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REPORT NO. UMTA-MA-06-0049-79-3

UMTA/TSC Project Evaluation Series

Case Studies in Reduced-Fare Transit: Seattle's Magic Carpet

Final Report
April 1979

Service and Methods Demonstration Program

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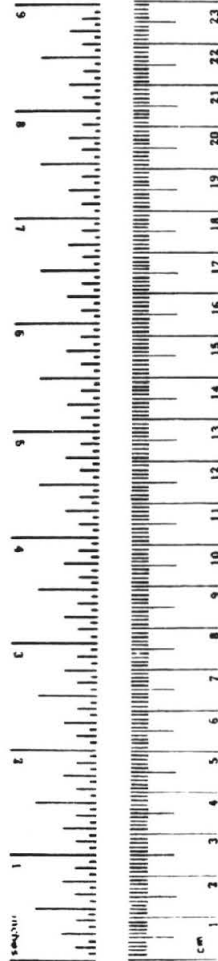
Technical Report Documentation Page

1. Report No. UMTA-MA-06-0049-79-3		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle CASE STUDIES IN REDUCED-FARE TRANSIT SEATTLE'S MAGIC CARPET				5. Report Date April 1979	
				6. Performing Organization Code	
7. Author(s) Steven B. Colman				8. Performing Organization Report No.	
9. Performing Organization Name and Address DeLew, Cather and Company* 120 Howard Street, PO Box 7991 San Francisco, CA 94120				10. Work Unit No. (TRAIS) UM927/R9742	
				11. Contract or Grant No. DOT-TSC-1409	
12. Sponsoring Agency Name and Address U. S. Department of Transportation Urban Mass Transportation Administration Office of Transportation Management and Demonstrations Washington, DC 20590				13. Type of Report and Period Covered Final Report May 1978 - April 1979	
				14. Sponsoring Agency Code	
15. Supplementary Notes *Under contract to: U.S. Department of Transportation Transportation Systems Center Kendall Square, Cambridge, MA 02142					
16. Abstract This report describes the downtown Seattle free-fare zone ("Magic Carpet") in terms of transportation characteristics of the system, characteristics of the area served, and the institutional roles of agencies involved with the program. The report also summarizes some of the operational problems and costs encountered with the service. Results of two user surveys are presented in order to aid the assessment of impacts and benefits relative to costs, including impacts on traffic and parking, air quality, and downtown retail sales. Finally, future plans for the system are reviewed, and a summary of conclusions applicable to other areas is presented.					
<div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 0 auto;"> <p>LACTC/RCC LIBRARY</p> </div>					
17. Key Words Fare-free transit, CBD fare-free transit, downtown improvements, transit pricing			18. Distribution Statement DOCUMENT IS AVAILABLE TO THE PUBLIC THROUGH THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VIRGINIA 22161		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 41	22. Price

METRIC CONVERSION FACTORS

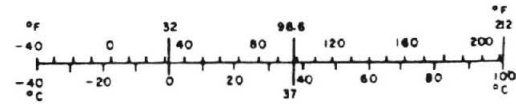
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares (10,000 m ²)	2.5	acres	
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³
TEMPERATURE (exact)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



PREFACE

This report describes the downtown Seattle free-fare zone ("Magic Carpet") in terms of the transportation characteristics of the area served, and the institutional roles of the agencies involved with the program. The report also summarizes some of the operational problems and costs encountered with the service. In addition, the impacts on users and non-users of the service, traffic and parking, air quality and downtown retail sales are assessed. Future plans for the system are reviewed, and a summary of conclusions applicable to other areas is presented.

Only available information was synthesized for this study; thus not all issues regarding fare-free systems could be resolved. Future research, particularly the Service and Methods demonstration projects in Denver, Albany, and Trenton, will hopefully be able to better answer some of these questions.

This case study evaluation was prepared by DeLeuw, Cather and Company. Steven Colman (San Francisco) is the principal author. The report was prepared for the Transportation Systems Center (TSC) of the U.S. Department of Transportation under Contract No. DOT-TSC-1409 as part of UMTA's Service and Methods Demonstration Program.

The author wishes to thank Rod Armour of Seattle Metro for his cooperation in providing information for this report.

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EXECUTIVE SUMMARY

Seattle's downtown free-fare zone, known as "Magic Carpet", was begun in 1973 in a one-half square mile area of the CBD. Buses passing through the zone, operated by METRO Transit, are free during all hours and days of the week. The service is paid for in part by a bi-annual grant from the City of Seattle from general revenue. The amount of the subsidy is currently \$166,000 per year. The free-fare zone has been expanded twice, in 1974 and 1978. The original zone covered the primary tourist retail, and office centers of downtown Seattle. Subsequent expansion, which has increased the area of the zone by a third, has encompassed an urban renewal area with some residential uses.

The free-fare zone has had the following identifiable impacts:

- Intra-CBD transit ridership has tripled, from 4,100 to 12,250 trips per day.
- Most of the new trips have been attracted during the mid-day period, from 11 AM to 2 PM. About half of all trips involve a purchase of some kind, although work-related trips are significant relative to the other trip purposes.
- Free-fare passengers generally have a higher income than their counterparts on the rest of the transit system.
- Of those who made their trip prior to free-fare, most either walked (45 percent) or rode the bus (41 percent) before the inception of free-fare service. The frequency of bus use by those riding before free-fare service has increased dramatically.
- The new fare collection method instituted with Magic Carpet was quickly grasped by riders. Occasional problems still occur with tourists or infrequent users of the system.
- The free-fare service may slow systemwide bus operations slightly: this is due to the greater passenger loads attributable to the free-fare zone, and because outside the free fare zone the pay-on-exit system slows the de-boarding of crowded buses during the PM peak. Balanced against this is the elimination of fare collection on boarding in the PM peak, which was found to decrease the boarding time per passenger by nearly 20 percent. The net effect is indeterminant.
- Other non-user impacts--on traffic, parking, and air quality--have been minor. Around 900 vehicle trips have been eliminated from downtown streets, (mostly during the mid-day) which represents about 2 percent of the intra-CBD traffic volume. Magic Carpet has not encouraged peripheral park-and-ride by downtown workers to any measurable extent.

1.0 PURPOSE AND SCOPE OF STUDY

This report is one of several case study evaluations of reduced and free-fare transit in central business districts. The purpose of the series is to provide guidance for other communities considering innovative techniques to increase transit usage and stimulate activity in the downtown area. Seattle has one of the oldest and most comprehensive CBD free-fare transit programs in the United States. Begun in September 1973, the free-fare zone has been expanded twice since that time and now covers virtually the entire retail and office core.

This report evaluates the impacts of the free-fare zone upon users, suppliers, and non-users of the service. The data presented here were developed from studies by others as well as interviews with key individuals familiar with the system. It should be noted that only available information was synthesized for this study, and that no new data was collected. While the report highlights the major issues regarding the effects of the free-fare zone, not all these issues could be resolved due to data limitations. Future research, particularly the Service and Methods Demonstration projects in Denver, Albany, and Trenton, will hopefully be able to better answer some of these questions. A major objective of this report was to be as brief as possible; the interested reader can refer to more detailed reports listed in the last section.

Some of the distinguishing topographic and demographic characteristics of the Seattle area are highlighted in Section 2. The historical background of the free-fare zone is discussed in Section 3, along with a general description of the service. Section 4 deals with the important impacts of the service, including:

- User Impacts

- Patronage
- Trip Purpose
- Prior Mode of Travel
- Hourly Distribution of Trips
- Income Characteristics of Users
- Regional Transit System Ridership

- Operator Impacts

- Delay to Buses
- Operating Costs

- Non-User Impacts

- Traffic and Parking
- Air Quality
- Retail Sales Stimulus

2.0 SETTING

2.1 The Metropolitan Area

Seattle is the major focus of a metropolitan area encompassing 1.4 million persons. It is similar in size to Atlanta, Buffalo, Cincinnati, and San Diego. The region has a relatively low population density, with about 3,000 persons per square mile. The residential development in the region is interrupted in many places by mountains and large expanses of water (see Figure 1). This exacerbates transportation problems, since a large portion of traffic is funneled through a few key routes.

Seattle itself is an inland seaport city, bordered on the west by the navigable waters of Puget Sound and on the east by Lake Washington. Development in the city is primarily along a north-south axis, narrowing to about 2½ miles in the downtown area. In contrast to its region's low population density, many areas in the City of Seattle have a higher-than-national average density, in some areas as high as 25,000 persons per square mile. The Seattle population also enjoys a fairly high family income; in 1977, the Department of Housing and Urban Development estimated the median family income as \$18,500 per year, as opposed to the national average of \$16,009. The cost-of-living in the area is also about the same as the national average for metropolitan areas.

Regional and local transit service in the area is provided by the Municipality of Metropolitan Seattle, commonly known as METRO. METRO currently operates a fleet of 711 diesel and trolley buses. METRO operates all major transit facilities in the region, including the monorail system, although the latter is owned by the City of Seattle.

2.2 The Downtown Seattle Area

Downtown Seattle is set on the slopes of hills facing Puget Sound. Many of the east-west streets have grades of ten percent or more. Because of this, and the narrow width of the downtown area, most development has occurred along a north-south axis. This orientation extends throughout much of the metropolitan area. Only the waterfront and the retail core are situated on relatively level ground. Figure 2 depicts the various land uses in downtown, and a description of these uses follows.

