NON TRADITIONAL TRANSIT SERVICE STUDY; THE 183 CORRIDOR, AUSTIN TEXAS

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OCTOBER 1988

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INTRODUCTION

STUDY OBJECTIVES

This study was undertaken by The University of Texas at Austin under contract to the Capital Metropolitan Transportation Authority. The Study was driven by Capital Metro's need to equitably and efficiently serve its 421 square mile low density service area. The widely scattered commercial, residential, and industrial development typical of the area presents a significant service problem. In response to this problem Capital Metro had begun limited, but largely successful, non-traditional transit services.

Capital Metro sought to expand the use of non-traditional transit services by 1) identifying which non-traditional options might be appropriate for different locations in Austin, 2) considering how appropriate non-traditional transportation options might be more widely implemented in the service area, and 3) investigating ways to incorporate planning for such options into the on-going Service Planning efforts.

The objective of the study was to consider the type of non-traditional services which would work in the 183 Corridor and to develop, based on empirical data from the 183 Corridor, implementation guidelines which could be applied throughout the service area. The Study considered as "non-traditional" those

services are delivered or in 2) who actually delivers them, or in 3) how and if a public subsidy is administered.

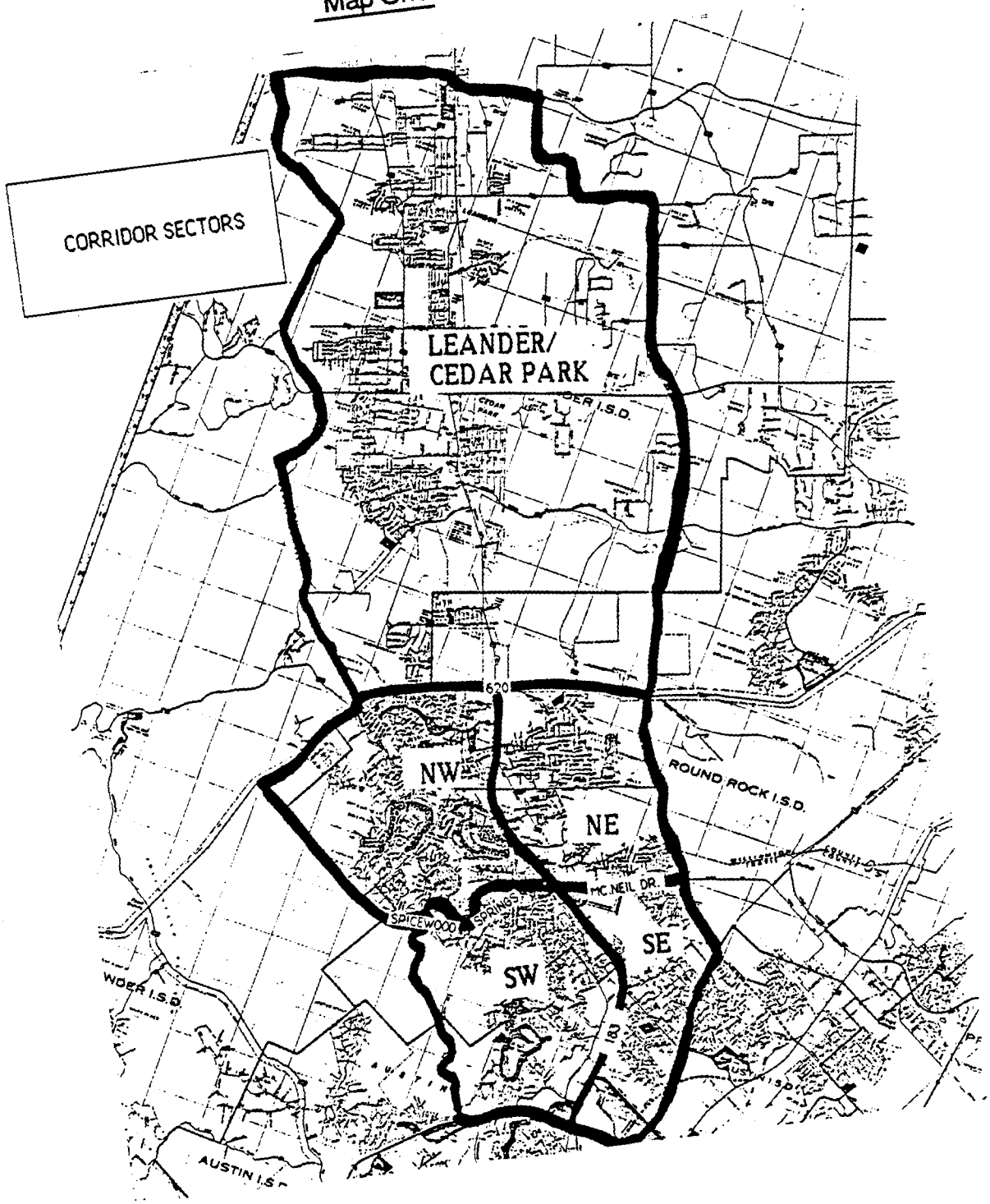
Overall the Study Team found that 1) vanpooling for major employment concentrations and demand-responsive services in limited areas for non-work trips would be appropriate for the suburban development found in the Corridor, 2) appropriate non-traditional options would or do incur costs lower than Capital Metro's average cost/hour for fixed route bus service, and 3) several non-traditional alternatives could be implemented in the Corridor with total subsidies at or below those required by conventional transit services.

At least three of the major work sites--the Arboretum, Texas Instruments, and Northwest Techniplex--might be appropriate candidates for vanpooling types of non-traditional transit services. Additionally three sub-areas of the Corridor could each be served by a separate but comparable demand responsive service focused largely on non-work trips.

STUDY APPROACH

The study investigated these questions in the context of the U.S. Highway 183 Corridor, one of six corridors or sections into which the Capital Metro service area has been divided for study and service planning. The 183 Corridor itself was sub-divided into five sections for analyses and presentation; these sections are shown on Map One. As the Map details, four sections fall south of Leander with

Map One


CORRIDOR SECTORS
LEANDER/
CEDAR PARK
620
NW
NE
SW
SE
ROUND ROCK I.S.D.
MC NEIL DR.
SPICEWOOD SPRINGS
WOER I.S.D.
AUSTIN I.S.D.

the East-West dividing line being U.S. Highway 183 and the North-South dividing line being Spicewood Springs/McNeil Road. The cities of Leander and Cedar Park comprise the fifth, and northernmost, section of the Corridor [1].

The Study Team evaluated a range of existing and potential non-traditional alternatives including taxi-based services and vanpools subsidized by Capital Metro but operated by another provider, demand-responsive services for the handicapped operated and subsidized by Capital Metro, as well as vanpools operated entirely by the private sector with no appreciable public subsidy.

In order to analyze travel patterns in the five areas of the Corridor and to evaluate alternative non-traditional options, the Study Team used population, employment, travel, and land use information on these five sections from a number of primary and secondary data sources.

When essential data were not available, the Study Team was forced to rely on proxy or **default values** from Austin-wide studies, from comparable areas or services in other cities, and from technical manuals and handbooks. The text below describes only the major default parameters used in each specific analysis; detailed technical information is generally reserved for the Appendix. The detailed Technical Appendices contain: a) a comprehensive description of methods

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[1] All analyses were performed at the Traffic Serial Zone level and aggregated to the Section level. None of these five sections splits a Zone; some Sections do, however, occasionally split Census tracts or zip codes.

used to derive estimates etc., b) a complete listing of all proxy or default data used, and c) a description of the source, and conditions, of all default data.

In addition the analyses often had to make **assumptions** about the nature of traffic flows, service costs, or ridership parameters, etc. To make this document accessible to the non-technical reader as well as the professional planner the text describes only the major assumptions underlying each analysis. Specific technical details about the assumptions used in each model are available in the Technical Appendices.

All readers should recognize that the assumptions underlying any analysis can have profound impacts on the findings. Since changes in key model parameters could raise or lower projected ridership or costs significantly, the professional planner is urged to consult the Appendices to understand the crucial assumptions made.

STUDY AND REPORT ORGANIZATION

The 183 Corridor study had four major phases; this report is organized to highlight each of these phases separately. **Phase One** analyzed socio-demographic characteristics, both city-wide and specifically in the Corridor, to identify the circumstances under which non-traditional or so-called "choice riders" might use carefully targeted non-traditional transit services.

Phase Two identified travel flows within the Corridor and between Corridors, distinguishing key work trip and non-work trip attractors in the Corridor--or concentrated activity sites on which non-traditional service options could be focused. **Phase Three** evaluated the cost and service characteristics of current Capital Metro non-traditional transit services as well as comparable or interesting services provided around the country.

Phase Four developed a series of implementation guidelines to match appropriate and productive non-traditional options with various work and non-work trip attractors. Such guidelines are designed to allow Capital Metro planning staff to evaluate the cost-effectiveness of various options in the 183 Corridor and throughout the service area.

To set the stage for the Study findings, the following section of this report highlights the problems of providing traditional transit service to increasingly suburban and low density communities. Then each of the next four sections focuses sequentially on one of the four Study Phases.

Phase One findings appear in the third section of this report which describes socio-economic characteristics historically related to transit usage and then analyzes the demographic makeup and travel patterns of Austin residents.

The next section of this report, describing Phase Two, analyzes travel flows in the 183 Corridor while the following section describes the results of Phase Three,

evaluating the cost and service parameters of Capital Metro's current non-traditional options and those operating in other cities. Finally, the report presents the implementation guidelines developed in Phase Four which allow the consideration of the cost effectiveness of various non-traditional options.

THE SERVICE ENVIRONMENT

Several recent studies clearly show that the "traditional commuter," traveling for work from the suburbs to the historic core of the city, represents a rapidly declining number of all workers [1]. Yet it is this kind of traveller whom traditional transit has served so well in the past. It is clear that new and "non-traditional" options must be implemented to deal with the largely suburb-to-suburb commute patterns of Austin's residents and to serve the discretionary trips of all suburban residents.

THE NEW COMMUTER

Between 1960 and 1980 two-thirds of all metropolitan job growth went to the suburbs--which now have over 60% of all jobs in the country. These patterns are uniform throughout the country; even in slow-growth parts of the country with declining population (for example, Philadelphia, St. Louis, Pittsburgh, and Buffalo) suburban employment growth far outstripped total employment growth.

As a consequence, the majority of work-trip growth, roughly 70%, was in the

suburb-to-suburb trip pattern. Thus in 1980 almost 60% of all commuters were travelling from one suburb to another. Moreover in the same time period, fewer people worked at home (less than 3%) and far fewer walked to work (5% down from 10% in 1960).

The implications of these trends for any worker's use of transit for commuting are staggering. Transit use is difficult for suburban travel because service coverage is poor; even if transit properties were to abandon their traditional radial focus on the City core, most suburbs lack concentrated corridors of transit demand. Moreover suburban transit always faces severe competition offered by the speedier car. As a major report recently commented,

> The negative effects on transit of current [suburban employment] trends are clear. Growth is centered where transit use is weakest--in the suburb-to-suburb market, and high levels of [private] vehicle availability severely diminishes the choice of transit [2].

Robert Cervero, in a 1986 study of suburban employment growth and subsequent traffic congestion, noted,

> Since 1970, the automobile has strengthened its dominance in the commuting market...Transit's standing could slip even more since buses operating on fixed routes and set schedules are usually ill suited for delivering workers to dispersed suburban addresses...Even workers in suburban office towers located

around rail transit stations are almost entirely dependent on the automobile. Regardless of how conveniently rail transit serves suburban office centers, if only a fraction of the workforce lives near a line, most employees will end up driving [3].

Not surprisingly, in 1980 the smallest transit ridership within metropolitan areas was recorded for suburb-to-suburb commutes; only 1.6% of these workers used transit to go to work (compared to 16.1% of workers who both lived and worked in the central city).

In short, many U.S. workers have jobs in lower density suburbs just like Austin's, which **are not** well served by public transit but just as important--**cannot** be well served by traditional fixed route services because of their inherent time costs.

THE TIME DISADVANTAGE OF FIXED ROUTE TRANSIT

Data from the American Housing Survey show that, on average buses, streetcars, and subways in the US average 13.2 miles per hour, less than half as fast as either cars or carpools [4] [**]; the Austin transit figure is comparable. Since the

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** While buses travel faster in the suburbs than these metropolitan averages would indicate--so do cars. In fact, the disparity in speed between the two modes is greatest in low density areas because buses still must stop and start frequently while cars take advantage of freer traffic flows. In fact, even in suburban operations, buses and streetcars rarely average over 16.0 miles per hour.

average suburb-to-suburb commute in 1980 was 8.2 miles, a direct transit trip--with no waiting or transferring--would take approximately 37 minutes by bus but only 16 minutes by car; a transfer or a lengthy walk at either end of the trip could increase the transit time by 50-100%!

Non-work trips are also not well served by traditional fixed route services. Data from the 1983 National Personal Transportation Study show that a striking percentage of all trips which people currently make in a car (as a driver or passenger) simply could not be made by transit. Table One illustrates this point by showing the percentage of 1983 one-way auto trips which could be made by walking or transit, **within one hour**, assuming a ubiquitous transit system; the Table reveals that few current auto trips could be made by even high levels of traditional transit in a reasonable time period.

The Table illustrates the result of a simple analysis which converts the average length (in miles) of 1983 auto trips for various purposes into the time that would be consumed for that distance by walking and transit. The breakdowns in each column represent the percentage of all auto trips for each purpose which take five or fewer miles, under 15 miles, and more than 15 miles; for example, roughly 15.1% of all 1983 **work** trips were under five miles, 52.5% of all work trips were under 15 miles and so on *.

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* The calculations assume an average walking speed of 4.0 mph, an average transit speed of 16.0 mph (with 5 minutes walking and waiting). Note that because trips were not disaggregated under 5 miles, the first column clearly

Table One

Distribution of Vehicle Trip Mileage by Trip Purposes;
One Hour Walking & Transit* Equivalents, 1983

	Under 5 Miles	Under 15 Miles	Over 15 Miles
	% of all trips that could walk	% of all trips that could use transit	% of all trips that can't walk or take transit
Work	15.1	**52.5**	**47.5**
Work Related	10.6	**35.4**	**64.6**
Shopping	29.0	**63.5**	**36.5**
Family/Personal Business	22.2	**33.8**	**66.2**
Medical	10.7	**55.0**	**45.0**
Visit Friends	11.9	**36.7**	**63.3**
Other Social Recreational	17.8	**46.7**	**43.3**

* Assuming a ubiquitous transit system

Sources: Derived from U.S. Department of Transportation, Personal Travel in the U.S., Vol II Table E-41

The Table shows that no more than 30% of any kind of trip could be made walking, less than half of most trips could be made in under an hour on transit and--**only if transit were actually available and did not require time-consuming transfers** (major assumptions). Over sixty percent of family and personal business trips, work-related, and visiting trips could not be made using traditional transit in under one hour--one way; over 40% of medical trips could not be made by transit.

Certainly the current location of some of these trips is a matter of choice and not necessity; substitutions could be made. But overall, the use of a fixed route vehicle would require substantial restructuring of the entire activity patterns of most households. Moreover, the use of a 60 minute maximum is questionable; it's unlikely that anyone would be willing to travel over 30 minutes one-way for any except a work trip. If so, over 80% of all current auto trips could not be made by the traditional bus or by walking.

In response to these service problems Capital Metro, along with other modern transit properties, has begun to experiment with non-traditional transit, alternatives whose service characteristics are modified to address the inflexibility and the lengthy time costs of fixed route services in suburban areas. Across the country many systems are operating or contracting for flexibly routed vehicles or

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overestimates the percentage of trips that could be made walking in under one hour.

ride sharing modes with limited pick-up points and only one destination. Such options are non-traditional in both their service patterns and in the fact that they often actively involve the private sector.

This study was directed at evaluating which non-traditional options would work best for the highly suburban 183 Corridor given the transportation patterns and the socio-demographic characteristics of citizens of the Corridor, as well as the travel flows and kind and location of major work and non-work trip attractors.

The next major section of this report focuses on Phase One of the Study which analyzed the demographic and transportation characteristics of Corridor residents in an attempt to indicate potential riders for non-traditional services. A latter section discusses Phase Two, which identified major trip attractors and evaluated the implications of traffic flows throughout the Corridor on potential transit usage.

SOCIO-DEMOGRAPHIC PROFILE

INTRODUCTION

This section describes the findings of Phase One which analyzed socio-demographic characteristics in the Corridor because of the significant relationship between transit use and certain population characteristics. Historically transit use has been highest among the lowest paid workers and those without cars--whether

or not in the labor force. On the other hand, there is growing evidence that--in certain narrowly defined situations-- higher income people with easy access to cars will use transit.

The Study Team analyzed two issues: the socio-economic characteristics of Corridor residents, and, the known travel preferences of Corridor and--where Corridor data were unavailable--Austin residents. The work was designed to identify:

a) pockets of traditional transit riders living in the Corridor, that is, captive riders--those who were poor, or carless, or with limited access to a household car;

b) non-traditional transit riders who might be induced to use a quality or tailored non-traditional transit service for either work or non-work trips; and

c) captive but also non-traditional riders, such as children travelling alone and elderly drivers who occasionally wish to use transit services but will not sign up for special services.

Overall the analyses below show that, while there are few traditional captive riders in the 183 Corridor--far less than in the City as a whole--there are pockets of potential riders for carefully structured work and non-work transit

services.

The following section first examines socio-economic information on those living in the five sections of the Corridor, then analyzes what is known about city-wide travel patterns and how those patterns might affect the 183 Corridor, and finally considers the transit planning implications of these findings.

SOCIO-ECONOMIC INFORMATION

The 183 Corridor is typical of many suburban places in Austin and the nation; with roughly 60 square miles and 60,000 people the average density is very low--under 1000 people per square mile. Most of those living in the Corridor have above average incomes, drive cars, and face relatively few disadvantages.

There are few people in the Corridor who fit the classic definition of traditional transit riders. Table Two, which is based on published 1980 Census data, augmented by 1985 ATS data, shows that no more than 8% of the households in any part of the Corridor live below poverty level; the highest concentration of those households are in the northernmost end of the Corridor (Leander and Cedar Park). While roughly 10% of the entire city of Austin is over 65 years of age, Corridor residents are much younger; only one section, that south of McNeil Road and east of Highway 183, has more than a 5% elderly population.

Table Two also shows that few of either the elderly or children are poor,

Table Two
SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE 183 CORRIDOR

CORRIDOR SECTION	1985 ESTIMATED POPULATION	PERCENT OF PEOPLE BELOW POVERTY	PERCENT OF POPULATION OVER 65	PERCENT OF ELDERLY PEOPLE BELOW POVERTY	PERCENT OF CHILDREN IN POVERTY
Southwest	12,115	3.00	2.00	0.12	1.30
Northwest	16,527	5.80	3.00	0.70	2.80
Southeast	7,845	3.60	8.00	0.00	2.10
Northeast	10,661	3.80	3.00	0.00	1.70
Leander/ Cedar Park	10,853	7.80	5.00	1.20	3.40

Note: The corridor sections are not completely co-terminus with census tract boundaries so some estimation was neccessary; a conversion table appears in the Technical Appendix.

