TOWN OF BOONSBORO

DEPARTMENT OF PLANNING, ZONING, AND ENGINEERING

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MEMORANDUM

To: **Megan Clark, Town Manager**
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From: **Brian Hopkins, Town Engineer**

Date: **Aug. 8, 2016**

Subject: **Traffic Speeding Control**

The Institute of Transportation Engineers (ITE) reports that "the basic purpose of stop signs is to assign right-of-way to vehicles at intersections. There are Stop Sign Warrants outlined in the Manual on Uniform Traffic Control Devices which must be satisfied before a stop sign can be installed. Stop signs are requested by residents more than any other traffic control device for the reduction of vehicle speeds and traffic volumes. **Unfortunately, studies have shown that stop signs are largely ineffective in meeting the speed control.**

Per Section 2B.04 Right-of-Way at Intersections of the Maryland Manual on Uniform Traffic Control Devices:

YIELD or STOP signs should not be used for speed control.

The current stop signs on the low volume cross streets (Ford, Lakin, Orchard) that enter the though street (St. Paul St.) are the appropriate signs for traffic control at the intersections on St. Paul St.

To my knowledge, no actual engineering studies have been done suggesting speed is a major problem on St. Paul St. There have been no patterns of accidents or near misses documented, no written complaints have been logged in, and there is scant evidence of speeding warning tickets being issued. It appears the vast majority of traffic on St. Paul St. is driving at a reasonable and prudent speed. St. Paul St. is a major collector street which serves as part of the regional transportation system.

A stop sign is one of our most valuable and effective control devices when used at the right place and under the right conditions. It is intended to help drivers and pedestrians at an intersection decide who has the right-of-way.

One common misuse of stop signs is to arbitrarily interrupt through traffic, either by causing it to stop, or by causing such an inconvenience as to force the traffic to use other routes.

Where stop signs are installed as "nuisances" or "speed breakers", there is a high incidence of intentional violation. In those locations where vehicles do stop, the speed reduction is effective only in the immediate vicinity of the stop sign, and frequently speeds are actually higher between intersections. For these reasons, it should not be used as a speed control device. Well-developed, national and state recognized guidelines help to indicate when such controls become necessary. These guidelines take into consideration, among other things, the probability of vehicles arriving at an intersection at the same time, the length of time traffic must wait to enter, traffic delays, and the availability of safe crossing opportunities. The Manual on Uniform Traffic Control Devices states specifically "YIELD or STOP signs should not be used for speed control."

<u>There are many reasons not to use unwarranted stop signs:</u>

Compliance: Drivers tend to ignore unwarranted traffic controls or obstacles that, in their view, are unnecessary. If they are frequently required to stop for STOP signs and rarely see any traffic on the opposing street, they may become impatient and tend to disregard STOP signs that have no obvious need.

Speed: An unwarranted STOP sign installation reduces speed only immediately adjacent to the sign. In most cases, drivers accelerate as soon as possible, to a speed faster than they drove before STOP signs were installed. They do this apparently to make up for time lost at the STOP sign. STOP signs are not effective for speed control.

Accidents: Unwarranted STOP signs do not reduce accidents and may increase the potential for accidents. There is not enough documentation to determine if there is an actual increase in accidents on local low volume streets, but experience of some cities shows that where unwarranted signs used to stop a high volume street for a local street, cause the accidents to increase drastically.

Vehicle Operating Costs: Unwarranted STOP signs increase vehicle fuel consumption. The unwarranted STOP signs require additional stop/start maneuvers costing the motorists a substantial amount of money, wear and tear, and causing excessive gasoline consumption. This is especially noteworthy in light of the present fuel situation. Wear and tear on vehicles also increases. It should be noted that no detailed mechanical evaluations have been made but obviously increased stopping and starting would increase wear on tires, brakes, transmission, and engine.

Environmental: Although not specifically documented, it is logical to assume that unwarranted STOP signs increase stop/start actions and therefore increase exhaust fumes and associated hydrocarbons.

Noise: Noise pollution increases due to stops and acceleration and the associated engine noises and brakes. Noise tests at the STOP signs and at mid-block locations showed that the stop/start and acceleration resulting from the fourway STOP installations increased the noise levels over the "before" conditions.

Effectiveness: Even the minimal initial compliance and through-traffic diversion wear off over time because the unwarranted signs are not associated with a perceived need by the motorist. Most drivers are reasonable and prudent with no intention of maliciously violating traffic regulations; however, when an unreasonable restriction is imposed, it results in flagrant violations. In such cases, the stop sign can create a false sense of security in a pedestrian and an attitude of contempt in a motorist. These two attitudes can and often do conflict with tragic results.

Reduced Level of Service: Unnecessary stop signs and other impediments reduce the capacity of the roadway and cause spacing issues as traffic becomes congested and spacing is reduced. The reduction in the level of service of streets will cause increased response times for emergency responders. In the event of an emergency where a mass evacuation is required, the reduced level of service will hamper the evacuation.

Professional organizations such as the Institute of Transportation Engineers (ITE) and Center for Problem-Oriented Policing recommend against using unwarranted stop signs for speed control and instead have a variety of methods to first document if there is a real problem versus a perceived one, and if there is a problem to solve it systematically. (See attached reference manuals)

I believe education and enforcement would be a much more viable options to control speeds in residential areas. If speed enforcement and giving out warnings or tickets to drivers traveling significantly over the speed limit is prohibitive, a Radar trailer posting the speeds of oncoming vehicles and flashing when speeds are above the limit would be a good option, these trailers are relatively inexpensive and can be moved around town to help calm traffic in other areas around Town such as Della lane with perceived speeding problems.

2 copies

SPEED CONTROL IN RESIDENTIAL AREAS

ite

DRIVE MICHIGAN SAFELY

FORWARD

This document is a revision of the "Speed Control in Residential Areas" booklet original written by the Residential Area Speed Control Ad-Hoc Committee. This revision represents the latest information and findings of the Institute of Transportation Engineers (ITE) Michigan Section's Technical Project Committee. The makeup of the Technical Project Committee is as follows:

Lori Swanson, Chair	Hubbell, Roth & Clark, Inc.
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Matthew Smith	McNamee, Porter & Seeley, Inc.
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The information presented in this document represents the findings of the authors and does not necessarily reflect the views of the Michigan Office of Highway Safety Planning.

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I. INTRODUCTION

The perception of speeding on local streets is probably the most persistent problem facing residents and traffic officials, alike. Although local or residential streets carry the lowest traffic volumes and suffer the fewest traffic crashes, they are the single largest consumer of a traffic engineer's time and energy. Residents observe vehicles being driven at speeds they perceive are too fast and conclude that the speeds would decrease if stop signs were installed. Speeds considered excessive by residents are considered reasonable by these same persons when they are driving in another neighborhood. Every traffic engineer has been shaken by these same residents who announce "if something is not done about the traffic problem on my street, someone is going to be killed and it will be your fault." This is usually followed by a demand for various traffic control measures and often backed up with petitions from residents. Traffic officials then must focus their attention on responding to these pressures, often diverting resources that could be dedicated to solving major capacity and traffic crash problems on other streets.

Residents' complaints are usually accompanied by a proposed solution to the speeding problem...stop signs. Traffic officials respond that stop signs installed to control speeding: (a) don't work, (b) are frequently violated, (c) are detrimental to safety, (d) are not warranted in the Manual* and, (e) actually increase speeds between stop signs. When residents are told that stop signs are not the answer to the speeding problem, they feel they must fight city hall to get them installed. A confrontational relationship is established between residents and traffic officials and the stop sign becomes a "trophy" which is awarded to the winner of the confrontation. Solving the speeding problem becomes secondary to winning the "trophy". The end results of this process are: (1) unhappy citizens, (2) continued complaints and requests for more stop signs, (3) increased political pressure and, (4) often, approval of stop sign installations to bring the controversy, temporarily, to an end. However, experience shows the

* The "Manual" refers to the *Michigan Manual of Uniform Traffic Control Devices* (MMUTCD that specifically states that stop signs should not be used for speed control).

speeding problem is usually not solved. Before and after studies show that stop signs usually increase mid-block speeds and create violators of the stop controls.

This booklet introduces traffic engineers, law enforcement officers, elected officials and community leaders to the concept of traffic calming which may help alleviate speeding in residential areas. Traffic calming is the combination of physical controls and community support to reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized users. Some objectives of traffic calming include: reducing speeds for motor vehicles, reducing crash frequency and severity, increasing safety, reducing the need for police enforcement, and reducing cut-through motor vehicle traffic.

Traffic calming measures are typically installed as part of an area wide traffic management scheme rather than on a single street to avoid shifting the problem from one street to another. A successful traffic calming program must include enforcement, education, engineering and community involvement. Community support and participation is an integral part of a successful traffic calming program. This booklet will give guidance on how to set up a successful traffic calming program in your community.

This booklet provides alternatives that may help decrease speeds on residential streets. It discusses the advantages and disadvantages of each alternative. It points out that there is no single, simple solution to all speeding problems that satisfies residents, is effective, and meets good engineering practices and standards. It also stresses that there may not be a tool to reduce speeds. Regardless of the approach used, there are certain criteria that should be followed:

- All devices must meet Michigan Manual of Uniform Traffic Control Devices requirements.

- The integrity of streets classified as Major under the provisions of Public Act 51 must be preserved.

- Permanent traffic control devices should be used to the minimum extent required to achieve the objectives.

- Access to all properties must be accommodated.
- Access from the nearest arterial to the destination should be as direct as practical.
- Local access to neighborhood facilities must be accommodated.
- All permanently installed devices must be designed to allow emergency vehicle access.
- Consideration must be given to circulation, parking and needs of customers and business owners.
- Consideration should be given to the access needs of essential commercial services such as garbage pickup, snow plowing, student busing, etc.
- Changes must not unduly impact adjacent areas.

It states that residents and local officials must work together with a full understanding of each other's problems, limitations and concerns for the common goal of safety on residential streets. One of the best ways to accomplish this is to have citizens involved in standing or ad hoc community traffic safety committees.

This booklet is intended to be used as a traffic safety tool by traffic engineers, law enforcement officers, elected officials, and community leaders in their day-to-day traffic control responsibilities.

References: 40, 41, 42

II. COMMUNITY INVOLVEMENT

An important component of any traffic calming program is community involvement. If citizens are involved, the chance for problem resolution and a successful traffic calming program is greatly improved. Often the problem cited is one of perception and not fact, and the solution proposed could be ineffective or even counter-productive. One way to avoid the knee-jerk approach to traffic engineering is to develop a process that involves the community. While there are many ways to accomplish public involvement, this section will describe two that have been successful.

