

Parking Study of Neighborhood and Community Shopping Centers

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A detailed assessment of parking demand at local-serving, neighborhood and community shopping centers in Fairfax County, Virginia, is presented in this paper. The objective of this work was to develop a reasonable, accurate, and easily implemented parking standard for these retail centers. Neighborhood and community shopping centers differ from regional shopping centers because they are primarily smaller and contain local-serving retail uses such as supermarkets, drug stores, and other service-oriented tenants. This study collected parking survey data on weekdays and Saturdays during June, October, and December at more than 30 neighborhood and community shopping centers throughout Fairfax County. In total, over 2,000 hourly observations of parking demand were taken at these centers. Peak parking rates at these centers were compared with their retail and tenant characteristics including the center size, the type of anchor store, the amount of use devoted to restaurants, and the presence of free-standing buildings. The results of this study indicated that a base parking rate of 4.0 spaces per 1,000 ft² of gross leasable area (GLA) would provide adequate parking throughout the year at almost all neighborhood and community shopping centers, regardless of most of the factors studied. The only consistent exception to the 4.0 base rate occurred at centers where more than 15 percent of their GLA was devoted to restaurant uses and additional parking would be needed. At these centers, the higher parking demand generated by their restaurants dominates the parking demand of the center's other retail uses.

A detailed, comprehensive assessment of parking demand for neighborhood and community shopping centers in Fairfax County, Virginia, is provided by this study. The objective of this work was to develop recommendations for the Fairfax County Board of Supervisors, the Planning Commission, the Parking Committee, and county technical staff to revise the current parking ordinance. Ideally, these recommendations should establish a reasonable, accurate, and easily implemented parking standards for the local-serving retail centers. A key issue is what should be the basis for formulating parking requirements for local-serving retail centers: one hour during a few Saturdays between Thanksgiving and Christmas, or what might occur daily throughout most of the year, covering 99 percent of a center's operating hours? In addition, it is desirable that a simple base parking rate be derived that will accommodate most, if not all, retail uses so that small changes in retail tenants can be readily addressed without having to go through a long regulatory review process.

This study performed the following tasks:

- Reviewed parking requirements of local jurisdictions in the metropolitan Washington, D.C., area and of profession-

- ally accepted standards such as those established by the Institute of Transportation Engineers (ITE) and the Urban Land Institute (ULI).

- Conducted surveys of actual parking demand during summer, fall, and holiday seasons at more than 30 local-serving centers in Northern Virginia, most in Fairfax County.

- Performed detailed data analyses of the parking survey data and tenant characteristics at these 30 centers to establish reasonable indicators of their parking demand.

BACKGROUND

This section reviews background information on shopping center parking ordinances for nearby metropolitan Washington, D.C., jurisdictions and the results of parking demand studies in these jurisdictions as well as elsewhere. The results of this review were significant in defining the scope of the present study. These other parking studies did not focus on neighborhood and community centers nor did they examine how parking demand varies by many different factors such as tenant mix.

Parking Ordinances

Table 1 contains a summary of parking ordinance requirements for shopping centers in jurisdictions throughout the metropolitan Washington area, including the current and proposed Fairfax County requirements. It should be noted that the existing Fairfax County parking requirements of 6.0 spaces per 1,000 ft² of net floor area (NFA) as well as their proposed 5.0 spaces per 1,000 ft² of gross leasable area (GLA) for shopping centers are among the highest in the metropolitan D.C. area. Most jurisdictions require 4.0 spaces per 1,000 ft² of GLA. Notably, the shopping center parking requirements in Prince George's County have separate rates for shopping centers with 400,000 ft² of GLA or less versus more than 400,000 ft² of GLA. The parking requirement for these smaller centers is 4.0 spaces per 1,000 ft² of GLA compared with 5.0 spaces per 1,000 ft² of GLA for larger centers.

Parking Studies

The major studies of actual survey data on parking demand for shopping centers include ITE, ULI, and several special studies such as the one performed by JHK & Associates for Fairfax and Montgomery counties.

