

PARKING

BALANCE BETWEEN PARKING DEMAND AND PUBLIC POLICY

by

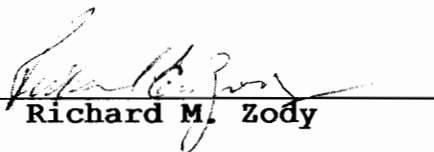
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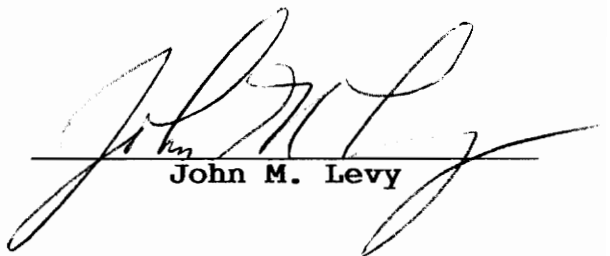
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SECTION I
INTRODUCTION

Parking space requirements are now recognized as a viable tool to achieve an array of public policy objectives relating to land use, transportation, economics and the environment. However, in order for a jurisdiction to effectively use their parking requirements, a relationship must be established between parking demand and the various public policy objectives. The purpose of this paper is to provide the analysis which a jurisdiction may use to establish such a relationship.

The parking requirements specified in local zoning ordinances control the amount and design of parking spaces associated with various land uses and therefore, have been extremely controversial since their conception. Parking problems related to land usage were recognized early by some cities. Columbus, Ohio, instituted off-street parking requirements for multiple-family dwelling units in 1923. Fresno, California acting in 1939 may have been the first city to extend the provisions to non-residential uses.¹ A few years later a study showed that 70 cities included off-

¹ Charles S. LeCraw, Jr. and Wilbur S. Smith, Zoning Applied to Parking, Eno Foundation for Highway Traffic Control, Saugatuck, Connecticut, 1947, p. 10.

street parking provisions in their zoning ordinances,² and a follow-up study in 1951 revealed that the number had increased to 203 cities.³

As with zoning, parking requirements were meant to provide a logical and consistent procedure for effective planning in urbanized areas and by the late 1950's, most major cities had included parking requirements in their zoning ordinances. The kinds of land uses covered by such provisions also grew. A report published by the American Society of Planning Officials in 1964 indicated that up to 29 land use categories were regulated by off-street parking controls in the 20 cities surveyed.⁴ Another report in 1971 by the same organization identified as many as 83 such categories.⁵ In 1988, 70 was found to be the average number of land use categories regulated by parking requirements in local zoning ordinances.⁶

² LeCraw and Smith, p. 7.

³ David K. Witheford and George E. Kanaan, Zoning, Parking and Traffic, Eno Foundation for Transportation, Saugatuck, Connecticut, 1972, p.14.

⁴ Planning Advisory Service Information, "Off-Street Parking Requirements," Report No. 182, American Society of Planning Officials, Chicago, Illinois, January 1964.

⁵ Robert J. Boylan and Neil S. Kenig, "An Approach to Determining Parking Demand," Planning Advisory Service Information Report No. 270, American Society of Planning Officials, Chicago, Illinois, June 1971.

⁶ Marya Morris, "Parking Standards - Problems, Solutions, Example," Planning Advisory Service, American Planning Association, Chicago, Illinois, July 1989.

During the three decades following War World II, parking requirements increased as the boom in automobile ownership, combined with mass movement to the suburbs, resulted in vastly increased automobile commuting. America's deference to and growing dependence on the automobile led most local jurisdictions to the conclusion that adequate parking must be provided where a person lived, worked and shopped. Lack of adequate parking became a major issue in many localities since, from a commercial or retail standpoint, it could drastically affect the economic vitality of business and commerce. One of the prime factors cited for the movement of commercial establishments to the suburbs was the ability to provide an almost unlimited supply of free parking within easy walking distance, a situation that did not exist in the downtown area.

The addition of parking requirements to zoning ordinances and the increase in the quantity of mandated spaces was a reflection of the changing land use and transportation environment that was occurring in the 1950's through the 1970's. However, by the mid 1960's, several emerging events began to change this picture. It began largely with the recognition that major urban centers were decaying with the flight of both business and residents to the suburbs. Merely providing more parking spaces in downtown areas was not adequate. Even with a large number of parking spaces, the roads leading to a central business area were often

congested. Surface parking in downtown areas usually required the demolition of existing buildings. On the other hand, parking in structures was very expensive and often beyond the financial means of the developer or the jurisdiction. It seemed clear to many that the decline in urban centers paralleled the decline in the urban transit system. The Urban Mass Transportation Administration (UMTA) was a confirmation of the belief that improved urban transit systems were needed to reduce the decline of central cities. In its first few years of operation, UMTA was badly underfunded. However, with the infusion of Federal monies and the changeover of transit from a privately sponsored, money-making enterprise to a publicly provided service, came a change in the Nation's approach to transportation in general.⁷

This change was hastened by the Arab oil boycott of 1973-74. Although for a number of years, persons familiar with the oil industry had been forecasting a decline in the U.S. proven reserves, America tended to ignore these forecasts as long as they were buying gasoline for less than 30 cents a gallon. However, with the boycott our vulnerability and dependence on foreign oil from an area of the world which historically had little stability was acknowledged.

⁷ U.S. Department of Transportation/Federal Highway Administration, Model Parking Code Provisions to Encourage Ridesharing and Transit Use, Washington, D.C., 1983.

Transportation policy became a key tool in dealing with the energy situation. More importance was given to improving transit service and still greater emphasis to energy conservation and ridesharing. Transportation policy was reflected by both the "carrot and stick" approach. The carrot approach was represented by such programs as high occupancy vehicle (HOV) lanes for buses and carpools that provide significant time savings to their users. Many local jurisdictions adopted provisions in their zoning ordinances to allow for reductions in required parking if uses were within proximity to rail transit stations or if programs were sponsored to reduce auto dependency. All these initiatives were used as incentives to encourage transit usage and ridesharing, reflecting the "stick" approach.

Many of these actions were based upon the concept of Transportation System Management (TSM) which began one of the key elements of the Federal transportation planning process. Similar actions came from the Environmental Protection Agency's Transportation Control Plan (TCP) requirements for those cities that were in non-compliance with legislated air quality standards.⁸

Generally, local suburban jurisdictions have maintained the policy that all land uses should be accompanied by a

⁸ U.S. Department of Transportation/Federal Highway Administration, Study of Parking of Parking Management Tactics, Volume 1, Washington, D.C., 1980.

sufficient amount of off-street parking to allow for easy access, convenience, and improved traffic circulation. However, in a time when issues such as high land costs, congested highways, energy conservation and air pollution have taken hold, this situation has begun to change. Local jurisdictions are recognizing that parking requirements can be used to promote more effectively policy objectives in areas such as land development, traffic management and environmental protection, including improvement of air quality.

Local jurisdictions are realizing that parking can be used as an traffic management tool to decrease automobile usage through parking provisions which favor the use of public transit and high occupancy vehicles such as carpools and vanpools. For example, limited parking may be advocated in areas where high quality rail transit or other alternatives are available. Reduced parking in such areas may help to induce a shift from single auto occupancy to the use of alternative forms of transportation. The promotion of TSM strategies is an act consistent with local objectives to reduce traffic congestion and air pollution. A powerful method of achieving these objectives can be introducing TSM incentives into the zoning ordinance, whereby parking reductions are permitted in exchange for commitments by developer/owners to promote ridesharing programs. In an effort to promote more efficient mixed land use patterns,

shared parking provisions can be employed to allow certain land uses to share parking facilities based on their proximity to one another and their use characteristics. This results in an overall reduction in parking in comparison to cases where each use provided parking based on its individual requirement.

While parking policies can be used to encourage the achievement of some public objectives, they can also be in conflict with others. For instance, the need to keep limited parking to encourage transit use and reduce auto dependency conflicts with the need to accommodate peak demands on-site rather than on the streets. The need to reduce the amount of land devoted to parking in order to keep construction costs down and lessen environmental problems competes with the desire to ensure accessibility and convenience to users and finally, the goal to enhance pedestrian traffic and improve site design contrasts with the need to avoid circulation problems within parking areas.

It is important for jurisdictions to also realize that they can not rely exclusively on off-street parking requirements to further the attainment of various public policies. On-street parking policies must also be considered. An abundance of available on-street parking greatly reduces the incentive for individuals to opt for alternatives to single auto occupancy travel.

Local jurisdictions reexamining the relationship of their

parking standards to their overall policy objectives will find themselves having to strike a precarious balance. They must consider parking demand, access, mobility, and traffic safety, but also must encourage appropriate land use and traffic management, environmental protection, and energy and resource conservation.

In order for parking to achieve specific public policy objectives, the relationship between parking demand and policy objectives must be established. That relationship depends on factors which vary from jurisdiction to jurisdiction. However, regardless of a particular jurisdiction's policies, a base parking standard which reflects as closely as possible the actual parking demand for the various land use categories must first be established. Once the base requirement has been determined, reduction provisions can be employed to foster specific policies with a clear understanding of their overall impact. The following sections will examine the establishment of appropriate base parking standards, potential factors and rationale for parking reductions, and the impact of policy objectives on the formulation of parking requirements including on-street parking policies.

SECTION II

**DEVELOPMENT OF THE TECHNICAL BASIS FOR THE EVALUATION
AND MODIFICATION OF PARKING REQUIREMENTS**

As in many other areas of the transportation field, the establishment of parking requirements is not an exact science. It involves making policy judgments with an understanding of how those judgments will impact various interest groups, and how they will accomplish local objectives. There is no "perfect" requirement for each land use. Parking needs or demand vary in response to a multitude of factors that cannot easily be predicted or quantified in advance of buildings being constructed and occupied. The methodology employed in this section is designed to provide the technical base for making such policy determinations.

In establishing parking standards, it is important not to set requirements too high or too low. Standards should reflect the judgment of staff and of governing bodies based on analytic studies, comparison of standards in other jurisdictions, and discussions with developers and promoters of various types of facilities.

While it is clear that some control must exist over the amount and design of parking in support of development, the provision of parking facilities is not without significant cost. According to a 1989 study conducted by the Eno Foundation, the average total development cost for one

surface parking space is \$4,987 and for one freestanding multilevel structured space the cost is \$20,175. (Refer to Table 1 for a further breakdown on cost). Unnecessarily high parking requirements waste land, add to the cost of development and create a disincentive to opt for an alternative to single auto occupancy travel. These costs are ultimately passed down to the local jurisdiction, and may result in the loss of a competitive edge in fostering development over other jurisdictions. On the other hand, a parking requirement set too low leads to parking spillover and traffic congestion. A delicate balance exists between having overly restrictive and overly permissive requirements. The determination of where that balance should lie is a policy judgment which must be made with an understanding of its impact.

