Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA/TX-96/1361-1F		

4. Title and Subtitle	5. Report Date
INVESTIGATION OF LAND USE, DEVELOPMENT, AND PARKING POLICIES TO SUPPORT THE USE OF HIGH-OCCUPANCY VEHICLES IN TEXAS	November 1995
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
Katherine F. Turnbull, Patricia A. Turner, and Nell Frazer Lindquist	Research Report 1361-1F

9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
Texas Transportation Institute The Texas A&M University System College Station, Texas 77843-3135	11. Contract or Grant No. Study No. 0-1361

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
Texas Department of Transportation Research and Technology Transfer Office P. O. Box 5080 Austin, Texas 78763-5080	Final: September 1993-August 1995
	14. Sponsoring Agency Code

15. Supplementary Notes

Research performed in cooperation with the Texas Department of Transportation and the U.S. Department of Transportation, Federal Highway Administration

Research Study Title: Investigation of Land Use, Development, and Parking Policies to Support the Use of High-Occupancy Vehicles in Texas

16. Abstract

This research study examined the factors that influence commuting behavior, the reaction of commuters to various strategies and techniques to encourage alternative commute modes, and the use of different programs by public agencies and businesses in Texas. This was accomplished through a state-of-the-art literature review; discussion groups with representatives from the public and private sectors in Dallas, Houston, and Austin; an evaluation of the Houston Employer Trip Reduction Plans; and surveys of bus riders, carpoolers, and motorists on HOV lanes and freeways in Dallas and Houston. The research results identify the strategies that appear most appropriate for further application in Texas and potential implementation techniques. The results indicate that voluntary efforts are favored over mandatory programs. Further, support was strongest for transit services and support facilities, ridesharing, employee incentives, and on-site amenities. Less support was voiced for pricing strategies, including congestion pricing, increasing parking rates, and raising the tax on gasoline.

17. Key Words	18. Distribution Statement
High-occupancy vehicles, HOV, transit, carpooling, vanpooling, ridesharing, parking, land use, development, travel demand management, TDM, TMO's/TMA's	No restrictions. This document is available to the public through NTIS: National Technical Information Service 5285 Port Royal Road Springfield, Virginia 22161

19. Security Classif.(of this report)	20. Security Classif.(of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	170	

INVESTIGATION OF LAND USE, DEVELOPMENT, AND PARKING POLICIES TO SUPPORT THE USE OF HIGH-OCCUPANCY VEHICLES IN TEXAS

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Sponsored by
Texas Department of Transportation
In Cooperation with
U.S. Department of Transportation
Federal Highway Administration

November 1995

TEXAS TRANSPORTATION INSTITUTE
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IMPLEMENTATION STATEMENT

Most urban areas in Texas continue to experience significant problems relating to traffic congestion, increasing concerns about air quality, and maintaining the mobility of area residents and visitors. All forms of high-occupancy vehicles—rail, bus, carpools, and vanpools—along with bicycling, walking, and work schedule management, are viewed as playing important roles in helping to address many of these concerns. Encouraging greater use of these approaches has become an important focus of efforts in Texas cities. Experience in Texas and throughout the country indicates HOV use can be enhanced by providing supporting policies such as employer incentives, land use and zoning practices, coordinated development activities, parking supply and pricing strategies, and other techniques.

This study examined the national experience with various programs and assessed the efforts currently underway in Houston, Dallas, and Austin. Discussion groups in these three cities provided an overview of current programs, as well as the reaction of public and private sector representatives to different approaches. Surveys of commuters in Houston and Dallas provided further insight into the general public's support for various strategies.

This research study should be of benefit to the Texas Department of Transportation, transit agencies, metropolitan planning organizations, municipalities, public and private sector employers, and other groups interested in identifying realistic approaches to encourage greater use of all high-occupancy commute modes. The results should also be of interest to federal agencies, national organizations, and groups in other states.

DISCLAIMER

The contents of this report reflect the views of the authors who are responsible for the opinions, findings, and conclusions presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration or the Texas Department of Transportation. This report does not constitute a standard, specification, or regulation, and is not intended for construction, bidding, or permit purposes.

ACKNOWLEDGMENT

The authors would like to recognize the following TTI staff for their assistance with the data collection and data entry activities associated with this research project:

Luke Albert, Student Worker, College Station
Paul Allen, Student Worker, Arlington
Jim Blagrave, Student Worker, Arlington
Patty Diaz, Student Worker, College Station
Jeff Dublin, Student Worker, Arlington
Bonnie Duke, Administrative Assistant, College Station
Kim Duren, Student Technician, College Station
Shari Cadogan, Graduate Research Assistant, College Station
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Steve Farnsworth, Graduate Research Assistant, College Station
William Frawley, Assistant Research Scientist, Arlington
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Laura Higgins, Assistant Research Scientist, College Station
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Brad Morello, Student Technician, College Station
Danny Morris, Research Associate, College Station
Darryl Puckett, Associate Research Scientist, Houston
Stephen Ranft, Research Associate, Arlington
Jordan Richard, Student Worker, College Station
Janet Ricci, Research Associate, College Station
Pam Rowe, Technical Secretary, College Station
David Schrank, Research Associate, College Station
JoBeth Schreiber, Student Worker, College Station
Jeff Simmons, Student Worker, Arlington
Doug Skowronek, Assistant Research Scientist, Arlington
Joe Slack, Student Worker, Arlington
Diana Wallace, Assistant Research Scientist, Arlington
Stacy White, Research Assistant, Arlington
Steve Wohlschlaeger, Assistant Research Scientist, Houston

The assistance of these individuals is both acknowledged and greatly appreciated.

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SUMMARY

INTRODUCTION

Major urban areas in Texas continue to experience problems with growing traffic congestion, increasing concerns about air quality and the environment, and maintaining the mobility of area residents. All forms of high-occupancy commute modes—bus, carpools, vanpools, and rail—as well as other strategies to reduce driving alone, can play important roles in addressing many of these concerns. Experience in Texas and other states indicates that encouraging greater use of high-occupancy vehicles (HOV) and alternative commute modes is most effective when integrated with other supporting policies and programs.

This research project was undertaken to expand the understanding of the factors that influence commuting behavior, the reaction of commuters to various strategies and techniques, and the use of different programs by public agencies and businesses in Texas. As such, it is intended to help develop a realistic assessment of the strategies and programs that appear most appropriate for use in Texas. Approaches examined include transit improvements, HOV facilities, TDM programs, parking policies, pricing strategies, land use and development requirements, and employer-based incentives and disincentives.

RESEARCH APPROACH

Researchers conducted a number of activities to accomplish the objectives of this study. First, a state-of-the-art literature review was completed on strategies and programs in use throughout the country. This review examined the experience with different approaches to encourage HOV use and identified those appropriate for further application within Texas.

Second, researchers assessed the efforts currently underway in Texas. Information on programs in the major cities was obtained from local agencies, and discussion groups were held with representatives from public agencies and private businesses in Houston, Dallas, and Austin. The Employer Trip Reduction Plans submitted by employers in Houston provided further information on commuter preferences and current programs. Third, surveys were conducted of carpoolers and bus riders using the HOV lanes and motorists in the general purpose lanes on two freeways in Houston and one freeway in Dallas.

This information helped identify the approaches and techniques that appear to have the most widespread support among businesses, governmental agencies, and the general public. Further, techniques for implementing these strategies were outlined. The study results provide a useful guide for all groups interested in encouraging greater use of HOV and other alternative commute modes in Texas.

RESEARCH RESULTS

A number of common themes emerged from the discussion groups, surveys, and Houston ETR plans. Although differences emerged from the discussion groups, participants voiced stronger support for voluntary measures rather than mandatory regulations. They supported increased transit services and more innovative service applications, rideshare programs, preferential parking and reduced parking rates for carpoolers, guaranteed ride home programs, alternative work schedules, and special programs on ozone alert days. Many, but not all participants, noted that on-site amenities for bus riders and bicyclists, such as bicycle shelters or lockers and shower facilities were important.

The surveys of HOV lane users and non-users included several questions designed to obtain a better understanding of the level of support among the various groups for different policies and programs encouraging HOV use. The three survey groups—bus riders, carpoolers and vanpoolers, and motorists—were asked to indicate their level of support for ten strategies. These strategies focused on the three general categories of expanded transit services and facilities, employer-based programs, and increasing the cost of driving alone. The major responses to these question are highlighted next.

- There was more support among all three groups for strategies focusing on expanding transit services and facilities and employer incentives, than increasing the cost of the driving.

- All groups rated employer incentives, flexible work hours, expanded bus services, additional park-and-ride lots, additional HOV lanes, telecommuting, and additional HOV lane access points the highest. Between 40 to 92 percent of the respondents supported these strategies.

- The three approaches receiving the least amount of support were increasing the gasoline tax, charging for the use of roads, or charging higher parking fees.

Only three to nine percent of respondents in the different groups indicated support for these strategies.

- Bus riders and carpoolers expressed stronger support for the bus service and facility enhancements and employer incentives than did motorists.

- Employer incentives were rated highest by bus riders with 82 percent to 92 percent indicating support. Telecommuting and expanded bus services were supported by 70 percent to 84 percent of the bus riders. Other strategies supported by at least half the transit riders were additional HOV lanes, additional park-and-ride lots, telecommuting, and additional HOV lane access points.

- Carpoolers rated additional HOV lanes, flexible work hours, and employer incentives the highest. All of these were supported by between 60 percent and 82 percent of the carpoolers in all three corridors. Additional HOV lane access points and telecommuting were supported by approximately 50 percent of the carpool respondents.

- Motorists indicated less support than the other two user groups for all the strategies. Flexible work hours, employer incentives, additional HOV lane access points, and telecommuting were rated the highest by the freeway motorists. These strategies received support from between 40 percent and 56 percent of the motorists responding to the survey. Support for expanding bus services, additional park-and-ride lots, and additional HOV lanes were supported by 30 percent to 46 percent of the respondents.

- None of the three user groups indicated support for increasing the gasoline tax, charging for the use of roads, or charging higher parking fees. Bus riders and carpoolers offered slightly higher levels of support for these strategies than did motorists, however.

STRATEGIES FOR FURTHER APPLICATION IN TEXAS

In assessing potential programs and strategies, it is important to remember some of the unique aspects of many metropolitan areas in Texas. These include low density land use and development patterns, fewer land use controls in some cities, a relatively stable source of funding for the metropolitan transit authorities (MTAs), and active private sector involvement in many activities. Some of these factors, such as lower densities and the lack of land use controls in some areas, may work against strategies to encourage HOV and other alternate commute modes. Others, such as stable funding sources for the larger transit agencies and the active participation of the business community in various programs, provide opportunities to undertake new and innovative efforts. The study results indicate that the following strategies are most appropriate for further application in Texas.

- **Transit Services**. There is widespread support for expanding and enhancing transit services in the three cities included in the study. Commuters, public agencies, and private businesses all responded favorably to strategies that enhance existing transit services, such as those oriented to the traditional markets, as well as innovative approaches to serving new markets. Expanding and enhancing transit services should continue to be a high priority for transit agencies, businesses, TMOs, TxDOT, and other groups.

- **Support Facilities**. There was also strong support among all groups for additional facilities to enhance the use of transit and ridesharing. TxDOT, transit agencies, local communities, developers, businesses, and other groups should continue to pursue the development and operation of a wide range of supporting facilities, such as HOV lanes, park-and-ride lots, transit centers, LRT and bus coordination, shelters, and other facilities.

- **Rideshare Programs**. Widespread support was voiced for carpool and vanpool programs and other ridematching services. These programs are appropriate for all travel markets, but are especially good for areas without fixed-route transit services. New and innovative rideshare approaches, including real-time ridematching, casual carpooling, and application of intelligent transportation system (ITS) technologies, should be pursued rather than relying solely on the traditional match list. Rideshare programs within transit agencies, TxDOT, MPOs, TMOs, and private businesses should continue to work together on these approaches.

- **Guaranteed Ride Home Programs**. All groups voiced strong support for guaranteed ride home programs. As a result, the use of guaranteed ride home programs should be actively pursued by public and private sector groups in Texas.

- **Employer Incentives**. HOV lane users and non-users in Houston and Dallas and employees in Houston responding to the ETR surveys viewed a number of employer incentives positively. These included subsidizing bus passes, payroll deduction for transit passes, on-site bus pass sales, and other incentives. Both the public and private sectors should be encouraged to continue existing incentives and to develop new programs.

- **On-Site Amenities**. The results from the Houston ETR surveys and the discussion groups indicate there is support for various on-site amenities. The provision of on-site amenities or the addition of services in close proximity to major work sites should continue to be explored and developed by private businesses and public agencies.

- **Work Schedule Management**. Strong support was voiced by all groups for various work schedule strategies, although management personnel did raise some concerns. Staggered schedules, flexible work hours, and compressed work weeks were rated the highest, followed by telecommuting. These approaches are currently being used by both the public and private sectors and further implementation should be supported by all groups.

- **Land Use and Development Regulations**. The discussion group participants generally supported strategies involving greater coordination of land use and development patterns, public transportation, roadway improvements, and other elements of the transportation system. Local communities, private businesses, and developers will need to take the lead on these strategies. TxDOT, transit agencies, MPOs, TMOs, and other groups can play important roles supporting and assisting with the planning and implementation of these techniques.

- **Public Awareness Campaigns and New Organizational Structures**. The need for ongoing informational and educational efforts aimed at the general public, policy makers, and businesses was raised by discussion group participants. Continued support should be provided by all groups for the development, implementation, and ongoing use of public information campaigns and other related activities. TxDOT can play a key role in helping promote these activities. Further, development and use of TMOs, TMAs, and other innovative organizational structures should be encouraged.

- **Comprehensive Programs**. Consideration should also be given to the development and implementation of comprehensive programs in major cities in Texas. Although efforts have been made in this direction in some areas, additional elements may be needed in various programs. All groups—TxDOT, transit agencies, MPOs, local communities, TMOs, and private businesses—should be involved in the development and implementation of comprehensive programs.

Three strategies—bicycling and walking, parking management and pricing, and congestion pricing—received lower levels of support from all groups. As noted next, however, additional consideration of these techniques is still appropriate.

- **Bicycling and Walking**. For various reasons, all groups voiced lower levels of interest and support for commuting by bicycling and walking. These techniques may have applications in some areas; however, and efforts to promote these alternatives should be focused carefully on these opportunities. Cities, MPOs, TxDOT, private businesses, and bicycle groups should work together on these applications.

- **Parking Management and Parking Pricing**. These techniques have not been used extensively within Texas. There was support among some groups for preferential parking strategies for HOVs, but little support was voiced for parking pricing strategies. Although it does not appear that widespread parking pricing programs will be used in the near future, it may be appropriate to consider a few demonstration projects focusing on parking pricing and supply strategies to test these concepts.

- **Congestion Pricing**. Little support was voiced for congestion pricing although some interest was expressed for charging single-occupant vehicles for use of the HOV lanes in Dallas and Houston. Monitoring the assessment of a possible Houston HOV lane demonstration and any test that may be conducted is appropriate. The results of this project can be used to help assess the potential for additional applications of congestion pricing in the state.

IMPLEMENTATION

A number of techniques are appropriate to help implement the strategies described in the previous section. These include videos, training courses, educational outreach programs, technical assistance, advanced communication technology, and other techniques. The successful planning, implementation, and ongoing operation of these strategies will require the coordinated efforts of numerous groups. TxDOT, transit agencies, MPOs, TMOs, local governments, private businesses, and other organizations will all need to be involved.

I. INTRODUCTION

RESEARCH OVERVIEW

Major urban areas in Texas continue to face significant problems related to traffic congestion, increasing concerns about air quality, and maintaining the mobility of area residents. All forms of high-occupancy commute modes—bus, carpools, vanpools, and rail—as well as other strategies to reduce driving alone, can play important roles in addressing many of these concerns. As a result, encouraging greater use of high-occupancy vehicles (HOVs), other alternative commute modes, and innovative work scheduling has become an important focus in many Texas cities. The forecasted growth in population and vehicle miles of travel (VMT) for the state indicate that these issues will continue to be important in the future (1).

Experience in Texas and other states indicates that encouraging greater use of HOV and alternative commute modes is most effective when integrated with other supporting policies and programs. A recent focus of transportation research has been on obtaining a better understanding of the factors that influence commuter behavior, especially mode choice, and the role incentives, disincentives, and supporting programs play in encouraging greater use of HOV and alternative modes. This research has lead to a growing realization that many factors influence commuting behavior and that a wide range of services, programs, and strategies must be present to meet the needs of diverse segments of the population.

This research project was undertaken to expand the understanding of the factors that influence commuting behavior, the reaction of commuters to various strategies and techniques, and the use of different programs by public agencies and businesses in Texas. As such, it is intended to help develop a realistic assessment of the strategies and programs that appear most appropriate for use in Texas. Approaches examined include transit improvements, HOV facilities, TDM programs, parking policies, pricing strategies, land use and development requirements, and employer-based incentives and disincentives.

The research conducted in this study builds upon previous work conducted by the Texas Transportation Institute (TTI) for TxDOT and others. These include surveys of HOV lane users and non-users in Houston (2,3), national assessments of HOV facilities (4), and the examination of policies supporting transit use (5). This research expands on these efforts and provides a realistic assessment of techniques for encouraging greater use of HOV and alternative commute modes in Texas. The results of the study, as outlined in this report, should be of benefit to

TxDOT, transit agencies, businesses, and other federal, state, and local groups interested in enhancing mobility and addressing traffic congestion and environmental concerns.

STUDY OBJECTIVES

This research study was designed to meet a number of objectives. The major focus of the study was to assess the role different policies, programs, and strategies play in encouraging greater use of HOV commute modes in Texas cities. Transit improvements, HOV facilities, TDM programs, parking policies, pricing strategies, land use and development requirements, and employer-based incentives and disincentives are the major techniques examined in the study.

The second objective of the research project was to gain a better understanding of the factors that influence the travel patterns and mode choice of commuters in major urban areas in the state, as well as preferences toward different strategies. This objective was accomplished by using discussion groups and mail surveys, as well as obtaining relevant information from public agencies and other groups.

The third objective of the study was to identify the approaches and techniques that appear to have the greatest potential for encouraging greater use of HOV modes and other alternatives among commuters in Texas. Techniques for implementing, monitoring, and evaluating selected strategies were also assessed.

The results of this study will be of benefit to TxDOT, transit agencies, metropolitan planning organizations (MPOs), cities and counties, businesses, and other groups interested in encouraging greater use of HOV modes. The research results provide guidance on the strategies and approaches that appear to be most appropriate for application in Texas. The study provides a realistic and useful resource for the development, implementation, and evaluation of programs and techniques to increase the use of HOV modes and other alternatives to meet local needs as well as federal requirements.

RESEARCH APPROACH

Researchers conducted a number of activities to accomplish the objectives of this study. First, a state-of-the-art literature review was completed on strategies and programs in use throughout the country. This review examined the experiences with different approaches to encourage HOV use and identified those appropriate for further application within Texas.

Second, researchers assessed the efforts currently underway in Texas. Information on programs in the major cities was obtained from local agencies, and discussion groups were held with representatives from public agencies and private businesses in Houston, Dallas, and Austin. The discussion groups provided additional insights into the factors that influence travel behavior and the mode choice of commuters. The current use of different approaches were discussed, along with the reactions toward potential strategies.

Third, surveys were conducted of carpoolers and bus riders using the HOV lanes and motorists in the general purpose lanes on two freeways in Houston and one freeway in Dallas. These surveys provided additional information about commuter travel behavior, as well as attitudes toward alternative commute modes and other strategies.

The information obtained from all these sources was used to identify the approaches and techniques that appear to have the most widespread support among businesses, governmental agencies, and the general public. Further, techniques for implementing these strategies were outlined. The study results are intended to provide a useful guide for all groups interested in encouraging greater use of HOV modes in Texas.

REPORT ORGANIZATION

The remainder of this report is divided into four chapters. The next chapter summarizes the national state-of-the-art programs focusing on encouraging HOV use and other alternative strategies to reduce driving alone. Examples are provided of various strategies in use throughout the country. Chapter Three reviews the experience with programs and activities within the state. The results of the discussion groups, as well as other information on efforts within Texas, are presented. Chapter Four summarizes the results of the on-board surveys of bus riders and the mail surveys of carpoolers and motorists using freeways and HOV lanes in Houston and Dallas. The final chapter identifies those approaches which appear most appropriate for further application, techniques to implement these strategies, and areas for further examination.

II. NATIONAL OVERVIEW

Public agencies and private businesses throughout the country are implementing a variety of different approaches to encourage greater use of alternative commute modes. Additional strategies, such as flexible work schedules, telecommuting, and congestion pricing are also being examined to help manage the demand on transportation facilities.

In general, the strategies being considered and implemented fall into two general categories. The first is those approaches aimed at encouraging commuters to change from driving alone to using an HOV mode, walking, or bicycling. The second group of strategies focuses on moving trips outside of the morning and afternoon peak-periods and into less congested travel periods or removing trips from the roadway altogether. A wide range of techniques falls into these general categories and there is no overlap between the different approaches.

Figure 1 provides a summary of the major strategies to encourage HOV use and to better manage demand on the transportation system. Twelve general approaches are identified, along with examples of specific techniques. While the national experience with some of these strategies is well established, the influence of many is still evolving. This chapter summarizes the general characteristics of the different techniques and reviews the experience with various programs throughout the country. The use of these strategies in Texas is examined in Chapter III.

Before assessing the various techniques to encourage greater use of HOVs, it is first important to understand the recent trends influencing travel behavior. Many of these trends are working against the use of HOVs and alternative commute modes. The discussion of these trends is followed by a brief overview of factors that appear to influence mode choice. The use of different strategies throughout the country are then summarized.

- Transit Services
  - Express Service
  - Crosstown or Suburban Service
  - Reverse Commute Service
  - Time-Transfer Service
- Supporting Facilities
  - Park-and-Ride Lots
  - HOV Lanes
- Rideshare Programs
  - Carpool Matching
  - Vanpool Programs
- Guaranteed Ride Home Programs
- Bicycling and Walking
- Employer Incentives
  - Transit Use Subsidies
  - Payments or Benefits for HOV Use
- On-Site Amenities
  - Shelters and Improved Walkways
  - Bicycle Lockers
  - Showers
- Parking Management and Parking Pricing
  - Preferential Parking Locations for HOVs
  - Decreased Parking Cost for HOVs
  - Increased Parking Cost for Driving Alone
  - Parking Cash-out
- Work Schedule Management
  - Staggered Work Hours
  - Flexible Work Hours
  - Compressed Work Week
  - Telecommuting
- Congestion Pricing
- Land Use and Development Regulations
  - Zoning and Land Use Controls
  - Joint Development
  - Transit-Oriented Development
  - Growth Management
- Public Awareness Campaigns and New Organizational Structures

Figure 1. Strategies to Encourage High-Occupancy Vehicle Use

RECENT DEMOGRAPHIC AND TRAVEL TRENDS

The changes in demographics, socio-economic characteristics, and travel behavior that have occurred over the last 30 years are well known. The three major trends that have influenced travel behavior over this time period are the worker boom, the suburban commuting boom, and the automobile commuting boom (6). An additional trend is that low income and transit dependent groups continue to reside primarily in the central city areas or older first ring suburbs. Many of these trends, which are highlighted next, are counter to encouraging the use of HOV modes.

- **Worker Boom**. Approximately 24 million new workers were added to the labor force in the United States between 1980 and 1990. About 10 million of this increase was due to population growth, while 14 million was due to the changing nature of the population. Further, approximately 60 percent of these new workers were women (6). The increase in workers means an increase in commuting trips. Although this trend would be good for transit if the new jobs were located in areas served by transit, they often are not. Further, the addition of significant numbers of women into the work force has resulted in more two-worker families and single parent households. As a result, two cars are often used per household for work trips and many work trips also must accommodate dropping and picking children up at school or day care, grocery shopping, and other errands. Recent studies have indicated that women have different commuting patterns, partly as a result of child care and other responsibilities (7).

- **Suburban Commuting Boom**. Since World War II, there has been a steady trend toward the movement of both housing and jobs from central city areas to the suburbs. This has resulted in major changes in commuting patterns in most metropolitan areas. In the past, the suburb-to-downtown work trip represented the major commute pattern in most metropolitan areas. On a national basis this is no longer the case. The development of suburban office parks and edge cities has resulted in the suburb-to-suburb work trip being the dominant commute pattern in most metropolitan areas today (6). This trend has resulted in significant levels of traffic congestion on many suburban freeways and arterial streets. This travel pattern, which focuses on dispersed origins and destinations, is difficult to serve with public transportation. It is important to note, however, that the suburb-to-Central Business District (CBD) trip still represents an important—and in some areas growing—commute pattern that is usually well served by transit (6,8).

- **Automobile Commuting Boom**. Automobile ownership, vehicle miles of travel (VMT), and the use of the single-occupant automobiles all continue to increase. In 1990, the majority of households in the United States owned two automobiles. Only 13 percent of the households in the country did not have an automobile available, and 20 percent of these were in New York City (8,9). Thus, the trend is toward higher automobile ownership and increased use of those vehicles. These trends have resulted in an increase in the use of the automobile—by a single driver—for commuting. According to the 1990 Census, the number of employed Americans who drive alone to work increased by some 9 percent between 1980 and 1990, while the number of carpoolers declined, and the use of public transit remained relatively constant (8,9).

- **Transit Dependent Groups**. Many of the groups that tend to rely heavily on transit as their main method of transportation—low income individuals, the elderly, and individuals without access to an automobile—still reside in central cities or first ring suburbs in many areas (8,9). Meeting the travel needs of these groups, and providing access to jobs, social services, and recreation activities—which are often located in the suburbs—will continue to be a priority for public transit.

These trends have resulted in significant levels of traffic congestion in major metropolitan areas, as well as concerns over air quality and mobility. The annual cost of congestion—based on the costs associated with time delay and fuel—for the 50 largest metropolitan areas in the country is estimated to be approximately $48 billion (10).

FACTORS INFLUENCING GREATER USE OF ALTERNATIVE COMMUTE MODES

A number of factors appear to influence mode choice selection and the use of alternative commute modes. These factors relate to the convenience and attractiveness of the various modes and commute alternatives. Most of the programs focus on increasing the use of HOV modes to make using the bus or ridesharing more convenient and more competitive with driving alone. Providing travel time savings, cost savings, and other incentives are examples of some of these approaches. Using disincentives to driving alone, such as higher parking costs, have also been examined. The state-of-the-art literature review provided insight into some of these factors.

- **Travel Time**. A number of studies have found that the travel times associated with different modes is a key factor in mode choice selection. The travel time savings offered by driving alone has been identified as a major factor in the selection of commute mode (11,12,13). Studies have also shown that providing travel time savings to HOVs through the use of HOV lanes or exclusive rail or bus facilities has attracted commuters to these modes from driving alone (2,4,14).

- **Convenience**. Commuters also rate convenience very highly in the mode choice decision. Convenience relates to the ease of use, flexibility, and related attributes of the various modes. Commuters often identify the conveniences of driving alone as the major factor in their choice of this mode (2,11,12,13). Convenience may also relate to the location of parking facilities. For example, commuters view more convenient parking for shared-ride vehicles as a benefit (15,16).

- **Cost**. The cost associated with various modes also influences commute choices, although many individuals do not use the lowest cost alternatives. The cost savings associated with transit and ridesharing have been identified as important factors influencing the use of these modes (2,15,16). This appears to be especially true if commuters receive additional subsidies from their employers. On the other hand, free or low cost parking tends to influence greater use of driving alone (15).

TRANSIT SERVICES

Alternatives must be available for commuters if they are to be expected to change from driving alone to using an HOV mode. Historically, transit services—including bus and rail—have provided the major alternatives to driving alone in metropolitan areas throughout the country. Traditionally, these systems have focused primarily on providing regular route services oriented toward the downtown or major activity centers.

Meeting the diverse travel needs of all segments of society is a challenge for public transit, especially in light of the trends described in the previous section. Identifying the traditional, as well as the new markets for transit, developing services that meet the needs of these markets, and operating cost-effective services is not an easy process. Many transit systems throughout the country have tried different approaches for addressing these new travel markets, with varying degrees of success.

In addition to the regular or fixed-route services, other approaches that have been tried or are being used include paratransit and demand responsive services, premium express services, reverse commute routes, timed-transfer systems, suburban shuttle services, suburban cross-town routes, downtown and major activity center circulation systems, point deviation services, and jitneys. A few examples of these services are presented next.

- **Multidestination Express Service—Community Transit**. Community Transit in Snohomish County operates express service from Everett, Washington and the surrounding areas to downtown Seattle, the University of Washington, and North Seattle Community College. The service, which originates from both neighborhoods and park-and-ride lots, uses the I-5 North HOV lanes to provide travel time savings and more reliable trip times (17).

- **Reverse Commute Services—Southwest Metro, Minneapolis, Minnesota, and Wheels Bus Service, New Jersey Transit**. Southwest Metro operates express service into downtown Minneapolis and reverse commute service providing inner city residents of Minneapolis with access to jobs in three southwestern suburbs. The Wheels Bus Service is oriented towards residents of Bergen and Passaic Counties who work in Newark. This is just one element of a program to increase non-traditional transit services. Other elements include providing more direct service to major suburban activity centers and linking shuttle services to major rail stations (18).

- **Suburban Circulator—Roseville Area Transit**. This service, which is operated in the communities to the north of St. Paul, provides circulation service within a suburban environment. The service is focused on Rosedale—a major suburban shopping center. This facility acts as a transit hub; it is both a major destination for many trips and provides riders with access to express bus service to both downtown Minneapolis and St. Paul. The system also connects with routes to the University of Minnesota (19).

- **Point Deviation Service—Hamilton, Ohio**. The Hamilton transit system provides fixed route point deviation services. Buses operating on fixed routes deviate to pick up passengers when requests are made (20).

- **Reverse Commute Services—Southwest Metro, Minneapolis, Minnesota; ACCEL Transportation, Chicago, Illinois; and Nickerson Gardens, Los Angeles.**

Southwest Metro provides transit services in three southwestern suburbs of Minneapolis. Express service to downtown Minneapolis is operated, along with reverse commute service, providing inner city residents of Minneapolis with access to jobs in suburban areas. ACCEL Transportation provides inner-city residents in Chicago with door-to-door services to employment sites located in the south and southwest suburbs. The Nickerson Gardens Resident Management Corporation (NGRMC) operates van service providing residents of the inner-city public housing project with low-cost transportation to jobs, training facilities, child care, and other services in suburban areas (20,21).

- **Timed-Transfer Services—I-394 Corridor, Minneapolis**. A timed-transfer bus system has been implemented in the I-394 corridor as part of an overall system that includes an HOV lane and other supporting facilities. The system focuses on major transit centers and park-and-ride lots in the corridor and is designed to facilitate fast and convenient transferring among different routes. Timed transfer networks have been set up so that routes and buses are linked at these major interchange points. Buses on all routes serving the transfer points operate on the same headways and arrive at the interchange point at the same time. Following a layover period that allows passengers to change buses, the vehicles leave the interchange point at the same time. The advantage of this system is that passengers do not have to go to downtown Minneapolis to transfer, as in a radial system, and riders can reach additional destinations more quickly and conveniently (22).

SUPPORTING FACILITIES

Park-and-ride lots, HOV lanes, and transit centers are three major types of support facilities commonly found with transit and ridesharing programs. Light rail transit (LRT) and heavy rail systems are also supported by park-and-ride lots and other elements. These facilities can help make the use of HOV modes more convenient to commuters and can enhance the ability of transit operators to offer a wide range of services.

Park-and-ride facilities provide a common location for individuals to transfer from a low-occupancy travel mode to a high-occupancy travel mode. This may mean transferring from an automobile to a bus or a rail system, or to a carpool or vanpool. Most park-and-ride lots provide ample parking spaces for automobiles connected with bus or rail stations and frequent transit services. In areas where bus and rail service is not available, however, park-and-pool lots may be provided to encourage the formation of carpools and vanpools. Parking areas for

the formation of carpools and vanpools may also be provided at bus and rail lots. Access to park-and-ride lots may also be accomplished by walking or bicycling. In addition, some travelers may be dropped off and picked up, rather than leaving their vehicles in the lot all day. Short term waiting areas, called kiss-and-ride facilities, are often provided at lots to accommodate these travelers (23). The following national examples of park-and-ride lots are most relevant to Texas.

- **Connecticut**. The Connecticut Department of Transportation (ConnDOT), in cooperation with FHWA, local jurisdictions, transit operators, rideshare agencies, and other groups, has developed a statewide system of park-and-ride lots. These facilities are designed to encourage commuters to change from driving alone to carpooling, vanpooling, or taking the bus or train. Currently, approximately 226 lots are in operation. Of these, 95 provide rail or express bus service, while the remainder are oriented toward local bus services, carpools, or vanpools. The facilities range in size from small lots of 10 to 20 parking spaces, to large lots averaging 800 to 1,000 spaces (23).

- **Denver, Colorado**. The Regional Transportation District (RTD) in Denver currently operates 49 park-and-ride lots, with a total of approximately 9,500 parking spaces. Most of these are exclusive lots, with a few shared-use facilities. All are currently served by buses and one is linked with the new LRT system (24).

- **Phoenix, Arizona**. Valley Metro, which serves the Phoenix area, currently uses 64 park-and-ride facilities accounting for some 2,462 parking spaces. Most of these are shared-use lots located at shopping centers; however, a few exclusive lots are in use. All facilities are oriented toward the bus system or ridesharing, and some lots provide bicycle racks or bicycle lockers. Further, some of the lots are oriented to the I-10 HOV lanes (24).

- **Sacramento, California**. A total of 15 park-and-ride facilities are operating in the Sacramento area. These lots, which are oriented toward the LRT system, bus services, and ridesharing activities, provide a total of 3,908 parking spaces. The Sacramento Regional Transit District (RTD) has nine park-and-ride lots, accounting for 3,713 spaces, at stations along the LRT system. The largest is the Roseville Road park-and-ride lot, which contains 1,087 parking spaces. Further, the RTD operates two shared-use lots, with 39 spaces, along bus routes. The California

Department of Transportation (Caltrans) operates and maintains four lots in the area, with parking spaces for 156 vehicles (24).

- **Seattle, Washington**. Park-and-ride facilities represent an important element of the overall transportation system in the Seattle metropolitan area and the state of Washington as a whole. Some 96 exclusive park-and-ride lots, providing almost 19,000 parking spaces, are in operation in King and Snohomish counties. Further, approximately 42 leased park-and-ride lots, with some 2,079 spaces, are in operation. Many of these facilities are oriented toward the HOV lane system in the area and support both bus and carpool use. The park-and-ride system has been developed through the cooperative efforts of the Washington State Department of Transportation (WSDOT), King County METRO, Community Transit, and local jurisdictions. To the south of Seattle, 19 lots, providing 1,998 parking spaces, are located in the City of Tacoma and Pierce county. WSDOT, Pierce Transit, and local jurisdictions are responsible for these facilities, which are oriented toward the bus system and carpooling. Some 238 park-and-ride facilities are in use throughout the State of Washington, accounting for a total of 28,793 parking spaces. WSDOT is responsible for 121 of these lots, while transit systems operate 26 and other groups have developed 91 facilities (23).

High-occupancy vehicle facilities, which offer priority treatments to buses, vanpools, and carpools, focus on increasing the person-movement—rather than vehicle-movement—efficiency of a travel corridor. Currently in North America, approximately 50 HOV lanes are in operation on freeways or separate rights-of-way in 22 metropolitan areas. Many more HOV projects are in the planning, design, and construction stages (4).

The primary concept behind HOV facilities is to provide travel time savings and more predictable travel times to buses, carpools, and vanpools. These two benefits serve as incentives for individuals to choose a higher-occupancy mode. Four general categories are usually used to describe HOV facilities. HOV facilities in separate rights-of-way are roadways or lanes developed in a separate right-of-way and designated for the exclusive use of HOVs. HOV facilities in freeway rights-of-way are physically separated from the general purpose freeway lanes, either by concrete barriers or painted buffers, and used exclusively by HOVs. Concurrent flow lanes are freeway lanes in the same direction of travel as the general-purpose lanes that are not physically separated from the general-purpose lanes. Contraflow lanes are typically the innermost lanes in the off-peak direction of travel, designated for exclusive use by HOVs traveling in the peak direction. Plastic posts or pylons separate the lane from the off-peak direction general-purpose travel lanes.

