Neighborhood Automobile Restraint: The Chevy Chase Section Four, Maryland, Experience

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The Town of Chevy Chase Section Four, Maryland, is an affluent community of 3000 people lying between two major north-south radial travel corridors in suburban Washington, D.C. Several town streets have become convenient shortcut routes for commuters on their way to downtown Washington and for shoppers and employees in downtown Bethesda, located immediately west of the town. New economic development and the advent of regional rail rapid transit in downtown Bethesda is expected to exacerbate current through-traffic problems. This paper describes a proposed plan to alleviate the town's traffic problems. The focus of this paper is the issues that shaped the development of the plan and citizen reaction to it. These issues include whether or not a community has the right to deny access to nonresidents, the importance of public acceptance of any plan, the need for citizens to understand each other's problems and concerns, citizen reaction to physical barriers and other traffic-control devices, and the limited effectiveness and applicability of some control measures. The Chevy Chase Section Four experience is of interest to transportation engineers, local officials, and neighborhood groups considering the development of neighborhood traffic management plans in their communities.

Few transportation system management strategies arouse more citizen interest or generate more controversy than the automobile-restraint method in residential neighborhoods. Neighborhood traffic management programs have wide-ranging social, economic, and environmental impacts that directly affect the lives of area residents. Neighborhood automobile-restraint measures literally hit close to home.

Over a period of years, the Town of Chevy Chase Section Four, Maryland, has developed a traffic-restraint system that has had limited success in dealing with neighborhood traffic problems, particularly with through-traffic encroachment. This paper describes the problems in Chevy Chase Section Four, the traffic management plan that was recently recommended to solve these problems, and, most importantly, the underlying issues that shaped the development of the plan and citizen response to it. The issues discussed in this paper include whether or not a community has the right to deny access to nonresidents, the importance of public acceptance of any plan, the need for citizens to understand each other's problems and concerns, citizen reaction to physical barriers and other trffic control devices, and the limited effectiveness and applicability of some control measures.

The Chevy Chase Section Four experience is of interest to transportation engineers, local officials, and neighborhood groups because the problems faced there are similar to those of many communities. This experience illustrates the important issues that must be addressed to resolve conflicts and develop a traffic management plan that can be supported by the entire community.

THE PROBLEM

Chevy Chase Section 4 Setting

The Town of Chevy Chase Section Four is a close-in suburban community of 3000 people in the Washington, D.C., metropolitan area. It is bounded on three sides by major, multilane arterial highways and on the fourth side by a two-lane secondary arterial street (see Figure 1). These four arterials carry a total of 110 000 vehicles per average weekday. Another secondary arterial street, Leland-Maple, penetrates the town from the west to the north. This route carries 5000 vehicles on an average weekday and approximately 800 vehicles during the evening peak hour.

The close proximity of these major arterial routes and major traffic generators places significant traffic pressure on the town. This pressure manifests itself in the form of through-traffic encroachment and parking by nonresidents on neighborhood streets. Traffic oriented toward the Bethesda, Maryland, central business district, located along the western town boundary, uses town streets. Commuters also use town streets during the early morning and late afternoon to avoid delays on the congested peripheral arterial street system. With the opening of regional rail rapid transit service in 1983 and greater development of downtown Bethesda in the future, the town's traffic problems will be exacerbated.

Approximately 1100 vehicles/h currently enter and leave the town during the peak commuting hours that begin at 8:00 a.m. and 5:00 p.m. Some streets carry as many as 800 vehicles/h, while others carry as few as 15 or 20 vehicles/h at these times. Based on the total number of vehicles entering and leaving the town and empirical estimates of the number of trips generated by Chevy Chase Section Four households, it was estimated that roughly half of all traffic on town streets during peak commuting hours is nonresident through traffic. Through traffic currently ranges from 460 to 740 vehicles/h between 8:00 a.m. and 9:00 a.m., and from 290 to 670 vehicles/h between 5:00 p.m. and 6:00 p.m. The magnitude of through traffic could double in the future in response to new economic development and kiss-and-ride activity at the new Metrorail station in downtown Bethesda. The major through-traffic movements are shown in Figure 2.