A number of important principles should be considered in establishing parking requirements.

1. Generally, parking requirements should be set so that the peak parking demand can be accommodated with minimal excess parking capacity. It may even be acceptable to allow parking demand to exceed capacity on a few days out of the year because the savings in additional costs of parking facilities to accommodate those few days may outweigh any problems that occur from the excess demand.

TABLE 1
DEVELOPMENT AND OPERATION COST FOR PARKING⁹
 (Price Per Parking Space in 1989 Dollars)

	Surface Lot	Free- Standing Structure*	Above- Grade Multiuse Structure*	Below- Grade Multiuse Structure*
Average Number of Spaces	450	1000	520	430
PREDEVELOPMENT				
Project Conception/ Initiation	\$ 30	\$ 80	\$ 80	\$ -
Project Evaluation/ Program Design	100	275	400	400
Land Acquisition/ Other Agreements	2880	8750	15200	20900
DEVELOPMENT				
Construction Financing/Perm- anent Agreement	\$ 50	\$ 280	\$ 358	\$ 457
Marketing/Leasing	2	10	40	40
Final Design (10% Construction)	175	980	1254	1600
Construction	<u>1750</u>	<u>9800</u>	<u>12540</u>	<u>16000</u>
TOTAL DEVELOPMENT	\$4987	\$20175	\$29872	\$39397
POST DEVELOPMENT				
ANNUAL COSTS/SPACE				
Operation (114hrs/week)	\$ 239	\$ 442	\$ 462	\$ 493
Maintenance	18	83	112	132
Promotion	1	2	25	25
Taxes (Real Estate)	15	40	88	88
Debt Service	541	1610	1993	2636
Equity Payments	138	562	835	1104
Depreciation (on Equipment)	<u>3</u>	<u>17</u>	<u>26</u>	<u>26</u>
TOTAL OPERATING COSTS	\$955	\$2756	\$3541	\$4504

* Freestanding structure is located adjacent to the use it serves. Multiuse structure - the use(s) it serves is constructed on top of the parking structure.

⁹ Robert A. Weant, Development and Operation Cost for Parking, Eno Foundation for Transportation, Saugatuck, Connecticut, June 1989.

2. A wide variation in peak parking demand exists within a single land use category. For example, certain office or industrial sites tend to have substantially higher parking demand than others because they have more employees per unit floor area. Restaurants and shopping centers can vary widely in their orientation and market capture rate. To the extent possible, the parking requirements should account for these differences, but they often do not. A standard should be established that does not unduly penalize those establishments which have less parking demand than average, nor allow establishments which have more than average parking demand to become a nuisance to the community.

3. Most zoning ordinances use minimum parking requirements. Developers may provide more parking than the ordinance requires and often do so when they think it is necessary. The financing institution backing the development venture usually requires a minimum amount of parking to ensure that a building will be leasable or salable. The requirements of the private sector should be given consideration in establishing or revising a parking provision. Parking requirements should not be set to accommodate the ultimate high demand building, particularly for those uses for which there is a self-induced incentive to provide adequate parking (e.g. patron-oriented uses).

4. It seems reasonable to allow a reduction in parking requirements when government or landowner action assures a

reduction in parking demand at a particular site and if, it is reasonably certain that such action will not be discontinued. This principle is the basis for introducing incentives into the requirements to provide more efficient modes of travel or to foster certain land use objectives. For example, if it can reasonably be expected that a Transportation System Management (TSM) program will reduce parking demand, an appropriate parking reduction should be permitted. However, certain guarantees need to be provided to have some reasonable assurance that the TSM programs will be continued.

5. Future changes in transportation facilities and other factors may affect parking demand or conversely the parking supply may affect the efficiency of the transportation facilities. In any event, future facilities should be considered in specifying parking requirements. For example, if an office building were to locate near a future rail transit station and a parking reduction provision is employed for uses located within proximity of a transit station (as a means to both encourage transit usage and be more responsive to a reduced parking demand), it would seem reasonable to specify parking requirements as if the station was already in place although a parking shortage might exist for several years until the station is operational. Buildings and parking areas are designed to have an useful life of 50 or

more years¹⁰, and future needs should be considered when requiring parking spaces for present construction.

6. Before being overly liberal with proposals to relax the requirements for certain developments, the likelihood of future changes in building occupancy or in other conditions which affect parking demand must be taken into account. Just because the first tenant has a low parking demand does not mean the next occupant will also be low. Again, a balance is needed in avoiding excessively high or low requirements.

7. From an administrative perspective it is important to simplify the interpretation and administration of the off-street parking requirements. This can be accomplished by clarifying and simplifying the language of the regulations, adjusting the general requirements to a common unit where feasible (for the most part 1,000 square feet of gross floor area), and consolidating all references to off-street parking requirements into one section of the zoning ordinance. The parking requirement should be based on a site characteristic that is easily quantified but does not change easily over time. Efforts should be made to choose units which would be available on site plans in order to readily verify the information. The use of employees as a basis for calculating standards, for example, is not desirable for most land uses since the number of employees is difficult to accurately

¹⁰ Robert Weant, Development and Operation Cost for Parking, Eno Foundation, Saugatuck, Connecticut, 1989.

forecast and can easily change over time. To the extent possible, all standards should be based on spaces per 1000 square feet of gross floor area (1000 GSF). Where this is not practical, such as for residential or hotel uses, other units of measure such as spaces per unit should be chosen.

The amount of parking needed for a particular development is a function of the type and intensity of land use, its location, accessibility, and the availability of rail transit and other transportation alternatives. The need for parking can also be influenced by the characteristics of local populations (e.g., average incomes, car ownership, age distribution, and the costs of parking). While demand studies from other jurisdictions are useful since they often provide insight into the relationship between land use patterns, changing trends and parking, discretion should be exercised so not to rely too heavily on the findings of a jurisdiction which has substantially different development and population characteristics. For example, the parking characteristics for a retail establishment located in a suburb of Washington, D.C. would probably be substantially different than if located in the Midwest. Even within a given metropolitan area, identical developments may exhibit a considerably different parking demand, because of the influence that rail transit has on different sites through its availability and quality. Depending upon conditions, the proportion of trips to retail establishments, office

buildings, or other uses can range up to 40 or 50 percent.¹¹

According to the most current research on national parking trends, parking demand is up at universities and hospitals but down at shopping centers and even some offices.¹² In each case, the changes in parking demand are related to some change in the function of the activity or to locational factors. For example, hospitals now provide more out-patient services; universities have more night classes; shopping centers have extended shopping hours, thereby shifting the peak hours of parking demand; and some offices have been constructed as part of a mixed use development, wherein a shared parking arrangement can be employed or have relocated to be in the vicinity of a rail transit station where employees can use transit instead of cars. Changes in the habits of people and the practices of institutions make it necessary to examine customary assumptions about parking.

DATA COLLECTION METHODOLOGIES

The best way for a local jurisdiction to analyze its local parking needs is to conduct actual field counts of parking accumulation. Such detailed studies, however, involve

¹¹ Urban Land Institute and National Parking Association, The Dimension of Parking, Second Edition, Washington D.C., 1983, p. 20.

¹² Urban Land Institute, Parking Requirements for Shopping Centers, Washington, D.C., 1982; and Edward M. Whitlock, P.E., Parking for Institutions and Special Events, Eno Foundation for Transportation, Saugatuck, Connecticut, 1982; and Institute of Transportation Engineers, Employment Center Facilities, Washington, D.C., 1985.

considerable staff time and expense. Parking demand can vary according to a site's location, the nature and intensity of the use, its ability to attract people coming by various modes of transportation, as well as the individual cycles of activity at the site. While no one value of demand fits every case, in a normal distribution of a sufficient number of cases it is expected that the average value for all cases will lie somewhere near the middle of the distribution curve.

The average value of actual peak parking demand obtained from field surveys is a good starting point for setting a parking standard. Policy forces, however, will influence the value that is ultimately selected as a standard. Competing objectives will tend to pull the value either toward the left or the right end of the curve.

Ideally, the zoning requirements should stem from local studies of actual parking demand for each type of land use. The estimation of parking demand is critical to the development of a jurisdiction's parking requirement. The term "parking demand" is equivalent to the term "parking generation". Basic parking demand or generation represents the number of persons that would be attracted to a given generator or development. Parking demand is the number of vehicles parked at a specific location or in a general area and is usually expressed as the number of vehicles during the

peak hour or period of maximum parking activity.¹³ Parking demand cannot be defined without introducing a time frame. Since person-trips are normally estimated in terms of a 24-hour day, the resulting parking demand should be based on an entire day. However, [the number of parking spaces required to meet parking demands should reflect the peak hour requirement during the day.] Additionally, the parking demand of many uses fluctuates. Periodic cycles occur by day of the week, month of the year, or season of the year.

The ideal site to be included in the sample survey for obtaining reliable parking demand or generation data should exhibit the following characteristics:

1. The site should be a freestanding, single land use type.
2. The site should contain ample and convenient parking facilities for the exclusive use of traffic generated by the site.
3. The physical and functional characteristics data of the site should be readily available.
4. The site should be typical of similar land uses and free of any unique characteristics.

Should a prospective site not exhibit all these characteristics, discretion is advised in attempting a parking demand survey. Unless the parking generated by

¹³ Urban Land Institute and The National Parking Association, The Dimensions of Parking, p. 18.

various land uses can definitely be segregated or easily identified, the reliability of a survey may be questioned. The parking survey should also be sensitive to the fact that land uses may exhibit different parking trends from day to day. Parking studies should be conducted at times when favorable and unbiased results can be obtained. This excludes days of extreme inclement weather, days preceding holidays or days of special events.

The physical and functional characteristics pertaining to the site which need to be known include the following:

- number of employees (this data is more difficult to obtain for some uses than others)
- building square footage (gross and net, where appropriate)
- building occupancy rate
- proximity to rail transit service
- parking costs
- existence of ridesharing programs
- development density of the surrounding area

Data not evident from a site inspection often may be obtained from the owner/manager or from the local government's files, either from site plans or occupancy permits. It is important to ascertain the occupancy of the site under study. The percentage of office space being utilized and the number of apartment units occupied has a direct bearing on the parking generation rates.

The objective of the survey is to count the number of vehicles parked at the time of peak parking demand. Residential uses typically peak very early in the morning, restaurants at meal times, and offices around 10:00 am and again around 2:00 pm. Peak parking accumulation at other types of land uses may be uncertain. These may require spot counts at specified intervals such as every one-quarter, one-half, one, or two hour intervals throughout the day or portions of the day in order to assure accurate data.