At the southern end of the Magic Carpet zone is the Kingdome (King County Stadium) and the International District, the latter containing many residences and businesses of Seattle's Asian community. The Pioneer Square area is the original site of downtown Seattle. This area, having gone through a period of disuse, has in the last decade become a major concentration of restored and renovated office and retail space. Much of this area caters to tourists and the downtown working population. A number of turn-of-the-century buildings in this area provide an historical and cultural focus for Seattle.

New high density residential and office construction is occurring on the eastern side of the Regrade area.....

.....while older, low-intensity land uses still predominate on the west side.

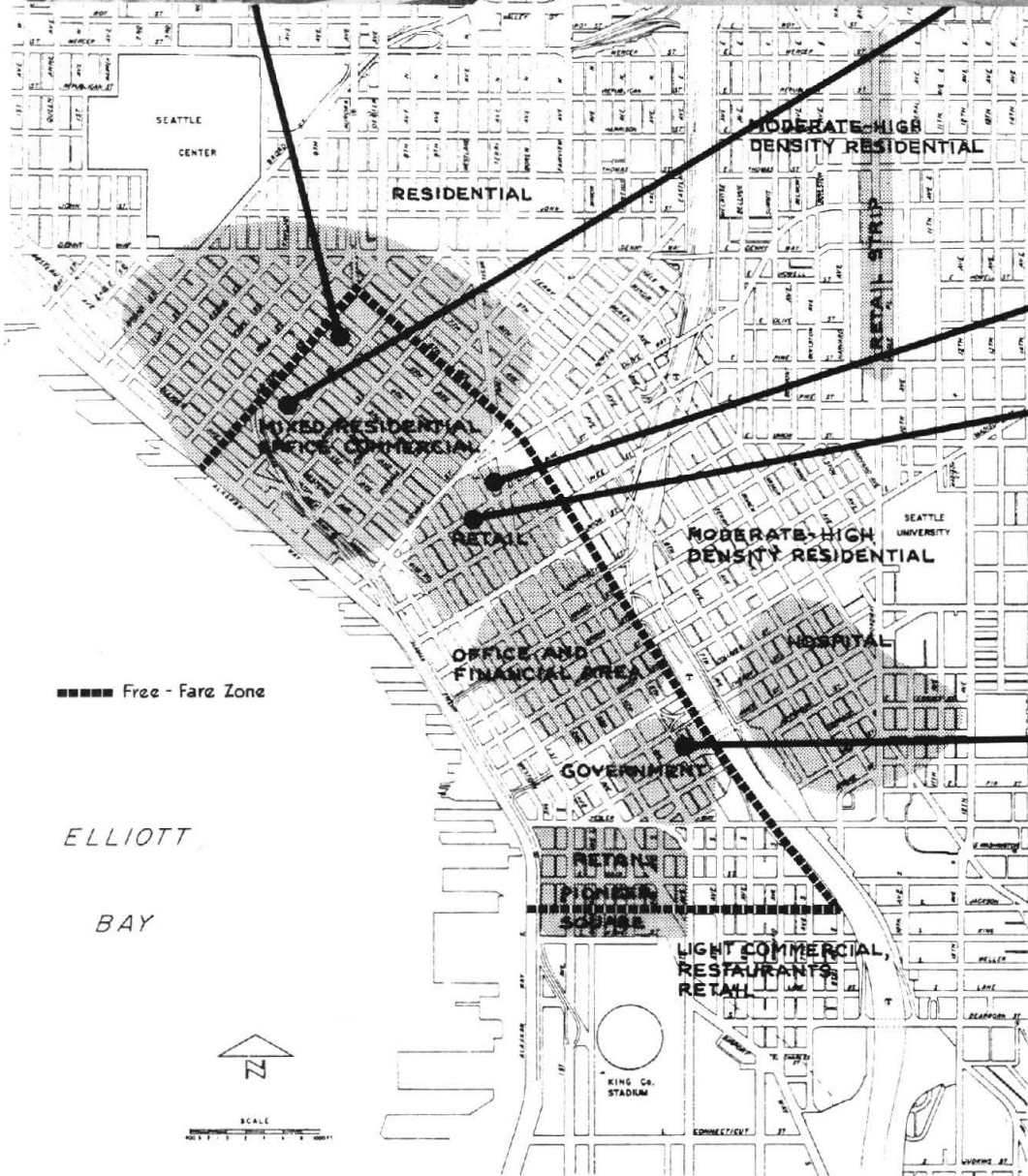
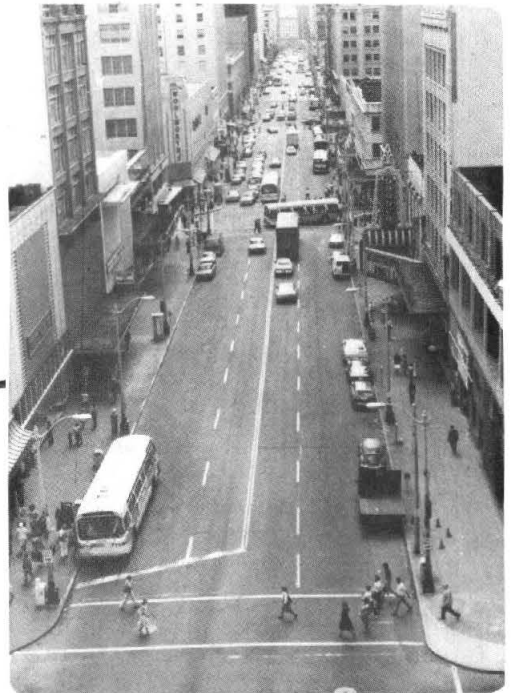
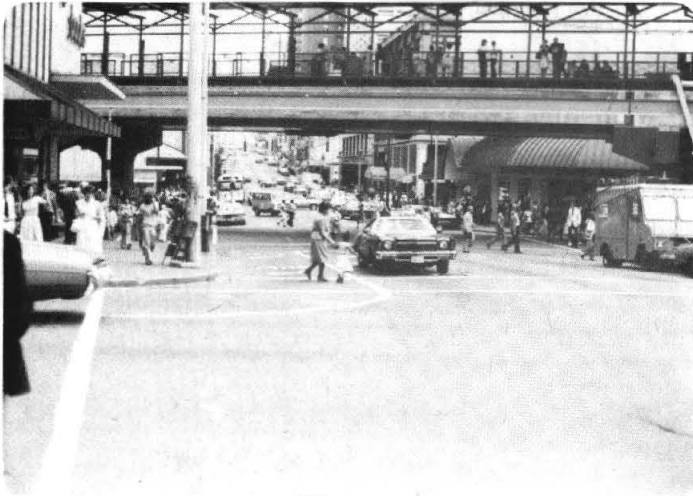


Figure 2
LAND USE IN
DOWNTOWN SEATTLE

Noon hour shopping crowds in retail area at 4th and Pine. The upper part of the picture shows patrons waiting for the monorail, which travels north through the Regrade area to Seattle Center.



View looking south on 3rd avenue during the noon hour. Peak hour congestion is considerably worse than this scene.



Steep hills limit the ability of buses and pedestrians to travel cross town, as this view demonstrates. The waterfront is in the background.

Immediately to the north of Pioneer Square, one encounters government buildings and then the office core of the CBD. The center of retail activity is located about a quarter mile north of the office center. Three major department stores are located here. Pioneer Square and the retail center are separated by about one mile.

North of Stewart lies the Denny Regrade, which until recently consisted entirely of land-extensive uses (motels, auto sales and service, parking lots, and so on). However, much of the area is now being redeveloped for office and residential use. The photograph below shows an aerial view of the downtown area, with the Regrade area in the immediate foreground.



Figure 3
VIEW LOOKING SOUTH FROM THE
REGRADE AREA.
(Photo courtesy of City of
Seattle)

Downtown Seattle has been undergoing rapid growth in the past 15 years, with the exception of a local recession in 1970-1972. The increase in new and renovated office space in the past eight years is depicted in Figure 4 (following page). Figure 5 shows that the major concentrations of employment are bounded by Second and Fourth Avenues.