Town Efforts to Control Traffic

The Town Council of Chevy Chase Section Four created a traffic committee in the fall of 1975 to consider the increasing impacts of traffic on the town and to develop a comprehensive traffic plan for coping with these impacts. The automobile-restraint system shown in Figure 1 was subsequently instituted. The first part of the system is a nonresident parking ban that has been successful in reducing nonresident parking encroachment. The second part is a through-traffic-restraint system consisting of commuter peak-period turn and enter prohibitions on most of the entrances to the town. Also, a one-way street "maze" was implemented in one of the neighborhood sectors.

The results of these restraints are mixed. Through traffic continues to encroach because (a) not all entrances to the town could be posted, (b) many motorists chose to ignore the restrictions, and (c) while the one-way maze is generally successful, through-traffic paths still exist and are used by outside traffic. Also, the system imposes significant excess travel on residents of certain areas and none on others. Having concluded that these measures were not adequately deterring through-traffic encroachment, the town, working through its traffic committee and with consultant assistance, undertook

Figure 1. Existing traffic-restraint system in Chevy Chase Section Four.

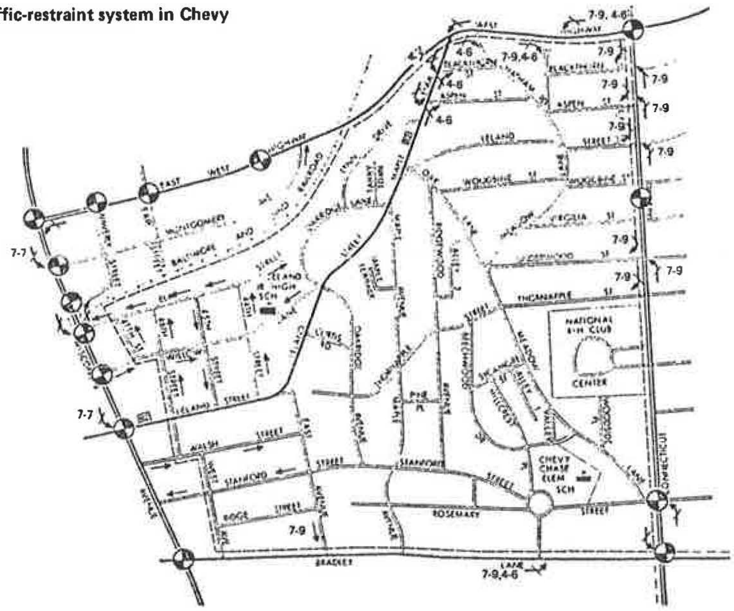
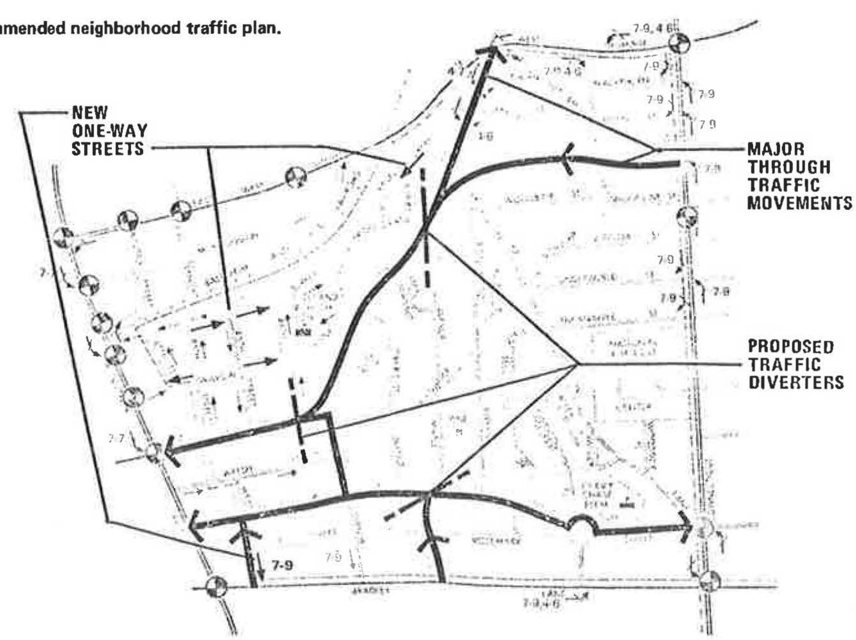