ITE's *Parking Generation Manual* compiles peak parking demand rates, typically by GLA, for various land uses for

TABLE 1 PARKING ORDINANCES FOR JURISDICTIONS THROUGHOUT THE METRO D.C. AREA

Jurisdiction	Shopping Center Parking Ordinance
Arlington County, Virginia	1.0 Spaces per 250 square feet gross floor area.
Fairfax County, Virginia	Current: 5.0 spaces per 1,000 square feet net floor area (NFA) for first 1,000 square feet NFA and 6.0 spaces for each additional 1,000 square feet NFA. Proposed: For shopping centers with less than 750,000 square feet gross leasable area (GLA). For centers with 750,000 square feet GLA or more, 5.5 spaces per 1,000 square feet GLA. If the combine square footage of GLA of eating establishments, fast food restaurants, and/or theaters is greater than 15 percent of the total GLA, then the individual parking requirements for those individual uses apply for that area that is in excess of the 15 percent criteria.
Montgomery County, Maryland.	5.5 Spaces per 1,000 square feet of GLA
Prince George's County, Maryland	For 25,000-400,000 square feet, 1.0 spaces per 250 square feet GLA. For larger centers, 1.0 spaces per 200 square feet GLA

weekdays and Saturdays (1). Using data collected from more than 140 surveys at all types of shopping centers ranging in size from 25,000 to 1,400,000 ft² of GLA, ITE found that the average peak parking rate was 3.23 and 3.97 vehicles per 1,000 ft² of GLA on weekdays and Saturdays, respectively. The range of rates reported was quite large: 1.02 to 6.17 for weekdays and 1.11 to 6.06 for Saturdays. ITE also performed regression analyses on their data and presented best fit regression equations that can be used to estimate the parking demand for shopping centers of a specific size, such as 500,000 ft² of GLA. Applying these equations to shopping centers of various sizes indicates that the smaller the shopping center, the less demand for parking (per 1,000 ft² of GLA). Also, these equations indicate that there is less difference between weekday and weekend peak parking demand at smaller shopping centers. Although based on a large number of surveys, the ITE rates and resulting equations are too general to develop a parking standard or ordinance because the mix of their survey data includes a wide range of conditions that significantly affect parking demand such as different times of the year, different sizes (i.e., neighborhood or large regional), and different commercial mixes (e.g., department stores or supermarkets). This may explain why the results of the ITE surveys are relatively low compared with the parking requirements in Table 1.

The ULI's *Parking Requirements for Shopping Centers* study of parking demand was performed on the basis of surveys at more than 135 shopping centers in the United States and

Canada (2). Parking surveys were conducted on the Friday after Thanksgiving and on the following three Saturdays before Christmas. Historically, this is the period when the yearly peak parking demand will occur. This study also investigated the impact of many variables including shopping center size, types of uses (retail or nonretail), and shopping center location. The ULI recommendations for providing adequate parking at shopping centers were as follows:

- Four (4.0) spaces per 1,000 ft² of GLA for centers having a GLA of 25,000 to 400,000 ft².
- From 4.0 to 5.0 spaces in a linear progression, with an average of 4.5 spaces per 1,000 ft² of GLA, for centers with 400,000 to 600,000 ft².
- Five (5.0) spaces per 1,000 ft² of GLA for centers with more than 600,000 ft².

These recommendations were developed on the basis of analyzing parking rates at shopping centers during their 20th busiest hour of the year. Thus, in all but 19 hr of the more than 3,000 hr during which a shopping center operates (99.4 percent of the time), shopping center patrons would have parking spaces available. Factors that the ULI study identified as significantly increasing parking demands included dedication of a large percentage of shopping center space to office, theaters, or food establishment uses. The results of the ULI study addressed some of the shortcomings of the ITE report, but its analysis did not address differences between neigh-

borhood and community centers versus regional shopping centers. However, two relevant findings from this study were that seasonal parking trends had less of an effect on smaller centers and that the duration of the peak parking demand at smaller centers was shorter than that at larger shopping centers.

On behalf of Fairfax County, JHK & Associates conducted a parking demand study that formed the basis for the county's currently proposed revisions to the ordinance (3). JHK's study analyzed the peak parking demand between Thanksgiving and Christmas at a limited number of shopping centers in Fairfax County and adjacent Montgomery County, Maryland. The report stated that, in general, the parking survey results verified the adequacy of the ULI recommendations, with the qualifier that certain combinations of retail uses could result in higher parking demands. However, there was no detailed analysis in the JHK study to identify what these uses were or what other factors (other than the type of anchor store) might affect parking rates in Montgomery or Fairfax counties. Even though the Fairfax County staff used this study as the basis for their recommendations, the staff's proposed parking requirement of 5.0 spaces per 1,000 ft² of GLA is significantly higher than the baseline rate of 4.0 spaces per 1,000 ft² of GLA, which was recommended by ULI and verified by JHK.