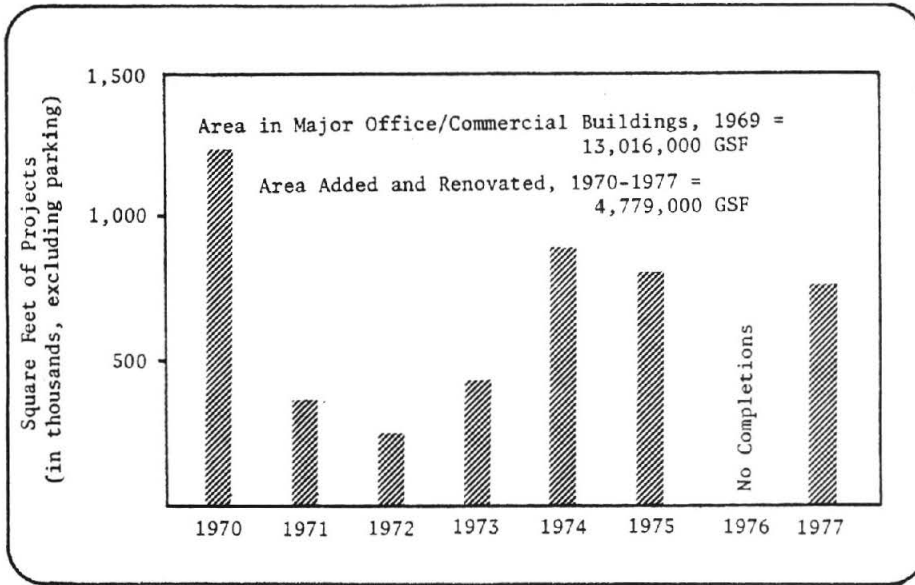


Figure 4
 MAJOR OFFICE AND
 COMMERCIAL BUILDING
 PROJECTS IN SEATTLE
 CBD, 1970-1977
 (Includes all pro-
 jects costing over
 \$500,000, including
 renovations)

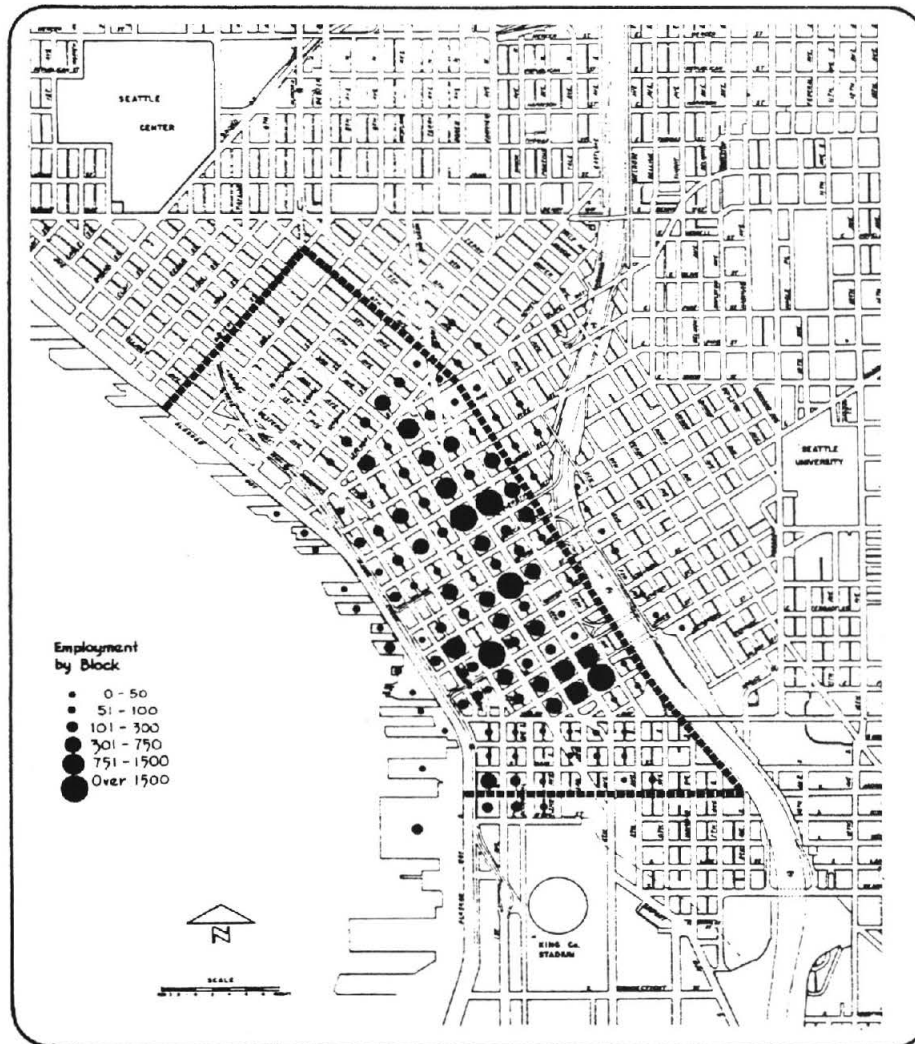


Figure 5
 EMPLOYMENT BY BLOCK
 IN DOWNTOWN, 1972.
 EMPLOYMENT IN DENNY
 REGRADE IS OMITTED.
 THE EMPLOYMENT IN
 THAT AREA HAS
 CHANGED DRAMATICALLY
 IN RECENT YEARS.

2.3 METRO Service

The Municipality of Metropolitan Seattle (METRO) is a special purpose government agency. Its transit responsibilities began in 1972, when voters authorized its takeover and operation of Seattle Transit and a private suburban bus operator. METRO is governed by a Metropolitan Council, consisting of elected officials representing local jurisdictions. Transit service is provided to most of the urbanized portions of King County, including the City of Seattle.

Table 1 gives a brief overview of the METRO Transit system. The table does not show the rapid rise in patronage and operating fleet METRO has been experiencing in the past years. For example, patronage between 1977 and 1978 rose nearly 13 percent. The transit modal split to the CBD during peak hours is around 35 percent, while the all-day mode split region-wide is 4 percent.

Table 1
FACTS AND FIGURES ON METRO TRANSIT, 1978

Average Weekday Revenue Passengers	168,000
Total Operating Budget	\$47.1 million
Number of buses	711
Number of Employees	1,747
Average Operator Wage	\$8.30/hour
Bus Hours Operated per Year	1.8 million
Service Area	2,100 square miles (5,460 square km)
Number of Routes Operated	100

3.0 SERVICE DESCRIPTION AND EVOLUTION

3.1 Institutional Roles

Downtown free-fare transit was proposed as early as 1970 in a study of the feasibility of a transit mall on Third Avenue. The free-fare system was seen as a means of speeding the loading and unloading process in the CBD, thereby increasing the capacity of the few major streets running through downtown. However, no action was taken on this proposal until 1973, when the Mayor of Seattle proposed the idea to the City Council and METRO Council. There are a number of reasons why the free-fare zone was supported by various individuals and agencies:

1. The City had already made a strong financial commitment to redeveloping Pioneer Square. Since this area is somewhat removed from the major activity centers downtown, the free-fare policy seemed a good way to strengthen it and encourage its use. It was felt that attempts to improve auto access to the area (e.g., with parking structures) would destroy the historical flavor of the area.
2. METRO's operational responsibilities for public transit were new, and the free-fare zone contributed to METRO's image of being an innovative, responsive organization.
3. The program enjoyed fairly high visibility at relatively low cost, and received support from local newspapers.
4. The idea was popular with the downtown business community, and no organized opposition to the program appeared.

Negotiations between METRO and the City of Seattle centered around the amount to be paid to offset lost fares. For some time, a "Dime Shuttle" bus had been running in the CBD on five minute headways from 10AM to 3 PM on work days. About 58 percent of all intra-CBD bus trips were carried by the Dime Shuttle. The fares collected on this bus totaled about \$64,000 in 1973. The Dime Shuttle was discontinued and the City paid METRO the amount of the lost fares. The free-fare policy was experimental and instituted on a one-year trial basis, with no funding guarantee for subsequent years. In early September 1973, only a few months after the idea had been first publicly aired, Seattle free-fare service began in a 105 block downtown area. The service was dubbed "Magic Carpet", and special signs were put up explaining the service to bus patrons. The boundaries of the free-fare zone were generally chosen to cover the same area served by the Dime Shuttle.

Legal and political opposition to the service was minor. There was some opposition from taxi companies, but taxi firms in Seattle are generally

not well-organized politically. There were no legal challenges to the use of City general funds for supporting Magic Carpet service.

3.2 Characteristics of the System

The Magic Carpet zone is currently 1.3 miles long in the north-south direction, and 0.4 miles wide in the east-west direction. There are about 140 city blocks in the zone. All buses and stops within the Magic Carpet area may be used by free-fare patrons although use of express buses is discouraged. The only service change which has occurred as a direct result of Magic Carpet is the provision of 25 additional bus hours of service in the CBD during the noon and PM peaks in order to accommodate the greater loads experienced during those hours. The additional noon service was accomplished by re-routing certain buses through the CBD which had formerly by-passed it. The problem with pronounced noon hour peaking occurs because of excessive demands on the system by downtown employees during their lunch hour. This problem is discussed more fully in Section 4.2.