Figure 2. Recommended neighborhood traffic plan.



the development of a comprehensive neighborhood traffic management plan.

PROPOSED SOLUTION

Development of Traffic Management Plan

Preliminary plan alternatives were developed and presented to the town council, town manager, and town traffic committee. Each alternative encompassed a combination of two or more of the following restraint techniques (1):

1. Posted turn prohibitions on peripheral arterials,
2. Physical barriers or diverters within the local street network to eliminate direct through routes,
3. Closure of local streets at the town periphery to reduce the number of entrances to the town,
4. Back-to-back one-way streets, and
5. One-way street maze patterns on local streets.

Some alternatives relied primarily on physical barriers and diverters to divert through traffic; others relied primarily on regulatory measures. The use of stop signs and traffic signals to reduce travel speeds and deter through traffic was not considered a viable control strategy. Flagrant violation of these controls has been observed in other communities (2). Placement of stop signs at intersections where there is visibly little need to control right-of-way can breed driver contempt and hazardous disregard for these devices. Stop controls have been observed to have very limited effect in reducing traffic speed, except in the immediate vicinity of the device itself (3). The exclusive reliance on peak-hour turn prohibitions and on one-way streets also was not considered a viable control strategy. Traffic monitoring during the course of this study indicated that 30 to 50 violations of existing controls of this type occur each day on town streets during peak commuting hours. These controls can be effective only if a high degree of police enforcement is available.

The town traffic committee selected three plan alternatives that were analyzed in greater detail. Each plan was evaluated in terms of the following criteria:

1. Effectiveness in reducing through traffic;
2. Degree of inconvenience to residents entering and leaving the town;
3. Ease of circulation within the town;
4. Impact on public services, such as police and fire protection, emergency vehicle access, snow removal, trash collection, etc.;
5. Impact on school bus routes;
6. Degree of enforcement required; and
7. Approximate capital cost.

Computer network analyses were used to quantify the first three criteria. The remaining criteria were measured qualitatively.

The traffic committee recommended that the traffic management plan shown in Figure 2 be presented to the town residents and adopted by the town council. New diagonal traffic diverters and one-way streets would inhibit the flow of through traffic and divert it to the peripheral arterial street system. The diverters would force approaching traffic to turn right or left; through traffic would not be permitted. The middle 12-ft section of each diverter would be designed to provide enough ground clearance for emergency vehicles such as fire trucks to pass over them safely. According to Anthony Kanz and William Keim, other communities in the region have used this type of diverter successfully for some time and, thus, have established a local precedent for their use. Inexpensive temporary diverters made from stock highway construction items such as wooden barriers would be installed for an initial trial period. Permanent diverters made of bollards, wooden or metal guard rails, or brick or masonry walls would be constructed and attractively landscaped and signed pending a successful demonstration of the temporary diverters. The initial capital cost of each diverter could range from several hundred dollars to $15 000 or more, depending on the design and the extent to which intersection reconstruction is required.

