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Trip Generation at Neighborhood Shopping Centers
With Frequent Bus Service

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1.0 Introduction and Purpose

During the past three decades, extensive development of shopping centers of all types has occurred in urbanized areas. These commercial facilities can generate thousands of vehicles daily on nearby streets which may already be congested with other traffic. Various CATS studies have been conducted that determined the number of vehicles that will be generated by different sized shopping centers.

A study completed in 1982 showed that middle-sized neighborhood shopping centers (with gross floor area between 45,000 and 310,000 square feet) can generate as many as 111 vehicle trips per 1000 square feet of retail space. Vehicle counts from that study revealed that up to 20,000 vehicle trips per day could be generated by a medium-sized shopping center. (Each vehicle makes two trips, entering and exiting the shopping center.) Given the pre-existing traffic volume on roads where shopping centers are built, congestion can result, especially when several sites are developed along a single stretch of highway or city street.

Following the 1982 study, the question was raised whether the existence of bus service has an effect on the vehicle trip generation rates at neighborhood shopping centers. It was speculated that frequent bus service might have an effect on the way people travel to shop.

The purpose of this report is to determine if there is a relationship between frequent bus service and the vehicle trip generation rate at neighborhood shopping centers. Specifically this study will answer the question, do shopping centers with bus service have lower vehicle trip generation rates than those without transit service? For this study four new sites were examined and compared with the twelve that were studied in the 1982 report.

2.0 Methodology

The criteria for selecting the four new shopping center sites included the following. First, only centers with a gross floor area between 45,000 and 310,000 square feet of retail space were considered. Second, no centers were selected that had large department stores such as Marshall Field's or Sears. Third, each center had to have direct and frequent bus service with at least four buses per hour. Last, the center's driveways had to be sufficient to install machine traffic counters.

The four shopping centers that were selected were geographically distributed within the city of Chicago (see Exhibit 2 on the next page). All are served by at least one Chicago Transit Authority bus route. All have at least one medium sized anchor store (supermarket, drug store or home center). They range in size from 80,000 to 175,000 square feet of retail space. The sites are listed below in Exhibit 1.