Both Houston and Dallas have operating HOV lanes. A few examples of extensive networks of HOV lanes in other metropolitan areas in North America are provided next.

- **Los Angeles and Orange County, California**. Several HOV lanes are in operation in the Southern California area, and many more are in the planning, design, and implementation stages. The San Bernardino Freeway (I-10) Busway operates from downtown Los Angeles to El Monte. The 2-lane, 2-direction facility is 13 miles in length. Open to buses, vanpools and carpools, the facility is supported by park-and-ride lots and transit centers at strategic locations. Currently, some 1,440 vehicles carrying 7,100 passengers, use the facility in the peak direction during the morning peak hour. Other HOV lanes are currently in operation on Route 55, I-405, Route 57, Route 91 and I-5. Although bus services are operated on some of these facilities, most are used by carpools (4,24).

- **Ottawa, Canada**. About 15 miles of an exclusive 2-lane, 2-direction transitway system is in operation in Ottawa, Ontario. This is part of a 19-mile, 26-station Phase I system. An additional 19 miles is planned for the future. About 180 buses, carrying 11,000 passengers, operate on the facility in the peak hour peak-direction (4,24).

- **Pittsburgh, Pennsylvania**. Two types of HOV lanes currently are found in the Pittsburgh area. Two, 2-lane, bus-only facilities, located in separated rights-of-way, have been in operation since 1977 and 1983. The East Busway is seven miles and the South Busway is four miles. The opening of both facilities reduced bus travel times from 25 minutes to 10 minutes on some routes. The East Busway currently carries some 6,000 passengers in 103 buses (4,24).

- **Seattle, Washington**. An extensive system of HOV lanes and supporting facilities and services are in operation in the metropolitan Seattle area. Major HOV lanes are located on I-5, I-90, I-405, and SR 520. Concurrent flow lanes are found on both the inside lane and the outside lane. Additional arterial street HOV treatments are also in place, including the downtown Seattle bus tunnel (4,24).

RIDESHARE PROGRAMS

Most transit agencies, or, in some cases, special regional organizations, provide ridematching, carpooling, and vanpooling programs for commuters who do not have access to regular route services or who desire more flexibility in their commute. In addition, some businesses provide in-house carpool matching services, vanpool programs, and other assistance to help employees share rides.

Ridematching involves the creation of match lists of potential carpool or vanpool members based on their origins, destinations, and schedules. Most rideshare programs use commercially available computer software programs or a specially designed system to provide ridematching services. These systems use some type of geographic base to record and track individual origins and destinations and to identify potential carpool matches.

An individual accesses the rideshare system by providing the necessary information over the telephone or by mailing in a ridesharing application. An individual's origin, destination, and travel times are matched by the computer with others in the database, and the individual is provided with a list of possible carpoolers. The individual is then responsible for making contact with prospective carpoolers. When the demand is large enough, vanpools may be formed. A number of approaches are used to organize and operate vanpools. These include owner operated, employer sponsored, and third-party arrangements.

A number of areas have implemented innovative approaches to attract more riders to carpools and vanpools. Most of these focus on enhancing the convenience of ridesharing. However, some programs are attempting to provide more personalized service to help commuters form carpools and vanpools. Many of the approaches being tested focus on providing greater flexibility for those who may not be able to rideshare every day. A few of these programs are summarized next.

GeoMatch RideMatching System—Portland, Maine. The greater Portland Council of Governments has implemented a geographic information system (GIS)-based ridematching program. The system allows operators to quickly identify possible matches on a color map. The system is also easy to use; operators can simply point and click for most functions (25).

Antelope Valley/San Francisco Valley—Burbank, Los Angeles, California. Kaufman and Broad, which is a large single-family home builder in Southern California, offers

vanpools to residents of the Antelope Valley to job locations in San Fernando Valley, Burbank, and Los Angeles (26).

Casual Carpooling, Washington D.C. and San Francisco. Casual carpooling is in use in both the Shirley Highway corridor in the northern Virginia/Washington D.C. area and on the Oakland Bay Bridge in the San Francisco area. In both cases, individuals are forming informal carpools on a daily basis to take advantage of the travel time savings afforded by the HOV facilities in the corridor. These activities occur without any formal planning or sanctions by any agency or organization and were initiated by commuters. Individuals wanting rides gather at park-and-ride lots and other locations and are picked up by drivers going to the same destination. The vehicle occupancy requirement on the Shirley Highway and the Bay Bridge HOV facilities is three or more individuals (4,24).

3M Vanpool Program—St. Paul, Minnesota. The 3M Company is often noted as the leader of business vanpool programs. The 3M vanpool program was started in 1973, primarily in response to the high cost of building additional parking facilities at the company's headquarters in the eastern suburbs of St. Paul. At its peak during the energy shortage of 1978 to 1980, some 135 vanpools were in operation. Currently, approximately 100 vans are used by company personnel (27).

State of Connecticut Vanpool Incentives Program. The state offers comprehensive assistance and incentive programs to encourage vanpooling. Working through the three non-profit ridesharing organizations in Connecticut, the program provides financing for the purchase of owner-operated vanpools. A partial rebate on the state gasoline sales tax is also offered for vans operating in Connecticut (27).

GUARANTEED RIDE HOME PROGRAMS

The lack of backup transportation in the case of an emergency at home or the need to stay late at work is often given as an important reason why many commuters do not use transit or ridesharing. Guaranteed ride home service is one approach that has been used in some areas to overcome these concerns. The intent of guaranteed ride home programs is to provide a source of transportation for bus riders, carpoolers, and vanpoolers to use if their travel needs change. The experience to date with guaranteed ride home programs indicates that employees use them only in cases of an emergency and do not abuse the benefit (27,28). Further, at least

one study has shown that the presence of this type of program did help encourage bus use (27,28).

Guaranteed ride home programs take many forms and may be offered by transit and ridesharing agencies or through employers. Taxis, agency or company vehicles, or personal automobiles may be used to provide the service (28). A few examples of these programs are summarized next.

U-Pass Program, University of Washington—The U-Pass Program offered by the University contains a number of elements, including a guaranteed ride home program. Faculty and staff who need to leave due to an emergency may call a taxi and be reimbursed for 90 percent of the fare for up to 50 miles a quarter (28).

Transamerica Life Company, Los Angeles, California—The Transamerica Life Insurance Company, which includes 3,000 employees at a site near downtown Los Angeles, has had a long history of vanpool and other related programs. A guaranteed ride home service is provided as part of the company's package to encourage greater use of all HOV modes. Vouchers for taxi service are given to employees who use HOV modes. The company pays for midday emergency trips out of their TDM program budget, while trips needed because an employee is required to work late are paid for out of departmental budgets (27).

BICYCLING AND WALKING

Bicycling and walking are not frequently used as commute modes due to a variety of factors. These include long distances between home and work locations, lack of safe and convenient bike or pedestrian paths, weather, and other barriers. Bicycling and walking may be appropriate commute modes in some areas, however. In addition to being the primary mode of travel, bicycling and walking can also be used to access other HOV modes and can be used for midday trips in a downtown area or a major activity center.

Improvements will be needed in most areas to accommodate greater use of bicycling and walking. Physical improvements, such as bicycle lanes, sidewalks, bicycle and pedestrian paths, bicycle lockers, and improved lighting may be necessary in many areas. On-site amenities, including showers and changing facilities, may also be needed. Examples of the use of these two modes for regular commuting are highlighted next.

University of California at Davis. The University has encouraged bicycle use on campus since the 1960s by providing extensive bicycle lanes and other support facilities. High parking fees further encourage bicycling, and enforcement of both bicycle registration and traffic laws has helped to minimize automobile traffic and maximize bicycling (27).

Boulder, Colorado. Boulder actively supports a pedestrian-friendly environment and encourages alternative commute modes, including bicycling and walking. Extensive sidewalks and pedestrian pathway systems encourage walking to stores, entertainment and transit centers. A city-funded Alternative Transportation Center and Pedestrian Systems Coordinator continue to explore possibilities for pedestrian, bicycle and public transit use. Boulder also hosts an annual International Pedestrian Conference (2).

Warner Center Transportation Management Organization (TMO)—Woodland Hills, California. The Warner Center TMO serves a mixed-use suburban center to the west of Los Angeles. The TMO uses a number of mechanisms to actively promote commuting by bicycle. These include a newsletter, a *Bike Buddy* program to introduce new cyclists, safety and bicycle maintenance seminars, special bicycling events and promotions, discounts at local bicycle stores, and on-site lockers and shower facilities (27).

EMPLOYER INCENTIVES

Employer incentives are often used to encourage alternative commute modes and other strategies. Experience indicates that most successful programs involve some type of employer support or incentives (27,29,30). These might include providing on-site bus information and ridematching services, subsidizing transit passes, providing company vanpools or paying part of the cost of vanpooling or carpooling, and providing bonuses or cash payments to employees who use alternative modes. A few examples of incentives currently being used by businesses throughout the country are provided next.

- **Payments for HOV Use—Commonwealth Land Title Company, Glendale, California**. Commonwealth has a multifaceted program to encourage alternative commute modes that includes ridematching services, a guaranteed ride home program, and subsidies for transit use and ridesharing. The company pays employees $1 a day for each day they use transit, $1 a day for participating in a 2

person carpool, $2 a day for a 3 person carpool, and $4 a day for a 4 person carpool (31).

- **Promotions for HOV Use—Allergan, Irvine, California**. The 1,300-employee Allergan company, located in Irvine, subsidizes employee vanpools and bus passes, and provides other bonuses for employees who use alternative modes. These include bonus holidays, drawings for vacation trips and free gas, and other promotions (27).

- **Transit Pass Subsidies and Transit Checks**. Numerous public agencies and private businesses throughout the country subsidize employee transit passes. A new approach that has been tested in a few areas recently is the use of transit checks. The Metrocheck program operated by the Washington Metropolitan Area Transit Authority (WMATA) provides one example of this. Metrocheck is an exchange fare voucher system that is good on rail, bus, and vanpool services in the Washington, D.C. area. Metrochecks have been marketed extensively with businesses and agencies, who provide them at a discount to their employees.

ON-SITE AMENITIES

The provision of on-site amenities is another approach that can enhance the use of alternative commute modes. On-site amenities may include showers and changing areas for employees who walk or bike to work, shelters for transit riders, and improved lighting and pathways. They may also include the provision of lunch, banking, and other services on-site or close by for employees who used an alternate mode and do not have an automobile available. These types of facilities and amenities are especially important in suburban areas where office complexes are often isolated. Examples of the current use of on-site amenities are highlighted next.

On-Site Services—Allergan Company, Irvine, California. This company provides a convenience store, cafeteria, banking facilities, postal service, and exercise facilities on-site to reduce the number of trips their employees need to make downtown (27).

Shower and Changing Facilities—Xerox, Palo Alto, California. The Xerox Company provides shower facilities, personal lockers, and a covered bicycle storage area for employees who cycle to work (27).

PARKING MANAGEMENT

Numerous studies have shown that the availability, cost, and accessibility of parking has a significant influence on mode choice (32,33,34). Individuals are more likely to drive alone when convenient, and reasonably priced parking is available. When parking is expensive or located far from an employee's work site, transit and ridesharing may be more attractive alternatives. Some employees also receive subsidized parking, which may further encourage driving alone. As a result, parking management strategies are being used in some areas to encourage greater use of alternative commute modes.

A variety of techniques are included under the broad heading of parking management. These may include limiting all-day parking, strictly enforcing parking regulations, providing fringe parking to facilitate transfers to transit, and providing preferential parking spots for carpools and vanpools. Pricing strategies may also be used. These could include eliminating parking subsidies, raising parking charges, and providing employees with transportation allowances which can be used for various purposes. Examples of different parking management programs are highlighted next. It is important to note that alternatives to driving alone must be provided in concert with the parking programs.

- **Downtown Parking Regulations to Encourage HOV Use—Portland, Oregon.** Portland has taken an active role in using parking, land use, and development requirements to encourage the use of alternative commute modes. For example, the city does not provide long-term parking in the downtown area and limits the amount private developers can build. The city does provide short-term parking on the edge of the downtown and use of buses and LRT is free in a downtown zone. Portland limits the number of parking spaces allowed for commercial and public buildings, permitting 0.7 to 1.0 spaces per 1000 square feet of building space, depending on the building's proximity to transit facilities. Forty-three percent of Portland commuters use transit, with another 17 percent using carpools (27,35).

- **Parking Discounts for Carpools and Vanpools—Seattle, Washington and Minneapolis, Minnesota.** Seattle provides parking rates for carpools at two downtown facilities. In Minneapolis, three parking garages were built on the edge of downtown as part of the I-394 HOV system project. Reduced parking rates are provided for carpools and vanpools, and a direct access ramp connects the HOV lane into the garages (27,36).

WORK SCHEDULE MANAGEMENT

The use of alternative work schedules can help spread the time people start and stop work, thus spreading the demand on the transportation system by alternating the time people travel to and from work. These strategies can help to ease congestion without requiring large investments in additional transportation facilities. Employers have also found that alternative work schedules help increase productivity and provide a benefit many employees find attractive (30). The three most common alternative work strategies—compressed work weeks, flextime, and staggered hours—are briefly described next.

- **Compressed Work Week**. The most common compressed work week arrangement consists of a four day work week composed of ten hour days. Employees thus complete the normal 40 hour work week while eliminating one day of work—and thus commuting—entirely. Other variations include maxiflex arrangements, which allow employees one extra day off every two weeks, and an arrangement with nine hour days incorporated into nine work days during a two week period. In addition to reducing vehicle miles of travel each week, compressed work weeks spread the normal peak commute times out due to the ten hour work day.

- **Flextime**. Flextime allows employees to choose their daily work schedules within certain guidelines. For example, employees may be allowed to start work anytime between 7 A.M. and 9 A.M., as long as they put in a complete eight hour day. Employees are allowed to vary their arrival times from day to day with flextime.

- **Staggered Work Hours**. Staggered work schedules allow employees to select their own work schedules within pre-set limits. In contrast to flextime, work schedules remain the same once selected. For example, some employees may work 8:00 A.M. to 5:00 P.M. schedules, while others work from 7:30 A.M. to 4:30 P.M.

The final work schedule management approach is telecommuting, which allows employees to work at home or at an alternative work site one or more days a week. Employees may be connected to the office by computer, modem, and/or fax machine, or they may simply be working on projects that do not require them to be in the office. There are several different forms of telecommuting, including work-at-home arrangements, satellite work centers, and neighborhood work centers. The obvious benefit of telecommuting is that it eliminates or shortens the home-to-work trips for participating employees. Additionally, employees enjoy personal advantages from working at home at their own pace. The impacts of telecommuting

on the transportation system and the issues commonly associated with telecommuting are being examined in a separate research study (37).

CONGESTION PRICING

Congestion pricing focuses on the concept of charging travellers for the use of roadways. The exact charges would be related to congestion levels to discourage drivers from using roadways during peak times of the day. The intent is to discourage single-occupant commuting and encourage commuters to use transit, ridesharing, or to switch to off-peak travel. Many transportation economists favor this approach because it reflects charging for the use of roadways and more efficiently uses society's economic resources, including both the capital invested in roads and the time motorists spend commuting. Economists hold that these resources would be used more efficiently if travel could be shifted from peak to non-peak hours. Congestion pricing would also provide a monetary incentive for those commuters who must travel during peak hours to rideshare or use transit and could provide a new revenue source for transportation improvements (38).

A number of concerns have been raised with congestion pricing, primarily relating to equity and efficiency. Equity concerns relate to the possibility that congestion pricing permits high income individuals to travel at the most convenient times, while those with lower incomes cannot afford peak-hour tolls. Criticisms related to the inefficiency of congestion pricing schemes arise from questions regarding the actual collection and enforcement of tolls. Both of these concerns could be addressed through providing low-income individuals with vouchers and the use of new technologies such as automatic vehicle identification (AVI) to streamline toll payments.

Congestion pricing has not been used in the United States to date and has had only limited applications in other parts of the world. The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 did provide funds for congestion pricing demonstrations, and possible projects are being considered at this time. These include varying time of day tolls on the San Francisco-Oakland Bay Bridge and charging single-occupant vehicles for use of the Route 91 HOV lane in Orange County, California. As summarized next, one congesting pricing project was tested in Hong Kong.

- **Hong Kong**. A test of this concept in Hong Kong included charging for use of roadways during different times of the day and tracked drivers who did not pay.

Closed circuit television cameras photographed the rear license plates of such vehicles. The photos were then transmitted to the system's control center, along with data on where and when the violation occurred. The Hong Kong demonstration, which lasted eight months, indicates that congestion pricing can be done with toll collection and enforcement using existing technologies.

LAND USE PLANNING AND DEVELOPMENT REGULATIONS

Enhancing the coordination between land use and transportation planning can help support the utilization of alternative commute modes and other strategies. Development regulations and design practices can also encourage HOV use. A number of different approaches and techniques are being used throughout the country. These include growth management, comprehensive planning, land use and zoning controls, and joint development. Many of these strategies have been examined in other TTI research projects (5,39,40). An overview of the various approaches is provided next; more detailed descriptions can be found in the previously cited reports.

- **Growth Management**. The concept of growth management emerged primarily in response to concerns in areas experiencing rapid growth, as well as those on the fringes of such areas. Growth management focuses on controlling the pattern, type, intensity, location, and timing of development. Growth management policies can encourage HOV use through more compact urban development patterns, thus helping to alleviate urban sprawl and its subsequent long distance commutes and increased dependence on the automobile. Growth management policies can be pursued at the state, regional, or local level. A number of states, including Washington, Oregon, Colorado, California, Florida, Maryland, and New Jersey, have enacted state-wide growth management legislation. Tools for implementing growth management strategies include mandatory comprehensive plans, local capital facilities plans, adequate public facilities ordinances, impact fees, establishment of urban growth boundaries, trip reduction ordinances, and criteria for jobs/housing balance (5).

- **Comprehensive Planning**. Comprehensive plans, which provide a long-range vision for the development of an area, can also help promote alternative commute modes. Comprehensive plans address transportation, housing, employment, recreation, schools, community facilities, water and sewer, and other community elements. The comprehensive planning process can help coordinate these elements and can promote development patterns more conducive to alternative commute modes. Linking

comprehensive planning to capital facility plans further helps ensure coordination between land use and transportation elements.

- **Land Use and Zoning**. Land use policies and zoning ordinances are two tools used to implement comprehensive plans. Specific techniques include transit zoning districts, mixed use zoning, special commercial zones, transition zones, pedestrian priority zones, incentive zones, floating zones, transit easements, land banking, and transfer of development rights. All of these approaches can enhance transit and pedestrian access to developments, further encouraging alternative commute modes.

- **Joint Development**. The joint development concept focuses on developing public transit facilities in conjunction with the private sector. Joint development has the potential to provide benefits for both public transit systems and the private sector. These benefits may include increased revenues to the transit system through lease or rental payments, reduced costs for property, increased ridership levels, promotion of economic development, or redevelopment, encouragement of transit compatible land use, and support for local and regional policies (40).

PUBLIC AWARENESS CAMPAIGNS AND ORGANIZATIONAL STRUCTURES

Commuters must be made aware of alternatives and options before they can be expected to use them. There is also often a need to educate and inform the general public and policy makers about the problems associated with increasing traffic congestion, declining air quality levels, and mobility concerns. Public awareness campaigns and ongoing education and outreach efforts are being used in a number of areas to promote alternative commute modes. A few examples of these programs are provided next.

- **Clean Air Month Campaign—Orange County**. This ongoing annual effort is sponsored by the Orange County American Lung Association Chapter, along with businesses and public agencies in the area. It includes a mix of activities and programs aimed at increasing the awareness of the general public about traffic congestion and air pollution, and promoting alternative commute modes. Activities include a 5K walk, a children's poster contest, a bike-to-work day, a clean commute day, corporate competitions and awards, and other efforts (41).

- **HOV Facilities—I-394, Minneapolis, Minnesota**. A major marketing and public information program was undertaken to introduce the Minneapolis-St. Paul Metropolitan area to the HOV lane concept and the components of the I-394 project. All types of media were used in the effort, including radio, television, and newspaper advertising: press tours and press releases; direct mail; a telephone information number; billboards; bus signs; special events; and bus and rideshare promotions (36,42).

Many areas are also using new organizational structures to develop and implement programs to encourage alternative commute modes and to address other needs. A common approach is to bring public and private sector groups together into a new organization, often referred to as transportation management organizations or transportation management associations (TMOs/TMAs). Representatives from major employers and developers, local communities, state departments of transportation, and transit authorities are typically involved in TMOs/TMAs. The purpose of these organizations is to work together to address community transportation issues and concerns. In addition to planning on a general scale, TMOs may help facilitate the implementation of ridesharing and transit services to private employment sites and serve as a forum for public/private discussions on local transportation improvements. The following are examples of TMOs and TMAs in use throughout the country.

- **Warner Center TMO—Woodland Hills, California**. The Warner Center TMO encompasses a suburban mixed-use employment center in Woodland Hills, California, 20 miles west of Los Angeles. The TMO provides a number of services to its members including ridesharing programs, transit marketing, a comprehensive bicycling program, and other activities (27,30).

- **Bellevue Downtown Association—Bellevue, Washington**. The Bellevue Downtown Association provides a mix of services to businesses and public agencies in Bellevue, Washington, which is located to the east of Seattle. The Association promotes transit and ridesharing, provides ridematching services, and has worked with King County Metro for service enhancements and a transit center (30).

- **Greater BWI Commuter Transportation Center—Baltimore, Maryland**. This TMO serves the suburban Baltimore area around the BWI airport. It is one of the older TMOs in the country and provides a wide range of services. These include rideshare promotions, newsletters, coordinating transportation improvements, guaranteed ride home programs, and other activities (30).

COMPREHENSIVE APPROACHES

Many areas utilize a combination of the strategies and programs described previously. Realizing that no single approach can meet the needs of diverse market segments, most programs attempt to offer a mix of services. It appears that the most successful programs provide a comprehensive package of services to reach multiple markets. The following case studies provide a few examples of comprehensive approaches.

- ***GO Boulder* Program—Boulder, Colorado**. The *Greater Options Boulder (GO Boulder)* program was created by the City Council in 1989. The multifaceted program offers information and programs to encourage transit use, ridesharing, bicycling, walking, alternative work schedules, and telecommuting. *GO Boulder* also offers transit passes for the University of Colorado and high school students, and sponsors events such as Bike Week, Find Another Way Day, and the annual national pedestrian conference. Information on alternative commute modes is also provided to realtors to help introduce new residents to the various programs (43).

- **U-Pass Program—University of Washington**. The U-Pass Program, which was implemented at the University of Washington in 1991, provides a wide range of commute options for the 50,000 students, faculty, and staff at the Seattle campus. Students pay $20 a quarter and faculty pay $27 for a sticker which is attached to an individual's University identification card. This sticker allows the individual to use bus services provided by Seattle Metro and Community Transit, free carpool parking spaces, ridematching services, University shuttle bus services, a guaranteed ride home program, and discounts at participating merchants. The program has been very popular and is well utilized. An evaluation of the U-Pass Program indicated that it has reduced the number of single-occupant vehicle trips to the campus by 15 percent and has increased transit ridership and carpooling (44).

III. STATE OVERVIEW

This chapter provides a summary of the approaches currently being utilized in Texas to encourage HOV commute modes, walking and bicycling, and other strategies to reduce demand on the transportation system. The information presented in this chapter comes from a number of sources. First, available reports, documents, and newsletters from agencies and groups throughout the state were reviewed. Additional information on specific programs was obtained from follow-up telephone calls to representatives from public and private sector groups. Second, information was reviewed from the Employer Trip Reduction (ETR) Plans submitted by employers in Houston to the Texas Natural Resource Conservation Commission (TNRCC). Finally, five discussion groups were held with representatives from the public and private sectors in Houston, Dallas, and Austin.

This chapter summarizes the results from these activities. An overview of information collected from the Houston ETR plans and the discussion groups is presented first. This is followed by a review of the various activities within Texas and the general level of support for different approaches. The same twelve categories used to describe the national activities are used to summarize efforts within the state.

EMPLOYEE TRIP REDUCTION PLANS

Houston is classified as a severe ozone non-attainment area by the Environmental Protection Agency (EPA). The 1990 Clean Air Act Amendments require employers with over 100 employees to develop, implement, and monitor plans and programs to increase vehicle occupancy levels and to reduce the number of commuters driving alone. Companies in Houston had to conduct surveys of employees to identify current commute modes and travel preferences, and develop plans outlining how they would meet the required average vehicle occupancy (AVO) levels. These plans were submitted to TNRCC on various dates in 1994 depending on the size of the company.

TTI was able to make copies of the approximately 1,400 plans submitted to TNRCC. The information in the plans is being analyzed to assist with a number of research efforts, including this study. Although the regulations governing the employee trip requirements are being reevaluated, the plans contain a wealth of information on the alternate mode preferences of approximately 400,000 employees in the Houston area and the programs proposed by employers to increase the use of alternative commute modes.

As shown in Table 1, the most popular measures noted by employees were guaranteed ride home programs and various flexible work schedules. Also rated favorable by at least 20 percent of the employees were employer subsidies for carpools, vanpools, and bus passes, park-and-ride bus service to the work site, and ridematching services. The responses are discussed in more detail under the individual strategies later in this chapter.

Table 1. Alternative Mode Preferences—Houston Employees*

Incentive or Measure	Percentage of Employees Favoring
Guaranteed ride home	39%
4/40 Compressed work week	39%
Variable/flexible work hours	29%
Employer pay some/all of vanpool/carpool costs	34%
Carpool/vanpool matching	21%
Employer pay all/some of bus pass	20%
Park-and-ride bus service to work site	20%
Telecommuting	19%
9/80 work week	16%
Preferential parking for carpools/vanpools	16%
Local bus service to your work site	16%
Employer provided vehicle for midday business trips	13%
Midday shuttle bus to shopping/dining areas near your work site	12%
HOV lanes	12%
Cafeteria on-site	12%
3/36 work week	12%
Increase costs for parking	11%
Banking facilities on site	11%
More information on bus routes	10%
Late evening bus service	10%
Day care on-site	8%
On-site showers/lockers for walkers/bikers	8%
Biking commuting incentives	6%
Secured bike racks	5%
Walking incentives	4%

*Information obtained from Employer Trip Reduction Plans submitted to TNRCC. Approximately 400,000 employees are represented in responses.

Employers were also required to identify in the ETR plans the services, incentives, facilities, and information they intended to provide to employees to encourage alternative commute modes. Any changes in company or agency policies needed to implement the ETR program also had to be outlined. Table 2 summarizes the major services and programs employers are currently offering, as well as those they intend to provide under the ETR requirements. The percentage of companies planning to offer each strategy is presented, along with the status of each effort. The percentage of employers indicating existing, revised, and new programs are noted.

The existing and proposed use of different strategies are described more extensively in the next sections. It is interesting to note, however, that the most frequently cited measures relate to information, marketing, and employee services. Fewer employers included changes in policies, incentives, and new facilities or equipment in their ETR plans.

DISCUSSION GROUPS

A series of discussion or focus groups were conducted to obtain additional insights into the factors that influence the travel behavior and the mode choice of commuters in Texas. The purpose of these meetings was to obtain information on the strategies currently being used by public agencies and private businesses to encourage greater use of HOVs by their employees. The application of other programs and policies identified through the national review were also discussed, along with potential issues and barriers associated with various approaches. Thus, information was obtained from the participants on current approaches, as well as reactions toward possible strategies.

Discussion groups were held with representatives from the public and private sectors in Houston, Dallas, and Austin. Existing organizations and committees in the three cities were used to help organize the discussion groups. A discussion group script was used to facilitate input from participants in the sessions. A copy of the script used with private business groups is provided in Appendix A, and a copy of the public agency script is provided in Appendix B. The script and a stamped return-addressed envelope was also given to participants at the end of the session to provide additional opportunities for comment on the various strategies. The following six discussion groups were held during this phase of the research study. Appendix C provides a listing of the participants in each of the discussion groups.

Table 2. Summary of Trip Reduction Measures Currently Offered or Planned by Houston Employers*

Strategy	Plan to Offer as Part of ETR Plan	Existing Program	Revised Program	New Program
Employee Service				
Commute information center	64%	10%	1%	51%
Guaranteed ride home program	55%	8%	2%	43%
Mail services	55%	47%	1%	5%
Personalized assistance	50%	6%	0	39%
Banking services	38%	30%	0	3%
On-site transit pass sales	33%	13%	1%	19%
Child care information	28%	15%	1%	11%
Dry cleaning arrangements	12%	9%	0	3%
Midday shuttle to food shopping	9%	6%	0	3%
Shuttle to park-and-ride lot	5%	1%	0	3%
Incentives				
Recognition	34%	1%	1%	29%
Subsidies	24%	1%	0	18%
Monetary rewards	23%	1%	0	19%
Time rewards	6%	1%	0	4%
Facilities/Equipment				
Lunchroom/food service	60%	57%	1%	1%
Clothes lockers/changing rooms	41%	37%	2%	2%
Shower facilities	34%	30%	2%	2%
Bicycle parking	32%	18%	1%	12%
Bus shelters	15%	13%	0	2%
Home office equipment	12%	9%	0	2%
Exercise equipment	9%	7%	0	1%
Child care	2%	1%	0	1%
Information/Marketing				
Posters	82%	23%	1%	54%
New employee orientation	80%	18%	9%	49%
Flyers	66%	16%	1%	46%
Brochures	64%	15%	1%	45%
Transit schedules	56%	14%	1%	38%
Pay envelope stuffers	43%	12%	1%	27%
Newsletters	42%	21%	5%	13%
Special events	33%	5%	1%	24%
Give-aways/promotional items	27%	2%	0	23%
Prize drawings	21%	1%	0	19%
Employer Policies				
Flexible work hours	47%	26%	4%	15%
Compressed work week	43%	15%	4%	22%
Late meetings/overtime policy	32%	9%	3%	18%
Parking management	28%	7%	1%	16%
Telecommuting	22%	8%	1%	13%
Leave early privilege	9%	3%	1%	4%

*Information obtained from Employer Trip Reduction Plans submitted to TNRCC. Approximately 1,200 employers are represented. Responses from some 200 Independent School Districts (ISDs) are not included.

- Dallas—Greater Dallas Area Chamber of Commerce Transportation Committee.
- Dallas—North Central Texas Council of Governments (NCTCOG) Surface Transportation Technical Committee and Travel Demand Management Task Force.
- Houston—Transportation Management Organization Coalition (TMOC).
- Houston—Houston Galveston Area Council (HGAC) Technical Advisory Committee.
- Austin—Voluntary Trip Reduction Program (V-TRIP).

Although differences exist among the comments made by participants in the various discussion groups, a number of common themes emerged. For example, participants voiced stronger support for voluntary efforts rather than mandatory measures. Increased transit services and more innovative service applications, ridesharing programs, guaranteed ride home programs, alternative work schedules, and special programs on ozone alert days were all supported by participants in the sessions. Noted as important by some, but not all, participants were on-site amenities for bus riders and bicycles, and preferential parking for carpools and vanpools. Little support was expressed for pricing strategies—such as roadway congestion pricing, increasing parking rates for single occupant vehicles, and raising the gasoline tax.

Two other common themes emerged from the discussion groups. First, participants in all groups stressed the need to raise awareness among the public and policy makers about the issues associated with traffic congestion, mobility, and air quality. Support was voiced for public education programs, as well as efforts targeted toward specific groups such as decision-makers, commuters, and businesses.

The second common theme from the discussion groups related to the role top management support plays in successful programs. Involvement from the head and key administrators of public agencies and private business was identified as critical to the success of different strategies. Obtaining the support and encouragement from management and decision-makers was stressed as an important step.

The information obtained from all the sources noted previously—reports from agencies, follow-up telephone calls, the ETR plans, and the discussion groups—is described in more detail in the remainder of this chapter. The Texas experience is presented by the 12 general categories of strategies outlined in Chapter II. Examples of the use of different approaches are provided as appropriate.

TRANSIT SERVICES

Participants in all of the discussion groups favored continuing existing transit services, expanding current systems, and implementing new services. Discussion group participants expressed general satisfaction for transit services provided to the downtown areas in all three metropolitan areas. New and innovative services were noted as needed to better meet travel patterns in suburban areas. Additional transit services were also favored by 16 to 20 percent of the Houston employees responding to the ETR surveys.

Express bus routes, park-and-ride services, and local services were all supported by discussion group participants. Individuals noted that good levels of service are currently provided from most areas to the downtowns. The HOV lanes in Dallas and Houston, and the new LRT system in Dallas, were noted as important techniques to encourage HOV use. Many participants expressed the need to continue to explore and implement innovative transit services to address travel needs in suburban areas, as well as to the downtowns. Reverse commute services, suburb-to-suburb routes, and other targeted services were a few examples suggested by participants for further consideration.

A number of examples of successful transit services were identified by participants in the discussion groups and through other information. These included the following traditional approaches and more recent innovative techniques.

- **Premium Express Service—Houston METRO**. METRO operates premium express bus services out of a number of park-and-ride lots in the Houston area. Over-the-road coaches are used and the service operates on the HOV lanes, providing significant travel time savings and travel time reliability. In addition, frequent service—with peak hour headways averaging 2 to 3 minutes—is provided. Most service is oriented to downtown Houston, but a few routes provide service to the Texas Medical Center, Greenway Plaza, and the Post Oak/Galleria areas.

- **Express Service—Capital Metro and DART**. Both Capital Metro and DART operate express and limited stop service from suburban locations into downtown Austin and downtown Dallas, respectively. The DART service in the East R. L. Thornton corridor uses the HOV lane on that facility.

- **Crosstown Routes—DART**. The Dallas Area Rapid Transit District (DART) has implemented a number of crosstown routes, many focusing on suburban areas.

DART is currently reviewing its route structure to provide additional crosstown routes and feeder services to the new LRT line.

- **Green Line Express—Houston, METRO**. The Green Line Express, which provides service from the Kingwood Park-and-Ride lot to the Greenspoint Business District, was initiated in 1994. The service was developed and implemented through the cooperative efforts of METRO and six businesses in the Greenspoint area. The cost of the service is being shared by METRO and the businesses. The six employers contributed $38,000 to help subsidize the first year of service, and METRO is providing a subsidy of up to $2.50 per passenger trip. Passengers pay a $90 monthly fare for the 42 mile round trip service. Ridership averaged 30 passengers over the first six months of operation.

- **Jitneys—Houston METRO**. METRO has recently implemented a program using Jitneys to provide service in some areas of Houston. Possible areas for the service were identified through a collaborative process between METRO and potential operators. METRO then issued a request for proposal (RFP) and selected operators for various areas. METRO sets the fare levels and subsidizes the operators. The program has been in operation since the spring of 1995.

- **Sunrise Service—Capital Metro**. This service, which was implemented in 1995, allows customers to ride Metro buses during what were previously dead-head portions of routes. These time periods are usually in the early morning as buses are traveling from the operations facility to the start of a run. The service was started in response to suggestions from passenger surveys, which indicated a need for early morning crosstown service from the area around Capital Metro's operations facility.

Participants in all of the discussion groups expressed interest in expanding transit services. For example, the Houston private sector discussion group voiced support for additional bus service to the Post Oak/Galleria area, Greenspoint, and other major non-downtown activity centers. The Austin discussion group noted the lack of good bus service to the Riverside area as an issue. In the same session, representatives from TNRCC indicated that they were working with Capital Metro on possible subscription bus and shuttle services to their offices which currently do not have any service. Capital Metro's guidelines require an initial ridership of at least 25 passengers to initiate subscription bus service. In response to a survey of TNRCC employees, 300 people indicated an interest in some type of bus service and 50 attended an initial informational meeting. Capital Metro responded to this demand and recently implemented

subscription service from two park-and-ride lots to the TNRCC offices. Some 50 employees are currently using the service.

The Houston ETR plans also indicated support for additional transit services from both employers and employees. Approximately 20 percent of the employees included in the ETR plans indicated a preference for park-and-ride service to their work site, while 16 percent supported local bus service, 12 percent indicated a need for midday shuttle busses, and 10 percent wanted additional late night service.