Key: The North-South dividing line for the sections is Mc.Neil Rd./Spicewoods Springs Rd.

Source: Derived from U.S. Census, Vol. 45, 1980, Tables H-7, P-9, P-10 & P-11 and tape readable Socio-Economic data by traffic serial zone provided by Capital Metro.

although both groups traditionally make up a significant percentage of those living below poverty level in most communities. Less than 1% of any of the elderly in the Corridor are below poverty level and two sections have no poverty-level elderly at all. No more than 4% of the children of any section of the Corridor are poor and the average for the Corridor is closer to 2%. The small concentrations of poor old and young people that do exist are again at the Leander/Cedar Park end of the Corridor.

Table Three, which is also based on published Census data augmented by 1985 ATS data, shows that few people in the Corridor lack adequate transportation resources or face transportation problems. Under 1% of the total population report a transit disability; the percentage of elderly reporting transit disabilities is often double that of the total population--and still under 1%!. Roughly 5% of families in the Corridor are headed by females (far less than the Austin average) but roughly 17% of such women in the entire city of Austin do not own a car; comparable figures are not available for the Corridor.

Overall there are barely any households in the Corridor that do not have at least one car. In fact, most Corridor residents have access to more than one car; Census data show that almost three-fourths of all households have two or more cars. In fact roughly **one-third** of all households have <u>three or more</u> cars! Car ownership rates are explained in part by the number of two worker households; over half of all families in the Corridor have two adult workers and another 9-15% have three or more workers.

Table Three

CORRIDOR HOUSEHOLD CHARACTERISTICS RELEVANT TO TRANSIT PLANNING

CORIDOR SECTION	PERCENT OF TOTAL POPULATION WITH TRANSIT DISABILITY	PERCENT OF ELDERLY POPULATION WITH TRANSIT DISABILITY	PERCENT OF HOUSEHOLDS WITH NO CARS	PERCENT OF TWO WORKER FAMILIES	PERCENT OF HOUSEHOLDS WITH ONE CAR	PERCENT OF FAMILIES HEADED BY A WOMAN
Southwest	0.24	0.56	0.43	63.50	17.90	7.00
Northwest	0.33	0.67	0.64	58.20	9.40	5.20
Southeast	0.31	0.20	0.00	58.60	9.40	6.60
Northeast	0.11	1.05	1.20	60.90	17.20	4.50
Leander / Cedar Park	0.62	0.48	2.30	51.60	15.20	5.70

Key: The North-South dividing line for the sections is Mc.Neil Rd./Spicewoods Springs Rd.

Source: Derived from U.S. Census, Vol. 45, 1980, Tables H-7, P-9, P-10 & P-11.

Obviously, while there may be small pockets of "captive" transit riders in the area, particularly in Leander and Cedar Park, the potential market for non-traditional services is among those who can chose to drive, or be driven, but who will use transit if it meets higher and very specific performance criteria.

The following section focuses in greater detail on the transportation patterns of Austin residents, although not those specifically in the Corridor. This analysis suggests the circumstances under which non-traditional people have been willing to use non-traditional transit options. 212

AUSTIN TRANSPORTATION PATTERNS

Introduction

This section focuses on the home-to-work travel patterns of Austin residents with an emphasis on who uses public transit or paratransit and under which circumstances. This information may indicate the willingness of non-captive travellers to use transit or non-traditional options like vanpools.

The analyses presented below show that, while the use of transit is heaviest among lower income groups, there is some small use by fairly high income individuals. The analyses also show that more women than men carpool to work but that larger carpools are dominated by higher income, generally male,

travellers! Both circumstances suggest that there is indeed a market for carefully designed non-traditional options in the 183 Corridor and similar areas in Austin.

Traditional Transit Usage

Austin transit users exemplify ridership patterns found throughout the country; in general transit ridership is negatively correlated with income. In 1980 Austinites were less likely to use transit to work as their household income went up; Table Four shows that less than 11% of any income group used the bus to go to work.

As transit ridership went down car use usually went up, although at very low incomes (under $10,000) and very high incomes (over $40,000) walking, cycling, and working at home were significant work trip modes. These Census findings, showing an inverse relationship between transit use and income, are consistent with the Capital Metro On-Board study which found that almost 50% of all bus riders had household incomes under $15,000.

However there are patterns in Austin's transit ridership that have implications for predicting non-traditional ridership in the 183 Corridor. Table Five, which disaggregates transit users by sex as well as household income, shows that more female riders had low income than male riders; that is, higher income men were more willing to use transit than comparable female workers. Over half of all female transit riders had incomes under $10,000 and almost all female transit

Table Four
Mode to Work by Household Income, Austin, 1980

Household Income	Car*	Public Transit	Other**
Under 5,000	73.5	10.8	15.7
5,000 - 9,999	83.2	4.8	12.0
10,000 - 14,999	89.4	4.3	6.4
15,000 - 19,999	94.2	2.1	3.8
20,000 - 24,999	94.7	1.6	3.7
25,000 - 29,999	94.7	0.5	4.8
30,000 - 34,999	97.4	1.7	0.9
35,000 - 39,999	95.4	-	4.6
More than 40,000	91.0	0.6	8.4

* "Car" includes drivers & passengers

** "Other" includes walking, cycling, and working-at-home

SOURCE: Derived from the U.S. Bureau of the Census (1983), Census of Population and Housing, 1980, Public Use Microdata, Sample B, Texas.

Table Five
1980 Transit Users to Work by Sex and Household Income, Austin

Household Income	Male	Female
Under $5,000	18.8	22.2
5,000 - 9,999	18.8	29.6
10,000 - 14,999	31.3	18.5
15,000 - 19,999	6.3	14.8
20,000 - 24,999	12.5	7.4
25,000 - 29,999	6.3	-
30,000 - 34,999	6.3	3.7
35,000 - 39,999	-	-
More than 40,000	-	3.7
Total	100.0*	100.0*

* Does not actually add to 100 beause of rounding errors

SOURCE: Derived from the U.S. Bureau of the Census (1983), Census of Population and Housing, 1980, Public Use Microdata, Sample B, Texas.

riders had incomes below $20,0000. However almost one-fourth of all male riders had incomes above $20,000.

In short, while all women are more likely to use transit for the home to work trip (10% compared to 8% for men), higher income men are more likely to use transit than comparable women. This may reflect differences in the location of men and women's traditional employment opportunities in Austin; there be may greater spatial concentrations of low income jobs for women, on one hand, and of higher income jobs for men, on the other. Such employment concentrations are an encouragement to transit use in suburban areas.

Carpool Use Patterns

There are similar patterns in carpool use data; while few people do carpool, overall women are more likely to do so than men, and, higher income men are more likely to do so than comparable women. Table Six shows the first pattern clearly: of the 90+% of travellers going to work by car, over 70% are driving alone at all income levels. Table Seven also illustrates the first pattern: differences, as with transit, may be sex related. Among those who use a car to travel to work, greater percentages of women are carpool members than men.

Table Six also shows, perhaps surprisingly, that carpool usage seems to go up as income increases, being highest at incomes in the mid $30,000 and only dropping off at incomes above $40,000. In fact those making between $30 and 40,000 are

Table Six

1980 Type of Auto Use To Work by Household Income, Austin

Household Income	Driving Alone	Carpool Member
Under 5,000	80.3	19.7
5,000 - 9,999	78.7	21.3
10,000 - 14,999	72.4	27.6
15,000 - 19,999	72.2	27.8
20,000 - 24,999	77.7	22.3
25,000 - 29,999	80.3	19.7
30,000 - 34,999	70.8	29.2
35,000 - 39,999	73.2	26.8
More than 40,000	84.1	15.9

SOURCE: Derived from the U.S. Bureau of the Census (1983), Census of Population and Housing, 1980, Public Use Microdata, Sample B, Texas.

Table Seven

1980 Type of Auto Use To Work by Sex of Respondent, Austin

Sex	Driving Alone	Carpool Member
Male	79.3	20.7
Female	72.7	27.3

SOURCE: Derived from the U.S. Bureau of the Census (1983), Census of Population and Housing, 1980, Public Use Microdata, Sample B, Texas.

more likely to carpool than those making between $5 and 15,000!

Table Eight illustrates the second major carpool usage pattern; high income men are more likely to be in a carpool than comparable women. Over 53% of all women who are carpool members have incomes below $20,000 while almost 70% of all male carpool members have incomes above $20,000. At every income level above $20,000 men are more likely to be in a carpool than women with comparable household incomes.

Table Nine shows a perhaps surprising fact; in general the size of the carpool goes up as household income goes up. The overwhelming number of two person carpools are made up of people with incomes below $25,000 while over 70% of four person carpools are made up of those with incomes above $25,000.

Of course, most carpools have only two members and the overwhelming majority are composed of spouses driving to work together; in short, most two member carpools are not "choice" carpools and the two workers may not be employed near one another. (The Capital Metro marketing study found that 81% of all Austin carpools were composed of people related to one another or living together.) But it seems safe to assume that the larger carpools, while only a small percentage of all carpools, are, indeed, composed of non family members or "choice" riders, who probably do work near one another.

Table Eight
Likelihood of Being in Carpool to Work by Sex and Household Income

	% Carpool Members	
Household Income	**Males**	**Females**
Under $5,000	5.9	1.2
5,000 - 9,999	8.2	15.5
10,000 - 14,999	18.7	15.5
15,000 - 19,999	15.8	21.4
20,000 - 24,999	15.8	14.9
25,000 - 29,999	11.7	8.9
30,000 - 34,999	9.9	9.5
35,000 - 39,999	5.9	7.1
More than 40,000	8.2	6.0
Total	100.0	100.0

SOURCE: Derived from the U.S. Bureau of the Census (1983), Census of Population and Housing, 1980, Public Use Microdata, Sample B, Texas.

Table Nine

Percentage of Each Carpool Size Accounted for by Household Income Groups, Austin 1980

Household Income	Number of People In Carpool		
	Two	Three	Four
Under $5,000	4.5	1.8	0.0
5,000 - 9,999	13.6	7.1	3.9
10,000 - 14,999	18.9	16.1	7.7
15,000 - 19,999	15.6	33.9	11.5
20,000 - 24,999	15.2	8.9	26.9
25,000 - 29,999	9.1	8.9	30.8
30,000 - 34,999	9.1	8.9	15.4
35,000 - 39,999	6.6	5.4	3.8
More than 40,000	7.4	8.9	0.0
Total	100%	100%	100%

SOURCE: Derived from the U.S. Bureau of the Census (1983), Census of Population and Housing, 1980, Public Use Microdata, Sample B, Texas.

Implications

These two sets of analyses show that there is a small group of higher income individuals who use transit or join non-family carpools. First, the basic demographic data suggest that there are a small number of non-traditional riders, such as children and the elderly as well as those in one-car households, who might use a customized non-work transit service. Second, the PUMS Census data suggest that higher income individuals in Austin can be induced to use vanpool type transit services similar to carpools if these services meet their specific worktrip needs.

TRANSPORTATION FLOWS IN THE CORRIDOR

The goal of Phase Two was to identify the work and non-work trip patterns within the Corridor which might be matched to promising non-traditional transit options. To do so, the analyses identified: 1) flows between the 183 Corridor and other parts of Austin by type of trip, 2) flows within the Corridor by type of trip, 3) major work-trip and non-work trips attractors within the Corridor, and 4) the number of trips attracted daily to those work and non-work sites.

The Team identified five major employment concentrations and five major shopping/personal business concentrations and then considered which non-traditional options could be matched to the daily trips attracted to those land use patterns, giving weight to the demographic analyses conducted in Phase One.

The kind and location of both employment centers and employees suggested that vanpool options would be most appropriate for non-traditional work oriented trips. The kind of non-work concentrations and the demographic make-up of the Corridor suggested that demand-responsive options would most appropriate for discretionary trips.

Given the resources of the study it was impossible to consider transit options for trips coming into the Corridor from outside; this is probably not a serious omission because only 2% of all trips originating in Austin outside the Corridor are destined for Corridor sites.

Phase Two analyses show that three of the major work sites--the Arboretum, Texas Instruments, and Northwest Techniplex--might be appropriate candidates for vanpooling types of non-traditional transit services. The analyses also show that three sub-areas of the Corridor could each be served by a separate but comparable demand responsive service focused largely on non-work trips.

INTER-CORRIDOR FLOWS

Most Corridor residents do not work within the Corridor but, like most modern suburban workers, they also do not work in the traditional core of the city. Table Ten shows inter- and intra-Corridor flows by trip purpose as derived from the 1988 Marketing Baseline Study conducted for Capital Metro by Nustats, Inc.;

Table Ten

DISTRIBUTION OF TRIPS TO AND FROM THE 183 CORRIDOR

	WORK	SCHOOL	DISCRETIONARY
Percent of all trips in Austin which originate in the 183 corridor	14%	14%	13%
Trips originating in the corridor			
Staying in the corridor	11%	3%	75%
Going to other corridors	77%	55%	20%
Going to Core	12%	42%	5%
Trips originating in other corridors			
Coming to 183 corridor	2%	2%	2%
Going to other corridors	85%	92%	93%
Going to Core	13%	6%	5%

Source: Derived from the Report on Marketing Baseline Study conducted for Capital Metro, Nustats, Inc., 1988.

roughly 11% of work trips generated by residents within the Corridor stay in the Corridor while the overwhelming majority--77%--work in other non-downtown areas of the City.

Non-work trips for shopping, medical, socializing, and personal business are slightly more likely to stay within the Corridor; roughly 20% of those trips are destined for facilities within the 17 mile long Corridor. On the other hand, even fewer non-work trips leaving the Corridor are destined for the traditional downtown.

The percentages of trips found to stay within the Corridor for work and non-work trips, 11% and 20% respectively, were used in subsequent analyses as default values where more site specific information was not available.

TRIP ATTRACTORS AND GENERATORS

In the second part of Phase Two the Study Team identified five major work trip and five non-work trip attractors in the Corridor and calculated the trips from within the Corridor attracted to, or near, each of these major attractors. The Team then considered how many of these trips were likely candidates for the non-traditional transit options suggested by Phase One: vanpooling and community demand responsive services.

Major Employment Sites

Most of the commercial and industrial development in the Corridor occurred in the southern portion, below Highway 620. Moreover the majority of those sites were "strip developments," on or adjacent to Highway 183. Residential development however, while also heavier in the southern end, was distributed all through the land area of the Corridor.

The Corridor has five major employers or employment concentrations, all in the southern portion below Highway 620, as shown on Map Two: The Arboretum Office Complex, a small 3M facility, The Stratum office complex near Balcones Woods, the large Texas Instruments site near the middle of the Corridor, and N.W. Techniplex, adjacent to Texas Instruments.

Table Eleven shows that approximately 1,000 of the 7,500 employees at these five sites live in the Corridor. However additional analysis shows that a significant percentage of those workers lived too close to their employment site to be good candidates for vanpooling or any other non-traditional transit services in the absence of sanctions against driving alone or parking at the job.

Data from other cities clearly indicate the relationship between distance from work and the use of company oriented vanpools; at the 3M facility in St. Paul, often heralded for its encouragement of transit and paratransit modes, approximately 13% of the total workforce comes to work in a vanpool but only

Map Two

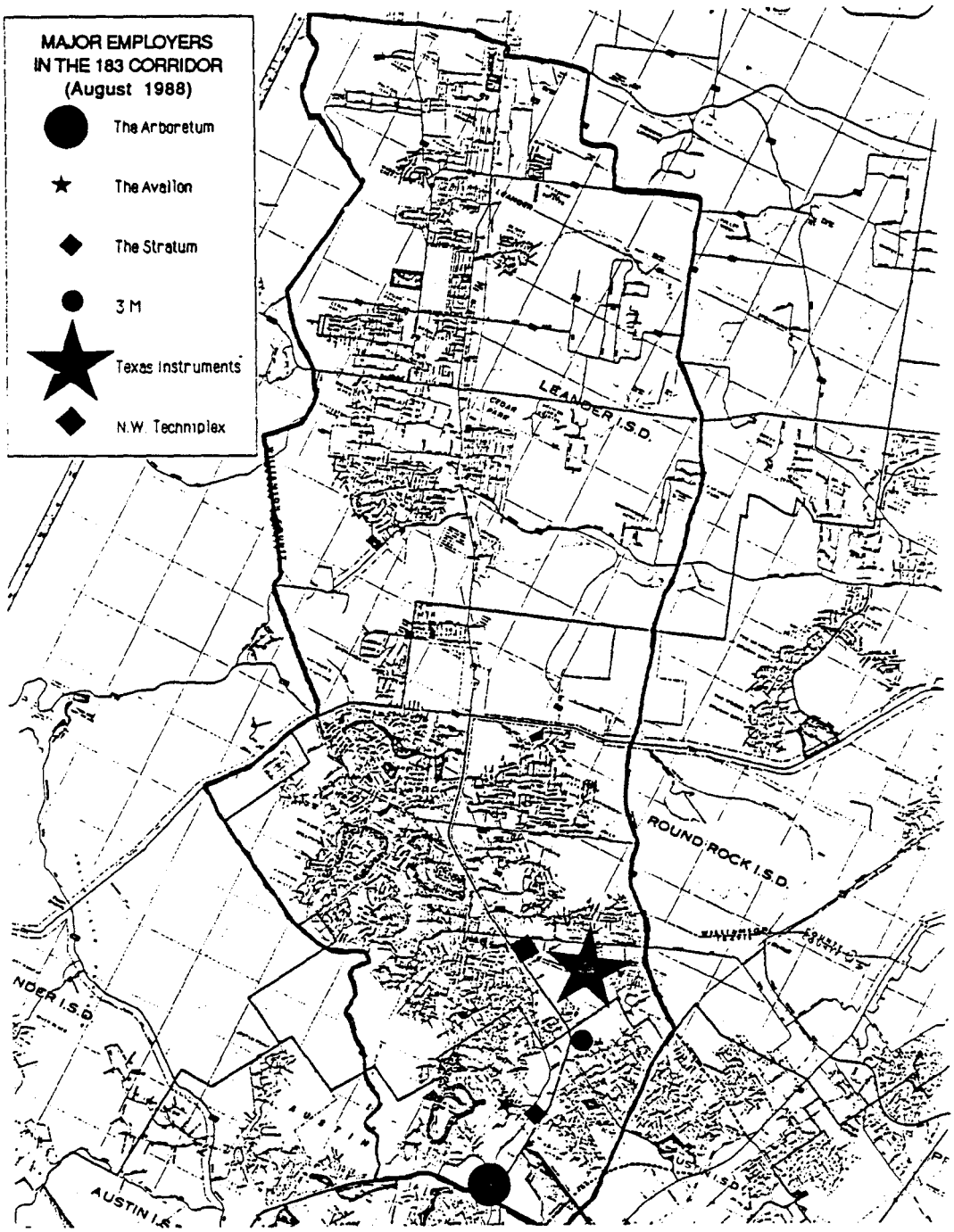
MAJOR EMPLOYERS
IN THE 183 CORRIDOR
(August 1988)
The Arboretum
The Avallon
The Stratum
3 M
Texas Instruments
N.W. Technoplex
LEANDER I.S.D.
ROUND ROCK I.S.D.
AUSTIN I.S.D.