Approaches to Citizen Involvement

Standing Committee

Some communities have successfully employed a standing committee, normally referred to as the "Citizen Traffic Committee," to deal with traffic control issues. The makeup, function and authority of the committee are described below:

a. The committee is appointed by the mayor or council. It should consist of an odd number of members who serve staggered terms.

b. Non-voting staff experts (police and engineers) are available to prepare agendas, collect data, provide input and send recommendations to the city council.

c. Efforts should be undertaken to make committee members as knowledgeable as possible about traffic engineering and enforcement principles. This can be realized by providing technical materials and training for committee members.

d. The Committee reviews citizen requests for traffic control devices and staff analysis of those requests, and makes recommendations to the city council.

The Committee should hold monthly, evening meetings. The standing committee offers several advantages; acts as a buffer between the council and citizens; lessens the pressure to install unwarranted devices; may be perceived as more objective than staff; provides technical and citizen input to the council; and dampens the adversary relationship that often develops between citizens and staff. On the other hand, there are some drawbacks: the committee can become politically motivated; one strong member can have too much influence; it can slow the process; and it requires some staff time.

Ad hoc committee

In this approach, an *ad hoc* or advisory committee is formed when a community seeks help in dealing with a specific traffic control problem. While the governmental agency has the ultimate responsibility, it is highly desirable that the committee and agency work through the process and arrive at a consensus. This process works as follows:

a. A working committee of neighborhood residents should be selected to represent different parts of the neighborhood. If the neighborhood has an organized association it should be asked to assist with the appointments; otherwise, volunteers are sought.

b. Committee members should identify the problem brought to their attention.

c. Staff collects the appropriate data and presents it to the committee. The committee sets goals which are quantifiable, e.g., reduce the average speed by a certain percentage, etc.

d. Options should be identified and alternatives presented, listing the pros, cons, cost, etc. of each.

e. Committee and staff reach agreement on the alternative to be recommended.

f. Committee with staff support presents the plan to the larger community through a large meeting or several small meet-

ings. One large meeting is enough if the plan is not controversial; the number of meetings should be directly related to the complexity of the plan. The purpose of the meetings is to obtain community support.

g. Once community support is achieved the plan is implemented. If possible, it is best to install temporary measures to determine the impact. This allows for adjustments and even removal if it is obvious that the measures will not produce the desired results.

The advantages of using advisory committees are that they will help develop neighborhood concerns and determine what, if anything, should be done; it builds a relationship between staff and residents to work through future problems; and the process creates a better understanding of traffic engineering and enforcement principles among lay people. Conversely, this process consumes considerable time and effort of staff. If consensus is not reached, the neighborhood can become divided. If not handled deftly by staff, the process can become unwieldy.

References: 19, 25, 28

III. PROBLEM IDENTIFICATION

The first step in a traffic calming program is to identify the problem. When a resident contacts their City, Village or County, a complaint is recorded. The resident will be directed to discuss their concerns with the other residents or an established traffic advisory committee. If an advisory committee has not been established, the public agency will give guidance on how to start one. Residents will assist the public agency in the identification of the problem.

These residents will also assist the public agency in the collection of data. Speed studies, traffic volume studies and license plate surveys, depending on need, will be performed at locations identified by the residents. The data collected will be analyzed to determine if there is a problem. If a problem is not identified, a letter with the supporting data will be sent to the residents explaining the findings and that no further action is required. If a problem is identified, then the public agency will move to the next steps of the program which include enforcement and education.

References: 42

IV. EDUCATION AND ENFORCEMENT

Once a speeding problem has been identified, the next steps in a traffic calming program is to initiate education and enforcement campaigns. Both of these steps should be conducted at the same time since many times a speeding problem can be reduced through effectively enforcing the traffic ordinances and educating the residents. From past enforcement activities, the City of Farmington Hills, Michigan found that most traffic violators within a residential area were the residents who live in the area. Therefore, it is critical to educate the residents of an area where a traffic problem is occurring.

Reference: 42

A. EDUCATION

1. Public Information And Education

An effective way to educate residents is through public information and education campaigns. Public information and education campaigns should be carried out through the mass media by law enforcement members of safety oriented groups. These campaigns "spread the word" about current enforcement emphasis and encourage voluntary compliance with the law. The perception that violators will be apprehended is essential to develop compliance with the law. Selecting the right media for your message is important. Clearly define the reason for the change; i.e., to reduce traffic crash casualties. The size of the audience and project will be a controlling factor in the media you select. An enforcement effort must be coordinated with the information and education campaign.

Reference: 5

2. Neighborhood Speed Watch Program

Another educational tool is the Neighborhood Speed Watch Program whereby residents can help control speeds with minimal police support.

A Neighborhood Speed Watch Program must involve law enforcement personnel and residents working as a team. Law enforcement's role is to provide the educational material and, if necessary traffic law enforcement. An effective tool used for education is speed radar trailers. The trailers are unmanned and equipped with radar equipment to detect the speed of vehicles. The trailer clocks the speed of an approaching vehicle and displays the speed on a display board that is visible to the motorist. This shows the motorist the actual speed at which they are traveling.

The neighbors must educate each other, establish their goals, and police themselves. Neighbors identify the speeders, the police make personal contact for the purpose of educating the speeder, and involve law enforcement as a last resort.

This program has the benefit of bonding the neighborhood together. The off-shoots of this are invaluable. The reduction of negative contacts with law enforcement enhances its image. The time involvement will depend on the individual's role and the size of neighborhood or community that is targeted. The media relationship involvement relates to the target area.

Neighborhood Speed Watch Programs rely on peer pressure and community spirit to increase awareness in a subdivision that may experience speeding traffic. It considers the fact that in a self-contained subdivision, the drivers involved are neighbors and friends of the people complaining of speeding. Neighborhood Speed Watch Programs have little or no effect on "through" traffic problems.

Typically, to be included in a Neighborhood Speed Watch Program, a street must (1) be a local street, (2) experience 85th percentile speeds in excess of 10 MPH greater than the posted speed, and (3) receive support from most of the households.

Once established, the following actions are taken:

a) A personal letter is sent to all households explaining the Program.

b) Neighborhood Speed Watch Program signs are posted.

c) Committee members call each household in the specific area to explain the program and appeal for cooperation.

d) Radar speed observations are made by local traffic personnel and personal letter are sent by the Chief of Police to drivers or owners of vehicles observed speeding.

e) Periodic speed studies are made to determine the Program's effectiveness.

f) Neighborhood organizations are involved as necessary.

Reference: 9, 42

B. ENFORCEMENT

1. Surveillance/Enforcement

Selective traffic law enforcement is the process of assigning police officers to a specific area at specific times to enforce traffic laws relating to a specific problem. The allocation of officers to the area is usually for a limited period.

When a police agency becomes aware of a particular traffic safety problem, officers can be assigned to the problem area to enforce related laws. Decisions must be made as to enforcement strategy, number of officers, time of day or any combination thereof, depending on the variables related to the location, type of violations, available officers, etc.

This type of activity tends to only solve the problem in the presence of the officer. The more officers assigned, the more effective this method. This is a costly process especially when it involves overtime or diverting officers from other assignments.

2. Automated Speed Enforcement Device

The newest tool in speed enforcement is the Automated Speed Enforcement Device, which is currently being tested at selected locations throughout the U.S. This device consists of a speed radar device and a 35 mm camera interfaced through a computer. It is located in an unmarked vehicle parked on the side of a road. As each vehicle comes within radar range its speed is determined. If that speed is over the preset threshold speed, the camera takes a photograph of the vehicle and its license plate.

The owner of the vehicle is then informed by either a warning letter or ticket of the date, time location, posted speed and travel speed of the vehicle. Currently, Michigan law does not permit the issuance of a ticket.

V. ENGINEERING

When the education and enforcement campaigns prove to be ineffective, the location qualifies for further analysis to determine what traffic engineering measure, if any at all, should be installed to effectively reduce speeds. In certain situations, vehicle speeds can only be effectively reduced by physical diversion of the traffic on the travelway. The application of traffic control devices, such as signs, alone normally are not effective in reducing vehicle speeds through residential neighborhoods. However, when used in conjunction with traffic calming devices, the proper use of traffic control signs can be an effective traffic management tool.

A. TRAFFIC CONTROL DEVICES

1. Stop Signs

The basic purpose of stop signs is to assign right-of-way to vehicles at intersections. There are Stop Sign Warrants outlined in the MMUTCD which must be satisfied before a stop sign can be installed. Stop signs are requested by residents more than any other traffic control device for the reduction of vehicle speeds and traffic volumes. Unfortunately, studies have shown that stop signs are largely ineffective in meeting the residents' requests for speed control.

a. Two-Way Stop

This is used to assign right-of-way to traffic on one of two intersecting streets by requiring traffic on one street to come to a complete stop. It is suitable where:

- one street is a major street;
- sight distances approaching the intersection are substandard, and traffic approaching under the general rules for uncontrolled intersections would run a strong risk of being involved in collisions;

- there is a history of a crash pattern that could be corrected by right-of-way controls, yet conditions do not require traffic on both streets to stop.

b. Four-Way Stop

This type of intersection control is intended primarily where two collector or major streets intersect and do not warrant a traffic signal. Its purpose is to assign right-of-way to traffic on both intersecting streets by requiring all approaching vehicles to come to a complete stop.

c. Effect on Traffic Volumes

When local streets offer significant savings in time over congested parallel major and collector routes, or allow avoidance of congestion points, traffic control devices, including stop signs, will do little to reduce traffic volumes. However, when the local streets offer only a slight savings in travel time over other routes, the time lost at stop signs may be enough to keep traffic off of local residential streets.

Stop signs may be installed at uncontrolled intersections in residential neighborhoods with a street network arranged in a grid pattern. Traffic would be stopped on every other block throughout the entire residential neighborhood. With no continuous "through" streets in the neighborhood, an even distribution of traffic would be encouraged.

d. Effect on Traffic Speed

Numerous studies have shown that stop signs are relatively ineffective as a speed control measure, except within 150 feet of the intersection. At the point of installation, speeds are reduced, but the effect on traffic approaching or leaving the stop-controlled intersection is negligible. In fact, some motorists actually increase their speed to make up for the "inconvenience" of stopping or disregard the stop signs. Studies show that more than 50% do not stop.

A study conducted in Boulder, Colorado, demonstrated that the 85th percentile speed and mean speeds on 25 mph and 35 mph roads were greater in areas that were controlled by stop signs.

Studies in various California cities showed a slight increase, or no change, in vehicle speeds after the installation of stop signs.

