of larger vehicles to turn around small-radius curves.
- Concerns raised by bicyclists and pedestrians that horizontal deflection forces motor vehicles into pedestrian crossing areas on cross streets or into travel paths of cyclists on main streets.

- Studies show that although speeds decrease at intersections, midblock speeds seldom decline. The influence of traffic circles is limited to a couple hundred feet upstream and downstream of circles.
- Large vehicles that are unable to negotiate the radius of the turns make left turns in front of center islands and can create hazardous potential for head-on collisions.

**AVERAGE COST: Approx. $10,000 per traffic circle (varies upon extent of landscaping, signage, and material used.)**

**Narrowings (nubs, bulbouts, knuckles)**

Narrowings are curb extensions that reduce roadway width from curb to curb. As the roadway narrows, driver's must reduce speeds to safely negotiate through the narrowing. The perception to the drivers forces them to slow down as traveling at higher speeds becomes far more dangerous.

Advantages:

- Little impact on aesthetics to the roadway and residential areas
- May be coupled with a mid-block pedestrian crossing to increase pedestrian safety
- Reduces speeds at the location of the narrowing

Disadvantages:

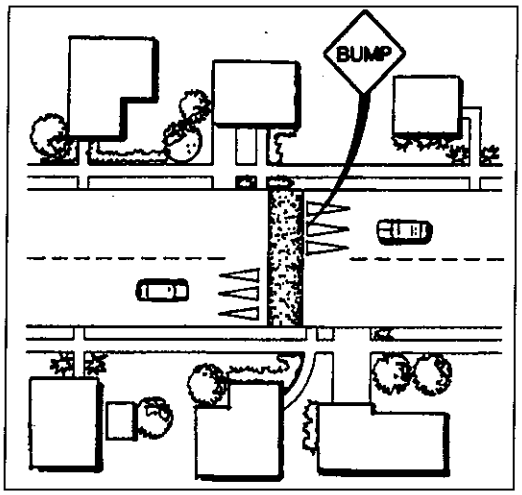
- Studies show that although speeds decrease at the narrowing, midblock speeds seldom decline. The influence of narrowings is limited to a couple hundred feet upstream and downstream of circles.
- Collision risk is greater as vehicles are passing in a much closer proximity in opposite direction of travel.

**AVERAGE COST: Varies depending on length of narrowing**

Please refer to the next several pages for photographs and diagrams of traffic calming measures.

# APPENDIX B

## SPEED HUMPS
## (road humps, undulations)



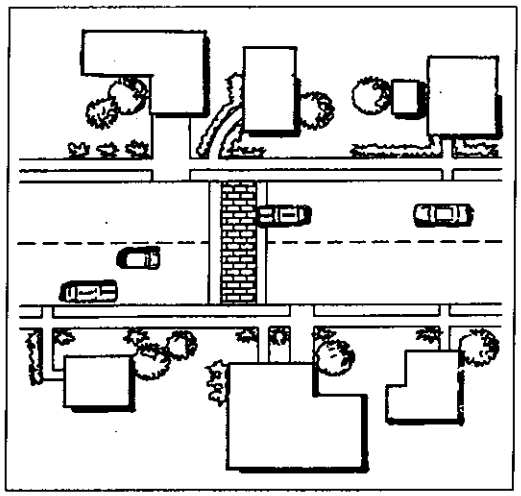

14-foot Hump. (Portland, OR)

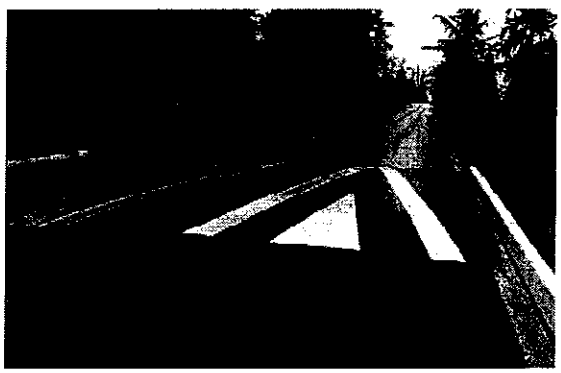
12-foot Hump. (West Palm Beach, FL)

22-foot Hump. (Ft. Lauderdale, FL)

30-foot Hump. (Beaverton, OR)