Table Eleven

TRIPS ATTRACTED TO THE MAJOR EMPLOYERS IN THE 183 CORRIDOR

COMPLEX	TYPE	AREA (Sq. Feet)	ACTUAL OR *CALCULATED EMPLOYMENT	COMPUTED AM PEAK IN-CORRIDOR ATTRACTIONS (Person Trips)
Arboretum 1	Office Building	250,000	608 *	39
Arboretum 2	Office Building	550,000	1,338 *	85
Arboretum Point	Office Building	148,000	360 *	24
Great Hills	Office Building	167,706	408 *	27
Health Care International	Office Building		200	18
Total "Arboretum Office Complex"	Office Building		2,914 *	192
3M	Light Industrial		300	84
The Stratum	Office Building	240,000	584 *	37
Texas Instruments	Light Manufacturing		2,400	669
N.W. Techniplex	Office Building	550,000	1,338 *	85

Sources: Derived from information provided in the ITE Trip Generation Report; National Personal Transportation Study, 1983; Report on Marketing Baseline Study for Capital Metro (Nustat Inc, Feb. 1988); Telephone conversations with the Human Resources Department of 3M; Sector 14 and Sector 15 Background Information (Planning and Growth Management, 1987); and a listing of places of residence of Texas Instruments employees by Zip Code.

15% of all vanpoolers live less than ten miles from the job. VPSI, the national private firm which operates vanpools in Austin (see the following section), will not consider organizing such services less than 15 miles from the employment site.

Tables Twelve and Thirteen illustrate two ways in which the Study Team estimated the number of potential vanpoolers among the employees at each of the five major work sites. Table Twelve estimates a **high** and a **moderate** percentage of <u>all</u> employees who live in the Corridor who might vanpool or rideshare. The percentages used were based in part on 3M's experience and in part on the experiences of other cities reported on in the literature [5].

Table Thirteen, with the smaller estimates, is perhaps the more realistic assessment; it also estimates a high and low percentage, but only of those employees <u>living over ten miles away</u> from each of the five work sites. In general, all of the employees shown in this Table live in the northernmost end of the Corridor in Leander and Cedar Park, although some potential riders among Arboretum employees live slightly south of those cities *.

It is clear that the moderate numbers of workers at each site would hardly support a vanpool effort. However, given active company encouragement and perhaps sufficient financial incentives, at least three of the major work sites--the

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* All calculations shown on Table Thirteen were done at the Traffic Serial Zone level and aggregated; specific details are given in the Technical Appendices.

Table Twelve

POTENTIAL RIDE-SHARING NON-TRADITIONAL OPTIONS RIDERSHIP FOR THE WORK TRIP

COMPLEX	COMPUTED A.M. PEAK IN-CORRIDOR WORK-TRIP ATTRACTIONS	POTENTIAL RIDE-SHARING NON-TRADITIONAL OPTIONS RIDERSHIP (number of vanpool subscribers)	
		HIGH 13%	MODERATE 3%
Arboretum Office Complex	192	26	6
3M	84	11	3
The Stratum	37	5	1
Texas Instruments	669	89	20
Northwest Techniplex	85	11	3

Table Thirteen

POTENTIAL RIDE-SHARING NON-TRADITIONAL OPTIONS RIDERSHIP FOR THE WORK TRIP FOR TRAVEL DISTANCES OVER TEN MILES

COMPLEX	COMPUTED A.M. PEAK IN-CORRIDOR WORK-TRIP ATTRACTIONS FOR TRAVEL DISTANCES OVER 10 MILES	POTENTIAL RIDE-SHARING NON-TRADITIONAL OPTIONS RIDERSHIP (number of vanpool subscribers)	
		HIGH 13%	MODERATE 3%
Arboretum Office Complex	147	20	4
3M	25	3	1
The Stratum	29	4	1
Texas Instruments	180	24	5
Northwest Techniplex	65	9	2

Sources: See Table Eleven and Technical Appendix.

Arboretum, Texas Instruments, and Northwest Techniplex--might be appropriate candidates for vanpooling types of non-traditional transit services.

Non Work Trip Attractors

There are seven major grocery stores located in five major shopping centers in the Corridor; they are shown on Map Three. Although there is substantial commercial development all along U.S. Highway 183, most of the shopping and routine commercial sites appear to be located in the shopping centers which these grocery stores "anchor" *. Two major medical facilities in the Corridor are near Balcones Woods in the southern end of the Corridor.

Table Fourteen shows that four of the five shopping centers attract a significant number of daily trips from inside the Corridor. The Simon David store near the Arboretum, which is located at the very southernmost border of the Corridor, largely serves the residents of other Corridors.

Phase One findings, based on 1980 Census data, suggested that there are a small number of potential riders for a non-work demand responsive service. Phase Two analyses show that there is an appreciable market for such services under even conservative estimates of potential ridership.

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* A complete list of all commercial and shopping sites in the corridor appears in the Appendix which also contains a list of all stores at each of the five centers.

Map Three

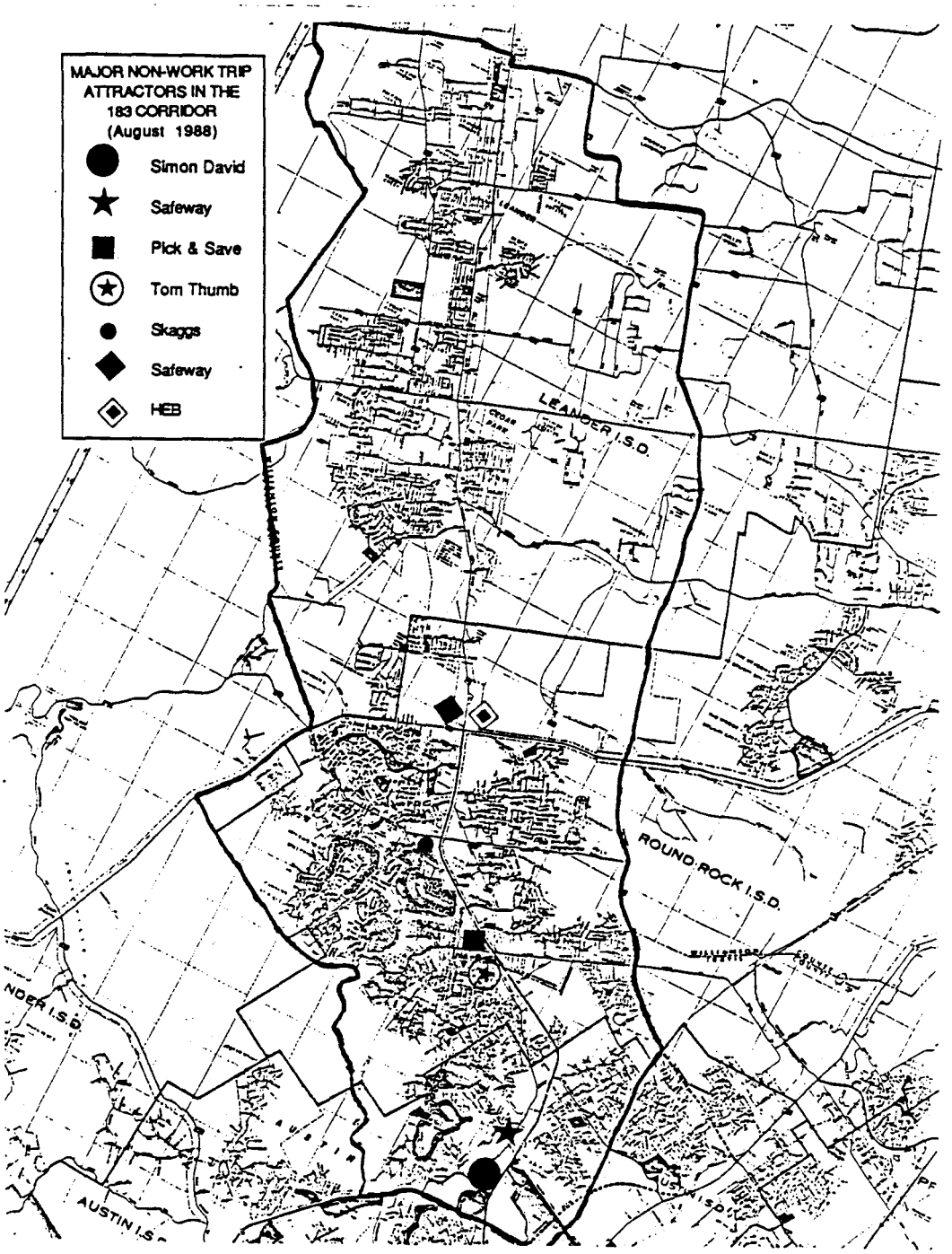
MAJOR NON-WORK TRIP ATTRACTORS IN THE 183 CORRIDOR (August 1988)
Simon David
Safeway
Pick & Save
Tom Thumb
Skaggs
Safeway
HEB
LEANDER I.S.D.
ROUND ROCK I.S.D.
AUSTIN I.S.D.

Table Fourteen

DAILY PERSON TRIPS TO MAJOR NON-WORK ATTRACTORS

SHOPPING CENTER COMPLEX; ANCHOR STORE(S)	COMPUTED DAILY IN-CORRIDOR PERSON-TRIPS		
	SHOPPING	FAMILY AND PERSONAL BUSINESS	TOTAL
Simon David	154	83	237
Safeway	2,188	1,179	3,367
Pick N'Save and Tom Thumb	2,222	1,198	3,420
Skaggs	2,944	1,587	4,531
Safeway and HEB	3,047	1,642	4,689

Source: See Technical Appendix

Table Fifteen shows that even if only 1% of all shopping, personal business, and other non-work trips were to be made using non-traditional service, there would be roughly 500 potential trips per day. (NPTS data show that roughly 1% of all non-work trips in the U.S. are made using conventional transit; the Capital Metro Baseline study shows a comparable figure for Austin.) If the superior nature of the service were to induce greatest ridership, as many as 1,500 trips per day would use a demand responsive service.

The location of these shopping centers, and the magnitude and nature of the travel they attract, suggest that there are three sub-areas of the Corridor which could each be served by a separate but comparable demand responsive service focused largely on non-work trips. There are three reasons for dividing the entire Corridor into three community service sections.

First, as Table Fifteen shows, there is sufficient ridership to support three separate community based services, even under conservative ridership estimates. Second, NPTS data show that people do most (almost 2/3) of their shopping and the majority of their other personal business (50-80%) within five miles of their home so most of their needs would be taken care of in one community service area.

Third, the Corridor is too large to be efficiently served by only one system--doing so would sharply reduce the level of service delivered to passengers and

Table Fifteen

NON-WORK TRIPS IN THREE POTENTIAL TRANSIT SERVICE AREAS

SERVICE AREA SECTIONS	COMPUTED DAILY IN-CORRIDOR NON-WORK TRIPS				POTENTIAL TRANSIT RIDERSHIP	
	SHOPPING	MEDICAL	FAMILY AND PERSONAL BUSINESS	ALL OTHER NON-WORK TRIPS	HIGH (3%)	AVERAGE (1%)
South Southwest Southeast	6,729	837	5,134	5,564	548	183
North Northwest Northeast	7,027	781	4,835	5,564	546	182
Leander/ Cedar Park	2,994	476	2,128	5,564	335	112

Source: See Technical Appendix.

would drastically reduce ridership. To address any problems created by restricting service to a one specific area, each service area could overlap slightly so that 90% of all the potential non-work destinations of an individual household would be served by one community demand responsive service. Additionally a special but much higher fare could be set for out-of-area trips.

IMPLICATIONS

Because there are concentrated sites of both employment and commercial activity within the Corridor, there are definite opportunities for some kinds of non-traditional transit services. These range from employer based or sponsored vanpools serving the large employment sites to community based demand responsive services serving heavily developed portions of the Corridor.

The next section considers 1) what it would cost to provide these services which seem initially appropriate and 2) how Capital Metro can evaluate the cost-effectiveness of comparable services in other portions of the City.

COST AND SERVICE CHARACTERISTICS

The goal of Phase Three was to identify the cost and service patterns of the most promising non-traditional transit options, to identify potential ridership and ultimately productivity for such options, and to consider their cost effectiveness. To do so, the Study Team 1) analyzed the cost and service patterns of the non-

traditional services already underway in Austin, 2) compiled cost and service data on similar systems throughout the country, and 3) suggested the likely cost and productivity ranges that Capital Metro would face in implementing promising options in the 183 Corridor or elsewhere in Austin.

The Study considered as "non-traditional" services those that differ from fixed route services in either the way services are delivered, who actually delivers them, or how a public subsidy is administered.

Because Phase One and Phase Two suggested definite types of non-traditional services which would be most appropriate for the Corridor--vanpools and community-based demand responsive services--this Phase focused on different ways to provide these services. The Study Team analyzed options ranging from totally private delivery and financing of vanpooling (much the way the VPSI vans in Austin now operate) to the taxi operator providing demand-responsive services to the general public (much the way the current Elderly and Handicapped services are delivered in Austin).

AUSTIN'S NON-TRADITIONAL SERVICES

Capital Metro has been diversifying the type of transit services it provides and it has been increasing the proportion of services contracted with private companies. Capital Metro currently provides or authorizes demand responsive service to the elderly and handicapped, feeder service to express buses, vans substituting for

fixed route buses in low density areas or on weekends or evenings, and vanpools for the commuter trip.

All of Capital Metro's current non-traditional options are shown in Table Sixteen; the Table makes clear that almost all of these options involve private providers in major service roles. The Table also shows that cost figures for different providers a) range widely from a high of almost $35/hour to a low near $20/hour and b) that all cost figures are not easily comparable because Capital Metro pays differently for different services.

An examination of the actual operating experiences of these non-traditional services reveals that more expensive ones are also the more experimental and small-scale; given either longer experience or larger passengers volumes it is likely that the cost of these services will fall so they are a) comparable with other city non-traditional services and thus fairly cost effective and b) comparable to costs found in other cities (discussed below).

All of the costs figures shown in Table Sixteen are far lower than Capital Metro's average cost for fixed route bus service--$45/revenue hour. Overall most of the non-traditional services which Capital Metro provides are relatively more cost effective than traditional services because of the great differential between the contract costs and the Authority's average cost per vehicle hour of service.

The sections below describe each current Capital Metro service in greater depth.

Table Sixteen

NON TRADITIONAL TRANSIT OPTIONS OPERATED OR CONTRACTED BY CAPITAL METRO (CMTA)

TYPE OF SERVICE	PROVIDER	VEHICLES	COST TO CMTA	RIDERSHIP
GENERAL PUBLIC				
FIXED ROUTE				
Off-Peak and Saturday fixed suburban route	American Cab	14 pass. vans	$34.93 / hour	5 riders / trip
Saturday fixed suburban route	American Cab	14 pass. vans	$34.93 / hour	6 riders / trip
Express (4 trips per day)	American Cab	14 pass. vans	$34.93 / hour	80 riders / week
OTHER				
Vanpools (from nearby towns to the CBD)	VPSI	14 pass. vans	$0.14 / pass. or $972 / month*	13 riders / trip
Demand responsive from the Northwest area to the central city	CARTS	Vans	$21 / hour	23 pass. trips / week
Feeder Service from Northwest communities to an express bus service to the central city	CARTS	Vans	$21 / hour	191 pass.trips / week
ELDERLY & HANDICAPPED				
Special Transit Services for the ambulatory elderly and the handicapped	American Cab	Taxis	$6.95 / pass.** $8.47 / pass.***	2,140 riders / week
Special Transit Services for the elderly and the handicapped	CMTA	Special vehicles	$47.32 / hour	3,939 riders / week

* Capital Metro acts as the project manager, in charge of marketing, management and facilitating contacts. The cost shown is the CMTA administrative cost allocated to this service.
** Amount paid to the taxi company (December 1987).
*** Total cost which includes the amount paid to the taxi company and the internal administrative cost (December 1987).

Sources: Capital Metro cost model for December 1987, conversations with CMTA officials, CMTA route maps, and Capital Metro's 1988 Boarding and Alighting Survey.

DRAFT 10/20

We also have subsidized vanpools in the corridor! (→ Tracor → Motorola)

Commuter Vanpool Service

The major vanpool service in the Capital Metro service area operates from outlying communities more than 30 miles from Austin and is provided entirely by a private operator without any direct public subsidy. Capital Metro participation is limited to marketing, matching potential poolers, and facilitating contracts between riders and the company.

VPSI, the operator, is a subsidiary of Chrysler, which operates commuter vanpools around the country. VPSI leases the vans to the users for approximately $560/month plus 7c/commute mile. The driver of the van is also a commuter; s/he does not pay for the service and is able to use the van for private use when not in commuter service. The driver however has to collect the fares from the other riders and to complete any required paperwork.

Currently each 15-person capacity van averages 13 daily riders; in December of 1987 slightly over 7,000 passenger trips were carried by the vanpool system at an average fare of roughly $50 per week. The fare to the rider is calculated by dividing total monthly cost (rent and gas) by the number of days in service and the number of riders (less the driver). Therefore the cost to each rider varies with the total ridership.

Capital Metro's expenditures are very low. Acting only as the project manager in

charge of marketing, Capital Metro's total cost in December of 1987 was only $972 for the whole month or 14c per passenger trip!

Unfortunately this option is not appropriate for service in the Corridor or VPSI would have already started such a system. The company will not even consider operations involving less than a 30 mile round trip commute.

Demand Responsive Services

Capital Metro provides two demand responsive services: those provided city-wide to elderly and handicapped people, and those provided only in the 183 Corridor for residents of Lago Vista, Jonestown, and Cedar Park.

Capital Metro's only truly demand responsive option serving all destinations is the special service available to all individuals older than 70 or those who, by reason of disability, are unable to use regular buses. Capital Metro provides two types of service; for those riders in wheelchairs, Capital Metro itself provides the demand responsive service, using specially equipped public vehicles and Authority drivers. However, Capital Metro contracts with a local taxi operator to provide service for the elderly and the disabled who can ride in ordinary vehicles.

Is this true?

The contract taxi option provides service to approximately 2,140 riders/week at a cost of $8.50 per passenger (above the $1.00 fare paid by riders); this cost includes $6.95 paid to the taxi operator and $1.55 in administrative costs incurred

includes $6.95 paid to the taxi operator and $1.55 in administrative costs incurred by Capital Metro. The Capital Metro demand responsive vehicles for those in wheelchairs carry approximately 3,900 riders/week at a cost of roughly $13.00 per passenger. Part of the cost differential is the lower productivity involved in serving seriously handicapped people.