SUPPORT FACILITIES

As noted in Chapter II, the provision of supporting facilities—such as park-and-ride lots, HOV lanes, transit centers, light rail transit (LRT), and other elements—can enhance the use of alternative commute modes. Many of these facilities are found in Texas cities. For example, as highlighted next, park-and-ride lots are currently used by transit systems in all of the major metropolitan areas in Texas.

Austin, Texas—Capital Metro currently operates three exclusive park-and-ride lots in the Austin area, which provide a total of 650 parking spaces, as well as eight shared-use lots. One fringe parking lot, located on the edge of the downtown area, is connected to the downtown "Dillo" circulator service, and another facility is coordinated with CARTS, the rural operator in the area, allowing riders to transfer between the two systems. All of these facilities are oriented toward the bus system. A new park-and-ride facility, which will contain 250 parking spaces, is scheduled to open by 1996. A number of park-and-pool lots, constructed and maintained by TxDOT, are also provided in outlying portions of the metropolitan area.

Dallas, Texas—The Dallas Area Rapid Transit (DART) currently operates 16 formal and four shared-use park-and-ride lots within its service area, providing a total of almost 9,600 parking spaces. Additional park-and-pool lots have been developed in the metropolitan area by TxDOT. Currently, all of these facilities are oriented toward the bus system or ridesharing. An additional three lots with 2,000 spaces are being planned as part of the bus system and nine park-and-ride lots are being developed with the new LRT system.

Houston, Texas—Currently, 39 park-and-ride and park-and-pool lots are in operation in the Houston metropolitan area. These include 21 existing park-and-ride lots, 7 transit

centers with park-and-ride facilities, and 11 park-and-pool lots, all of which provide approximately 27,000 parking spaces. Planning for five additional park-and-ride and five park-and-pool facilities is underway. The park-and-pool lots have been developed either jointly by TxDOT and Houston METRO or by METRO alone. All of the park-and-ride lots are exclusive facilities focused on bus service, and most are large lots located adjacent to the five operating HOV lanes. Fourteen of the lots, with headways the largest of which is the Kuykendahl park-and-ride lot along the I-45 North Freeway, contain spaces for between 950 and 2,246 automobiles each. Direct access to the HOV lanes is provided from most of these facilities. Frequent bus service is provided from most lots, averaging around 5 minutes or less during peak hours. At the largest lots, peak-hour headways average 3 minutes or less, and limited midday service is provided using mini-buses.

High-occupancy vehicle lanes are in use in Houston and Dallas. As summarized next, these systems are also linked with park-and-ride lots, transit centers, and service improvements. The Dallas Area Rapid Transit (DART) is also constructing a new light rail transit (LRT) line.

- **HOV Lanes and Supporting Facilities—Houston METRO**. HOV lanes are in operation on five radial freeways in Houston. These facilities account for about 103 kilometers of a planned HOV system. The HOV lanes are primarily one-lane, reversible facilities located in the freeway median. The lanes are separated from the general purpose lanes by concrete barriers. The HOV lanes are supported by an extensive system of park-and-ride lots, transit centers, and premium bus services. An HOV lane is under design in a sixth corridor and extensions to existing lanes are under construction in several other corridors.

- **HOV Lanes—DART**. A contraflow HOV lane, using a moveable barrier, is in operation on the East R. L. Thornton Freeway (I-30E) in Dallas. The lane, which operates only in the morning and afternoon peak-periods, takes a lane in the off-peak direction of travel and designates it exclusively for use by HOVs traveling in the peak direction. The facility represents the first use in the United States of a moveable barrier with an HOV facility. The East R. L. Thornton Freeway HOV lanes represent just the first of a number of planned HOV lanes in the Dallas area.

- **Light Rail Transit (LRT)—DART**. An LRT system is under construction in the Dallas area. The 20-mile LRT starter line represents a major component of the DART 20-year plan. The initial system provides radially-oriented LRT lines connecting the Dallas Central Business District (CBD) with major activity centers to

the north and to the south. Provisions for system expansion have also been provided. The LRT starter line includes both at-grade and tunnel sections. Further, it includes LRT stations, 3 transit centers, and a vehicle maintenance building. The initial LRT line is scheduled to be operational by late 1996.

Participants in the discussion groups reacted favorably to the development of additional support facilities. Extending existing HOV lanes and constructing new lanes in Houston and Dallas were viewed positively. The use of park-and-ride lots, direct access ramps, LRT, and other facilities were also supported. Similar support was also indicated by employees in Houston. Twelve percent of the employees responding to the ETR plan survey indicated a preference for additional HOV lanes.

RIDESHARE PROGRAMS

Rideshare programs—focusing primarily on carpooling and vanpooling—were rated highly by the discussion group participants, and by Houston employees responding to the ETR surveys. Although ridesharing was suggested as an appropriate approach for all areas, it was noted as especially important in areas that do not have bus service. Most participants indicated they utilize the rideshare programs offered through their local transit agency, although some use company programs or coordinated efforts among employers. For example, in Houston, only 6 percent of the companies submitting ETR plans currently offer in-house ridematching services.

Advantages to the identified rideshare programs included employees familiarity with these approaches, the relative ease to set up and operate rideshare efforts, and the flexibility provided by ridesharing. Concerns were raised, however, related to liability and confidentiality. For example, some companies ask employees to sign a waiver form before using any type of ridematching service. Other participants noted that their employees are matched only with others in their company, unless an individual specifically requests to be included in the regional pool.

A few participants suggested that incentives such as preferential parking, subsidies, additional vacation time, or other benefits may need to be provided to obtain higher levels of carpooling and vanpooling. For example, some of the petrochemical companies in Southeast Houston have linked staggered and flexible work hours with ridesharing, since employees consider these a benefit. Only individuals ridesharing are eligible for flexible work schedules.

Discussion group participants in Houston and Austin expressed interest in the vanpool initiatives provided by Houston METRO and Capital Metro. Support was also voiced for other

innovative approaches, such as casual carpooling, real-time ridematching, and providing commuters with current traffic and transit information.

The following examples of region-wide and company or area based rideshare programs were highlighted in the discussion groups.

- **Vanpool Program—Capital Metro**. The Ridefinders vanpool program offered by Capital Metro utilizes leased vehicles from a van service company. Vanpool riders pay a monthly fee of $10 for vanpools within the Capital Metro service area. Fees for vanpools outside the service area are based on round trip mileage and the number of riders. Vanpool riders are also provided with a bus pass for use on any Capital Metro route.

- **METROVAN—Houston METRO**. In late 1994, Houston METRO implemented a new vanpool program. Called METROVAN, the program includes three different elements or options for employers. First, METRO will match employer funding of vanpool cost up to $35 a month for up to four months. Second, METRO will match monthly employer vanpool subsidies up to $35 per rider. Finally, METRO will pay $10 toward the RideHome program. The METROVAN program has been well received by employers and employees. As of mid-1995, 35 vans have been funded, accommodating approximately 492 riders or 15,885 monthly passenger trips. Some 30 different companies are participating in the program.

- **SchoolPool—Fort Worth Transit (T)**. This program is aimed at promoting ridesharing among the parents of elementary and junior high students who regularly drive their children to school. In the same way that workers going to a single employee site are encouraged to share rides, match lists are provided for parents whose children attend the same schools so that carpools can be formed for student transportation.

- **Real-time Ridematching—Houston METRO**. One element of the Houston *Smart Commuter* ITS operational test focuses on the provision of a real-time carpooling system in the I-10 West corridor. This system, which is currently under development, will include the ability to provide real-time carpool matches to employees in the Post Oak/Galleria area who live in the I-10 West corridor.

GUARANTEED RIDE HOME PROGRAMS

Participants in all of the discussion groups supported the use of guaranteed ride home programs. Representatives from both public agencies and private businesses noted that these services were viewed very positively by employees and helped encourage the use of HOV modes. Further, participants noted that guaranteed ride home programs were supported by management and that management was willing to commit funds to support these services. Private sector representatives in Houston went so far as to indicate that providing guaranteed ride home services was a "given" part of their employee commute assistance plans.

Guaranteed ride home programs were also rated very highly by employees and employers on the Houston ETR surveys and plans. Guaranteed ride home programs were supported by 39 percent of the Houston employees responding to the ETR surveys. Further, 55 percent of the employers included guaranteed ride home programs in their ETR plans. Only 8 percent reported existing programs, however, with some 43 percent indicating that new programs would be developed.

A wide variety of approaches are currently being used with guaranteed ride home services in Texas. These include programs offered through transit agencies, as well as those provided directly by a company or a group of companies. For example, some of the participants in the Houston meetings noted that they received guaranteed ride home services through their participation in METRO's RideSponsor program. Other representatives, such as those representing petrochemical companies located outside the METRO service area, provide their own service.

Currently, most guaranteed ride home programs provide service to carpoolers, vanpoolers, and transit riders. The City of Austin is considering expanding its program to include bicyclists and walkers.

- **RideHome—Houston METRO**. METRO implemented a guaranteed RideHome Program in 1993. The service is offered to businesses participating in METRO's Corporate RideSponsor Program. Employees of these businesses can access the RideHome program in case of an emergency or other change in schedule that requires a trip when regular METRO service is not available.

- **Guaranteed Ride Home Program—Capital Metro**. Capital Metro offers a guaranteed ride home service to vanpool commuters, and Express/Park & Ride and

Flyer bus passengers, for a $5 annual fee. The fee buys four vouchers for guaranteed rides home, good for one calendar year. The service is provided through local taxi companies. Trips up to 35 miles and fares up to $49.50 are reimbursed, less a $1 surcharge.

BICYCLES AND WALKING

The use of bicycling and walking as alternative commute modes elicited lower levels of support among discussion group participants and employees in Houston. Hot and humid weather, the lack of sidewalks and bicycle paths, and the long distance of commutes were identified as major barriers to greater use of these travel modes. A few examples were provided of commuters using these modes, however, especially in Austin. The bicycle users group (BUG) at TNRCC represents one of these. This group promotes bicycling to the TNRCC office in Austin and coordinates support activities for employees. Although participants in the discussion groups indicated that these travel options should be supported, concerns were raised that walking and bicycling would never account for major work trip modes in the three cities.

EMPLOYER INCENTIVES

Discussion group participants identified a variety of employee benefits or incentives to encourage HOV use. The most frequently cited incentives were subsidizing bus passes, payroll deduction for transit passes, on-site bus pass sales, and special promotions. The Houston ETR plans provide additional insights into the types of incentives employers are currently offering, as well as those under consideration.

Currently, most employer incentives focus on subsidizing bus passes or allowing passes to be sold on-site and providing guaranteed ride home programs described previously. The ETR plans indicated that only about one percent of Houston employers offer any type of monetary, recognition, or time benefits for HOV use. Only one example, the cash payments to employees of the North Central Texas Council of Governments (NCTCOG), was identified during the discussion groups.

On the other hand, employees responding to the Houston ETR survey indicated that employer incentives would help influence their use of HOV modes. For example, 32 percent supported employers paying some of the costs associated with carpooling and vanpooling, 20 percent supported employer subsidization of transit passes, 13 percent favored employer

provided vehicles for midday trips, and 6 percent and 4 percent supported employer incentives for bicycle use and walking.

- **RideSponsor Program—Houston METRO**. The Corporate RideSponsor program provides a number of services to encourage employers to help support and promote bus use among employees. The program is open to public and private sector employers. To participate, a company must agree to sell bus passes on-site and must have at least 25 regular bus riders. Employers are also encouraged to subsidize a portion of their employees' bus fares. METRO, in turn, provides a discount of 10 percent on all passes and ticket books. Currently, 104 public agencies and private businesses are participating in the program.

- **North Central Texas Council of Governments (NCTCOG)**. The NCTCOG recently implemented a financial incentive program to encourage employees to use alternative commute modes—including walking, bicycling, carpooling, and vanpooling. The program pays $1.00 for each one-way commute trip an employee makes using an alternate mode. Employees must use an alternative commute mode at least 20 times a month to quality for the program. The program has been in operation for approximately 6 months and 25 of 125 staff members are currently participating.

ON-SITE AMENITIES

The responses from discussion group participants and the analysis of the Houston ETR plans indicate that with the exception of some type of lunchroom facility, few on-site amenities are being provided by either public or private sector employers. Almost 60 percent of the Houston employers filing ETR plans currently provide lunchroom or food services on site. Approximately 37 percent have some type of area for employees to change clothes, and 30 percent have shower and changing facilities. A few additional examples were provided during the discussion groups. These included adding bicycle racks at the TxDOT Riverside complex, consideration of bicycle racks and converting a janitor's closet into a shower facility by the City of Austin Air Quality group.

Discussion group participants indicated that additional on-site amenities could be considered if it was determined that employees would find them of benefit and if they would help encourage use of alternative commute modes. The Houston ETR employee surveys indicate approximately 8 percent supported on-site shower and changing facilities, while on-site

cafeterias, day care, and banking services each received favorable responses from 10 percent of the employees.

PARKING MANAGEMENT AND PARKING PRICING

The discussion of parking management and parking pricing strategies elicited some of the most heated debate among discussion group participants. Support was voiced for providing preferential parking locations for carpools and vanpools, but there was little interest in pricing strategies. Although participants acknowledged that parking pricing strategies were likely to have significant impacts on travel behavior, both public and private sector representatives indicated that pricing strategies should be considered as a last resort.

Sixteen percent of the employees responding to the Houston ETR surveys favored preferential parking for carpools and vanpools, while 12 percent indicated that increasing parking costs for driving alone would encourage them to use an HOV mode. Only 7 percent of the employers submitting ETR plans reported existing parking management programs, while 16 percent indicated new programs were being developed.

A number of issues were raised with parking pricing strategies. These included concerns about potential loss of competitive advantages in attracting and retaining employees and customers, equity issues, and administrative procedures. There was a general consensus that parking pricing strategies would need to be applied on a region-wide basis to be seriously considered. Overall, participants emphasized the use of incentives, such as preferential parking locations or lower parking rates for carpools and vanpools, rather than increasing parking rates for commuters who drive alone.

WORK SCHEDULE MANAGEMENT

The results from the discussion groups, as well as the Houston ETR plans, indicate that there is a fairly widespread support among employees and employers for various work schedule management strategies. Staggered and flexible work hours, and compressed work weeks, were noted most frequently, followed by telecommuting.

Employees responding to the Houston ETR surveys ranked the 4/40 compressed work week and variable/flexible work hours among the top three incentives, with 39 percent and 29 percent, respectively. Telecommuting was supported by 19 percent of the respondents, and other variations of compressed work weeks were favored by between 12 percent and 16 percent.

On the other hand, 26 percent of the Houston employers submitting ETR plans currently have flexible work hour programs, while 15 percent utilize compressed work weeks, and 8 percent have telecommuting programs.

CONGESTION PRICING

Congestion pricing strategies were not rated highly by discussion group participants. Concerns were raised with equity issues, the lack of alternative routes in some areas, the development and implementation of a congestion pricing system, and how funds generated from the program would be used.

Some interest was expressed for using congestion pricing on the toll facilities in Houston and Dallas to encourage HOV use. For example, providing reduced toll charges for carpools and vanpools was suggested. An alternative approach would be to allow lower occupancy vehicles to use the HOV lanes for a price. As described next, a feasibility study is being conducted on this concept in Houston.

- **HOV Lane Pricing–Houston**. A feasibility study is currently underway in Houston examining the concept of allowing single occupant vehicles or lower occupant vehicles to use the Katy HOV lane for a price. One of the possible approaches being evaluated would allow three person carpools to continue to use the Katy HOV lane during the morning and afternoon peak hours for no charge. Carpools with only two people could also use the lane during this time for a charge and single-occupant vehicles may also be allowed access for a cost. During other operating hours, two person carpools would continue to use the HOV lane for free, while single-occupant vehicles would have access for a fee. The feasibility study is examining public policy and legal issues, public reaction, and how such a demonstration would be implemented and operated.

LAND USE PLANNING AND DEVELOPMENT REGULATIONS

The potential use of land use planning and development regulations to encourage alternative commute modes received generally favorable reactions from discussion group participants. Many respondents noted that these strategies have a longer term focus than other techniques. Land use policies and changes in development patterns take longer to implement and potential benefits will be realized over the long term. Although some participants indicated

that it may be too late to reverse existing trends in some areas, others were more optimistic that changes could be realized over time.

A few examples of land use and development activities supporting HOV use were identified during the discussion groups, the literature review, and conversations with agency representatives throughout the state. A few of these examples are highlighted next. Additional information is available on some of these projects in previous TTI reports (5,40).

- **Joint LRT and Land Use Planning—DART.** DART has worked with the City of Dallas and other groups in the development of plans for stations associated with the new LRT system. The station area planning activities have included consideration of traffic issues, pedestrian access, and land use concerns.

- **Joint Developments—Houston METRO.** METRO has been involved in public/private joint developments, including the construction of additional space at the Addicks Park-and-Ride facility for use by an intercity bus company. In addition to the commuter parking area, the bus platform, and the passenger waiting areas, METRO constructed a shelter for the intercity buses and ticketing agents. The company is leasing the facility from METRO and also sells METRO passes and tickets at the site. METRO has also completed two small joint development projects at Greenspoint Mall and at a Fiesta grocery store. These have been informal, cooperative ventures, through which METRO has been allowed to operate small transit centers on parts of the privately owned property.

- **Downtown Transit Terminal—El Metro, Laredo.** El Metro, the public transit department in the city of Laredo, is developing a downtown joint-use transit terminal. At the time of this survey, the necessary land was being acquired and financing was being arranged. The facility will be owned and operated by the city, and space will be leased to other public agencies and private businesses. The plans for the transit center call for a five-level structure. Most of the first level will consist of a bus terminal with 24 bus bays. Six of those spaces will be leased to an intercity bus company, several others will be used by a Section 18 provider, and the rest are intended for El Metro buses. Space on the first level also will be leased to at least one restaurant company. The upper four levels of the structure will house a 500-space parking ramp.

- **Livable Community Initiative—Regional Transit Authority, Corpus Christi.** The Regional Transit Authority (RTA) has received a $1 million Livable Community

Initiative grant from the Federal Transit Administration (FTA). The grant will be used to enhance pedestrian access to two major transit centers through improved sidewalks, lighting, and landscaping around the transit centers and the neighborhoods. This project builds on a previous effort by the RTA, the City of Corpus Christi, the Project for Public Spaces (PPS), and private businesses to develop a series of bus transfer centers. RTA engaged PPS to work on a bus transfer center at City Hall. Serving seven routes, the center opened in February 1994 with new landscaping and an innovative public art project. The Creative Arts Center, a local arts organization, sponsored a project to embellish the bus transfer centers with decorative ceramic tiling, handmade by 1,500 children and adult members of the community.

PUBLIC AWARENESS CAMPAIGNS AND ORGANIZATIONAL STRUCTURES

Participants in the discussion groups identified informational and outreach activities as critical components to any effort aimed at encouraging alternative commute modes and other strategies. The involvement of the state, regional, and local agencies, and the private sector, was noted as important for successful programs. Members of the Houston area private sector discussion group cited the lack of public awareness as a major obstacle to implementing mandated trip reduction programs. The private sector discussion group in Dallas also cited education and marketing as essential for building an awareness of congestion and air quality issues and the need for ridesharing and public transit.

Examples of public awareness efforts currently underway in Texas are highlighted next. As noted, a number of significant programs have been implemented, while others are in the development stage.

- **Ozone Alert Program—Dallas/Fort Worth Area**. A number of coordinated efforts have been undertaken in the Dallas Fort Worth area to raise awareness of ozone alert days and to promote commute alternatives and other strategies on these days. NCTCOG produced two videos—one oriented toward Chief Executive Officers and one oriented to the general public—on ozone alert days and strategies that can be used on those days. Both DART and the T do not charge bus fares on these days to encourage commuters to take the bus rather than driving alone. Other agencies and businesses have also developed activities oriented to these days.

- **Austin AIR Force**. Agencies and groups in the Austin area have formed a coalition called the Austin AIR Force to help promote actions and activities to improve air quality. Formerly called Clean Air Metro Austin, the Austin AIR Force has undertaken a variety of activities. These include the Ozone Action Days, the V-TRIP program mentioned previously, and other educational efforts. Brochures on *How You Can Help Improve Austin's Air* and *Ozone Action Days* have been developed and distributed widely throughout the Austin area. Additional activities and programs are also being considered.

- **Don't Be An SOV Campaign—TxDOT**. TxDOT is developing a public information and marketing campaign around the slogan of *Don't Be An SOV*. The multimedia campaign will be used by TxDOT and will be made available to groups throughout the state.

A number of new organizational structures are also being used in Texas cities to encourage alternative commute modes, coordinate programs among multiple groups, and promote other transportation improvements. These include new employer-based organizations and public/private organizations, as well as existing groups. Transportation management organizations (TMOs) and other coalitions have been formed in Houston, Dallas, Austin, and other areas to develop new initiatives and better coordinate existing efforts. Examples of these organizations are provided next.

- **Trip Reduction Efficiency Council (TREC)—Houston**. The TREC serves the 60,000 - 80,000 employees in the Galleria/Post Oak area and coordinates with the Galleria Chamber of Commerce and the Uptown District. TREC has organized several conferences, seminars, and training sessions for its members. It also conducts educational programs on ridesharing, telecommuting, and alternative work schedules. TREC has also approached a major taxi company in the area about discounted rates for the members to provide guaranteed ride home programs. The organization is a major coordinator of information on the employer trip reduction program. It has been designated by Houston METRO and the Houston-Galveston Area Council (HGAC) as a Transportation Reduction Assistance Center (TRAC) for the area and regularly provides material and information for companies not belonging to TREC. TREC is also working with Houston METRO to expand transit services and facilities in the area.

- **Clear Lake Transportation Partnership (CLTP)—Houston**. The CLTP serves the high-tech corridor in and around NASA, which is approximately a 400-square

kilometer area. The CLTP currently serves over 60,000 employees in this region and has a goal of 120,000 employees when funding sources become more secured. Approximately 20 large employers participate in their employer trip reduction activities. Membership dues are based on a rate of $3.00 per employee. The CLTP provides information to its members on alternative commute modes and work schedules, and coordinates other activities among its members. The CLTP also is involved in long range mobility planning for the area and is working with METRO on enhancing bus services and the area-wide traffic light synchronization project.

- **Central Dallas Association (CDA)—Dallas**. This organization is currently the only operating TMO in the Dallas/Fort Worth area. The CDA is part of the larger Central Dallas Business Association (CDBA) which represents employers in downtown Dallas. The CDA currently provides information and limited assistance to members. Plans are underway to expand the range of services offered, however.

- **Voluntary Trip Reduction Program (V-TRIP)—Austin**. V-TRIP is comprised of public agencies and private businesses in the Austin area. Participating groups include the City, Capital Metro, TxDOT, TNRCC, Travis County, Southwestern Bell, and IBM. V-TRIP is focusing on a number of initiatives and activities including employee surveys, public information, and promoting alternative commute modes and work schedules.

IV. HOUSTON AND DALLAS HOV LANE USER AND NON-USER SURVEYS

During the second phase of this research study, surveys of users and non-users of the HOV lanes in Houston and Dallas were conducted. The purpose of the surveys was to gather additional information about commuter travel behavior, as well as public attitudes toward alternative commute modes and various strategies designed to encourage HOV travel.

SURVEY METHODOLOGY

As illustrated in Figure 2, the Houston HOV lanes represent the most extensive network of barrier-separated HOV lanes in the country. Designed and operated to provide preferential treatment for buses, carpools, and vanpools, the HOV lane system represents one important approach to managing traffic congestion and enhancing mobility in Houston. As of 1995, almost 103 kilometers of a planned 167 kilometer system were in operation. The majority of the HOV lanes are approximately 6.1 meters wide, reversible, and are located in the median of the freeway (3).

Approximately 81,000 daily passengers travel on the region's five HOV lanes. The Katy Freeway HOV lane is the most heavily traveled with more than 21,000 passengers per day, while the North Freeway HOV lane carries about 20,000 passengers per day. The Northwest Freeway HOV lane carries about 13,000 passengers, the Southwest HOV lane about 15,000, and the recently extended Gulf Freeway HOV lane about 11,000 passengers per day (3). Surveys for this study were conducted of HOV users and non-users on the Katy and Northwest Freeways. These facilities are highlighted in Figure 2.

Figure 3 shows the existing and the proposed Dallas HOV lane system. Dallas plans to construct and operate 59.5 kilometers of permanent HOV lanes by the year 2010. Currently an 8.4 kilometer HOV lane is in operation on the East R. L. Thornton Freeway HOV lane. This HOV lane carries about 13,000 passengers per day (3). This HOV lane is a one-lane contraflow facility that utilizes a lane from the off-peak direction of traffic and is separated from the opposing traffic flow by movable concrete barriers. Surveys were conducted for this study on the East R. L. Thornton Freeway and HOV lane.

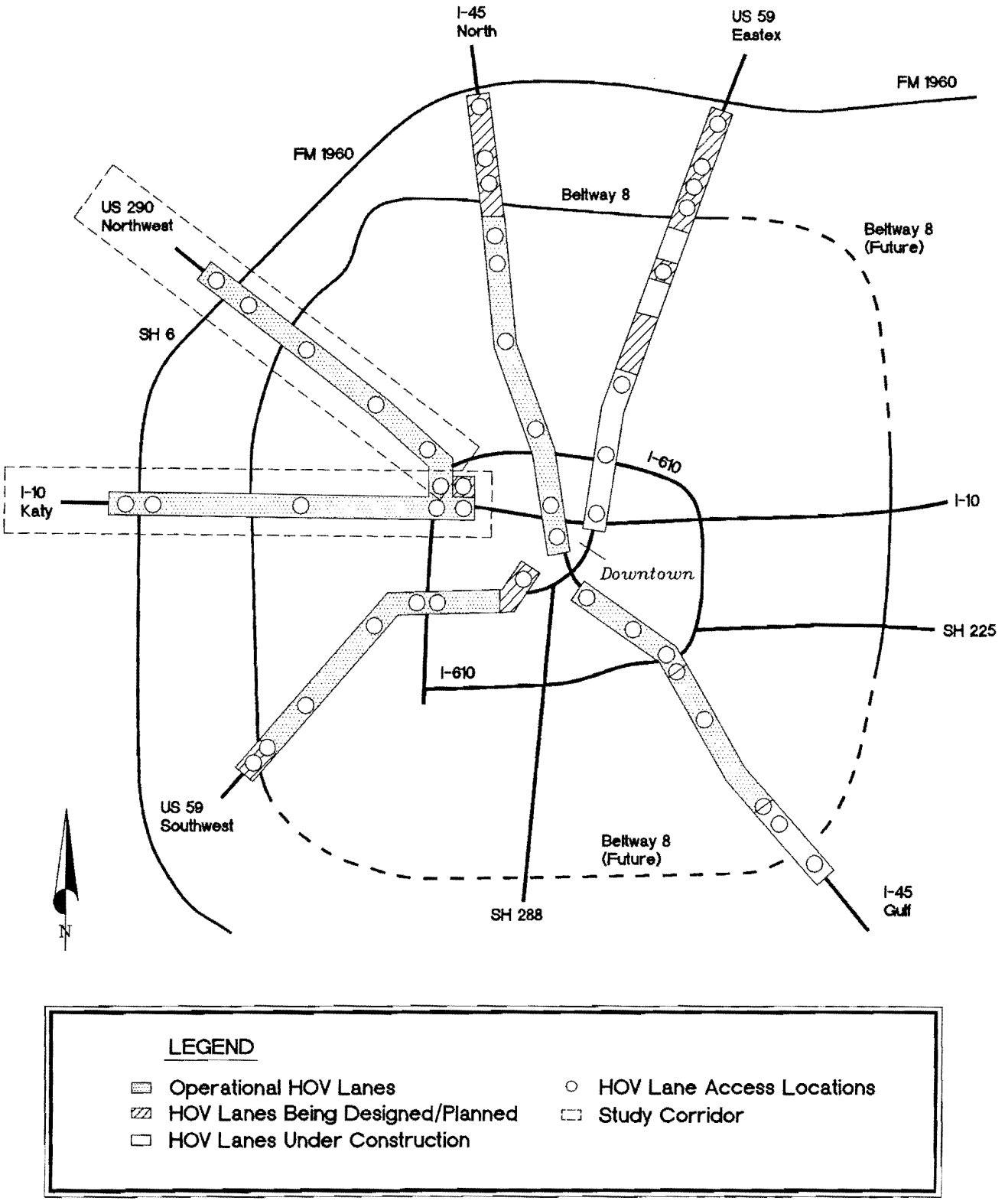


Figure 2. Houston HOV System

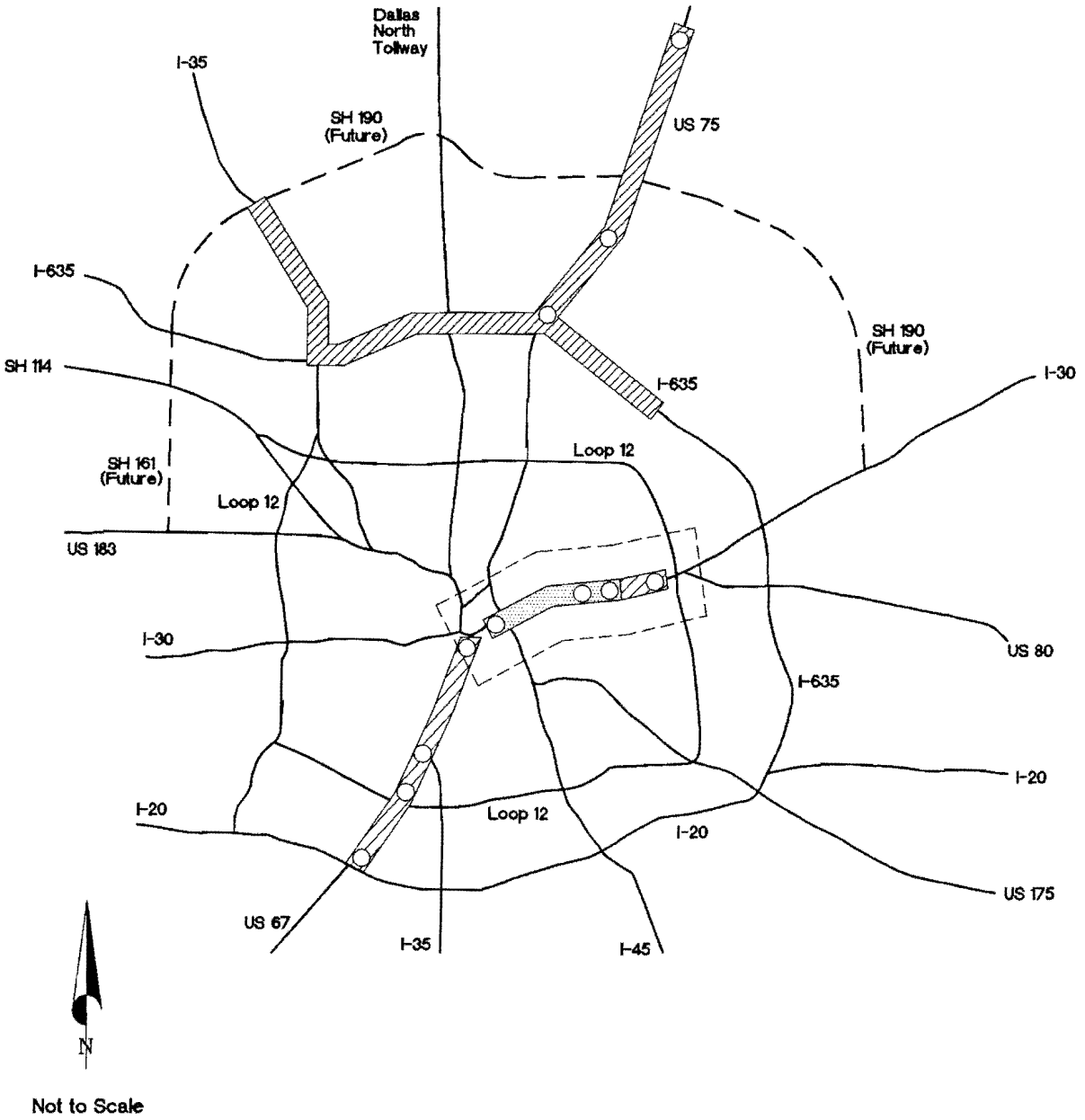


Figure 3. Dallas HOV System

The instruments used in this research were developed based on standard survey design techniques and previous surveys conducted by TTI of HOV lane users and non-users (2). Three different surveys were used—one for carpoolers and vanpoolers, one for bus riders, and one for motorists in the general-purpose lanes. The surveys were reviewed by representatives from TxDOT, METRO, and DART before being implemented. The survey instruments are provided in Appendix D.

As noted previously, surveys were conducted of carpoolers, transit users, and motorists in the general-purpose lanes on the Katy and Northwest HOV lanes and freeways in Houston and the East R. L. Thornton HOV lane and freeway in Dallas. Carpoolers in the HOV lanes and motorists in the general-purpose lanes were identified by recording the license plate number of vehicles on audiotape during the morning peak-period from 6:00 A.M. to 9:00 A.M. The names and addresses of the vehicle owners were then obtained from the Texas Division of Motor Vehicles. The sample for the on-board transit user survey was selected from METRO and DART bus routes operating on three HOV lanes during the morning peak-period. For each route the objective was to survey 100 percent of the passengers on approximately 30 percent of the bus runs.

A survey with a cover letter from TxDOT was mailed to each carpool driver and motorist along with a postage-paid return envelope. Vehicles registered to persons residing in other states and persons living outside the zip code areas shown in Figure 4 were excluded to omit motorists that do not travel the corridors on a daily basis. Information on the number of license plates recorded, surveys mailed, surveyed returned, and on-board bus surveys conducted are summarized next.

- **Dallas—Carpool and Motorist Survey**. Vehicle license plates were recorded on the East R. L. Thornton Freeway HOV lane and the general-purpose lanes on January 17, 1995. Surveys were mailed on March 3, 1995, and the survey return period extended to May 2, 1995. As summarized in Table 3, of 3,152 motorist surveys mailed, 823 were returned, yielding a response rate of 26 percent. Of the 797 HOV user surveys mailed, 210 were returned, yielding a response rate of 26 percent.

- **Dallas—On-Board Passenger Survey**. The Dallas on-board bus survey was conducted March 28, 1995, on DART bus routes using the East R. L. Thornton Freeway HOV lane during the morning peak-period. TTI staff rode the selected buses and handed out and collected surveys from bus riders. As summarized in Table 4, the overall response rate for all the routes surveyed was 84 percent.