DESIGN OF CURRENT STUDY

The review of past studies found that they have not explicitly addressed parking requirements for neighborhood and community shopping centers. These types of shopping centers typically contain less than 300,000 ft² and have stores (supermarkets, banks, and dry cleaners) that cater to local patrons who may visit these centers daily (Table 2). It should be noted that the restaurants in the study centers are typically sit-down, quality eating establishments, or fast service restaurants such as delicatessens and ice cream shops, but are not generally fast food restaurants such as McDonalds.

In general, the 33 centers included in this study are well-distributed throughout Fairfax County. Details about the selection of the centers studies and the data collection process are contained in the main report (4). Counts of parked vehicles were conducted on the half-hour (10:30, 11:30, 12:30, etc.) during the following days in 1988:

Date	Day	Hours
June 21	Tuesday	10:30 a.m. to 6:30 p.m.
June 24	Friday	10:30 a.m. to 8:30 p.m.
June 25	Saturday	10:30 a.m. to 6:30 p.m.
October 14	Friday	10:30 a.m. to 8:30 p.m.
October 15	Saturday	10:30 a.m. to 6:30 p.m.
December 16	Friday	10:30 a.m. to 8:30 p.m.
December 17	Saturday	10:30 a.m. to 6:30 p.m.

These dates were chosen to provide a broad representation of parking demand during different days and times of the year including spring, fall, and Christmastime. In the initial June survey, weekday studies were conducted on both Tuesday and Friday. Tuesday was chosen because other traffic studies indicate that it is an average day, and Friday was chosen because its traffic is typically higher than on other days. After reviewing the initial June data, it was found that most shopping centers had their weekday (as well as ultimate peak) on Fri-

day. Additionally, the pattern of parking demand during Tuesday observations was similar to Friday's data. Consequently, only Friday surveys were performed in the subsequent data collection efforts. The December observations were performed during the next-to-last weekend before Christmas, which was on the following Sunday. In addition, a few of the sites with retail anchors were surveyed on an additional Saturday, December 10, to provide a second seasonal observation. Thus, parking demand was recorded at these shopping centers for over 2,000 hr.

Surveys were conducted at 26 of the 33 centers on all these dates. Not all centers were surveyed at all times because some shopping centers were added as the study progressed. Also, a few of the centers initially surveyed, but located outside Fairfax County, were subsequently not studied further based on a Fairfax County staff recommendation that the study focus only on centers in Fairfax County.

The centers in this study had a wide range of characteristics including their size (e.g., 20,000 to 387,353 GLA), type of anchor store (none, supermarket, and retail), and amount of restaurant use. There are some general patterns. For example, smaller centers [less than 75,000 ft² of occupied gross leasable area (OGLA)] generally have no major anchor store, while larger centers typically have supermarket anchors, and the largest shopping centers have retail anchor stores such as a junior department or variety store, such as K-Mart, Bradleys, or Best. With this relatively large, detailed data base of shopping center characteristics and with several repeated observations of parking demand, this study is capable of examining a range of factors influencing peak parking demand at neighborhood and community shopping centers.

ANALYSES AND RESULTS

The parking survey data were analyzed by comparing differences in peak parking demand rates at these local-serving retail centers by time of year (June, October, or December), day of the week, and shopping center characteristics, such as size, percentage of restaurants, and freestanding buildings. Two key measures were the focus of the analyses: peak parking demand rates per 1,000 ft² of OGLA, and the duration of this peak demand. The results presented in this section are a summary of the key findings of this study. For more complete and detailed information on peak parking rates and their duration at these shopping centers refer to the main report (4).

Peak Parking Demand Rates

This section presents the analysis of actual observed peak parking demand rates observed at the individual shopping centers. Peak rates were calculated by determining the highest number of parked vehicles during an observation period (for example, on a weekday between 10:30 a.m. and 8:30 p.m.) and dividing this number by the ft² of OGLA in that shopping center. For ease of presentation, these peak parking rates are summarized and/or grouped by different factors or shopping center characteristics that might affect parking demand rates.