Both demand responsive services have experienced significant increases in ridership in the last two years, with combined growth far ahead of the Authority's impressive 32% ridership gain. Between the beginning of 1986 and the beginning of 1988 special transit ridership increased 55%.

The Authority's other demand responsive service is a far more limited one with far less impressive ridership. Capital Metro contracts with CARTS, the federally funded rural transit provider in Travis and surrounding counties, to provide the Northwest Dial A Ride (DAR) service. The DAR operates Monday, Wednesday, and Friday from any location in Lago Vista, Jonestown, Leander, or Cedar Park to any location along the actual 183 Corridor (that is, extending beyond the artificial study boundaries) and to specific shopping malls and medical centers in Austin.

The DAR service, which requires a 24 hour advance notice, operates only once per day, departing in the morning and returning in the early afternoon. Because of the severe limits on service, ridership has been very low and relatively stable. Ridership in the first seven months of 1988 was only 438 passenger trips (for the entire period), a 6% increase over the comparable period in 1987.

Capital Metro pays CARTS $21.00/vehicle hour for this service. While low, given the small ridership, the cost per passenger is higher than for the Authority's other non-traditional services.

Other Non-Traditional Services

Capital Metro also provides other services which, while far more like traditional service, are set apart by the fact that they are all delivered by private or non-profit operators under contract to the Authority. Capital Metro operates several such options including suburban feeder services and off-peak services.

Capital Metro contracts with CARTS, the rural public system with which it contracts for Northwest DAR, for a feeder service from Lago Vista and Jonestown to an express bus service departing from Leander and serving the University of Texas and downtown. Ridership is high and growing; during the first seven months of 1988 there were 5,758 passenger trips, a 73% increase over the same time period in 1987. CARTS is also paid $21.00/hour for this service.

The last major non-traditional service provided by Capital Metro is off-peak and Saturday service on fixed suburban routes operated by a local taxi operator in vans. Capital Metro awarded a contract to American Cab in August of 1988 paying $34.95/revenue hour.

This cost is substantially higher than an equivalent hourly cost for elderly and

This cost is substantially higher than an equivalent hourly cost for elderly and handicapped service provided for Capital Metro by the same operator, and substantially higher than comparable services across the country (in higher labor cost areas). However, the service is largely experimental and the operator was required to purchase vans for which it has no other use; should services be extended, officials believe that the hourly contract costs could drop significantly.

NON-TRADITIONAL SERVICES: STATE-OF-THE-ART

As part of Phase Three, the Study Team contacted over a dozen cities with interesting and relevant non-traditional services and analyzed published reports covering the operations of almost 90 systems or services. Rarely were completely comparable data available on either costs or service standards but several clear patterns emerged which bear on Capital Metro's use of appropriate non-traditional options.

Several factors were of interest to the Study Team. First, the Team was concerned about a **unit cost** measure, cost/vehicle hour, or the total service cost, including the administrative cost borne by the contracting agency, divided by total hours in service (or revenue hours). Unfortunately the Study Team couldn't always tell if administrative costs were included in reported total or unit costs; in the Capital Metro system such costs were 18% of total costs for some services.

But cost has to be balanced with a measure of the **amount** of service provided per

what? Is it the syntax or is something missing.

usually total costs divided by the total number of passenger trips. Ultimately this cost figure is based on how productive the system is--how many passengers it carries during the time service is available. The most useful **productivity** measure is passenger trips/vehicle hour. This figure **should be computed** by dividing total daily (or weekly) ridership by every hour service is available.

In fact some demand responsive systems, either because they consciously wish to hide low productivity or because they don't understand the distinction, simply divide ridership by only those hours when someone requested service. Doing so greatly inflates productivity and hides the fact that vehicles may be underused for large portions of a service day (when the contractor is still being paid or the system incurring an hourly charge). Productivity figures for general public demand responsive systems over 7.0 passenger trips/hour are very suspect *.

Several Tables in the Appendix summarize all relevant findings; they were it was too detailed and complex to present in the text. The Appendix also lists the major published work from which these findings were drawn. The major findings of this analyses are:

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* Productivity for systems for the elderly and handicapped can be higher if many people live in the same place (a community home for the mentally retarded, for example) and/or are all going to one place (a congregate meal site for the elderly). But such conditions rarely apply to general public demand responsive systems. Moreover systems for the handicapped often have low productivity because it takes so long to board and de-board handicapped travellers and because they often make very long trips.

1) private or contracted delivery of non-traditional services was always cheaper and generally more cost-effective than public delivery of the same service, although the differential was greater for demand-responsive than vanpooling services;

2) most demand-responsive contracted services averaged between $20-30 per vehicle hour, with the lowest costs always shown by taxi operators who operated in their traditional mode, the highest costs generally shown by transit agencies themselves operating demand-responsive services although this was not always true;

3) most contracted or publicly delivered vanpool services cost between $11-20 per vehicle hour;

4) vanpool productivity was always high (80-90% of capacity) largely because such services were rarely started unless sufficient riders had already signed up;

5) demand-responsive productivity varied with the clients and the service area; it was generally much higher when service was delivered in limited areas; and

6) general public demand-responsive productivity realistically fell between 2.9 and 7.0 passenger trips/vehicle hour.

These findings are consistent with Capital Metro's own non-traditional service cost and service patterns (discussed above). In addition, they give weight to Phase One and Phase Two analyses, which found that the most appropriate services for the 183 Corridor were 1) carefully crafted vanpools for work trip commuters and 2) demand-responsive service for the general public in limited service areas.

These national cost and productivity patterns, combined with those already experienced in Austin, gave the Study Team a way to develop cost-effectiveness and implementation guidelines for non-traditional services; these were developed in Phase Four and are described in the final section of this report.

IMPLEMENTATION AND COST EFFECTIVENESS GUIDELINES

The overall objective of the first three Phases of this study was to indicate non-traditional strategies appropriate for work and non-work trip needs in the 183 Corridor and elsewhere in the service area. The Study Team has suggested that two non-traditional options may be highly appropriate for the Corridor: vanpooling for major employment centers, and, demand-responsive services in three sub-areas for non-work trips.

The objective of Phase Four, described in this section, was to develop guidelines to allow Capital Metro to 1) judge if otherwise appropriate non-traditional service options are cost-effective and 2) to chose between alternative ways of delivering the same type of non-traditional services. These two issues are not, of course, mutually exclusive; one way of delivering demand responsive service may be cost-effective while another is not.

In order to facilitate those decisions the Study Team developed guidelines on the three major parameters of alternative service options: costs per vehicle hour, costs per passenger trip with different productivity estimates, and subsidies per passenger trip.

Overall, the guidelines developed in Phase Four suggest that vanpools centered on major employment sites in the Corridor would be moderately to highly cost-effective under either public or private administration of service delivery.

Demand responsive services for non-work trips in limited areas of the Corridor would be very cost-effective if delivered by the private sector under contract to Capital Metro. These services are cheaper than fixed route service, if measured on a vehicle hour basis, and would require less subsidy per hour than fixed route service (by a factor of three to one, under some ridership estimates).

RECOGNIZING POLICY TRADE-OFFS

Capital Metro must make a number of trade-offs in choosing service strategies. The Study Team can provide guidelines, and does so here, but ultimately most service decisions require major policy choices. Guidelines merely provide guidance--they are not an end onto themselves.

Two very different services could have comparable service costs and even require comparable subsidies: a very expensive service may attract many riders so the cost per rider is equivalent to an inexpensive service which attracts few riders. The choice between the two options requires several major policy decisions: should the Authority chose the service that minimizes costs or the one that maximizes ridership if it can't do both?

Because transit options, traditional or non-traditional, generally require some public subsidy, a major concern is the individual and total subsidy required by each option. The subsidy, of course varies with productivity and cost, so the guidelines attempt to indicate the <u>percentage</u> of total operating costs which must be subsidized.

Yet as with cost and ridership figures, the service decision can't be based on subsidies alone--the decision still requires policy evaluation. Because various parts of the service area have different needs and face different problems the Authority already has varying subsidy patterns: currently some traditional routes

cover as much as 25% of all costs while others cover only 4% of total costs. Moreover, some services may grow over time ultimately reducing the subsidy required; other services may never become cheaper but Capital Metro may wish to continue operations because of the nature of the users or local needs.

The two following sections each focus separately on alternative ways to organize the major types of non-traditional services identified as appropriate for the 183 Corridor by the findings of Phases One through Three: vanpooling centered on major work trip sites, and, demand-responsive services in three sub-areas of the Corridor.

VANPOOLING OPTIONS

There are four major types of vanpooling options appropriate for the Corridor although only two are currently worth deeper investigation:

1) vanpools organized and sponsored by employers (such as 3M in St. Paul and Shell in Houston),

2) vanpools organized entirely by the profit sector (such as VPSI in Austin and elsewhere),

3) vanpools operated by the transit authority (as in Knoxville) and,

4) vanpools organized by the authority but provided by private firms.

The first two options are not considered further for intra-Corridor use because private companies and employers have expressed no interest in either option.

Tables Seventeen and Eighteen focus separately on the two currently feasible options, estimating the number of vehicles required to provide needed service to each of the major employment sites under different ridership estimates, and, the costs of the option at each work site. Because of the nature of vanpooling services, there is not much difference in cost or vehicle patterns for the two services.

Table Seventeen illustrates the cost patterns and vehicle needs if Capital Metro were to organize and operate the service; Table Eighteen illustrates comparable patterns if Capital Metro only organized the service but contracted with a private provider to deliver services. The average hourly cost/vehicle hour is $16.12 for Capital Metro and $15.29 for services organized by Capital Metro but delivered by a private provider; these figures represent the average for those types of services developed from the vanpool cost data collected in Phase Three.

Tables Nineteen and Twenty take the vehicle requirements and hourly costs developed above and compute a) total revenue per trip under different ridership assumptions given a $72.00/month fare (the average amount VPSI currently charges in Austin), and b) the average daily subsidy required at each site with

Table Seventeen

COST OF RIDE-SHARING NON-TRADITIONAL OPTIONS FOR THE WORK TRIP FOR TRAVEL DISTANCES OVER TEN MILES VANPOOL OPERATED BY CAPITAL METRO

WORK-TRIP CONCENTRATION	ESTIMATED DEMAND A.M. PEAK		NUMBER OF VEHICLES REQUIRED*		TOTAL COST / A.M. TRIP^	
	HIGH	MODERATE	HIGH DEMAND	MODERATE DEMAND	HIGH DEMAND	MODERATE DEMAND
Arboretum Office Complex	20	4	2	1	$32.24	$16.12
3M	3	1	1	1	16.12	16.12
The Stratum	4	1	1	1	16.12	16.12
Texas Instruments	24	5	2	1	32.24	16.12
Northwest Techniplex	9	2	1	1	16.12	16.12

* 14 passenger vans are typically used in vanpooling operations.

^ See Appendix. It was assumed that the cost/hour is equal to the cost for an A.M. trip. The cost/hour figure ranges from $11.41 to $20.84 for other systems in operation. The average figure of $16.12 was used in this analysis.

Sources: Derived from Table Thirteen; see Appendix.

Table Eighteen

COST OF RIDE-SHARING NON-TRADITIONAL OPTIONS FOR THE WORK TRIP VANPOOL CONTRACTED WITH A PRIVATE PROVIDER

WORK-TRIP CONCENTRATION	ESTIMATED DEMAND A.M. PEAK		NUMBER OF VEHICLES REQUIRED*		TOTAL COST / A.M. TRIP	
	HIGH	MODERATE	HIGH DEMAND	MODERATE DEMAND	HIGH DEMAND	MODERATE DEMAND
Arboretum Office Complex	20	4	2	1	$30.58	$15.29
3M	3	1	1	1	15.29	15.29
The Stratum	4	1	1	1	15.29	15.29
Texas Instruments	24	5	2	1	30.58	15.29
Northwest Techniplex	9	2	1	1	15.29	15.29

* 14 passenger vans are typically used in vanpooling operations.

Sources: Derived from Tables Thirteen; see Appendix.

the two ridership assumptions. Table Nineteen focuses on vanpool services organized and operated by Capital Metro while Table Twenty focuses on services contracted to a private provider.

Both Tables show that two of the work sites cannot support either type of vanpooling arrangement: the 3M facility and The Stratum. However there would be little or no subsidy required at three sites--Texas Instruments, Northwest Techniplex, and the Arboretum--if the high demand figures were accurate. In short these guidelines suggest that vanpools centered on major employment sites in the Corridor would be moderately to highly cost-effective under either type of service delivery administration.

DEMAND RESPONSIVE SERVICES

The findings of Phase Two and Three suggested that demand-responsive services in limited sub-areas of the Corridor would be appropriate for meeting non-work trip needs. There are three major ways to organize these services:

1) demand-responsive service in a limited area by a private operator charging for dedicated vehicle hours of service under contract to a transit authority;

Table Nineteen

SUBSIDY REQUIRED IN RIDE-SHARING NON-TRADITIONAL OPTIONS FOR THE WORK TRIP VANPOOL OPERATED BY CAPITAL METRO

WORK-TRIP CONCENTRATION	AVERAGE TOTAL COST / A.M. TRIP^		TOTAL REVENUE PER A.M. TRIP AT A $72.00/PASS./MONTH FARE*		TOTAL SUBSIDY REQUIRED PER TRIP AT A $72.00/PASS./MONTH FARE*	
	HIGH DEMAND (13%)	MODERATE DEMAND (3%)	HIGH DEMAND (13%)	MODERATE DEMAND (3%)	HIGH DEMAND (13%)	MODERATE DEMAND (3%)
Arboretum Office Complex	$32.24	$16.12	$30.86	$5.14	$1.38	$10.98
3M	16.12	16.12	3.43	N/F	12.69	N/F
The Stratum	16.12	16.12	5.14	N/F	10.98	N/F
Texas Instruments	32.24	16.12	37.71	6.86	0.00	9.26
Northwest Techniplex	16.12	16.12	13.71	1.71	2.41	14.41

N/F: Not feasible

* Assuming 21 days per month and two trips per day. It was also assumed that the driver for each van needed does not pay any fare. $ 72.00 is the amount that VPSI currently charges a passenger riding in a van with 10 persons commuting 30 miles per day.

^ See Appendix. It was assumed that the cost/hour is equal to the cost for an A.M. trip. The cost/hour figure ranges from $11.41 to $20.84 for other systems in operation. The average figure of $16.12 was used in this analysis.

Sources: Derived from Tables Thirteen and Seventeen; see Appendix.

Table Twenty

SUBSIDY REQUIRED IN RIDE-SHARING NON-TRADITIONAL OPTIONS FOR THE WORK TRIP VANPOOL CONTRACTED WITH A PRIVATE PROVIDER

WORK-TRIP CONCENTRATION	AVERAGE TOTAL COST / A.M. TRIP^		TOTAL REVENUE PER A.M. TRIP AT A $72.00/PASS./MONTH FARE*		TOTAL SUBSIDY REQUIRED PER TRIP AT A $72.00/PASS./MONTH FARE*	
	HIGH DEMAND (13%)	MODERATE DEMAND (3%)	HIGH DEMAND (13%)	MODERATE DEMAND (3%)	HIGH DEMAND (13%)	MODERATE DEMAND (3%)
Arboretum Office Complex	$30.58	$15.29	$30.86	$5.14	$0.00	$10.15
3M	15.29	15.29	3.43	N/F	11.86	N/F
The Stratum	15.29	15.29	5.14	N/F	10.15	N/F
Texas Instruments	30.58	15.29	37.71	6.86	0.00	8.43
Northwest Techniplex	15.29	15.29	13.71	1.71	1.58	13.58

N/F: Not feasible

* Assuming 21 days per month and two trips per day. It was also assumed that the driver for each van needed does not pay any fare. $ 72.00 is the amount that VPSI currently charges a passenger riding in a van with 10 persons commuting 30 miles per day.

Sources: Derived from Tables Thirteen and Eighteen; see Appendix.

2) demand-responsive service in a limited area by the transit authority; and

3) demand-responsive service by a private operator charging by the passenger trip under contract to a transit authority.

Tables Twenty One and Twenty Two illustrate the cost, vehicle requirements, and subsidy patterns of each of the three major ways to deliver community demand-responsive services, based on several ridership and productivity assumptions. The most sensitive assumptions are, indeed, those that deal with productivity, or the number of riders who use a service in each hour it is available.

The least sensitive are the cost parameters because cost patterns across the country are remarkably similar--as well as consistent with Austin's current experiences. Therefore each analyses assumes only one average cost per hour of service but computes a range of productivity figures. The analyses also consider subsidy requirements under two different fare assumptions.

Determining productivity is controversial because it is not clear why a system has only a few passengers per hour; many analysts believe that there is a "natural" limit of roughly 7.0 passenger trips/hour above which a general public system cannot go simply because the diverse origins and destinations of the riders prevent higher ridership. On the other hand, some systems do not provide very good service so that lower ridership figures may represent--not capacity constraints--but rather rational rider response to poor service.

Table Twenty One indicates the number of vehicles required to service two levels of estimated demand for non-work trips in the three sub-areas of the Corridor. Table Twenty Two shows that the average cost per hour of service ranges from just under $18 to just over $30 with taxi operators charging by the ride being much cheaper than transit authority delivered service. Given the vehicle requirements computed in Table Twenty One, subsidy requirements per passenger hour range from $8 to $28, with private service delivery being the lowest and public delivery being the highest.

Overall, if measured on a vehicle hour basis, these services are both cheaper than traditional fixed route services and, because they are less costly, they require less subsidy per hour than fixed route service (by a factor of three to one, under some ridership estimates).

POLICY CONSIDERATIONS

The analyses above suggest that both vanpooling and demand-responsive services could be cost-efficient in the 183 Corridor. Much of the ultimate assessment depends on Capital Metro's overall goals and objectives and on the actual rather than theoretical ridership. However, Capital Metro, and other public agencies in the service area, could undertake some policies which would enhance ridership and ultimately the feasibility of these options.

Table Twenty-one

VEHICLE REQUIREMENTS FOR THE NON-WORK TRIPS

	OPTION	AVERAGE HOURLY ESTIMATED TRANSIT DEMAND	NUMBER OF VEHICLES REQUIRED HOURLY IN EACH SERVICE AREA (Passengers / Hour)	
			HIGH PROD.	AVG. PROD.
HIGH RIDERSHIP (3%)	Service Area, private contractor	South 46 North 46 Leander/C.P. 28	8 8 5	15 15 9
	Service Area, transit authority	South 46 North 46 Leander/C.P. 28	8 8 5	15 15 9
	Service Area, shared	South 46 North 46 Leander/C.P. 28	8 8 5	15 15 9
AVG. RIDERSHIP (1%)	Service Area, private contractor	South 15 North 15 Leander/C.P. 9	3 3 2	5 5 3
	Service Area, transit authority	South 15 North 15 Leander/C.P. 9	3 3 2	5 5 3
	Service Area, shared	South 15 North 15 Leander/C.P. 9	3 3 2	5 5 3

Source: See Technical Appendix.