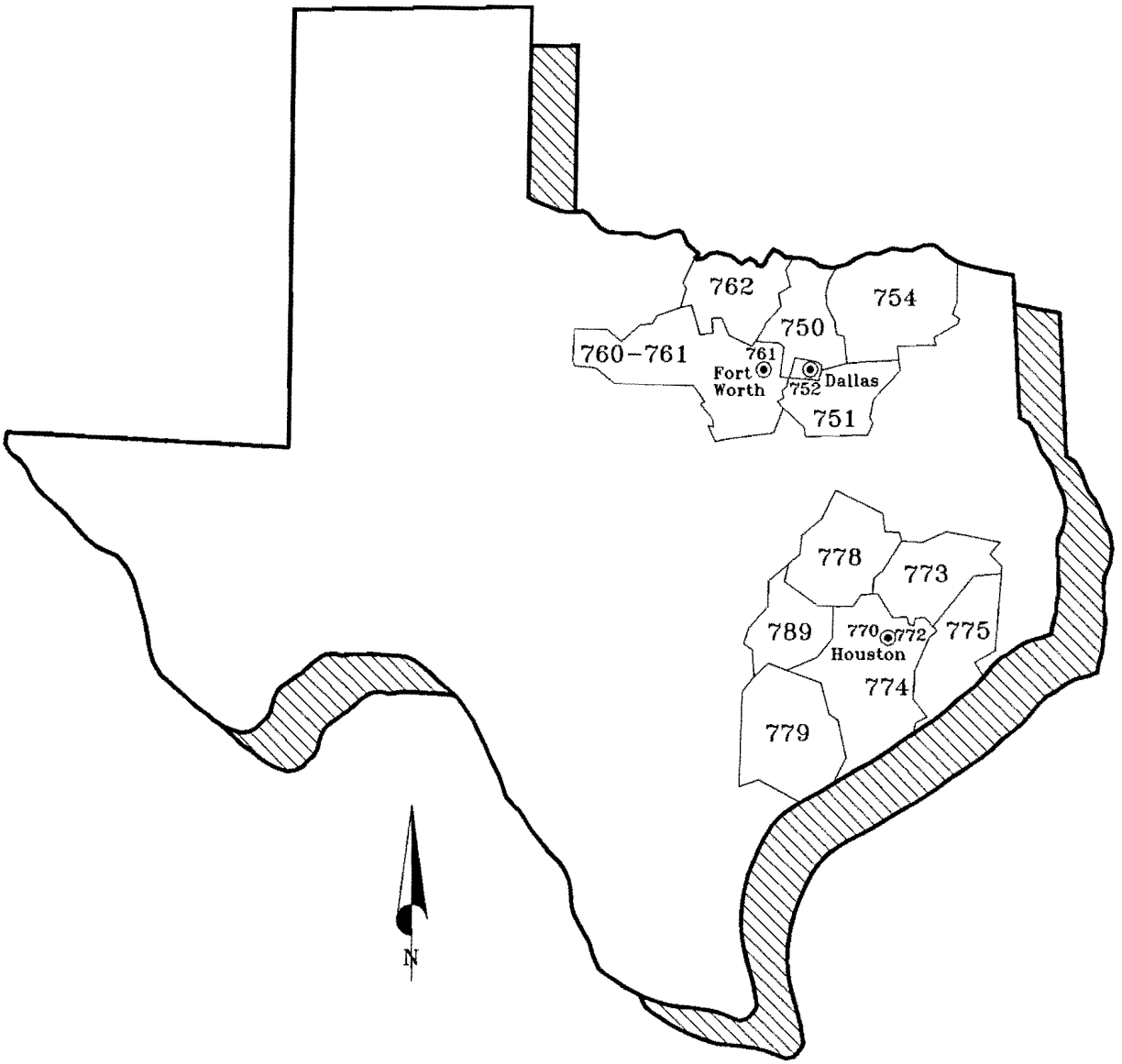


Figure 4. Carpooler and Solo Commuter Sample Zip Codes

Table 3. Survey Distribution and Response Rates—East R. L. Thornton Freeway and HOV Lane

Survey Sample	Morning Peak-Period Vehicle Volume	License Plates Read	Surveys Mailed	Surveys Returned Address Unknown	Surveys Completed	Response Rate
General-Purpose Lane Drivers	17,955	4,943	3,152	23	823	26%
HOV lane	2,252	1,315	797	15	210	26%
TOTAL	20,207	6,258	3,949	38	1,033	26%

Table 4. On-Board Transit User Survey Distribution and Response Rates—East R. L. Thornton Freeway HOV Lane

Route Number	Block Number	Garage Start Location	Number of Passengers	Surveys Completed	Response Rate
281/282	28120	ATE	47	45	96%
281/282	28103	ATE	42	34	81%
282/283	28109	ATE	59	55	93%
283/281	28106	ATE	65	58	89%
283	28114	ATE	57	57	100%
207	20702	ATE	26	26	100%
207	20705	ATE	30	30	100%
64	6410	East Dallas	69	49	71%
64	6409	East Dallas	55	39	71%
64	6411	East Dallas	61	59	97%
64	6414	East Dallas	89	52	58%
64	6415	East Dallas	35	30	86%
64	6417	East Dallas	36	34	94%
18	1805	East Grand	34	34	100%
60E/N	6010	East Grand	40	22	55%
60N/E	6006	East Grand	27	24	89%
TOTAL			772	648	84%

- **Houston—Carpool and Motorist Survey**. Vehicle license plates were recorded during the peak-period on the Katy and Northwest HOV lanes on March 29 and March 30, 1995, and on the freeway main lanes on April 25 and April 26, 1995. The freeway motorist and HOV user surveys were mailed on May 5, 1995, and the survey return period extended to June 16, 1995. As shown in Table 5, response rates ranged from a low of 28 percent for the Katy Freeway HOV lane users and the Northwest Freeway motorists, to a high of 39 percent for the Northwest Freeway HOV lane users. The overall response rate for all four groups was 31 percent.

- **Houston—On-Board Passenger Survey**. The Houston on-board bus survey was conducted May 24, 1995, on a sample of runs for METRO bus routes using the Katy and Northwest HOV lanes during the morning peak-period. Table 6 summarizes the distribution and the response rates for Katy and Northwest bus passengers. An overall response rate of 82 percent was achieved on the Houston on-board surveys.

A data entry code book was created for each of the surveys, and TTI staff entered the survey data into d-Base, a database software program. The statistical analysis was completed using the SAS-PC software program. The initial analysis included verification testing for accuracy of data input. A combination of descriptive and inferential statistics was used to analyze the survey data. Standard frequencies were computed for each entry and bivariate analyses were conducted using the standard cross-tabulation program, yielding the appropriate tests of statistical significance. The next section highlights the results of the survey analysis.

Table 5. Motorist and Carpooler Survey Distribution and Response Rates—Katy and Northwest Freeways and HOV Lanes

Survey Sample	Morning Peak-Period Vehicle Volume	License Plates Read	Surveys Mailed	Surveys Returned Address Unknown	Surveys Completed	Response Rate
Katy						
General-Purpose lane	14,189	5,357	2,767	18	853	31%
HOV lane	2,242	1,799	676	8	188	28%
Northwest						
General-purpose lane	15,628	4,792	2,657	6	745	28%
HOV lane	2,503	1,499	874	6	352	39%
TOTAL	34,562	13,447	6,974	38	2,138	31%

Table 6. On-Board Transit User Survey Distribution and Response Rate, Katy and Northwest Freeway Bus Routes

Route Number	Block Number	Park & Ride Location	Number of Passengers	Surveys Completed	Response Rate
210	1021	Katy/West Belt	34	29	85%
228	321	Kingsland	108	46	43%
228	322	Kingsland	89	70	79%
228	323	Kingsland	101	92	91%
228	359	Addicks	77	67	87%
228	326	Addicks	84	82	98%
228	327	Addicks	77	67	87%
228	331	Addicks	80	62	77%
295	1023	Kingsland	18	13	72%
214	621	Northwest Station	114	104	91%
214	622	Northwest Station	136	108	79%
214	623	Northwest Station	84	70	83%
214	624	Northwest Station	90	71	79%
214	628	Northwest Station	88	82	93%
216	621	West Little York	62	58	93%
TOTAL			1,242	1,021	82%

SURVEY RESULTS

Knowledge of commuter travel behavior characteristics and the underlying motivating factors that influence daily travel decisions is essential in the development of effective policies and programs to encourage high-occupancy vehicle use. Several survey questions were designed to gather demographic and travel behavior information from bus riders, carpoolers and vanpoolers, and motorists. Other questions solicited information about employer-provided incentives for HOV use, attitudes toward alternative commute modes, and preferences for various strategies that may encourage HOV travel. The survey results are summarized in this section. The analysis includes comparisons of the responses from the three sample groups, as well as additional observations on similarities and differences in the responses from Houston and those from Dallas.

The section is divided into five major parts. Demographic information is presented first, followed by travel behavior characteristics, attitudes pertaining to the HOV lanes, employer incentives and disincentives to encourage HOV travel, and preferences toward potential strategies to encourage HOV use. Information for Dallas is presented first, followed by Houston. A complete tabulation of the survey responses is provided in Appendix D.

Demographic Information

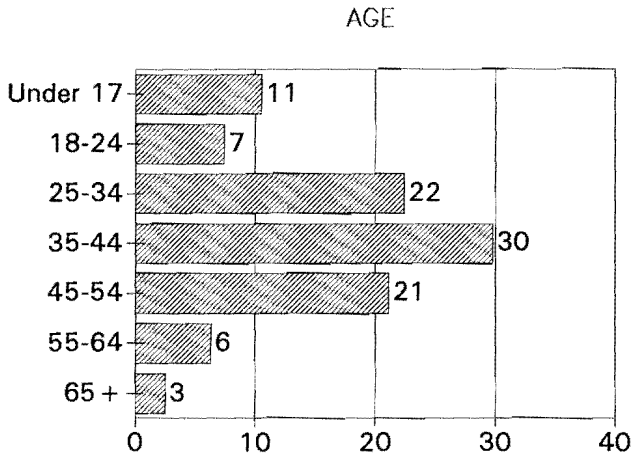
A number of survey questions focused on the demographic characteristics of transit users, carpoolers, and freeway motorists. The demographic and socioeconomic information examined in this section includes the age, gender, education level, and occupation of the three user groups. Information is provided for transit users first, followed by carpoolers and freeway motorists.

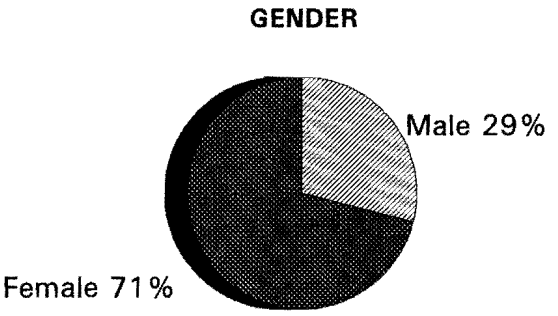
HOV Lane Transit User Profile

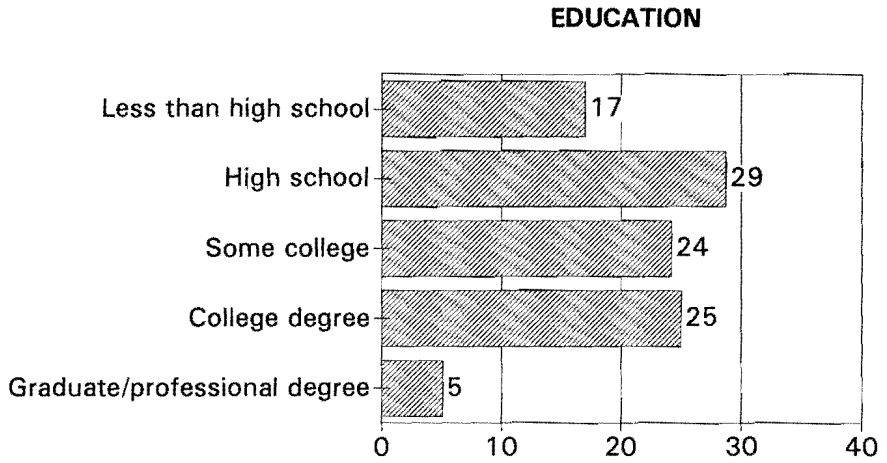
The demographic information for HOV lane transit patrons is presented in Figures 5-7 and summarized below.

- **Age**. The median age of transit users is 37 years on the East R. L. Thornton HOV lane and 38 years on the Katy and Northwest Freeway HOV lanes. The 35 to 44 age group represents the largest group of riders on all three HOV lanes, followed by the 25 to 34 age group. A higher percentage of transit patrons using buses on the East R. L. Thornton HOV lane are under 17 years of age, which corresponds to a higher school trip purpose reported on a later question.

Figure 5. East R. L. Thornton Freeway HOV Lane Transit User Demographic Profile







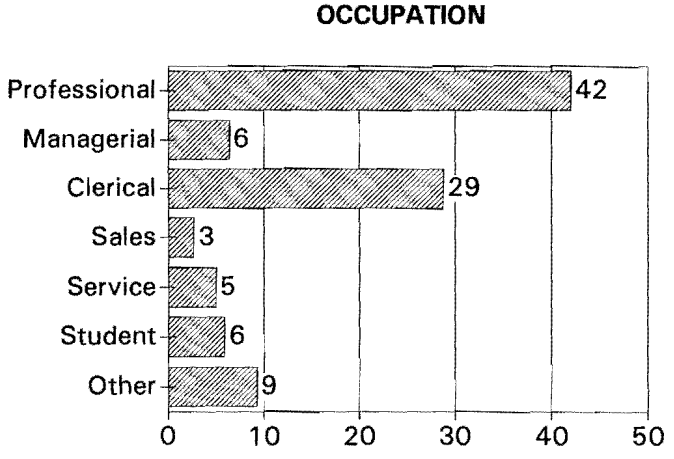


Figure 6. Katy Freeway HOV Lane Transit User Demographic Profile

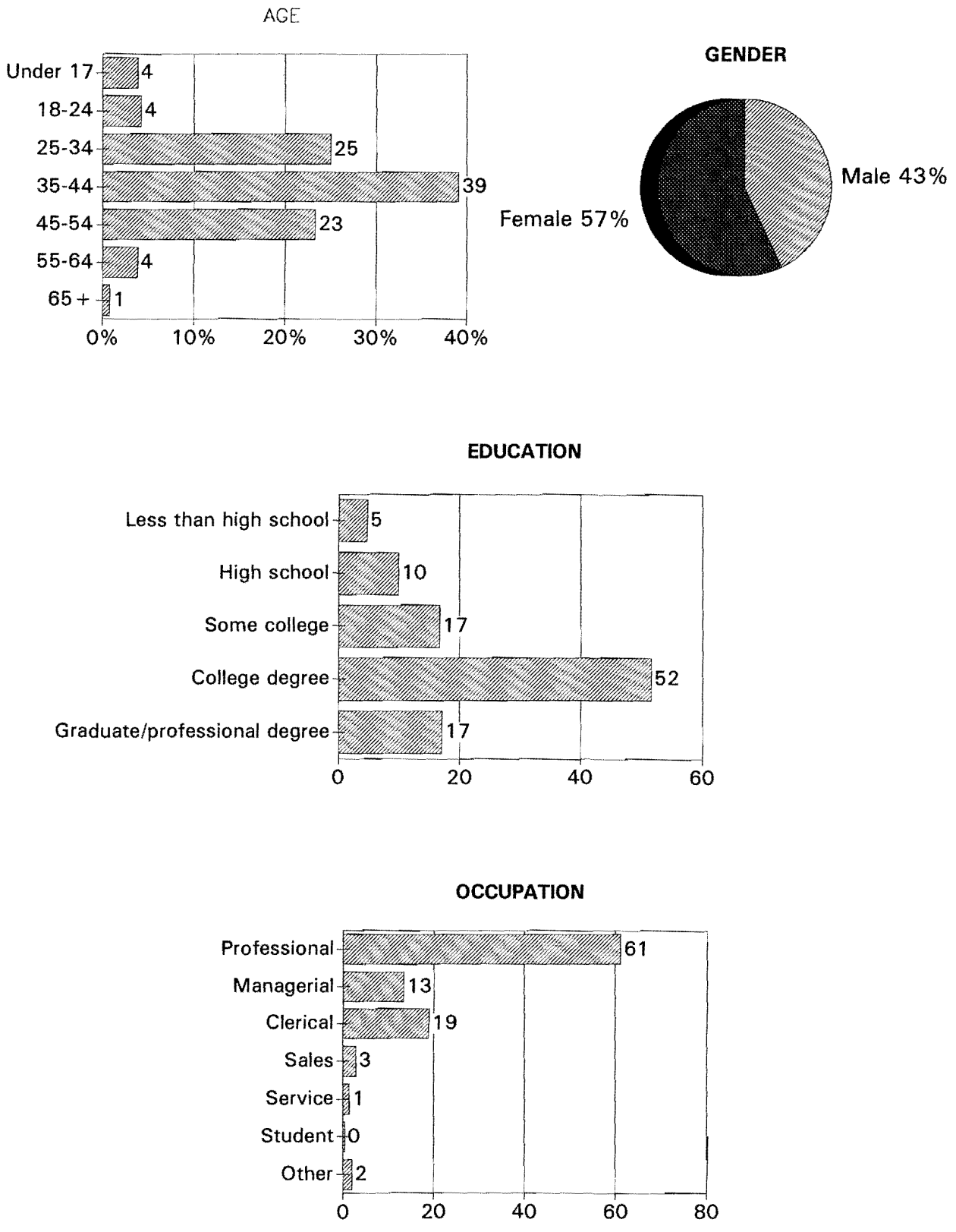
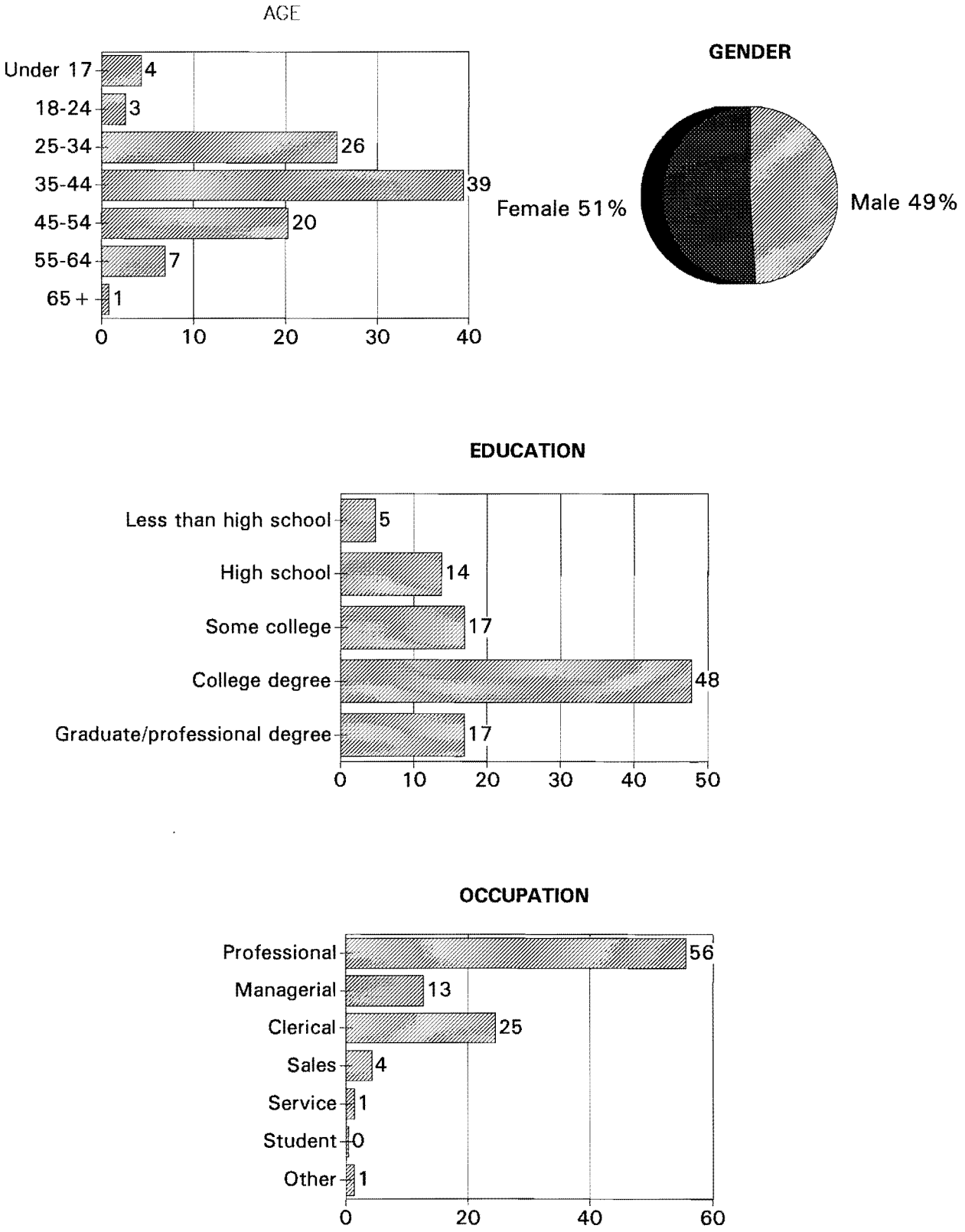


Figure 7 . Northwest Freeway HOV Lane Transit User Demographic Profile



- **Gender**. As is typical for transit ridership, more women than men ride buses on all three HOV lanes. The percentages range from 72 percent female and 28 percent male on the East R. L. Thornton HOV lane, to 57 percent female and 43 percent male on the Katy HOV lane and 51 percent female and 49 percent male on the Northwest Freeway HOV lane.

- **Education**. The educational profile of Dallas HOV lane bus patrons differs from bus passengers on the two Houston HOV lanes. The average educational level of the Dallas transit rider is 12 years compared to 15 years for the Katy and Northwest samples. The Dallas sample displays an almost equal representation among high school graduates, college graduates, and those indicating some college training, and contains the highest proportion of respondents without a high school diploma. The differences may be attributed to the fact that a large number of students in Dallas use DART to travel to and from school. Katy and Northwest HOV lane transit users report higher education levels, with about half having college degrees and some 17 percent holding graduate or professional degrees.

- **Occupation**. A majority of bus riders on all three HOV lanes work in a professional capacity, with clerical and managerial employees representing the second and third largest occupational groups. Six percent of the Dallas HOV lane transit users identified themselves as students—the highest among the three facilities.

HOV Lane Carpooler Profile

Graphical summaries of the demographic information for HOV lane carpoolers are presented in Figures 8-10.

- **Age**. The median age for carpoolers varies from 41 years on the East R. L. Thornton HOV lane to 39 years on the Katy and Northwest Freeway HOV lanes. Over 60 percent of the HOV lane users in all three facilities are between the ages of 25 and 44. The largest percentage of carpoolers on the Northwest and East R. L. Thornton HOV lanes are in the 35 to 44 year old age group, while the largest on the Katy HOV lane are in the 25 to 34 age group.

Figure 8. East R. L. Thornton Freeway HOV Lane Carpooler Demographic Profile

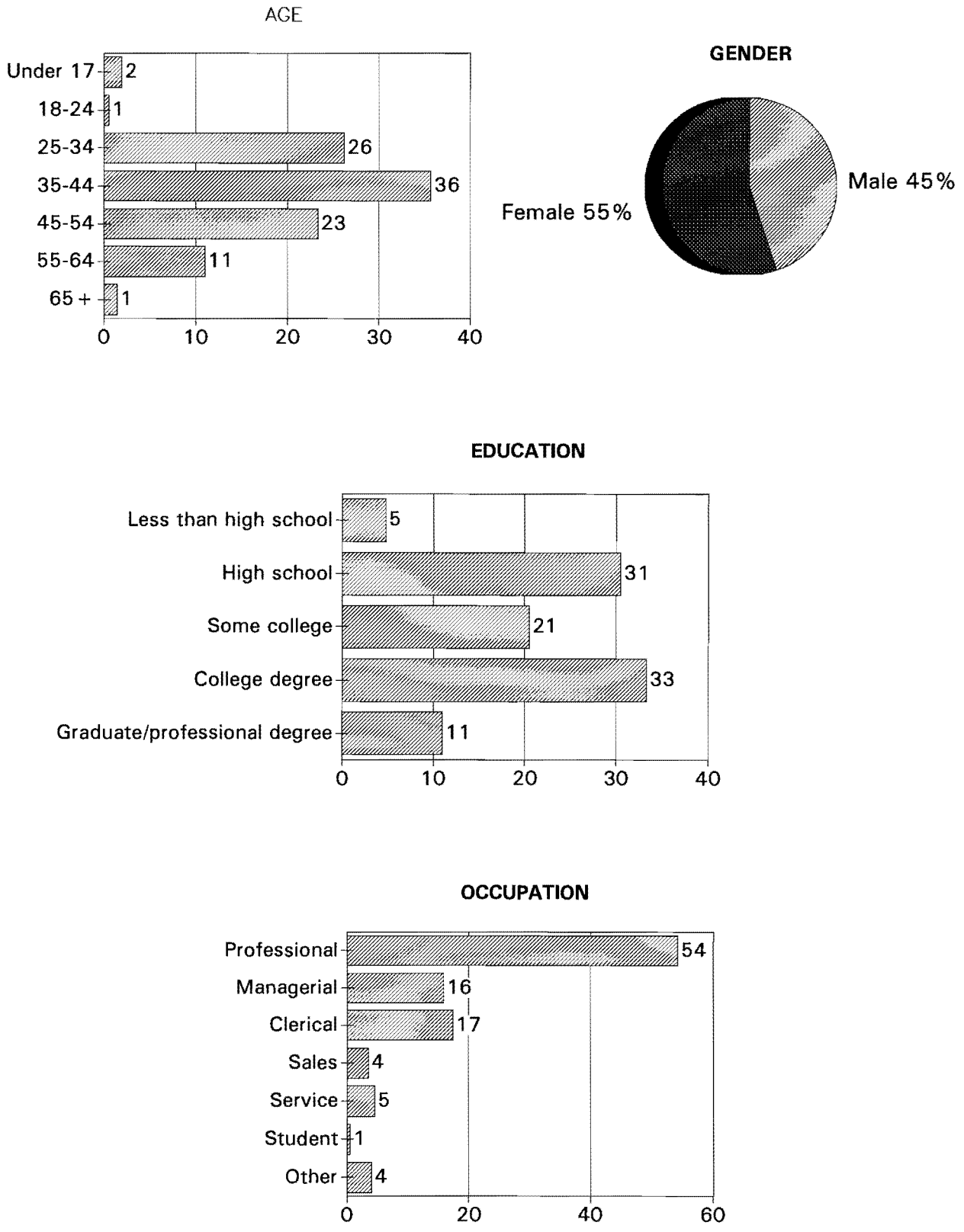


Figure 9. Katy Freeway HOV Lane Carpooler Demographic Profile

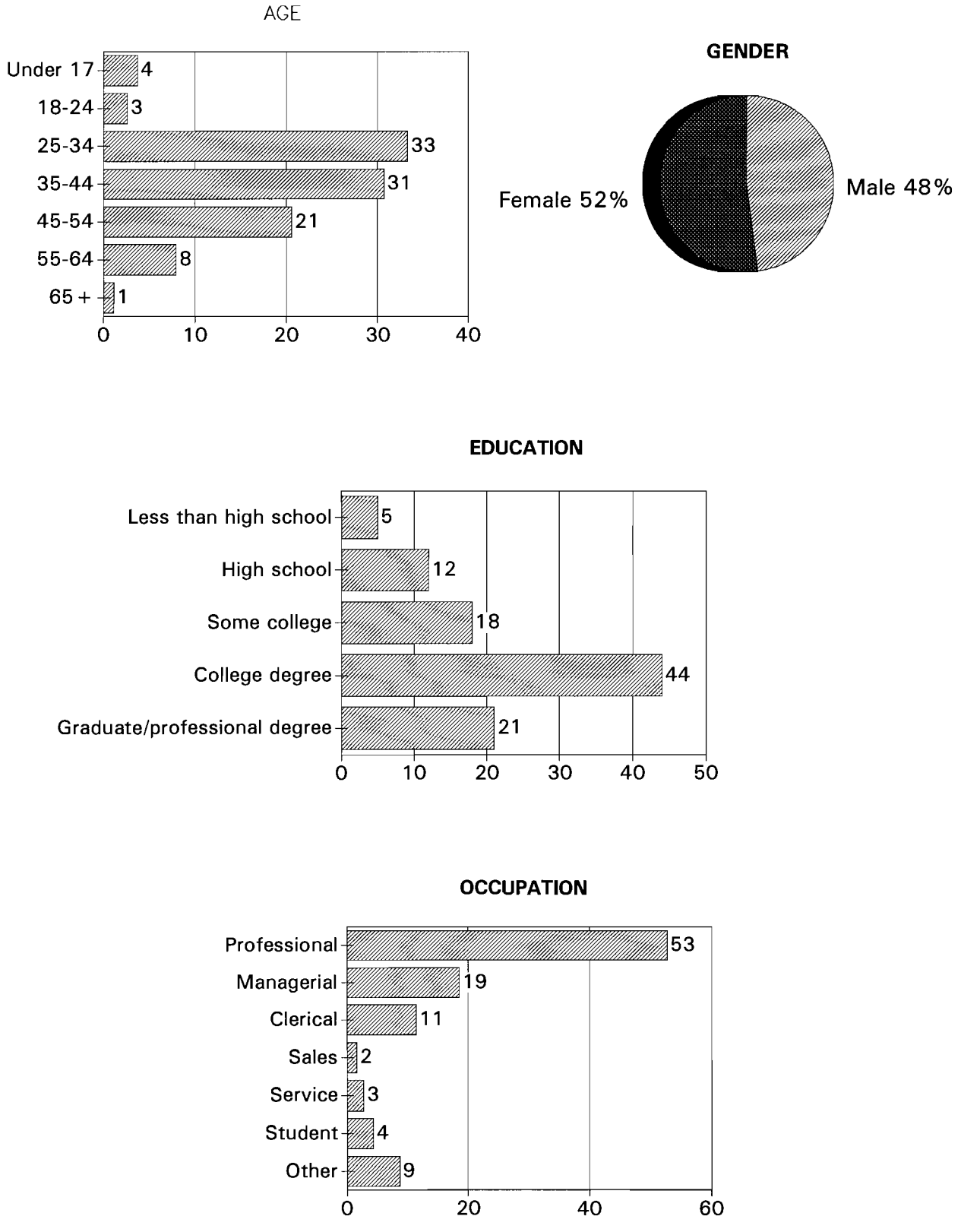
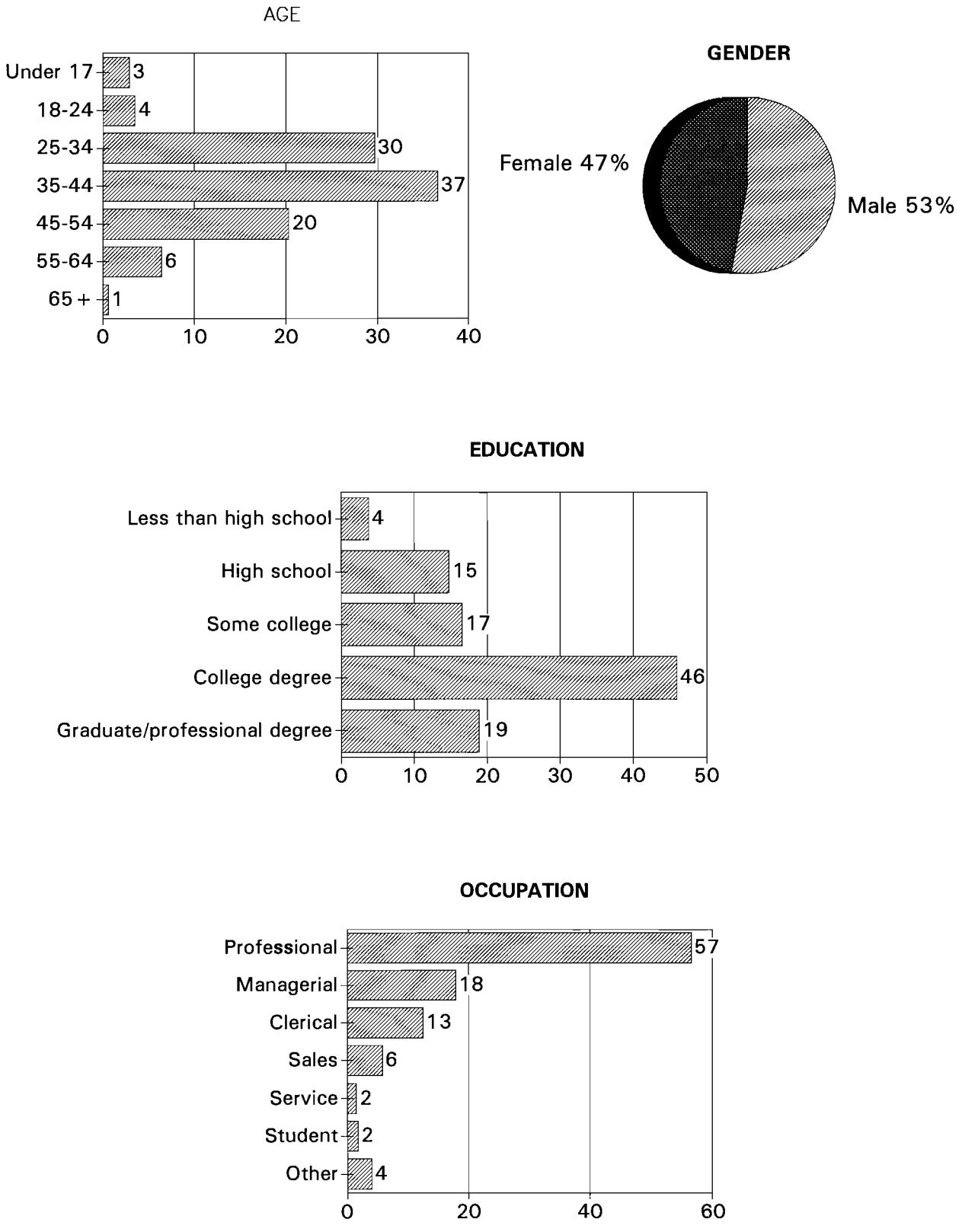


Figure 10. Northwest Freeway HOV Lane Carpooler Demographic Profile



- **Gender**. Carpoolers tend to be more evenly split between males and females than bus riders. Males represent from 45 percent to 53 percent of the carpoolers surveyed on all three HOV lanes.

- **Education**. The average Katy and Northwest HOV lane carpooler has completed at least three years of college, with approximately 45 percent holding college degrees and another 20 percent with graduate or professional degrees. Fewer than 20 percent of those surveyed have a high school education or less. The average East R. L. Thornton HOV lane carpooler has completed at least two years of college; 33 percent have college degrees, while 30 percent are high school graduates, and 11 percent hold graduate or professional degrees.

- **Occupation**. The majority of HOV lane carpoolers in all three corridors are employed in a professional capacity. With the exception of East R. L. Thornton HOV lane carpoolers, managerial and clerical employees represented the second and third largest occupational groups, respectively. In Dallas, slightly more carpoolers hold clerical positions than managerial positions.

Freeway Motorist Profile

Graphical summaries of the demographic information for motorists in the general-purpose freeway lanes are presented in Figures 11-13.

- **Age**. The median age of the freeway motorists in all three corridors is 42 years. The largest age group of motorists on all three freeways fall within the 35 to 44 year old category, with the 45 to 54 age group representing the second largest percentage. These figures indicate a slightly higher median age for the motorist than for carpoolers and bus riders.

- **Gender**. Men comprise the majority of single-occupant drivers on all three freeways. Males represented 54 percent of the East R. L. Thornton Freeway motorists, 56 percent on the Northwest Freeway, and 60 percent on the Katy Freeway.