While the request for stop sign installation leads all resident requests for speed control measures, it must be emphasized that studies have proven there is little or no effect on vehicle speeds in residential road networks after installation.

e. Warrants/Compliance

Warrants for stop sign installations are included in the Michigan Manual of Uniform Traffic Control Devices (MMUTCD). These warrants relate to right-of-way assignment and respond to site safety consideration.

A stop sign observance study of unwarranted four-way stops in Troy, Michigan, found that the percentage of "no" or "roll" stops to be significant after installation of unwarranted stop signs, while there was no significant change in 85th percentile speeds.

Many studies have been conducted to determine the degree to which stop signs are obeyed. When not required to stop by cross street traffic, only 5 to 20 percent of all drivers come to a complete stop; 40 to 60 percent will come to a "rolling" stop below 5 MPH, and 20 to 40 percent will pass through at higher speeds. High-volume, four way stop-controlled intersections have demonstrated the highest compliance levels, while three-way stop controlled intersections have shown the lowest.

In Star City, West Virginia, before and after studies showed an increase in "no-stops" from 14.1% to 25.1% when two-way stop intersections were converted every summer to four-way stops for pedestrian safety. Mean Speed was not significantly affected by the presence of the four-way stops. The recommendation of this particular study was to end the practice of using four-way stops for speed control.

Studies have shown that when a driver does not believe that a stop sign appropriately reflects the actual traffic conditions, the driver often disregards it. The use of unwarranted stop signs not only decreases the compliance levels of motorists, but has the unintended effect of decreasing compliance at intersections where stop signs have been installed for warranted operation and collision reduction.

f. Effect on Traffic Safety

While no study has proven the effectiveness of stop signs as traffic safety measures, general engineering belief is that the unwarranted use of stop signs increases the safety hazard at the intersection. This is shown in the studies of the compliance rates at stop-controlled intersections. In addition, motorists disregard for unwarranted stop signs presents a significant hazard to crossing pedestrians.

Effects of unwarranted stop signs on driver behavior and safety at stop signs throughout a community are difficult to substantiate. Evidence to date on the safety effects of individual stop signs placed for volume and speed reduction purposes is mixed. At some intersections where a degradation in safety was measured, placement of the signs in poor visibility positions and lack of supplementary markings may account for the crash experience. Cases where safety experience was reportedly improved may include instances where traditional warrants for stop sign installation were actually met, or were close to being met.

g. Environmental Effects

Stop signs affect the environment around the intersection, and the use of unwarranted stops signs could unnecessarily add to this problem. Stopping and idling at intersections increases the amount of automobile exhaust in the area. In addition, tire noise and engine noise increase with the braking and acceleration associated with stop signs. Automobile fuel consumption is increased with the stopping, accelerating, and idling of vehicles at stop-controlled intersections.

h. Community Reaction

Residents often see stop signs as a solution to "near miss", as well as actual crashes. They are also viewed as being effective at controlling vehicle speeds. Suggestions that unwarranted stop signs have very poor compliance and that they might be detrimental to safety are generally discounted by residents. Residents also dismiss concerns over a community's exposure to tort liability for unwarranted use of traffic control devices. By disregarding the warrants presented in the MMUTCD, this presents potential liability concerns for the responsible jurisdiction. If a stop sign installation could be considered irresponsible or in clear contradiction to accepted standards, liability suits could result.

Objections to stop signs come mainly from residents at the intersections who are subjected to additional noise and pollution which come from decelerating and accelerating vehicles, and from motorists who think they are being stopped needlessly.

It should be the goal of the traffic engineer and local policy makers to explain to the public why unwarranted stop signs are ineffective at controlling vehicle speeds. Special attention should be given to explaining the adverse effects on the environment, motorist safety, and pedestrian safety.

A community's policy of installing 4-way stops at school crossings should be reviewed in light of the above items. Stops at these locations are only useful about 2% of the time. Therefore, 98% of the time, they can be serious traffic safety hazards.

References: 1, 2, 3, 4, 36, 37, 38, 39, 40

2. Speed Limit Signs

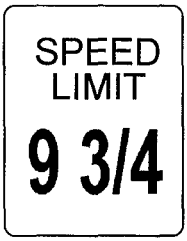
a. Speed Limit Signs/Speed Zoning

The speed limit sign is a regulatory device that informs drivers of the speed limit imposed by the governing agency. Some signs merely remind drivers of the limits applicable to the type of highway and area. Where the speed

limit is not applicable to specific sites because of special hazards, a deviation from that limit is shown by posting advisory speed signs. A new speed limit is determined by an engineering and traffic study of the street section involved. Special attention is given to the character of the street (sidewalks, driveways, and sight obstructions), horizontal and vertical alignment, pedestrian activities, and hazards which may not be easily detected by drivers. If no unusual safety problems are detected, the 85th percentile speed of traffic on a street is usually taken as an indication of the speed limit which could be implemented.

Studies that tested the effect of speed limit signs on speeds have been largely confined to major streets and expressways. Performance on these highways is not considered relevant to the local street situation. Studies have shown that speed limit signs have very little impact on drivers' speeds on major streets. Motorists drive at speeds that they consider reasonable, comfortable, convenient and safe under existing conditions. Drivers appear not to operate their vehicles by the speedometer, but by roadway conditions.

Speed limit signs, other than the standard 5 MPH increment (i.e., 28 MPH), are not standard and may be illegal. The desired effect of posting a non-standard speed limit sign is to gain compliance by capturing the driver's attention with a unique number. If drivers are consciously aware of the speed limit, they are more likely to comply with it. While the signs are inexpensive, they do not conform to the MMUTCD. Initially, the signs would be noticed and make drivers aware of their speed. Once drivers became used to the signs, they have no further effect on drivers' speeds.



If posted speed limits are significantly lower than prevailing traffic speed, residents normally place some hope in them or in subsequent enforcement. However, if the posted limits are within a few miles per hour of the previously prevailing traffic speed, they are not addressing the residents' problem.

b. Speed Limit Signs With Other Devices

Speed limit signs with flashing beacons have been shown to have a minor effect in reducing vehicular speeds. Such signs have been shown to be most effective in school zones. Other traffic activated signs with variable messages and warnings may also have minor effectiveness in reducing speeds.

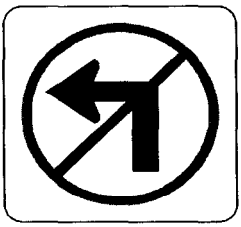
One such device is a trailer-mounted variable message sign with a radar speed gun which displays the posted speed limit and the approaching driver's speed. The intent is to increase the motorists' awareness of both posted speed limit and their own travel speed.

Observations show that most motorists reduce their speed when they see the device. In addition to reducing motorists' speeds, other advantages of the equipment include the creation of positive public relations, better acceptance of speeding tickets, and its ability to act as a teaching device. The disadvantages include potential vandalism to the equipment if left unattended, and it may encourage speeding by those who wish to "test" it. Its speed reduction effectiveness is isolated to the immediate area and time of its use, and this likely will diminish over time. However, effectiveness can be improved with the use of visible speed enforcement.

References: 5, 6, 7

3. Turn Prohibitions

Turn prohibitions will reduce traffic volumes, noise, and, in some cases, speeds on streets where they are applied. They may also improve traffic safety on streets to which they are applied. However, volumes, noise and speeds will increase on alternate routes. They are difficult to enforce, and reduce access for residents. In some cases, speeds may increase, and traffic safety may decrease, when motorists are forced to take alternate routes.



Turn prohibitions can be used to reduce traffic volumes on local streets by installing them on major/collector streets to prevent traffic from entering local streets. Such controls are usually in effect during peak traffic volume hours, when motorists are seeking less congested, alternate routes.

Although turn prohibitions have been in use for some time, very little quantitative research was found, and it was related to the number of violations. Violations in the range of 10% to 15% of the original turning volume can be expected.

Reference: 8

4. <u>One-Way Streets</u>

The use of one-way streets has mixed results. They are not useful in reducing speeds on local streets. In fact, the use of one-way signs may increase speeds in the permitted direction, and may increase the amount of cut-through traffic on other residential streets.

One-way streets can be used to make travel through a neighborhood difficult by creating a maze effect in the internal street pattern, which may discourage through traffic. However, the amount of traffic on other residential streets may be increased.

Reference: 8

5. <u>Commercial Vehicle Prohibitions</u>

It is a common practice in communities to prohibit commercial vehicles from most, if not all, local streets in residential areas. This is done to protect the pavements and eliminate nuisances. However, commercial vehicles are normally allowed to travel on any street when engaged in pickup and delivery. Such regulations are unlikely to affect vehicle speeds, but they will reduce truck traffic volume and noise.

Reference: 8

6. Special Warning Signs

Special warning signs such as "Children at Play", "Watch for Children", or others that warn of normal conditions are not effective in reducing speeds in residential areas. It is also likely that such signs encourage parents to believe that there is an added degree of protection, which is not the case. These signs suggest that it is acceptable for children to play in the street. The Michigan Vehicle Code prohibits the use of signs not deemed standard by the MMUTCD.

The MMUTCD provides standards for signs warning drivers that they are approaching recreational facilities such as parks and playgrounds. However, there is not enough evidence to determine the effect of these warning signs on vehicle speeds.

Reference: 40

7. Portable Signs

One growing trend in many communities is the use of portable stop signs placed in the street between crosswalks, to protect pedestrians. This has actually turned out to be a very controversial issue in many areas.

Municipalities feel that these signs are very effective in forcing traffic to stop for pedestrians in crosswalks. However, some state departments of transportation have banned the use of these portable signs, citing reports that the signs, when hit by vehicles, have caused injuries to nearby pedestrians. The MMUTCD states "As noted herein or for emergency purposes, portable or part-time STOP signs shall not be used". The exceptions refer to hand-held STOP signs used by construction flaggers and school crossing guards.

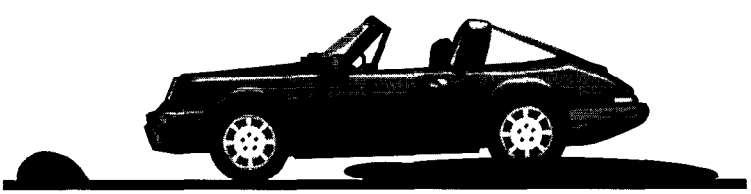
B. TRAFFIC CALMING DEVICES

1. Speed Humps and Bumps

The speed hump is generally 3 to 4 inches high, rounded section of pavement, approximately 12 feet in length. A speed bump is approximately 12" to 18" long, causing a more severe "bump" to be felt by the driver.