TABLE 2 CHARACTERISTICS OF NEIGHBORHOOD, COMMUNITY, AND REGIONAL SHOPPING CENTERS

Center Type	Leading Tenant	Typical GLA (Square Feet)	Range of GLA (Square Feet)
Neighborhood	Supermarket	50,000	30,000 to 100,000
Community	Junior Department Store, Variety Store, or Discount Store	150,000	100,000 to 400,000
Regional	One or More Full-Line Department Store(s)	400,000	300,000 to 900,000
Super Regional	Three or More Full-Line Department Stores	800,000	500,000 to 1.5 million or more

Source: Urban Land Institute (2)

Table 3 presents peak parking rates observed at neighborhood and community shopping center by month of observation, day of the week, and center size. For most centers, peak parking demand rates during June and October were similar; both were almost always significantly less than 4.0 vehicles per 1,000 ft² of OGLA. However, a few of the smaller shopping centers consistently experienced weekday peak parking demand rates greater than 4.0 vehicles per 1,000 ft² of OGLA regardless of the month observed. As detailed later, these higher peak parking demand rates are not actually related to

center size but can be attributed to the influence of having a high percentage of OGLA devoted to restaurants. For all centers surveyed, the number of parking spaces available always exceeded the peak parking demand. The peak parking demand at almost all centers never exceeded 80 percent of available parking, even during December.

Month and Day of Week

The peak parking demand rates during June and October typically occurred on weekdays. This was true at 18 of the 27

TABLE 3 COMPARISON OF AVERAGE PEAK PARKING DEMAND RATE BY SIZE OF CENTER

	JUNE			OCTOBER			DECEMBER		
	NUMBER	AVERAGE*	STD**	NUMBER	AVERAGE	STD	NUMBER	AVERAGE	STD
<u>ALL CENTERS</u>									
WEEKDAYS	27	3.07	0.77	31	3.16	0.76	31	3.43	0.76
SATURDAYS	27	2.72	0.69	31	2.82	0.63	31	3.61	0.70
<u>CENTERS WITH 75,000 SQUARE FEET OF OGLA OR LESS</u>									
WEEKDAYS	6	3.22	0.86	10	3.63	0.90	10	3.77	0.94
SATURDAYS	6	2.51	0.65	10	2.62	0.71	10	3.39	0.96
<u>CENTERS WITH MORE THAN 75,000 SQUARE FEET OF OGLA</u>									
WEEKDAYS	21	3.03	0.74	21	2.93	0.56	21	3.26	0.60
SATURDAYS	21	2.78	0.68	21	2.91	0.56	21	3.71	0.50

* Per 1,000 Square Feet of Occupied Gross Leasable Area

** Standard Deviation

shopping centers surveyed in June and 21 of the 31 shopping centers surveyed in October. Overall, peak parking demand rates on weekdays in December were comparable to rates observed during June and October. However, the peak parking demand during December typically occurred on Saturday. This was the case for 20 of the 31 shopping centers surveyed. Moreover, the December peak demand rates on Saturdays were higher than either the June or October Saturday results at 26 of the 31 shopping centers. On the Saturday in December, 5 centers experienced peak parking demand of more than 4.0 vehicles per 1,000 ft² of OGLA that were also substantially higher than any of their October and June observations, as well as their December Friday observations made only the day before.

Shopping Center Size

Table 3 also displays the observed peak parking demand rates for centers with 75,000 ft² of OGLA or less compared with centers with greater than 75,000 ft² of OGLA. This breakpoint size of 75,000 ft² of OGLA was chosen because, as noted earlier, this size differentiates between centers with no anchor and those with supermarket or retail anchors. The trends noted earlier about the influence of month and day of week on peak parking demand are true regardless of shopping center size. In addition, the results in Table 3 show that smaller shopping centers typically experienced higher peak parking demand rates on weekdays than larger ones. In contrast, larger shopping centers typically had higher peak parking demands on Saturdays and were more affected by seasonal shopping.

Type of Anchor Store

Detailed examination of the data base of center characteristics found that the results presented so far do not solely reflect a simple function of shopping center size. As noted earlier,

tenant characteristics differ significantly between larger and smaller shopping centers. Smaller shopping centers in this study typically did not contain a major anchor store, devoted a higher percentage of their OGLA to restaurants, and did not contain freestanding uses or a bank office. In contrast, larger centers typically had a supermarket or retail anchor store, devoted proportionally less of their OGLA to restaurants, and more often contained freestanding buildings and one or more banks. Consequently, any comprehensive analysis of parking demand must assess the effect of these characteristics.