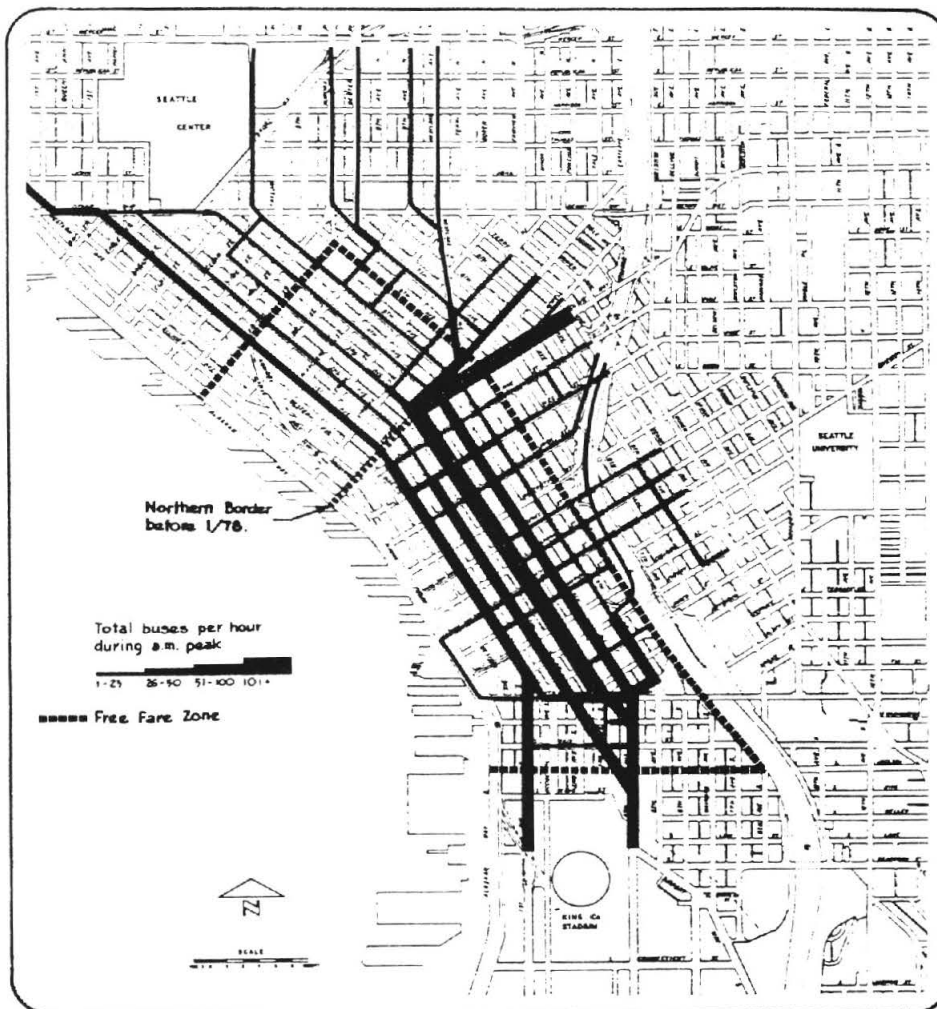


Figure 6
CURRENT TRANSIT
SERVICE DURING
A.M. PEAK IN
DOWNTOWN SEATTLE

Some unconventional equipment used by METRO includes a recent order of AM General buses with double-width center doors (see Figure 7). These doors are particularly useful in the CBD, because loading is permitted through all doors. Thus, peak hour passengers can be loaded in about two-thirds the time of conventional loading arrangements. In addition, 150 sixty-foot articulated buses are now being delivered, which have two double-width doors.

METRO Transit operates about 6,500 bus trips per day through the free-fare area; about 85 percent of all its routes pass through the zone. Service is provided between the Alaskan Way on the waterfront to Fifth Avenue on the east, as shown in Figure 6. East-west cross-town service traversing the steep slope of the southerly portion of the downtown area was recently begun. Two-way service is now provided on Cherry Street east of Third Avenue, and on the Marion/Madison and Spring/Seneca one-way couplets, east of First and Third Avenues, respectively. Established east-west routes cross the flatter retail core, principally via the Pike/Pine and Olive Way/Stewart Street couplets. A typical bus stops sign used in the CBD is shown in Figure 8. At many CBD stops, route schedules and a system map are displayed.



Figure 7
DOUBLE-WIDTH (44) CENTER DOORS
ON METRO BUSES



Figure 8
TYPICAL BUS STOP SIGN IN CBD IN USE IN 1978.
Bus route numbers are given; the "Magic
Carpet" designation has given way to the
"Ride Free Area."

Before Magic Carpet was implemented, METRO charged a single-zone fare of 20 cents for regular buses in the CBD, and 10 cents on the Dime Shuttle bus. Abolishing fares within the CBD presented some technical problems concerning fare collection for trips into or out of the downtown. The system implemented has been unchanged since first introduced; it involves paying on exit for trips leaving the CBD, and paying on entry for trips travelling toward the CBD. Thus, a passenger travelling inbound toward downtown pays normally (on entry) until the bus reaches the boundary of the free-fare zone. After that point, passengers may board or exit without paying a fare using all doors. When the bus reaches the other side of the free-fare zone on its journey outbound, a passenger pays only on exit from the bus.

Seattle formerly used a zone-based system of fare collection, and essentially the free-fare area became just another zone. The only complication occurs when a patron wants to ride through the free-fare zone. In that case, the patron must ask for a transfer on boarding an inbound bus, which is surrendered to the driver on exit on the outbound portion of the trip.

3.3 Expansion of the System

Two expansions of the system have occurred since 1973. The first of these extensions occurred in the International District in 1974. This was a minor expansion, involving just four additional bus stops. The expansion occurred because the area appeared to be logically within the free-fare zone boundaries; the area had an interesting "ethnic flavor", and the cost of the expansion was rather minor in terms of foregone fares.

The second expansion was into the Denny Regrade area (see map, Figure 2). This expansion was larger in extent and involved substantially more controversy than the expansion into the International District. While this extension had been under study for several years, it was not implemented until January 1978. A number of factors motivated support for the expansion. The City has a policy of promoting in-town living in the Regrade, and extension of free-fare service to the area was a way to make the Regrade a more desirable residential area. Also, it was hoped that the extension would encourage more parking on the periphery of the CBD. While the behavior of travelers and real estate developers cannot be solely attributed to Magic Carpet, it should be noted that new residential construction in the Regrade has continued at a rapid pace, while little peripheral parking apparently is taking place.

The only major issue was how far north to extend the Magic Carpet zone into the Regrade area. As additional blocks are added to the free-fare zone, the subsidy cost for the City rises in greater proportion than the number of blocks added, because the Seattle Center area attracts a large number of trips. Due to the cost, it was decided to expand the free-fare zone to cover most, though not all, of the Regrade area.

3.4 Sources of Funds and Subsidy Administration

The City of Seattle pays for nearly all of the incremental costs of the Magic Carpet service. The City's primary source of revenue is a general property tax. METRO's attitude has been that the benefits of Magic Carpet accrue primarily to a relatively identifiable group of passengers and businesses in the CBD. Since METRO is a regional transit operator, it has maintained that it would be unfair to expect the majority of its constituency, who may seldom or never use Magic Carpet, to subsidize those who do. METRO has not opposed expansion of the Magic Carpet zone, so long as the City is willing to pay the cost; however, METRO itself has not proposed any extensions of the Magic Carpet service.

Until the extension to the Denny Regrade, all subsidy payments were financed by an appropriation from the City's general fund. The first year (trial) appropriation was based on the prior year's farebox revenue of the Shoppers' Shuttle (\$64,000). The subsequent renewals of the subsidy have been for two year periods. After the first year of operation, METRO determined it was encountering delays just outside the free-fare zone for which it sought compensation from the City (see Section 4.2 for further discussion). At the same time, the City claimed that METRO was benefiting from greater ridership on its regional system as a result of Magic Carpet. Ultimately, this led to an upward adjustment in the subsidy to \$100,000 per year in 1975.

The service to the Denny Regrade was financed slightly differently. Because this extension provided identifiable benefits to a developer in the area, the cost of the service increment was split 50/50 between the developer and City for the years 1977-1982. The added cost of service to the Regrade area (in lost fares) was \$22,000 per year. There have been discussions, though no formal proposal, to place some of the financial burden on downtown businesses. The support of the service by a real estate developer may be a precedent for increased transfer of the subsidy cost to business.

4.0 EVALUATION AND ANALYSIS OF THE FREE-FARE ZONE

4.1 User Impacts

This section discusses the demand-oriented aspects of the Magic Carpet service, including the level of usage (patronage), the purpose and hourly distribution of trips, the income characteristics of users, and increased demand on the regional transit system.

4.1.1 Patronage

Between July 1973 and May 1974, transit ridership within the free-fare zone rose from 4,100 to 12,250 trips per weekday. The 1973 survey was conducted approximately three months before the beginning of Magic Carpet service, and includes ridership on both the regular fare and Dime Shuttle buses. METRO planning staff feels that this number has probably risen to somewhere between 13,500 and 16,000 trips daily in 1978, although no conclusive evidence is available to support this. Although a 1977 origin-destination study was conducted by METRO, there were problems with weighting this data in order to make valid comparisons with the 1974 survey. To put patronage in perspective, Magic Carpet riders constitutes about 7-8 percent of total system ridership, and the estimated employment of the Magic Carpet zone in 1974 was 70,000. While the downtown workforce has undoubtedly increased in the last few years, the increase between 1973/74 is probably insignificant when compared with the three-fold increase in patronage. The increase in patronage indicates that the fare of 10 or 20 cents was a substantial impedance to transit use for short intra-CBD trips.

4.1.2 Trip Purpose

Figure 9 shows the results of surveys of trip purposes on Magic Carpet in 1974 and 1977. No data on trip purposes before free-fare service is available for comparison. Interpretation of the figure can be misleading, however, without a few qualifications.