The speed hump was developed in the Transportation Road Research Laboratories (TRRL) in Great Britain and has been tested in closed test areas and on public roads. Tests in the United States and in various countries around the world, have shown speed humps to be effective in controlling vehicle speeds and in reducing traffic volumes in the immediate area of the hump or bump.

Studies in Australia, the United Kingdom, and the United States have shown reductions in 85th percentile speeds ranging from 3 MPH to 14 MPH between speed humps and from 6 MPH to 27 MPH at the speed hump location. Recent experience in a Michigan community indicated a 5 mph reduction in the 85th percentile speed. Volumes were found to be reduced from 1 to 55 percent.



SPEED BUMP **SPEED HUMP**

Another type of speed hump is the flat top hump or speed table. These humps are typically 22 inches long with a 10 foot flat

section and can be used on collector roads with more than 12,000 vehicles per day. This type of speed hump can serve as pedestrian crossings. Studies have shown these humps not only greatly reduce the 85th percentile speed of mainstream traffic but also have shown that, unlike speed humps, the speed between the humps and at the humps are essentially the same as before hump or bump installation.

Some of the negative effects of speed humps are an increase in noise level from individual vehicles near the humps caused by braking and acceleration, but not due to the sound of vehicles striking the humps. Studies have shown that speed humps have a more severe impact on longer wheel base vehicles and should not be used on neighborhood collectors, major fire and ambulance routes, or on routes frequently used by large trucks or buses. They are a major hindrance to snowplowing efforts.

Often the implementation of such traffic calming measures bring up liability issues. A recent survey of a number of communities using different traffic calming devices found that most had no legal problems at all while the remainder had mostly experienced threats and no action. As more and more traffic calming devices are installed, the question of the legality of these measures are becoming irrelevant.

The reports on speed humps have shown that both the design and location/spacing of speed humps are critical. For typical residential streets the most widely used design is the circular, parabolic speed hump. A series of speed humps is more effective than a single installation. The spacing of speed humps ranges from 200 feet to 750 feet, depending upon the desired 85th percentile speed between speed humps. Formulas have been developed to determine the optimal spacing of humps, depending on the use of either a 3 inch or a 4 inch high hump. Adequate pavement markings and traffic signs are important to warn drivers of speed humps. Speed humps can be installed on roadways carrying 3,000-8,000 vehicles per day. The cross-section design of humps or bumps is critical to their effectiveness.

The speed hump should not be confused with the speed bump that is 3 to 5 inches in height and 1 to 1 ½ feet in length. Because speed bumps are abrupt, they are considered to be potentially hazardous for motor vehicles. The main use of the speed bump

has been in private parking lots and on private roads. They are generally considered to be inappropriate by traffic engineers because they are not included in design guides.

As of September 10, 1997, The Institute of Transportation Engineers (ITE) plans to publish the recommended practices for Guidelines for the Design and Application of Speed Humps.

References: 10, 11, 12, 13, 14, 15, 16, 32, 33

2. Rumble Strips

Rumble strips are a series of either bumps or depressions in the pavement. They are intended to alert drivers of a special situation, such as a speed reduction or stop ahead condition. They are typically ½ to 1 ½ inches high or deep, 3 to 4 inches wide and placed 90° to traffic flow.

Rumble strips produce both an audible rumble and a vibration that creates an awareness of a condition for which a driver must react. They are used most frequently on shoulders of high-speed roadways to alert drivers that they are not driving in the travel lanes of a road. They are also commonly used to alert drivers in rural or high speed areas of an unexpected stop-ahead condition.

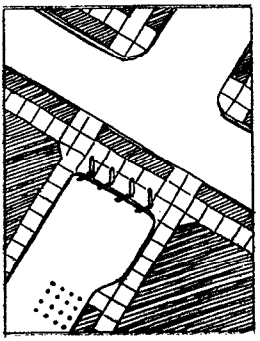
Many states now use 'portable' rumble strips, which are basically high density rubber sheets with a series of undulations. Though these are popularly used near construction zones, these may be used as a temporary measure in residential areas before installing permanent rumble strips.

Little research has been performed in residential areas for their use as a speed control device. A study in the City of Rochester Hills showed speed reductions of up to 2 MPH, whereas another study showed reductions of up to 15 MPH. Rumble strips can produce an annoying noise, cause vibration in nearby homes and be snow removal obstructions. One study suggests they should not be used where there is significant bus or truck activity or where traffic volumes exceed 2,500 vehicles per day. Due to the adverse effects, their installation must be carefully considered.

References: 4, 17, 18

3. Street Closures

The primary effect of street closures is to eliminate through traffic rather than to reduce speed. There may be some speed reduction because higher speed through traffic is discouraged from using the neighborhood streets. This is true particularly where a pattern of closures is carefully designed to accomplish this end. Street closures can be constructed at an intersection or at midblock. The midblock application can be effectively used where it is desired to restrict traffic in a residential section while allowing access to a high traffic generator adjacent to the residential area. Generally, whenever a street closure is used, a cul-de-sacs should be constructed so as not to "trap" a vehicle. Cul-de-sacs often require the purchase of right-of-way and often are constructed in a resident's front yard.



Among the disadvantages of street closures are:

- Restricted access to the neighborhood by service and emergency vehicles.
- Problems with vandalism and maintenance.
- Traffic is often transferred to neighboring streets, generating new problems and complaints.

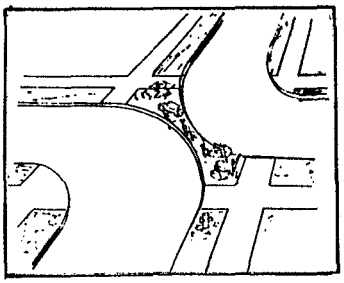
Street closures are difficult to apply to existing roadways and are better suited for newly developing subdivisions.

When cul-de-sacs are used, adequate turnaround areas must be provided at the end of the street. Proper signs must be installed to warn drivers of the end of the street.

Reference: 8, 28

4. Traffic Diverters

a. Diagonal Diverters



Diagonal diverters are barriers placed diagonally across an intersection. This converts a normal four-legged intersection into two separate roadways, each with a 90° turn. The purpose is to discourage "through" traffic by requiring it to take a circuitous route through the neighborhood.

Speeds of vehicles are only affected in the immediate vicinity of the diverter because drivers must make a 90° turn. Diverters may discourage drivers from using the street as a short-cut route. However, some drivers will simply move to another residential street, thus moving the problem. Since they create formidable barriers in the intersection, they must be marked similar to one-way streets and have appropriate lights so they can be seen at night.

References: 8, 9, 19

b. Semi-Diverters

A semi-diverter is a barrier placed transverse to traffic at the beginning of a block. It prohibits traffic from entering the block, but allows two-way traffic within the block. Since they create formidable barriers in the intersection, they must be marked similar to one-way streets and have appropriate lights so they can be seen at night.

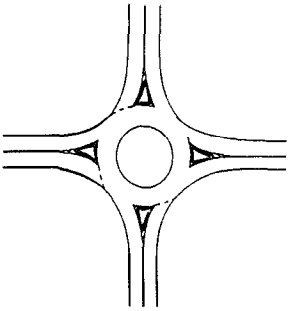
Semi-diverters have no effect on speeds other than in the immediate vicinity of the barrier. They can reduce traffic volumes, but only at the end of the block at which they are placed. The violation incidence can be quite high.

Reference: 8, 19

5. Traffic Islands

a. Traffic Roundabout

Modern roundabouts are different from traditional traffic circles, in that all approaching traffic yields right of way to circulating traffic. This is reinforced through the use of yield signs on the approaches. Other characteristics of roundabouts include deflection and flared approaches. Use of deflection helps slow entering vehicles, leading to safer merges with the circulating traffic stream. The use of splitter islands helps drivers perceive a change in the roadway geometry and enter the roundabout safely. Benefits of roundabouts realized in the states of California, Florida, Maryland and others include slowing of traffic, reducing delay and emissions when compared to stop/signal controlled intersections, improving safety and aesthetics.



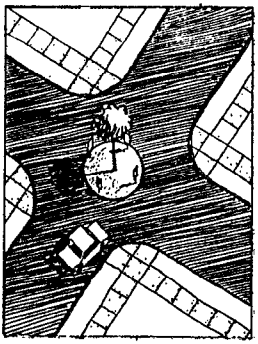
Its primary use is to reduce crash frequency at residential intersections. These roundabouts also have an effect on traffic volume and speeds.

At ten study locations, average speeds were reduced 4 MPH (from 27.5 MPH to 23.3 MPH) downstream from the circles, but only for short distances. Speed reductions can be even more significant near the circle, similar to speeds near stop signs.

One study shows a significant 77% decrease in crashes. Traffic volumes on the higher volume street at twenty study locations decreased an insignificant 2%. The construction cost of a roundabout is quite high ($10,000 - $30,000).

References: 4, 8, 19, 20, 30

b. Traffic Islands



A traffic island is a defined area, painted or raised, included in highway design for the primary purposes of controlling and directing traffic movements. They also provide refuge for pedestrians, reduce excessive pavement areas, and can be used to indicate proper use of an intersection or to locate traffic control devices.

Painted/striped islands do not affect speeds significantly; raised islands reduce vehicle speeds in some instances, mostly in combination with narrow lanes, which can create hazards.

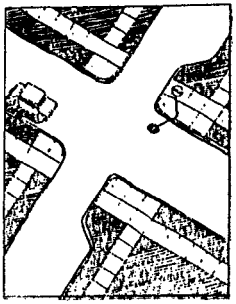
Improper islands make roadways unsafe. If an island is not large enough to command attention, motorists will drive over it. Curbed islands are sometimes difficult to see at night due to oncoming headlights or other light sources, thus causing crashes.

Islands do not reduce traffic volume by any significant amount, but can be an effective treatment for traffic movement and safety. If a traffic island is used, it might be beneficial to plan an island initially, then observe the effect and change the layout arrangement accordingly. The same process can be repeated until an optimum arrangement is established and a permanent raised island can be installed.

6. Chokers and Road Narrowing

Chokers are narrowed roadway widths using landscaped areas between the sidewalk and street. The pavement width between chokers can be constructed for one or two lanes of traffic. The choker can be constructed parallel to the traveled way or twisted to the direction of travel.

Road narrowing is a method used mostly in residential areas to control vehicle speeds and reduce traffic volume to improve safety. Another road narrowing technique can be found by the use of medians. In one community in Maryland, medians 20 to 50 feet or more in length have been constructed in advance of intersections. It was found to effectively reduce speeds though, it was necessary to construct bulb-outs to force drivers to shift over inconveniently. Once implemented, the 85th percentile speeds were reduced by 2-5 mph.