Figure 11. East R. L. Thornton Freeway Motorist Demographic Profile

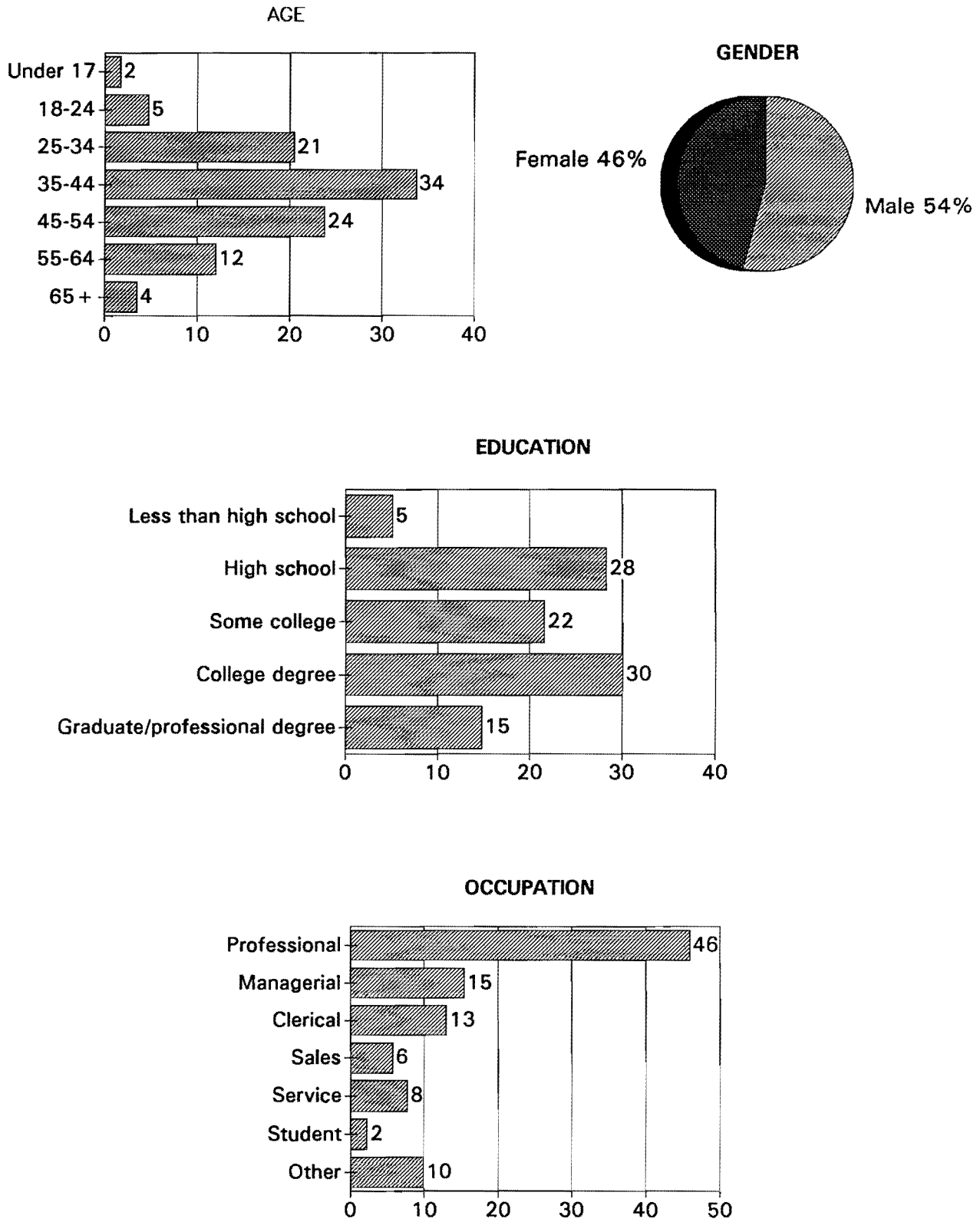


Figure 12. Katy Freeway Motorist Demographic Profile

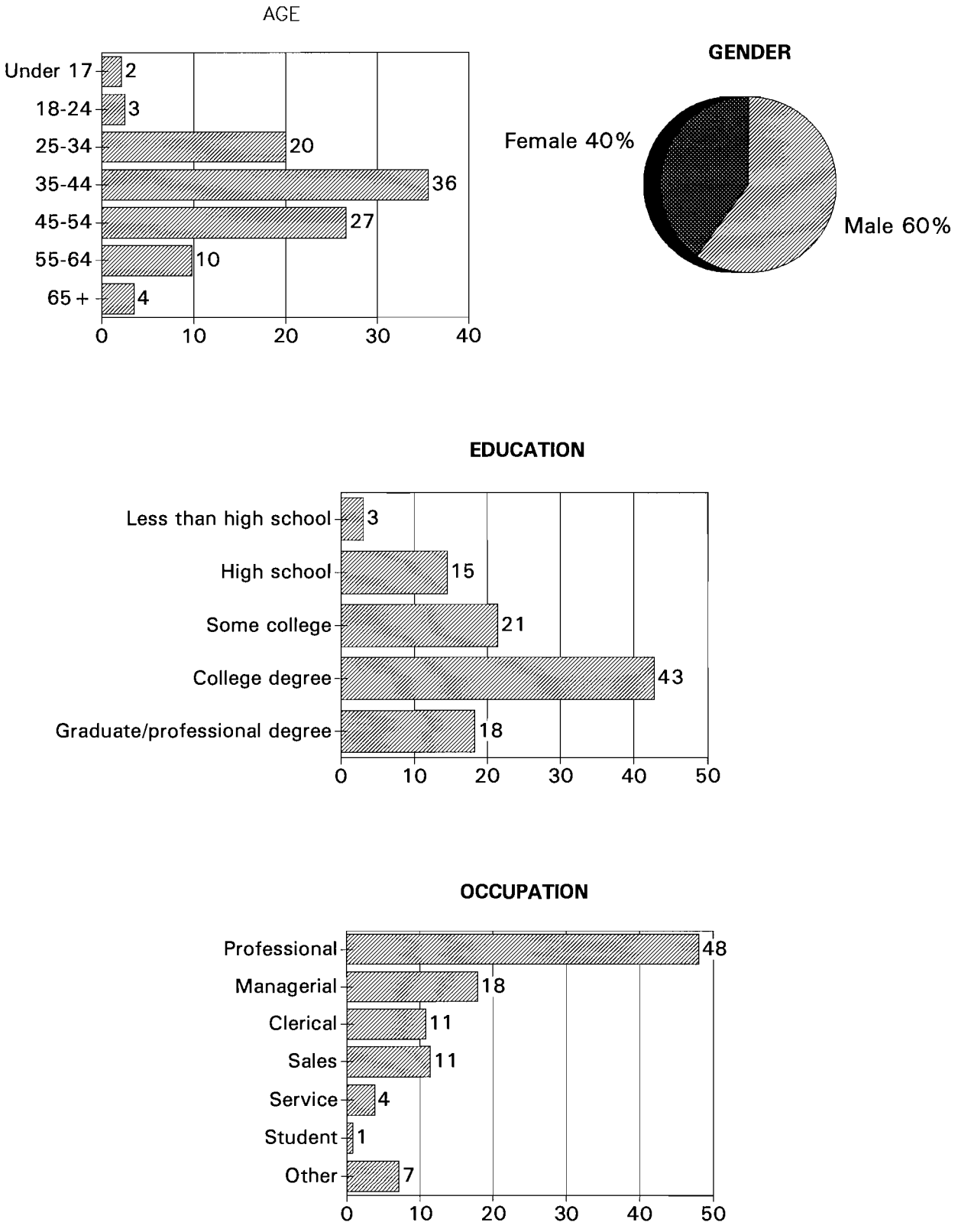
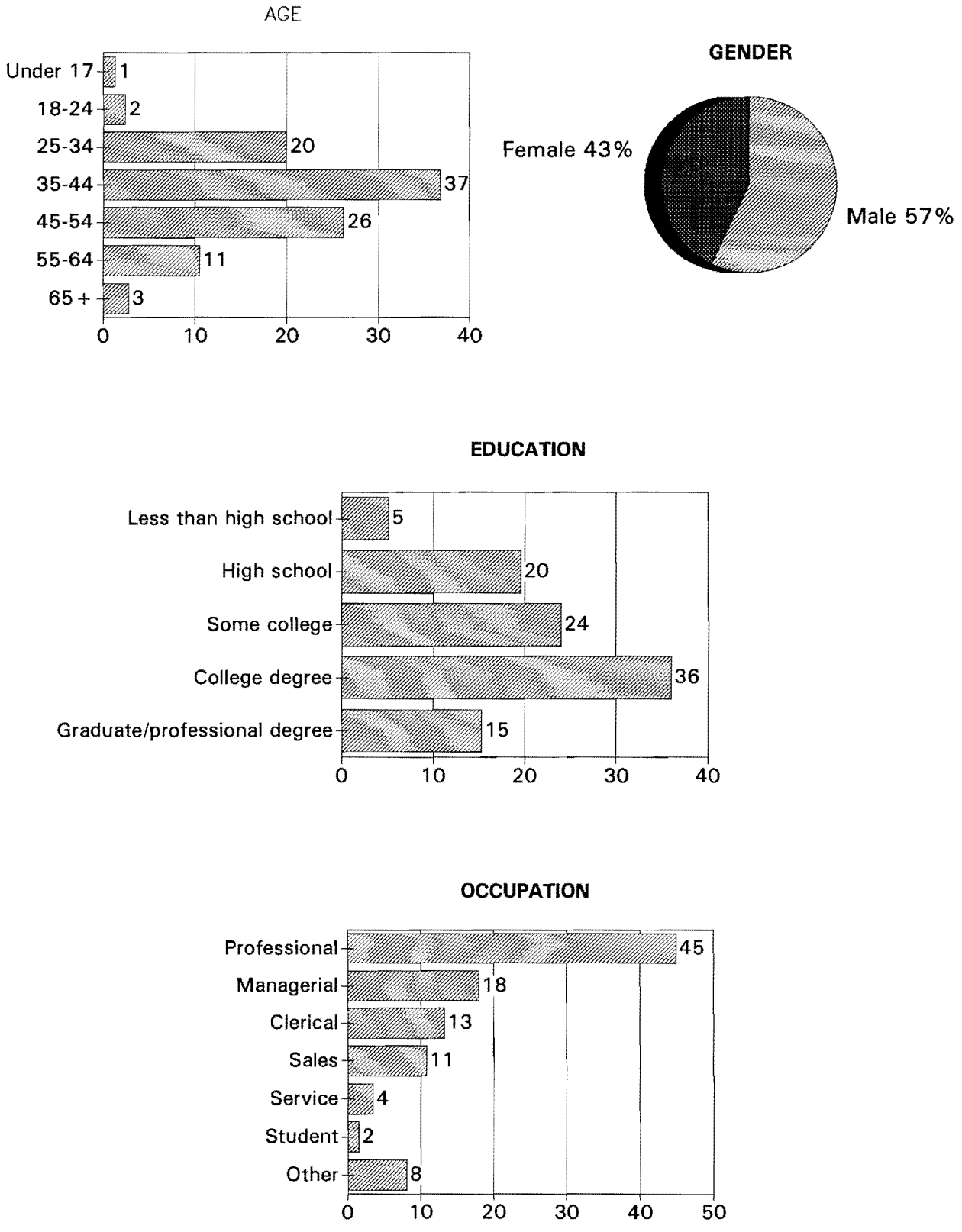


Figure 13. Northwest Freeway Motorist Demographic Profile



- **Education**. The motorists responding to the surveys on all the freeways are well educated. The average educational level of Dallas freeway motorists is 14 years, compared to 15 and 14 years for the Katy and Northwest Freeways, respectively. Approximately 43 percent of the Katy Freeway motorists have college degrees, compared to 36 percent of the Northwest Freeway motorists. Among East R. L. Thornton motorists, almost one third graduated from college and about 15 percent hold graduate or professional degrees.

- **Occupation**. Similar to the HOV lane users, between 45 and 48 percent of motorists on the three freeways work in professional occupations. The percentage of motorists employed in managerial positions ranged from 15 percent to 18 percent, while clerical workers ranged from 11 percent to 13 percent.

Travel Behavior Characteristics

The surveys contained several questions focusing on the travel behavior of HOV users and non-users. Travel behavior information was obtained on trip purpose, mode choice, and previous trip mode choice for bus riders, carpoolers, and vanpoolers. In addition, information was collected on any previous carpool participation by bus riders and the composition of existing carpools. The survey results in these categories are summarized next.

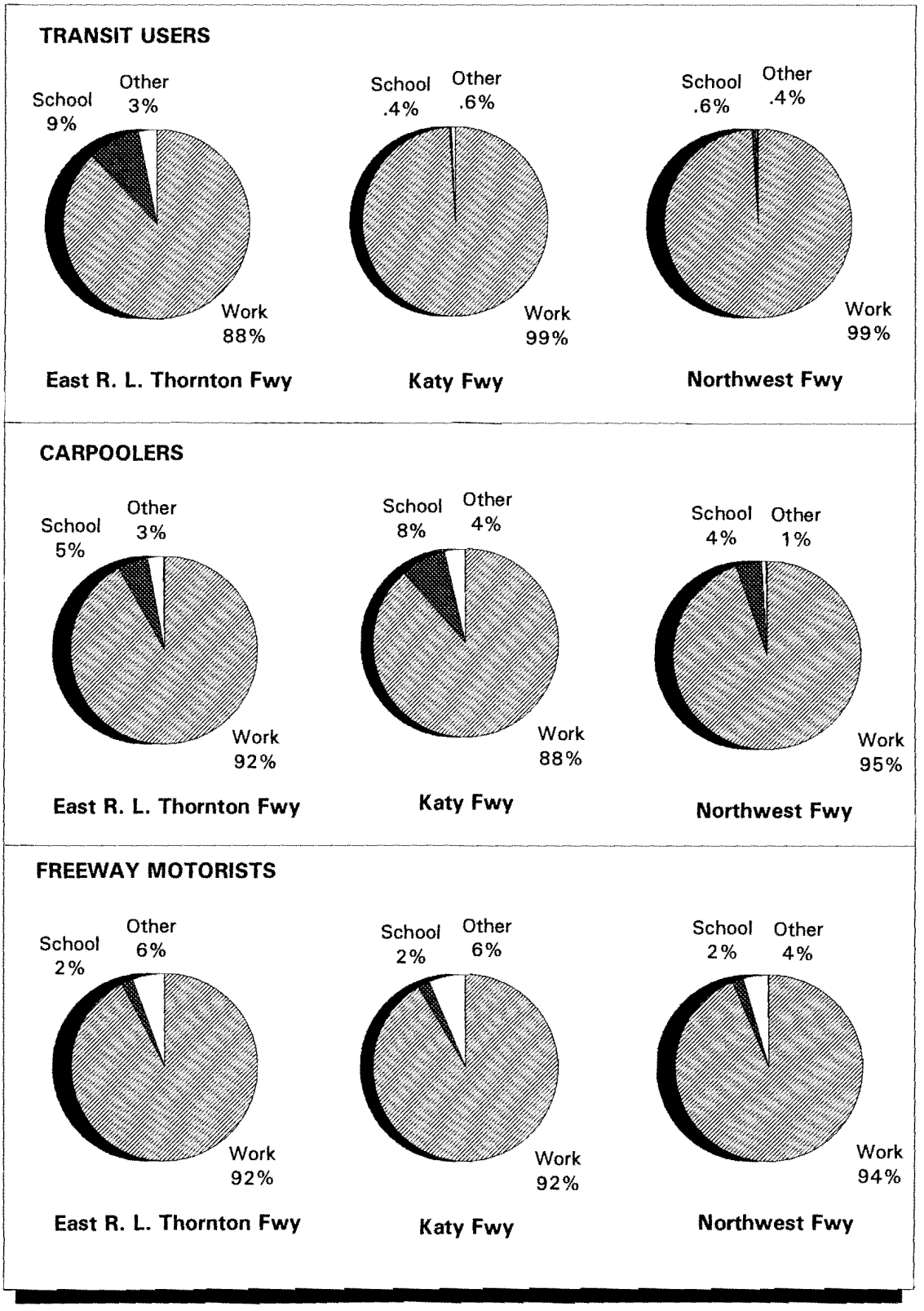
Trip Purpose

Survey respondents were asked about the purpose of their trip. Figure 14 shows the results of this question for the three user groups on all three facilities.

- **Transit Users**. The predominant trip purpose for the HOV bus passengers is work. In Houston, 98 percent of the bus riders were traveling to work, compared to 88 percent in Dallas. A larger proportion of Dallas respondents—approximately 9 percent—were traveling to school.

- **Carpoolers**. HOV lane carpoolers exhibit slightly more varied trip purposes. Work-related trips range from 88 percent on the Katy HOV lane to close to 95 percent on the Northwest HOV lane. Approximately 8 percent of the Katy carpoolers cited school-related trip purposes. Other reasons carpoolers were traveling on the HOV lane include medical and day-care trips.

Figure 14. Trip Purpose: Transit Users, Carpoolers, and Freeway Motorists



- **Freeway Motorists.** The majority of freeway motorists are also going to work. Motorists reported more trips for other purposes, however, including jury duty, personal business, medical appointments, shopping, working out, meetings, and running errands.

Mode Choice

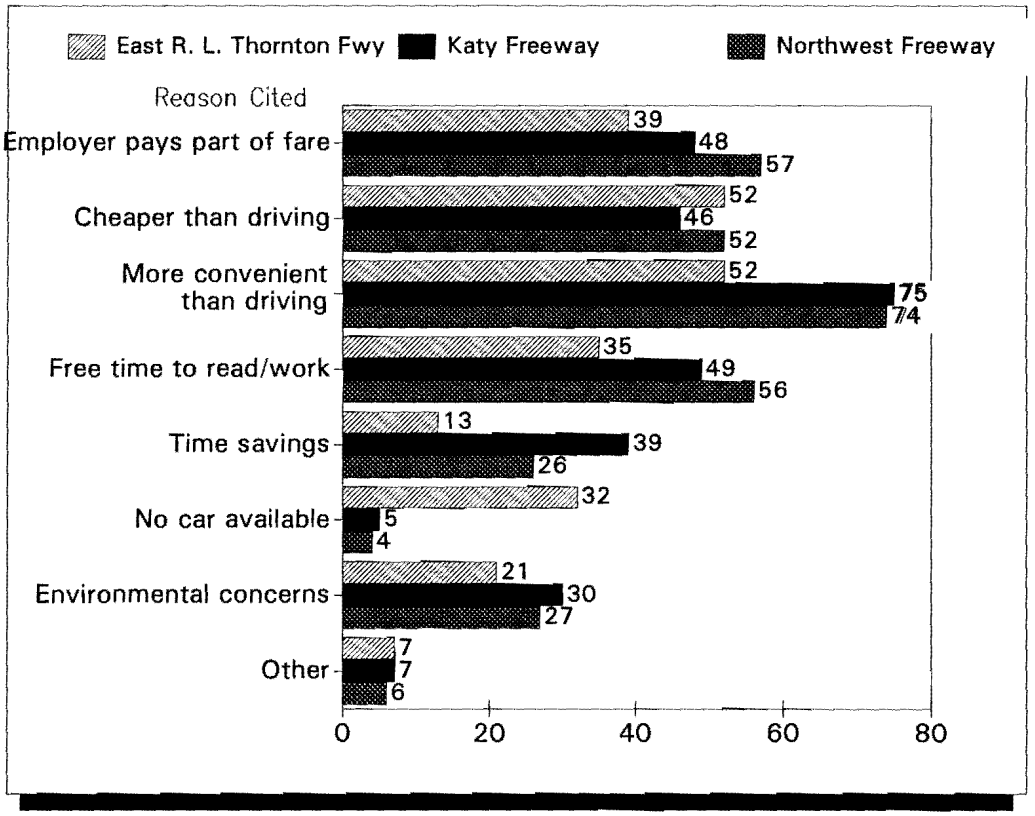
Survey respondents were asked to identify the major reasons for using their particular commute mode. The results are presented in Figures 15-17.

- **Transit Users.** Bus riders in all three corridors cited convenience as their main reason for using transit. Having free time to read or work is also an important factor in the decision to use transit, as is employer support of bus fares. Cost factors, time savings, and environmental concerns are other reasons identified for using transit. The lack of an automobile is not a significant factor for many in the decision to use the bus in Houston, but it is for 32 percent of the respondents in Dallas. Between 39 and 57 percent of the bus riders in all three corridors receive fare subsidies from their employers.

- **Carpoolers.** Houston respondents cited time savings as the primary reason for carpooling, while carpoolers in Dallas rated the cost savings of carpooling first. Cost, convenience, companionship, environmental concerns, and parking cost/availability are also important factors. In both urban areas, less than 8 percent of the respondents indicated that employer incentives induced them to carpool.

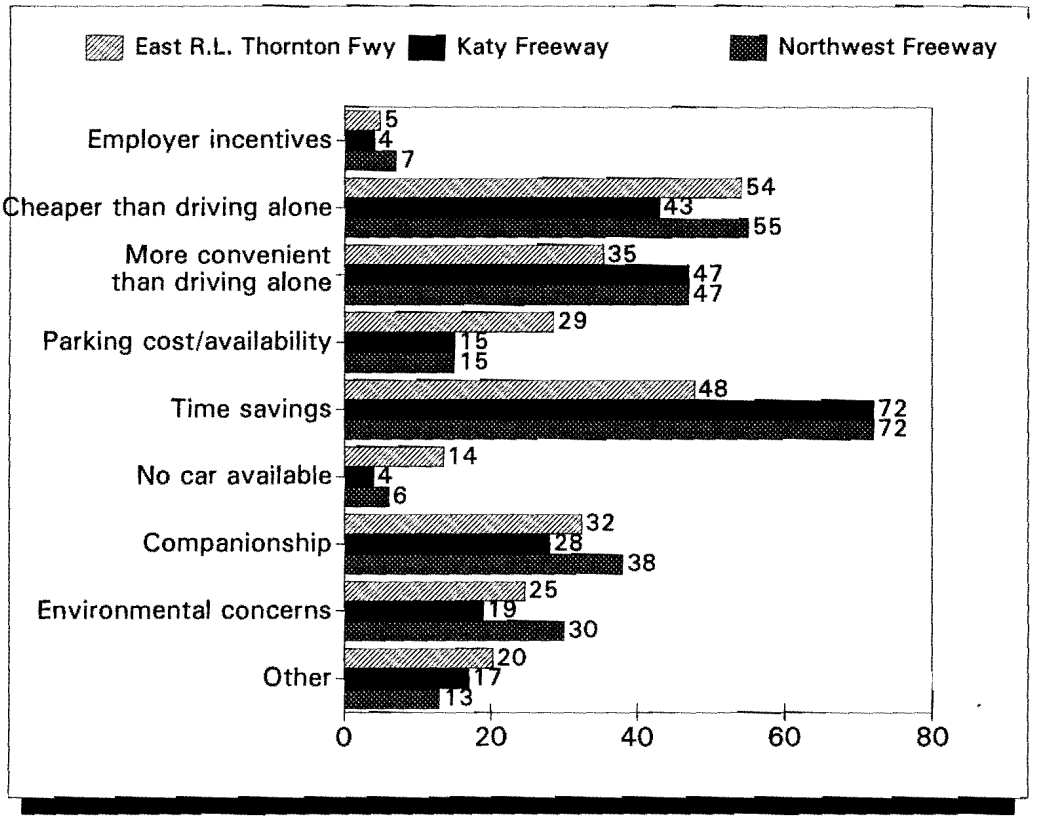
- **Freeway Motorists.** The largest percentage of motorists in both urban areas rated the convenience and flexibility of having a car as primary reasons for driving alone. Almost one half of all respondents indicated they drove alone because of irregular work hours and another 40 percent needed a car for their job. About the same number indicated a lack of convenient bus service and vanpooling or carpooling partners. Although driving a company car and having gas paid for were not noted by many respondents as significant reasons for driving alone, free parking was cited as a reason for driving alone by over one fourth of the survey respondents. Other reasons for driving alone are the need for a car for taking children to day care or school, visiting family or friends after work, attending school during or after work hours, working out at the gym, and running errands. Insufficient access points to get on and off the HOV facilities is also a reason for driving alone for some motorists.

Figure 15. Reasons for Using Transit



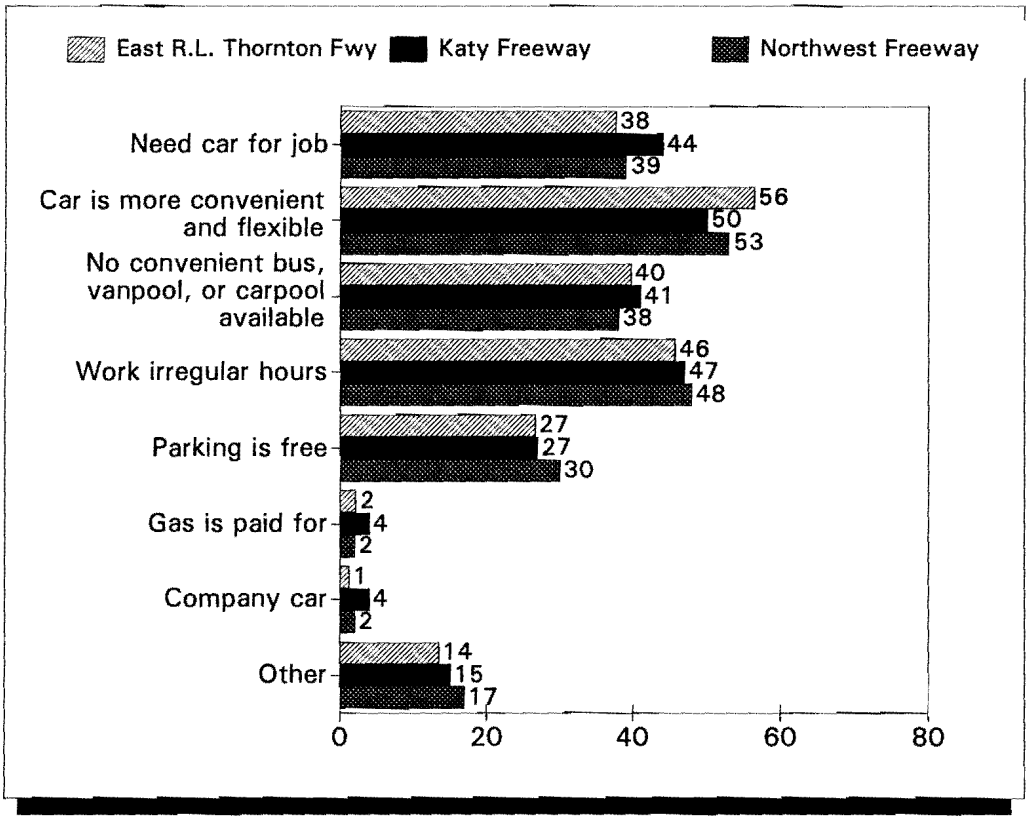
Note: Respondents were asked: "Why did you choose to ride the bus? **(Please check all that apply.)** Percentages do not total 100 percent due to the multiple response nature of the question.

Figure 16. Reasons For Carpooling



Note: Respondents were asked: "Why do you choose to carpool/vanpool rather than drive alone or ride the bus? **(Please check all that apply.)** Percentages do not total 100 percent due to the multiple response nature of the question.

Figure 17. Reasons For Driving Alone



Note: Respondents were asked: "What are your reasons for driving your car on the freeway mainlanes, rather than traveling in a bus, carpool, or vanpool on the HOV lane? **(Please check all that apply.)** Percentages do not total 100 percent due to the multiple response nature of the question.

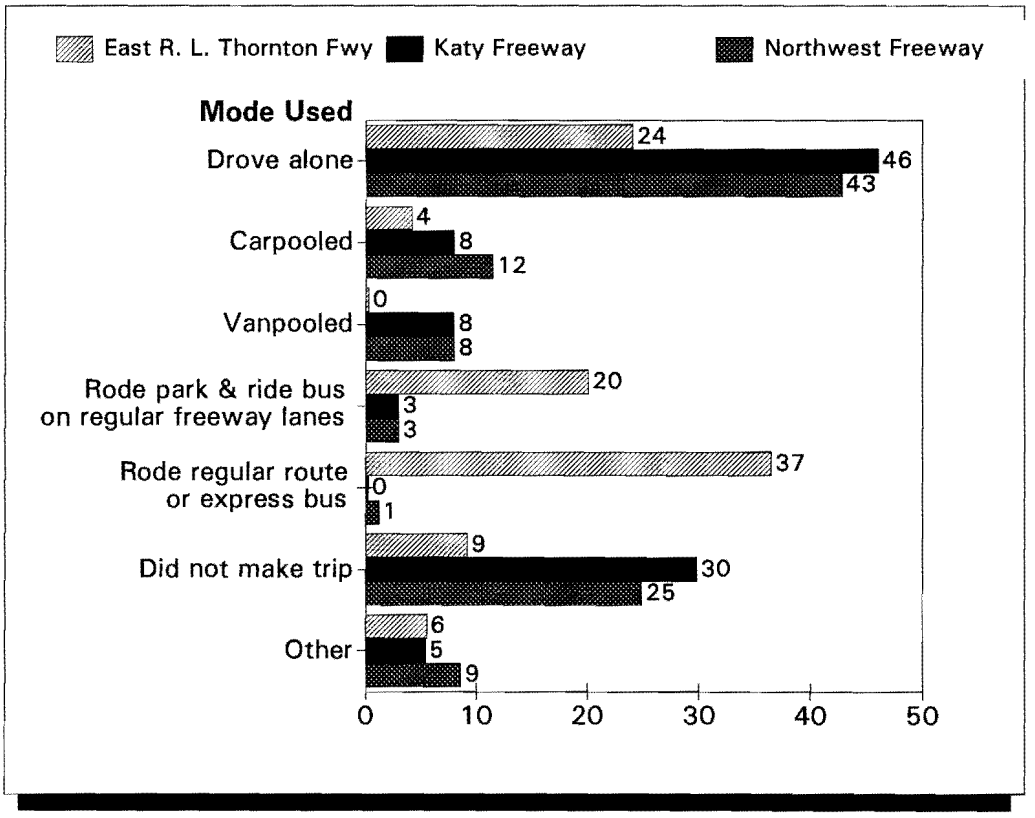
Previous Trip Mode

The primary reason for developing HOV facilities is to influence commuters to change from driving alone to taking the bus or carpooling or vanpooling. HOV lanes attempt to encourage drivers to switch to HOV modes by offering an attractive alternative to heavily congested freeway main lanes. Figures 18 and 19 identify the previous travel modes of bus riders and carpoolers in the three corridors.

- **Transit Users**. Transit patrons were asked to report their mode of travel prior to riding a bus on the HOV lane. As Figure 18 indicates, previous trip mode choices differ between the urban areas, possibly reflecting the approach to developing the HOV lanes and bus services in the two areas. In Dallas, existing buses were re-routed to utilize the HOV lane, while in Houston bus service did not exist in the corridors and new park-and-ride bus service was implemented along with the HOV lanes. In Dallas, 57 percent of the respondents rode the bus before the HOV lane was open. However, 24 percent reported previously driving alone to make the trip. In contrast, in Houston, less than 5 percent of those surveyed indicated any previous use of park-and-ride, regular route, or express bus services. Approximately 46 percent previously drove alone, while some 30 percent did not make the trip. Previous carpoolers accounted for less than 12 percent in all three corridors, while previous vanpoolers accounted for 8 percent or less. The majority citing other factors said that they either worked elsewhere or did not live in the area prior to riding the bus on the HOV lane.

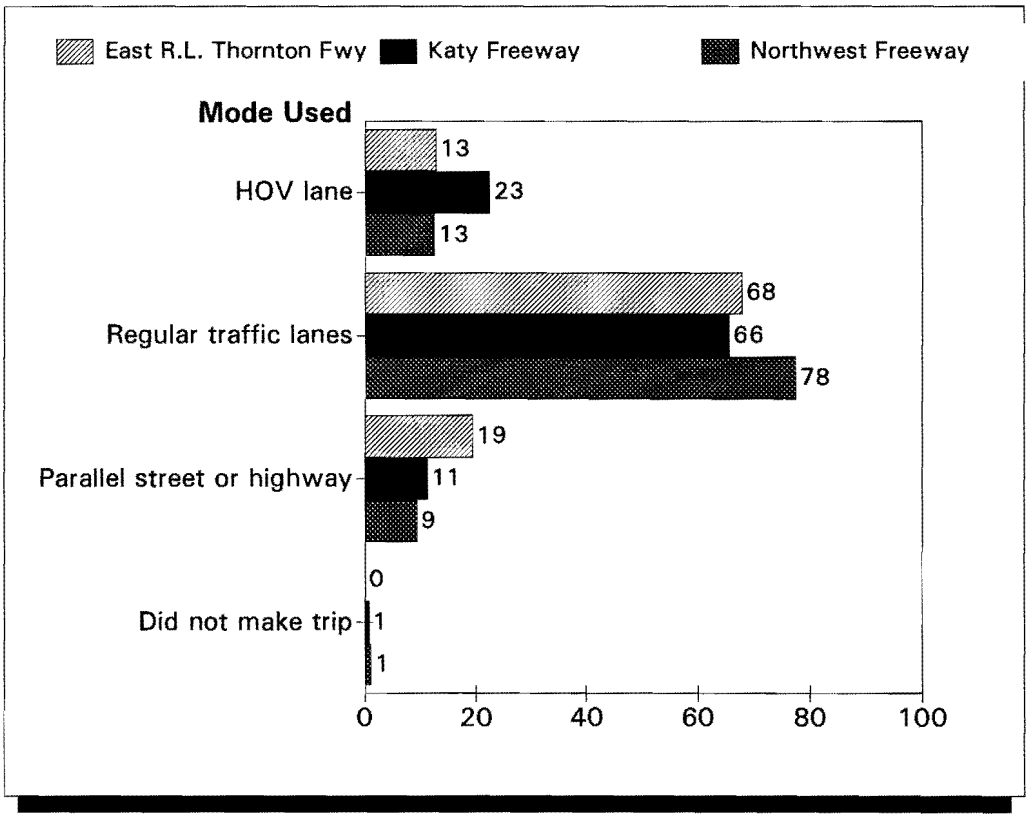
- **Carpoolers**. Figure 19 shows that the majority of carpoolers in both urban areas previously used the regular freeway lanes. As shown in Table 7, however, there are differences between carpoolers in the urban areas regarding which mode was used to travel on the freeways. Carpoolers in Houston who formerly used the regular freeway traffic lanes or a parallel roadway were more likely to have driven alone than those in Dallas.

Figure 18. Previous Trip Mode: Transit Users



Note: Respondents were asked: "Before you began riding a bus on the HOV lane, how did you normally make this trip? **(Please check one.)**

Figure 19. Previous Trip Mode: Carpoolers



Note: Respondents were asked: "Prior to carpooling/vanpooling on the HOV lanes, how did you normally make this trip? **(Please check one.)**

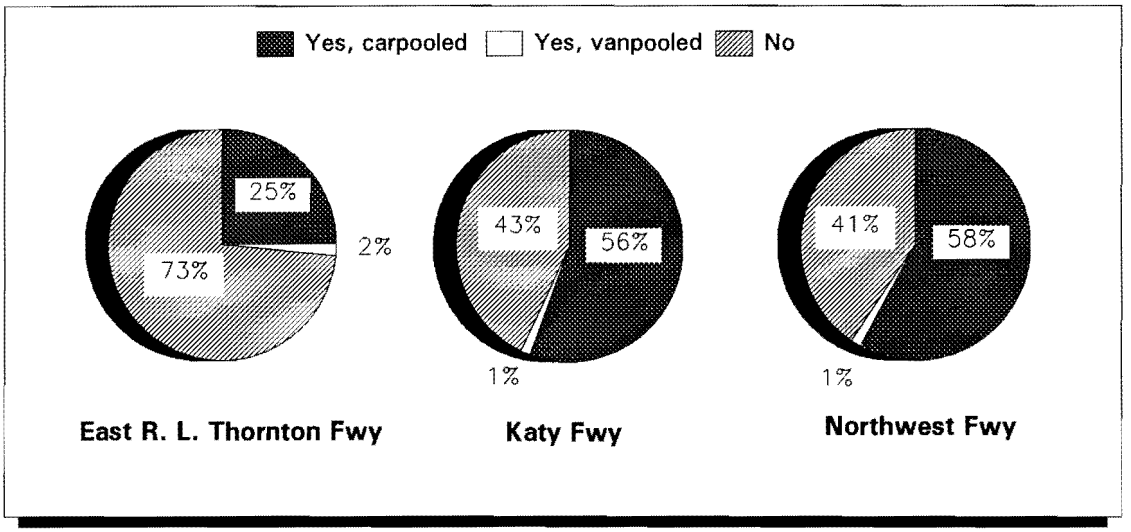
Table 7. Previous Trip Mode: Carpoolers

Previous Trip Mode	East R. L. Thornton Fwy	Katy Fwy	Northwest Fwy
On HOV Lane			
Bus	48%	76%	82%
Vanpool	0	6%	3%
Carpool	52%	18%	15%
On regular freeway traffic lanes			
Bus	3%	0	1%
Vanpool	7%	1%	1%
Carpool	47%	18%	21%
Drove alone	43%	81%	77%
On a parallel street or highway			
Bus	3%	6%	0
Vanpool	3%	12%	0
Carpool	63%	29%	40%
Drove alone	31%	53%	60%

Previous Carpool Participation by HOV Lane Transit Users

Transit users were asked if they had previously carpooled or vanpooled in the HOV lane. As illustrated in Figure 20, less than two percent of transit users on all three facilities identified themselves as former vanpool participants. Slightly over half of the Katy and Northwest Freeway HOV lane transit users indicated that they had previously carpooled, while 41 and 43 percent indicated no prior carpooling or vanpooling experience. Approximately 73 percent of the bus riders on the East R. L. Thornton HOV lane had not participated in vanpools or carpools, while 25 percent indicated they had previously been in a carpool.