First, the survey phrased the trip purpose question differently in the two surveys (see Appendix A). In 1974, a single question was asked regarding "the purpose of this trip." In 1977, two questions were asked, one regarding origin of the trip, and the other regarding the destination. It is very likely that, in the 1974 question, riders could have interpreted both the "going" and "return" portion of the trip as being the same, i.e. a shopping trip during lunch might have been considered "for shopping" even though the rider was actually returning to work. This would help explain why the number of work-related trips appeared to jump from 28 to 39 percent between the two surveys. "Work-related" trips are mostly lunch-hour employees returning to work, not the traditional home-to-work trip. Second, different weightings were applied to the 1974 data using spot checks of riders.

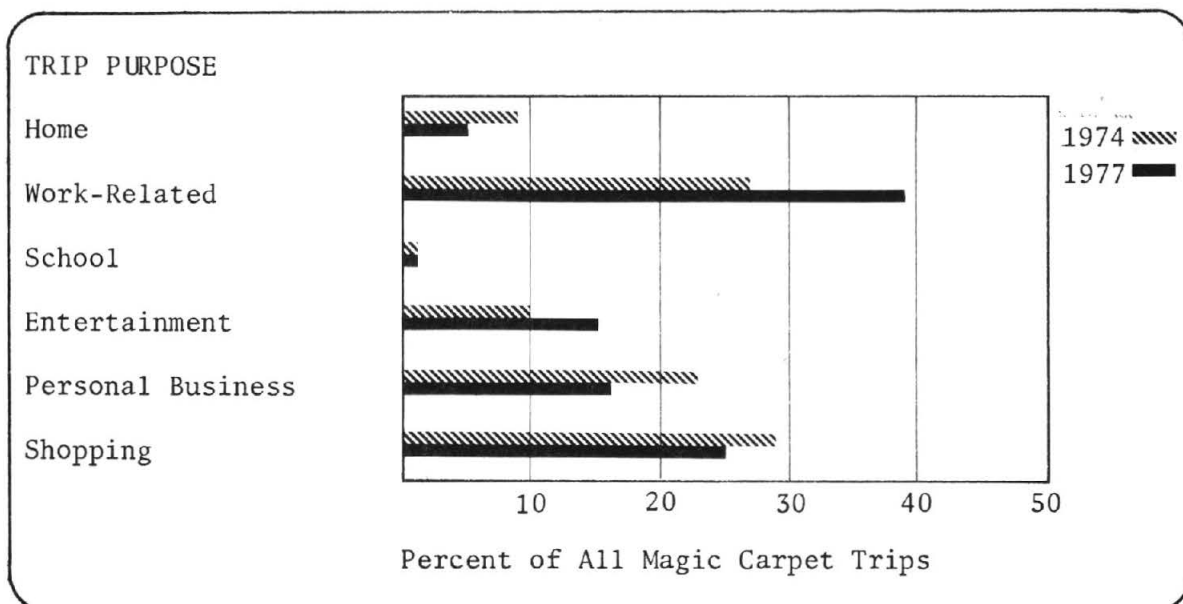


Figure 9
TRIP PURPOSE FOR FREE-FARE BUS TRIPS IN SEATTLE CBD, 1974 AND 1977

The low number of trips destined for "home" can be attributed to the small residential population of the zone, about 3,300 persons. In summary, we can note that there probably has been very little change in the trip purposes of riders between 1974 and 1977.

4.1.3 Prior Mode of Travel of Magic Carpet Users

The 1974 survey asked patrons whether they had made the present trip prior to Magic Carpet service, and if so, by what mode of travel (see Figure 10). Slightly over 25 percent of the respondents said they had never made the trip prior to Magic Carpet service. It is likely that a large number of these trips were actually made but to a different destination by walking. It is reasonable to presume that those who switched destinations after Magic Carpet service began made some trip during their lunch break, most likely by walking.

Figure 10 shows that, of those who did make a trip prior to Magic Carpet, nearly half (45 percent) were made by walkers. Former auto drivers formed a small but not insignificant share (11 percent) of Magic Carpet users, while diversion from taxis was negligible (less than two percent). The diversion of auto trips implies that 900-1000 fewer vehicle trips per day may be attributed to Magic Carpet service. It is also possible that some of this modal diversion could have occurred in spite of Magic Carpet; there may have been permanent changes in behavior induced by the gasoline shortage, which occurred between the times the two surveys were taken. It is also interesting to note that as many as 25 percent of all Magic Carpet users may end their trip outside the free-fare boundaries, by walking a few blocks to a free-fare stop.

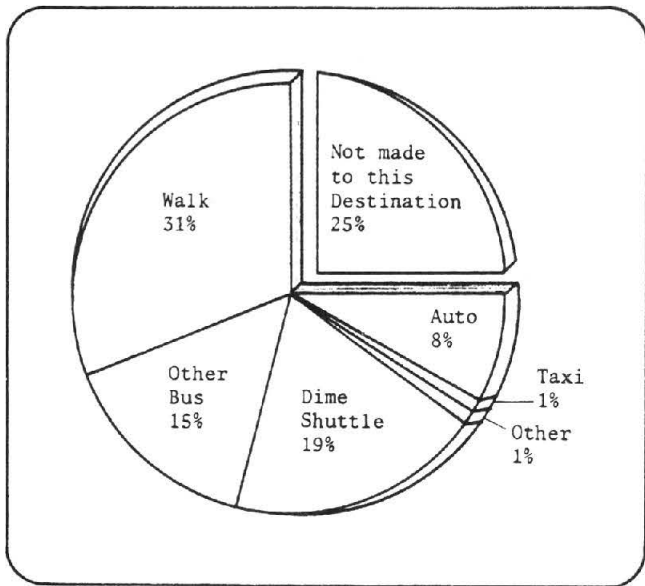


Figure 10
MAGIC CARPET RIDERS' MODE OF TRAVEL PRIOR TO FREE-FARE SERVICE (Based on 1974 survey)

4.1.4 Hourly Distribution of Trips

Figure 11 shows a comparison of the hour of boarding for Magic Carpet riders in 1973 and 1974. The comparison shows that during the AM period, the number of passengers carried before and after Magic Carpet did not change greatly. Where the two periods differ substantially is

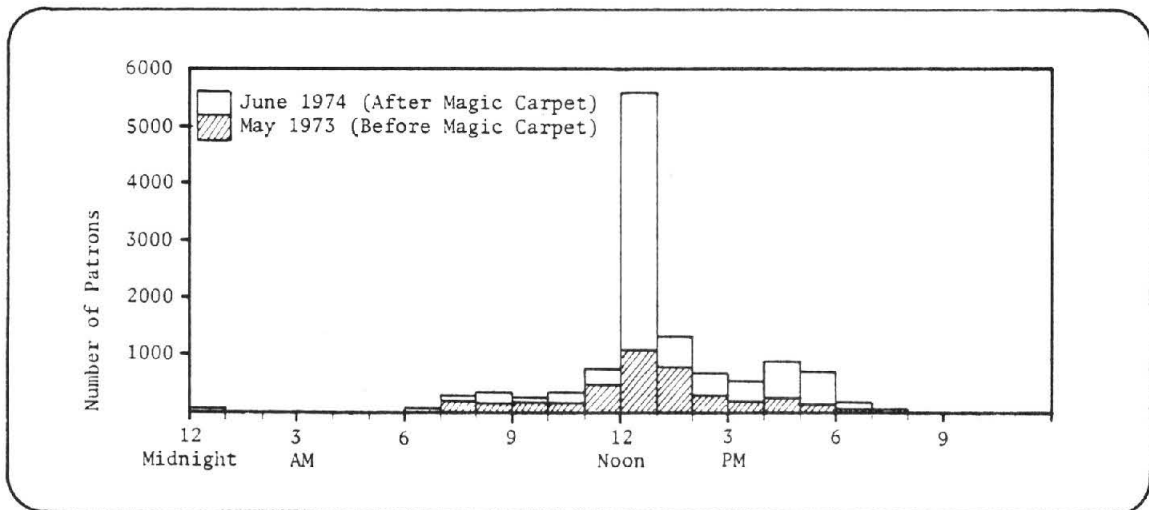


Figure 11
BOARDING HOUR FOR INTERNAL CBD BUS TRIPS

in the number of passengers carried between noon and 2 PM, namely, the lunch hour peaks of office workers and those visiting the downtown. After 6 PM, the trips made via free-fare buses again fall back to roughly the same rate as before free-fare was instituted. Apparently, free-fare in Seattle is not able to capture a significant number of nighttime trips for shopping and entertainment. This is in spite of the fact that the city has a substantial amount of nighttime activity, including entertainment and stores which remain open in the evening. This effect may be partly attributed to the availability and lower cost of evening parking in the CBD and relatively infrequent bus service in the evening hours.

4.1.5 Income Characteristics of Free-Fare Patrons

Users of the free-fare zone tend to have a higher income than transit riders in general (\$10,000 vs. \$8,100 per year in 1974). This is because, typically, CBD employees receive higher wages than do employees in outlying areas. The median family income for all CBD employees at the time of the survey was \$9,700. There also appears to be a substantial number of professional and managerial personnel using the Magic Carpet service for work-related trips.