Table Twenty-two

SUBSIDY REQUIRED FOR NON-WORK TRIP OPTIONS

OPTION	VEHICLE COST/HOUR (Average)	SUBSIDY REQUIRED/HOUR/VEHICLE			
		HIGH PRODUCTIVITY 6.0 PASSENGERS/HOUR		AVERAGE PRODUCTIVITY 3.0 PASSENGERS/HOUR	
		$1.00 FARE	$1.50 FARE	$1.00 FARE	$1.50 FARE
Service Area, private contractor	$26.68	20.68	17.68	23.68	22.18
Service Area, transit authority	$30.69	24.69	21.69	27.69	26.19
Service Area, shared	$17.57	11.57	8.57	14.57	13.07

Source: See Technical Appendix.

Table Twenty Three lists a number of policies or practices which have been used effectively elsewhere to promote transit and ridesharing. Obviously some of these policies have little to do with the Transit Authority but it might be wise to help other public bodies remember how relevant are their actions to the success of transit options.

SUMMARY

Overall the Study Team found that all of the non-traditional options appropriate for the Corridor would or do incur costs lower than Capital Metro's average cost/hour for fixed route bus service. With total subsidies at or below those required by conventional transit services, several non-traditional services could be implemented in the Corridor.

At least three of the major work sites--the Arboretum, Texas Instruments, and Northwest Techniplex--might be appropriate candidates for vanpooling types of non-traditional transit services. Services could be cost-effectively delivered to these sites by either the Transit Authority or private contractors; in some circumstances no subsidy would be required at all.

Tree sub-areas of the Corridor could each be served by a separate but comparable demand responsive service focused largely on non-work trips. In general private providers would be more cost-effective, although public subsidies would still be required. The subsidy required by the least expensive options would be roughly one third of Capital Metro's current cost per vehicle hour.

Table Twenty-three

MECHANISMS AVAILABLE TO FACILITATE PARATRANSIT RIDERSHIP

OPTIONS	POLICIES WHICH WOULD FACILITATE RIDERSHIP
WORK TRIPS Vanpool operation contracted with a private provider Vanpool operated by Capital Metro	-Employer subsidies -Preferential parking for vans -Restricted parking for auto users -Vanpool/carpool lanes on adjacent highways -Off peak transportation available -Promotion of mixed land used development -Encouragement of dense residential development -Encouragement of dense commercial development -Extensive marketing
NON-WORK TRIPS Service area demand responsive with dedicated vehicles operated by a private contractor Service area demand responsive with dedicated vehicles operated by the transit authority Service area demand responsive with shared vehicles (taxis) operated by a private contractor	-Introduction of timed transfer centers -Subsidies from shop owners -Encouragement of dense residential construction -Restricted parking -Promotion of mixed land use development -Extensive marketing and reduced fares

NOTES

1. See the Eno Foundation for Transportation, Commuting in America: A National Report on Commuting Trends and Patterns, by Alan Pisarski, Westport, Conn: The Eno Foundation, 1987; and, Robert Cervero, Suburban Gridlock, Rutgers, NJ: The State University of New Jersey, 1987.

2. Commuting in America, op. cit., p. 48.

3. Cervero, Suburban Gridlock, op. cit., pp. 12-13.

4. Commuting in America, op. cit., p. 57.

5. Cervero, p. 101

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SUMMARY TECHNICAL APPENDIX

DATA AND DEFAULT SOURCES

The City of Austin Office of Land Development Services and the Division of Planning and Growth Management (both now incorporated into one City Planning Department), were major sources of information on land use, employment, and population characteristics in the Corridor. The land use and economic information supplied by the Austin Planning Department was augmented by several windshield surveys undertaken by the Study Team in July of 1988. Additional demographic information was obtained directly or indirectly from the Austin Transportation Study (ATS). Texas Instruments and 3M, two large employers in the Corridor, also provided useful employment information; VPSI, a private vanpool operator, provided cost specifications.

In order to conduct the transportation analyses required in each Phase, (for example to predict the number of shopping trips attracted to each of the Corridor's Shopping Centers), the Study Team developed detailed spreadsheet models. To address local data deficiencies the Team used a series of "proxy" or default measures derived from several sources:

1) the Institute of Traffic Engineering's (ITE) Trip Generation Manual,

2) published and unpublished data from the 1983 National Personal

Transportation Study (NPTS),

3) published and tape-readable data from the 1980 U.S. Census of Austin by census tract and city-wide, and,

4) Austin-specific data developed by other researchers or studies, particularly the Capital Metro 1988 Marketing Baseline Study (by Nustats).

Because the Study Team needed analytical data at the Traffic Serial Zone level--small geographic units widely used in transportation planning--a number of conversions between census tracts, traffic zones, and zip codes were required. Since the boundaries of these various units did not always match, some estimation was required. The second Technical Appendix describes the conversion factors and the boundary estimates.

METHODOLOGY BY PHASE

PHASE ONE-DEMOGRAPHIC ANALYSIS

The Study Team based these analyses on three major data sources:

1) 1980 published Census data for Austin by Census track;

2) 1985 population and socio-demographic data available by Traffic Serial

Zone, prepared by Capital Metro and ATS.

3) a 1% sample of Austin's 1980 Census data available on tape (PUMS) for Austin city-wide; and

In addition, data from the Capital Metro marketing and on-board studies were used to supplement the Census data.

The first two sources, data available from the published 1980 Census, as updated by ATS and Capital Metro, were the foundation of the evaluations of Corridor specific socio-demographic characteristics.

The analyses of transit and carpool use were based on tape readable Public Use Micro-Sample data (PUMS), a product of the 1980 Census; the PUMS data set ultimately represents a 1% sample of the Austin population. The PUMS data allowed the Study Team to formulate its own questions and cross-tabulations and not to rely simply on published Census tables.

Unfortunately, the PUMS data set suffers from several serious deficiencies, two of which it shares with all Census data: 1) there are only four transportation questions in the Census, all relating to home-to-work travel; 2) less than 40% of all transportation responses were coded by Census because of financial constraints; 3) the PUMS data set deletes most locational information to protect the anonymity of households; and 4) the sample size become very small when the

1% sample is disaggregated (for example, by sex, car ownership, hours worked per week, mode to work, etc.)

PHASE TWO-MAJOR TRIP ATTRACTORS

The Study Team identified major employment and non-employment work sites, and calculated the number of square feet in each, using data available from the Division of Planning and Growth Management which had prepared Sector Reports for the two sectors in which the 183 Corridor sits, and, from detailed land use maps prepared by the Office of Land Development Services. These sources were confirmed and updated by several windshield surveys in the summer of 1988; the Team actually measured several sites.

Once major sites had been identified , the Study Team used different methods to estimate the number of residents' trips drawn to the five employment and to the five shopping/personal business sites.

Work Trip Calculations

The Study Team estimated trips drawn to major employment sites by 1) obtaining or calculating employment at each site and 2) estimating how many of these employees actually lived in the Corridor. Then the Study Team 3) gauged the range of potential non-traditional transit riders by estimating the number of employees in the Corridor who lived ten miles or more away form their jobs--

since national data indicate few potential vanpoolers live closer than that to work.

Actual employment figures were available only for Texas Instruments and 3M and one office building in the Arboretum complex; employment figures were calculated for the remaining three sites, using national default data on vacancy rates and ITE rates on the number of employees per square foot of different types of commercial and industrial space. Then these employment figures were divided--based on a mixture of actual data and estimates--into work trips originating in the Corridor and those originating outside the Corridor.

Since Texas Instruments gave the Study Team the zip codes of all Texas Instruments employees it was relatively easy to estimate the number of TI employees actually living in the Corridor (roughly one-third); the only difficulty was that some zip codes extended beyond the boundaries of the Corridor. The Texas Instruments figures are shown in the table below.

Non-Work Trip Calculations

The Study Team calculated trips drawn to non-employment attractors by 1) estimating the number of non-work trips generated by households in the Corridor and then 2) distributing these trips among the potential sites within the Corridor.

The Study Team calculated non-work trips by housing type (ie single family, multi-family, and mobile home) using Austin Planning Department data to identify housing types by Traffic Serial Zones (TSZ), using ITE default data on trip production by household type to calculate total trips by households and ultimately by TSZ, and using NPTS default data on the percentage of all non-work trips taken for particular non-work purposes to divide non-work trips into specific categories (ie shopping, medical, etc.).

The Study Team distributed those specific kinds of non-work trips to the various sites using NPTS default data on average trip length by specific trip purpose. Detailed descriptions of these procedures, and the default values and assumptions underlying them, are described in the second Technical Appendix.

TECHNICAL APPENDIX II

LIST OF APPENDICES

LIST OF APPENDICES
(Continued)

SOCIO-ECONOMIC CHARACTERISTICS OF THE 183 CORRIDOR

SOCIO-ECONOMIC CHARACTERISTICS OF THE 183 CORRIDOR

Traffic Zone	Census Tract in Which T.Z. is Located	1985 Total Population	1985 Occupied Units	Occupied Household Size	Percent People Over 65	Number People Over 65	% Total Pop Public Trans Disability 16-64
1	203	977	386	2.53	5	49	0.60
2	203	3224	1168	2.76	5	161	0.60
3	203	1667	604	2.76	5	83	0.60
7	203	1963	725	2.71	5	98	0.60
103	203	173	63	2.76	5	9	0.60
110	203	779	288	2.7	5	39	0.60
117	203	1553	574	2.71	5	78	0.60
118	203	0	0	0	5	0	0.60
151	204	5131	1574	3.26	3	154	0.11
152	204	1445	444	3.25	3	43	0.11
153	204	974	293	3.32	3	29	0.11
154	204	827	249	3.32	3	25	0.11
161	204	2444	750	3.26	3	73	0.11
162	204	64	20	3.2	3	2	0.11
163	204	2898	931	3.11	3	87	0.11
164	204	1941	598	3.25	3	58	0.11
165	204	1717	571	3.01	3	52	0.11
166	204	126	38	3.32	3	4	0.11
168	204	2028	658	3.08	3	61	0.11
169	204	1803	543	3.32	3	54	0.11
177	17.09	1195	410	2.91	2	24	0.24
178	17.1	427	128	3.34	3	13	0.48
179	17.1	1002	334	3	3	30	0.48
180	17.1	3225	1075	3	3	97	0.48
181	17.1	2309	1021	2.26	3	69	0.48
182	17.1	544	292	1.86	3	16	0.48
183	17.08	2048	756	2.71	8	164	0.31
186	17.09	767	264	2.91	2	15	0.24
187	204	0	0	0	5	0	0.11
188	17.09	2889	993	2.91	2	58	0.24
189	17.09	591	203	2.91	2	12	0.24
190	17.09	2406	819	2.94	2	48	0.24
191	17.08	1436	472	3.04	8	115	0.31
194	17.09	45	15	3	2	1	0.24
195	17.09	0	0	0	2	0	0.24
196	17.09	617	212	2.91	2	12	0.24
197	17.09	783	270	2.9	2	16	0.24
198	17.09	2024	673	3.01	2	40	0.24
199	17.08	4361	1510	2.89	8	349	0.31
214	17.09	798	266	3	2	16	0.24
215	17.08	0	0	0	8	0	0.31
567	203	484	179	2.7	5	24	0.60
573	205	26	10	2.6	2	1	0.65
574	205	7	3	2.33	2	0	0.65
Totals		59718	20382			2279	
						3.80%	

Source: U.S. Census, Vol. 45, 1980, Tables H-7,P-9,P-10 & P-11 and tape readable data on Socio - Economic characteristics of Traffic Serial Zones provided by Capital Metro.

SOCIO-ECONOMIC CHARACTERISTICS OF THE 183 CORRIDOR

(continued)

Traffic Zone	Number Public Trans Disabilty 16-64	% Total Pop Public Trans Disability 65 & over	Number Public Trans Disabilty 65 & over	% Pop Below Poverty Level 65 & over	Number Below Poverty Level 65 & over	% Total Pop Below Poverty Level
1	6	0.78	8	1.22	12	7.82
2	19	0.78	25	1.22	39	7.82
3	10	0.78	13	1.22	20	7.82
7	12	0.78	15	1.22	24	7.82
103	1	0.78	1	1.22	2	7.82
110	5	0.78	6	1.22	9	7.82
117	9	0.78	12	1.22	19	7.82
118	0	0.78	0	1.22	0	7.82
151	6	1.05	54	-	-	3.82
152	2	1.05	15	-	-	3.82
153	1	1.05	10	-	-	3.82
154	1	1.05	9	-	-	3.82
161	3	1.05	26	-	-	3.82
162	0	1.05	1	-	-	3.82
163	3	1.05	31	-	-	3.82
164	2	1.05	20	-	-	3.82
165	2	1.05	18	-	-	3.82
166	0	1.05	1	-	-	3.82
168	2	1.05	21	-	-	3.82
169	2	1.05	19	-	-	3.82
177	3	0.56	7	0.12	1	2.93
178	-	-	-	-	-	4.10
179	-	-	-	-	-	4.10
180	-	-	-	-	-	4.10
181	-	-	-	-	-	4.10
182	-	-	-	-	-	4.10
183	6	0.20	4	-	-	3.90
186	2	0.56	4	0.12	1	2.93
187	0	1.05	0	-	-	3.82
188	7	0.56	16	0.12	4	2.93
189	1	0.56	3	0.12	1	2.93
190	6	0.56	13	0.12	3	2.93
191	4	0.20	3	-	-	3.90
194	0	0.56	0	0.12	0	2.93
195	0	0.56	0	0.12	0	2.93
196	2	0.56	3	0.12	1	2.93
197	2	0.56	4	0.12	1	2.93
198	5	0.56	11	0.12	2	2.93
199	13	0.20	9	-	-	3.90
214	2	0.56	4	0.12	1	2.93
215	0	0.20	0	-	-	3.90
567	3	0.78	4	1.22	6	7.82
573	0	0.20	0	0.32	0	4.10
574	0	0.20	0	0.32	0	4.10
Totals						

Source: U.S. Census, Vol. 45, 1980, Tables H-7,P-9,P-10 & P-11 and tape readable data on Socio - Economic characteristics of Traffic Serial Zones provided by Capital Metro.

SOCIO-ECONOMIC CHARACTERISTICS OF THE 183 CORRIDOR
(continued)

Traffic Zone	Number of Total Pop Below Poverty Level	Household Units Below Poverty Level	% HH 0 Vehicles	Number HH 0 Vehicles	% HH 1 Vehicle	Number HH 1 Vehicle	% HH 2 Vehicles
1	76	30	2.93	11	19.13	74	44.35
2	252	91	2.93	34	19.13	223	44.35
3	130	47	2.93	18	19.13	116	44.35
7	153	57	2.93	21	19.13	139	44.35
103	14	5	2.93	2	19.13	12	44.35
110	61	23	2.93	8	19.13	55	44.35
117	121	45	2.93	17	19.13	110	44.35
118	0	0	2.93	0	19.13	0	44.35
151	196	60	1.20	19	17.20	271	53.92
152	55	17	1.20	5	17.20	76	53.92
153	37	11	1.20	4	17.20	50	53.92
154	32	10	1.20	3	17.20	43	53.92
161	93	29	1.20	9	17.20	129	53.92
162	2	1	1.20	0	17.20	3	53.92
163	111	36	1.20	11	17.20	160	53.92
164	74	23	1.20	7	17.20	103	53.92
165	66	22	1.20	7	17.20	98	53.92
166	5	1	1.20	0	17.20	7	53.92
168	77	25	1.20	8	17.20	113	53.92
169	69	21	1.20	7	17.20	93	53.92
177	35	12	0.43	2	17.90	73	55.82
178	17	5	-	-	7.31	9	56.64
179	41	14	-	-	7.31	24	56.64
180	132	44	-	-	7.31	79	56.64
181	95	42	-	-	7.31	75	56.64
182	22	12	-	-	7.31	21	56.64
183	80	29	-	-	16.74	127	52.86
186	22	8	0.43	1	17.90	47	55.82
187	0	0	1.20	0	17.20	0	53.92
188	85	29	0.43	4	17.90	178	55.82
189	17	6	0.43	1	17.90	36	55.82
190	70	24	0.43	3	17.90	147	55.82
191	56	18	-	-	16.74	79	52.86
194	1	0	0.43	0	17.90	3	55.82
195	0	0	0.43	0	17.90	0	55.82
196	18	6	0.43	1	17.90	38	55.82
197	23	8	0.43	1	17.90	48	55.82
198	59	20	0.43	3	17.90	120	55.82
199	170	59	-	-	16.74	253	52.86
214	23	8	0.43	1	17.90	48	55.82
215	0	0	-	-	16.74	0	52.86
567	38	14	2.93	5	19.13	34	44.35
573	1	0	1.67	0	11.17	1	58.67
574	0	0	1.67	0	11.17	0	58.67
Totals				212		3315	
				1.00%		16.30%	

Source: U.S. Census, Vol. 45, 1980, Tables H-7,P-9,P-10 & P-11 and tape readable data on Socio - Economic characteristics of Traffic Serial Zones provided by Capital Metro.

SOCIO-ECONOMIC CHARACTERISTICS OF THE 183 CORRIDOR
(continued)

Traffic Zone	Number HH 2 Vehicles	% HH 3+ Vehicles	Number HH 3+ Vehicles	% Families Female HH Head	Number Families Female HH Head	% People Under 18 Poverty Status	Number People Under 18 Poverty Status
1	171	33.59	130	5.65	22	3.44	34
2	518	33.59	392	5.65	66	3.44	111
3	268	33.59	203	5.65	34	3.44	57
7	322	33.59	244	5.65	41	3.44	68
103	28	33.59	21	5.65	4	3.44	6
110	128	33.59	97	5.65	16	3.44	27
117	255	33.59	193	5.65	32	3.44	53
118	0	33.59	0	5.65	0	3.44	0
151	849	27.68	436	4.52	71	1.67	86
152	239	27.68	123	4.52	20	1.67	24
153	158	27.68	81	4.52	13	1.67	16
154	134	27.68	69	4.52	11	1.67	14
161	404	27.68	208	4.52	34	1.67	41
162	11	27.68	6	4.52	1	1.67	1
163	502	27.68	258	4.52	42	1.67	49
164	322	27.68	166	4.52	27	1.67	32
165	308	27.68	158	4.52	26	1.67	29
166	20	27.68	11	4.52	2	1.67	2
168	355	27.68	182	4.52	30	1.67	34
169	293	27.68	150	4.52	25	1.67	30
177	229	25.14	103	6.89	28	1.15	14
178	72	36.05	46	4.81	6	1.95	8
179	189	36.05	120	4.81	16	1.95	20
180	609	36.05	388	4.81	52	1.95	63
181	578	36.05	368	4.81	49	1.95	45
182	165	36.05	105	4.81	14	1.95	11
183	400	30.40	230	5.47	41	1.46	30
186	147	25.85	68	6.89	18	1.15	9
187	0	27.68	0	4.52	0	1.67	0
188	554	25.85	257	6.89	68	1.15	33
189	113	25.85	52	6.89	14	1.15	7
190	457	25.85	212	6.89	56	1.15	28
191	250	30.40	143	5.47	26	1.46	21
194	8	25.14	4	6.89	1	1.15	1
195	0	25.85	0	6.89	0	1.15	0
196	118	25.85	55	6.89	15	1.15	7
197	151	25.85	70	6.89	19	1.15	9
198	376	25.85	174	6.89	46	1.15	23
199	798	30.40	459	5.47	83	1.46	64
214	148	25.85	69	6.89	18	1.15	9
215	0	30.40	0	5.47	0	1.46	0
567	79	33.59	60	5.65	10	3.44	17
573	6	28.50	3	5.65	1	1.82	0
574	2	28.50	1	5.65	0	1.82	0
Totals	10734		6115		1094		1133
	1		30%		5.40%		5.60%

Source: U.S. Census, Vol. 45, 1980, Tables H-7,P-9,P-10 & P-11 and tape readable data on Socio - Economic characteristics of Traffic Serial Zones provided by Capital Metro.