Studies to determine the parking demand of specific land uses are simply accumulation counts. Hourly, daily, weekly and seasonal variations in demand must, of course, be considered. Present parking needs depend on the daytime population of workers and other visitors, the proportion of trips made by automobile drivers, the parking supply, and parking regulations. The total demand may be regarded as consisting of (a) the demand evidenced by the drivers now parking there legally, (b) the equally evident demand of the illegal parkers, (c) the demand of those drivers who may now park off-site and walk in, and (d) the demand of those who use some other mode but would drive if parking were available. When the available supply is used to capacity, factor (d) may be substantial. The extent to which actual and potential demand is to be met is governed partly by economics and partly by local public policy.

By normal standards, when 85 to 90 percent of the spaces

available to the general public are occupied, the system is considered to be at capacity¹⁴. Some spaces are always unoccupied because drivers are maneuvering to park, or are leaving or because spaces may be preempted by construction, special events, or careless parking that encroaches on adjoining spaces.

There are several types of field surveys which may be utilized in data collection. The type of survey required for any use or for studying a special provision may vary from use to use. For most, the numerical parking requirement (such as spaces per 1,000 square feet) is the primary value to be established. However, it will also be necessary to determine if and when the basic requirement varies in response to certain factors such as development density and transit availability. Therefore, a range of field data collection techniques is specified, and the appropriate technique must be determined for each use. These data collection techniques are described below:¹⁵

PEAK PARKING OCCUPANCY STUDIES - This is the most basic and least costly collection method. It involves counting the number of cars parked in a parking lot or garage around the

¹⁴ Highway Research Board and The National Academy of Sciences, Parking Principles, Special Report 125, Washington, D.C., 1971, p. 83.

¹⁵ Highway Research Board and The National Academy of Sciences, Parking Principles, pages 75-88; and JHK and Associates, Parking Policies for Montgomery County, Maryland, Technical Report, Washington, D.C., November 1984.

peak parking time only. It is adequate for establishing the peak parking demand. For many uses, the hours during which parking would be expected to peak can be very closely estimated based on previous data and studies. For example, peak hours for restaurants are typically during lunch and dinner times; theaters, recreation clubs, and other entertainment facilities generally peak during the evenings and especially during the weekends; and office parking normally peaks in late morning and sometimes in early afternoon.

PARKING ACCUMULATION STUDIES - In some cases, a more complete parking accumulation study may need to be performed when parking accumulation could not be estimated reasonably well from other sources. In addition, other reasons exist for conducting a parking accumulation study over the course of a day. One is the need to determine how the use would function with a shared parking plan. A parking accumulation study simply consists of a series of parking occupancy counts taken at regular intervals. These intervals should vary depending on the parking turnover at the use.

For those with a high turnover rate, a frequent parking count should be taken (e.g., 15-minute intervals). Accumulation counts for low turnover facilities would typically be done at one hour intervals.

PARKING TURNOVER AND DURATION - Parking turnover and duration studies are considerably more time consuming and

costly than the previous two methods. Parking turnover is the rate of use of a facility and is determined by dividing the number of available parking spaces into the number of vehicles parked in those spaces in a stated period of time. The normal procedure involves the recording of license plate numbers (usually three digits) for vehicles in each parking space. The turnover rate and duration can be determined by changes in the occupancy of a space. Parking turnover and duration studies are intended primarily for operational analyses of on- and off-street parking areas. The length of time parked is an index of the type of parking that should be provided to serve the needs of motorists. The proportion of short-time parking (the absolute number, not the total occupancy time) is particularly significant in setting up time restrictions so the greatest number of parkers may be served.

MODE SPLIT/TRIP PURPOSE SURVEYS - Although the above mentioned surveys provide a good understanding of parking demand and parking operations, they do not necessarily indicate the underlying reasons for the parking demand characteristics being the way they are. For example, if the demand for a particular facility appeared to be lower than average, additional data would be needed to determine why it was low. Mode split and trip purpose are important factors in determining whether parking occupancy will be high or low. Therefore, mode split and trip purpose surveys are conducted

at selected sites to gain an understanding of these effects. Mode split refers to the percentage of people at a site who use a particular mode of transportation, with the total of all modes equaling 100 percent. These surveys could be done not merely to develop the basic parking standards but also to serve as the basis for justifying parking reduction criteria.

The purpose of a trip affects four important characteristics of the parking system: the time of parking and duration of stay, percentage of vehicles entering or leaving facilities during a given period of time, acceptable walking distances, and acceptable parking fees. In determining the total quantity of parking required, time of occurrence and duration of stay are paramount.

Three approaches to trip purpose surveys cover the various types of methods and are as follows:

- 1. Patron Surveys** Patron surveys are needed where a use caters extensively to the general public. Examples would be restaurants, shopping facilities, hospitals and hotels. Three basic approaches to this type of survey include a windshield survey with postcards returned by mail, handout surveys distributed to patrons as they enter or leave, or personal interviews. Of these three, the greatest success has been with the personal interviews. Table 2 shows a sample form used to obtain trip purpose and mode of travel data at hotels. The interview is very brief and concise and can be conducted within 30 to 60 seconds. The interviewer is

TABLE 2
PARKING DEMAND SURVEY FORM
FOR MODE SPLIT/TRIP PURPOSE INTERVIEWS (HOTELS ONLY)¹⁶

Location: _____ Date: _____ Observer: _____

Entrance: _____ Weather: _____

1/2 Hour period beginning: _____

No. cars in parking lot or garage: _____

Cum. No. persons in: _____ Cum. No. persons out: _____

Interviews:

Excuse me. We're conducting a travel survey for Virginia Tech. Could I ask you a few quick questions on your trip to the hotel?

- | | | | | |
|--|--|------------------------------------|--|--|
| 1) Are you:
1. Employee
2. Checking in as a guest?
3. Attending a meeting
4. Coming to the restaurant
5. Coming to lounge
6. Other | 2) How did you get to the hotel?
1. Auto
2. Transit
3. Bus
4. Walk
5. Taxi/limo
6. Other | 3) How many persons came with you? | 4) Ask if necessary: is coming to this building your main reason for parking here? | 5) What time do you expect to leave the hotel? |
| | | | 1. Yes
2. No | |

Ar-
rival
Time:

_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

¹⁶ JHK and Associates, Sample Form for Mode Split/Trip Purpose Interview, Washington, D.C., 1984.

stationed at the entrances to the facility and asks patrons if they would pause to answer a few questions as they are entering the establishment. Each horizontal line on the form in Table 2 represents one respondent, including the group he or she is traveling with. When the survey is over the data can be easily key entered directly from the form in preparation for computer processing.

The personal interview approach has been found to be superior to the other methods. It provides a better return rate for the dollar investment, allows the interviewer to assess any special factors which may have influenced the trip and lessens the effect of non-response bias. Identification badges are worn by the interviewers and permission is always obtained from the owner.

2. Work Place Surveys These are done primarily for employment-oriented uses. They consist of questionnaires distributed to employees within a building with returns either by mail or through the internal management structure. Typical questions involve times of arrival and departure, mode of travel, auto occupancy, and parking characteristics. In a work place survey, contact needs to be made with the various employers, and questionnaires ideally should be distributed through the internal mail structure. Provided that cooperation is obtained from the employers, this survey is relatively inexpensive, and it can also be designed for

direct key entry of the data. An approach similar to the patron survey could also be conducted for employment-oriented uses, depending on the conditions.

3. Home Surveys These are designed to cover residential uses. The forms would normally be hand delivered to the household. For multi-family residences, the questionnaires might be distributed through an internal distribution system, if available. Obviously, an important factor in parking demand generated at residential uses is auto ownership. Auto ownership data would be acquired through the survey as well as through census data.

The above constitutes the basic techniques needed to acquire data upon which to base the recommended parking requirement. Once the data collection effort has been completed, the next step involves determining the numerical parking requirement or requirements to be established for each use. These determinations are based on the parking demand studies and subsequent analyses. Usually one calculation is parking ratios (e.g. ratio of peak parked cars to 1000 GSF). The mode split and trip purpose surveys can be summarized in frequency distributions or cross tabulations. Statistical tests might be performed, as appropriate, linking the dependent variable, usually parking demand, to explanatory independent variables which are physical, measurable, and predictable units quantifying the site, such as development density, employee density, building square

footage, seats, or dwelling units. The data are then often used in a regression analysis to determine which factors had the most effect on parking demand.¹⁷

As previously indicated, a set of recommended parking standards cannot be formulated completely independent of any policy guidelines or overriding objectives. For example, suppose that Figure 1 represents a hypothetical frequency distribution of parking demand at office buildings. The recommended requirement would have to be based on both the technical data and a policy judgment regarding what percentage of the office buildings should be completely accommodated by their parking demand. In the example, if the requirement is set at 3.0 spaces per 1000 square feet, perhaps 70 percent of the office buildings would be accommodated. If 3.5 spaces per 1000 square feet is selected, 95 percent of the office buildings would be accommodated. However, the higher the requirement, the more inordinate costs will be placed on the buildings with lower parking demand. For a 200,000 square foot building with structured parking, this difference means approximately \$500,000 in parking construction costs alone.

From the demand studies it can be determined the probable impact of setting the requirement at 3.0 versus 3.5. It must be kept in mind that while numerous sites are included for

¹⁷ Institute of Transportation Engineers, Parking Generation, Washington, D.C., 1987.