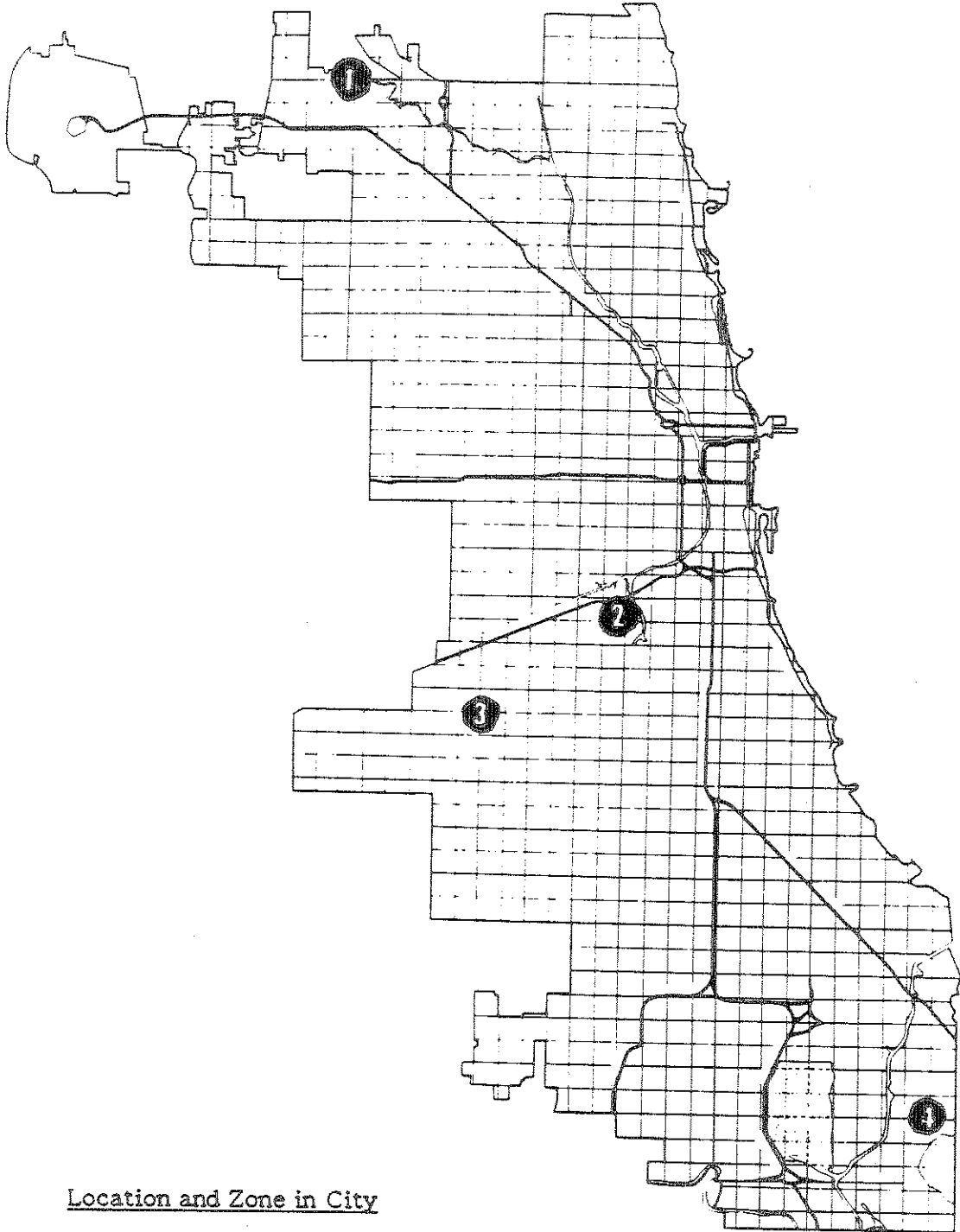
Exhibit 1

Location of Neighborhood Shopping Centers

<u>Site</u>	<u>Location and Zone in City</u>	<u>Square Feet of Retail Space</u>
Devon/Nagle S.C.	Devon/Nagle/Milwaukee, Far North	80,000
Riverside Square	Archer/Ashland, Central	133,000
Courtesy Plaza	52nd/Pulaski, Southwest	82,000
East Side Plaza	118th/Avenue O, Far Southeast	175,000

Each site was inventoried and sketched. Included were the site layout, a list of all tenants and vacancies, parking lots, driveways and adjacent

SHOPPING CENTERS WITH FREQUENT TRANSIT SERVICE
STUDY SITE LOCATIONS



<u>Site</u>	<u>Location and Zone in City</u>
1. Devon/Nagle S.C.	Devon/Nagle/Milwaukee, Far North
2. Riverside Square	Archer/Ashland, Central
3. Courtesy Plaza	52nd/Pulaski, Southwest
4. East Side Plaza	118th/Avenue O, Far Southeast

streets. Traffic counting machines were installed at all shopping center entrances and counts were taken over three complete weekdays (Tuesday, Wednesday and Thursday), whenever possible.

The comparison of vehicle trip generation with transit trips necessitated the use of person trips rather than vehicle trips. This was done to provide a common basis for the comparison since bus riders were counted singularly and those in automobiles tended to travel with two or three persons per vehicle. At each shopping center, person trips by all possible access modes were counted.

A field crew was assigned to conduct weekday traffic volume counts of entering vehicles at all access points. Wherever possible, hourly entering counts were taken over the three day period. Traffic counting machines were installed on Monday mornings and removed on Fridays, yielding at least three full days of counts. Manual counts were also taken so that the machine counts could be factored. The counts were averaged for the three day period. Trip generation studies require that all vehicle trips be counted, so for the purposes of this study, the access counts were doubled to represent both entering and exiting vehicles and are shown below in Exhibit 3.

Exhibit 3

Shopping Center Vehicle Trips

<u>Shopping Center</u>	<u>Total Daily Vehicle Trips</u>
Riverside Square	11,476
Devon/Nagle S.C.	9,262
East Side Plaza	8,836
Courtesy Plaza	4,504

The field crew also observed auto occupancies at these sites. This information allowed the vehicle trips to be converted to auto person trips for comparison with the transit and walking trips. The number of persons per auto during four time periods were averaged together for the entire survey period (9 AM to 7 PM). The occupancy rates range from 1.32 to 1.64 persons per vehicle. Exhibit 4 shows the rate for each shopping center and the factoring of auto trips to person trips.

Exhibit 4

Shopping Center Auto Occupancy Rates and
Conversion of Traffic Volume Counts to Person Trips

<u>Shopping Center</u>	<u>Occupancy Rate</u>	<u>X</u>	<u>Vehicle Count</u>	<u>=</u>	<u>Person Trips Via Auto</u>
Riverside Square	1.64	X	11,476	=	18,821
Courtesy Plaza	1.56	X	4,504	=	7,026
East Side Plaza	1.55	X	8,836	=	13,696
Devon/Nagle S.C.	1.32	X	9,262	=	12,226

The field crew was then assigned to determine the total number of transit trips generated by each of the four shopping centers. All bus stops directly serving these sites were inventoried and counts of passengers going to the shopping centers were conducted over a ten hour period from 9 AM to 7 PM. It was assumed that each person taking a bus to the site would also leave by bus, so the counts were doubled to represent the total trips generated. The results are shown below in Exhibit 5.