INFORMATION ON AUSTIN TRANSPORTATION PATTERNS

Mode to Work by Age, Austin, 1980

Age	Car*	Public Transit	Other**
16-19	100.0	-	-
20-29	90.6	3.5	5.9
30-39	92.2	2.7	5.1
40+	89.5	1.9	8.6

* Includes drivers and passengers.
** Includes walking, cycling and working at home.

SOURCE: Derived from the U.S. Bureau of the Census (1983), Census of Population and Housing, 1980, Public Use Microdata, Sample B, Texas.

Mode to Work by Sex, Austin, 1980

Sex	Car*	Public Transit	Other**
Male	91.9	1.8	6.3
Female	89.7	3.9	6.4

* Includes drivers and passengers.
** Includes walking, cycling and working at home.

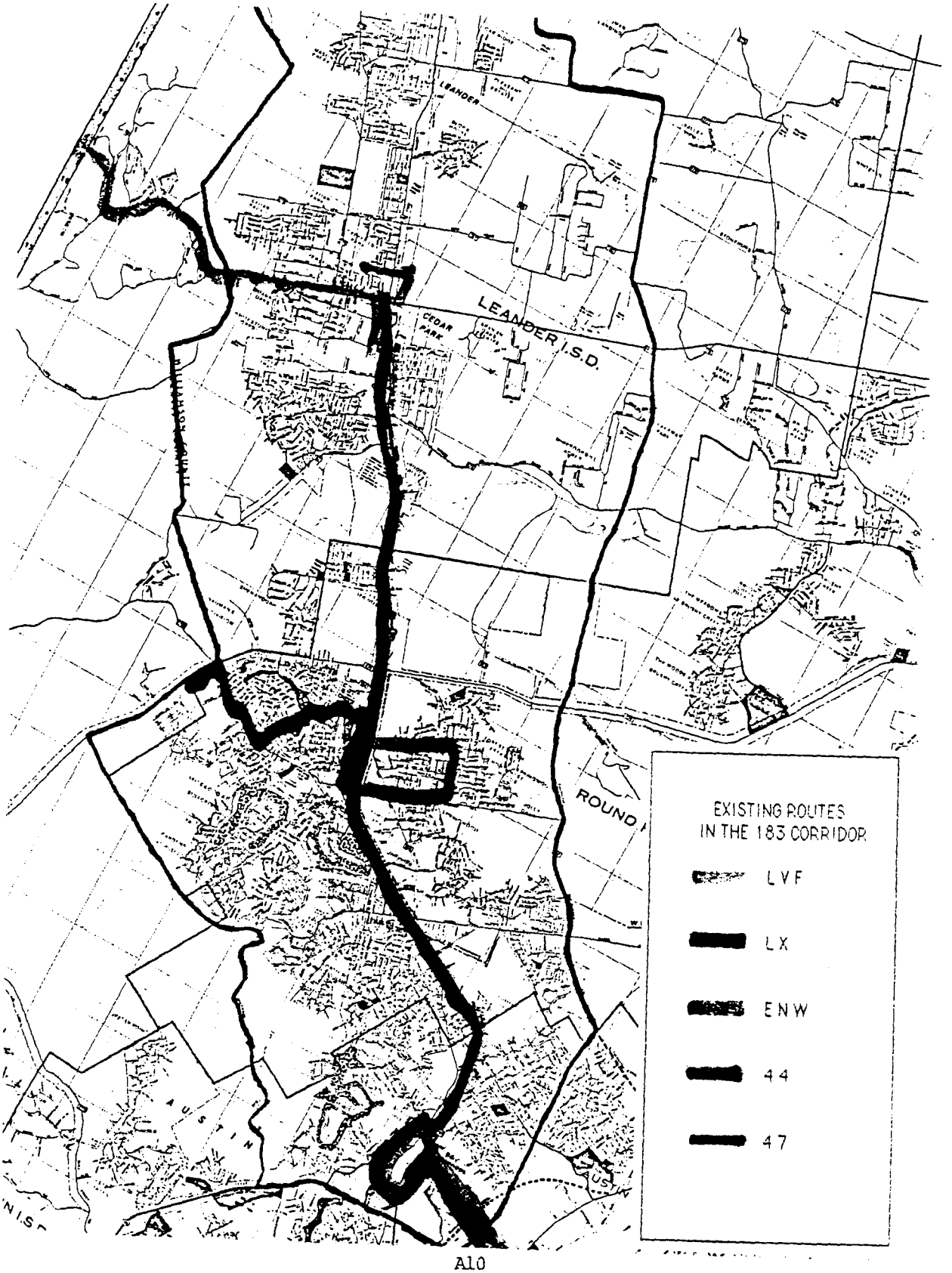
SOURCE: Derived from the U.S. Bureau of the Census (1983), Census of Population and Housing, 1980, Public Use Microdata, Sample B, Texas.

Size of Carpool by Household Income, Austin 1980

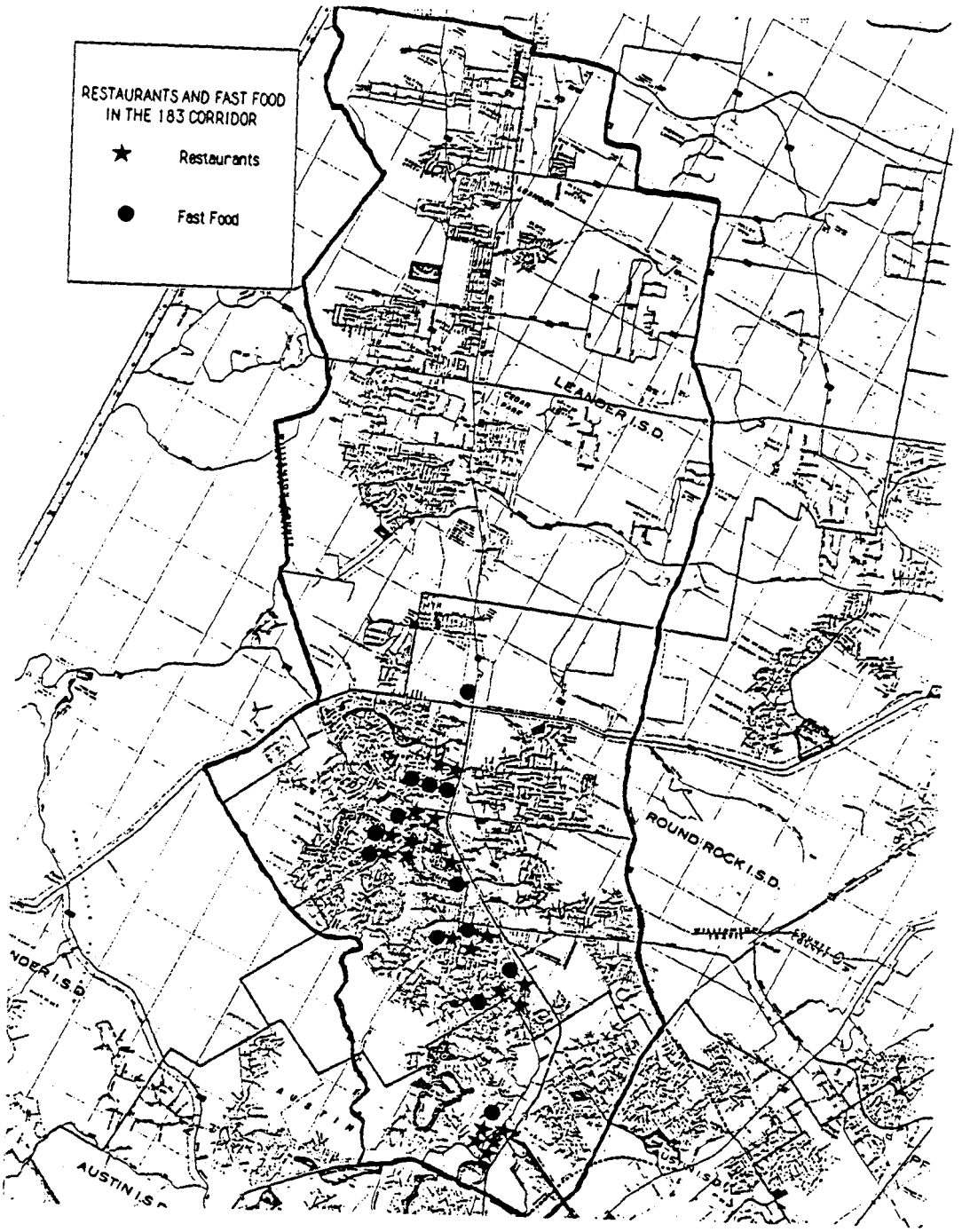
Household Income	Number of People in Carpool		
	Two	Three	Four
Under 5,000	91.7	8.3	0.0
5,000 - 9,999	82.5	10.0	2.5
10,000 - 14,999	79.3	15.5	3.4
15,000 - 19,999	60.3	30.2	4.8
20,000 - 24,999	71.2	9.6	13.5
25,000 - 29,999	62.9	14.3	22.9
30,000 - 34,999	66.7	15.2	12.1
35,000 - 39,999	72.7	13.6	4.6
More than 40,000	75.0	20.8	0.0

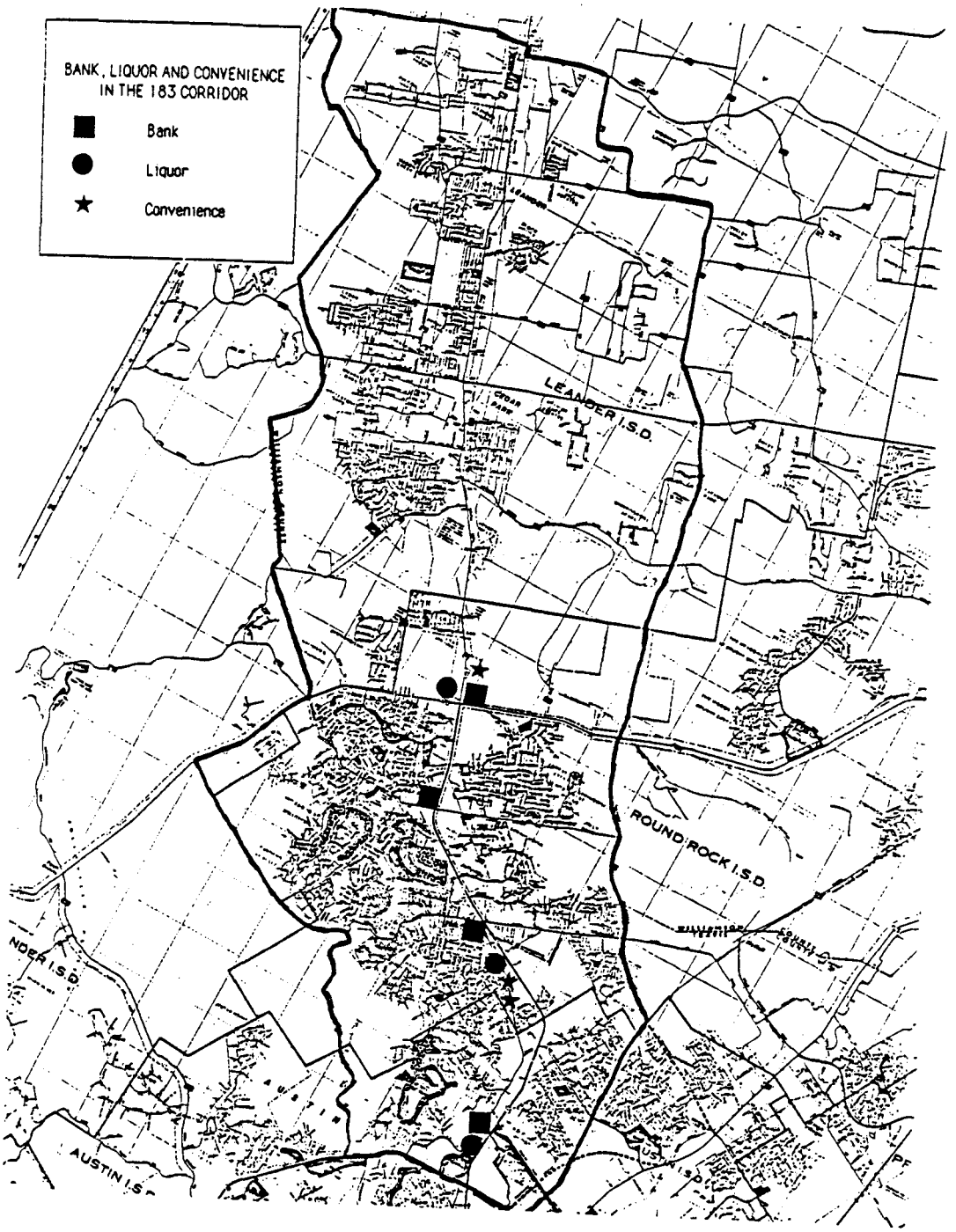
SOURCE: Derived from the U.S. Bureau of the Census (1983), Census of Population and Housing, 1980, Public Use Microdata, Sample B, Texas.