Figure 20. Previous Carpool Participation By Transit Users



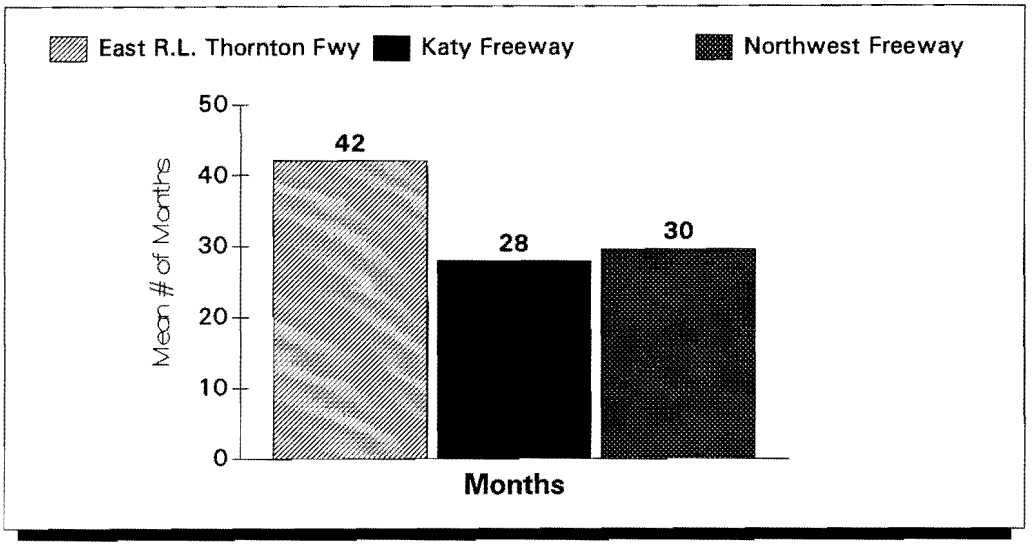
Note: Respondents were asked: "Have you ever carpooled or vanpooled on the [X] HOV lane?"

Characteristics of Carpools

Carpoolers and vanpoolers were asked a series of questions pertaining to the composition and formation of their current carpooling arrangements. Figures 21-23 illustrate the responses to these questions, which are also summarized below.

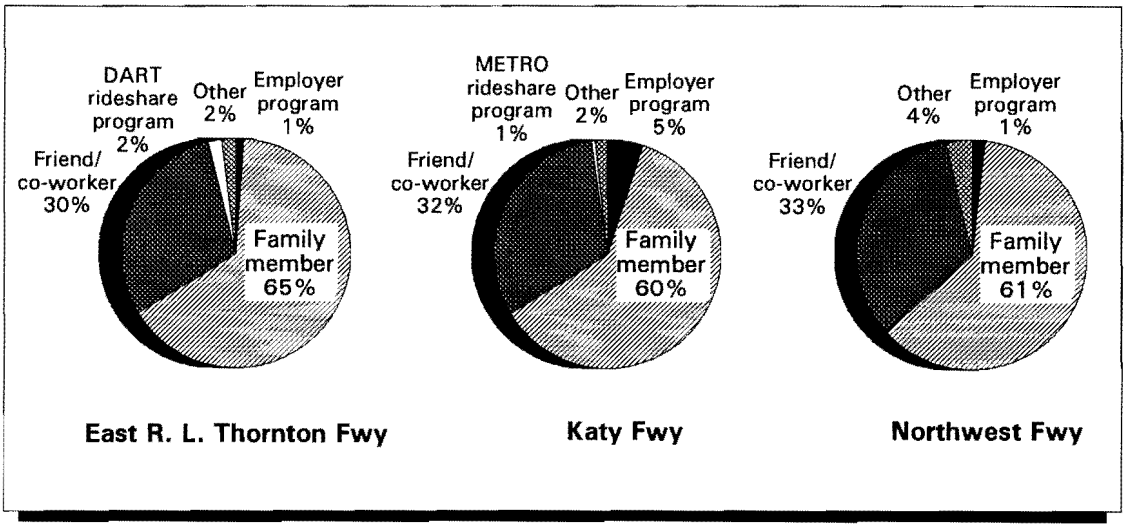
- **Duration of Carpool.** Carpoolers were asked to identify the length of time their current carpool or vanpool had existed. As shown in Figure 21, the median age of carpools on the East R. L. Thornton HOV lane is 42 months, compared to 28 months for carpools on the Katy HOV lane and 30 months for carpools on the Northwest HOV lane.

Figure 21. Length of Time Carpool Exists



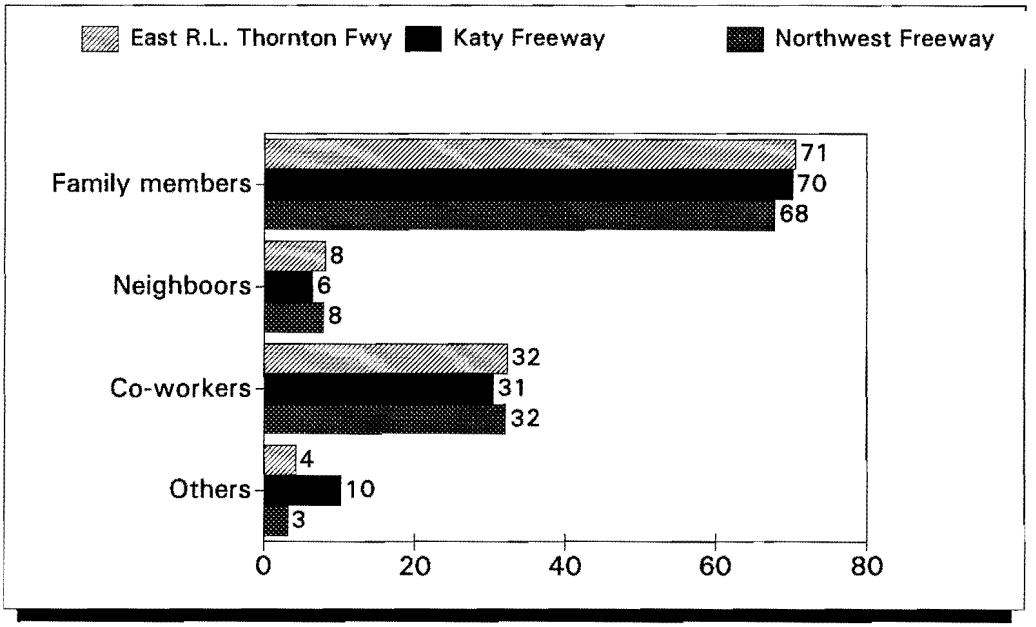
Note: Respondents were asked: "How long has your current carpool/vanpool existed?"

Figure 22. How Carpools Are Formed



Note: Respondents were asked: "How did you form your carpool/vanpool?" **(Please check one.)**

Figure 23. Composition of Carpools



Note: Respondents were asked: "Who makes up your carpool/vanpool group? **(Please check all that apply.)** Percentages do not total 100 percent due to the multiple response nature of the question.

- **Formation of Carpools**. Information was also obtained on carpool formation. The results, as shown in Figure 22, indicate that the majority of carpools are formed with family members. Friends and co-workers comprise the second largest group, with only a small percent formed through the ridesharing programs offered by local transit agencies or employers.

- **Composition of Carpools**. Supporting the trends in carpool formation described previously, as illustrated in Figure 23 approximately 70 percent of carpoolers on all three HOV lanes ride with family members. Most of the remaining carpools are formed with co-workers. These trends follow national experiences, which indicate most carpools are comprised of family members, friends, or co-workers.

Attitudes About HOV Facilities

Transit users and carpoolers were asked several questions to obtain additional information concerning their attitudes toward HOV facilities. Information on the impact of the HOV lanes on mode choice and the perceived HOV lane travel time savings is summarized in this section.

Impact of HOV Lane on Mode Choice

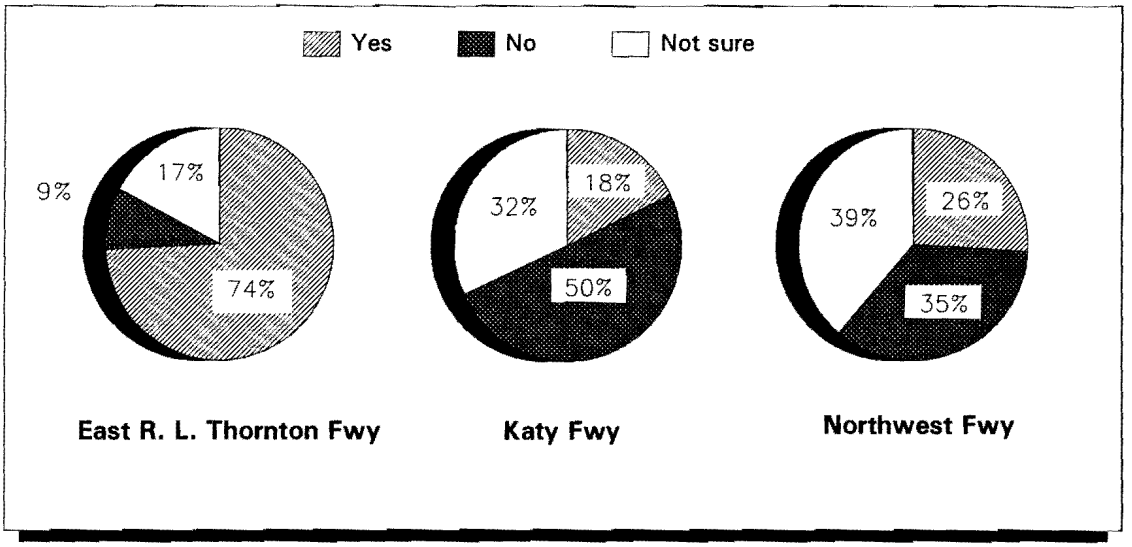
- **Transit Users.** As shown in Figure 24, the impact of the HOV lanes is different among transit riders in Houston and Dallas. Almost three fourths of the East R. L. Thornton HOV lane transit users would still use the bus even in the absence of the HOV lane. In Houston, the presence of HOV facilities is a significant factor in the decision to use transit. Only 18 percent of the Katy and 26 percent of the HOV lane bus riders would continue to ride the bus if the HOV lane was not available. One half of the transit users on the Katy HOV lane and 35 percent of the transit patrons on the Northwest HOV lane indicated they would change travel modes in the absence of the HOV lane. Further, as shown in Figure 25, 92 percent of the Katy, 88 percent of the Northwest, and 65 percent of the East R. L. Thornton bus riders noted that the HOV lanes are very important factors in their decision to use transit.

- **Carpoolers.** As shown in Figure 26, the HOV lanes play a slightly less important role in the decision to carpool. Approximately 73 percent of the carpoolers on the East R. L. Thornton HOV lanes indicated they would continued to carpool in the absence of the HOV lane. In Houston, 40 percent of the Katy and 47 percent of the Northwest HOV lane carpoolers would continue to rideshare without the HOV lanes. However, the Houston facilities would lose many more carpoolers—39 percent on the Katy Freeway and 29 percent on the Northwest Freeway—than the East R. L. Thornton Freeway—14 percent—if the HOV lane was not available.

Perceived HOV Lane Travel Time Savings

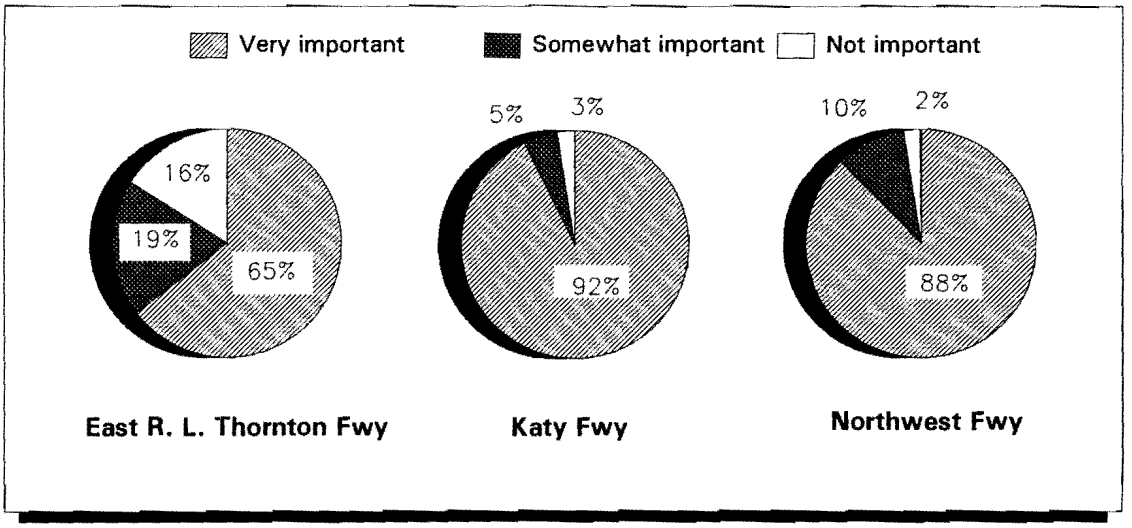
Figures 27 and 28 illustrate the travel time savings transit riders and carpoolers perceive through use of the HOV lanes. As summarized next, the differences in travel time savings among the three facilities relates somewhat to the length of the HOV lanes and traffic congestion on the adjacent freeways.

Figure 24. Impact of HOV Lane on Mode Choice: Transit Users



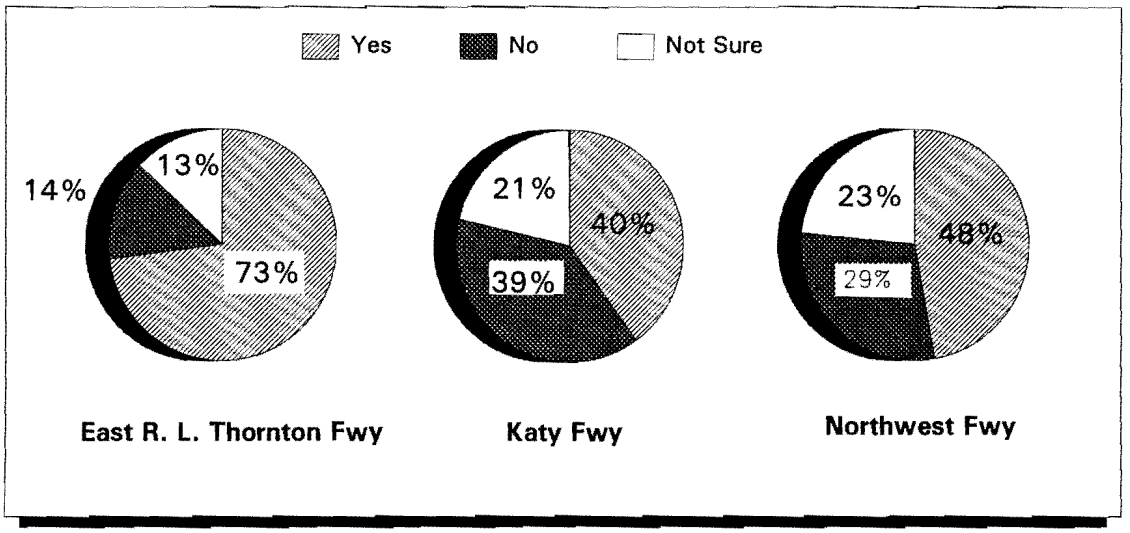
Note: Respondents were asked: "If the HOV lane did not exist, would you be riding the bus now?

Figure 25. Importance of HOV Lane in Decision to Use Transit



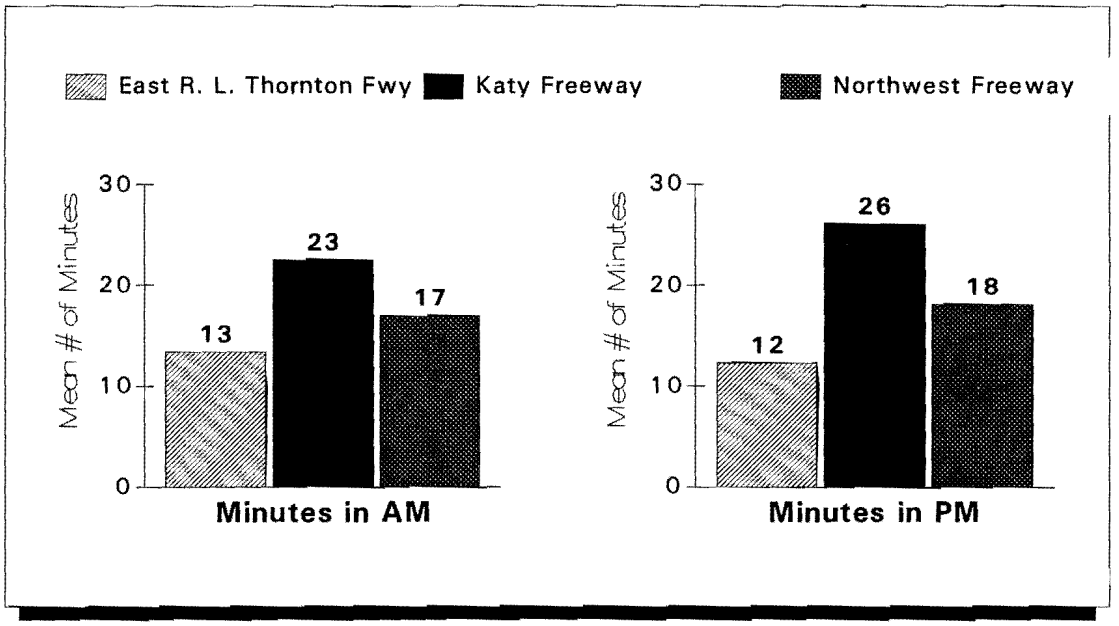
Note: Respondents were asked: "How important is the HOV lane in your decision to ride the bus?"

Figure 26. Impact of HOV Lane on Mode Choice: Carpoolers



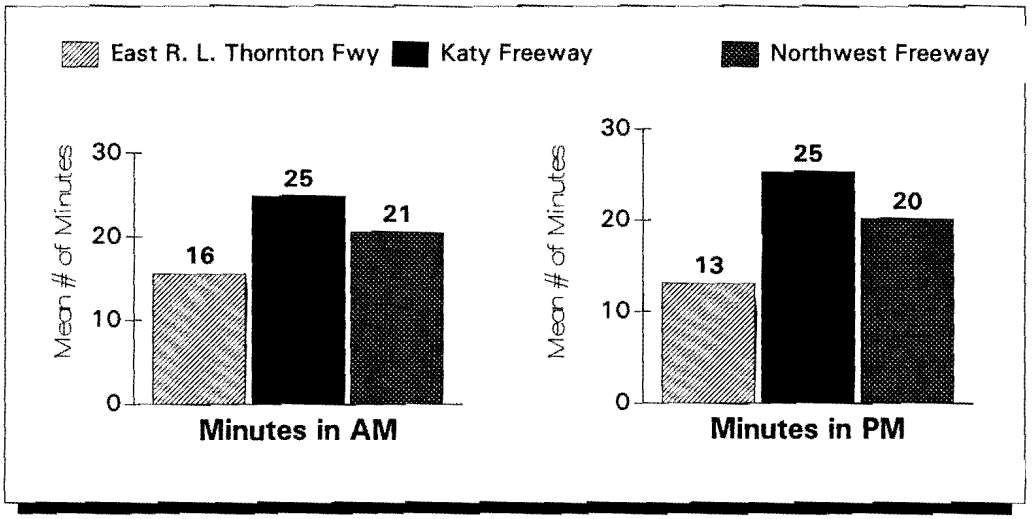
Note: Respondents were asked: "If the HOV lane did not exist, would you be carpooling/vanpooling now?"

Figure 27. Perceived HOV Lane Travel Time Savings: Transit Users



Note: Respondents were asked: "How many minutes, if any, do you believe this bus saves by using the HOV lane instead of the regular traffic lanes?"

Figure 28. Perceived HOV Lane Travel Time Savings: Carpoolers



Note: Respondents were asked: "How many minutes, if any, do you believe your carpool/vanpool saves by using the HOV lane instead of the regular traffic lanes?"

- **Transit Users.** As shown in Figure 27, the most significant travel time benefit is perceived by Katy Freeway HOV lane transit users who attribute close to 23 minutes of savings during the morning commute and just over 26 minutes in the afternoon commute through use of the HOV facility. Northwest Freeway transit users perceived the HOV lane saved less time, with 17 and 18 minutes saved in the morning and afternoon commutes, respectively. East R. L. Thornton HOV lane transit users perceived they saved approximately 13 minutes during their morning trip and just over 12 minutes on their afternoon trip by using the HOV facility.

- **Carpoolers.** Figure 28 illustrates the perceptions of travel time savings by carpoolers using the East R. L. Thornton, Katy, and Northwest HOV lanes. Similar to bus riders, Katy Freeway carpoolers reported the largest time savings, with 25 minutes in the morning and just over 25 minutes in the afternoon. Carpoolers using the Northwest Freeway HOV lane reported a time savings of approximately 20 minutes for both the morning and afternoon commute. East R. L. Thornton HOV lane carpoolers perceived that the HOV lane use reduced their morning and afternoon commutes by approximately 15 and 13 minutes, respectively.

Employer Incentives to Encourage HOV Use

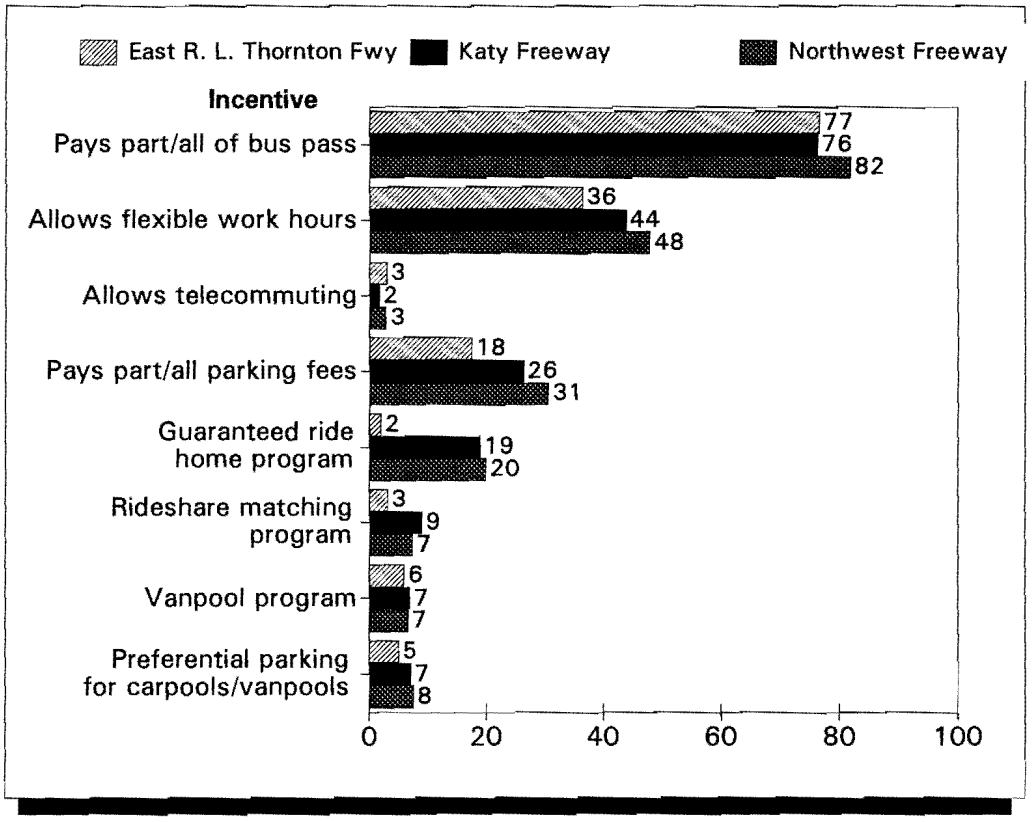
All three user groups were asked to identify any incentives or programs provided by their employers to encourage HOV use. The responses to this question are summarized below and illustrated in Figures 29-31.

- **Transit Users**. As shown in Figure 29, over three fourths of the bus riders in all three corridors indicated that their employer pays for part or all of their bus fare. At the same time, between 17 percent and 30 percent of the bus respondents indicated that their employer paid all or part of their work site parking costs. Houston employers appear to be more likely to pay part or all of an employee's parking fees than in Dallas. Flexible work hours was the second most frequently reported incentive among bus riders. The availability of a guaranteed ride home program was noted more frequently by Houston bus riders than by their counterparts in Dallas. Other employer incentives such as rideshare matching and vanpool programs, preferential parking for carpools, and telecommuting were cited by less than 8 percent of respondents in all three corridors.

- **Carpoolers**. Figure 30 illustrates the responses from carpoolers on the incentives offered by their employers. Flexible work hours was the most frequently cited incentive, although Houston employers appear more likely to offer this incentive than Dallas employers. Employer contributions toward the cost of bus passes, as well as paying for parking fees, were also reported by at least one third of the respondents. Other incentives noted included preferential parking for carpools and vanpools, vanpool programs, guaranteed ride home programs, and ride matching services. Houston employers were again more likely to provide guaranteed ride home programs than Dallas employers.

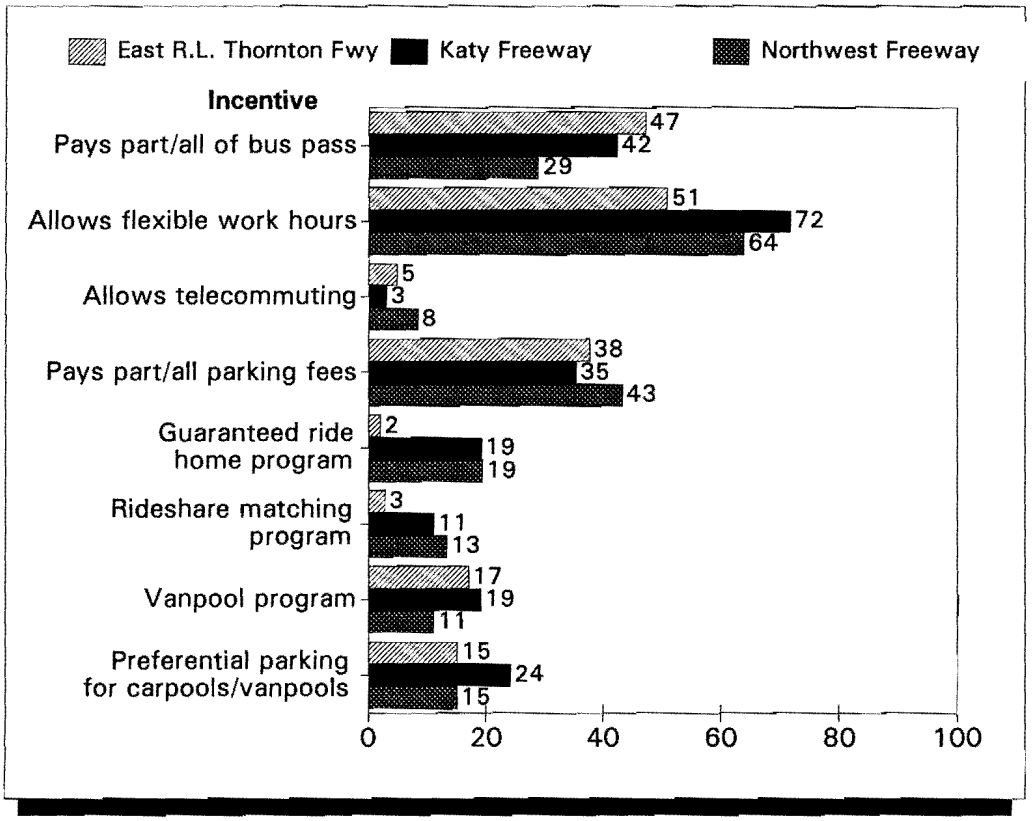
- **Freeway Motorists**. As shown in Figure 31, flexible work hours and employer support of parking fees were the most commonly reported incentives by motorists in all three corridors. Over 50 percent of the respondents noted that their employers allow flexible work hours, while between 44 percent and 54 percent receive subsidies for parking. Freeway motorists reported lower levels of employer bus pass subsidies than bus riders or carpoolers. This may be the case, or motorists may not be aware of transit pass programs offered by their employer.

Figure 29. Employer Incentives to Encourage HOV Use: Transit Users



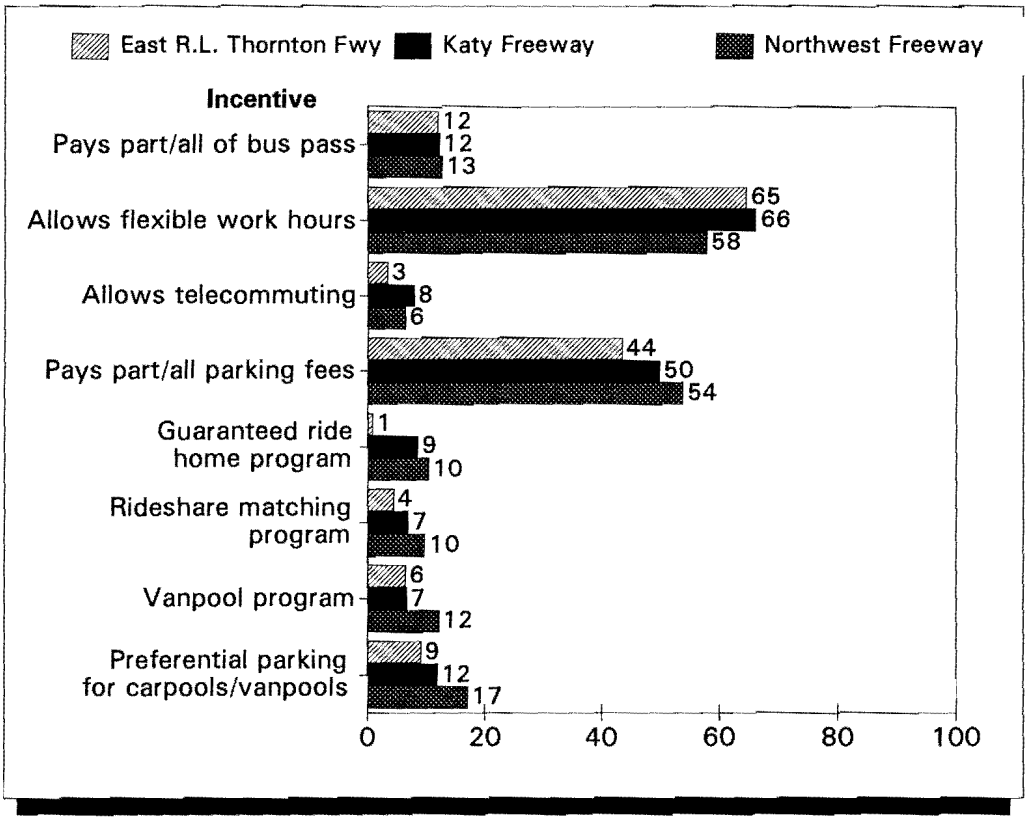
Note: Respondents were asked: "Does your employer provide any of the following?" **(Please check all that apply.)** Percentages do not total 100 percent due to the multiple response nature of the question.

Figure 30. Employer Incentives to Encourage HOV Use: Carpoolers



Note: Respondents were asked: "Does your employer provide any of the following?" **(Please check all that apply.)** Percentages do not total 100 percent due to the multiple response nature of the question.

Figure 31. Employer Incentives to Encourage HOV Use: Freeway Motorists



Note: Respondents were asked: "Does your employer provide any of the following?" **(Please check all that apply.)** Percentages do not total 100 percent due to the multiple response nature of the question.

Strategies to Encourage HOV Use

The surveys included several questions to help evaluate the level of public support for various strategies to encourage HOV use. Alternatives included those commonly found in Texas cities, as well as other techniques being used or considered in urban areas through the country. Survey respondents were given a list of several strategies and asked to identify the approaches they would support. Freeway motorists were also asked if these strategies would influence them to change their travel behavior. The success of these policies and programs to encourage HOV use is largely dependent on public support and acceptance. The results from this part of the survey are summarized into three major categories—expanded transit facilities, employer programs, and policies that increase the cost of driving alone. Tables 8 and 9 provide a summary of the results for all user groups in the three corridors. Figures 32 through 41 also illustrate the responses.

Support for Expanded Transit Facilities

Transit users, carpoolers, and freeway motorists were asked about their level of support for expanded bus services, more park-and-ride lots, additional HOV lanes, and more HOV lane access points to help reduce traffic congestion and improve air quality. The results are presented graphically in Figures 32 through 35 and summarized next. Overall, there was strong support among all three user groups.

- **Expanded Bus Service**. Bus riders, carpoolers, and freeway motorists in all three corridors supported expanding bus services. As could be expected, the highest degree of support came from current bus riders. Approximately 80 percent of the bus users in all three corridors supported this approach. Support among carpoolers and motorists ranged from 26 percent to 48 percent.

- **Additional Park-and-Ride Lots**. Providing more park-and-ride lots was also supported by all three user groups, with bus riders again showing the strongest preference for this strategy. Between 57 percent and 71 percent of the bus passengers supported this technique, compared to 30 percent to 42 percent of the carpoolers and 34 to 39 percent of the freeway motorists.