Chokers and road narrowing can control the speeds of vehicles efficiently and can increase safety and reduce traffic flow if properly installed. However, they should not be used on high volume streets, and sudden road narrowing should always be avoided. Curbside parking may have to be sacrificed to implement these methods. Proper signs should be installed to warn drivers of the chokers.

Reference: 4, 32

7. On-Street Parking

On-street parking is parking that is allowed on a street in the curb lane and is commonly permitted in residential areas.

Drivers of through vehicles generally reduce their speed in anticipation of conflict situations with parked vehicles or pedestrians. A study was done in Dallas where parking was removed in four central business districts. A 60-day study showed an increase of 26.7% in vehicle speed. In another study, only peak period prohibitions were reported which increased average speeds by 27%.

A clear relationship exists between crashes and vehicles parked on-street. One study in a community of 65,000 people found that 43% of all local and collector-street crashes involved on-street parking.

The angle of on-street parking has an affect on safety. Although angle parking allows for more parking spaces per unit of curb length than parallel parking, it requires more space for maneuvering, increases the amount of time a car is exposed to oncoming traffic, and can create a visibility problem for drivers when backing out into traffic. Therefore, angle parking has a substantially higher crash rate than parallel parking. Many studies have found that eliminating angle parking and replacing it with parallel parking reduces crashes 19 to 63 percent. A study in Maine found that parallel parking had a crash rate 12 percent lower than angle parking. A study in Nebraska concluded that parking should be of parallel rather than angle type to improve safety by reducing traffic crashes.

Several studies have been conducted that show the safety concerns of on-street parking. Primary hazards are:

1. Parked vehicles make the road width narrower and significantly restrict the flow of traffic. Parked vehicles can easily increase rear-end or side-swipe crashes due to hazardous maneuvers by drivers avoiding parked vehicles or drivers entering or leaving parking stalls.

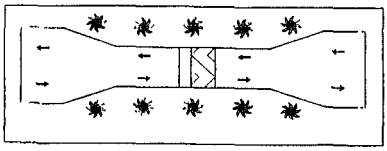
2. Drivers or rear-seat passengers getting out of parked vehicles on the side street present an added obstacle in the roadway. This produces both rear-end and side-swipe collisions.

3. Reduced sight distances involving pedestrians, especially children, attempting to cross the street from between parked vehicles or at intersections.

It is advisable to avoid on-street parking especially on residential streets because of the crash hazard, traffic volume/capacity/flow reduction, etc. It does, however, reduce speeds by restricting sight distances.

References; 21, 22, 23, 24, 34, 35

8. Combination of Physical Control Measures



Various combinations of traffic control and traffic calming measures can be used to enhance effectiveness. The combinations are governed by the major objectives or purpose for which the installation is planned. For example, the objective of reducing speeds and cut through traffic may be achieved by using a combination of a speed hump and street narrowing. The illustration presents such a combination. This combines the installation of a speed hump as well as street narrowing within the vicinity of the speed hump. The street narrowing helps to reduce speeds over a longer distance than a conventional speed hump.

References: 31

C. ROADWAY MARKINGS

1. Transverse Markings

Transverse pavement markings consist of a series of painted lines placed across the road. The spacing between the lines gradually decreases as the hazard is approached. The paint pattern is intended to give the illusion of high speed and causes drivers to reduce their speeds. In Maine, transverse pavement markings used in conjunction with standard speed limit signs, when entering a small town, increased the number of vehicles traveling below the speed limit by 10 percent. In Scotland, similar

success occurred when yellow transverse markings were applied in advance of a traffic circle. Initial results showed a 30 percent reduction in 85th percentile speeds. which were later reduced to 16 percent after one year. Crashes were reduced at the Scotland site from 14 crashes in the year prior to the installation to only 2 crashes in the 16 months following the installation.

A study in Great Britain showed that speeds were influenced by the existence or non-existence of a hazard following the transverse markings. If no hazard exists at the first location with transverse markings, the driver would not slow down at the second location even if a hazard existed.

It appears from the various studies that if transverse markings are used at locations in advance of potentially hazardous locations or in addition to normal speed limit signing when entering small towns, that speed reductions will occur at both types of locations and crashes will be reduced at the hazardous locations. However, it does not appear from the literature reviewed that reductions in speeds should be anticipated by applying transverse pavement markings in the middle of a typical residential area.

Reference: 27

2. Longitudinal Markings

Longitudinal pavement markings for speed control is intended to give drivers the impression of a narrow lane through which the vehicle must be guided. One study involved the striping of two residential streets to nine foot wide lanes. It was found that speeds changed in a range of a decrease of 1.4 MPH to an increase of 3.2 MPH. It was theorized that the narrowing by striping was ineffective because it actually made the drivers task of tracking the roadway easier.

3. Crosswalks

The use of painted crosswalks is to provide improved pedestrian safety by guiding them across the street and to notify drivers of the possibility of the presence of pedestrians. When painted

crosswalks are used, sidewalks on both sides of the road should also be provided. There is no indication in the literature that crosswalks result in lower vehicular speeds.

Reference: 16

D. PLANNING-RELATED ALTERNATIVES

1. Adequate Arterial Capacity

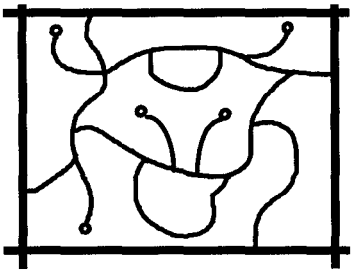
By providing adequate capacity on the surrounding major street network, the amount of through traffic using residential streets can be reduced. Although not specifically a speed regulating method, reducing the traffic volume can decrease the number of speed complaints on residential streets and can improve safety.

Though this is a costly means of reducing residential speeding complaints, improved traffic flow and crash reduction can be realized on residential streets.

Reference: 26

2. Subdivision Planning

Residential street design can influence the speed of vehicles through a neighborhood. Designs that feature curvilinear alignment, a narrow cross-section, short block length, reduced building setback and roadside tree planting can create a feeling of restriction and result in a speed reduction and may increase traffic crashes. Conversely, local streets built to high standards, in an attempt to improve safety, create an environment that allows increased vehicle speeds.



New subdivision streets can be designed to discourage cut-through traffic, which will reduce speeding complaints.

Care must be taken in the design process to ensure adequate sight distances along the roadway and at intersections, to provide the highest level of safety possible.

Reference: 26, 29

VI. CONCLUSIONS

An effective traffic calming program can be implemented by following the guidelines in this booklet. The key to a successful program is **community involvement**. Local officials and residents must work together for the common goal of improving safety on residential streets. This booklet provides alternatives that may help decrease speeds and/or reduce through traffic on residential streets. It also gives direction for developing a traffic calming program in those communities that currently use only traffic law enforcement to control speeds.

Whenever traffic calming devices are used, special care must be taken to advise drivers of the device by installing adequate warning signs and/or permanent markings.

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This pamphlet has been produced in cooperation with the Office of Highway Safety Planning, a division of the Department of State Police, State of Michigan, and funded by the U.S. Department of Transportation, National Highway Traffic Safety Administration. 15,000 copies were printed at $0.27 per copy, at a total cost of $4,084.00.

#OHSP 701 (2/98)

Speeding in Residential Areas *2nd Edition*

Guide No.3 (2010)

by Michael S. Scott with David K. Maddox

The Problem of Speeding in Residential Areas

What This Guide Does and Does Not Cover

This guide addresses the problem of speeding in residential areas, one of the most common sources of citizen complaints to the police. The guide begins by describing the problem and reviewing factors that increase its risks. It then identifies a series of questions to help you analyze your local speeding problem. Finally, it reviews responses to the problem and what is known about them from evaluative research and police practice. †

† See the companion online learning module on Speeding in Residential Areas at www.popcenter.org/learning/speeding/.

Speeding in residential areas is but one aspect of the larger set of problems related to speeding and traffic safety. This guide is limited to addressing the particular harms created by speeding in residential areas. Related problems not directly addressed in this guide, each of which requires separate analysis, include the following:

- aggressive and reckless driving (commonly referred to as "road rage"),
- drunken driving,
- inattentive driving,
- pedestrian injuries and fatalities,
- running of red lights,
- speeding and traffic crashes on highways,
- speeding and traffic crashes on rural roads,
- street racing, and
- traffic congestion around schools.

Other guides in this series—all listed at the end of this guide—cover some of these related problems. For the most up-to-date listing of current and future guides, see www.popcenter.org

General Description of the Problem

Speeding in residential areas is often community groups' chief concern, largely because of the perceived risks to children. Yet because speeding must compete with other problems for police attention, problems that may appear far more serious, police often do not devote a lot of resources to it.

Speeding in residential areas causes five basic types of harm:

- it makes citizens fear for children's safety;
- it makes pedestrians and bicyclists fear for their safety;
- it increases the risk of vehicle crashes;
- it increases the seriousness of injuries to a speeder's own passenger(s) and to other drivers and passenger(s), pedestrians and bicyclists a vehicle strikes; and
- it increases noise from engine acceleration and tire friction.

Speeding increases the risks of crashes and injuries for several reasons:

- the driver is more likely to lose control of the vehicle;
- the vehicle safety equipment is less effective at higher speeds;
- the distance it takes to stop the vehicle is greater;
- the vehicle travels farther during the time it takes the driver to react to a hazard; and
- crashes are more severe at higher speeds.[1]

Factors Contributing to Speeding in Residential Areas

Understanding the factors that contribute to your problem will help you frame your own local analysis questions, determine good effectiveness measures, recognize key intervention points, and select appropriate responses.