Table 4 presents the observed peak parking demand rates for the shopping centers categorized by anchor store. Study shopping centers were categorized as having no anchor store, having a supermarket anchor store, or having a retail anchor store. Several patterns emerge from these data that offer further insights into the peak parking demand at neighborhood and community shopping centers. Shopping centers with no major anchor store had significantly higher weekday peak parking demand compared with their Saturday parking demand and their weekday demand rates were not affected as much as the other centers by seasonal trends. Supermarket shopping centers typically had higher weekday and Saturday average peak parking demand rates compared with the retail anchors centers; both of these rates increased significantly in December. Shopping centers with retail anchors, which were also typically the largest shopping centers, had the lowest peak parking demand rates of the three groups. The Saturday parking rate experienced a significant increase in December, but the weekday rates did not.

Restaurants

Table 5 presents the parking demand rates for centers by anchor type and percentage of their OGLA square footage devoted to restaurants (0 to 15 percent and greater than 15 percent). The Fairfax County Zoning Ordinance defines two

TABLE 4 COMPARISON OF AVERAGE PEAK PARKING DEMAND RATE BY TYPE OF ANCHOR STORE

	JUNE			OCTOBER			DECEMBER		
	NUMBER	AVERAGE*	STD**	NUMBER	AVERAGE	STD	NUMBER	AVERAGE	STD
<u>WEEKDAYS</u>									
No Anchor	6	3.50	0.95	11	3.31	0.75	11	3.58	0.78
Supermarket	13	3.05	0.60	12	3.29	0.67	12	3.66	0.66
Retail	8	2.80	0.72	8	2.73	0.73	8	2.87	0.58
<u>SATURDAYS</u>									
No Anchor	6	2.53	0.66	11	2.61	0.66	11	3.37	0.87
Supermarket	13	2.86	0.67	12	3.19	0.37	12	3.98	0.36
Retail	8	2.63	0.68	8	2.54	0.62	8	3.38	0.58

* Per 1,000 square feet of occupied gross leasable area

** Standard Deviation

TABLE 5 COMPARISON OF AVERAGE PEAK PARKING RATE BY PERCENT OGLA DEVOTED TO RESTAURANTS

	WEEKDAYS DURING:								
	JUNE			OCTOBER			DECEMBER		
	NUMBER	AVERAGE*	STD**	NUMBER	AVERAGE	STD	NUMBER	AVERAGE	STD
NO ANCHOR									
0-15 PERCENT	5	3.34	0.97	7	2.97	0.46	7	3.16	0.58
15+ PERCENT	1	4.27	----	4	3.91	0.80	4	4.32	0.48
SUPERMARKET ANCHOR									
0-15 PERCENT	13	3.05	0.60	11	3.12	0.35	11	3.52	0.50
15+ PERCENT	0	----	----	1	5.23	----	1	5.19	----
RETAIL ANCHOR									
0-15 PERCENT	8	2.80	0.72	8	2.73	0.73	8	2.87	0.58
15+ PERCENT	0	----	----	0	----	----	0	----	----

* Per 1,000 square feet of occupied gross leasable area

** Standard Deviation

categories of restaurants: eating establishments and fast-food restaurants. On the basis of these definitions "fast service" restaurants, such as ice cream parlors and sandwich shops, are classified as fast-food uses. Most restaurants at the shopping centers in this study are primarily sit-down or fast-service restaurants and are not typical fast-food restaurants such as McDonalds or Wendys. The term restaurants is used in this report to include both eating establishments and fast-service restaurants.

The results in these exhibits are most revealing and show that a higher percentage of restaurants is the factor that most significantly affects parking demand. In fact, the earlier observations and trends of higher parking rates at small centers and no-anchor shopping centers actually can be attributed to the fact that many of the centers in these categories have greater than 15 percent of the OGLA as restaurants. The centers with a large percent of their OGLA restaurants had significantly higher weekday parking demand compared with any other group of centers. In fact, the majority of the peak parking demand rates observed that were greater than 4.0 spaces per 1,000 ft² of OGLA are attributable to shopping centers with over 15 percent of their OGLA as restaurant uses. For the most part, the other observed peak parking demand rates that exceed 4.0 per 1,000 ft² of OGLA occurred in only a few other shopping centers during December, probably their yearly maximum demand.