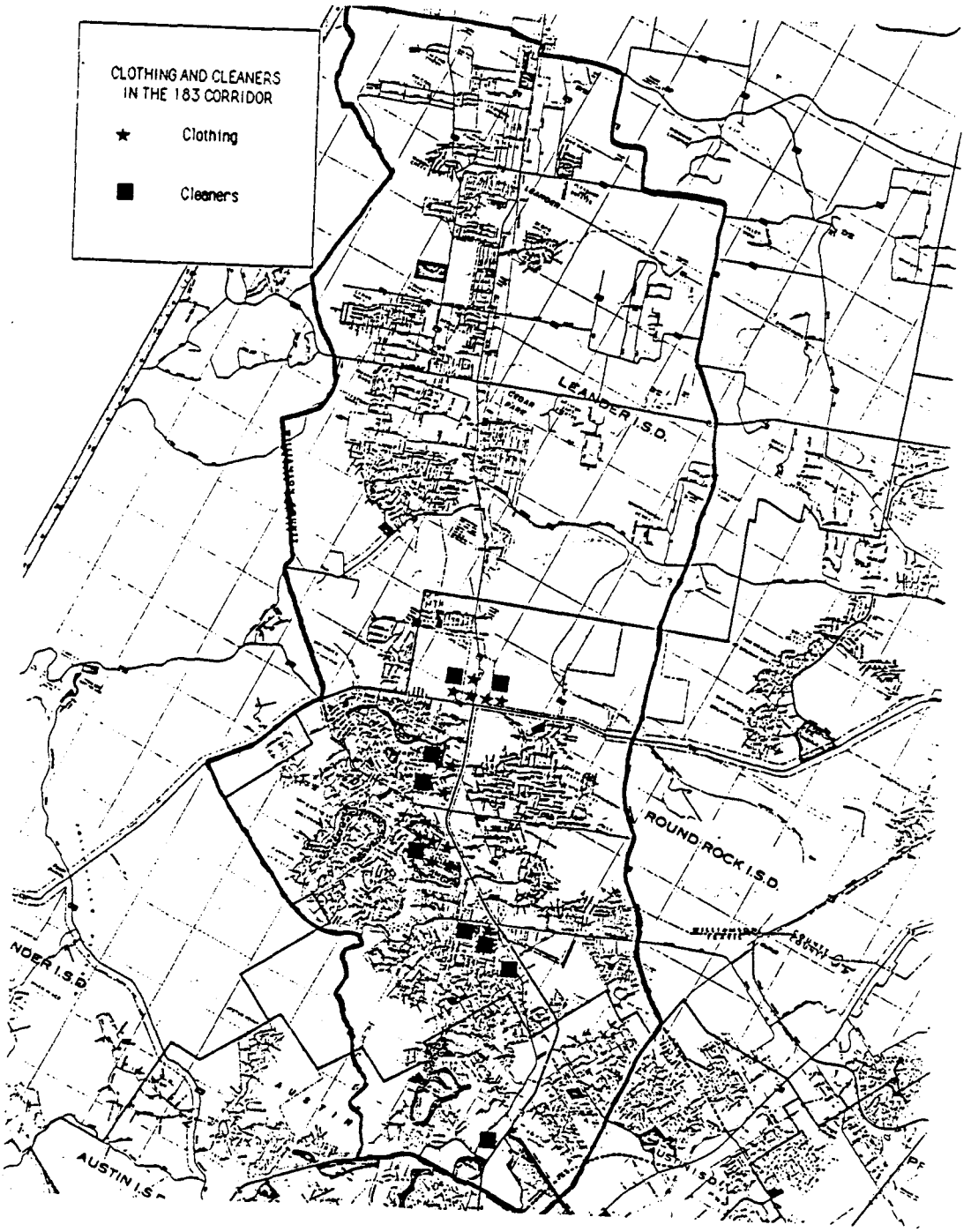
EXISTING ROUTES IN THE 183 CORRIDOR

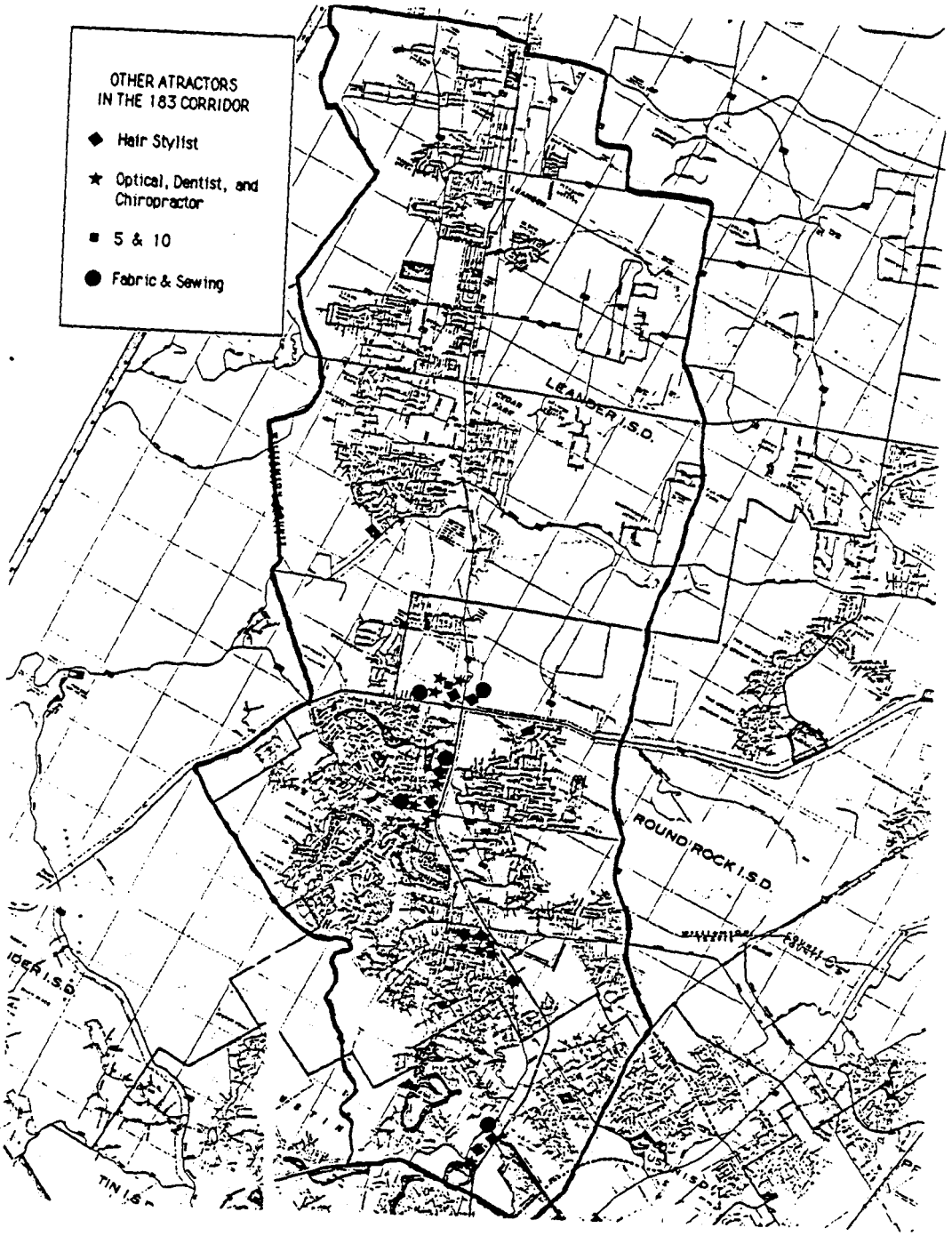

LEANDER
LEANDER I.S.D.
CEDAR PARK
ROUND
AUSTIN
EXISTING ROUTES
IN THE 183 CORRIDOR
LVF
LX
ENW
44
47

COMMERCIAL ACTIVITY IN THE 183 CORRIDOR


RESTAURANTS AND FAST FOOD
IN THE 183 CORRIDOR
Restaurants
Fast Food
LEANDER I.S.D.
ROUND ROCK I.S.D.
AUSTIN I.S.D.


BANK, LIQUOR AND CONVENIENCE
IN THE 183 CORRIDOR
Bank
Liquor
Convenience
LEANDER I.S.D.
ROUND ROCK I.S.D.
AUSTIN I.S.D.


CLOTHING AND CLEANERS
IN THE 183 CORRIDOR
Clothing
Cleaners
LEANDER I.S.D.
ROUND ROCK I.S.D.
NDER I.S.D.
AUSTIN I.S.


OTHER ATRACTORS
IN THE 183 CORRIDOR
Hair Stylist
Optical, Dentist, and Chiropractor
5 & 10
Fabric & Sewing
LEANDER I.S.D.
ROUND ROCK I.S.D.

LIST OF STORES

SHOPPING CENTER COMPLEX ANCHOR STORE

SKAGG'S (Anderson Mill Road)	HEB & SAFEWAY (Highway 620)
Home video	The Bottle Shop liquor
Sally Beauty Supply	Chiropractor
Flowers	A Corner Bookstore
Lone Star Cafe	Barry's Children's Shoes
Vic's Corn Popper	Torres Hair Designs
vacant	Party Palace
SAS shoes	Sub Shop
GIVING tree	Young at Heart Toy Shop
Fabric Gallery	Texas Tax service
Vic Self Chem	Austin Beauty Supply
chiropractor	Austin Travel and Tours
Yankee Clipper	Clear Cut Opticians
Conan Pizza	Jack Brown cleaners
TCBY Yogurt	Schauer and Turner dentists
Sylvan Learning Center	Marshall and Co jewlers
Austin Driving School	vacant
Whataburger	Yaring's
Fitness Center	House of Tuxedo and Bridal
Brotherss II Cleaners	Payless Shoes
Mazzio Pizza	Bright Bank
vacant	Linen Mill Outlet
Herart O' Texas Savings	K-Mart
Wal greens	7-11
Gulf	Comet Cleaners
Burger King	Eckerd's
NorthWest Music	Great West Savings
Blockbuster Video	Federal Express
Nanking Chinese Restaurant	Michael's Crafts
Golden Life Fitness Center	Suzanne's women's clothes
La Morada Mexican restaurant	Floor King
Hardware Store	Austin Vacuum Cleaner
Ben Franklin crafts	The Connection shoes
Shipley Donuts	Agape Christian Bookstore
Golden Fried Chicken	Noah's Toy Shop
Royal Optical	London Fabrics
	Freytag's Florist
	SunTana
	Paint Shop
	Supercuts
	Video Station
	Merle Norman Cosmetics
	One Hour Photo
	5 vacant bays

LIST OF STORES

SHOPPING CENTER COMPLEX ANCHOR STORE

SAFEWAY	PIC n SAVE & TOM THUMB	SIMON DAVID
(Balcones Woods)	(Spicewoods Springs)	(Arboretum)
Bill Miller's	Short Stop	Arboretum shopping mall
Mc Donald's	Diamond Shamrock	
Jack Brown Cleaners	Lamar Savings	
Hair It Is	The Pit Bar B Que	
Budget Rent to Own	Time Masters Watch Repair	
Laundrymat	Revco	
Mail Bocws Etc.	Roslyn's Hallmark	
Kwik Kopy	Radio Shack	
Chiropractor	Harrel's Hardware	
Bernina SewingCenter	Weiner's	
Aardvark video	Little Caesar's	
Gibraltar Savings	Asia Market Grocery	
Eckerd's	Edwin's Jewelry	
Jeff's Liquors	Craft Connection	
Freytag's Florist	Simpson's Barber	
Shin Yuan chinese Restaurant	Olan Mills	
Wanderlust Travel	Bait Shop	
Nane Tamers	Winn's	
Nail Boutique	Shoe Repair	
Back in a Flash	Rainbow Thrift Store	
Mr. Gatti'ss	Merle Norman Cosmetics	
Lamp Shop	Dynasty Chinese Restaurant	
Cafe Roma	Award Masters	
Casita Jorges	Wilbur dentist	
Austin Shoe Hospital	Mrs. Baird's Thriift Store	
	Hair by us	
	Jack Brown Cleaners	
	Double Eagle Coins	
	Sally's Typing Etc.	
	Ripley Realtors	
	Murfido Commodities tax service	
	Herbal Nutrition	
	Glenn Maass Insuraance	
	Capitol Hearing Aids	
	Birdsong dentist	
	Travel agent	
	United Videos	
	Capital City Savings	
	Florist	
	Cleaaners	
	Jim's Restaurant	

MAJOR NON-WORK TRIP ATTRACTORS

ANCHOR STORE	LOCATION	APPROXIMATE SQUARE FOOTAGE OF THE ANCHOR STORE	APPROXIMATE NUMBER OF PERSONS ATTRACTED TO THE ANCHOR STORE PER DAY
Safeway	Balcones Woods	40,000	2,000
Simon David	Arboretum	N/A	N/A
Pick & Save	Mc.Neil Road	32,000	N/A
Tom Thumb	Mc.Neil Road	40,000	N/A
Skaggs	Anderson Mill	62,000	3,000
Safeway	Highway 620	52,000	N/A
HEB	Highway 620	N/A	N/A

Source: Telephone interviews with store managers.

CHARACTERISTICS OF NON-TRADITIONAL TRANSIT OPTIONS OPERATED OR CONTRACTED BY CAPITAL METRO

GENERAL CHARCTERISTICS OF NON TRADITIONAL TRANSIT OPTIONS OPERATED OR CONTRACTED BY CAPITAL METRO

TYPE OF SERVICE	PROVIDER	ROUTE	VEHICLES
GENERAL PUBLIC			
FIXED ROUTE			
Off-Peak and Saturday fixed suburban route	American Cab	42	14 passenger vans
Saturday fixed suburban route	American Cab	39	14 passenger vans
OTHER			
Express (4 trips per day)	American Cab	Oak Hill Express	14 passenger vans
Vanpools (from nearby towns to the CBD)	VPSI		14 passenger vans
Demand responsive (Monday, Wednesday and Friday service from Lago Vista, Jonestown, Leander and Cedar Park to locations along the 183 corridor and to some shopping malls and medical centers in Austin)	CARTS	Northwest DAR	Vans
Feeder Service from Lago Vista and Jonestown to an express bus service to downtown and the University of Texas	CARTS	LVF	Vans
ELDERLY AND HANDICAPPED			
Special Transit Services for the ambulatory elderly and the handicapped	American Cab	STS	Taxis
Special Transit Services for the elderly and handicapped. Only for qualified, registered individuals	CMTA	STS	Special vehicles

Sources: Capital Metro cost model for December 1987, conversations with CMTA officials, CMTA route maps, and Capital Metro's 1988 Boarding and Alighting Survey.

COST, FARES AND RIDERSHIP OF THE NON TRADITIONAL TRANSIT OPTIONS OPERATED OR CONTRACTED BY CAPITAL METRO

TYPE OF SERVICE	COST TO CMTA	FARE	RIDERSHIP
GENERAL PUBLIC			
FIXED ROUTE			
Off-Peak and Saturday fixed suburban route	$34.93/rev. hour	25¢ for chilren, elderly and disabled. 50¢ all others.	5 riders / trip (from the 1988 boarding and alighting survey)
Saturday fixed suburban route	$34.93/rev. hour	25¢ for chilren, elderly and disabled. 50¢ all others.	6 riders / trip (from the 1988 boarding and alighting survey)
OTHER			
Express (4 trips per day)	$34.93/rev. hour	$1.00	4 riders / trip (from the 1988 boarding and alighting survey)
Vanpools (from nearby towns to the CBD)	$0.14/pass. or $972/month*	See next page	There are 12 vans carrying approximately 13 riders/ trip
Demand responsive (Monday, Wednesday and Friday service from Lago Vista, Jonestown, Leander and Cedar Park to locations along the 183 corridor and to some shopping malls and medical centers in Austin)	$21/veh. hour	60 ¢ for persons 65 and older and for disabled. $1.00 for all others.	23 passengers / week (July 1988)
Feeder Service from Lago Vista and Jonestown to an express bus service to downtown and the University of Texas	$21/veh. hour	25¢ for chilren, elderly and disabled. 50¢ all others.	191 passengers / week (July 1988)
ELDERLY AND HANDICAPPED			
Special Transit Services for the ambulatory elderly and the handicapped	$6.95/pass. ** $8.47/pass.***	60¢	2,140 riders / week (July 1988)
Special Transit Services for the E & H Only for qualified, registered individuals	$47.32/veh. hour (December 1988)	60¢	3,939 riders / week (July 1988)

* Capital Metro acts as the project manager, in charge of marketing, management and facilitating contacts. The cost shown is the allocated administrative cost for December 1987.
** Amount paid to the taxi company (December 1987).
*** Total cost which includes the amount paid to the taxi company and the internal administrative cost (December 1987).

Sources: Capital Metro cost model for December 1987, conversations with CMTA officials, CMTA route maps, and Capital Metro's 1988 Boarding and Alighting Survey.

2100 N. Highway 360
Suite 2200A
Grand Prairie, TX 75050-1015
(214) 988-8458

Fare Estimates - 15-passenger vans (1987 Model)

($560.00 per month fixed cost; $.05, $.06 or $.07 per commute mile for gasoline, assumes $.90 per gallon of gasoline and 10 mpg; 21 working days per month; excludes parking costs; fare estimates rounded to the nearest dollar for ease of discussion)

Commute Miles/Day	Number of paying passengers in the vanpool group 14	13	12	11	10	9	Driver
30	$46	$50	$54	$59	$65	$72	$-0-
40	48	52	56	61	67	74	-0-
50	50	54	58	63	70	77	-0-
60	52	56	60	66	72	80	-0-
70	53	58	62	68	75	83	-0-
80	55	59	64	70	77	86	-0-
90	57	61	66	72	80	88	-0-
100	60	65	70	77	84	94	-0-

(Based upon current economic conditions. Subject to change)

FARE CALCULATION: 1) Daily round trip miles x 21 days per month x per mile operational cost equals the total operational cost per month per van, 2) Daily round trip miles x 21 days per month divided by 10 miles per gallon x $.90 per gallon equals total gasoline cost per month per van, 3) the operational cost added to the gasoline cost plus the fixed cost per month divided by the number of paying passengers equals the passenger fare per month.

OPERATING CHARACTERISTICS SEVERAL SYSTEMS

OPERATING CHARACTERISTICS SEVERAL SYSTEMS

SYSTEM	LOCATION	TARGET POP	SERVICE AREA (SQ. MILES)	DENSITY (POP/ SQ. MILE)	AVERAGE WEEKDAY RIDERSHIP	TRIPS/ DAY/ RESIDENT	PASS./ VEHICLE- HOUR	REVENUE/ PASS.	NET OPER. COST/ PASS.	NET OPER. COST/ VEH-HR.	NET OPER. COST/PASS. CONV. TO 1988 DOLLARS	NET OPER. COST/VEH-HR CONV. TO 1988 DOLLARS	YEAR OF DATA	TYPE OF SERVICE
MOR	Merril, WI	9,500	5.5	1,727	280	0.029	10.4	0.35	$1.37	$14.25	1.96	20.41	1980	Point Deviation
mbus/Maxi	Westport, CT	30,000	22.0	1,350	2,200	0.073	14.0	0.27	$1.70	$20.03	2.43	28.68	1980	Flexible Fixed Route/Demand Responsive
Telran	Ann Arbor, MI	106,000	23.5	4,510	2,500	0.024	5.6	0.23	$3.54	$19.85	6.89	38.65	1977	Zonal Demand Responsive
Dial-A-Ride	La Habra, CA	65,000	16.2	4,012	287	0.004	3.8	0.60	$4.24	$15.87	6.07	22.73	1980	Dial-A-Ride
Dial-A-Ride	Villa Park, CA	92,500	19.6	4,625	407	0.004	4.2	0.56	$3.99	$16.75	5.71	23.99	1980	Dial-A-Ride
Dial-A-Ride	Fullerton, CA	94,000	22.0	4,270	385	0.004	3.5	0.56	$4.69	$16.30	6.72	23.34	1980	Dial-A-Ride
Trans-Cab	Peterborough Ont.	3,400	4.4	773	350	0.100	N/A	0.29	$0.90	N/A	1.63	N/A	1978	Zonal Demand Responsive
Badger Cab	Madison, WI	170,000	52.1	3,263	2,000	0.012	N/A	0.90	N/A	N/A	N/A	N/A	1980	Demand Responsive
Mission St. Jitney	San Francisco California	63,000	5.0	12,600	N/A	N/A	N/A	0.50	N/A	N/A	N/A	N/A	1980	Fixed Route
Dial a Ride	Palos Verdes,CA	N/A	N/A	N/A	N/A	N/A	3.36	N/A	N/A	$32.30	N/A	$32.30	1988	General public Dial a Ride
Dial a Ride	Pomona V., CA	N/A	N/A	N/A	N/A	N/A	4.37	N/A	N/A	$26.65	N/A	$26.65	1988	General public Dial a Ride
Dial a Ride	Redondo Beach California	N/A	N/A	N/A	N/A	N/A	3.70	N/A	N/A	$40.23	N/A	$40.23	1988	General public Dial a Ride
Dial a Bus	Rochester (Greece), NY	N/A	N/A	N/A	N/A	N/A	4.90	N/A	$3.44	$18.25	$7.54	$40.03	1975	General public Dial-a-Bus
Loop Bus	Rochester (Irondequat), NY	N/A	N/A	N/A	N/A	N/A	3.00	N/A	$7.00	N/A	$15.35	N/A	1975	Loop bus in a small community
Vanpool	Spokane, WA	N/A	N/A	N/A	N/A	N/A	8.70	N/A	$2.20	$19.00	$2.41	$20.84	1985	Vanpool operated by the transit authority
Vanpool	Winston, NC	N/A	N/A	N/A	N/A	N/A	9.30	N/A	$1.10	$10.40	$1.21	$11.41	1985	Vanpool operated by the transit authority
Vanpool	San Francisco California	N/A	N/A	N/A	N/A	N/A	7.90 *	$1.19	$1.19	N/A	$2.15	N/A	1978	Golden Gate Vanpool Demonstration Project
Dial a Ride	Chicago Schaumburg, IL	50,000	N/A	N/A	N/A	N/A	N/A	N/A	$5.42	$24.93	$7.04	$32.36	1981	Suburban Dial a Ride in a low density upper-middle income community.
Dial a Ride	San Diego, CA	N/A	N/A	N/A	N/A	N/A	5.90	$0.73	N/A	$15.97	N/A	$16.58	1987	General Public Dial a Ride primarily serving as feeder to fixed route bus service
Dial a Ride	Phoenix Arizona	N/A	N/A	N/A	N/A	N/A	2.31	$0.96	$6.05	$18.56	$6.05	$18.56	1988	General Public Dial a Ride primarily serving as feeder to fixed route bus service
Median - Dial-A-Bus	50 Systems	18,000	7.6	2,059	206	0.011	5.9	0.29	$1.82	$10.00	3.29	18.10	1978	
Median - Shared Ride Taxi	28 Systems	34,200	11.4	4,110	260	0.007	5.5	0.45	$1.70	$9.95	3.08	18.01	1978	

Sources: General Community Paratransit Services in Urban Areas; Multisystems, Inc., 1982. Operating Statistics for Existing Projects, Orange County Transportation Department (one page summary). The Rochester, New York Integrated Transit Demonstration, U.S. DOT., U.M.T.A., 1979. National Urban Mass Transportation Statistics: 1985 Section 15 Annual Report. Golden Gate Vanpool Demonstration Project, U.S. DOT, UMTA, 1979. San Diego DART System Statistics, 1984-1987. Contract with Arnett Cab Service for North Phoenix Dial a Ride, 1988. The Consumer Price Index, taken from the U.S. Department of Labor, Bureau of Labor Statistics was used to convert cost figures to 1988 Dollars.