Even modestly higher speeds can spell the difference between life and death for pedestrians struck by a vehicle. The impact's force on the human body is more than one-third greater at 35 mph than at 30 mph.[2]Each one-mph reduction in average speeds translates roughly to a 5 percent reduction in vehicle crashes.[3]

Speeders are disproportionately involved in vehicle crashes.[4] Speeding is a contributing factor in about one-eighth of *all* crashes and in about one-third of all *fatal* crashes.[5] Most crashes occur in urban areas, although most fatalities occur on more-remote highways.[6]

Beliefs and Attitudes About Speeding

Many cultures heavily promote speeding, giving it a generally positive social image. Vehicle advertisements often show driving that would be unsafe for average drivers on real roads. Most drivers do not think speeding is a particularly serious or dangerous offense, except in areas where children might be present.[7] Drivers tend to overestimate their driving skills and underestimate the crash risks.[8] Drivers tend to feel they can travel seven to eight mph over the posted speed limit without the police's citing them.[9]Chronic speeders also have a greater likelihood of being involved in crashes.[10]

Speed-related vehicle collisions are more commonly thought of and referred to as "accidents" rather than "crashes," suggesting that collisions are not drivers' fault. Studies in Canada and Australia, as well as in the United States, have found that a driver's risk of a crash increases in direct proportion to the number of times police have cited the driver for speed violations in the past.[11]

Many drivers admit to speeding in residential areas.[12] Their reasons for speeding include running late and wanting to make up for lost time, being unaware of the speed limit and trying to keep up with other traffic.[13] The most important factor in determining speed is the driver's perception of the road environment and of what speed is safe to drive.[14]†† Whatever drivers' specific reasons, it appears they make calculated decisions to speed,[15] creating opportunities for the police to alter their calculations.†††

From a wider social policy perspective, reducing speed must be balanced with other goals such as promoting a healthy economy (which partly entails getting goods and services delivered quickly), reducing environmental pollution and promoting healthful behavior (by encouraging walking, running and bicycling).[16]

†† Traffic engineers take drivers' perceptions into account in setting speed limits. The common standard for a posted speed limit is the speed at which 85 percent of drivers travel at or below, known as the 85th-percentile speed (National Highway Traffic Safety Administration 1997).

††† For detailed information on drivers' habits, attitudes and beliefs, see National Highway Traffic Safety Administration (1998); U.K. Department of the Environment, Transport and the Regions (1998); and Corbett and Simon (1992).

Understanding Your Local Problem

The information provided above is only a generalized description of speeding in residential areas. You must combine the basic facts with a more specific understanding of your local problem. Analyzing the local problem carefully will help you design a more effective response strategy.

Stakeholders

In addition to criminal justice agencies, the following groups have an interest in the speeding-in- residential-areas problem, and you should consider the contribution they might make to gathering information about the problem and responding to it:

- neighborhood and business associations (these associations often receive complaints about speeding and can mobilize support from the local government);
- local government agencies and committees that deal with traffic engineering, public transportation, planning, and noise abatement (these agencies and committees have useful data, expertise and resources); and
- school boards, school administrators and school parent associations (these groups have special interests in protecting students' safety around schools, capacities to mobilize support and resources that they might dedicate)

Asking the Right Questions

The following are some critical questions you should ask in analyzing your particular problem of speeding in residential areas, even if the answers are not always readily available. Your answers to these and other questions will help you choose the most appropriate responses later on.

Crashes and Complaints

- How many crashes occur in residential areas? How many are crashes with other vehicles? Pedestrians? Bicyclists?
- How serious are the injuries?

- What percentage of crashes in residential areas are speed-related?
- How, specifically, do the speed-related crashes occur? A single vehicle's going off the road? Multiple vehicles' crashing into one another? Head-on, rear-end, side-impact crashes?
- Are there multiple factors involved, such as speeding to make it through yellow traffic lights?
- How many complaints do police receive about speeding in residential areas? What, specifically, do citizens complain about? Actual crashes? Fear of walking or riding? Noise?

Speeders

- Who are the most frequent offenders? Area residents? Commuters? Visitors? Why do they say they speed? Where are they coming from? Where are they going?
- Who are the worst offenders? How fast do they drive?

Locations/Times

- On which specific streets or blocks is speeding a problem? On what days and at what times? (Computer mapping software can help you answer many questions about where and when the problem occurs.)
- Is the speed limit prominently posted?
- Is the speed limit proper for road conditions? Too high? Too low? What is the 85th-percentile speed?
- What road conditions make speeding more likely? Can these conditions be modified?
- Do crashes occur at intersections, on straight roads or at curves?

Current Responses

- How much do officers conduct speed enforcement in the problem areas now? What factors determine where they conduct it? Do police conduct speed and crash studies before targeting particular locations for enforcement?
- What is the formal or informal tolerance range before officers issue citations? What do most drivers think it is?
- Do officers give warnings in lieu of citations? Do they officially record those warnings? What criteria do they use in deciding to give warnings?
- Does the law allow police to use speed cameras? If so, do they use them in residential areas?
- What are the typical fines and penalties for speeding in the problem areas? Do they seem to be meaningful consequences for offenders?
- Have officers used speed-display boards in problem areas?
- Do officers work closely with road and traffic engineers to establish speed limits, develop traffic-calming strategies, and identify and correct speed-related problems?

Measuring Your Effectiveness

Measurement allows you to determine to what degree your efforts have succeeded, and suggests how you might modify your responses if they are not producing the intended results. You should take measures of your problem before you implement responses, to determine how serious the problem is, and after you implement them, to determine whether they have been effective. You should take all measures in both the target area and the surrounding area. (For more detailed guidance on measuring effectiveness, see the companion guide to this series, *Assessing Responses to Problems: An Introductory Guide for Police Problem-Solvers*.)

Speeding, unlike so many other problems the police must address, allows for precise measurement-of speeds, crashes, causes, complaints, etc. Measures of the effectiveness of responses to speeding problems, therefore, can and should be reliable and accurate. The following are potentially useful measures of the effectiveness of responses to speeding in residential areas:

- the average speeds of vehicles (taken in mid-blocks),
- the percentage of vehicles speeding,
- the percentage of vehicles exceeding the speed limit by various amounts,
- the number of vehicle crashes,
- the number of injuries vehicle crashes cause,
- the severity of injuries vehicle crashes cause, and
- the volume of citizen complaints about speeding.

The number of citations issued is not an appropriate measure of the your responses' impact; it merely provides information about police enforcement levels. Pay attention to your efforts' possible displacement effects: drivers may divert to adjoining areas or roads, with positive or negative results. †

† See Problem-Solving Tools Guide No. 10, *Analyzing Crime Displacement and Diffusion* for further information.

Responses to the Problem of Speeding in Residential Areas

Your analysis of your local problem should give you a better understanding of the factors contributing to it. Once you have analyzed your local problem and established a baseline for measuring effectiveness, you should consider possible responses to address the problem.

The following response strategies provide a foundation of ideas for addressing your particular problem. These strategies are drawn from a variety of research studies and police reports. Several of these strategies may apply to your community's problem. It is critical that you tailor responses to local circumstances, and that you can justify each response based on reliable analysis. In most cases, an effective strategy will involve implementing several different responses.

Law enforcement responses alone are seldom effective in reducing or solving the problem. Do not limit yourself to considering what police can do: carefully consider whether others in your community share responsibility for the problem and can help police better respond to it. The responsibility of responding, in some cases, may need to be shifted toward those who have the capacity to implement more-effective responses. (For more-detailed information on shifting and sharing responsibility, see Response Guide No. 3, *Shifting and Sharing Responsibility for Public Safety Problems*).

Engineering Responses

1. **Using traffic calming.** Traffic-calming describes a wide range of road and environmental design changes that either make it more difficult for a vehicle to speed or make drivers believe they should slow down for safety.[17]† 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.[18] Common traffic-calming measures are divided into three main categories: vertical deflections, horizontal deflections and horizontal narrowing:

† The U.S. Transportation Department prepares traffic-advisory leaflets that provide illustrations and technical details about many road design features. There are also a number of useful web-based summaries and descriptions of traffic-calming measures: see, for example, TrafficCalming.org, the Federal Highway Administration, at www.fhwa.dot.gov/environment/tcalm/, and the Los Angeles County Public Works Department's neighborhood traffic-management-plan toolbox, at http://ladpw.org/TNL/NTMP/.

1a. Vertical Deflection

Speed humps. Speed (or road) *humps* are different from speed *bumps*. Speed *humps* are about 12 feet wide and 2 to 3 inches high, and can be crossed safely at 20 to 30 mph. Properly designed, they can accommodate large vehicles such as fire trucks. Speed *bumps* are shorter and narrower, and can be crossed safely only at lower speeds. They can damage large vehicles. They are more appropriately installed in parking lots than on roads.††

Although the street sign describes them as "street bumps," these "speed humps" can be crossed safely by cars traveling 20 to 30 mph. (Photo credit: Kip Kellogg)

†† Some jurisdictions have experimented with placing optical illusions of speed bumps, potholes or other obstructions on the road. These devices tend to have at least a short-term effect of reducing speeds until drivers realize they are illusions. There is an obvious risk that drivers might subsequently come to believe that real obstacles are illusions and fail to slow down when they should.

Speed tables. Speed tables are similar to speed humps, but are usually long enough for the entire wheelbase of a passenger car to rest on top of the flat, top section. They are often made with brick or other textured materials to draw attention to them or improve their appearance.

Raised crosswalks. These are speed tables placed at crosswalks and outfitted with crosswalk markers to improve pedestrian visibility to motorists.

Speed cushions. Speed cushions are narrow, rectangular humps that are placed close enough to reduce the speed of passenger vehicles, but that allow vehicles with wide tracks, such as emergency vehicles and buses, to straddle them and not affect their speed.

Raised intersections. These are similar to raised crosswalks, but cover the entire intersection, identifying it as a pedestrian zone.

Textured pavements. Pavements made from brick or cobblestone can be used for entire street blocks and can substantially reduce vehicle speeds.

1b. Horizontal Deflection

Traffic circles. Traffic circles are raised islands placed at intersections where traffic volume is not a concern.

Traffic circles, of varying sizes, reduce speeds and crashes in residential areas. (Photo credit: Kip Kellogg)

Roundabouts.††† Roundabouts are similar to traffic circles but are used in areas where traffic volume is also a consideration.

Chicanes. Chicanes are traffic deflections that narrow or redirect the road.

Realigned intersections. Realigning intersections involves putting bends and curves in the road at "T" intersections to help reduce speeds.

††† It is essential that vehicles traveling in the roundabouts have the right-of-way, rather than those entering the roundabouts, for them to be effective in reducing crashes (National Highway Traffic Safety Administration 1999).

1c. Horizontal Narrowing

Neckdowns. Neckdowns are built-out curbs at intersections that reduce the width of the road and the distance needed for pedestrians to cross.

Center islands. These are raised islands in the centerline of a road. They can be installed as gateways to residential neighborhoods.

Neighborhood gateways remind drivers that they are entering residential areas where lower speeds are appropriate. (Photo credit: Kip Kellogg)

Chokers. These are mid-block build-outs (sidewalk-area extensions into the road).

Other strategies include:

- marking the road to create the illusion that it is narrowing,
- planting trees and other foliage along roadsides,
- permitting parking on both sides of residential streets,†
- timing traffic signals for vehicles traveling the desired speed, and
- erecting mid-block barriers that create two cul-de-sacs.