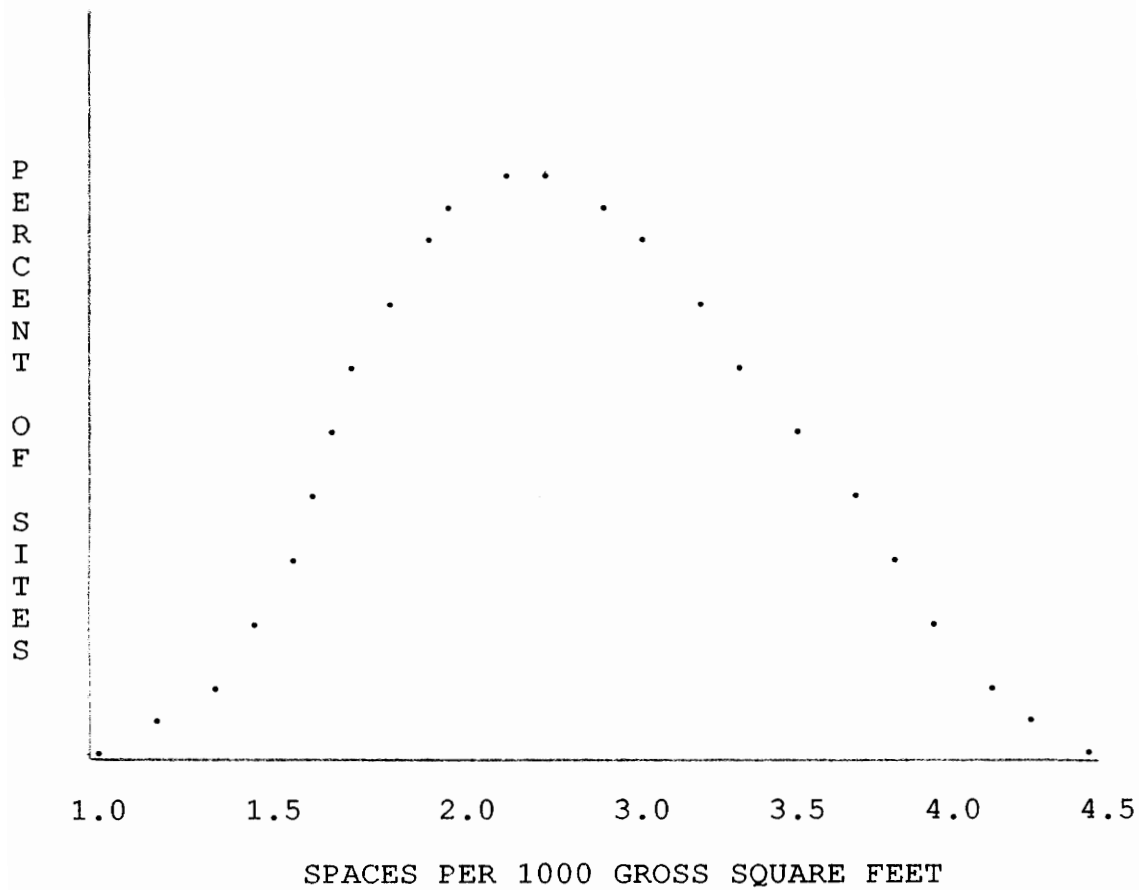


FIGURE 1
HYPOTHETICAL FREQUENCY DISTRIBUTION OF
PARKING DEMAND AT OFFICE BUILDINGS

the individual uses, the data collection only represents a sample of existing conditions and is utilized as representing not only the total of the existing uses but also any future developments of the respective uses. Based upon the sample data, reference can be made to "level of confidence" supporting the justification for specific requirements.¹⁸ Confidence levels are computed using a statistical formula which reflects both the average and the range of parking demands found among the samples. The level of confidence provides an indication that a certain percentage of sites are likely to exhibit parking demands which can be accommodated by the standard for parking supply. That is, a 95 percent confidence level indicates that 95 out of every 100 sites will be adequately supplied with parking.

An important factor to consider in establishing any parking requirement is determining what the requirement should be based on. A close inspection of the land use categories and associated definitions or basis for the requirement must be performed. For example, it has been found that the use of employment data is an important variable in determining peak parking demand for office buildings and as such would suggest that parking requirements are more accurately computed if employment is known in

¹⁸ Fairfax County, Virginia, Staff Report - Proposed Zoning Ordinance Amendment - Parking Provisions, Office of Comprehensive Planning, Fairfax, Virginia, September 7, 1988.

advance or can be readily predicted. However, serious difficulties exist in predicting the total number of employees in advance (particularly for speculative multi-tenant buildings) and in assuring that those totals will not change significantly in the future. If number of employees is used as the basis, it poses particular problems in a parking standard because of the difficulties of obtaining data on employment. Several of the uses in many zoning ordinances have part of the requirement based on employees. Generally, an applicant for a particular development does not have in mind a specific number of employees at the time of the application, and any such numbers would be difficult to verify from an administrative standpoint. In the event an employee basis is used, spaces per employee on the major shift is suggested as a good minimum base requirement. It should, however, be oriented only toward buildings occupied by an employer who had an expectation of long tenancy and should require a well-documented verification of projected employment levels.

For these reasons, a standard based on square footage is recommended. It is further recommended that the square footage be gross square feet (GSF) rather than net square feet (NSF). The calculation of net square feet necessitates identifying and subtracting all areas devoted to such uses as toilets, utility closets, hallway and elevators. These calculations are onerous and time consuming, and the

resultant square footage may change based on placement of walls and partitions. Use of gross square feet, on the other hand, incorporates all floor area and provides a more stable measurement.

For a restaurant related requirement, a 1988 study conducted by the Restaurant Association of Metropolitan Washington¹⁹ indicates that the use of a per seat based parking requirement is more appropriate than either square footage or combination of square footage and employees due to the diversity which exists within the restaurant industry. The study also indicated that the percentage of non-public area varies greatly among restaurant types and is the main problem with a square footage measure. A square footage based parking requirement would unjustly penalize restaurants with more spacious seating arrangements and larger kitchens. From an administrative standpoint, the seat count is normally required information on site plans so it could be easily verified.

With residential related parking requirements, some jurisdictions use a per unit base while others employ a per bedroom rate. In a recent review of their parking requirements, Fairfax County, Virginia, considered converting

¹⁹ Restaurant Association of Metropolitan Washington (RAMW), An Industry Study of Recommended Parking Standards for Restaurants as Proposed by Fairfax County, Virginia, RAMW Task Force on Restaurant Parking Standards, Washington, D.C., January 1988.

from a per unit to a per bedroom rate for townhouse and multifamily dwellings. However, Fairfax County retained a per unit base because:

- 1. The number of bedrooms often are not known at the time of site plan submission and therefore could not be verified;
- 2. A definitional problem exists as to what constitutes a bedroom, (many units are advertised as having a den which can easily be used as a bedroom); and
- 3. A requirement based on bedrooms would adversely impact the common practice of providing for options in the sale of new units.

In some cases, a range of requirements may be recommended, based on conditions. Alternatively, further divisions of land use categories may be indicated as a result of the analysis. For example, in Fairfax County the parking requirement for general office use differentiates between office building size in order to accommodate the higher parking demand associated with smaller office complexes.

The data collected in Fairfax County showed that smaller office complexes under 50,000 square feet, such as townhouse offices, tended to exhibit greater parking demands than larger office buildings. It was also found that the smaller offices tended to attract office use which has a high percentage of patron visitation, such as real estate and attorney offices. For offices with 50,000 GSF or less, the

requirement was set at 3.6 spaces/1000 GSF. For offices with more than 50,000 square feet but less than 125,000 square feet, the requirement was set at 3.0 spaces/1000 GSF. The requirement of 2.6 spaces/1000 GSF was set for offices with 125,000 square feet or more. All three requirements satisfy a 85 percent confidence level for the respective sized office developments, which the County felt was an appropriate confidence level for this use. Medical offices consistently exhibited a higher parking demand than general offices and as such a separate and higher parking requirement was established for medical offices, 5 spaces/1000 GSF regardless of building size.

Residential uses are generally broken down into single family detached, single family attached (townhouses) and multifamily. The commonly accepted requirement for single family detached is 2 spaces per unit, related to the assumed average number of vehicles owned by a household in a suburban area. Parking shortages generally are not a problem within single family areas since any overflow parking can usually be accommodated on the street without any adverse traffic impacts. Townhouse and multifamily developments, however, are somewhat different. Fairfax County recently revised their parking provisions and increased the off-street parking for townhouses from 2 spaces to 2.3 spaces per unit.

Parking requirements need to be based not just on the current characteristics but on the characteristics over the

next five, ten and twenty year period. To the extent possible, an attempt to forecast the types of uses which will predominate in the future (e.g. major high-technology parks) must be made so that the zoning ordinance is prepared to respond to those situations. It should also be kept in mind that a parking lot or garage, once built, generally goes unchanged for many years. During the life of a facility, certain things may change which affect parking demand, such as a building occupant changing, and transit use increasing or decreasing. Therefore, it is important to foresee such circumstances which may affect the parking standards.

The general parking requirements are designed to reflect actual demand for parking as closely as possible. The base parking requirements indicate appropriate parking ratios for typical homogeneous land uses where parking demand would not be expected to be lower because of rail transit ridership, shared parking, or some other reason. These requirements do not take into account lower parking demand due to transit, ridesharing and shared parking. The ability or flexibility to reduce the general parking requirements accordingly is of critical importance if a jurisdiction seriously desires to use parking to effectively achieve an array of public objectives.

SECTION III
POTENTIAL FACTORS AND RATIONALE FOR PARKING
REDUCTIONS

A number of factors justify reductions in the parking standard under certain situations. This section identifies potential factors and rationale for parking reductions, identifies the probable methods of approach to data collection, and evaluates and recommends parking reduction criteria and procedures.

Most, if not all, parking reduction strategies fall into the areas of either reducing the amount of automobile travel to a site or in taking advantage of the temporal relationship of the parking distribution. In recent years, substantial attention has been placed on these areas as a way to reduce the investment in parking facilities and as providing incentives to promote local objectives. The more promising areas of parking reductions include reductions due to proximity to rail transit stations, to Transportation System Management (TSM) Strategies, and to shared parking arrangements.

Much of the data for the parking reduction criteria can be gathered in conjunction with the data collection described in Section II. However, it may be possible to collect mode split data where it would not be possible to collect parking demand data. A good example of this would be in a densely

developed setting where it is difficult to cordon off a parking lot or garage and associate it with a single building but where knowledge of travel mode might assist in understanding the travel characteristics around a rail station.

PROXIMITY TO RAIL TRANSIT STATIONS - Less parking is necessary where more trips are made by rail transit. Therefore, the parking requirements should allow for reductions in parking where there exists good transit opportunities. Areas around rail transit stations have such characteristics. If reductions are not given for such situations, too much parking may exist. An abundance of parking may reduce the incentive for individuals to take transit. This has major economic impacts on developers (since land costs in these areas are usually higher than in other parts of a jurisdiction), and on the local jurisdictions (who have financial commitments to rail transit, and try to encourage transit usage).

Factors which affect whether or not rail transit reduces the parking demand of nearby uses include the type and density of development surrounding the station, the location of the development relative to the station and the location of the station relative to the line and the entire transit system. Development surrounding in-line stations typically warrant greater reductions due to a greater commuting population from which to draw, than terminus stations.

Terminus stations must rely completely on reverse commute patterns and feeder bus trips.

Though it is reasonable to assume that locating certain uses close to rail stations can significantly reduce parking demand, it has been difficult to develop a direct relationship between parking demand and distance from a rail station. This is primarily due to the many factors that can also affect parking demand. As such, little data exist regarding the impact a rail station has on parking demand for certain surrounding uses.

The limited quantitative data that do exist are derived from transit mode splits of trip generation. Mode split data are collected through the patron, work place or home survey techniques, as previously discussed. Data should be collected at uses surrounding rail stations within approximately a half mile of the station entrance. Mode split data should correspond to the peak parking times, as this is the base level to which the parking reductions should be applied. Thus, certain uses such as restaurants, hotels, and retail sites would have to be considered for evening and/or weekend surveys.