It should be noted that preliminary analyses examined the effect of percent of total ft² of OGLA devoted to restaurants at several criteria levels such as 8 or 10 percent, but the effect of percent OGLA restaurant was not as large as using the 15 percent criteria. The significance of 15 percent criteria can be demonstrated by estimating parking demand from individual uses based on ITE parking rates as detailed in Table 6. This table shows the overall parking demand rate for a hypothetical shopping center containing varying mixes of retail and restaurant uses using the ITE rate for family quick-service res-

taurants (Code 835), approximately 9 spaces per 1,000 ft² of GLA, and retail shopping center (Code 820), 3.2 spaces per 1,000 ft² GLA. The calculated overall parking demand rate for this hypothetical center begins to significantly exceed 4.0 spaces per 1,000 ft² of GLA when less than 85 percent of total ft² of GLA is devoted to retail uses and more than 15 percent of total ft² of GLA is devoted to restaurant uses.

Other Shopping Center Characteristics

Several other shopping center characteristics were analyzed including the presence of freestanding buildings, bank offices, and location of the center in Fairfax County. However, none

TABLE 6 OVERALL PEAK PARKING RATE OF A SHOPPING CENTER WITH DIFFERENT MIXES OF RETAIL AND RESTAURANT USES

Percent of Space		Effective Peak Parking Demand per 1,000 gross Leasable Floor Area
Retail	Restaurants	
95	5	3.50
92	8	3.67
90	10	3.79
85	15	4.09
80	20	4.38

of these factors seems to affect parking demand sufficiently to require parking in excess of the 4.0 spaces per 1,000 ft² OGLA base rate already noted.

Finally, our limited survey of six shopping centers with a retail anchor store on Saturday December 10 gave mixed results. Compared to the peak rates observed on December 17 (a week later), three of the shopping centers had virtually the same rate, two had substantially lower rates, and one was higher. However, all of the December 10th peak parking demand rates were greater than the rates observed on Saturdays in June and October. Five of the six shopping centers still had peak parking rates below 3.6 spaces per 1,000 ft² OGLA. The remaining center in this additional survey had a peak parking rate of 4.08 spaces per 1,000 ft², which was consistent with its other December data.

Duration Of Peak Parking Demand Rates

Thus far, the peak parking demand rates observed at shopping centers throughout Fairfax County have been categorized by several factors that might affect their peak parking demand. It is important that a parking standard be based on a peak demand rate that is likely to occur on a frequent basis as well as consider the duration of a peak demand rate. A reasonable base rate would be one that meets parking needs that occur almost all of the time, but not on those occurring for only a few hours primarily during the Christmas shopping season.

Figures 1 and 2 present the hourly time distribution of parking demand rates (averaged for all shopping centers over all months surveyed) by type of shopping center anchor store on weekdays and Saturdays, respectively. On weekdays the peaking and hourly distribution of shopping centers were similar regardless of type of anchor store. These distributions had sharp peaking characteristics with the absolute peak parking demand occurring at almost all centers during the midday (noon to 1:00 p.m.) hour. The next highest parking demand rate was after the midday hour and was, on average, about 90 percent of the peak demand. In the afternoon and evening,

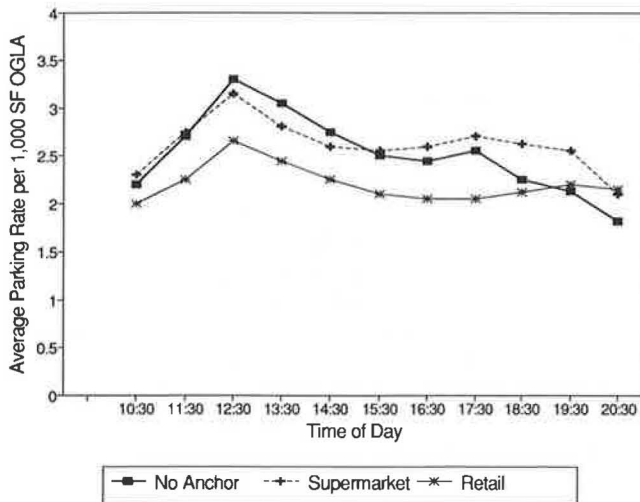


FIGURE 1 Comparison of average hourly parking rates on weekdays by type of anchor store.