* Since generally there was only one trip per hour, passengers per vehicle trip was assumed to be the same as passengers per vehicle hour.

FACTORS USED IN THE ESTIMATION OF NON-WORK TRIPS

DAILY NON WORK TRIPS BY TRAFFIC SERIAL ZONE

TRAFFIC SERIAL ZONE	DAILY NON WORK PERSON CORRIDOR TRIPS	DAILY MEDICAL PERSON CORRIDOR TRIPS	DAILY SHOPPING PERSON CORRIDOR TRIPS	DAILY PERSONAL & FAMILY BUSINESS CORRIDOR TRIPS
151	3828	172	1378	995
152	1077	48	388	280
153	764	34	275	199
154	648	29	233	169
161	1822	82	656	474
162	42	2	15	11
163	1893	85	681	492
164	1507	68	543	392
165	1240	56	446	322
166	99	4	36	26
168	1283	58	462	334
169	1414	64	509	368
171	1098	49	395	286
177	593	27	213	154
178	325	15	117	85
179	1450	65	522	377
180	2544	114	916	661
181	2044	92	736	531
182	523	24	188	136
183	1654	74	596	430
186	644	29	232	167
187	565	25	203	147
188	2370	107	853	616
189	496	22	178	129
190	1783	80	642	464
191	1152	52	415	300
192	3502	158	1261	911
194	38	2	14	10
195	0	0	0	0
196	502	23	181	131
197	1163	52	419	302
198	1164	52	419	303
199	3302	149	1189	859
200	1008	45	363	262
201	0	0	0	0
215	19	1	7	5
216	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
7	0	0	0	0
103	0	0	0	0
110	0	0	0	0
117	2177	98	784	566
118	0	0	0	0
567	4104	185	1478	1067
573	27	1	10	7
574	7	0	2	2

DISTRIBUTION OF NON-WORK TRIPS GENERATED WITHIN THE CORRIDOR TO SHOPPING COMPLEXES AND SERVICE AREAS WITHIN THE CORRIDOR

	DISTRIBUTED TO		
TYPE OF TRIP	CLOSEST COMPLEX OR OWN SERVICE AREA	NEXT COMPLEX OR NEXT SERVICE AREA	THIRD COMPLEX OR NEXT SERVICE AREA
Shopping	68.00%	22.00%	10.00%
Medical	40.00%	40.00%	20.00%
Family and Personal business	50.00%	37.50%	12.50%
All other Non-work trips	33.33%	33.33%	33.33%

Source: Based on average trip lengths by trip purpose as reported in the 1983 NPTS, Vol. II Table E-96.

CORRIDOR SECTION EQUIVALENTS

SECTION	TRAFFIC SERIAL ZONES		CENSUS TRACT (S)
Southwest West of 183 South of Spicewood Springs Road	177 186 188 189 190	194 195 196 198 214	17.09
Northwest West of 183 North of Spicewood Springs Road South of Cedar Park	151 152 187 161		204
	178 179 180 181		17.1
Southeast East of 183 South of McNeil Road	183 191 199 215		17.08
Northeast East of 183 North of McNeil Road South of Cedar Park	153 154 162 163	164 166 168 169	204
Cedar Park/Leander	1 2 3 7 103 110 117 118 119 567		203
	573 574		205

TRAFFIC ZONE SHOPPING COMPLEX EQUIVALENTS

SIMON DAVID	SAFEWAY	PIC' N' SAVE & TOM THUMB	SKAGGS	SAFEWAY & HEB
194	177	168	161	1
195	189	169	163	2
214	190	182	164	3
1/2 of 198	191	183	165	7
215	197	184	166	103
	199	188	178	110
	1/2 of 198	1/2 of 162	179	117
		1/2 of 181	180	118
		1/2 of 187	1/2 of 181	151
			1/2 of 187	152
			1/2 of 162	153
				154
				567
				573
				574

DEFAULT FACTORS USED TO COMPUTE NON-WORK TRIPS GENERATED PER HOUSEHOLD

ITE FACTORS

AM PEAK EXIT FACTORS	DU
SINGLE FAMILY(SF_DU_AM):	0.55
MULTI FAMILY(MF_DU_AM):	0.40
MOBILE HOMES:(MH_DU_AM)	0.38

AM PEAK EXIT FACTORS	ACRES
SINGLE FAMILY(SF_AC_AM):	1.60

DAILY VEHICLE TRIPS	DU
SINGLE FAMILY(SF_DU_DA):	10.00
MULTI FAMILY(MF_DU_DA):	6.60

DAILY VEHICLE TRIPS	ACRES
SINGLE FAMILY(SF_AC_DA):	26.20
MOBILE HOMES:(MH_AC_DA):	39.10

NPTS FACTORS

PERCENT AM PEAK VEHICLE WORKTRIPS (AM_VEH_WORK):	0.46
AVERAGE AM PEAK WORKTRIP VEHICLE OCCUPANCY (AM_WORK_OCCUP):	1.20
PERCENT DAILY VEHICLE NON WORK TRIPS (%_VEH_NONWORK)	0.72
AVERAGE DAILY NONWORK VEHICLE OCCUPANCY (NONWORK_OCCUP)	1.6
PERCENT DAILY SHOPPING TRIPS (%_SHOPPING)	0.36
PERCENT DAILY FAMILY & PERSONAL BUSINESS (%_PERS_BUSINESS)	0.26
PERCENT DAILY MEDICAL TRIPS (%_MEDICAL)	0.045

MARKETING STUDY FACTORS

WORK PERCENT INTRACORRIDOR (WORK_CORRIDOR):	0.11
PERCENT DISCRETIONARY TRIPS INTRA-CORRIDOR (%_DISC_CORRIDOR)	0.20

FACTORS USED IN THE ESTIMATION OF WORK TRIPS

AREAS WITH POTENTIAL FOR GENERATING WORK TRANSIT TRIPS

EMPLOYMENT CENTER	SECTOR(S) WITH POTENTIAL FOR GENERATING WORK TRANSIT TRIPS	CORRESPONDING TRAFFIC ZONES WITH POTENTIAL FOR GENERATING WORK TRANSIT TRIPS (Located over 10 miles from the employment center)
Texas Instruments	Cedar Park /Leander	1, 2, 3, 7, 103, 110, 567
3M	Cedar Park /Leander	1, 2, 3, 7, 103, 110, 567
Northwest Techniplex	Cedar Park /Leander	1, 2, 3, 7, 103, 110, 567
Arboretum Complex	Cedar Park /Leander	1, 2, 3, 7, 103, 110, 117,118, 119, 567, 573, 574
	Northwest	151, 152, 178
	Northeast	153, 154
The Avallon	Cedar Park /Leander	1, 2, 3, 7, 103, 110, 117, 118, 119, 567, 573, 574
The Stratum	Cedar Park /Leander	1, 2, 3, 7, 103, 110, 117, 118, 119, 567, 573, 574

POTENTIAL CARPOOLERS (THOSE LIVING 10+ MILES FROM WORK) BY EMPLOYMENT CONCENTRATION

EMPLOYMENT IN TEXAS INSTRUMENTS

TSZ OVER 10 MILES	1,988 EMP TI-1st SHIFT PEAK-TRIPS	PERCENT OF ALL EMP.
1	14	0.66%
2	46	2.18%
3	24	1.13%
7	61	2.87%
103	2	0.12%
110	24	1.14%
567	7	0.33%
Total	180	
Perc. of All Emp	8.44%	

Total Number of Employees = 2129

Note: Assumption: 1 employee = 1 person trip at peak.

EMPLOYMENT IN 3M

TSZ OVER 10 MILES	1,988 EMP PEAK-TRIPS	PERCENT OF ALL EMP.
1	2	0.66%
2	7	2.18%
3	3	1.13%
7	9	2.87%
103	0	0.12%
110	3	1.14%
567	1	0.33%
Total	25	

Total Number of Employees = 300

Note: Assumption: 1 employee = 1 person trip at peak.
Note: Assumption: Percentages are the same as TI's

EMPLOYMENT IN THE AVALLON & THE STRATUM

TSZ OVER 10 MILES	1985 POP FOR TSZ	1,988 EMP PEAK-TRIPS	PERCENT OF ALL PER-TRIPS
1	977	3	0.75%
2	3,224	9	2.48%
3	1,667	4	1.28%
7	2,004	5	1.54%
103	173	0	0.13%
110	795	2	0.61%
117	1,585	4	1.22%
118	0	0	0.00%
567	494	1	0.38%
573	27	0	0.02%
574	8	0	0.01%
Total	10,954	29	

Avg. AM Person-Trips of Generator: 349
Calculated from ITE Report.
8.44% of Avg. AM Person-Trips of Generator: 29
(8.44% is the percentage of TI employees that commute over 10 miles within the corridor)

EMPLOYMENT IN N.W. TECHNIPLEX

TSZ OVER 10 MILES	1,988 EMP PEAK-TRIPS	PERCENT OF ALL PER-TRIPS
1	5	0.66%
2	17	2.18%
3	9	1.13%
7	22	2.87%
103	1	0.12%
110	9	1.14%
567	3	0.33%
Total	65	

Avg. AM Person-Trips of Generator: 773
Calculated from ITE Report.
Note: Assumption: Percentages are the same as TI's

EMPLOYMENT IN THE ARBORETUM

TSZ OVER 10 MILES	1985 POP FOR TSZ	1,988 EMP PEAK-TRIPS	PERCENT OF ALL PER-TRIPS
1	977	7	0.42%
2	3,224	24	1.37%
3	1,667	12	0.71%
7	2,004	15	0.85%
103	173	1	0.07%
110	795	6	0.34%
117	1,585	12	0.67%
118	0	0	0.00%
151	5,217	39	2.22%
152	1,470	11	0.63%
153	974	7	0.41%
154	827	6	0.35%
178	427	3	0.18%
567	494	4	0.21%
Total	19,834	147	

Avg. AM Person-Trips of Generator: 1,744
(calculated using ITE report.)
8.44% of Avg. AM Person-Trips of Generator 147
(8.44% is the percentage of TI employees that commute over 10 miles within the corridor)
Employees peak trips are allocated based on the population of each TSZ.

TRIP ATTRACTIONS - EMPLOYMENT

COMPLEX	AM PEAK OF GENERATOR ENTER (Trips/1000 S.F.)	AM PEAK OF GENERATOR ENTER (Trips/Employee.)	AM PEAK OF GENERATOR ENTER (Veh. Trips)	AM PEAK OF GENERATOR ENTER (Person Trips)	IN-CORRIDOR OF GENERATOR ENTER (Person Trips)
Arboretum 1	1.81		293	351	39
Arboretum 2	1.81		644	773	85
Arboretum Point	1.87		179	215	24
Great Hills	1.87		203	243	27
Health Care International		0.67	135	161	18
Total "Arboretum Office Complex"			1,453	1,744	192
3M		0.71	213	256	84
The Stratum	1.81		281	337	37
The Avallon		0.13	10	12	1
Texas Instruments		0.71	1,704	2,045	669
N.W. Techniplex	1.81		644	773	85

Auto Occupancy Factor: 1.2. Taken from the 1983 National Personal Transportation Study (NPTS) Peak Factor.
In-Corridor factor TI and 3M: 0.3272
In-Corridor factor: 0.11
Office building vacancy rate: 35.3%. Taken from Accross the Nation, 2nd Quarter 1987, Cushman & Wakefield.

CALIBRATION OF EMPLOYMENT FIGURES FOR THE TRIP ATTRACTIONS MODEL

COMPLEX	TYPE	ADDRESS	AREA (Sq. Feet)	ACTUAL AND *ESTIMATED* EMPLOYMENT	TRAFFIC SERIAL ZONE
Arboretum 1	Office Building	10000 Research	250,000	***608***	214
Arboretum 2	Office Building	10000 Research	550,000	***1,338***	214
Arboretum Point	Office Building	9505 Arboretum	148,000	***360***	214
Great Hills	Office Building	Great Hills & Loop 360	167,706	***408***	214
Health Care International	Office Building	9737 Great Hills Trail		200	214
Total "Arboretum Office Complex"	Office Building		1,115,706	***2,914***	214
3M	Light Industrial	705 Research Blvd.		300	199
The Stratum	Office Building	183 & Balcones Woods	240,000	***584***	198
The Avallon	Nursing Home	10415 Marado Cr.	126,000	74	198
Texas Instruments	Light Manufacturing	12501 Research		2400	183
N.W. Techniplex	Office Building	183 & Technology	550,000	***1,338***	183

EMPLOYMENT ESTIMATION FOR KEY ZONES IN THE CORRIDOR
183 CORRIDOR MODEL VERSUS CMTA 1985 FIGURES

TRAFFIC SERIAL ZONE	A 1988 ESTIMATED EMPLOYMENT (ONLY MAJOR GENERATORS)	B CMTA ESTIMATED 1985 EMPLOYMENT FOR THE TRAFFIC SERIAL ZONE	DIFF. BETWEEN B AND A
183	3,738	4,049	-7.68%
198	658	707	-6.93%
199	300	259	15.83%
214	2,914	943	209.01%*

* This difference can be explained by the fact that most of the development in the arboretum area has occurred in the last three years.

HOURLY COSTS AND SUBSIDIES REQUIRED FOR THE NON-WORK TRIP OPTIONS

HOURLY COSTS AND SUBSIDIES REQUIRED FOR THE NON-WORK TRIP OPTIONS

	OPTION	AVERAGE HOURLY ESTIMATED TRANSIT DEMAND	TOTAL HOURLY COST (Avg. cost/hr. X number of veh.)		TOTAL HOURLY SUBSIDY			
					$1.00 FARE		$1.50 FARE	
			HIGH PROD. 6.0 PASS./HR.	AVG. PROD. 3.0 PASS./HR.	HIGH PROD. 6.0 PASS./HR.	AVG. PROD. 3.0 PASS./HR.	HIGH PROD. 6.0 PASS./HR.	AVG. PROD. 3.0 PASS./HR.
HIGH RIDERSHIP (3%)	Service Area, private contractor	South 46	$213	$400	$168	$355	$145	$332
		North 46	213	400	168	355	145	332
		Leander/C.P. 28	133	240	105	212	92	198
	Service Area, transit authority	South 46	246	460	200	415	177	392
		North 46	246	460	200	415	177	392
		Leander/C.P. 28	153	276	126	248	112	234
	Service Area, shared	South 46	141	264	95	218	72	195
		North 46	141	264	95	218	72	195
		Leander/C.P. 28	88	158	60	130	46	116
AVG. RIDERSHIP (1%)	Service Area, private contractor	South 15	80	133	65	118	57	111
		North 15	80	133	65	118	57	111
		Leander/C.P. 9	53	80	44	71	39	66
	Service Area, transit authority	South 15	92	153	77	138	69	131
		North 15	92	153	77	138	69	131
		Leander/C.P. 9	61	92	52	83	47	78
	Service Area, shared	South 15	53	88	37	73	30	65
		North 15	53	88	38	73	30	65
		Leander/C.P. 9	35	53	26	43	21	39

SUMMARY OF AVAILABLE INFORMATION - AUSTIN

SUMARY OF AVAILABLE INFORMATION - AUSTIN

DOCUMENT	INFORMATION PROVIDED
Demographics for 183 Corridor Author: CMTA (developed for TCAP)	- 1985 Total Population by TSZ for every zone in the corridor - 1985 Occupied Units - 1985 Household Size of Occupied Units - 1985 Retail Employment - 1985 Non-Retail Employment - 1985 Total Employment - 1980 Median Household Income - 1980 Mean Household Income - PGM Sector of every TSZ - Zip Code - Area in Acres - Population/Sq. Mile - Employment/ Sq. Mile - 1986 ACC Students - 1986 U.T. Students - 1986 St. Edwards Students - ATS Planning Sector

DOCUMENT	INFORMATION PROVIDED
Marketing Baseline Study (February 1988) Author: Nustats (for Capital Metro)	- Map of Corridors - Origin and Destination for work trips (Sample = 7692) - Origin and Destination for school trips (Sample = 7692) - Origin and Destination for discretionary trips (Sample = 7692) - Home corridor, public transit usage, level of dependancy on public transit

DOCUMENT	INFORMATION PROVIDED
Comparison of Ridership Levels 1987-1988 Author: CMTA (Spring B/A Counts)	- 1987 Riders for every existing route - 1988 Riders for every existing route - Percent change - 1987 Hours for every existing route - 1988 Hours for every existing route - Percent change - 1987 Riders/Hour for every existing route - 1988 Riders/Hour for every existing route - Percent change

DOCUMENT	INFORMATION PROVIDED
Capital Metro On Board Survey (April 1986) Author: Nustats (for CMTA)	- Trip purpose from by trip purpose to - Fares - Mode of Access to Bus - Mode of egress - Number of buses riden - Age Distribution of Capital Metro passengers - Gender of CMTA passengers - Ethnic composition of transit ridership - Household size of CMTA transit riders - Auto ownership of CMTA transit riders - Household income of CMTA passengers

DOCUMENT	INFORMATION PROVIDED

Northwest Area Land Use Guidance Plan (Revised January 1986)
 	
Author: PGM
	- Map of the area and sub-areas
	- Adopted roadway plan map
	- Residential component of the land use guidance plan of the sub-areas
	  - Existing housing units of each sub-area
	  - Platted housing units of each sub-area
	  - New housing units of each sub-area
	  - Total housing units of each sub-area
	  - Existing Population of each sub-area
	  - Platted population of each sub-area
	  - New population of each sub-area
	  - Total population of each sub-area
	- Non-Residential component of the land use guidance plan of the sub-areas
	  - Existing acres of retail
	  - New acres of retail of each sub-area
	  - New acres of retail of each sub-area along 183
	  - Total acres of retail of each sub-area
	  - Retail employment of each sub-area
	  - Existing acres of office R&D
	  - New acres of office R&D of each sub-area
	  - Total acres of office R&D of each sub-area
	  - Office R&D employment of each sub-area
	  - Total non residential employment of each sub-area
	  - Total non residential acres of each sub-area
	- Existing strip centers (leasable area)
	- Total strip centers (leasable area)
	- Existing neighborhood centers (leasable area)
	- Under construction neighborhood centers (leasable area)
	- Total neighborhood centers (leasable area)
	- Existing community centers (leasable area)
	- Under construction community centers (leasable area)
	- Total community centers (leasable area)

DOCUMENT	INFORMATION PROVIDED
Basic data 1987 Author: PGM	- Land use distribution at planning sector level - Urban land use patterns map for whole city - Map of major retail centers - List of major employers - Map of major employers - List of major manufacturers - Map of major manufacturers - List of major office buildings - Map of major office buildings - List of major hotels and motels - Map of major hotels and motels - List of major banks - Map of major banks - List of major shopping centers - Map of major shopping centers - List of secondary schools, colleges and universities - Map of secondary schools, colleges and universities - List of public libraries - Map of public libraries - List of Metropolitan and District parks - Map of Metropolitan and district parks - List of hospitals and EMS stations - Map of hospitals and EMS stations - Daily traffic volumes on selected locations (80-85) - Annual transit ridership