Public Involvement and Reaction to Plan

Local officials and town residents played key roles in developing the recommended neighborhood traffic management plan. Formal working sessions between the consultant, members of the town council and traffic committee, the town manager, and school, county, state, and public service representatives were conducted at each major milestone of the project. Town residents volunteered to conduct traffic counts and a traffic sign inventory. They participated in two public meetings, one at the outset of the study to indicate their perceptions of traffic problems and one near the end of this study to solicit reactions to the plan recommended by the traffic committee. Each household was mailed a short summary report describing the town's traffic problems, the process by which the recommended plan was developed, and the recommended plan itself. Approximately 200 persons attended the first public meeting and 300 persons attended the second public meeting. Members of the traffic committee conducted three additional meetings subsequent to the second public meeting to answer further questions and solicit suggestions for improving the recommended plan.

Strong community support for alleviating neighborhood traffic problems was expressed at both public meetings. However, at the second meeting, there was adamant, vocal opposition to the traffic diverters. Opponents outnumbered proponents four or five to one. The opponents favored a plan that would include more turn prohibitions, one-way streets, stop signs, speed bumps, and/or traffic signals on the streets most frequently used by through traffic. In addition, there was a groundswell of support for establishing the town's first police force (or contracting with a neighboring community for such services) to more strictly enforce existing and any additional traffic control devices. As might be expected, the strongest opposition came from those who do not now experience significant traffic problems but feared that they would if the recommended plan was adopted. They generally supported efforts to solve traffic problems in other areas of the neighborhood but were concerned that the proposed plan would merely divert traffic to their street--and not to the peripheral arterials. They were especially supportive of regulatory measures to control outside traffic and favored the status quo over the traffic diverter solution. Some opponents threatened legal action if the proposed plan was implemented.

Chevy Chase Section Four has subsequently elected to experiment with less drastic measures before further considering a barrier solution. A series of stop signs has recently been installed at three intersections on Leland-Maple Street. The town traffic committee is also investigating the formation of a town police force. The cost to the town for one police officer and equipment has been estimated at approximately $25 000 annually. Other nonbarrier solutions are also being explored by the committee.

ISSUES

The neighborhood traffic problems experienced by Chevy Chase Section Four and the residents' reactions to the proposed installation of physical diverters are similar to those of many other communities. The underlying issues that shaped the development of the Chevy Chase Section Four plan and the citizen response to it are described below.

Each community must resolve for itself the question of whether or not it has the right to deny access to through traffic. Most citizens believe that high through-traffic volumes, excessive speeds, and nonresident parking encroachment are not compatible with life in residential areas. There is typically general support for some type of neighborhood traffic management that will preserve the integrity of the neighborhood, reduce the potential for traffic accidents and property damage, and reduce litter and noise and air pollution. In the context of a functional classification of highways, local neighborhood streets are not intended to carry significant through-traffic volumes but rather to serve as access to residents' homes. Others believe that neighborhood traffic controls will divert through traffic to other adjacent communities, overburden already congested arterial streets, and reduce the efficiency of the overall transportation system. They feel that, since the regional highway network has evolved over a period of decades and residents from all parts of the region have routinely used town streets for some time, the town residents have no right to deny them access. Although the Chevy Chase Section Four residents are clearly in favor of adopting measures to discourage through traffic, they have elected not to barricade themselves from the outside world.

Public acceptance is the key to establishing any kind of neighborhood traffic management program. It is important that the public participate in (a) defining neighborhood traffic problems, (b) identifying and assessing solutions to these problems, and (c) selecting the best plan for implementation. In the case of Chevy Chase Section Four, this involvement extended from local elected officials to ordinary citizens. Members of the town council, the traffic committee, and town manager were actively involved in every step of the planning process. Input from the general citizenry was received during the data-collection effort, through their representatives on the traffic committee, and at two public meetings. Those who are now most affected by neighborhood traffic problems and would benefit most from a successful control strategy attended in greater numbers and were most eager to be heard at the first public meeting. Those who are now least affected by neighborhood traffic problems and feel most threatened by changes in existing traffic patterns dominated the second public meeting. Greater involvement of both groups of citizens during the formulation and assessment of various plan alternatives may have promoted greater understanding and facilitated development of a recommended plan that could be supported by the entire community.