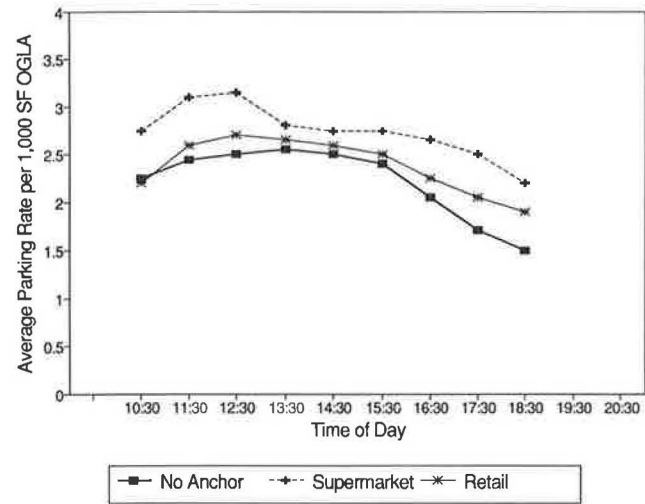


FIGURE 2 Comparison of average hourly parking rates on Saturday by type of anchor store.

parking demand was significantly less than the peak rate: about 80 percent of the midday peak rate. In contrast, the hourly distribution of parking demand rate during midday on Saturdays was not peaked but rather flat or stable particularly at centers with retail anchor stores.

A detailed peak parking duration analysis was conducted to examine those centers that had at least one hour during which a parking demand rate of greater than 4.0 spaces per 1,000 ft² of OGLA was recorded. Of the over 2,000 hourly observations taken at all of the study shopping centers, a parking demand rate exceeding 4.0 spaces per 1,000 ft² of OGLA was only experienced for a total of 40 hr (approximately 2 percent of the total hours observed) at only 14 of the study's centers. However, twelve of these high peak hour rates only marginally exceeded the 4.0 space rate (their peak demand was 4.10 spaces per 1,000 ft² of OGLA or less). Furthermore, over half of the hours (21 hr) occurred at shopping centers with 15 percent or more of their OGLA devoted to restaurants. A detailed discussion of each of the circumstances where a peak parking demand rate exceeded 4.0 spaces per 1,000 ft² of OGLA follows.

Shopping Centers with Greater Than 15 Percent OGLA Restaurants

As noted in the preceding, shopping centers with greater than 15 percent of their total square footage of OGLA devoted to restaurants experienced the highest peak parking rate demand, which occurred at lunchtime on weekdays. Our study contained five such centers. Only one of these centers contained an anchor store, a supermarket. Figure 3 compares the average hourly parking rate distribution of the no-anchor centers by percent restaurant uses. Notably, shopping centers with greater than 15 percent OGLA for restaurants had a significantly peaked hourly distribution compared with the other no-anchor ones. This reflects the lunchtime draw of these restaurants during the day, but there is significantly less parking demand during the rest of the day. Based on all the results, it is clear that shopping centers with 15 percent of

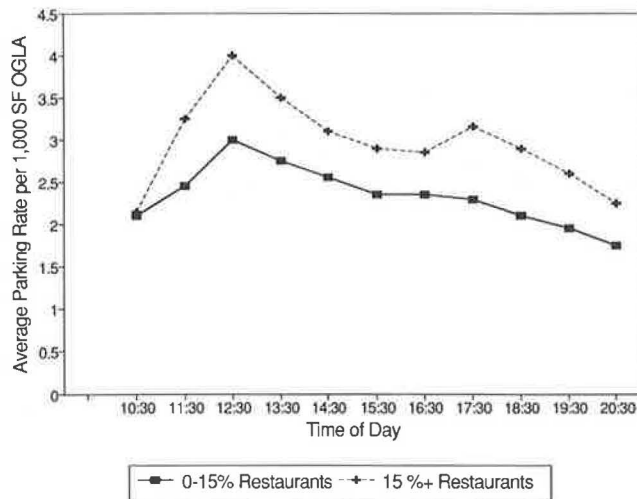


FIGURE 3 Comparison of average hourly parking rates on weekdays at centers with no anchor tenant by percent OGLA devoted to restaurants.

their OGLA devoted to restaurants do comprise a special category of centers that will require additional parking above the proposed 4.0 base rate to accommodate their parking demand.