4.1.6 Use of the Regional Transit System

A final demand-oriented impact of the free-fare zone is the stimulus to ridership on the transit system outside of the zone. A limited amount of information is available to assess the significance of this impact from an attitude survey of 642 downtown employees. About 7 percent of those surveyed (representing an inferred population of 4,900 persons) said they rode the bus more often outside the free-fare zone as a result of Magic Carpet service. However, nothing was asked about how frequently such trips were made. A reasonable bracketing of this number would be one additional round-trip made once every week to two weeks. In that case, between 1,000-2,000 one-way trips daily on the regional transit system are attributable to Magic Carpet.

4.2 Operator Impacts

4.2.1 Delay to Regional Transit Buses

One impact of Magic Carpet which was not anticipated in 1973 was the delay to regional transit buses just outside the free-fare zone. This occurs primarily during the afternoon peak, when the major flow of passengers is away from the CBD. Since passengers pay on exit, only the front door of the bus (near the driver) can be used for exiting. If a bus is carrying many standees, the problem is exacerbated as passengers must work their way to the front door of the bus in order to exit.

Seattle is particularly vulnerable to this problem because the downtown is surrounded by high-density residential areas served by trolley routes with heavy patronage and high turnover. There are also many elderly who live in retirement housing along these lines. The added loads created with Magic Carpet slowed the operation of many of these high-volume lines.

In order to measure the delay attributable to the change in fare collection method used by Magic Carpet, more than 150 bus trips were timed before and after implementation of the free-fare zone. These measurements were made before the arrival of buses with double center doors; in addition, a 16 percent increase in systemwide patronage occurred between the "before" and "after" measurements. Much of the systemwide patronage can be attributed to the gasoline shortage in Winter 1974.

Within, the free-fare zone, it appears that the additional delay to buses may amount to some 11-40 seconds per trip, depending on the route. Outside the free-fare zone, three locations were surveyed. Only one showed a significant increase in travel time (about 45 seconds). The "before" and "during" time differences on the other two streets were about the same as the variations in ordinary day to day bus operations and were not statistically significant. Boarding of passengers during the PM peak downtown appears to have been speeded-up because of the use of both front and center doors. During the AM peak and mid-day, however, buses are slowed as much as a half minute on the portion of their trip within the free-fare zone.

It is difficult to determine the net delay to buses due to Magic Carpet's fare collection mechanism, except to say that there is some added delay involved. It is likely that, within the constraints in vehicle and driver scheduling faced by most transit systems, the delay would not represent a significant cost.

Measurement of passenger loading times inside the free-fare area shows that two-door, fareless loading has reduced the average time required to load or unload a passenger from 2.8 to 2.3 seconds (18 percent). If so, this would represent a savings of 25 seconds to a fully loaded bus in the CBD (.5 seconds x 50 passengers).

4.2.2 Operating Costs

Figure 12 represents METRO's assessment of the incremental costs of the Magic Carpet service in 1977/78 (not including subsidy payments from the City of Seattle). An explanation of each cost item follows:

- Dime Shuttle Farebox Revenue: The Shuttle carried an average of 2,370 patrons per day before Magic Carpet was instituted. At a fare of ten cents per trip, this amounts to about \$64,000 per year. The patronage estimate has not been updated since 1973.

METRO COSTS		Total \$425,014	SOURCES OF FUNDS	
	Service Extensions	\$43,775	Metro	\$24,265
	Additional Coach Hours Run	\$176,964	City of Seattle	\$166,275
	Fare Evasion	\$350		
	Added Sign Maintenance	\$2,925		
	Lost Intra-CBD Farebox Revenue (other than Dime Shuttle)	\$138,000	Savings from Discontinuance of Dime Shuttle	\$225,474
	Lost Dime Shuttle Farebox Revenue	\$64,000		
			Private Developer	\$10,000

Figure 12
MAGIC CARPET COSTS ESTIMATED BY METRO FOR 1978

Source: METRO Transit Planning Department

- Lost Intra-CBD Farebox Revenue: The 1973 origin-destination survey estimated there were about 1,730 regular-fare trips made within the CBD on an average weekday. Using METRO's current base fare of 30 cents, this results in a loss of farebox revenue of \$138,000.
- Additional Coach Hours: This figure represents METRO's claim for compensation as a result of bus delays caused by paying-on-exit in the PM peak, as well as additional service added to meet the needs of the noon hour peak. A coach was added to the base service of many of the short, high density lines. A total of 7,595 coach hours of service is provided each year, calculated at an average cost of slightly over \$23 per coach hour. This represents about 1 percent of the daily bus-hours of METRO service. Whether such costs should be fully allocated to the cost of operating Magic Carpet is not clear, since it is likely that much of the operator and vehicle cost would be incurred even in the absence of the free-fare zone.

- Fare Evasion: This is METRO's estimate of the additional fare evasion attributable to the "pay-on-exit" system.
- Sign Maintenance: At the inception of service, METRO placed signs explaining the service at every bus stop in the CBD. These 117 signs have subsequently been removed, but were estimated to cost about \$20 a year to maintain (each).
- Operation of Dime Shuttle: This was the saving to METRO from freeing 9,677 bus-hours which this service consumed.

4.2.3 Fare Evasion and Driver-Passenger Conflicts

Another by-product of the change to pay-on-exist fare collection has been an increase in fare evasion. While METRO estimates such costs as being relatively minor (\$350 per year), pay-on-exit has apparently resulted in a significant increase in driver-passenger conflicts over fares. Since the rider is already at the destination of his trip in the outbound direction, the driver has no coercive mechanism to assure fare payment. While most of the conflicts have been verbal, a few have resulted in drivers being assaulted. This has lead to some discussion within METRO of changing the fare collection system in the future. One system being considered is payment of a double fare on the inbound trip, with a free outbound trip.

4.3 Non-User Impacts

4.3.1 Traffic and Parking Impacts

Figure 10 showed that 8 percent of Magic Carpet users had previously made their trip within the CBD by automobile. This equates to about 1,000 person-trips per day in 1974. Since no vehicle occupancy information is available, a rate of 1.1 is assumed. This would imply that about 900 vehicle-trips per day were diverted from the auto to free-fare transit. This would constitute about a two percent reduction in intra-CBD vehicle trips. Obviously, the energy impacts are negligible. To estimate vehicle miles traveled (VMT), we must make an assumption about the average trip length of intra-CBD auto trips. The Magic Carpet Evaluation Report uses a figure of 0.5 miles, which would mean a reduction of about 450 vehicle miles per day in the CBD.

A more significant impact would occur if the modal choice of commuters to the CBD had changed as a result of Magic Carpet. We know this is true to a degree from the survey of downtown employees. But since the frequency of use by respondents to the survey is unknown, figures regarding the total reduction in VMT attributable to Magic Carpet cannot be accurately estimated. This also applied to calculation of the air quality impacts, discussed later.

Changes in parking patterns can have important impacts on both users and non-users of the free-fare system. Initially, it was hoped that Magic Carpet would encourage the use of peripheral parking by providing free connections to downtown destinations.

Free-fare service apparently did not cause a significant shift in parking to areas with lower parking rates on the periphery of the CBD. The changes in parking patterns in the ten months after free bus service began were not significantly influenced by the free-fare zone, after allowing for changes in parking price, traffic volume entering the CBD, peak hour transit headways, and land use. The results of a survey of CBD employees confirmed that very few employees shifted their parking locations due to the free-fare service (only two out of 558 respondents said they had shifted from driving to peripheral parking and bus use).

The failure of Magic Carpet in this area can be attributed to its inability to simultaneously satisfy the three following conditions anywhere near the CBD:

- A high volume of inbound automobile traffic with downtown destinations.
- All-day parking prices significantly lower on the CBD periphery than at the downtown destination.
- Frequent transit service connecting the parking location to the downtown destination.

Figure 13 shows the price of parking in downtown Seattle in the form of a price-contour map. These prices are for 1974, but the relative prices for various locations in the city do not appear to have changed since then. While the north and northeast fringes of the free zone have high inbound traffic volumes and frequent transit service, parking in those locations is relatively expensive. On the south fringe of the free zone, cheaper parking and frequent transit service are available, but most auto traffic from the south enters via the Interstate 5 or Alaskan freeways. Both of these facilities have offramp arrangements which provide only indirect access to the low priced parking south of the free-fare zone where the above three conditions are met simultaneously.

The expansion to the Denny Regrade area has provided an area with moderately-priced parking, good transit access, and high entering volumes. Unless a downtown employee arrives early in the morning, parking in the Denny Regrade is difficult. New office and residential construction of a fairly high density is expected to worsen this situation.