Citizens from all areas of the community must understand each others' problems and concerns. Not everyone is affected equally by neighborhood traffic problems; some residents are greatly affected, and others are not affected at all. Those who are least affected must be made aware of their neighbor's legitimate traffic problems, if they are to be enrolled in the effort to combat these problems. A cooperative problem-solving process must be established so that no single neighborhood group is unduly made worse off for the betterment of others. Otherwise, a situation develops that pits citizens who are most directly affected by neighborhood traffic problems and want something to be done about them against those who are less affected and perceive that they can only be made worse off by anything that disrupts the status quo. The polarization of neighborhood residents into two groups--clear winners versus clear losers--obviously reduced the chances of developing and implementing a successful neighborhood traffic management program.

Consider, for example, the effort to combat through traffic. Through-traffic encroachment is not a new problem in the town; it has existed for many years. Those who purchased homes in recent years presumably did so in full recognition of traffic conditions on their street and with the expectation that these conditions would not change dramatically during the period over which they would own their homes. Those who purchased homes on streets heavily traveled by through traffic would directly benefit from the diversion of this traffic to other streets. Those who purchased homes on streets to which through traffic is diverted would be adversely affected. Thus, some citizens would benefit to the detriment of others. Ultimately, this could be translated into changes in property values and direct income transfers that could be considerable in an affluent community such as Chevy Chase Section Four.

A well-conceived traffic management plan would, of course, divert through traffic from local town streets to the peripheral arterial street system, not from one local street to another. Nonetheless, citizens who perceive, correctly or incorrectly, that a neighbor's problem will be solved by diverting through traffic onto their street will oppose such plans. Citizens who are not convinced (or will not be convinced) that a plan will divert through traffic to peripheral streets will not support the plan. This kind of concern was the greatest source of opposition to a barrier solution in Chevy Chase Section Four.

Strategies that rely on traffic-control devices are generally more acceptable than those involving physical barriers or diverters. Barriers and diverters are viewed by many citizens (and transportation engineers as well) as a source of inconvenience, a nuisance, and potentially hazardous. Turn prohibitions, one-way streets, and stop signs are less onerous. The extent to which they will result in through-traffic reductions depends on the degree to which they are enforced. Some citizens believe that traffic signs must be obeyed by outsiders passing through the town but not by residents traveling to and from their homes. As a result, they think that by selectively enforcing traffic signs, through traffic can be eliminated without inconveniencing them. This may have been why some citizens endorsed the use of more signs and opposed traffic diverters in Chevy Chase Section Four.

Barriers and diverters, even those with mountable center sections, are also opposed by the police, fire departments, and emergency rescue squads. They were concerned that the diverters would reduce emergency response by fire trucks and ambulances, cause equipment damage, and endanger the safety of bicyclists, motorcycle riders, and firefighters who ride on the back of fire trucks.

It is important that all concerned understand the effectiveness and applicability of the various traffic-restraint techniques. Consider the case of speed bumps. Several citizens believe that speed bumps would be an effective measure to reduce vehicle speeds and the amount of through traffic on Maple-Leland Street. The idea has a logical appeal; the best way to slow down a speeding vehicle is to place obstacles in its path (4). After all, speed bumps appear to be successful in many apartment complex and shopping center parking lots. Experiments in other communities, however, have shown that, far from reducing speeds, these bumps could cause drivers to speed up to minimize their shock and discomfort (4). The bumps could cause vehicle damage; endanger the safety of bicyclists, motorcyclists, and firefighters; and possibly involve legal action. Speed bumps have been removed in some communities because of the noise generated by vehicles hitting them (3). Some citizens were skeptical of these arguments and remained convinced that speed bumps were applicable in their community.