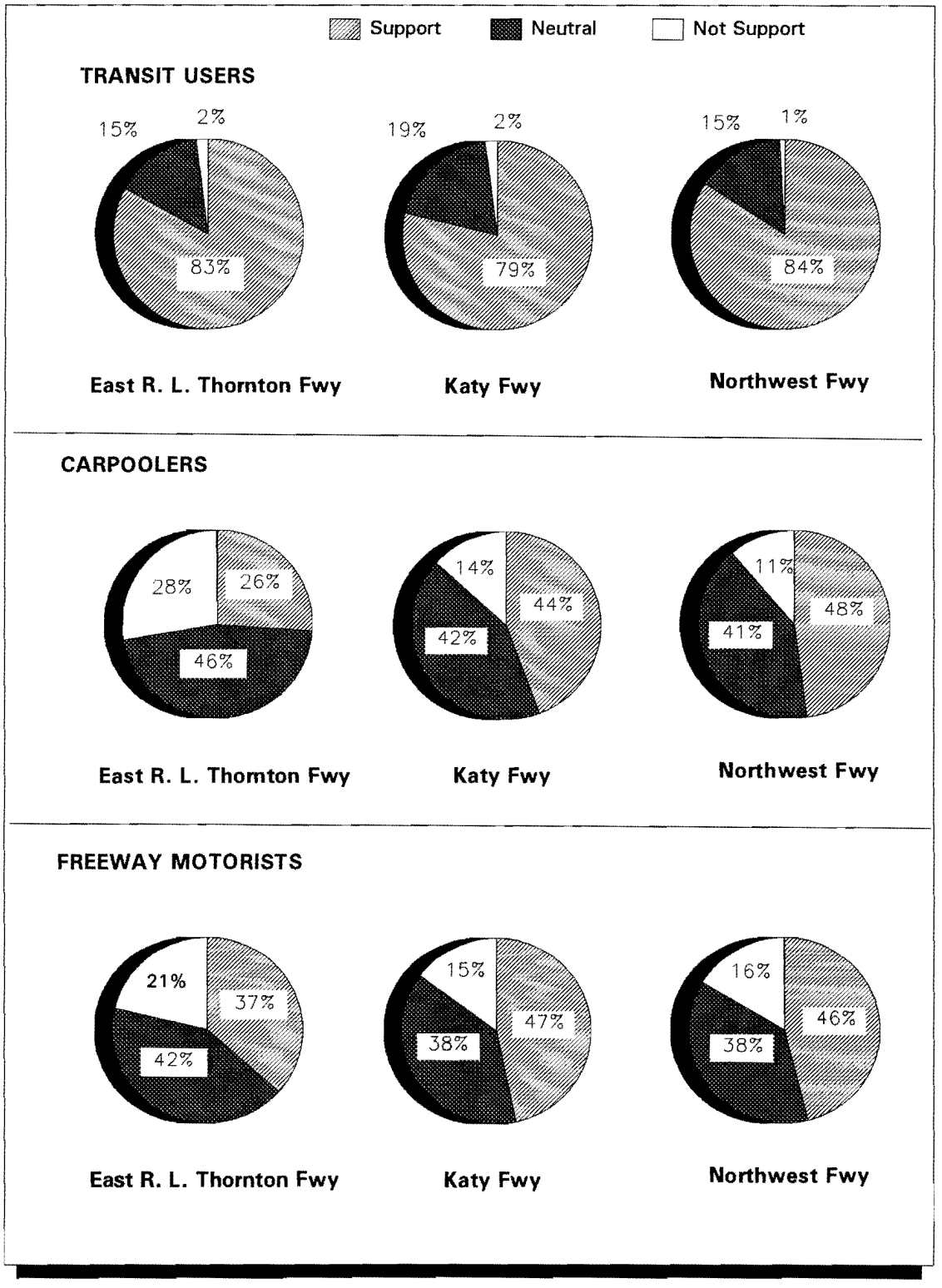
Table 8. Support for Strategies to Encourage HOV Use: Transit Users and Carpoolers

	Transit Users								
	East R. L. Thornton			Katy Freeway			Northwest Freeway		
	Support	Neutral	Not Support	Support	Neutral	Not Support	Support	Neutral	Not Support
Expanded Transit Facilities									
Expanded bus service	83	15	2	78	19	2	84	15	1
More park-and-ride lots	58	39	4	64	31	5	71	24	5
More HOV lanes	75	21	4	67	24	8	63	31	6
More HOV lane access points	59	29	12	48	29	23	48	36	17
Employer programs									
Flexible work hour arrangements	63	32	6	85	13	2	81	17	2
Charging more for parking	9	26	65	7	20	74	7	22	71
Employer incentives for use of buses or ridesharing	82	14	4	90	9	1	92	6	2
Telecommuting	43	48	9	55	40	5	56	41	3
Increase costs of SOV commuting									
Charging for use of roads	9	20	71	8	14	78	5	13	83
Higher gasoline taxes	4	12	84	5	8	87	6	10	85
	Carpoolers								
Expanded Transit Facilities									
Expanded bus service	26	46	28	44	42	13	48	41	11
More park-and-ride lots	30	58	12	32	56	12	42	51	8
More HOV lanes	82	15	3	66	24	10	71	23	6
More HOV lane access points	61	20	19	56	25	19	50	29	21
Employer programs									
Flexible work hour arrangements	66	30	4	76	20	4	78	19	3
Charging more for parking	2	18	80	5	23	72	3	28	69
Employer incentives for use of buses or ridesharing	60	32	8	68	24	9	75	19	6
Telecommuting	43	49	8	47	42	11	51	43	6
Increase costs of SOV commuting									
Charging for use of roads	4	11	85	10	17	73	4	13	83
Higher gasoline taxes	2	5	93	6	10	85	5	8	87

Table 9. Support for Strategies to Encourage HOV Use: Freeway Motorists

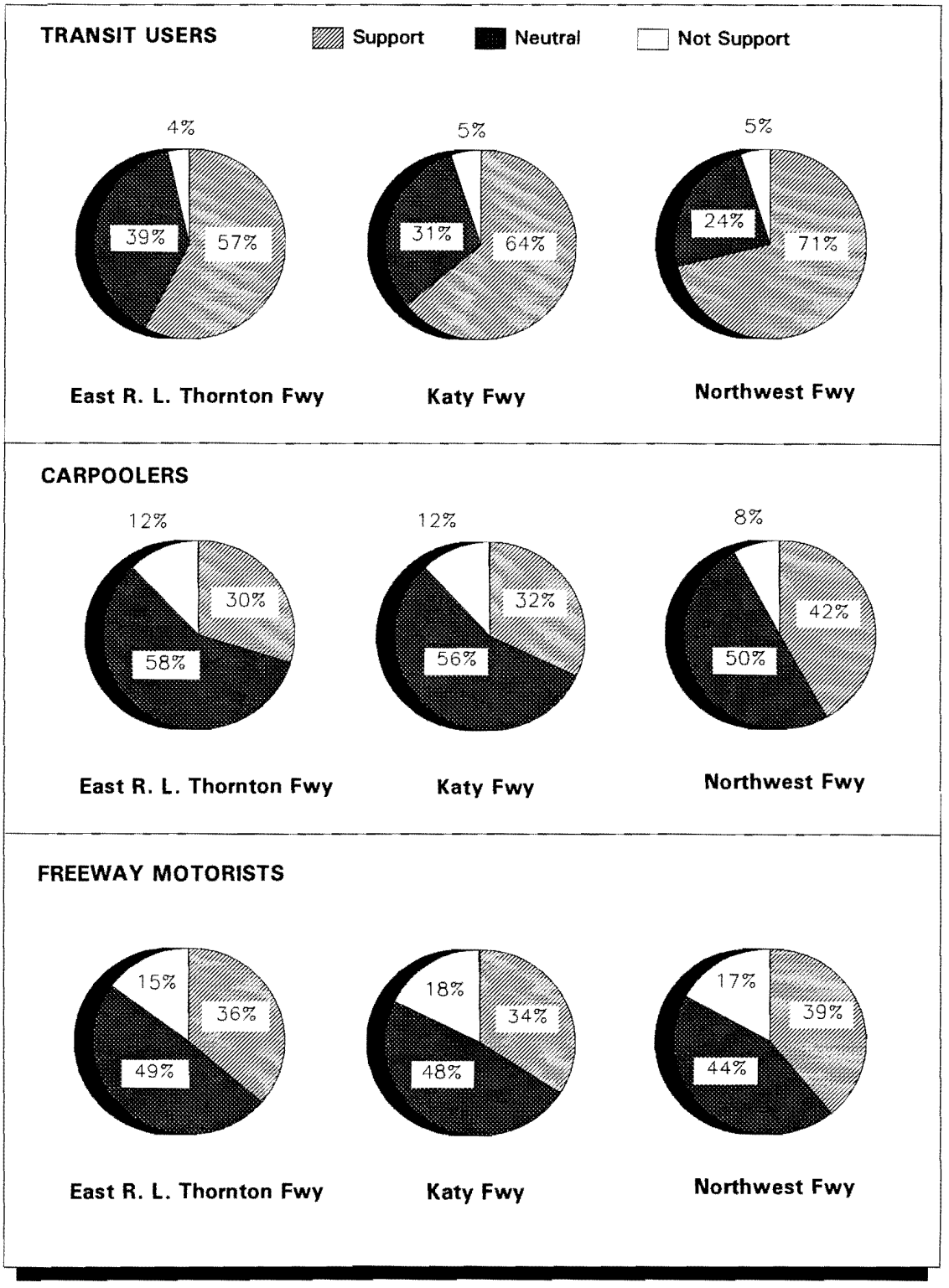
	East R. L. Thornton				
	Support	Neutral	Not Support	Would	Would Not Support
Expanded Transit Facilities					
Expanded bus service	37	42	21	23	77
More park-and-ride lots	36	49	15	19	81
More HOV lanes	41	30	30	21	79
More HOV lane access points	41	35	24	21	79
Employer Programs					
Flexible work hour arrangements	58	35	8	42	58
Charging more for parking	5	22	74	14	86
Employer incentives for use of buses or ridesharing	49	37	14	35	65
Telecommuting	40	46	14	38	62
Increase Costs of SOV Commuting					
Charging for use of roads	4	9	87	29	71
Higher gasoline taxes	3	6	9	21	79
	Katy Freeway				
Expanded Transit Facilities					
Expanded bus service	47	39	15	26	75
More park-and-ride lots	34	48	18	16	84
More HOV lanes	33	33	34	23	78
More HOV lane access points	51	27	22	30	70
Employer Programs					
Flexible work hour arrangements	65	25	10	44	56
Charging more for parking	3	22	75	11	89
Employer incentives for use of buses or ridesharing	51	32	18	35	65
Telecommuting	42	44	14	34	66
Increase Costs of SOV Commuting					
Charging for use of roads	8	12	81	25	75
Higher gasoline taxes	3	8	89	16	84
	Northwest Freeway				
Expanded Transit Facilities					
Expanded bus service	46	38	16	28	72
More park-and-ride lots	39	44	17	21	79
More HOV lanes	29	39	32	17	83
More HOV lane access points	46	33	21	27	73
Employer Programs					
Flexible work hour arrangements	68	22	10	49	51
Charging more for parking	4	18	77	12	88
Employer incentives for use of buses or ridesharing	56	29	15	41	59
Telecommuting	44	42	14	38	62
Increase Costs of SOV Commuting					
Charging for use of roads	4	9	87	26	74
Higher gasoline taxes	3	7	90	19	81

Figure 32. Degree of Support for Expanded Bus Service



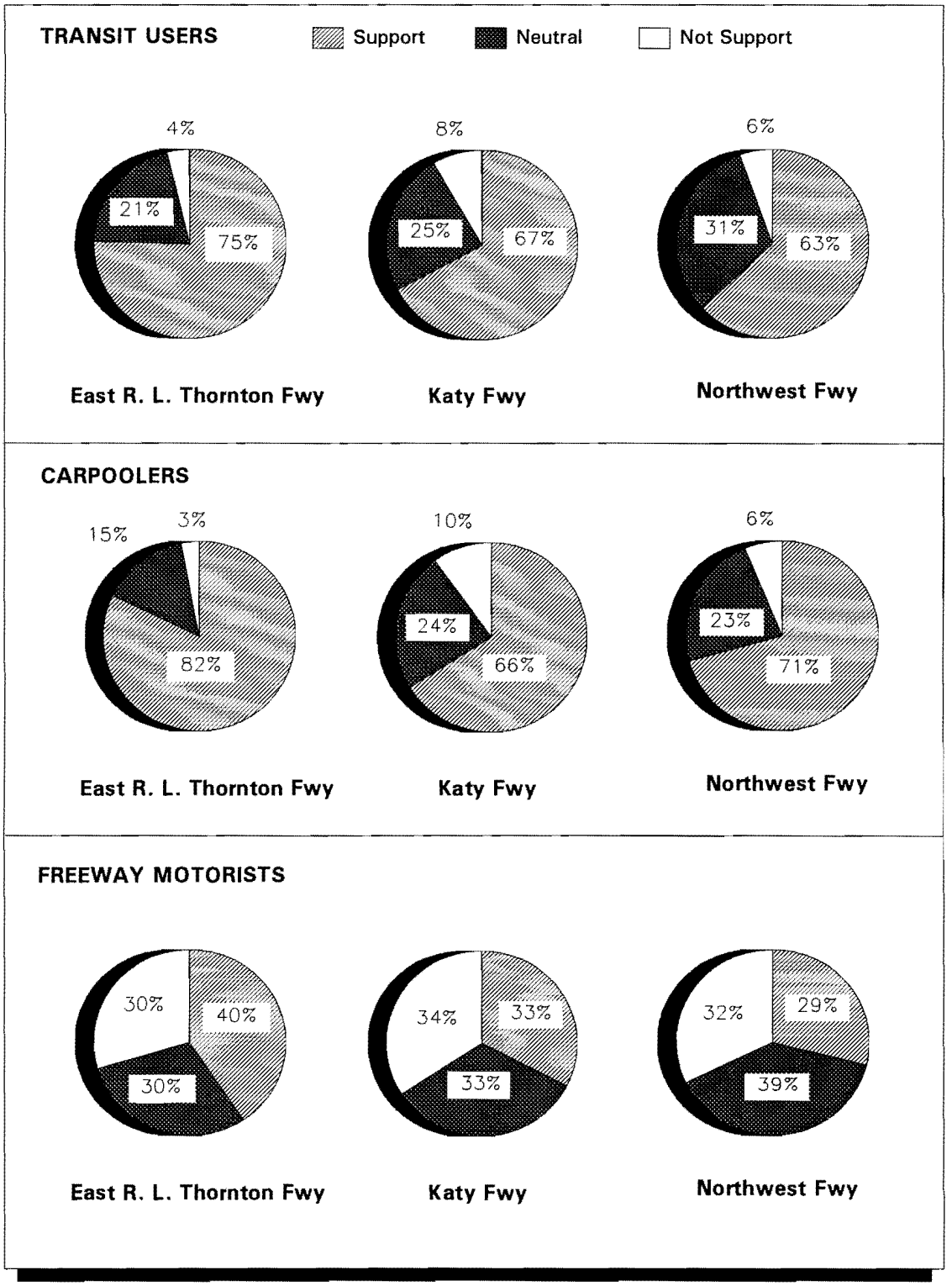
Note: Respondents were asked: "A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches would you support to help address these concerns?"

Figure 33. Degree of Support for More Park-and-Ride Lots



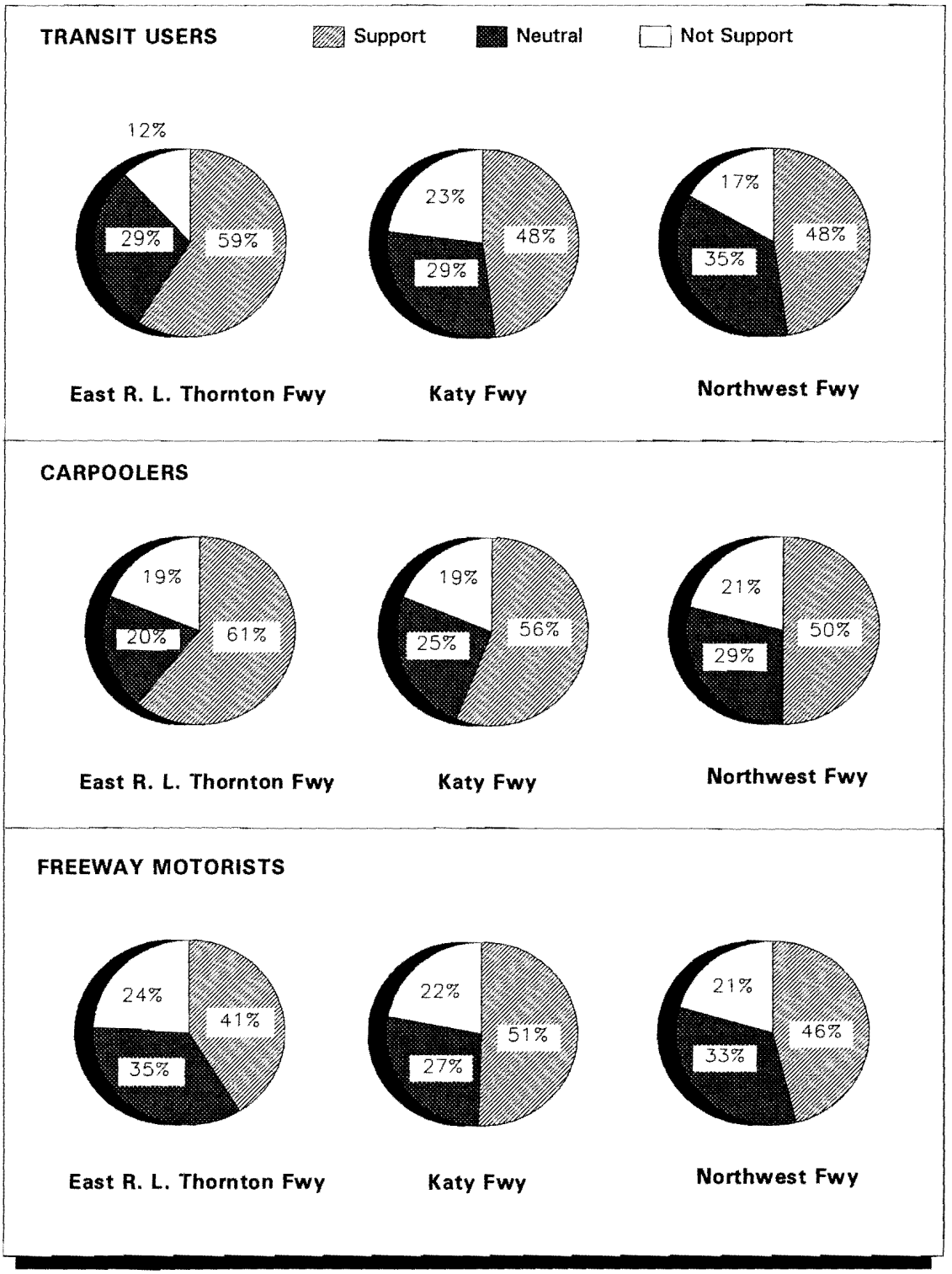
Note: Respondents were asked: "A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches would you support to help address these concerns?"

Figure 34. Degree of Support for the Addition of More HOV Lanes



Note: Respondents were asked: "A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches would you support to help address these concerns?"

Figure 35. Degree of Support for the Addition of More HOV Lane Access Points



Note: Respondents were asked: "A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches would you support to help address these concerns?"

- **Additional HOV Lanes.** Carpoolers and bus riders strongly supported the development of additional HOV lanes, while freeway motorists were more neutral on this technique. Between 71 percent and 82 percent of carpoolers in the three corridors supported adding more HOV lanes. Support was also strong from bus riders with between 63 percent and 75 percent favoring this approach. Support among motorists in the three corridors averaged between 29 percent and 40 percent.

- **Additional HOV Lane Access Points.** Providing additional HOV lane access points received slightly lower levels of support than the other three strategies in this category. Approximately half of the respondents in all three user groups supported this approach.

Support For Employer Programs to Encourage HOV Use

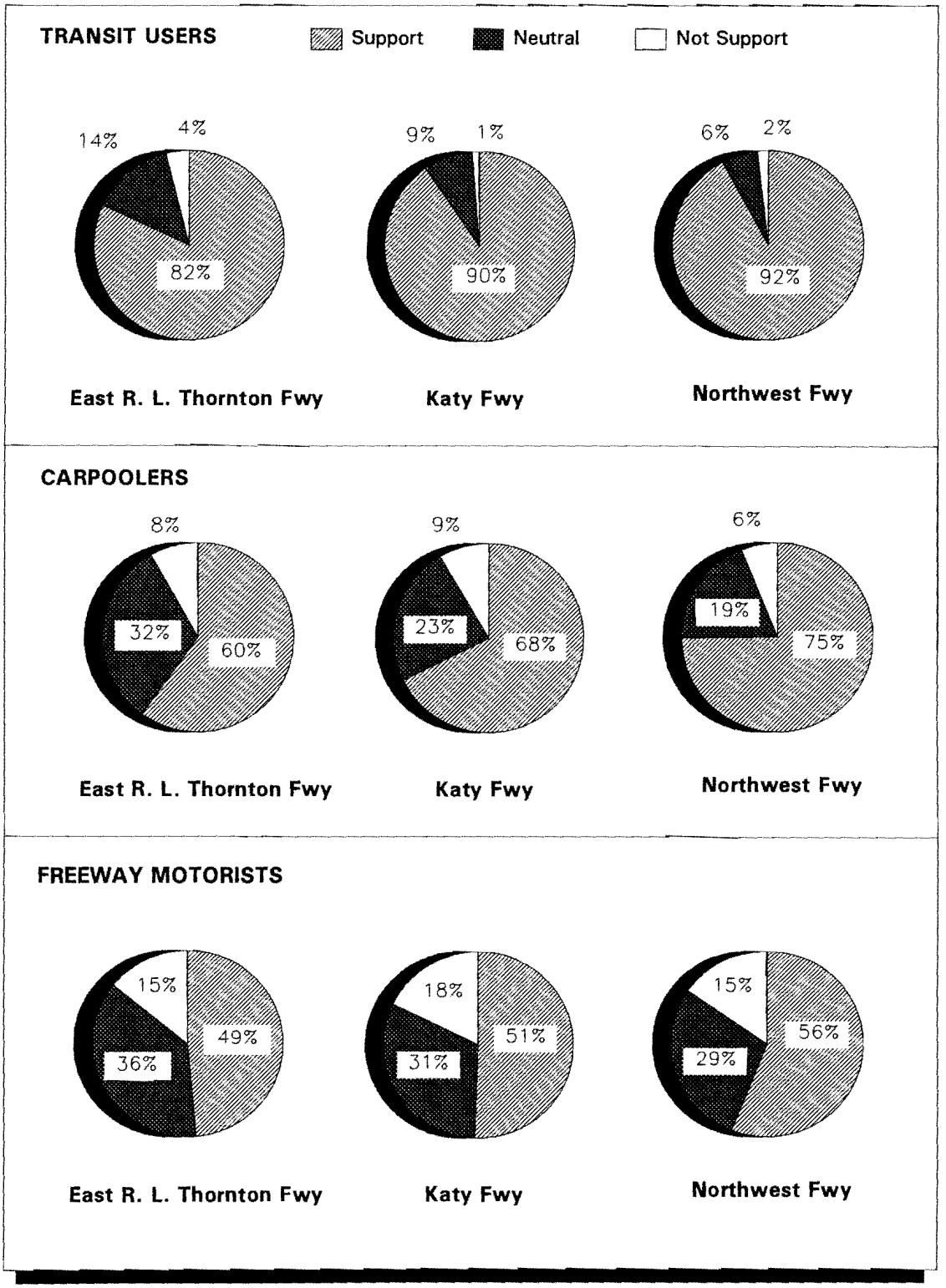
Survey respondents were asked to indicate their degree of support for several employer-based strategies to encourage HOV travel to and from the work site, including employer incentives for transit and carpool use, flexible work hour arrangements, and telecommuting. As summarized below and illustrated in Figures 36 through 38, there was fairly strong support for these approaches among bus riders, carpoolers, and motorists in all three corridors.

- **Incentives for Ridesharing and Transit Use.** Bus riders and carpoolers strongly supported the use of incentives by their employers. Over 80 percent of the Dallas bus riders and over 90 percent of the Houston passengers supported this approach. Carpoolers' preference for employer incentives were slightly lower, ranging between 60 percent and 75 percent. Although they may not make use of these incentives, motorists still showed support for this approach with approximately half indicating approval.

- **Flexible Work Hour Arrangements.** All user groups in the three corridors expressed support for flexible work hour arrangements. Approximately 60 percent of all respondents indicated support for this incentive.

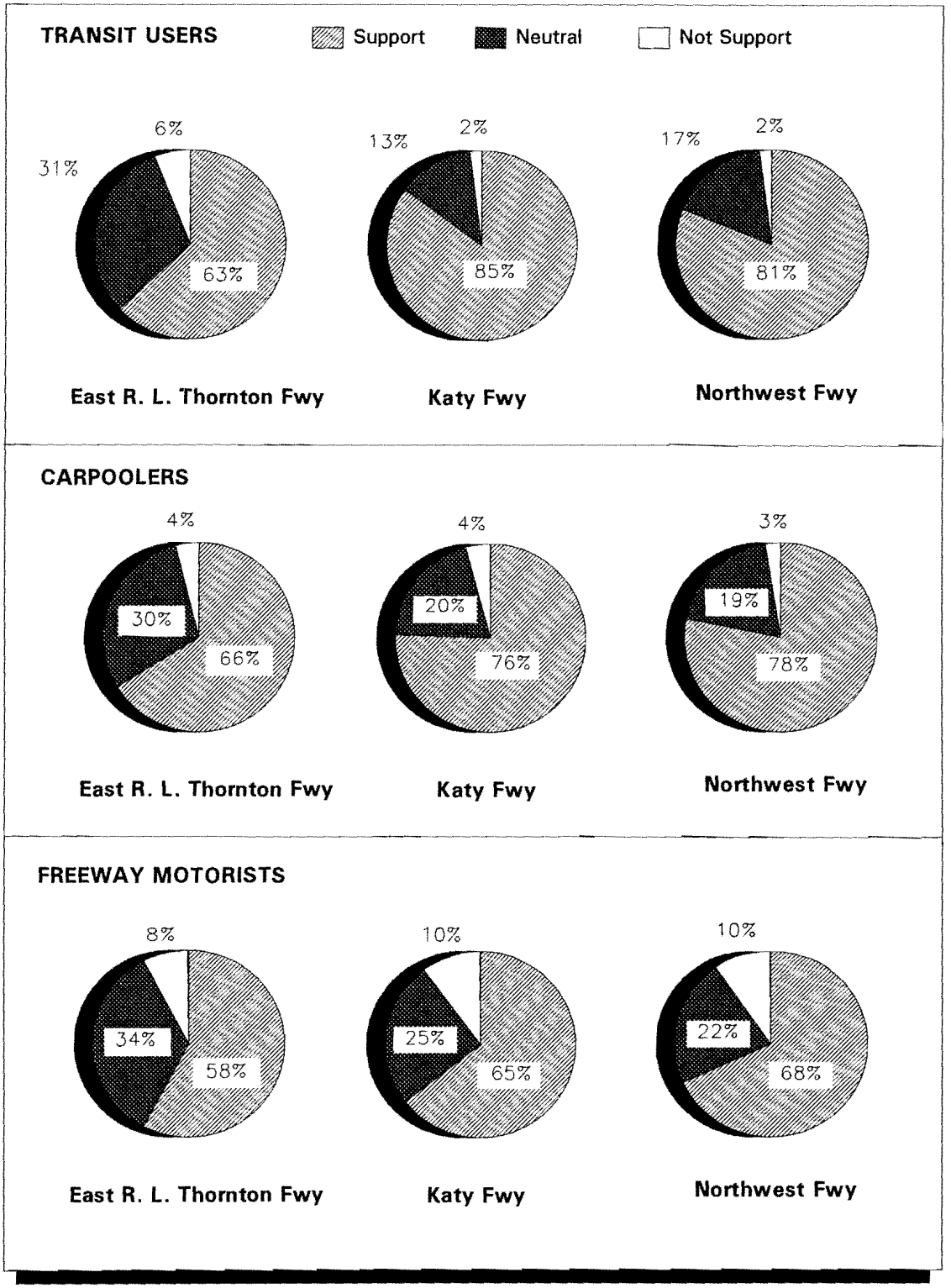
- **Telecommuting.** Telecommuting received a slightly lower level of support among all groups than flexible work hour arrangements, although at least 40 percent of the respondents in all three corridors favored this approach.

Figure 36. Degree of Support for Employer Incentives To Rideshare and Use Transit



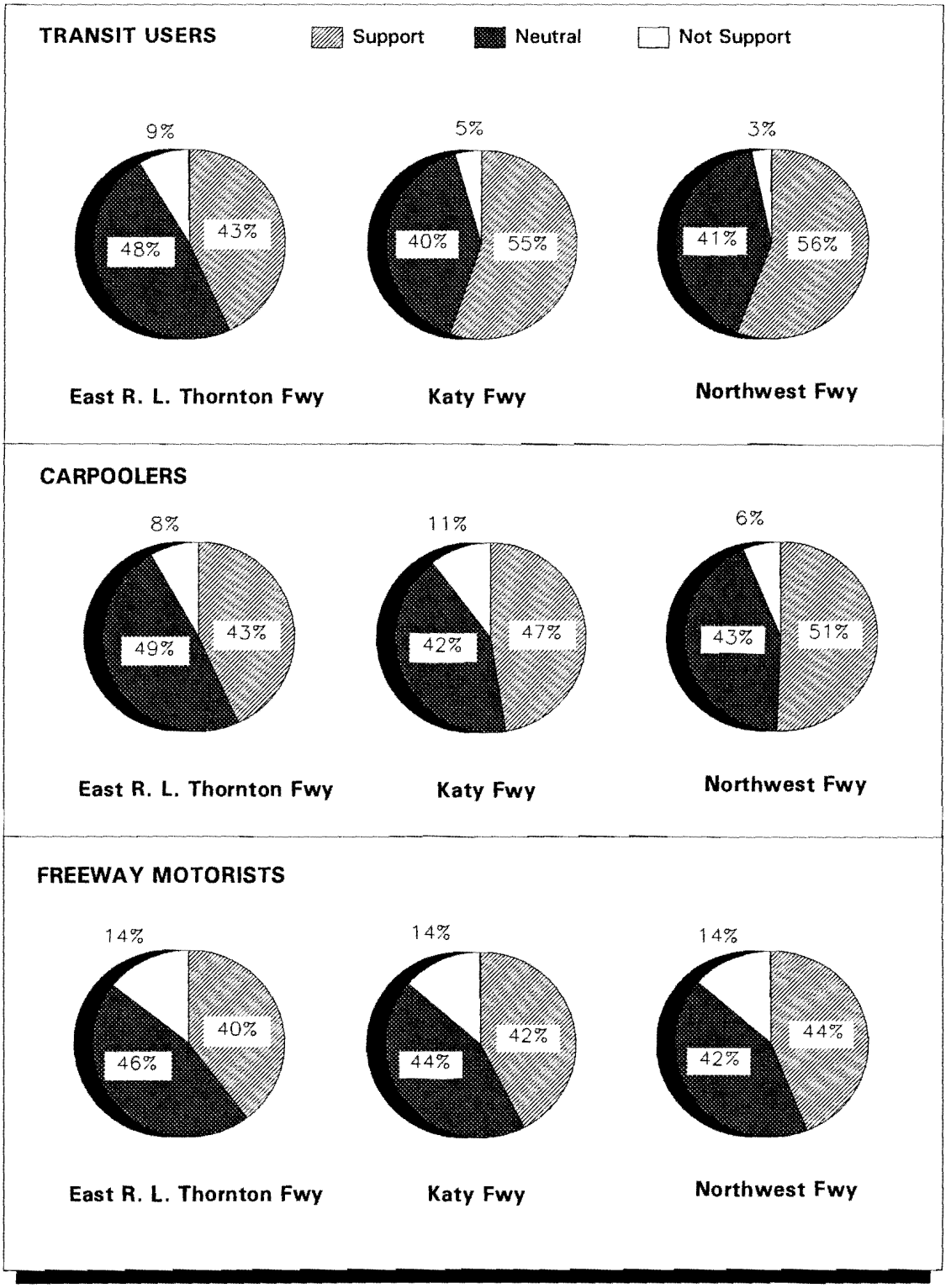
Note: Respondents were asked: "A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches would you support to help address these concerns?"

Figure 37. Degree of Support for Flexible Work Hour Arrangements



Note: Respondents were asked: "A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches would you support to help address these concerns?"

Figure 38. Degree of Support for Telecommuting



Note: Respondents were asked: "A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches would you support to help address these concerns?"

Support for Measures That Increase the Cost of Operating Automobiles

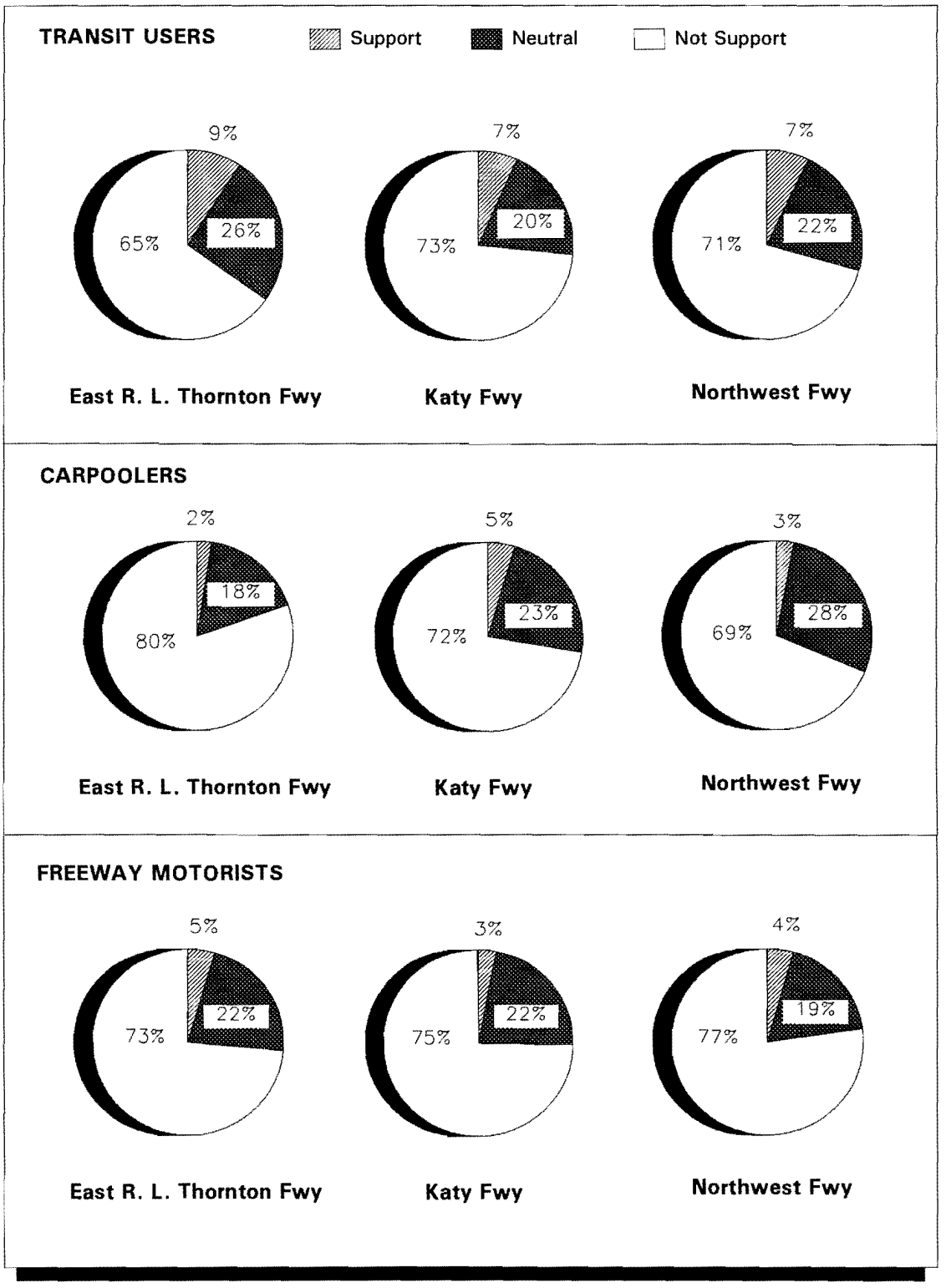
Three pricing strategies were included in the survey. These were higher parking charges, increased gasoline taxes, and charging for the use of roads or congestion pricing. As illustrated in Figures 39 through 41 and summarized next, there was little support for these approaches by any user group.

- **Higher Parking Fees**. None of the user groups in the three corridors supported higher parking fees for single-occupant vehicles. Less than 10 percent indicated support for this approach, while between 65 percent and 80 percent noted they would not support increased parking fees.

- **Increased Gasoline Taxes**. This strategy was also not supported by any group. Between 84 percent and 93 percent of the respondents opposed higher gasoline taxes, with 6 percent or less indicating any support for this approach.