In jurisdictions which have established rail transit related reductions, the reductions were primarily based on policy judgment and limited quantitative data derived from transit mode splits of trip generation. Although trip generation data are not directly correlated to parking demand

(i.e., a 10% reduction in trip generation does not necessarily indicate a 10% reduction in parking demand) they can provide some indication as to the maximum percent reduction in parking demand expected at a given transit station.

Intuitively some relationship between distance from a transit station and transit mode share must exist, and this relationship should be reflected in the parking requirements. Downtown Washington, D.C. in the mid 1980s was experiencing a transit mode split averaging approximately 40 percent, with higher percentages at some offices located next to a transit station. Surveys in Rosslyn, Virginia, which is located just across the Potomac River from Washington, indicated a 22 percent transit ridership at offices close to the station.²⁰ Within the Washington suburban area, where rail stations are just beginning to attract development, little data exist on mode split; however, assumptions are that up to a 15 percent transit related parking reduction for offices is appropriate.²¹ It is reasoned that such a reduction will give developers substantial relief from the cost of parking construction; promote more efficient land use in those areas where development is encouraged; encourage the use of more

²⁰ JHK and Associates, Parking Policies Study for Montgomery County, Maryland, Technical Report, Washington, D.C., November 1984.

²¹ JHK and Associates, Parking Policies Studies for Montgomery County, Maryland.

efficient modes of travel by locating development where advantage can be taken of those modes; and result in overall restraint in auto travel and corresponding reduction in traffic congestion, air pollution and energy consumption.

Reductions typically are given for office oriented development rather than residential, retail or hotel uses. Unlike office buildings, the parking reduction for residential buildings cannot be based purely on the transit mode split. Even though residents may take rail transit, this does not necessarily affect their auto ownership patterns. Any reduction in the residential requirement must be based on a reduction in auto ownership, which at best may be indirectly linked to the availability of transit service.

With regard to retail uses, essentially no information is available on reductions for retail development in the vicinity of rail stations. Transit is a much smaller factor than other site characteristics, such as the type and magnitude of surrounding development, in justifying a parking reduction. To justify a reduction, from a technical standpoint, a significant transit mode share would have to be demonstrated around the peak parking time, normally Saturdays. The transit percentage at shopping centers rarely exceeds 1 to 2 percent²², which is too low to justify any reductions. Retail development is normally very dependent on

²² JHK and Associates, Parking Policies Study for Montgomery County, Maryland.

easy vehicular access in order to attract customers. It is not practical to make parking "tight" at retail developments in hope of influencing a shift to more efficient modes of transportation. Past experience shows that retail employees and customers are not usually attracted to public transit or ridesharing. However, shared parking arrangements are certainly feasible for retail uses.

As for hotel uses, studies indicate that travel characteristics of hotel patrons are probably influenced more by proximity of the hotel to places of business than to proximity to rail stations. In Montgomery County, Maryland, data indicated that in the outlying suburban areas, approximately 90 percent of the trips to hotels by overnight guests were made by auto, and in the suburban commercial business districts approximately 30 to 50 percent arrived by taxi or limousine.²³ A hotel located in a suburban commercial business district is likely to be in close proximity to major office buildings and is more likely to provide some arrangement for travel services to their door. At hotels located in proximity to rail stations, few of the overnight guests arrived by rail even though there is a rail link directly from the airport. Given that the peak parking demand for hotels often tends to be in the evenings, when dining and lounge facilities are in full operation, a

²³ JHK and Associates, Parking Policies Study for Montgomery County, Maryland.

reduction in the parking requirement would have to be based on a reduction during these times. Given that development within a rail station area is more dense than in other areas, the opportunity for a shared parking arrangement is again feasible, particularly with an office development which has a transit related parking reduction.

Varying methods exist for incorporating provisions for rail transit related reductions into the zoning ordinance. In some cases, it may be decided to include all of the procedures within the zoning ordinance, thereby allowing for an automatic reduction if a particular development complies with the specified criteria. For instance, if an office development is within a specified distance from a transit station, a specified percentage reduction from the base parking requirement is automatically granted. In other cases, the zoning ordinance could simply reference the allowance for parking reductions due to proximity to a rail station with the specifics of the reduction, determined on a case by case assessment of the development, with final approval given by the governing body.

While the second approach affords more flexibility with regard to the amount of reduction which could be granted, there is no guarantee that the analysis would result in any reduction at all. This approach also, requires considerable expenditures of time and money on both the part of the local jurisdiction and the applicant.

In the establishment of reduction provisions, the following issues must be addressed. Should certain uses be excluded from reduction consideration due to proximity to transit, such as residential and retail? Should a distance limit be specified within which a reduction may be considered? Should a flat or maximum percent reduction be assigned or should no percent reduction be specified? Should more than one distance limit and/or corresponding percent reduction be specified for all station areas, or for different land uses or depending on type of station (whether it is an in-line or terminus station)? Should a flat reduction be automatic if a particular use satisfies the distance and use criteria, or should a reduction request be required of the applicant subject to analysis and some type of special approval via the staff or governing body? Should any conditions be imposed to ensure that parking is adequate? A particular jurisdiction's approach toward addressing these issues is dependent on the objectives the jurisdiction is trying to achieve.

TRANSPORTATION SYSTEM MANAGEMENT (TSM) STRATEGIES - Over the last two decades much emphasis has been placed in the transportation field on making more efficient use of existing transportation resources. This process has come to be known as Transportation System Management (TSM). In the past, much of the TSM activity has focused on public initiatives as opposed to private. Typical publicly sponsored TSM actions

include traffic signal timing optimization, minor widening of bottleneck sections of highways, preferential treatment for high occupancy vehicles (HOV), and improvement of public transit services. It has been recognized more recently that the private sector also has an important role to play in instituting TSM actions. Employers and land developers are particularly instrumental groups for they are in a position to influence employee choice of travel mode either directly through various incentives or indirectly through the design of building and parking facilities.

The basic premise of TSM strategies is to allow parking reductions for office use and possibly industrial uses in exchange for prescribed levels of effort in ridesharing and transit-related programs. Ridesharing is the generic term used to describe a range of alternatives to single occupant vehicle commuting, such as car or vanpooling. Ridesharing has been defined as a mode of travel principally associated with the journey to work in which ridership is by advanced reservation, two or more persons traveling together on a continuing basis, and routes are tailored to accommodate rider needs.²⁴ For purposes of this study, ridesharing takes on a collective meaning referring broadly to all such alternatives to single occupancy commuting such as transit usage, carpooling and vanpooling. TSM actions related to

²⁴ JHK and Associates, Parking Policies Study for Montgomery County, Maryland.

transit focus on ways that the private sector can encourage the use of existing public transit services. Examples include the provision of transit amenities, promotional efforts, fare subsidies or supplementary services (e.g. shuttle bus from rail stations).

The concept of permitting reductions in parking requirements in exchange for landowners providing incentives for TSMs, particularly ridesharing, has already been enacted into some zoning ordinances, including those in Montgomery County, Maryland and Alexandria, Virginia. Over the last two decades there has been widespread interest and participation in ridesharing by both the public and private sectors. Ridesharing and other TSM actions have developed in the private sector because of parking problems and traffic congestion. Governmental interest in developing ridesharing programs surfaced during the early 1970s when faced with growing air pollution and widespread urban traffic congestion problems. The 1970 Clean Air Act identified motor vehicles as major sources of pollution and set forth guidelines for pollution control. Reducing vehicle miles traveled emerged as a major objective in all transportation control plans for urban areas. Federal investment in fringe parking and carpool facilities, vanpool acquisition, and a computerized matching programs topped the \$100 million mark in 1981. A total of 106 carpool demonstration projects in 34 states were initiated through 1977. By 1983 between 17 and 20 percent of

all work commute trips were done by ridesharing.²⁵

From a traffic standpoint, parking reductions in exchange for TSM actions must not permit abuses nor endanger the well-being of communities and neighborhoods. From a financial standpoint, this exchange must be attractive enough to developers to assume the associated risks. This will mean that the local jurisdiction must also incur some risk, but with the ultimate expectation that a more efficient use of land and transportation resources may result.

However, quite often the attractiveness of the TSM provisions is not as much of an issue as the overall attractiveness of development. Certain locations may be so inherently attractive to developers that if TSM measures were the only means to ensure approval of the development, the developer would no doubt commit to certain TSM actions. On the other hand, if a site has a less attractive location and a parking reduction through the provision of TSM actions is the only alternative to develop at the desired density, the developer may continue to look for another site which can accommodate the level of development desired without TSM actions. The economic, land use and development objectives of a given jurisdiction will be the determining factor as to the applicability of TSM provisions.

²⁵ Department of Transportation/Federal Highway Administration, Model Parking Code Provision to Encourage Ridesharing and Transit Use, Washington, D.C., September 1983.

Analysis has indicated that both the public and private sectors stand to benefit significantly from a reduction in vehicle trips brought about or reinforced by including TSM provisions in the zoning ordinance. Because of the significant variation in local land use law and the methods of encouraging TSM, it is difficult to establish distinct classifications of approaches for TSM parking provisions. Generally, however, some sort of TSM incentive option is employed. This method requires the addition of a zoning ordinance provision whereby an applicant may reduce the minimum parking requirement by a certain percentage (up to a maximum) proportionate to the strength of a TSM incentive program to be provided. The comprehensiveness of the TSM program, that is, the extent of the TSM actions or techniques which are agreed to, affects the amount of the reduction which may be granted. The percent reduced can range from anywhere from 5 percent to 25 to 30 percent. At a minimum TSM related action requires an Employee Transportation Coordinator (ETC) and a matching service. A 5 to 10 percent reduction in parking demand is normal for this level program.

It is recognized that the standard approach to parking requirements has been the establishment of minimum requirements. Although the selection of appropriate minimum parking requirements is an important area of parking policy, this is not considered, in itself, to be a TSM measure. Adjustment in the minimums, however, may serve to encourage

the development of a comprehensive approach to employee transportation management and thereby reduce parking space demand at employment locations. The array of TSM actions or techniques to promote ridesharing and transit usage and reduce parking demand typically include the following.

- Designation or employment of an Employee Transportation Coordinator (ETC) to serve as manager of the TSM actions. The ETC's functions include assisting employees in ridesharing formation, promoting benefits of ridesharing and transit usage, and coordinating with and serving as the liaison to local and regional ridesharing agencies. The ETC normally conducts in-house rideshare matching which may include a locator board or a match list of commuters with potential for ridesharing based on an employee transportation pattern survey. This also ensures participation in any locally sponsored ridesharing program, which usually entails a computerized matching service. The ETC must take an active role in meeting employees transportation needs.

- Provision of preferential parking for vehicles arriving at the site with two or three or more persons (reserved spaces for carpools and vanpools closest to the building entrances).