It is also noteworthy that in 1975 the City of Seattle decided to place stringent restrictions on expansion of parking facilities downtown. This policy forbade the construction of any primary-use parking structures,

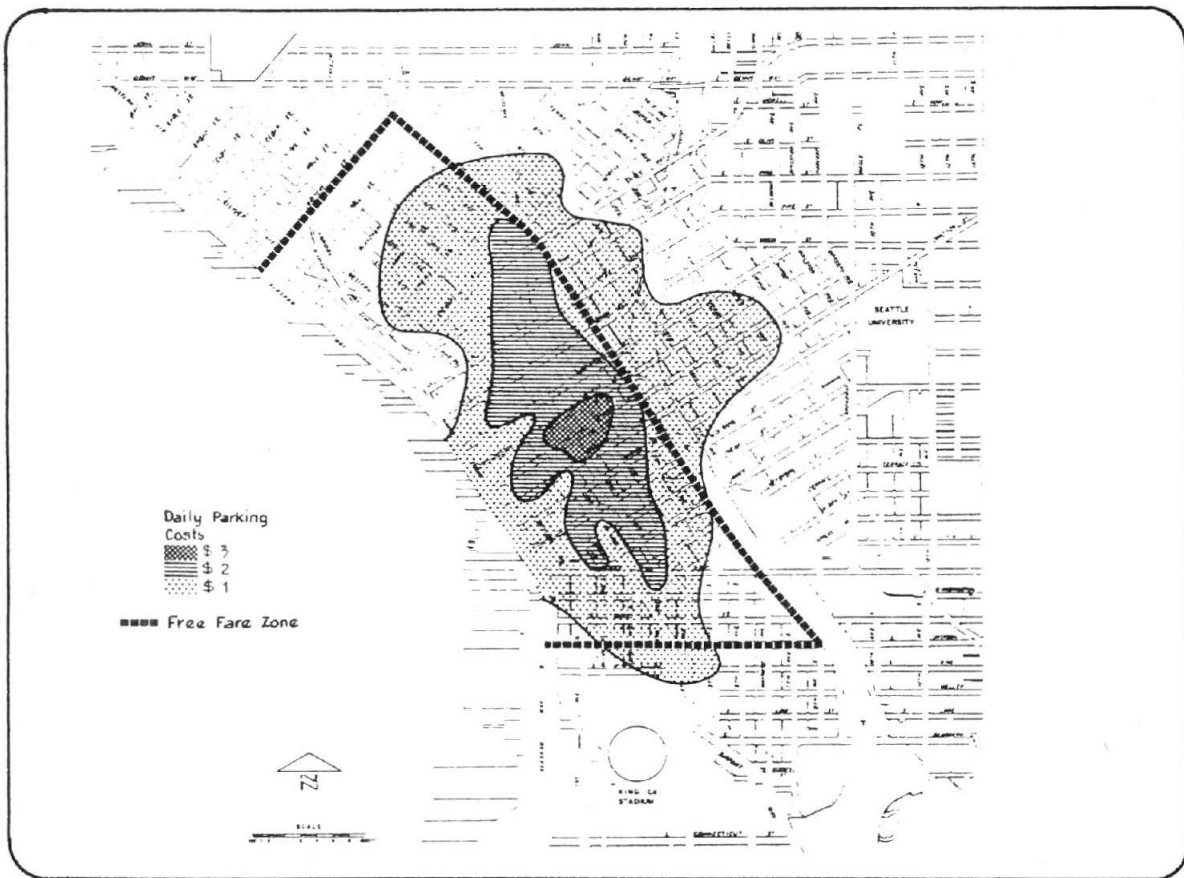


Figure 13
 PARKING PRICE CONTOUR MAP FOR DOWNTOWN SEATTLE, 1974. While the area covered by \$3 per day parking has remained relatively the same, the area covered by \$1 and \$2 per day parking has increased significantly.

and specified that no more than one parking space could be provided in new buildings per 2,000 square feet of usable space. It is likely that the presence of Magic Carpet made such a policy more politically viable.

4.3.1 Air Quality Impacts

An assessment of air quality impacts of Magic Carpet depends upon being able to accurately determine the reduction in automobile usage attributable to the free-fare service. As noted earlier, this is difficult to do. The issue is further complicated because violations of air quality standards have been generally decreasing in Seattle, primarily as a result of improved auto emission controls.

The air quality standard most commonly violated in Seattle is the eight hour average carbon monoxide (CO) standard of nine parts per million. This was exceeded 82 days in 1974. METRO estimated that Magic Carpet results in the CO standard being violated four fewer days per year than it otherwise would be.

4.3.3 Impact on Retail Sales in the Downtown Area

There are two principal ways that this impact can be assessed. One is a direct comparison of total retail sales downtown before and after the institution of the free-fare zone. Efforts to use this aggregate information were not useful because of the problems of separating businesses inside the free-fare zone from those outside, and also because of the normal fluctuations in retail sales which cannot be separated from the effects of the free-fare zone.

Instead, free-fare riders were asked what they would have done in the absence of the Magic Carpet service; they indicated that between 2.5 and 5 million dollars per year of additional sales in downtown were the result of Magic Carpet. This represents about a 1 percent of all downtown sales. Twenty percent of those making a purchase indicated that they would have made the purchase outside the free-fare zone without the service. These same respondents further indicated that their average purchase amounted to \$15. Applying this to the total ridership of 12,250 trips per day, we see that the incremental amount of purchases transferred from outside to within the free-fare zone was $12,250 \times .56 \times .20 = \$20,000$ daily (approximately). Assuming 250 days per year of work, this amounts to around \$5 million of additional sales.

While this is the "official" number reported by the survey consultant, it needs to be qualified in a number of ways. The most important of these qualifications is that there is a potential for double counting if passengers stated that both the "going" and "return" portions of the trip involved a purchase of some kind. The reliability of the results is also decreased because respondents were asked to reply to a hypothetical rather than an actual situation. And finally, the survey was conducted during July, when the retail sales may be above average because of good weather and visiting tourists.

The attitudes and perceptions of the downtown business community appear to be very positive about the free-fare zone, according to a July 1974 survey of downtown employers. Eighty-six percent of all established businesses and 94 percent of new businesses in the CBD said that free-fare service should be continued. Seventy percent of established businesses felt the City of Seattle should use City tax money to support Magic Carpet. Only 10 percent of the businesses felt the City was spending too much money on the service. Magic Carpet is supported from general funds, not from any special tax on businesses. Were businesses taxed directly for the service, the responses might be significantly different.

Surprisingly, business people feel most positive about the free-fare service because it makes their own mobility easier downtown. Improved accessibility for customers and clients was rated as second most

important. Nineteen percent of the businesses surveyed indicated a positive impact on the average value of purchases attributable to the free-fare zone. There appears to be a belief by much of the downtown business community that mass transit improvements are more significant in their sales impact than additional parking facilities. Mass transit improvements were indicated to have a positive effect on sales by 35 percent of the businesses, while the availability of parking was indicated to have a positive effect by 25 percent of the businesses.

5.0 FUTURE PLANS

A number of operational and hardware improvements are planned for the Magic Carpet zone in the next two years. Already programmed are orders for articulated and electric trolley buses. While the primary function of these new vehicles is incidental to Magic Carpet service, they will improve service in the free-fare area in a number of ways.

The articulated buses, with their 70-seat capacity and double-width doors, will facilitate the pay-on-exit system in the PM peak. At present, there are no plans to use them during the noon hours. Articulated buses have also compounded some of the problems with the pay-on-exit fare collection, because of their high loads and long lengths. The trolley buses will be used primarily on short, high density lines. Because of their more favorable acceleration rate and performance on hilly cross-town routes, they will reduce the delay to buses and passengers in the free-fare zone.

Changes which are being discussed but which are not currently programmed include expansion of the free-fare zone, as well as additional cross-town routes. The free-fare zone is generally agreed to be a permanent part of Seattle's transit system. A number of geographic extensions of Magic Carpet have been suggested, including Seattle Center on the north, and the hospital complexes and Seattle University to the east. The drawback to expansion is financial, since some of the extensions would result in major losses in fare revenue. Extension to the Seattle Center would incorporate a sizeable residential population in the free-fare zone, and it could be questioned on equity grounds as to why these people should be given a free commute trip to downtown. It appears that any extension of service will probably be financed, at least in part, by either the private sector or special purpose agencies (like the hospitals or university themselves) who would benefit most.

6.0 CONCLUSIONS APPLICABLE TO OTHER AREAS

The Seattle experience suggests that CBD free-fare systems are likely to attract many new transit riders at mid-day. Magic Carpet's most significant impact has been to enhance the mobility of those living and working downtown, as evidenced by a three-fold increase in intra-CBD transit usage. Most of these trips occur during the noon hours (11 AM to 2 PM) and involve a large number of trips between work and shopping areas. The retail and office core are connected by frequent service along Third Avenue, making the bus competitive with walking and driving. Seattle's rainy weather undoubtedly adds to the patronage of the free-fare zone.

Magic Carpet also promotes retail sales in the downtown area; the dollar increase in retail activity created by Magic Carpet is probably around 1 percent of total downtown sales. Seattle has maintained much of its downtown retail business while many other cities have found stores closing their downtown operations. Seattle has three "full-line" department stores in its downtown, an unusual accomplishment for a city of its size.

Seattle's experience indicates that a downtown free-fare zone probably will have small (perhaps negligible) impacts in encouraging greater use of transit for commute trips. Although the size of Magic Carpet's impact on regional transit ridership is probably small, it can be said that the free-fare zone does familiarize non-users with the system, particularly those who are reluctant to use the bus because of not knowing the fare structure. In essence, the free-fare zone is equivalent to the free samples given out by many firms selling products. It lures consumers to change some habitual behavior and try something they might not have otherwise. If patrons like the product or service, they may change some element of their purchasing behavior permanently. The free-fare zone also eliminates the need for transfers in the downtown area, and may result in improved service through faster boarding of buses.