Exhibit 5

Shopping Center Transit Trips

<u>Shopping Center</u>	<u>Total Transit Trips</u>
Riverside Square	310
East Side Plaza	142
Courtesy Plaza	20
Devon/Nagle S.C.	12

Persons walking to each of the shopping centers were also counted between 9 AM and 7 PM. Just as the bus trips were doubled, so were the walking trips. As the findings show, the potential for walk-in trips was great since these sites are all located in or adjacent to densely developed neighborhoods. In fact, more walk-in trips were recorded than bus related trips.

3.0 Findings

Presented in this section are the trip generation rates developed as a result of this study. In addition, a direct comparison is presented between the vehicle trip generation rates from this study and the results of the 1982 effort. As will be seen, the availability of frequent bus service does not appear to reduce the need for automobile parking spaces.

3.1 1988 Trip Generation Summary

The results of the data collection efforts are shown below in Exhibit 6. This trip generation table is similar to the one produced in the 1982 study. It shows both physical and traffic related characteristics, including the name, location, size, gross floor area, parking spaces and trip generation

TRIP GENERATION AT NEIGHBORHOOD SHOPPING CENTERS WITH FREQUENT BUS SERVICE

EXHIBIT 6

NAME/LOCATION	STORES	BUS ROUTE NUMBERS	VACANT CRES. SQ. FT.	GROSS SIZE (ACRES)	GROSS FLOOR AREA (SQ. FT.)	PARKING SPACES	VEHICLE TRIPS PER DAY	TOTAL VEHICLE TRIPS		TOTAL PERSON TRIPS		PERSON TRIPS PER 1000 SQ. FT.			
								PER ACRE	PER 1000 SQ. FT.	PER PARKING SPACE	AUTO TRIPS		TRANSIT TRIPS	WALK TRIPS	ALL MODES
DEVON/MANGLE S.C. Chicago	Dominicks, Walgreens, 3 Others	CTA 56A, 91 Pace 211, 270	0	5.25	80,000	349	9,262	1,764	115.8	26.5	12,226	12	108	12,426	155.3
RIVERSIDE SQUARE Archer/Ashland, Chicago	Dominicks, 20 Others	CTA 9, 31, 45, 61, 129	3,000	15.00	133,000	550	11,476	765	88.3	20.9	18,821	310	776	19,907	153.1
COURTESY PLAZA 52nd/Pulaski, Chgo.	Courtesy Home Ctr. 12 Others	CTA 53A 162	0	4.50	82,000	400	4,504	1,001	54.9	11.3	7,026	20	102	7,148	87.1
EAST SIDE PLAZA 118th/Ave. O, Chgo.	Dominicks, Walgreens, Service Merch. 16 Others	CTA 30	0	16.00	175,000	950	8,836	552	50.5	9.3	13,696	142	110	13,948	79.7

rates. The shopping centers are listed in order by vehicle and person trip generation rates.

Person trips and a percent distribution for three access modes--bus, auto and walking--were calculated for each of the four shopping centers. These figures are presented in Exhibit 7.

Exhibit 7

Shopping Center Person Trips by Mode of Access

<u>Shopping Center</u>	<u>A c c e s s M o d e</u>			<u>Total Person Trips (100%)</u>
	<u>Auto (%)</u>	<u>Bus (%)</u>	<u>Walk (%)</u>	
Riverside Square	18,821 (94.5)	310 (1.6)	776 (3.9)	19,907 (100.0)
East Side Plaza	13,696 (98.2)	142 (1.0)	110 (0.8)	13,948 (100.0)
Devon/Nagle S.C.	12,226 (98.4)	12 (0.1)	188 (1.5)	12,426 (100.0)
Courtesy Plaza	<u>7,026</u> (98.3)	<u>20</u> (0.3)	<u>102</u> (1.4)	<u>7,148</u> (100.0)
Total	51,769 (96.9)	484 (0.9)	1,176 (2.2)	53,429 (100.0)

The above table shows that bus trips represent a very small percentage of the total person trips generated by these shopping centers. The percentage of person trips via bus ranges from 0.1% to 1.6% of the total at the four sites in this study. If all of these bus users were to switch to auto, as either drivers or as passengers, the resulting additional traffic would be negligible. The table in Exhibit 8 shows the likely increase in auto traffic if all bus users switched to automobiles. The additional auto trips were calculated using the daily auto occupancy rate for each shopping center.