- If parking is provided at a cost, parking cost for HOVs is reduced. This can be a significant incentive in areas with high parking costs but can produce administrative and enforcement problems. Used with preferential HOV spaces in

areas of high parking cost, it is expected that a five percent demand reduction may be achieved.

- Elimination of parking cost subsidies. Employers would agree not to subsidize employee parking cost in full or in part. Elimination of subsidies could reduce parking demand by three percent in low cost areas and by 20 percent in high cost areas.

- Subsidize or operate a vanpool or buspool service. This action can take on a variety of forms but involves aggressive employer participation in arranging this sort of transportation for employees. Auto occupancies of up to 2.5 to 3 persons have been achieved with the best programs and 50 percent reductions in parking demand compared to sites with no ridesharing programs.

- Daytime employer-sponsored shuttle services. This action includes the provision of shuttle services to transit stations or within or to major employment centers. This enables employees to make midday trips without a car and be free to rideshare or take transit to work.

- Fringe parking and shuttle service. This action allows a percentage of parking to be supplied at an off-site location with transportation provided to the sites. Concerns with this technique include: the possibility of employees parking near the site anyway, use of the fringe lot by those for whom it was not intended, inconvenience, and cost of

transportation.²⁶

- Employer-subsidized transit passes. This action involves an employer committing to purchase public transit passes for use by employees. Employees taking advantage of this opportunity are not necessarily all new transit riders. The costs to employers and the effect of the measure will vary depending on how much of the cost of the pass is subsidized.

- Provisions of transit amenities. This includes providing bus shelters, walkways from transit stops, and convenient information displays to foster transit use. Estimates indicate impact on parking demand is small.

- Pedestrian and bicycle facilities. Providing walkways, bike lockers, and showers. Estimated effect on parking demand is small.

- Implementation of flex-time or other work schedule conducive to ridesharing and transit use. The employers with the best ridesharing programs almost always have an alternative work schedule arrangement.

- Payment of a fee per parking space reduced to a local ridesharing fund for promotion and enforcement activities.

The effects of TSM action on parking demand is generally addressed by including variables such as

²⁶ U.S. Department of Transportation/Federal Highway Administration, Model Parking Code Provisions to Encourage Ridesharing and Transit Use, pages 23-24.

ridesharing activity into the overall data analysis. For example, relationships could be developed between certain program types and auto occupancy at particular uses, primarily office and industrial uses. Perhaps the best way to measure the effectiveness of a TSM program is to determine how it affects vehicle occupancy rates, or the average number of persons per vehicle. The higher the occupancy, the less the parking demand. To make vehicle occupancy figures meaningful, some background on National statistics is helpful.

National work trip auto occupancies in 1983 were about 1.3. This is less than the 1.4 figure reported in 1969, probably reflecting continuing increases in auto ownership.²⁷ These figures provide a base from which to evaluate current parking demand figures at office or industrial land uses, and then to evaluate anticipated parking demand reductions caused by TSM (ridesharing) programs.

Where a developer exercises the option to institute TSM actions, a legal, binding agreement stating the responsibilities of both the public agency and the developer or landowner must exist. The agreement must set forth not only all the terms and conditions but also any penalties to be imposed in the event of non-compliance. Some of the possible approaches to this agreement include: a contract, a

²⁷ JHK and Associates, Parking Policies Study for Montgomery County, Maryland.

performance bond, building permit conditions, TSM development fee or trust fund. Most of the above have been implemented by various jurisdictions. The applicability of the method will vary depending on each jurisdiction's land use legal environment.

A contract would recite the terms of the TSM parking reduction measures acceptable to the jurisdiction and the developer, and should be used to guarantee the TSM commitments. To be effective, contracts must be used to ensure commitments regarding parking and TSM commitments, not as a pre-condition to receiving rezoning approval. Unless it is recorded in the land records, a contract is a private legal document binding only on the parties to it. Thus, any such contract enforcement mechanism must be recorded in the jurisdiction's land records to ensure compliance by future owners.

A performance bond is a method of ensuring compliance with a specific commitment that requires money to be placed in escrow until the condition is satisfied. Should a jurisdiction wish to use this approach, it must have authority to exercise this method or it may have to seek the authority to require performance bonds as a pre-condition to the issuance of development approval. For some jurisdictions, special state enabling legislation may be necessary. This is particularly true when state-granted municipal authority operates under "Dillions' Rule". Under

this rule, jurisdictions may act only when so authorized by state action. Thus, some jurisdictions may need state enabling authority to create a TSM trust fund.

One performance bond method would require the landowner to place money in an interest-bearing escrow account prior to issuance of a use and occupancy permit. The amount of money may be based on the one year cost of operating a well run company ridesharing program or some equivalent cost. The bond may be released at the end of a specified time period, such as three years after the building site attains 80 percent occupancy and is in compliance with the terms of the TSM commitments.

Forfeiture of the bond would occur only for willful non-compliance as demonstrated by failure to employ some of the specific techniques agreed to. For instance, a failure to hire an in-house ETC or failure to designate HOV parking spaces might justify outright forfeiture of the bond. This method provides up-front cash to ensure compliance. A disadvantage, however, is the perceived development disincentive to make an up-front development payment that may not qualify for regular developer financing and may also have adverse tax consequences to the developer. Further, once the enforcement bond terminates, its leverage as an enforcement method ends and program continuation becomes uncertain.

One of the most frequently mentioned potential problems with granting parking reductions based on commitments to TSM

is that if the commitments go unsatisfied, there will be no opportunity to supply the necessary additional parking capacity. One method some jurisdictions have used to provide for additional parking, should it be necessary, is to require land to be set aside for possible surface parking or contingency plans to be established for additional structured parking. On notice from the public agency, such additional parking could be required. The major disadvantage of this approach is that it can act as a significant deterrent to a developer making any TSM commitments. The cost of this assurance is often too high.

The monitoring element of TSM parking provisions comprises the means by which compliance or non-compliance is determined. If certain standards are to be met, it must be determined whether, in fact, the standard has been satisfied. Monitoring determines whether enforcement is necessary. Monitoring ranges from simple periodic reviews to determine whether the landowner is generally following through on his commitments or can involve a more elaborate quantitative assessment through auto occupancy surveys and other data analyses. This is an area where public agencies should be concerned with simplicity as they generally cannot afford to spend a great deal of time and effort on most monitoring processes. In some cases, fees could be assessed on developers who benefit from significant parking reductions to help offset the cost of the program monitoring.

Enforcement procedures have been one of the most controversial areas of TSM parking provisions to date. Although it would be hoped that the need to exercise enforcement procedures would be rare, mechanisms must be available to protect the public interest when TSM actions are agreed upon. Not only must it be determined what enforcement measures will apply to the original landowner, should his commitment fail, but it must be determined how enforcement procedures are made applicable to subsequent owners of that property. Again, several options are available.

- Though land set asides or the addition of more structured parking;
- Forfeiture of performance bond;
- Revocation of use and occupancy permits;
- Injunction against continued building use; and
- Contractually established liquidated damage clauses.

The prescribed enforcement measures should be specific in the agreement, and the timing and actual enforcement of a violation predetermined.

Because of the great variety of local zoning practices, there are various enforcement techniques potentially applicable, and the more promising alternatives were mentioned above. However, until more experience is gained with TSM actions, ridesharing provisions in particular and their ensuing enforcement problems, it is difficult to determine which enforcement strategies will be most

effective.

The problems of enforceability may arise more from a political than legal cause. Legally, any contracting party, such as a local zoning board or other public agency overseeing the zoning ordinance, may seek damages, enforce a liquidated damage clause, or seek an injunction against a landowner failing to fulfill a TSM commitment. The enforcement problem arises in proving the extent of the harm from the program failure and in moving a public agency to mitigate such harmful action.

Given that a contract sets forth the terms of the parking reduction granted, a jurisdiction may seek legal recourse when the terms are not met. The political complexity of seeking an injunction against non-compliance with the TSM terms is great. The more clearly such enforcement terms are defined, the easier enforcement may be achieved.

Once a jurisdiction determines the mix of TSM measures to implement, it must develop its approach to implementing the provisions, guaranteeing their long-term viability and also monitoring and penalizing any violations of those terms. The first step lies in determining how a decrease in the amount of parking spaces will be granted to a applicant.

Jurisdictions vary in their methods of proceeding with land use development. Some rely heavily on establishing a multitude of specific standards and some permit wide variation in the process. Of major importance is the degree

to which zoning ordinance provisions should be negotiable on a case by case basis. While a highly negotiable approach affords a high degree of flexibility, it places a substantial burden on both the public agency and developer to prove their case and may result in an adversarial relationship. It may also result in unnecessary delays or cancellations of projects and consume additional private and public sector staff time. In addition, the final resolution of negotiated parking reductions often must be based on the same data or same precedents each time. This argues for establishing a ridesharing provision which has more rigid guidelines based on the best available data and with enough flexibility to enable a response to the more unusual circumstances. Jurisdictions may want to retain the right to negotiate on very large developments, but let the smaller routine developments be addressed directly by provisions in the zoning ordinance.

The most simple method to obtain development approval is to qualify for a parking requirement reduction for TSM measures as a right. In other words, there would be a section in the parking ordinance that clearly establishes the percentage reduction in parking obtainable through the implementation of specific TSM actions.

As is the case with reductions due to rail transit proximity, TSM related reductions can also be approached in a number of ways. Should the reductions be automatic or should

a case by case review of a reduction request be required? Should the reductions be specified in the zoning ordinance with the percent reduction dependent on the TSM actions selected by the applicant? Again, these are policy decisions which must be made based on the particular objectives a jurisdiction is trying to achieve.

SHARED PARKING - This is an area of significant interest on the part of both the development community and public agencies. The basic concept behind shared parking arrangements involves the fact that demand patterns for parking vary among land uses, and where the peak demands do not conflict, some of the parking required for one land use could be supplied by the parking spaces required to serve the peak demand for a second use. Shared parking, also referred to as "joint use of parking", is defined as parking space that can be used to serve two or more individual land uses without conflict or encroachment.

Shared parking is the result of two conditions. The first is the variations on the peak accumulation of parked vehicles due to time differences in the activity patterns of adjacent or nearby land uses (by hour, by day, by season). For example, a parking facility can be used by office employees during the day and serve patrons of an adjacent theater at night. The second is the relationships among land use activities that result in people being attracted to two or more land uses on a single auto trip to a given area or

development.²⁸ The sharing of parking by two or more land uses is most attractive in that it presents the opportunity for supplying less parking overall than if parking were separate for each use. In the past, the majority of zoning ordinances have required that the total number of parking spaces provided for two or more uses sharing a parking facility be the sum of the requirements for the individual uses considered separately.

| A rational procedure for allowing reductions in parking based on the sharing of a common parking facility is a promising concept to promote greater land efficiency and reduce the escalating costs of providing parking facilities. If careful design and planning can increase the efficiency in both the use of land and physical structures, both the providers and the users of the facilities will benefit. |

Several important principles and prerequisites must be adhered to before reductions in the parking requirements through shared parking can be considered practical.