Magic Carpet apparently has a relatively small impact on mitigating the adverse effects of the auto. While some 900-1,000 daily vehicle trips have been eliminated, this represents only a small fraction of total intra-CBD vehicle trips. Thus, the reduction in traffic delay and air pollution in the downtown area due to such free-fare systems is likely to be imperceptible. The same conclusion holds true for parking availability, as survey data indicate that few drivers have switched to parking on the periphery of the CBD and riding the bus to their final destination.

7.0 SELECTED REFERENCES AND APPENDICES

References Relating Specifically to Seattle's Experience

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APPENDIX A
 EXAMPLES OF MAGIC SURVEY QUESTIONNAIRE USED IN 1974 (TOP) AND 1977 (BELOW)

No 54982


METRO TRANSIT AND THE CITY OF SEATTLE MAGIC CARPET SURVEY


You can help us improve your bus service by answering ALL of these questions. A survey card should be filled out for each passenger over five years old. Please fill out one of these cards each time you receive one today. All information is confidential. Please return card to DRIVER or fill it out later today and drop it in any U.S. mail box, postage FREE. Thank you.

1 THE TIME I BOARDED THIS BUS WAS
 1 A.M. to Noon
 2 P.M. to Midnight
 (Write or check A.M. or P.M.)

2 THE ADDRESS OF THE PLACE I AM COMING FROM IS: (Please be exact)

 (City or town)
 (Street address or nearest intersection, name of place, business or building)

3 THE ADDRESS OF THE PLACE I AM GOING IS: (Please be exact)

 (City or town)
 (Street address or nearest intersection, name of place, business or building)

4 THE PURPOSE OF THIS TRIP IS: (Check one)
 1 HOME 4 ENTERTAINMENT (Recreation, dining, etc.)
 2 WORK 5 PERSONAL BUSINESS (Dr., Dentist, Bank, etc.)
 3 SCHOOL 6 SHOPPING
 7 SOCIAL SERVICE AGENCY

5 IS YOUR ENTIRE BUS TRIP A FREE MAGIC CARPET RIDE?
 1 YES
 2 NO


6 DID YOU MAKE THIS TRIP PRIOR TO MAGIC CARPET SERVICE?
 1 YES
 2 NO

7 IF YES, HOW?
 1 CAR 4 WALK
 2 DIME SHUTTLE BUS 5 TAXI
 3 OTHER METRO TRANSIT 6 OTHER

8 COMMENTS ON MAGIC CARPET SERVICE

WE APPRECIATE YOUR COOPERATION.

No 64974


METRO TRANSIT DOWNTOWN SURVEY

1 DEAR BUS RIDER: This completes our survey of Metro Transit bus riders. Please fill out this card each time you receive one today. A card should be completed for all persons 5 years or older. ALL INFORMATION WILL BE KEPT CONFIDENTIAL.

2 THE TIME I GOT ON THIS BUS WAS: _____: _____
 AM (Incl. Noon) PM (Incl. Midnight)
 (Record time & check AM or PM)

3 I AM COMING FROM: (Check one)
 1 Home 4 College/Trade Sch. 7 Dining/Recreation
 2 Work 5 School (K. to 12) 8 Personal Business
 3 Shopping 6 Dr./Dentist 9 Other _____

4 THE EXACT ADDRESS OF THE PLACE I AM COMING FROM IS: _____ in _____
 (Address or Name of Place, Bldg. or Business) (City)

5 I AM GOING TO: (Check one)
 1 Home 4 College/Trade Sch. 7 Dining/Recreation
 2 Work 5 School (K to 12) 8 Personal Business
 3 Shopping 6 Dr./Dentist 9 Other _____

6 THE EXACT ADDRESS OF THE PLACE I AM GOING TO IS: _____ in _____
 (Address or Name of Place, Bldg., or Business) (City)

7 IS YOUR ENTIRE TRIP ON THIS BUS A FREE MAGIC CARPET RIDE? 1 YES 2 NO

8 DID YOU OR WILL YOU USE ANOTHER BUS ON THIS TRIP? 1 YES 2 NO

**PLEASE RETURN CARD TO
 DRIVER OR MAIL (FREE)
 THANK YOU!**

This study is financed in part through a technical studies grant from the U.S. Department of Transportation, Urban Mass Transportation Administration under the Urban Mass Transportation Act of 1967 as amended.

APPENDIX B
 REPRODUCTION OF METRO BROCHURE ON MAGIC CARPET ZONE (WITH OLD BORDERS)
 (Actual brochure is in four colors and 1.3 times larger).



Metro Transit buses and trolleys make more than 6,500 trips back and forth within the downtown Magic Carpet area every week. You may ride free on any bus or trolley inside the area. The squares on this map show the location of all Magic Carpet bus stops. The triangles point the direction of travel. Simply stand at one of the more than 100 stops marked by a colorful Magic Carpet service sign.

Each sign will show you the routes that stop there and where they go. When the bus or trolley pulls up, just hop aboard. As long as your trip is within the area, the ride is free. We ask that, if possible, you please avoid using buses marked "Flyer," "Express," or "Limited" because it slows the trip for those heading outside the Magic Carpet area. Thank you.

Magic Carpet service is funded by a contribution of \$115,000 a year from the City of Seattle.

How to use your free Magic Carpet service.

Metro's Magic Carpet service is unique in all the world. It enables you to ride free anywhere in the downtown Magic Carpet area. (Please see map inside.) As long as you get on the bus — and off again — within that area, the ride is free. No fares or transfers are collected, and no transfers are issued within the Magic Carpet area. Both front and rear doors may be used to board or leave the bus. This greatly speeds bus travel throughout the downtown area.

And the benefits of this service, funded by the City of Seattle, are many. It reduces dependence on cars for downtown travel, helps reduce pollution and traffic congestion, reduces the cost of travel for all who use it, and has improved retail sales in the downtown area.

Riding outside the Magic Carpet area.

Any time you ride or board a bus outside the Magic Carpet area, the normal fares apply. These are paid in exact change, or with convenient Metro tickets. Here are some points to remember:

Going toward downtown Seattle — pay as you board.

If you're riding from an outlying area toward the downtown Magic Carpet area, pay your fare when you get on the bus, just as you do now. If you wish to ride through and beyond the Magic Carpet area on that same bus, ask your driver for a transfer when you board — and return it to him when you get off. This tells him you are a passenger who has already paid a fare. If you change buses downtown and are going beyond the Magic Carpet area, your transfer will be collected when you leave the second bus at your destination. Additional zone fares, if any, also will be collected at that time.

Going away from downtown Seattle — pay as you leave.

If you board downtown, in the Magic Carpet area, and ride beyond it, your entire fare and any transfers will be collected as you leave the bus at your destination. Once outside the Magic Carpet area, only the front door of the bus may be used to enter or exit. Should you need a transfer to take another bus in an outlying area, ask your driver for one when you pay your fare — as you get off.



If you board in an outer zone, but are still headed away from downtown, you'll be given a zone marker like the one shown here. This indicates where you got on. Return it to your driver when you get off at your destination so he can determine your fare. If you also have a transfer, be sure to show that to your driver, too. Zone markers are for identification only and are not valid as transfers.

Shuttle or local routes — pay as you board.

On any bus routes which do not travel into the Magic Carpet area, your full fare will be collected as you board, no matter what your direction of travel.

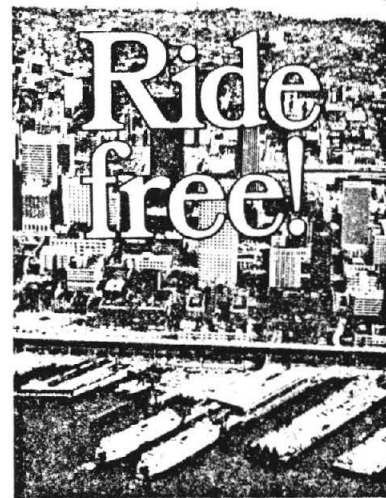
Ask for transfers only when you pay your fare.

To make bus riding easier, you may now transfer to any bus at any junction, as long as you don't return to your starting point on the same route. Transfers are issued only when you pay your fare.

Bicentennial Honor

This Magic Carpet service has been honored as one of 20 through the awarding of a community project honor grant by the American Revolution Bicentennial Administration's Horizons on Display program. Horizons on Display, a 1976 component of the Centennial Exposition held in Philadelphia in 1976, is intended to provide an example of American ingenuity in action rather than an exhibit of a single location. Selection for this honor will bring many additional visitors to Seattle because of the national publicity that is being given to the Horizons program.

For Information Call 447-4800.



City of Seattle's Bicentennial award winning transit project. Chosen as an outstanding example of innovative local problem solving.



METRO TRANSIT

Look for these signs.

You'll know you're in the free-ride area whenever you see a Magic Carpet service sign. They look like this. They show the numbers and routes of Metro Transit buses or trolleys that serve that specific stop. Your driver will announce the last stop before leaving the Magic Carpet area.



It shrinks downtown to "shopping" size.


Stores, restaurants and office buildings that are blocks apart become just a free-and-easy ride away with Magic Carpet service. You can cover a lot of ground quickly and easily — without any traffic or parking headaches. That's the magic of it.



HE 18.5 .A37 no. 79-3 c.2

Colman, Steven B **15451**

Case studies in reduced-fare
transit



U.S. DEPARTMENT OF TRANSPORTATION
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