## SPEED TABLES
## (trapezoidal humps, speed platforms)





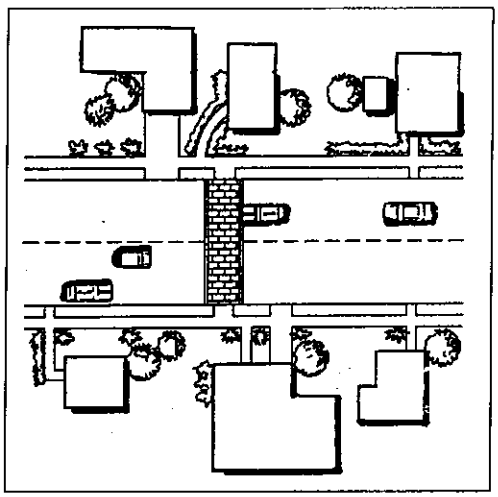
Bellevue, WA

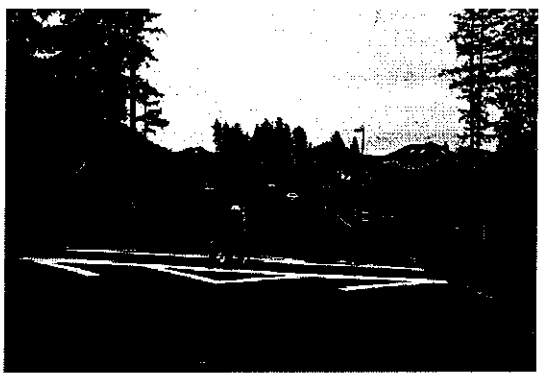
Charlotte, NC

Portland, OR

Naples, FL

## RAISED CROSSWALKS
## (raised crossings, sidewalk extensions)





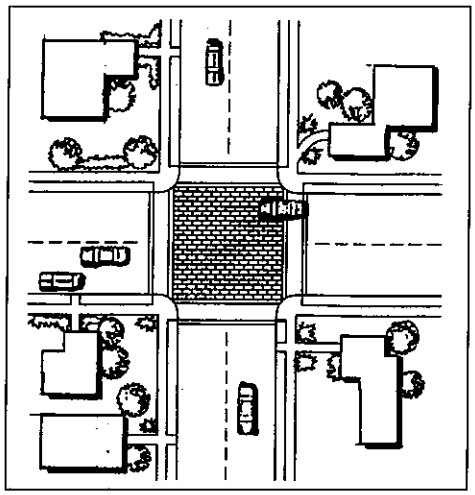
Beaverton, OR

Eugene, OR

Montgomery County, MD

Tallahassee, FL

## RAISED INTERSECTIONS
## (raised junctions, intersection humps, plateaus)



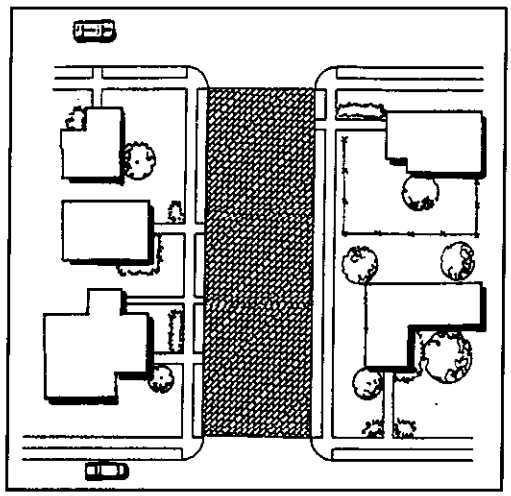
Beaverton, OR

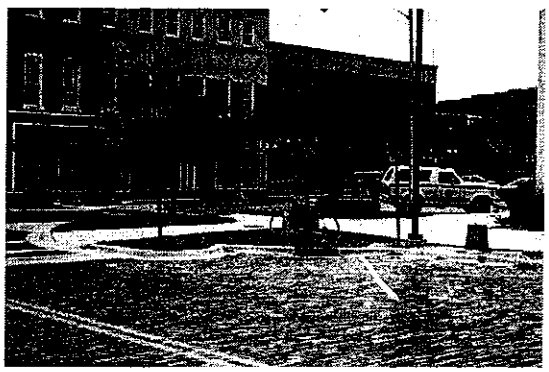