† The speed reductions achieved by permitting parking must be offset against the increased risk to pedestrians who dart into the road from between parked vehicles.

Traffic-calming measures can be expensive, however, so you must determine their cost-effectiveness over the long term. Traffic-calming measures work best if they are understood and accepted by the public, take into account the special requirements of emergency response vehicles and are reinforced with adequate levels of police enforcement.[19] Properly designed, traffic-calming measures can also reduce noise levels by reducing vehicle acceleration. Without traffic-calming measures, it is difficult for police to reduce average vehicle speeds below 25 mph.[20]

2. **Posting warning signs and signals.** Painting speed limits or "SLOW" on the road surface, in combination with posting roadside signs, can help reduce speeds.[21] Transverse pavement markings create the illusion of high speed, and when placed ahead of traffic hazards, have been shown to cause drivers to slow down.[22] Strobe-light signals, flashing signals and warning signs painted in eye-catching fluorescent colors can improve drivers' awareness of special hazards and reduced speed limits.[23] Where there are many other signs and sights competing for drivers' attention, it is hard to get drivers to notice speed warnings. Warning signs and signals are more effective if they convey why drivers should slow down (e.g., curve ahead, school zone, road construction).[24] Other signs, such as those that warn of children in the area, are not known to effectively reduce speeds.[25]

Warning signs such as these pedestrian-crossing and school-zone signs remind drivers to slow down. (Photo credit: Kip Kellogg)

3. **Blending motor and non-motor vehicle uses of public space through urban design.** In some communities, urban planners are rethinking the conventional separation of driving and nondriving uses of public space. They are removing standard barriers, signs and road markings that delineate where vehicles, bicycles and pedestrians belong, replacing them with gateways, new surface materials and street furniture, such as benches, short posts or pillars, streetlamps, waste bins, fountains, and bus stops. This reduces the traditional separation between motorists, bicyclists and pedestrians by eliminating wide, straight routes and blurring the lines between public and private space. The results are greatly reduced speeds because motorists recognize that they are sharing the space with non-motorized users and therefore must be more cautious.[26] First pioneered by the Dutch, these designs are being used successfully in the United States in Seattle; Portland and Eugene, Oregon; and West Palm Beach and Sarasota, Florida.

Education Responses

The goal of education responses is to make speeding socially unacceptable. But given the current acceptability of speeding, there is the potential for a negative backlash against anti-speeding campaigns.[27]

4. **Conducting anti-speeding public awareness campaigns.** Anti-speeding public awareness campaigns have been recommended, even though their effects may not be immediate and substantial; they can help change the social acceptability of speeding and alter drivers' beliefs that they are better and safer than other drivers. [28] Public awareness campaigns need not be overtly accusatory, but should convey facts about the dangers and consequences of speeding so as to debunk common myths about speed and driving. Because many drivers say they speed merely to keep up with traffic, encouraging voluntary compliance with speed limits can help slow down those drivers who consciously or subconsciously follow other drivers' lead.

Targeted information campaigns can be even more effective than publicly broadcast campaigns. Police can issue warnings and requests directly to groups of chronic speeders if they can identify them. For example, Raleigh, North Carolina, police determined that students' parents were the most common speeders near schools: police set up warning signs in the school zones, published speeding education information in the school newsletters, and distributed warning and education information to parents stopped for speeding and those dropping off their children at school, resulting in a doubling of the percentage of drivers obeying the speed limit.[29]

A twist on the conventional public awareness campaign that *discourages* speeding is a campaign that *encourages* obeying the speed limit. In some campaigns of this sort, police have achieved positive results by stopping drivers and thanking them for obeying the speed limit; in others, signs have been posted indicating the percentage of drivers obeying the speed limit.[30]

An interesting method for making the public aware of the hazards of speeding in school zones comes from Lithuania. There, drivers are required to keep their headlights on at all times during the first week school is in session as a reminder to one another to drive carefully where children are present.

Some public awareness campaigns are professionally developed, using television, radio and billboards. These campaigns typically convey official, government-sanctioned messages about speeding risks. Anti-speeding campaigns developed at the grass-roots level are potentially even more effective than official campaigns. Using simple lawn signs, speed display boards, warning letters, or personal appeals to speeders who have been stopped, these campaigns can convey more heartfelt messages to speeders about the risks they create.

Grass-roots anti-speeding signs convey more heartfelt messages to speeders. (Photo credit: Kip Kellogg)

5. **Informing complainants about actual speeds.** Complainants do not always estimate vehicle speeds accurately. Vehicle speed almost always seems faster to a stationary pedestrian than to a moving motorist. Where you suspect that complainants' concerns may be exaggerated, you might have a police officer monitor speeds with complainants present. Some complainants may be surprised to learn that vehicles are in fact traveling the speed limit. This does not necessarily mean that speeds are appropriate for the conditions, but at a minimum it helps complainants better understand what responses might be most appropriate to remedy the problem.

6. **Providing realistic driver training.** Realistic driver training similar to what police officers receive can help drivers better appreciate speed's effects on their ability to control a vehicle.[31] Proper, realistic training courses require skilled instructors, special safety equipment and protected driving areas.

Enforcement Responses

7. **Enforcing speeding laws.** Long-term changes in drivers' attitudes toward speeding depend on drivers' perceived risk of being stopped.[32] However, a considerable investment of resources is required to significantly increase the risk of getting caught.[33] The public generally supports speed enforcement, especially in residential areas and other areas where there are children.[34] Speed enforcement works best if

- drivers believe it will occur;
- it has meaningful costs to offenders;
- police apply it generally, rather than at specific times and locations; and
- drivers are not tipped off by cues as to when it is or is not happening.[35]

With respect to the last condition above, you must balance making the public aware of the enforcement campaign against allowing drivers to anticipate precisely where and when officers are conducting enforcement. For example, you might consider advertising on the radio that the police will be enforcing speeding laws on particular roads on particular days, but not give visual cues to drivers of the exact location of the speed detection devices and officers. This will enhance the deterrent effect for drivers listening to the radio, without reducing the deterrent effect for those who are not. You should vary the enforcement times and locations enough so that drivers do not become confident that they can avoid detection. Advance publicity of enforcement campaigns also increases public support for enforcement by establishing a sense of fairness to drivers. Explaining why police have targeted particular locations for enforcement (e.g., there's a high rate of crashes or citizen complaints) also increases public support.†† You should conduct enforcement both at problem locations and at randomly selected locations to maximize deterrence.††† Stationary marked police vehicles are more effective than moving marked police vehicles in reducing speed.[36]

†† The Silverthorne, Colorado, Police Department surveyed the community to determine the thresholds at which the public believed the police should issue speeding citations at specific locations. The police issued the survey results to drivers stopped for speeding, thereby enhancing police authority to enforce speeding laws and minimizing citizen complaints about speed enforcement.

††† An Australian study concluded that posting police officers in marked police vehicles on randomly selected stretches of road at random times generally is a cost-effective way to maximize deterrence and reduce traffic crashes (Leggett 1997).

Police enforcement is expensive to maintain consistently, and it quickly loses its effect where the enforcement effort is not visible to drivers.[37] Intensive speed enforcement also loses its effectiveness because of the typical incentive system for traffic officers—they are rewarded for issuing citations rather than for maintaining reduced average speeds. Consequently, as soon as the enforcement effort has the positive effect of reducing speeds, there are fewer violations and traffic officers move on to other locations, after which speeds quickly resume their pre-enforcement levels.[38]

Drivers should not be able to easily detect when and where police are enforcing speed limits. (Photo credit: Kip Kellogg)

8. Enforcing speeding laws with speed cameras. Speed cameras, also referred to as *photo radar*, are cost-effective in reducing speeds, crashes, injuries, and fatalities, particularly when detected violations are prosecuted.[39] Police determined that speed cameras, used in conjunction with other responses, have proved effective in reducing the percentage of speeders, vehicle crashes, injuries, and fatalities in Victoria, Australia.[40] There, police mounted speed cameras either in unmarked police vehicles or on tripods along the roadside, without advance warnings to drivers about the cameras' location. The police could move the cameras around so drivers could not predict where they placed them. Speed-camera use can be effective in residential neighborhoods as well as on major arteries and highways.[41] Some drivers slow down when approaching speed cameras, but quickly speed up once they pass.[42] This can be countered by hiding the cameras better and otherwise preventing drivers from knowing exactly where they are. In some jurisdictions, the relatively inexpensive protective boxes in which speed cameras are placed are mounted in many locations, leaving drivers uncertain as to which boxes actually contain cameras at any particular time.

The public has generally accepted the use of speed cameras, especially in high-risk zones, although there are some strong objections to the invasion of privacy and preferences for personal interactions with enforcers.[43] Some jurisdictions have experienced significant vandalism to speed cameras.[44] The United Kingdom first authorized speed cameras by law in 1991; now, all British police forces use them. Norway has used them effectively since 1988.[45] Not all U.S. jurisdictions have specifically authorized speed cameras for prosecution, and some states and municipalities have specifically rejected proposals for their use. You should first gauge public support for speed cameras before formally attempting to use them. In addition, some issues exist regarding the fees companies that install and operate speed cameras charge, and how the jurisdiction uses revenue generated from fines.

The first generation of speed cameras required that someone take film from the cameras, to be processed. More-advanced technology allows for more-efficient remote-image processing.[46]

9. Using speed display boards. Speed display boards measure oncoming vehicles' speeds and prominently display the speeds to drivers. Research has shown that speed display boards reduce speeds and crashes, seem at least as effective as speed cameras and are more cost-effective.[47] Speed display boards are particularly effective with drivers who do not pay attention to their speed. Large, changeable-message signs that combine site-specific messages with speed displays have effectively reduced speeds by as much as nine mph in and around school speed zones.[48] They are more effective when supplemented with police enforcement—in this combination, the effect can last several weeks after they are removed. Unattended display boards, however, are vulnerable to vandalism.

Speed display boards are a cost-effective way to reduce speeds. (Photo credit: Kip Kellogg)

10. **Arresting the worst offenders.** As one method for changing public attitudes toward speeding, some police agencies have amended their policies and arrested serious offenders (those driving much higher than the speed limit) rather than merely releasing them with a citation. The intent is to convey a strong message that driving well over the speed limit is a seriously dangerous offense and not a harmless technical infraction.† This response may require special legislation and policies.

† The Glendale, Ariz., Police Department (1998) used this response as part of a comprehensive strategy to reduce speeding. State law specifically authorized the police department's custodial arrest policy.