1. In order for shared parking to be successful, the existing parking requirements for individual land uses must reflect the actual peak demand for parking as closely as possible. If the parking requirements for a certain land use are too low, the reduction for shared use will be in addition to the already low requirement, probably resulting in an

²⁸ Urban Land Institute and Barton-Aschman Associates, Inc., Shared Parking, Washington, D.C., 1983.

under supply.

2. The land uses sharing a common parking facility must be located in proximity to one another. Although the uses need not be contained within the same physical structure, they must be close enough to one another so that most parkers would be willing to walk to either building from most points in the parking lot or structure. Establishments sharing a common parking facility may have different owners provided a suitable leasing arrangement has been worked out to the satisfaction of the jurisdiction. Normally, recordation of a permanent cross-use parking and ingress-egress easement is required.

3. Operators of a shared parking facility should be prepared to work out localized parking shortages and provide proper information and traffic direction.

4. Parking spaces reserved for certain individual or groups on a 24-hour basis cannot be shared. Each parking space should be usable by all parkers (i.e., no restrictions).

5. The developer/owner must understand that any subsequent change in land uses within the mixed use development would require a new occupancy permit and proof that sufficient parking will be available.

A specific methodology for computing shared parking is often used. It is based on extensive data collection and development of parking accumulation curves for each land use.

One approach and that used by Montgomery County, Maryland, evaluates the opportunity for sharing parking for five time periods for both a weekday and Saturday; nighttime (approximately midnight to 6:00 am); midday (approximately 9:00 am to 4:00 pm) for both a weekday and a Saturday; and evening (approximately 6:00 pm to midnight) for both a weekday and a Saturday (refer to Table 3). These periods, while not completely steady state, appear to be stable enough in terms of parking demand that they can be considered as a unit. The transition periods during weekday commuting hours (e.g. 4:00-6:00 pm) will usually be less prohibitive in terms of opportunity to share parking, but should be examined for unusual conditions, to ensure adequate supply. The five time period approach provides a balance between the need to keep the procedure relatively simple and the need to keep the shared parking analysis at the equivalent level of accuracy as the other elements of the parking requirements.

Another approach which from an administrative standpoint is somewhat more involved evaluates the opportunity for sharing parking based on hourly parking demand for each land use. This approach typically uses a 12, 16 or 24 hour demand cycle. Table 4 exhibits a 16 hour demand cycle used by Alexandria, Virginia.

The key data for evaluating a shared parking proposal are the percentages of peak parking demand for each land use for each of the time periods or hours examined. To determine the

TABLE 3
MONTGOMERY COUNTY, MARYLAND
SHARED PARKING FORMULA²⁹

	Weekday		Weekend		Nighttime
	Daytime (6 am- 6 pm)	Evening (6 pm- midnight)	Daytime (6 am- 6 pm)	Evening (6 pm- midnight)	(Midnight- 6 am)
Office/ Industrial	100%	10%	10%	5%	5%
Retail	60%	90%	100%	70%	5%
Hotel/Motel	75%	100%	100%	100%	75%
Restaurant	50%	100%	100%	100%	10%
Theater and Commercial Recreational Establishment	40%	100%	80%	100%	10%
All Other Uses	100%	100%	100%	100%	100%

²⁹ Montgomery County, Maryland, Zoning Ordinance,
Montgomery County, Maryland, Revised 1986.

TABLE 4
CITY OF ALEXANDRIA, VIRGINIA
SHARED PARKING ACCUMULATION SCHEDULE³⁰

<u>Time of Day</u>	<u>Hotel</u>	<u>Office</u>	<u>Retail</u>	<u>Restaurant</u>	<u>Entertainment</u>
6 a.m.	1.00	-	-	-	-
7 a.m.	.90	.20	.05	-	-
8 a.m.	.65	.60	.20	.10	-
9 a.m.	.55	.90	.30	.10	-
10 a.m.	.45	1.00	.50	.20	-
11 a.m.	.35	1.00	.70	.30	-
12 p.m.	.30	.90	.75	.50	.30
1 p.m.	.30	.90	.75	.70	.50
2 p.m.	.35	1.00	.75	.60	.60
3 p.m.	.35	.95	.70	.55	.60
4 p.m.	.50	.75	.65	.50	.60
5 p.m.	.60	.50	.60	.70	.60
6 p.m.	.70	.20	.60	.90	.65
7 p.m.	.75	.15	.70	1.00	.75
8 p.m.	.90	.15	.65	1.00	.80
9 p.m.	.95	.05	.40	1.00	.80
10 p.m.	1.00	.00	.20	.90	.80

³⁰ City of Alexandria, Virginia, Zoning Ordinance, Supplement Number 21, Alexandria, Virginia, 1989.

amount of parking required for a specific mix of uses, the expected parking demand for each individual use is first computed for each of the five time periods (one night, two weekday and two weekend) or times of the day. This is accomplished by multiplying the amount of parking required by the zoning ordinance for each use by the corresponding percentage. The parking requirements for all the uses are then summed for each of the five time periods or times of the day. The sum having the highest value constitutes the required amount of parking for the entire development. To illustrate this procedure, Table 5 provides a hypothetical shared parking calculation based on the City of Alexandria's parking accumulation schedule.

It is typically recommended that shared parking for non-residential uses be permitted throughout a jurisdiction. Non-residential uses with complementary peak parking demand curves include the office, industrial, retail, shopping center, hotel, restaurant, entertainment and recreation categories.

Residential uses are generally not included in the shared parking provision. It is difficult to plan for shared parking with residential uses. Developers tend to reserve spaces to assure prospective residential tenants that parking will always be available. Shared parking cannot work with reserved spaces. The morning and afternoon "transition", when residents leave and return from work, may overlap with

TABLE 5
HYPOTHETICAL SHARED PARKING CALCULATION³¹

Project: Virginia Tech Corner (hotel, office, retail and restaurant development). Required parking in accordance with the individual use requirements: hotel = 253, office = 96, retail = 43 and restaurant = 10. TOTAL OF **402** PARKING SPACES.

	Hotel	Office	Retail	Rest.	Enter.	TOTAL
6 a.m.	253.00	N/A	N/A	N/A	N/A	253.00
7 a.m.	227.70	19.2	2.15	N/A	N/A	249.05
8 a.m.	164.45	57.6	8.60	10.0	N/A	240.65
9 a.m.	139.15	86.4	12.90	10.0	N/A	248.45
10 a.m.	113.85	96.0	21.50	2.0	N/A	233.35
11 a.m.	88.55	96.0	30.10	3.0	N/A	217.65
12 p.m.	75.90	86.4	32.25	5.0	N/A	199.55
1 p.m.	75.90	86.4	32.25	5.0	N/A	199.55
2 p.m.	88.55	96.0	32.25	6.0	N/A	222.80
3 p.m.	88.55	91.2	30.10	5.5	N/A	215.35
4 p.m.	126.50	72.0	27.95	5.0	N/A	231.45
5 p.m.	151.80	48.0	25.80	7.0	N/A	232.60
6 p.m.	177.10	19.2	25.80	9.0	N/A	231.11
7 p.m.	189.75	14.4	30.10	10.0	N/A	244.25
8 p.m.	227.70	14.4	27.95	10.0	N/A	280.05
9 p.m.	240.35	4.8	17.20	10.0	N/A	272.35
10 p.m.	253.00	0.0	8.60	10.0	N/A	271.16

TOTAL OF **280.05** SPACES REQUIRED BASED ON SHARED PARKING
OPPOSED TO 402 SPACES REQUIRED IF PARKED INDIVIDUALLY

³¹ Based on the City of Alexandria, Virginia Parking Accumulation Schedule.

the office hours of the mixed-use development. It is difficult to predict the time of day when residential parking spaces will be available. Also, the demand for parking at multi-family uses varies widely making it difficult to accurately predict the base demand for residential parking.

Two approaches are available for implementing a shared parking provision depending on the degree of negotiability a jurisdiction desires to retain. A basic formula for shared parking, similar to that shown in Tables 3 and 4, could be developed and included in the zoning ordinance or a more rigorous procedure could be applied to address specific conditions by providing the opportunity for shared parking through a negotiating process with the developer submitting a technical justification for the amount of parking to be reduced.

Either of these two approaches are workable. With the first approach, actual values are incorporated into the zoning ordinance and applied to the base parking requirements for each land use, and the final number of required spaces is easily determined. Including such values into the zoning ordinance simplifies the administration of the requirement and for that reason is the preferred choice. The second approach requires more administration and analysis as well as being more time consuming and costly, but may allow more flexibility in the way shared parking is approached for each specific development.

SECTION IV
IMPACT OF POLICY OBJECTIVES ON
FORMULATION OF PARKING REQUIREMENTS

Since 1939 when the first non-residential off-street parking requirements became effective, jurisdictions have recognized and attempted to manage the problems associated with traffic and parking spaces for motor vehicles responsible for that traffic. Most off-street parking requirements have sought to preserve street capacity and mitigate traffic nuisance effects. In attempting to protect the public's investment in its streets, sufficient off-street parking has been encouraged to limit the traffic circulation problems associated with on-street parking.

More recently, the objectives of such requirements have been modified and expanded to deal with other urban and municipal issues. For instance, provisions including parking reductions due to proximity to rail transit stations and shared parking arrangements have been introduced in some jurisdictions to provide incentives for certain types or mixes of land development. Parking reduction provisions due to TSM measures have also been introduced to encourage the use of more efficient travel modes such as carpools, vanpools and rail transit. The scope and extent of these provisions should be directly related to the particular characteristics of a jurisdiction and the type of objectives they are trying

to achieve.

While such parking policies may be used to encourage the achievement of some public objectives, they may also be in conflict with others. One of the major sources of conflict in parking policy objectives is the generally acknowledged desire to induce a shift to more efficient modes of travel (i.e. transit and ridesharing) as opposed to the desire by neighbors of commercial activity centers to aesthetically contain all parking off-street. It can be argued that providing ample parking induces additional auto travel but, on the other hand, too little parking creates both traffic circulation and delay problems for the users as well as annoyance to the surrounding community. Significant pressure to contain the supply of parking also comes from an economic point of view as developers seek to minimize the cost of construction and unnecessary allocation of land to parking. The parking requirements can often be a major determining factor as to the size of the building structure which can be placed on a given site and, as previously discussed, is virtually always a major cost consideration.