Columbia, MD

Cambridge, MA

West Palm Beach, FL

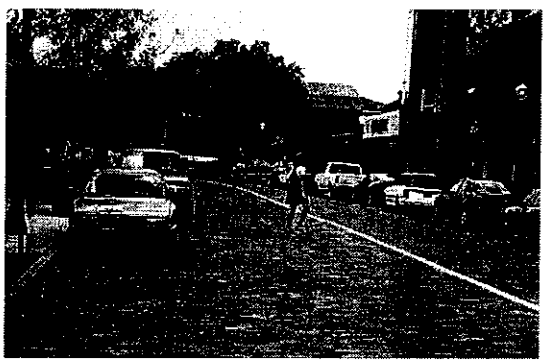
## TEXTURED PAVEMENTS



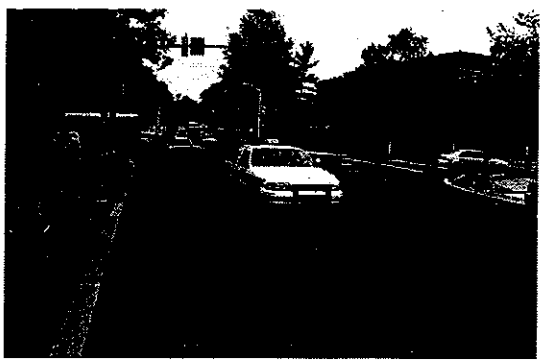


Gainesville, FL

Seattle, WA

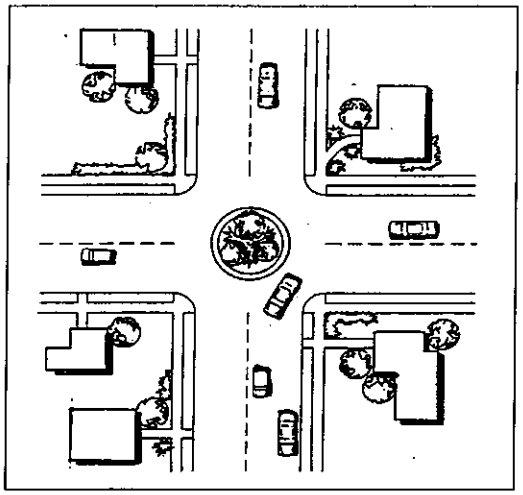


Winter Park, FL



Montgomery County, MD

## NEIGHBORHOOD TRAFFIC CIRCLES
*(intersection islands)*



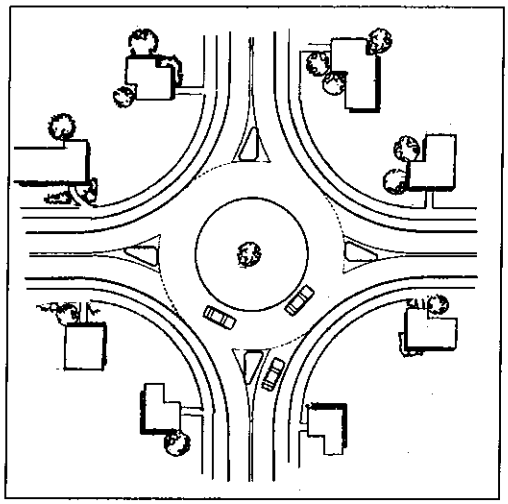
Boulder, CO

Portland, OR

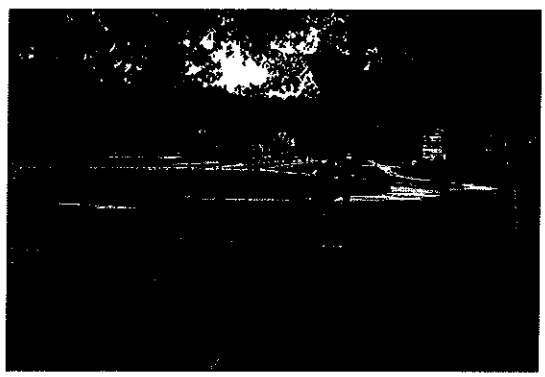
San Jose, CA

Eugene, OR

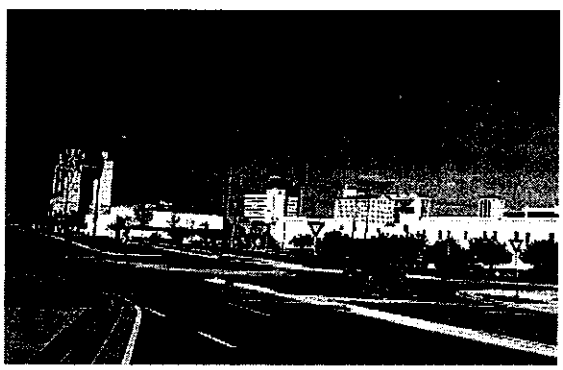
## ROUNDABOUTS
## (rotaries)