December Season Peak Demands

For those shopping centers with 15 percent or less of the OGLA devoted to restaurants, the majority of the remaining peak demands that exceeded 4.0 spaces per 1,000 ft² of OGLA (12 out of 18) occurred during December (typically during the Saturday before Christmas) and lasted only one hour. The December peaks at almost all of these centers were significantly higher than comparable rates during June and October, or even their December Friday peak rate. Thus, many of these observations most likely were the yearly peak parking demand. It is also important to note that three of these high parking demands were attributed to special or unusual events that occurred at these centers. Specifically, one center contained a Christmas tree sales booth, one had a large wedding reception, and another had a group meeting.

June and October Peak Demands

Considering only shopping centers with 15 percent or less of their OGLA devoted to restaurants, only 4 centers had peak parking demand rates that exceeded 4.0 spaces per 1,000 of OGLA during the June and October surveys. Most of these higher demand were also attributed to special circumstances such as a crafts fair.

OTHER RESULTS AND OBSERVATIONS

During this study, there was significant evidence that the parking lots in many of studies' shopping centers are used by commuters. A special survey was conducted at all the study shopping centers on weekdays from 8:00 to 9:00 a.m. to as-

certain the effects of commuter parking, if any. The results of this special survey found that it was not uncommon to find 10 to 20 percent of the parking spaces occupied by 9:00 a.m., although few stores, if any, were open by this time. However, the shopping center owners did not want our observers to interfere or mark vehicles parked in their lots, and consequently the counters could not eliminate these commuter vehicles from their hourly counts. Consequently, some of the parking demand rates in this study were higher than the retail draw at shopping centers, because the rates include commuter parking. Thus, our results should be considered conservative.

SUMMARY AND CONCLUSIONS

This study provides a detailed, comprehensive assessment of parking demand for local-serving neighborhood and community shopping centers in Northern Virginia. The data base consists of parking demand surveys conducted at more than 30 shopping centers throughout this area on weekdays and Saturdays during June, October, and December. The objective of this work was to develop a reasonable, accurate, and easily implemented parking standard for neighborhood and community retail centers. In addition, it is desirable to identify a simple base parking rate that can be applied to a wide range of conditions so that small changes in the mix of tenants will not lead to a lengthy regulatory review.

From analyzing this data, it is clear that any assessment of parking demand at retail centers can not ignore the tenant mix. For example, an initial analysis of the data in this study might have lead to the conclusion that smaller centers or ones without an anchor store need more parking spaces than other types center. Such a cursory analysis may not have even found that some of these tenant characteristics, such as small size and not having an anchor store, are related. However, only a detailed analysis could have found that the real issue turned out to be the percent of GLA devoted to restaurant uses. As demonstrated by the results of this study as well as analyzing ITE parking rates, as the percent of restaurant use exceeds 15 percent, the higher parking generation of these restaurants tend to dominate the lower parking generation of retail-merchandise sales uses. In this study, this high percentage of restaurants occurred at several of the smaller, no-anchor centers.

Based on this results of this study, a base parking rate of 4.0 spaces per 1,000 ft² of GLA will provide adequate parking throughout the year at almost all local-serving centers, regardless of the size or most of the factors studied. The factors studied included: the shopping center size, the type of anchor, the presence of freestanding buildings, and other tenant characteristics. The only consistent exception to this 4.0 standard occurred at centers where greater than 15 percent of their OGLA was devoted to restaurant uses. If this situation exists additional parking will be required to meet the demand that will occur. Unfortunately, this study contained only five centers with this high percent restaurants and, consequently, a method of how to increase this base rate for these centers was not derived. At a few centers containing less than 15 percent OGLA for restaurant uses, several with supermarkets, their yearly peak hour or hours in the seasonal Christmas shopping period exceeded this 4.0 base rate. However, this

seasonal peak demand typically exceeded the base rate for only one hour on Saturday between 1:00 to 2:00 in the afternoon. Of the over 2,000 data points collected, these peaks represent about two percent of the total observations. Extrapolating these observation on the few hour or hours exceeding the 4.0 base rate indicates that in less than one-half of one percent of the total operating hours of the worst case center would the 4.0 standard be exceeded. Finally, it should be noted that even this result is conservative because many of the centers contained vehicles parked by commuters and not shoppers.

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