The source of conflict is often linked to the specific objectives of the various interest groups, all of which should be considered in establishing the requirements. Table 6 identifies the major groups which would be expected to have interest in the establishment and structure of the parking requirements. For each group, its principal objectives are

TABLE 6
OBJECTIVES OF THOSE WITH AN INTEREST IN PARKING

INTEREST GROUPS	PRIMARY RELEVANT OBJECTIVES
Developers/owners	<ul style="list-style-type: none"> - minimize parking facility costs - provide access for uses - insure leasability/salability of property
Employers/business establishment operators	<ul style="list-style-type: none"> - provide environment for attracting adequate work force or customers (access is key to that environment)
Users (employees, shoppers residents, etc.)	<ul style="list-style-type: none"> - provide adequate access (minimize travel time, maximize convenience) - minimize transportation costs
Community (usually those adjacent to office/commercial development)	<ul style="list-style-type: none"> - minimize intrusion by users (traffic or parking on neighborhood street)
Lenders	<ul style="list-style-type: none"> - Insure that the development is economically viable (this means satisfying the objectives of those groups, i.e. employers and users)
Local Jurisdiction	<ul style="list-style-type: none"> - Promote coordinated and managed land development - enhance access - reduce traffic congestion, air pollution and energy consumption - minimize cost to jurisdiction and its citizens - ease of interpretation and administration - should consider the objectives of all above groups and maintain a balance that is in the overall public interest

indicated.

Because all of the interest groups shown in Table 6 are constituents of a jurisdiction, the jurisdiction's role is to weigh all the objectives and determine the course which will lead to the optimum combination of results, recognizing that not all, if any, of the objectives can be completely satisfied.

Protection of the public interest reflects the need for balancing parking policy between land use, transportation, environmental and economic objectives and protecting the street environment, particularly residential streets. Local jurisdictions must give careful attention to what can be done to both further the attainment of the applicable objectives as well as to relieve any adverse impacts should, for example, a developer not achieve the reductions in parking demand expected after the reduction in required parking is granted. Various strategies can be instituted from the public side concurrently to relieve some of the impacts.

Of major concern to jurisdictions is the possible adverse impacts the various parking related policies may have on residential areas adjacent to major office and commercial developments. In addition, if parking is available within a relatively close distance to a development, the incentive to opt for an alternative form of transportation is greatly reduced. Therefore, if on-street parking is not available in conjunction with a limited supply of off-street parking, the

travel alternatives are considerably narrowed down. If the parking related programs are to be attractive in promoting transit, carpooling and vanpooling, an effective prohibition of on-street parking particularly on residential streets must be enacted. This can be a substantial effort and can be a major reason parking related policies are not practical for a number of jurisdictions. The cost of enforcement may exceed any possible benefit.

Actions or tactics to alter the supply, operation, and/or parking demand of a jurisdiction's on-street parking supply to further the attainment of local objectives should be implemented as part of an overall policy to discourage the growth of vehicular traffic. Such parking actions should be employed in conjunction with transit, carpooling, and other TSM measures. In particular, such efforts are directed to reducing automobile work trips which can be served by public transit and HOV options but at the same time encouraging shoppers and other short-term parkers to patronize the business districts. The most widespread tactic is the strict enforcement of on-street parking regulations, including residential parking permit programs.

The on-street parking supply can be altered by regulations or by physically changing the number of the spaces. Parking durations can be adjusted to favor short-term versus long-term parkers to prevent commuters from parking all day. Short-term parking supply is intended for parking up to three

hours while long-term supply is intended for parking in excess of three hours. Restrictions on parking hours can be used to prevent commuter parking by prohibiting parking until after most employees have to be at work (e.g., no parking from 7:00 am to 10:00 am).

Conventional methods to prohibit long-term commuter parking include restrictions on parking hours and duration. Unfortunately, these restrictions apply to residents as well as non-residents and often create unreasonable burdens for residents who lack off-street parking. In an effort to protect residential areas from spillover parking from nearby developments, residential parking permit programs have been employed with much success.

Residential Parking Permit Programs (RPPP) were initiated in the early 1970s and have become an increasingly popular method to prevent long-term parking by commuters in residential neighborhoods. The initiation of these programs was accompanied by numerous lawsuits alleging unconstitutional discrimination between residents and non-residents. The U.S. Supreme Court upheld the constitutionality of RPPPs in 1977.

RPPPs have been implemented as a response to the excessive parking demands of persons living outside a neighborhood but who park their vehicles there in order to shop, work, or attend school nearby. Typically, a single use or geographic area can be identified as the major parking generator whose

proximity to the residential neighborhood creates the non-resident parking problem. Major parking generators that have led to the use of RPPPs include employment centers, universities, hospitals, retail trade centers and transit terminals.

Non-residents parking in neighborhood areas can include both long-term commuter parkers and shorter term parkers, such as students or shoppers. Parking usage may easily exceed 100 percent (due to illegal parking) in aggravated situations and residents in these areas often find they cannot move their cars without losing a space that is within a reasonable distance from their homes. The characteristics of the traffic generator determines the duration and intensity of the parking problem. Uses which generate nighttime parking demand such as shopping areas or recreation facilities can create serious impacts as this is the period during which most residents are at home. In some areas, the RPPP is a direct outgrowth of resident dissatisfaction with hourly restrictions. Neighborhood groups have also requested RPPPs to regain the use of street space, reduce the congestion and safety hazards of excess parking, and to improve emergency vehicle access.

Most jurisdictions require approval by the governing body for each petition for a RPPP in a particular neighborhood. RPPPs are generally implemented in specific neighborhoods or subareas within a jurisdiction. This is largely due to the

nature of the parking problems that they are designed to address. The distance that a commuter is willing to walk is clearly finite, and the purpose of an RPPP is to create a zone that exceeds the realistic walking radius around the use generating the parking demand. Determining what the feasible walk limits are for non-resident parkers may require boundary adjustments as parkers choose to park their autos farther and farther from the destination.

Almost all of the ordinances adopted for creating RPPPs require occupancy counts prior to designating an area for permit parking. Ordinances usually contain usage criteria which must be met for a neighborhood or district to be eligible for an RPPP. Criteria generally require that a traffic survey conducted during peak parking periods reveal overall usage at least 75 percent and non-resident usage of at least 15 percent. (These criteria vary by locale and range from 50 percent to 80 percent for overall occupancy and from 10 percent to 50 percent for non-resident occupancy).³² Occupancy calculations may be based upon a one street unit of analysis, a one block unit, or the entire proposed district. A problem that develops when the one street unit is employed is the opportunity it creates for displaced parkers to easily shift from permit parking spaces to unrestricted spaces. On

³² U.S. Department of Transportation/Federal Highway Administration, Parking Management Tactics, VOLUME III, Washington, D.C., 1981, p. 28.

the other hand, occupancy levels calculated at the district level may fail to meet required criteria even though specific streets within the proposed district may clearly qualify. Analysis at a small district level with the opportunity for expanding the zone later would address both of these limitations.

Citizen participation is an integral part of the RPPP process and most jurisdictions require citizens to petition them before they will analyze the potential for an RPPP in their area. RPPPs are very effective for solving local level parking problems, and the characteristics of a particular program should reflect the problems it addresses. RPPP characteristics vary from one locale to the next depending upon community objectives and preferences.

RPPPs may be in effect on weekdays only, from 7:00 am to 6:00 pm, or at all times except Sundays. If a specific use can be identified as the source of the parking problem, the jurisdiction may only wish to apply non-resident restrictions during those times when the use is open and attracting parkers. Non-resident parking restrictions range from complete prohibition to limited parking privileges. Some jurisdictions, such as Alexandria, Virginia, permit non-residents to park for two or three hours during the time the RPPP is in effect. Jurisdictions which allow non-resident parking for limited durations are frequently trying to preserve short-term parking opportunities for shoppers and

business clients while preventing long-term parking. A limitation to this approach is the increased enforcement efforts necessary to monitor the parking duration of non-resident vehicles. If permissible non-resident parking is as long as three to four hours, then commuters may try to circumvent the policy by moving their cars during the day.

Residential parking permits are generally small decals that residents place on their windshields, rear windows, or bumpers. RPPPs usually have some provision for issuing visitor permits. For instance, in Fairfax, each residence is provided with two residence stickers and two visitor transferable visitor permit cards.

RPPPs are normally introduced with a fairly high level of enforcement and publicity. After an initial period of vigorous ticketing, many jurisdictions have reduced their level of enforcement without a serious recurrence of overparking. In smaller RPPP districts police often respond to neighbors' complaints rather than perform regular patrols. The appropriate level of enforcement depends largely upon the characteristics of the use generating the parking demand, the availability of alternative parking or transit, the stiffness of the penalty for violation, and the characteristics of the non-resident parkers. If commuters with relatively fixed destinations (i.e., their workplace) consistently incur stiff fines for illegal RPPP parking, it is reasonable to conclude that they will seek alternative solutions to their long run

transportation needs.

When RPPPs are implemented, displaced on-street parkers are likely to impact other components of the parking or transit systems. In situations where off-street parking existed but was not being used due to the costs, some displaced on-street parkers are likely to start using the off-street facility. However, displaced parkers hopefully will seek alternative transportation modes such as carpools, vanpools, or transit.

SECTION V

CONCLUSION

As evidenced by the preceding Sections, the establishment of minimum parking requirements is not merely a technical determination but a policy judgment made in light of transportation and land use objectives. In other words, it is not possible to arrive at a set of recommended parking standards on a purely technical basis. Establishing parking requirements involves complex issues of land use and transportation policy which need to be locally determined. Parking demand relationships are one important input to this process but more detailed data are often necessary to enable local officials to make better assessments of the effects of certain parking policies. Specifically, more data would be helpful for certain types of uses and on the relationship between parking demand and certain factors such as development density, proximity to transit, and TSM measures.

Off-street parking requirements have a profound effect on other local objectives. For that reason, the requirements should be consistent with the objectives most valued by the jurisdiction. Parking requirements have varying impacts on local objectives. They may affect some objectives very strongly, while others hardly at all. In some cases, they may have impacts on objectives that conflict with each other, or differ in importance depending on the general location,

type of land use, and other considerations related to development. The setting of parking requirements should be more than a technical exercise. It should also take into account policy considerations that weigh the benefits and the risks to the developers, the jurisdiction and the general public.

Clearly, the need for parking will continue to grow. Overall parking needs are likely to fluctuate, depending on such variables as the extent to which transit systems are improved, and the state of local economies. Different jurisdictions will continue to have very different needs. It is imperative that public officials recognize these differences, and that they base their programs on analyses of specific situations.

Essentially, each jurisdiction needs to make their basic parking standards more consistent with actual peak parking demands, introduce flexibility in the requirements to account for special conditions, and implement parking policies that better fulfill the jurisdictions objectives.

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