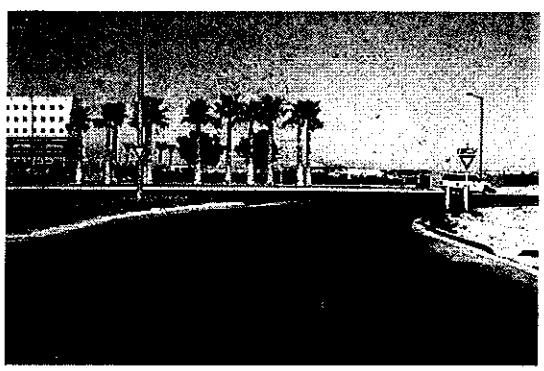
Beaverton, OR



Tallahassee, FL

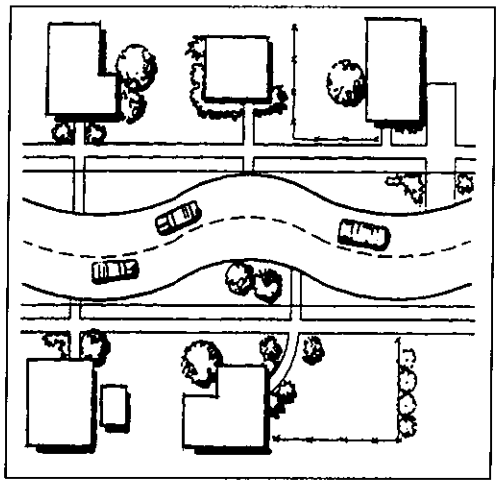


West Palm Beach, FL



Las Vegas, NV

## CHICANES
## (deviations, serpentines, reversing curves, twists)



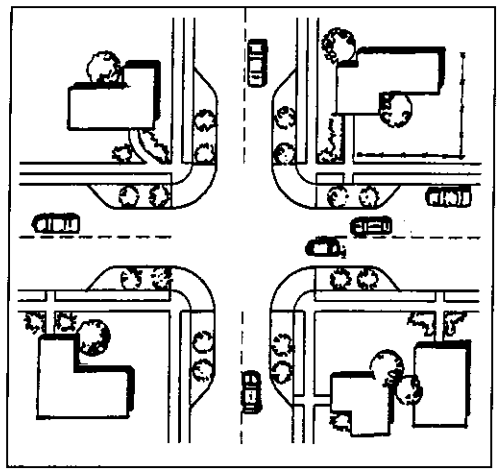
Seattle, WA

Alachua, FL

Tallahassee, FL

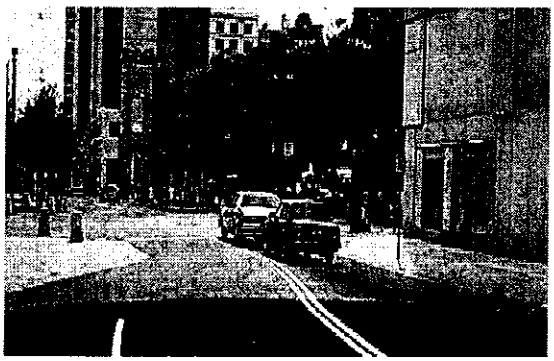
Montgomery County, MD

## NECKDOWNS
## (nubs, bulbouts, knuckles, intersection narrowings, corner bulges, safe crosses)



Eugene, OR

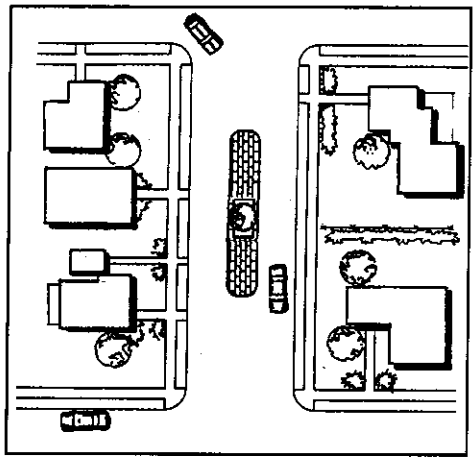
Cambridge, MA



Jacksonville, FL

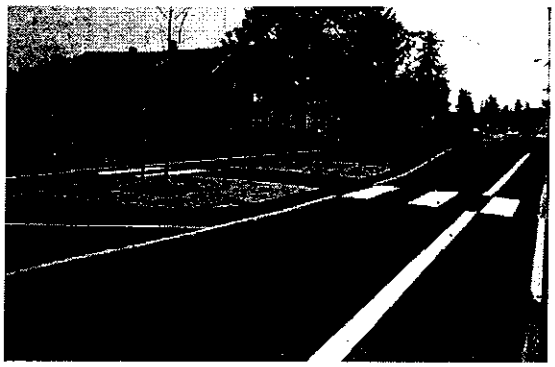
Sarasota, FL

## CENTER ISLAND NARROWINGS
## (midblock medians, median slowpoints, median chokers)

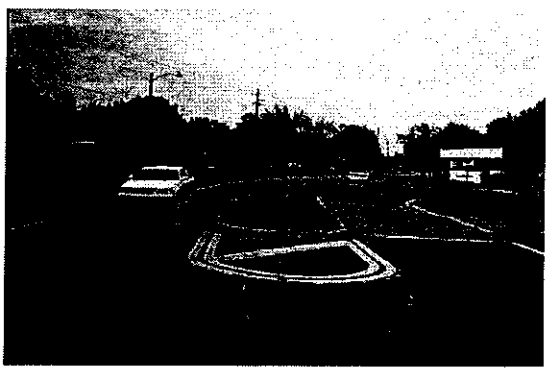


Montgomery County, MD

Tallahassee, FL

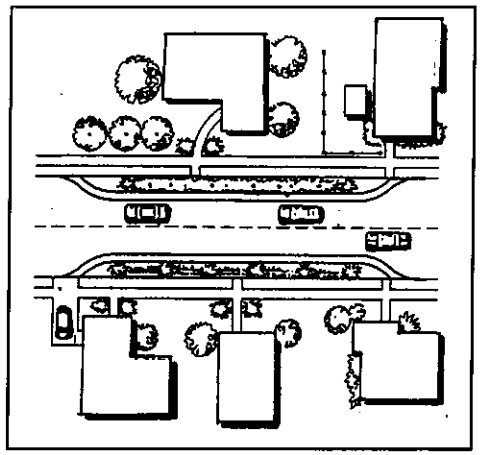


Portland, OR