Most neighborhood traffic problems are relative. For example, it does not matter that the number of nonresidents using or parking on town streets is less than neighboring communities, if residents perceive that these problems seriously affect their quality of life. What may be considered tolerable in one community may be considered excessive in another.

CONCLUSIONS

The experience in developing a neighborhood traffic management plan for Chevy Chase Section Four illustrates that there are inescapable trade-offs between the benefits that would accrue to some versus the hardships that would be imposed on others. These trade-offs are of two types: (a) reduced traffic problems in the community versus increased travel time and cost to diverted through traffic and others using the peripheral arterial streets and (b) the benefits that accrue to those who would have through traffic diverted from their street versus those who would be made worse off by changing existing neighborhood traffic patterns.

Technical solutions to neighborhood traffic management problems can be found to make the community as a whole better off. In the case of Chevy Chase Section Four, several feasible solutions were identified. However, all of these solutions had something in common. In the jargon of the economist Lester L. Thurow, each solution had a significant zero-sum element (5). That is, someone had to be made worse off so others could benefit. For this reason, the selection of a recommended course of action becomes a matter of political choice.

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Assessing Traffic Management Strategies in Residential Neighborhoods

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This paper describes the development and application of a dense network-type of model, with emphasis on the assessment of traffic management strategies in a residential neighborhood. The MICRO-ASSIGNMENT model was selected for use in this study after extensive literature review and operational experience. The model input and output were modified and fuel computation added. The model was applied to the College Terrace residential neighborhood area of Palo Alto, California. The no-control base condition and five transportation-system-management-type neighborhood strategies were evaluated. The strategies included interior traffic restraint measures and improvement of surrounding arterials. The selected strategies were compared with the no-control base condition. The assessment was on the basis of comparative flows, travel times, and fuel consumption rates on individual links and vehicle miles, vehicle hours, and fuel consumption for residential and arterial street subsystems. This assessment, supported by extensive literature review, served as the basis for developing initial policy guidelines for traffic management strategies in residential neighborhoods.

In recent years, transportation system management (TSM) has become a viable approach to solving traffic problems in various operating environments--dense networks, freeway corridors, arterial networks, rural highways, and so on. The key objective of TSM is to conserve fiscal resources, energy, environmental quality, and quality of urban life through short-term, low-cost transportation improvements. In order to effectively achieve this objective and predict consequences before implementation, analytical techniques are needed for these various operating environments.

This paper describes a research project that was concerned with the development and application of such an analytical technique for dense networks (1,2). The particular dense network covered in this paper was a residential neighborhood. A companion paper addresses a central-business-district-type of dense network.

LITERATURE REVIEW

A literature search was undertaken to make a survey of existing experience and to identify existing and emerging analytical techniques (3).

The survey of existing experience included identification of the problems encountered in the neighborhood areas, various types of TSM strategies implemented, and measures of effectiveness considered. Special attention was devoted to well-documented case studies.

The literature survey also was directed to the identification of analytical techniques tht might be employed to evaluate TSM-type strategies (3). More than 30 such techniques were identified, and six models were evaluated in some detail (4).

MODEL SELECTION

As mentioned in the literature review, 30 models were initially identified (3), and six were selected for in-depth study (4). The six models were CATS (5), CONTRAM (6,7), DHTM (8), MICRO-ASSIGNMENT (9,10), MICRO-UROAD (11,12), and TRANSIGN (13). The six models were evaluated with respect to their input requirements, their method of representing driver behavior and intersection operations, and their history of use and potential for incorporating expanded impact capabilities. Two models, CONTRAM and MICRO-ASSIGNMENT, appeared to be the best-suited for this study. Their nearly offsetting weaknesses and strengths resulted in their both being recommended for use in an actual application to determine which one would be ultimately more suitable for the objectives of this project.

The two models were placed in operation on the IBM system at the California Department of Transportation (Caltrans) and applied simultaneously to the College Terrace residential neighborhood area. The results of these applications provided first-hand information concerning model use-related features. In addition, the theoretical basis of the models and