Exhibit 8

Additional Auto Trips to Shopping Centers
If Bus Service Did Not Exist

<u>Shopping Center</u>	<u>Present Volume</u>	<u>Additional Auto Trips If Buses Were Unavailable</u>	<u>Projected Volume</u>	<u>Additional Auto Trips During Peak Travel Hour</u>
Riverside Square	18,821	189	19,010	(12)
East Side Plaza	13,696	92	13,788	(13)
Devon/Nagle S.C.	12,226	9	12,235	(3)
Courtesy Plaza	7,026	13	7,039	(1)

While walking trips tend to be almost twice as frequent as bus trips, this mode of travel also does not have great impact in terms of the total number of trips generated. An average of only 2.2% of the trips at all four sites involve walking access. The range is from 0.8% to 3.9% of all person trips.

3.2 1982 Comparison

Vehicle trip generation rates in the current study were compared to the vehicle trip generation rates from 1982. Exhibit 9 shows the combined vehicle trip generation data for 16 shopping centers (12 for 1982 and 4 for 1988). Shopping centers that had frequent bus service are in italics and those that are in the current study have the year, 1988, in the left margin.

Exhibit 9

Vehicle Trip Generation Rates for Neighborhood Shopping Centers

<u>RANK</u>	<u>NAME</u>	<u>LOCATION</u>	<u>VEHICLE TRIPS PER 1000 Sq. Ft. RETAIL SPACE</u>
	1. <i>Kennedy Plaza</i>	<i>Chicago</i>	110.7
	2. Cumberland Plaza	Des Plaines	107.1
1988	3. <i>Devon/Nagle S.C.</i>	<i>Chicago</i>	103.3
	4. Eastview Center	Woodstock	97.8
	5. <i>Pulaski/71st S.C.</i>	<i>Chicago</i>	76.1
	6. Palatine Plaza	Palatine	65.9
1988	7. <i>Riverside Square</i>	<i>Chicago</i>	65.5
	8. <i>Market Place</i>	<i>Oak Lawn</i>	60.5
	9. Briarbrook Commons	Wheaton	58.5
	10. Eagle Creek Plaza	Round Lake	57.5
	11. Libertyville Plaza	Libertyville	56.4
1988	12. <i>Courtesy Plaza</i>	<i>Chicago</i>	54.9
	13. K-Mart/Butera Plaza	Addison	53.3
	14. <i>Harlem/Foster. S.C.</i>	<i>Harwood Heights</i>	52.1
	15. K-Mart-Elgin	Elgin	41.5
1988	16. <i>East Side Plaza</i>	<i>Chicago</i>	38.4

NOTE: Italics denotes a shopping center with frequent bus service.

The results of this analysis show that shopping centers with frequent bus service tend also to have comparatively high vehicle trip generation rates. The ranking by the number of vehicle trips per 1000 square feet of retail space shows that five of the eight highest trip generation rates are for transit accessible shopping centers. It appears that available bus service does not reduce the vehicle trip generation rates.

4.0 Conclusions

The data presented in this report suggests that frequent bus service does not affect the volume of auto trips generated by neighborhood shopping centers. In fact, person trips via auto represented almost 97% of the trips at the four bus accessible sites that were studied. Also, when sites with and without transit access were compared, those with bus service generally had higher vehicle trip generation rates. Therefore, the question raised earlier that suggested that shopping centers with frequent bus service have reduced vehicle trip generation rates, could not be substantiated.

Bus accessible neighborhood shopping centers do not attract large numbers of bus users (0.1 to 1.6%). This suggests that there may be some behavioral factors working against the use of public transportation. The most obvious factor is that shopping plazas have an abundance of parking and it is free. Another factor is the type of tenants that locate in these shopping centers. In both the 1982 study and the current effort, virtually all of the study sites had supermarkets, discount stores or home centers, which tend to sell items that are large in size (appliances) or large in amount (groceries) and, therefore, difficult to transport on a bus. Also, it is possible that the

neighborhood shopping centers attract a highly mobile auto user who can drive from plaza to plaza in a manner not conducive to traditional transit service.

As a final note, the evidence suggests that neighborhood shopping centers are principally served by automobiles and the quantity of parking spaces should be the same as at suburban centers. Specifically, the availability of bus service has little impact on the parking required for this type of shopping center.

References

1. Trip Generation Rates for Multiple Family Residential Developments and Neighborhood Shopping Centers in the Chicago Area, Chicago Area Transportation Study, Technical Memorandum 83-01, 1982.
2. Changes in Traffic Operations at Regional Shopping Malls, Chicago Area Transportation Study, Technical Memo 87-1, 1987.
3. Traffic Operations Impacts of Major Regional Shopping Centers, Chicago Area Transportation Study, 1980.