Ft. Lauderdale, FL

## CHOKERS
## (pinch points, midblock narrowings, midblock yield points, constrictions)



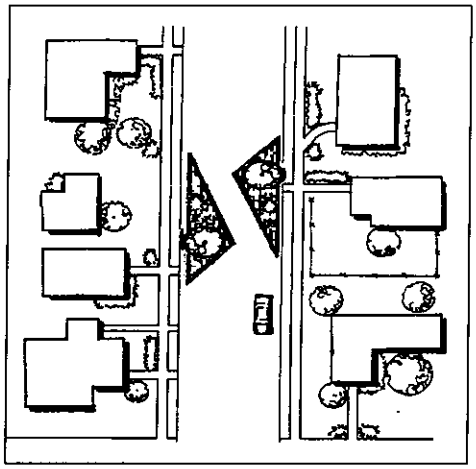
Winter Park, FL

Montgomery County, MD

Howard County, MD

Sarasota, FL

## OTHER SPEED CONTROL MEASURES
## (various names and designs)



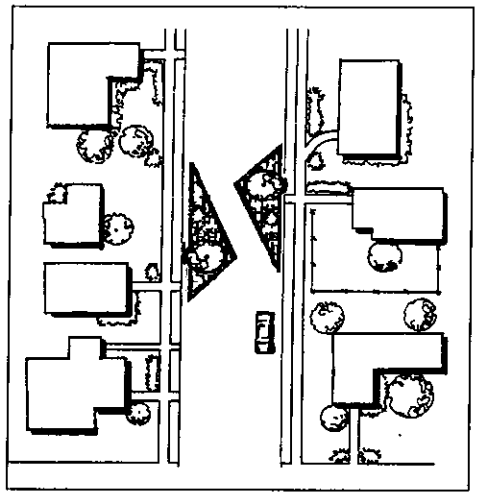
Intersection Jiggle Bumps. (Dayton, OH)

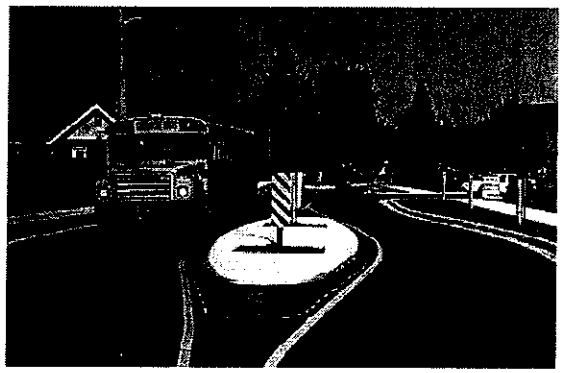
Hammerhead. (Beaverton, OR)

Angle Point. (Bellevue, WA)

Lateral Shift. (West Palm Beach, FL)

## OTHER SPEED CONTROL MEASURES
## (continued)

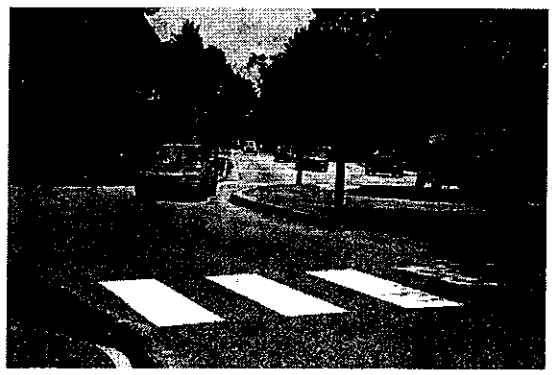




Midblock Deflector Island. (Eugene, OR)

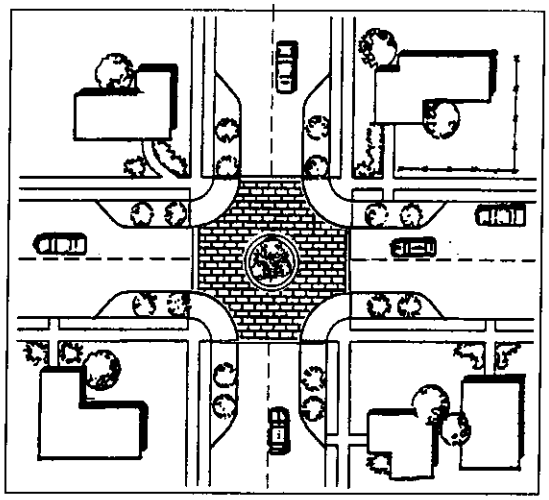
Median Choker. (San Jose, CA)

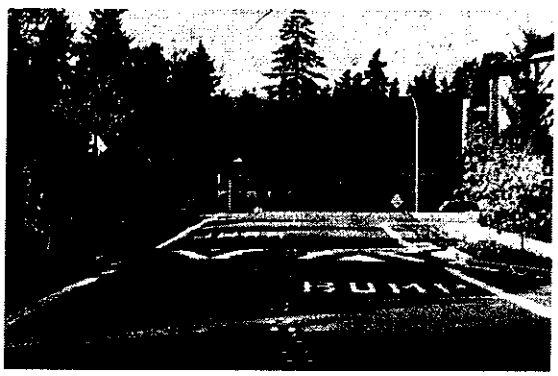
Split Median. (Portland, OR)



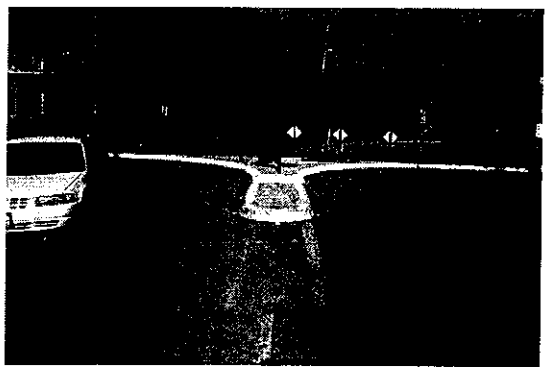
Half Circle. (Williamsburg, VA)