11. **Having citizen volunteers monitor speeding.** Some police agencies have recruited and trained citizen volunteers to operate speed detection devices in residential areas.[49] The volunteers record the vehicle speeds and license plate numbers and turn them over to the police. Police then send official warning letters to the registered vehicle owners. Other police agencies, such as the Madison, Wisconsin, Police Department, have had citizens join police officers on traffic stops to explain the community's concerns about speeding to drivers.

Responses With Limited Effectiveness

12. **Reducing speed limits.** Speed limits alone have little effect on actual vehicle speeds. Reducing posted speed limits will typically decrease actual average vehicle speeds by only one-fourth of the reduction.[50] So, for example, reducing the posted speed limit from 30 to 25 mph will reduce actual average vehicle speeds by only a little more than one mph. When police set speed limits lower than what most drivers consider safe (typically, the 85th percentile), the net effect is to cause many drivers to ignore those speed limits, as well as other posted speed limits;[51] if police enforcement of the reduced limits fails to establish a credible deterrent, drivers may increasingly lose respect for *all* speed limits. In some jurisdictions, a posted speed limit lower than the 85th-percentile speed may constitute a legal defense to enforcement. Researchers should conduct careful speed studies before police change speed limits. Similar roads should have similar speed limits so drivers do not come to believe that police arbitrarily set speed limits.[52], ††

†† The Wisconsin Transportation Information Center (1999) published a guide for setting speed limits on local roads. Although it specifically refers to Wisconsin, much of the information applies to any jurisdiction.

Traffic and road engineers may inadvertently increase vehicle speeds when they build extra safety margins into the road design and speed limit.[53] For example, if they want vehicles to travel 25 mph along a particular road, they might set the speed limit at 25 mph, but design the road using accepted guidelines for 30-mph travel, thinking this will provide an extra safety margin. However, the accepted guidelines already have a safety margin factored into them, resulting in a double safety margin that actually makes the road seem travel-safe at 35 to 40 mph. Because most drivers travel at what they perceive as safe speeds rather than the posted speed limit, they will end up driving 10 to 15 mph faster than the engineers originally intended. This unintended effect reflects an underlying tension in road safety—a desire on the one hand to build roads that encourage drivers to drive at slower, safer speeds, and a desire on the other hand to make roads safe enough for drivers who choose to drive faster. Road and traffic engineers have often tried to resolve this tension by making roads wider, straighter and more obstruction-free. More recent trends have turned in the opposite direction, to get drivers to slow down.

13. **Increasing fines and penalties.** Higher fines and penalties, beyond the threshold that offenders consider meaningful, do not continue to reduce speeds.[54]

14. **Erecting stop signs.** Many aggrieved citizens believe that erecting stop signs along residential roads will force drivers to slow down. They pressure elected officials and traffic engineers to erect new stop signs. However, the unintended effects may be that drivers speed up mid-block to make up for lost time, thereby keeping average speeds high, increasing acceleration noise and decreasing fuel efficiency.[55]

15. **Installing speed bumps or rumble strips.** Speed *bumps*, as opposed to speed *humps*, do not effectively reduce speeds, and can prove hazardous.[56] Rumble strips—intermittent series of bumps across the road—do not reduce speeds directly; they serve merely to warn drivers of a hazard ahead.[57]

16. **Reengineering vehicles.** New vehicle technology holds some potential to control speeding, but most features are not yet standard or widely accepted by the public.[58] *Speed limiters* prevent a vehicle from going faster than a set speed. Speed limiters can be programmed to receive electronic signals from transmitters along the road and adjust maximum speeds automatically. So-called *smart cards* can electronically record a vehicle's speed and automatically report it to police. *Electronic speed indicators*, reading electronic roadside signals, warn drivers they are speeding, or speed indicators in the vehicle electronically trigger roadside warning signals.

There is currently available more practical and increasingly popular in-vehicle technology that records speeds and other data for later or real-time monitoring by drivers' guardians, commonly teenage drivers' parents. Prosecutors might also consider such technology as a conditional sentence for convicted chronic speeders.

Summary of Responses to Speeding in Residential Areas

The table below summarizes the responses to speeding in residential areas, the mechanism by which they are intended to work, the conditions under which they should work best, and some factors you should consider before implementing a particular response. It is critical that you tailor responses to local circumstances, and that you can justify each response based on reliable analysis. In most cases, an effective strategy will involve implementing several different responses. Law enforcement responses alone are seldom effective in reducing or solving the problem.

Engineering Responses				
Response No.	Response	How It Works	Works Best If...	Considerations
1	Using traffic calming	Makes it more difficult for vehicles to speed, or makes drivers believe they should slow down for safety	road and environment changes are made in compliance with recommended specifications, the affected public supports the changes, and potential negative impacts are considered and minimized	Some changes to the environment require high capital expenditures; cost-effectiveness must be considered over the long term

2	**Posting warning signs and signals**	Encourages drivers to slow down by reminding them of the speed limit and calling their attention to hazards on the road ahead	...the signs or signals stand out from other road signage, they convey the reason for the reduced speed, and they are supplemented by police enforcement	Where there are many other signs and sights competing for drivers' attention, it is not easy to get drivers to notice speed warnings
3	**Blending motor and non-motor vehicle uses of public space through urban design**	Reduces the traditional separation between motorists, bicyclists and pedestrians, greatly reducing motorists' speed	...urban planners have the funds to change urban design, and drivers are willing to reduce their speed	Some jurisdictions may not have the funds to change urban design; some drivers may still refuse to adhere to posted speed limits

Education Responses

Response No.	Response	How It Works	Works Best If...	Considerations
4	**Conducting anti-speeding public awareness campaigns**	Intended to change the social acceptability of speeding	...campaigns are carefully tailored for various target audiences (e.g., commuters, young male drivers)	Effects are usually not immediate and substantial; the messages need not be overtly accusatory, but may convey facts about the dangers and consequences of speeding to debunk myths about speed and driving
5	**Informing complainants about actual speeds**	Improves complainants' understanding of the exact nature of the problem	...you suspect that complaints are exaggerated or unrealistic	Proving that vehicles are traveling the speed limit does not necessarily mean that speeds are appropriate for conditions, but might suggest that responses other than enforcement are more appropriate
6	**Providing realistic driver training**	Helps drivers better appreciate speed's effects on their ability to control a vehicle	...drivers can actually feel speed's effects on their driving skills	Requires skilled instructors, special safety equipment and protected driving areas

Enforcement Responses

Response No.	Response	How It Works	Works Best If...	Considerations
7	**Enforcing speeding laws**	Increases drivers' risks of being stopped	...drivers believe it will occur, it has meaningful costs to offenders, police apply it generally rather than only at specific times and locations, and drivers are not tipped off by cues as to when enforcement is or is not happening	Requires a lot of resources initially to change drivers' perceived risks of getting stopped; giving the public advance notice must be balanced against not allowing drivers to anticipate where and when enforcement is occurring; expensive to do consistently
8	**Enforcing speeding laws with speed cameras**	Significantly increases the level of speed monitoring and enforcement, thus increasing drivers' perceptions of the risk of getting caught speeding, and serving as a deterrent	...camera placement is not too obvious, and locations are changed periodically	Drivers slow down when they know they are approaching a speed camera, but quickly speed up once they have passed it; some strong public concerns exist about invasions of privacy and absence of personal interaction in enforcement; usually requires special legislative authorization for cameras' use as evidence in prosecution; financial issues exist related to fees and uses of fine revenue
9	**Using speed display boards**	Encourages drivers to slow down by measuring vehicle speeds and prominently displaying them	...a high percentage of drivers speed inadvertently, and police enforcement supplements the speed display boards	Unattended speed display boards are vulnerable to vandalism

10	**Arresting the worst offenders**	Helps change the common belief that speeding is not a serious offense	...sufficient public support exists	May require special legislative and policy authorization
11	**Having citizen volunteers monitor speeding**	Enhances informal social disapproval of speeding	...citizens directly affected by the speeding participate	Citizens must be properly trained for the specific tasks
Responses With Limited Effectiveness				
Response No.	Response	How It Works	Works Best If...	Considerations
12	**Reducing speed limits**	Intended to slow drivers' speeds through posted signs and police enforcement	...adequate levels of police enforcement exist	Reducing speed limits by itself will reduce average speeds only by small amounts; some speed limits are too low rather than too high, inviting disrespect for them; police should conduct careful speed studies before changing speed limits
13	**Increasing fines and penalties**	Creates meaningful consequences for speeders, thereby deterring all drivers, generally, and those cited, specifically	...the fines and penalties are set high enough to get drivers' attention, but not so high as to compromise public support for them	Beyond a certain threshold, higher fines and penalties do not continue to reduce speeds
14	**Erecting stop signs**			The effects are to increase speeds mid-block and increase noise from vehicle acceleration
15	**Installing speed bumps or rumble strips**			They do not reduce speeds directly, but merely warn drivers of hazards ahead
16	**Reengineering vehicles**	Technological devices can restrict vehicles' maximum speed, automatically notify authorities that vehicles are speeding, or trigger warning signals to drivers when they are speeding	...consumers are willing to accept this technology and pay for it	To date, few vehicles or roads are equipped with this technology, and public support for it is not yet certain

Endnotes

[1] National Highway Traffic Safety Administration (1997). [Full Text]

[2] UK. Department of the Environment, Transport and the Regions (1999); National Highway Traffic Safety Administration (1999) [Full Text]. [Full Text]

[3] UK. Department of the Environment, Transport and the Regions (1998)[Full Text]; Corbett and Simon (1999)[Full Text].

[4] UK. Department of the Environment, Transport and the Regions (1998)[Full Text].

[5] Corbett and Simon (1999)[Full Text]; UK. Department of the Environment, Transport and the Regions (1998)[Full Text]; National Highway Traffic Safety Administration (1997). [Full Text]

[6] UK. Department of the Environment, Transport and the Regions (1998)[Full Text]; Glazer (1997)[Full Text].

[7] Corbett and Simon (1999)[Full Text]; National Highway Traffic Safety Administration (1998). [Full text]

[8] Corbett and Simon (1999) [Full Text].

[9] National Highway Traffic Safety Administration (2002).

[10] Insurance Institute for Highway Safety (1998).

[11] Insurance Institute for Highway Safety (1998)

[12] Corbett and Simon (1999) [Full Text]; National Highway Traffic Safety Administration (1998). [Full text]

[13] National Highway Traffic Safety Administration (1998). [Full text]

[14] U.K. Department of the Environment, Transport and the Regions (1998) [Full Text]; National Highway Traffic Safety Administration (1999) [Full Text].

[15] Corbett and Simon (1992).

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