## COMBINED MEASURES





Speed Hump with Choker. (Bellevue, WA)

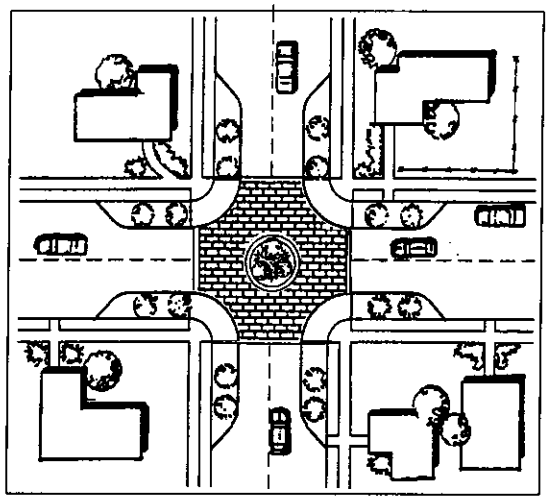


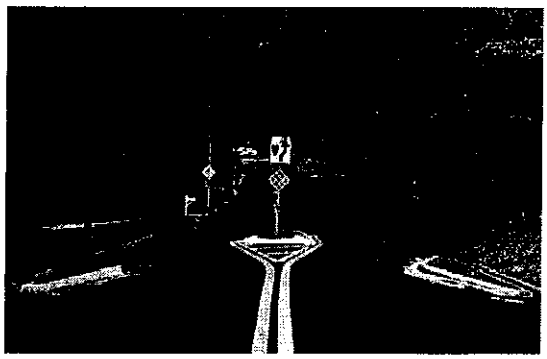
Diverter-Closure. (San Jose, CA)

Center Island with Neckdown. (Eugene, OR)

Raised Intersection with Neckdown. (Toronto, ON, Canada)

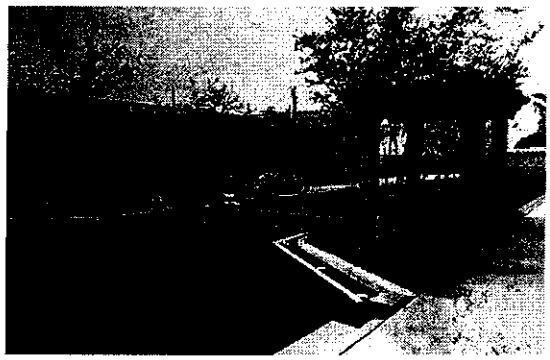
## COMBINED MEASURES
## (continued)





Center Island with Chokers. (Tallahassee, FL)

Center Island with Tables. (Boulder, CO)



Raised Crosswalk with Choker. (West Palm Beach, FL)

Center Island with Humps. (Montgomery County, MD)

# APPENDIX C

# Village of Downers Grove
# Traffic Calming Guidelines

## *Rating Chart*

| Criteria | Points | Basis For Point Assignments |
|---|---|---|
| Vehicular Speed | 0 to 40 | 5 points assigned for every mph greater than 5 mph above the posted speed limit (using 85th percentile speed) |
| Traffic Volume | 0 to 15 | 1 point for every 200 vehicles per day. |
| Pedestrian Generators | 0 to 20 | 5 points for each elementary or middle school within 500 feet of project area. 2 points for each other school, bus route, park, or community center within 500 feet of the project area. 2 points should be given for any (not each) retail, commercial, or other institutional (including churches) uses within 500 feet of project area. |
| Roadway/Intersection Geometry | 0 to 10 | Each street segment rated 0 to 10 points for potentially hazardous roadway geometry and other factors. Factors to be considered include horizontal and vertical geometry (< than 6% grade), horizontal curvature, street width, parkway widths, stopping and intersection sight distance, driveway sight distance, and driveway geometry. |
| Residential Density | 0 to 10 | 1 point assigned for every 25 dwellings units per mile. |
| Sidewalks | 0 to 5 | 5 points assigned if there is no continuous sidewalk on at least one side of street |
| Total Points Possible | 100 | |

- For streets that exhibit cut-through traffic during specific hours, the following alternative method may be used if it results in a higher score:
    - For Speed: 3 points for every mph greater than 5 mph over the posted speed (use 85th percentile speed of heavy cut-through periods).
    - For Traffic Volume: 1 point for every 20 vehicles per hour during the peak hour recorded on the street.

## Village of Downers Grove
## Traffic Calming Guidelines

# *General Criteria Review by Staff*

***Office File Code#*** _____ ***Date:*** _____

**Street:** _____ **From / To:** _____

**Identify Problem:**
- ☐ Cut-Through Traffic
- ☐ Speeding
- ☐ Pedestrian safety
- ☐ Other

**Petition Received & Complete?**
- ☐ **If YES, Proceed with analysis**
- ☐ **If NO, Send back to Petitioner(s)**

**Criteria Checklist:**
- ☐ Local Street, Speed Limit 25 mph
- ☐ Minimum Residential block: 85%
- ☐ Roadway = 2 lanes
- ☐ Neighborhood Petition Signed by 55% of affected block
- ☐ Minimum Traffic Volumes: 500 ADT
- ☐ Maximum Street Width: 40 ft.
- ☐ Maximum Roadway Vertical Grade: 6%
- ☐ Vehicle Speeds (85% percentile measured speed)
  - 35 mph min. General
  - 30 mph school zones
  - 33 mph adjacent to parks
- ☐ Not an Emergency Route (Fire Dept.)
- ☐ Not on a Stage I Priority Snow Plowing Route
- ☐ Not a Mass Transit Route (Pace)
- ☐ Not on Sharp Horizontal Curve

**All Criteria Satisfied?**
- ☐ **YES**
- ☐ **NO**

**If YES, Proceed to Rating Chart Then to Matrix**

**If NO, Send Letter to Petitioner with explanation.**

**Village of Downers Grove**
**Traffic Calming Guidelines**

# *Traffic Calming Toolbox*

**Speed Control Measures**

Variable Message Speed Limit Boards
Speed Tables 32' deep (midblock)
Raised Intersections/w Landscaping
Road Narrowings/Chockers (intersections)
Curb Bulb-Outs (intersections)
Chicanes (midblock)
Textured Pavement (intersections)
Citizen Appeal Signs (various)
"We Care. Drive Slowly"
" Slow Down. Watch for Kids."
Pavement Markings
Speed Humps
Speed Lumps
Median Islands

**Volume Control Measures**

Turn Restrictions
Half Closures
Forced Turns
Diagonal Diverters
Medians/Center Islands
One-Way Streets
Right-in/Right-Out designs
Chicanes
Pavement Markings
Roundabouts
Cul-De-Sacs

*Performance Indications:*

Significant Positive Impacts are:

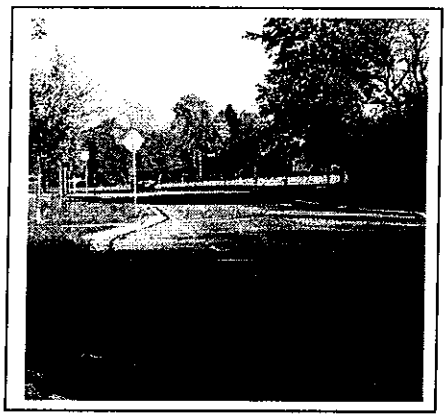
- ☐ 10% reduction in traffic volume
- ☐ 5 mph reduction in travel speed

*Reasons for Removals:*

- ☐ Maintenance Costs
- ☐ Residents Request (75% affected block)
- ☐ Change in Street Configuration
- ☐ Performance Not Satisfactory
- ☐ Adverse impacts to other area streets
- ☐ Village Policy change

# APPENDIX D

**TYPE: Pavement Narrowing ("Chokers")**



**LOCATION: City of Geneva**
Williamsburg Avenue, a neighborhood collector connecting two high volume arterial streets, IL Rte. 38 and Randall Road,

**PROBLEM:** Williamsburg Ave. (ADT = 2,500), a neighborhood collector street is used as a shortcut between IL Rte. 38 (ADT= 25,000) and Randall Rd. (ADT=34,000) and a major shopping center on Randall Rd.

**TRAFFIC CALMING DESCRIPTION:** The curb to curb dimension of the Street was narrowed from 42 feet to 24 feet at three locations to create "chokers". A parking lane was striped on both sides of the street. These modifications followed a failed experiment with (and removal of) speed "humps" (non-residents were furious and blew horns as they traveled past each device; damage to City emergency vehicles was also reported).

**CONSTRUCTION COST/DATE:** +/- $40,000. Installed in the Fall of 2001.

**CHANGE IN VEHICLE SPEEDS/VOLUME:** Posted speed limit is 25 mph. With the chokers, the 85$^{th}$ Percentile Speed stayed essentially the same (34 mph before versus 33 mph after) and the total percent violations was reduced slightly from 79% to 77%. No change in vehicle traffic volume was noted.

**OPERATIONAL IMPACTS:** No significant change in traffic volume on the street.

**NEIGHBORHOOD REACTION:** Residents along Williamsburg Avenue are generally satisfied with the chokers and reacted positively to the City doing "something".

**MUNICIPAL GOVERNMENT REACTION:** Snow plowing not adversely affected and no problem for emergency vehicles (fire trucks or ambulances).

**MUNICIPAL CONTACT:**

Bob Smith, Traffic Safety Specialist
Geneva Police Department
Ph: 630-933-7100
Fax: 630-655-1767
E-mail: rsmith@geneva.il.us

**TYPE: Neighborhood Traffic Circle**

**LOCATION: City of Naperville**
4 locations in the River Rd. area south of Oswego Rd.

**PROBLEM:** Neighborhood complaints about speeding (existing Neighborhood Speed Limit is 25 mph) on busy (3,200 ADT) collector street.

**DESCRIPTION:** Pilot program to retrofit existing collector street intersections to provide 24.5' circle (including 2'wide mountable apron). "Traffic Circle Ahead" and MUTCD "Circle" signs. Traffic control is "all-way stop." Landscaped circle center done by residents with City guidance.

**CONSTRUCTION COST/DATE:** +/- $7,000.00 each. Circles constructed between Sept., 2000 and July, 2001.

**CHANGE IN VEHICLE SPEEDS:** There was a slight reduction of 1-2 mph in the 85$^{th}$ percentile speed on the streets which had circles installed (from 34 to 32 mph on northbound River Road and 31 to 30 mph on southbound River Road). Traffic volume after installation showed a tendency to be slightly lower, but the difference could simply be statistical variation in traffic flow or could reflect changing travel patterns in the rapidly growing Naperville area.

**OPERATIONAL PROBLEMS:** Motorists continue to turn left in front of the circles despite signs directing traffic to the right (around the circle).

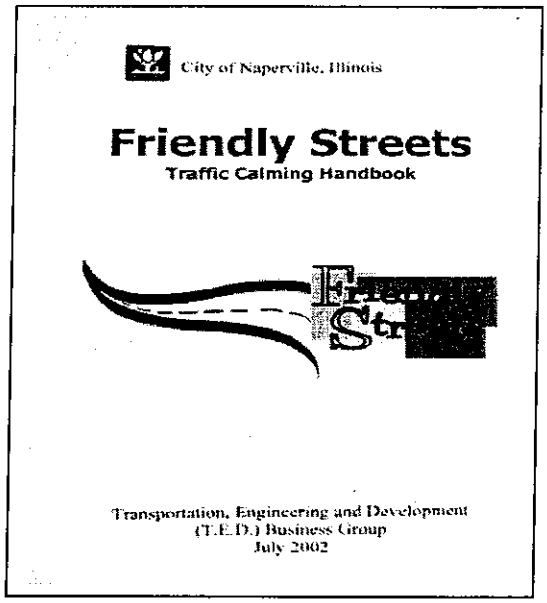
**NEIGHBORHOOD REACTION:** In a follow-up survey, 48% of neighborhood residents responded that they were "somewhat dissatisfied" and 39% "satisfied" with the traffic circles. 55% of residents responding favored retention of the traffic circles and 64% would consider additional traffic calming measures.

**MUNICIPAL GOVERNMENT REACTION:** Both police and fire departments are dissatisfied with the traffic circles.

**MUNICIPAL CONTACT:**

Deb Kreider, City of Naperville
Ph: 630-305-5985
Fax: 630-305-5986
E-mail: kreiderd@naperville.il.us

**TYPE: "Friendly Streets" Traffic Calming Policy Handbook**




**LOCATION: City of Naperville**
Citywide

**PROBLEM:** In most communities, responding to multiple neighborhood concerns with cut-through traffic and speeding could be very expensive and not really address resident perceptions or real traffic problems. The Naperville "Friendly Streets" program is an effort to establish a progressive course of action that begins with neighborhood education, follows-up with enforcement if certain prescribed traffic problem threshold levels are exceeded and then would consider installation of traffic calming devices.

**DESCRIPTION:** Establishes guidelines for addressing neighborhood traffic issues using a progressive 3-tiered system consisting of education, enforcement and engineering (of physical traffic calming improvements).

**IMPLEMENTATION COST:** N.A.

**CHANGE IN VEHICLE SPEEDS:** N.A.

**OPERATIONAL PROBLEMS:** N.A.

**NEIGHBORHOOD REACTION:** Generally positive.

**MUNICIPAL GOVERNMENT REACTION:** Generally positive.

**MUNICIPAL CONTACT:**

Deb Kreider, City of Naperville
Ph: 630-305-5985
Fax: 630-305-5986
E-mail: kreiderd@naperville.il.us

**TYPE: Speed Humps**

**LOCATION: City of Wood Dale**
3 different residential street segments: Forestview, Harvey and Mary Jane Lane (see attached location map).

**PROBLEM:** Neighborhood complaints about "cut-through" traffic and speeding during am and pm rush hours on local residential streets that connect to arterial streets.

**DESCRIPTION:** Typically a series of 4 permanent asphalt speed humps at +/- 800 foot spacing was installed. The speed humps have a maximum height of 4 inches, are 12 feet in length and span the entire paved surface of the street. White triangular pavement markings delineate the speed humps and yellow reflective delineator posts were installed on each side of the hump to control against vehicle "run-arounds". Warning signs ("Caution – Speed Bumps Ahead") are posted in advance of each speed hump.

**CONSTRUCTION COST/DATE:** The speed humps were constructed in 2000 at a cost of +/- $1,000.00 each. All speed humps are still in place.

**CHANGE IN VEHICLE SPEEDS/VOLUMES:** The City Police Department reported a significant reduction in speeds through the speed hump sections with 85$^{th}$ percentile speeds at or below the posted speed limit. The City also reports that cut-through traffic volume for all practical purposes was eliminated after installation.

**OPERATIONAL PROBLEMS:** Appears to be a pattern of cut-through traffic moving to adjacent streets that do not have speed humps which necessitated a domino effect for speed hump installation on the three streets. Snow plow damage to pavement markings necessitates yearly pavement marking replacement. No major concerns with emergency vehicle response time.

**NEIGHBORHOOD REACTION:** The majority of residents liked the speed humps.

**MUNICIPAL GOVERNMENT REACTION:** City Council reaction is positive based on satisfaction of neighborhood residents.

**MUNICIPAL CONTACT:**

Chief Frank Williams
Wood Dale Police Department
Ph: 630-787-3810
Fax: 630-766-9897
E-mail: fwilliams@ci.wood-dale.il.us