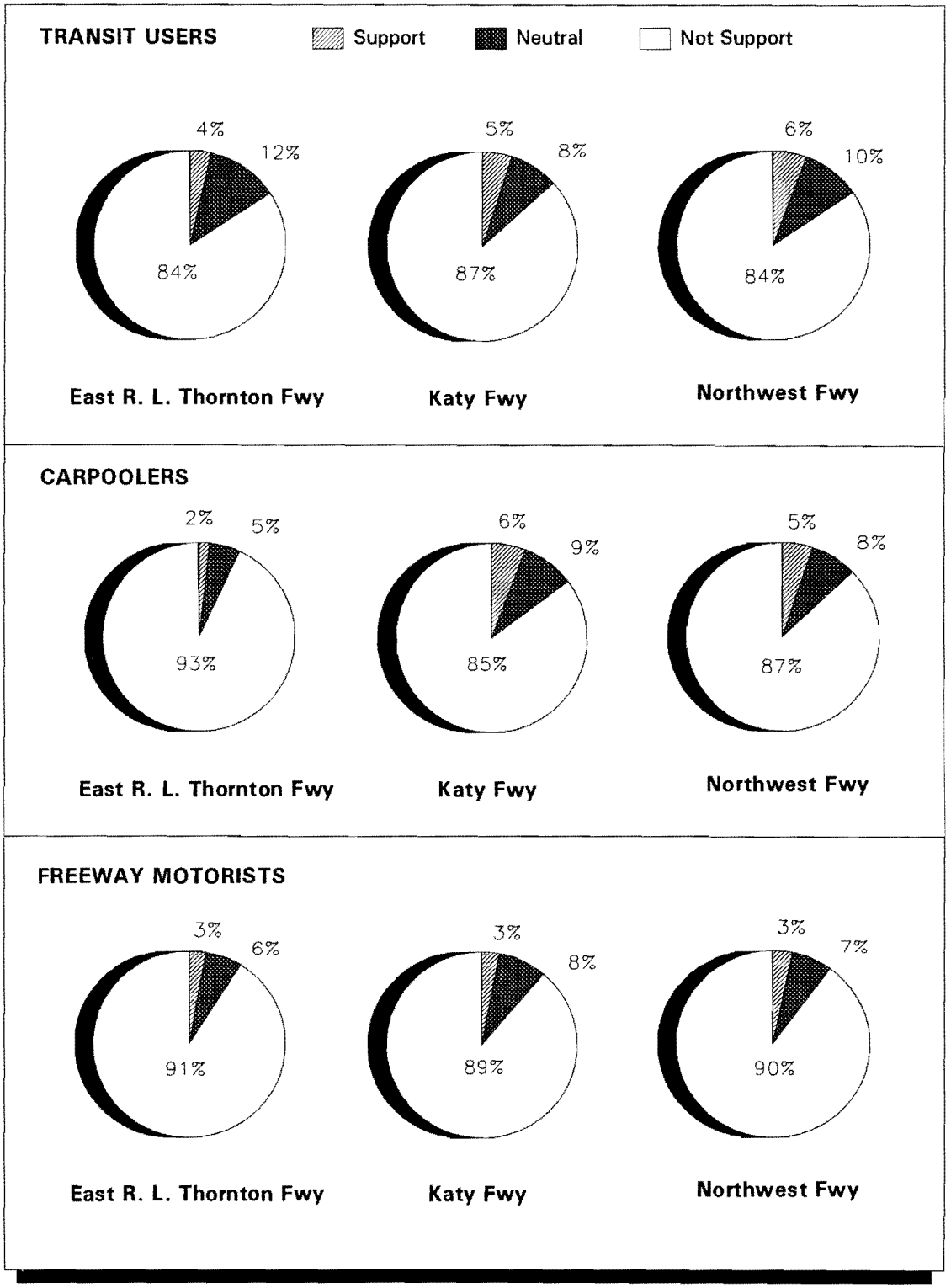
- **Charging for Use of Roads**. At least 70 percent of the respondents in all user groups in the three corridors would not support congestion pricing. Support for this approach was 10 percent or less among the various groups.

Figure 39. Degree of Support for Higher Parking Fees



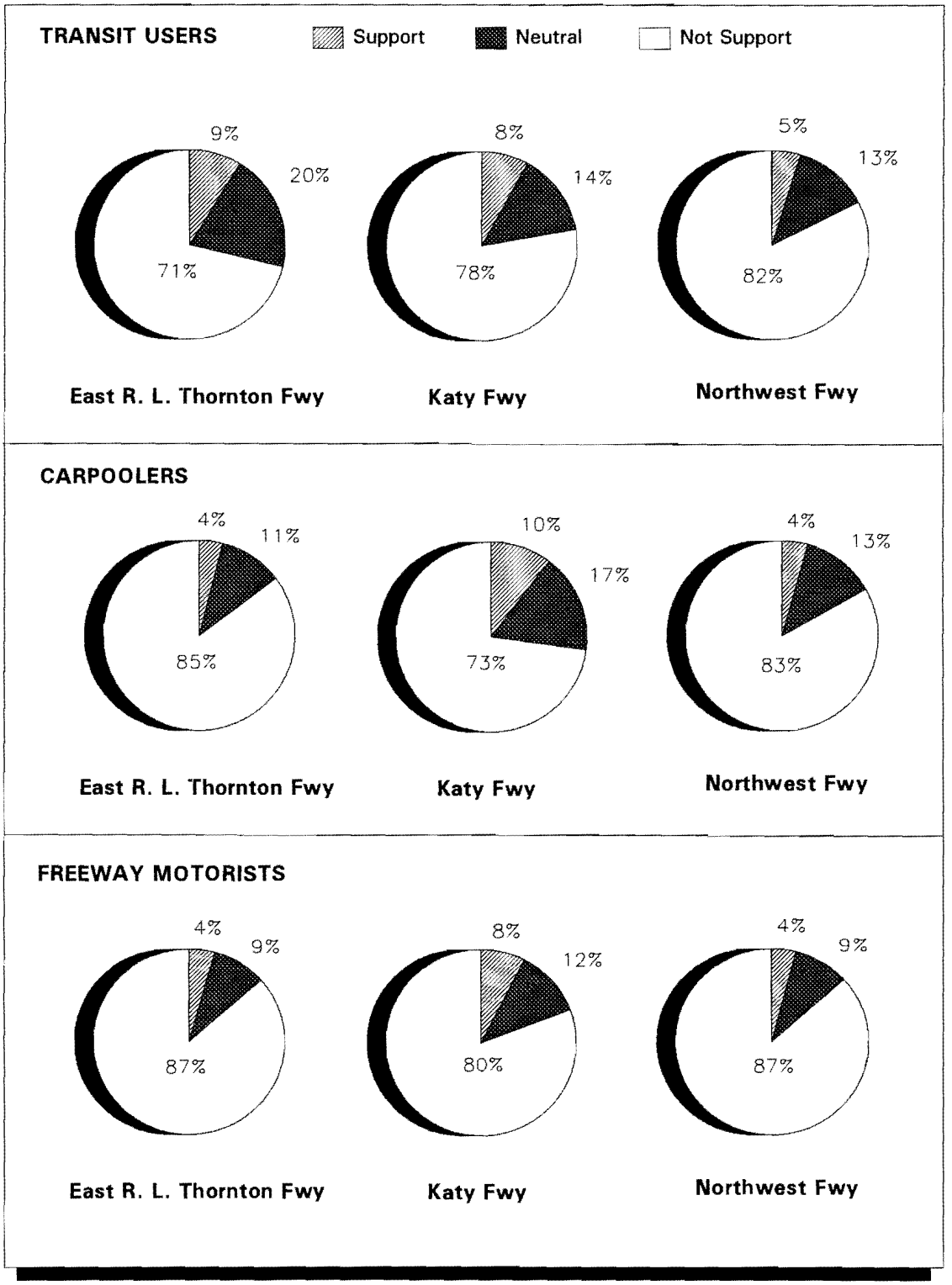
Note: Respondents were asked: "A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches would you support to help address these concerns?"

Figure 40. Degree of Support for Higher Gasoline Taxes



Note: Respondents were asked: "A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches would you support to help address these concerns?"

Figure 41. Degree of Support for Charging For Use of Roads



Note: Respondents were asked: "A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches would you support to help address these concerns?"

V. CONCLUSIONS

This report has provided an overview of strategies and techniques to encourage greater use of HOV and alternative commute modes. The national experience with different approaches was reviewed, and programs within Texas were assessed. Information from the national literature review, the discussion groups, the Houston ETR plans, and the surveys of HOV lane users and non-users in Dallas and Houston were analyzed.

The results of this study indicate that a wide range of strategies, techniques, and programs are in use throughout the state and the country to encourage alternative commute modes and other efforts aimed at managing demand on the transportation system. The results also suggest that some approaches are favored more than others by commuters, public agencies, and private businesses in Texas. This information was used to better define the techniques that appear most appropriate for further application in Texas and those that appear to have the greatest chance of success.

This chapter reviews each of the 12 general strategies described previously and identifies those that appear to be most appropriate for further consideration in the state. Specific techniques within the 12 categories are highlighted as appropriate. Suggestions on potential implementation approaches are also described, along with areas for additional research.

STRATEGIES FOR FURTHER APPLICATION

In assessing potential programs and strategies, it is important to remember some of the unique aspects of many metropolitan areas in Texas. These include low density land use and development patterns, fewer land use controls in some cities, a relatively stable source of funding for the metropolitan transit authorities (MTAs), and active private sector invovlement in many activities. Some of these factors, such as lower densities and the lack of land use controls in some areas, may work against strategies to encourage HOV and other alternate commute modes. Others, such as stable funding sources for the larger transit agencies and the active participation of the business community in various programs, provide opportunities to undertake new and innovative efforts. The potential to implement additional techniques and programs in each of the twelve general areas are reviewed next. Those that appear most appropriate for further use in Texas are highlighted, and the groups that should be involved in implementing the techniques are identified.

- **Transit Services**. The study results indicate that there is widespread support for expanding and enhancing transit services. Commuters, public agencies, and private businesses all responded favorably to strategies that enhance existing transit services, such as those oriented to the traditional markets, as well as innovative approaches to serving new markets. Transit agencies in Texas are implementing new suburb-to-suburb, subscription, crosstown, reverse commute, and route deviation services to try to meet the needs of emerging markets. Expanding and enhancing transit services should continue to be a high priority for transit agencies, businesses, TMOs, TxDOT, and other groups.

- **Support Facilities**. There was also strong support among all groups for additional facilities to enhance the use of transit and ridesharing. TxDOT, transit agencies, local communities, developers, businesses, and other groups should continue to pursue the development and operation of a wide range of supporting facilities. These may include HOV lanes, park-and-ride lots, transit centers, LRT and bus coordination, shelters, and other facilities.

- **Rideshare Programs**. Widespread support was voiced for carpool and vanpool programs and other ridematching services. Although these programs are appropriate for all travel markets, targeting them to areas without fixed-route transit services and to other markets that are hard to serve with more traditional transit modes should be a priority. New and innovative rideshare approaches, including real-time ridematching, casual carpooling, and application of intelligent transportation system (ITS) technologies, should be pursued rather than relying solely on the traditional match list. Rideshare programs within transit agencies, TxDOT, MPOs, TMOs, and private businesses should continue to work together on these approaches.

- **Guaranteed Ride Home Programs**. The fact that guaranteed ride home programs were rated as the top enhancement on the Houston ETR surveys provides an indication of the value commuters place on these services. The results from the discussion groups further indicate that these programs have widespread support among top management in public agencies and private businesses. The state and national experience indicates that employees do not abuse the privileges of guaranteed ride home programs, and, therefore, they are very cost effective. As a result, the use of guaranteed ride home programs should be actively pursued by public and private sector groups in Texas.

- **Bicycling and Walking**. Commuting by bicycling and walking elicit lower levels of interest and support. The hot and humid weather during much of the year, long commute distances, and the lack of showers and changing facilities at most employment sites appear to limit the potential use of these strategies. Commuting by bicycling and walking may have applications in some areas, however, and efforts to promote these alternatives should be focused carefully on these opportunities. Cities, MPOs, TxDOT, private businesses, and bicycle groups should work together on these applications.

- **Employer Incentives**. HOV lane users and non-users in Houston and Dallas and employees in Houston responding to the ETR surveys view a number of employer incentives positively. These included subsidizing bus passes, payroll deduction for transit passes, on-site bus pass sales, and other incentives. The NCTCOG program was the only effort identified which currently provides cash incentives for alternative commute modes. Both the public and private sectors should be encouraged to continue existing incentives and to develop new programs.

- **On-Site Amenities**. The results from the Houston ETR surveys and the discussion groups indicate there is support for various on-site amenities. The provision of on-site amenities or the addition of services in close proximity to major work sites should continue to be explored and developed by private businesses and public agencies. Given the costs involved with many on-site facilities, these efforts should be carefully planned and implemented to help ensure that any amenities will be used by employees.

- **Parking Management and Parking Pricing**. These techniques have not been used extensively within Texas, although examples do exist of parking management programs which provide preferential parking to carpools and vanpools. There was support among discussion group participants, as well as employees responding to the Houston ETR surveys and the Houston and Dallas HOV user and non-user surveys for preferential parking strategies for HOVs. Little support was voiced for parking pricing strategies, however. Given this lack of interest, it does not appear that widespread parking pricing programs will be used in the near future. It may be appropriate to consider a few demonstration projects focusing on parking pricing and supply strategies to test these concepts.

- **Work Schedule Management**. Strong support was voiced by all groups for various work schedule management strategies. Staggered schedules, flexible work hours, and compressed work weeks rated the highest, followed by telecommuting. Management

personnel in the discussion groups did raise some concerns with these techniques, however, especially with telecommuting. These approaches are currently being used by both the public and private sectors and further implementation should be supported by all groups. These techniques have beneficial impacts on the transportation system and are of personal benefit to employees.

- **Congestion Pricing**. Little support was voiced for congestion pricing although some interest was expressed for charging single-occupant vehicles for use of the HOV lanes in Dallas and Houston. This approach may be more appropriate, and more amenable to commuters, at some future point. Monitoring the assessment of a possible Houston HOV lane demonstration and any test that may be conducted is appropriate. The results of this project can be used to help assess the potential for additional applications of congestion pricing in the state.

- **Land Use and Development Regulations**. Strategies involving greater coordination of land use and development patterns, public transportation, roadway improvements, and other elements of the transportation system should be encouraged. These may include providing joint development opportunities, enhancing planning and zoning around major transit stations and park-and-ride facilities, and better integrating new developments to support HOV use and alternative commute modes. Local communities, private businesses, and developers will need to take the lead on these strategies. TxDOT, transit agencies, MPOs, TMOs, and other groups can play important roles supporting and assisting with the planning and implementation of these techniques.

- **Public Awareness Campaigns and New Organizational Structures**. Many of the discussion group participants stressed the need for ongoing informational and educational efforts aimed at the general public, policy makers, and businesses. Continued support should be provided by all groups for the development, implementation, and ongoing use of public information campaigns and other related activities. The recent efforts undertaken in Austin and the Dallas/Fort Worth area, as well as the state wide program being developed by TxDOT, provide excellent examples of public informational efforts. Additional programs could be initiated in other areas. TxDOT can play a key role in helping promote these activities. Further, development and use of TMOs, TMAs, and other innovative organizational structures should be encouraged. Providing ongoing support and technical assistance to these

groups is appropriate. TxDOT, local agencies, MPOs, and private businesses should all support these efforts and actively participate in the new organizations.

- **Comprehensive Programs**. Consideration should also be given to the development and implementation of comprehensive programs in major cities in Texas. Although efforts have been made in this direction in some areas, additional elements may be needed in various programs. All groups—TxDOT, transit agencies, MPOs, local communities, TMOs, and private businesses—should be involved in the development and implementation of comprehensive programs.

- **Other Approaches**. ITS technologies may help encourage the use of HOV and alternative commute modes. TTI, through the Texas A&M ITS Research Center of Excellence, is currently exploring innovative applications of ITS technologies to enhance the use of transit, carpools, vanpools, and other TDM strategies. TxDOT is participating in these efforts, and possible demonstration projects may be implemented in the future.

IMPLEMENTATION

A number of techniques are appropriate to help implement the strategies described in the previous section. The successful planning, implementation, and ongoing operation of these strategies will require the coordinated efforts of numerous groups. TxDOT, transit agencies, MPOs, TMOs, local governments, private businesses, and other organizations will all need to be involved. Further, a wide range of approaches can be used to help encourage the use of the strategies described in this report. The following highlight a few of the techniques TxDOT and other groups may wish to consider.

- **Videos**. A video could be produced explaining the various strategies that can be used to encourage the use of HOVs and alternative commute modes. The video could include state and national examples, as well as describing techniques to plan and implement different approaches.

- **Training Courses**. A training course or seminar could be developed and offered providing a summary of the various techniques and methods to plan and implement specific elements. It might be appropriate to provide a general overview seminar for policy and management level personnel and a more detailed course focusing on technical staff.

- **Educational Outreach Program**. TxDOT could utilize the new *Don't Be An SOV* program and other information to develop a state-wide educational outreach program. Such an effort would be aimed at the general public and could be coordinated with local public and private sector groups throughout the state.

- **Technical Assistance**. A technical assistance program could be developed to provide ongoing support to TMOs, private businesses, public agencies, and other groups interested in implementing the strategies discussed in this report. Such a program could be developed and funded at the metropolitan level or at the state level.

- **Use of Advanced Technologies**. Electronic mail, a Home Page on the World Wide Web, and video and telephone conferencing could all be used to provide ongoing assistance, education, and outreach efforts. Consideration could be given to coordinating these activities at the state level, through TxDOT, or at the regional level through MPOs.

ADDITIONAL RESEARCH

This research project examined various techniques to encourage greater use of HOVs and alternative commute modes. It built on previous studies conducted by TTI and others on the factors that influence commute mode choice, commuter preferences toward different strategies, and the impact of various techniques on commuter behavior. As such, it has helped enhance the understanding of commute mode choice and the strategies that appear most appropriate for further application in Texas.

Additional research in the future should focus on continuing to expand the level of knowledge in these areas. For example, it would be beneficial to monitor and evaluate the impact of new programs in the state, such as the NCTCOG payment for alternative mode use and the innovative transit services being implemented in many areas. Continuing research studies focusing on commuter behavior and the factors that influence mode choice will be important in the future.

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APPENDIX A—SCRIPT FOR PRIVATE SECTOR DISCUSSION GROUPS

ENCOURAGING HOV USE—DISCUSSION QUESTIONS FOR PRIVATE SECTOR

The Texas Transportation Institute (TTI), a part of The Texas A&M University System, is conducting a research project for the Texas Department of Transportation (TxDOT) focusing on techniques that can be used to encourage greater use of high-occupancy vehicles (HOV), including buses, carpools and vanpools, and other strategies to better manage demand on the transportation system. As part of this study, information is being gathered from major employers and businesses to obtain a better understanding of employer-based strategies and approaches that impact private sector groups. The intent of this element of the study is to develop a realistic assessment of approaches to encourage HOV use that the private sector may feel are most appropriate and the potential issues associated with implementation of the identified strategies.

Your help in this effort is greatly appreciated. The following list of questions is provided for discussion. In addition, please feel free to write any comments and return them at the end of the meeting, or mail them to the address given at the end of this form. Thank you again for your assistance!

I. In general, how do your employees get to and from work? Do you have any idea of the approximate number or percentage who take the bus, carpool, vanpool, or drive alone?

II. Has your company implemented, or are you considering, any of the following programs to help encourage greater use of high-occupancy commute modes?

- Subsidize employee transit use (passes, vouchers, etc.).
- Promote rideshare programs.
  -In-house.
  -Transit agency program.
- Guaranteed Ride Home program.

- Provide other incentives to employees to use bus or carpool/vanpool.

- Allow employees to work alternative schedules? If yes, what type of schedules are used?

- Allow employees to telecommute, part- or full-time?

III. Do you plan to implement any other programs or strategies to encourage HOV use?

IV. Are there any factors that limit the ability of your company to implement any strategies to encourage HOV use?

V. Studies have indicated that the cost and location of parking has a significant impact on commute mode choice. Do you provide free parking for your employees?

- If your company charges for parking, what is the rate?

- How far from your workplace is employee parking located?

- Would you consider initiating parking charges, or raising parking fees, to encourage greater use of alternative commute modes?

VI. Do you have, or do you intend to add, any physical amenities to encourage alternate commute modes—such as bus shelters, sidewalks from transit stops, bike racks, and shower facilities?

- Would you consider adding any of these?

VII. What interaction have you had with METRO, DART, TxDOT, and other public agencies to help with your programs? What could these agencies do to help you implement various strategies to encourage HOV use?

VIII. In general, how effective do you think the following strategies are at reducing the use of single-occupant vehicles and encouraging HOVs, from an employee and employer perspective?

- Car/Vanpooling programs.
- Employer programs:

  -Financial incentives to employees.

  -In-house rideshare programs.

  -Guaranteed ride home services.

  -Alternative work arrangements.

  -Telecommuting.

  -Transportation management organizations/associations.

- Parking management—including preferential parking for car/vanpool vehicles, charging for parking, raising parking fees.
- Transit education and outreach programs.
- Enhanced transit services—from transit providers.

  -Reverse commute programs.

  -High-occupancy vehicle facilities.

  -Park-and-ride lots.

  -Express bus service.

  -Suburb-to-suburb services.

- Employer support services provided by transit agencies.

- Increasing the costs of owning and operating automobiles.

- Planning policies, land use controls, and development regulations to guide growth in denser patterns.

- Joint development and site design improvements.

IX. Congestion pricing—or charging commuters for use of roadways during different times of the day—has been discussed recently at the national and local level. How do you think your employees would react to this concept?

X. Is your company required to draft a trip reduction plan under the Clean Air Act Amendments?

XI. Do you have any other suggestions or ideas for approaches to encourage high-occupancy vehicle use that should be considered in the Houston area?

Thank you for your time. If you have any questions on this discussion guide, or would like to provide additional information, please contact Kevin Hall, Nell Lindquist, or Patricia Turner by telephone at (409) 845-1535, or send your comments to their attention at:

Texas Transportation Institute
Systems Planning Division
Texas A&M University System
College Station, TX 77843-3135

APPENDIX B—SCRIPT FOR PUBLIC AGENCY DISCUSSION GROUPS

ENCOURAGING HOV USE—DISCUSSION QUESTIONS FOR PUBLIC SECTOR

The Texas Transportation Institute (TTI), a part of The Texas A&M University System, is conducting a research project for the Texas Department of Transportation (TxDOT) focusing on techniques that can be used to encourage greater use of high-occupancy vehicles (HOV), including buses, carpools and vanpools, and other strategies to better manage demand on the transportation system. As part of this study, information is being gathered from both public and private sector representatives to obtain a better understanding of various policies and strategies that impact commute mode choice. The intent of this element of the study is to develop a realistic assessment of approaches to encourage HOV use that representatives of public agencies may feel are most appropriate, and the potential issues associated with implementation of the identified strategies. In addition, this discussion is intended to gather information on any current and future strategies used by public agencies to encourage HOV use among their own employees.

Your help in this effort is greatly appreciated. The following list of questions is provided for discussion. In addition, please feel free to write any comments and return them at the end of the meeting, or mail them to the address given at the end of this form. Thank you again for your assistance!

I. What agency or governmental entity do you represent?

II. In general, how do the employees of your organization get to and from work? Do you have an idea of the approximate number or percentage who:

- Take the bus.
- Carpool.
- Vanpool.
- Drive alone.

III. Are there any factors that limit the ability of your agency to implement strategies to encourage HOV use?

IV. Has your agency implemented, or are you considering, any of the following programs to help encourage greater use of high-occupancy commute modes?

- Subsidize employee transit use (passes, vouchers, etc.)
- Promote rideshare programs:
  -In-house.
  -Local transit agency.
- Guaranteed Ride Home program.
- Allow employees to work alternative schedules? If so, type of schedules are used?
- Allow employees to telecommute, part- or full-time?
- Other programs or strategies to encourage HOV use? (Please specify).

V. Studies have indicated that the cost and location of parking has a significant impact on commute mode choice.

- Do you provide free parking for your employees?
- If your agency charges for parking, what is the rate?
- How far from your workplace is employee parking located?
- Would you consider initiating parking charges, or raising parking fees, to encourage greater use of alternative commute modes?

VI. Do you have, or do you intend to add, any physical amenities to encourage alternate commute modes, such as:

- Bus shelters.
- Sidewalks from transit stops.
- Bike racks or lockers.
- Shower facilities.
- Other (please specify).

VII. What is your opinion of the effectiveness of the following strategies at reducing SOV use and encouraging HOVs? What are some issues that may be associated with the initiation and implementation of these strategies in your area and in Texas?

- Car/Vanpooling programs.
- Public awareness/Education programs.
- Enhancing services provided by transit agencies, including:

  -Reverse commute programs.

  -High-occupancy vehicle facilities.

  -Park-and-ride lots.

  -Express bus service.

  -Suburb-to-suburb services.

  -Employer support services provided by transit agencies (i.e., ridematching, vanpool start-up assistance, offering transit vouchers, etc.).

- Planning policies, land use controls, and development regulations to guide growth in denser patterns.

- Joint development and site design improvements.

- Parking management—including preferential parking for car/vanpool vehicles, charging for parking, raising parking fees, parking caps.

- Congestion pricing—charging commuters for use of roadways during different times of the day.

VIII. Do you have any other suggestions or ideas for approaches to encourage high-occupancy vehicle use that should be considered for your area and for Texas?

Thank you for your time. If you have any questions on this discussion guide, or would like to provide additional information, please contact Kevin Hall, Nell Lindquist, or Patricia Turner by telephone at (409) 845-1535, or send your comments to their attention at:

Texas Transportation Institute
Systems Planning Division
Texas A&M University System
College Station, TX 77843-3135

APPENDIX C—DISCUSSION GROUP PARTICIPANTS

HOUSTON TMO COALITION

Tuesday, October 25, 1995

Name	Representing
Cindy Sparkman	Apache Corp/TREC
Will Sieber	Mitchell Energy & Development Corp.
Larry Willis	Continental Airlines
Bill Kennedy	M.D. Anderson
Susan Sugarbaker	Texas Medical Center
Diane Coufer	M.D. Anderson
Sharon Barnes	Rockwell/CLTP/CLASP
Malisa Stanley	North Houston Association
Susan Renner	West Houston Association
Sammy Woody	Shell Oil Company
Rod Branch	EOTT Energy Corporation

NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS

January 20, 1995

Name	Representing
Lisa Pyles, Chairman	RAILTRAN
Dave Davis, Vice Chairman	City of Farmers Branch
Wallace Ewell, Secretary	Texas Department of Transportation, Fort Worth
Nancy Amos	Fort Worth Transportation Authority
Deanna Anderson	Fort Worth Transportation Authority
John Baumgartner	City of Addison
Roger Beall	Texas Department of Transportation, Austin
Kent Bell	City of Irving
Rick Berry	City of Mesquite
John Blain	Texas Department of Transportation, Dallas
Trip Brizell	Dallas Area Rapid Transit
J. Milton Brooks	City of Dallas
John Brunk	City of Dallas
Larry Cervenka	City of Garland
Jerry Clark	City of Denton
Walter Cooper	City of Fort Worth
Don Cranford	Dallas County

Clarence Daugherty	Collin County
Frank Davis	Ellis County
Tom Dingler	City of Lewisville
Jim Driscoll	City of Irving
Ron Epps	City of Bedford
Rondell Fagan	Texas Department of Transportation, Fort Worth
Steve Gilbreath	Town of Flower Mound
James Griffin	Texas Turnpike Authority
Jerry Hodge	City of Grapevine
George Human	City of Richardson
Michael Jones	Denton County
Mary Kaderka	City of Dallas
Paul Kruckemeyer	City of Euless
Richard Larkins	City of Grand Prairie
Gordon Mayer	City of DeSoto
Don McChesney	Tarrant County
Mark Mendez	Tarrant County
Emil Moncivais	City of Fort Worth
Koorosh Olyai	Dallas Area Rapid Transit
Phillip Patterson	City of Haltom City
Richard Peterson	Dallas County
Terry Sams	Texas Department of Transportation, Dallas
Sue Scanlan	City of Arlington
Dave Schultz	City of Garland
Dennis Schwartz	City of Duncanville
Bud Smallwood	City of University Park
Wilma Smith	City of Arlington
Jim Sparks	City of Hurst
Cissy Sylo	City of Carrollton
Paul Tiley	Texas Department of Transportation, Austin
Mike Walker	Johnson County
Tom Walton	City of Plano
Mary Wieder	City of North Richland Hills
Dallas Williams	City of Fort Worth
Richard Williams	Rockwall County
Mark Young	Texas Department of Transportation Regional Planning Office

DALLAS CHAMBER OF COMMERCE

February 7, 1995

Name	Representing
Vic Travis	TU Service
Jeff McLaughlin	Texas Instruments
Don Lenz	GTE
Tom Barton	Central & Southwest Services
Charlie Davidson	Southwestern Bell
Terri West	OGA EDS
Lois Smith	EDS
Allen Curry	Greater Dallas Area Chamber of Commerce

AUSTIN VOLUNTARY TRIP REDUCTION PROGRAM (V-TRIP) COMMITTEE

March 2, 1995

Name	Representing
Nancy Ledbetter	Austin Transportation Study
Jenny Peterman	Texas Department of Transportation
Charlie Albert	City of Austin
Karen Glynn	City of Austin, Public Works and Transportation
Joel Brundrett	City of Austin, Public Works and Transportation
Ita Ufot	Texas Natural Resource Conservation Commission
Kim Herndon	Texas Natural Resource Conservation Commission
Scott Fieldman	City of Austin, Public Works and Transportation

APPENDIX D—SURVEY RESULTS

NORTHWEST HOV LANE BUS RIDER SURVEY

This survey is being undertaken by the Texas Transportation Institute, for the Texas Department of Transportation, in cooperation with the Metropolitan Transit Authority of Harris County. The survey is intended to obtain information about your use of the Northwest HOV lane. Please take a few minutes to answer the questions below and return this form to the survey taker before leaving the bus. Thank you for your assistance.

---

1. What is the purpose of your bus trip this morning? 99.4 Work 0.4 School 0.2 Other (specify)____

2. What is your home Zip Code? _____

3. What is your final destination on this trip?
   94.7 Downtown 1.4 Texas Medical Center 1.4 Other (specify Zip Code below)
   1.2 Greenway Plaza 1.4 Galleria area _____

4. Why did you choose to ride the bus? **(Please check all that apply.)**
   57.1 Employer pays part of fare 56.3 Free time to read/work 27.0 Environmental concerns
   52.4 Cheaper than driving 26.4 Time savings 6.3 Other (specify)_____
   74.4 More convenient than driving 3.5 No car available

5. How did you get to the location where you boarded the bus? **(Please check one.)**
   88.2 Drove alone to park-and-ride lot 0.4 Walked to bus stop
   0.4 Dropped off at park-and-ride lot 3.0 Dropped off at bus stop
   7.9 Carpooled to park-and-ride lot 0 Other (specify)_____

6. How many miles is it from your home to the park-and-ride lot or bus stop? 6.4 (mean)

7. How many blocks is your final destination from the stop where you get off the bus? 1.9 (mean)

8. Have you ever carpooled or vanpooled on the Northwest HOV lane?
   58.0 Yes, carpooled 1.4 Yes, vanpooled 40.6 No

9. How important is the Northwest HOV lane in your decision to ride the bus?
   87.8 Very important 9.8 Somewhat important 2.4 Not important

10. If the HOV lane did not exist, would you be riding a bus now? 25.9 Yes 35.3 No 38.8 Not sure

11. How many minutes, if any, do you believe this bus saves by using the HOV lane instead of the regular traffic lanes?
    17.0 Minutes in the morning 18.1 Minutes in the evening

12. How long have you been using the bus on the Northwest HOV lane? 35.3 months (mean)

13. Before you began riding a bus on the Northwest HOV lane, how did you normally make this trip? **(Please check one.)**
    42.8 Drove alone 2.9 Rode a park and ride bus on the regular freeway lanes.
    11.5 Carpooled 1.2 Rode a regular route or express bus.
    8.0 Vanpooled 24.9 Did not make this trip prior to using the Northwest HOV lane.
    8.6 Other (specify) _____

14. Does your employer provide any of the following? **(Please check all that apply.)**
    81.9 Pays part/all of bus pass. 19.9 Guaranteed ride home program.
    47.9 Allows some type of flexible work hours. 7.4 Rideshare matching program.
    2.8 Allows telecommuting. 6.7 Vanpool program.
    30.6 Pays part/all parking fees. 7.6 Preferential parking for carpools/vanpools.

15. Do you feel that the HOV lane is presently being sufficiently utilized?
    70.9 Yes 10.7 No 18.4 Not sure

16. A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches would you support to help address these concerns?

	Support	Neutral	Not Support
Expand bus service	84.2	14.9	0.9
More park-and-ride lots	71.3	23.7	5.1
Add more HOV lanes	63.1	31.4	5.5
Add HOV lane access points	47.7	35.5	16.8
Flexible work hour arrangements	81.0	17.1	1.9
Charging more for parking	7.1	22.3	70.6
Employer incentives for use of buses/ridesharing	92.0	6.2	1.8
Telecommuting	55.9	40.7	3.4
Charging for use of roads	4.7	12.7	82.6
Higher gasoline taxes	5.5	9.9	84.6

17. What is your . . . Age? 38.3 (mean) Sex? Male - 48.9 Female - 51.1 Occupation?_____

18. What is the last level of school you completed? 14.7

Please use the back of this form to provide any additional comments.

THANK YOU FOR YOUR COOPERATION.

KATY HOV LANE BUS RIDER SURVEY

This survey is being undertaken by the Texas Transportation Institute, for the Texas Department of Transportation, in cooperation with the Metropolitan Transit Authority of Harris County. The survey is intended to obtain information about your use of the Katy HOV lane. Please take a few minutes to answer the questions below and return this form to the survey taker before leaving the bus. Thank you for your assistance.

---

1. What is the purpose of your bus trip this morning? 99.0 Work 0.4 School 0.6 Other (specify)

2. What is your home Zip Code? _____

3. What is your final destination on this trip?
   93.1 Downtown 1.7 Texas Medical Center 2.7 Other (specify Zip Code below)
   0.2 Greenway Plaza 2.3 Galleria area _____

4. Why did you choose to ride the bus? **(Please check all that apply.)**
   47.9 Employer pays part of fare 49.4 Free time to read/work 30.2 Environmental concerns
   46.0 Cheaper than driving 39.3 Time savings 7.1 Other (specify)_____
   75.2 More convenient than driving 4.6 No car available

5. How did you get to the location where you boarded the bus? **(Please check one.)**
   88.4 Drove alone to park-and-ride lot 0.8 Walked to bus stop
   0.2 Dropped off at park-and-ride lot 1.1 Dropped off at bus stop
   9.0 Carpooled to park-and-ride lot 0.6 Other (specify) _____

6. How many miles is it from your home to the park-and-ride lot or bus stop? 6.7 (mean)
7. How many blocks is your final destination from the stop where you get off the bus? 1.9 (mean)
8. Have you ever carpooled or vanpooled on the Katy HOV lane?
   55.7 Yes, carpooled 1.3 Yes, vanpooled 43.0 No

9. How important is the Katy HOV lane in your decision to ride the bus?
   92.7 Very important 4.8 Somewhat important 2.5 Not important

10. If the HOV lane did not exist, would you be riding a bus now? 17.9 Yes 50.3 No 31.9 Not sure

11. How many minutes, if any, do you believe this bus saves by using the HOV lane instead of the regular traffic lanes? 22.6 (mean) Minutes in the morning 26.1 (mean) Minutes in the evening

12. How long have you been using the bus on the Katy HOV lane? 41.6 months (mean)
13. Before you began riding a bus on the Katy HOV lane, how did you normally make this trip? **(Please check one.)**
    46.0 Drove alone 3.1 Rode a park and ride bus on the regular freeway lanes.
    7.9 Carpooled 0.2 Rode a regular route or express bus.
    7.5 Vanpooled 29.8 Did not make this trip prior to using the Katy HOV lane.
    5.4 Other (specify) _____

14. Does your employer provide any of the following? **(Please check all that apply.)**
    76.3 Pays part/all of bus pass. 18.9 Guaranteed ride home program.
    43.8 Allows some type of flexible work hours. 9.0 Rideshare matching program.
    1.6 Allows telecommuting. 6.9 Vanpool program.
    26.3 Pays part/all parking fees. 7.1 Preferential parking for carpools/vanpools.

15. Do you feel that the HOV lane is presently being sufficiently utilized?
    63.7 Yes 16.9 No 19.4 Not sure

16. A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches would you support to help address these concerns?

	Support	Neutral	Not Support
Expand bus service	78.4	19.2	2.3
More park-and-ride lots	64.1	30.9	5.0
Add more HOV lanes	67.1	24.4	8.4
Add HOV lane access points	48.1	28.8	23.1
Flexible work hour arrangements	84.8	13.0	2.2
Charging more for parking	6.7	19.8	73.5
Employer incentives for use of buses/ridesharing	90.2	8.5	1.2
Telecommuting	55.4	40.1	4.5
Charging for use of roads	8.0	14.1	77.9
Higher gasoline taxes	5.0	8.3	86.8

17. What is your . . . Age? 38.0 (mean) Sex? Male - 42.6 Female - 57.4 Occupation?_____

18. What is the last level of school you completed? 14.99

Please use the back of this form to provide any additional comments.

THANK YOU FOR YOUR COOPERATION.

EAST R. L. THORNTON HOV LANE BUS RIDER SURVEY

This survey is being undertaken by the Texas Transportation Institute, for the Texas Department of Transportation, in cooperation with Dallas Area Rapid Transit (DART). The survey is intended to obtain information about your use of the East R. L. Thornton HOV lane. Please take a few minutes to answer the questions below and return this form to the survey taker before leaving the bus. Thank you for your assistance.

1. What is the purpose of your bus trip this morning? 87.8 Work 9.1 School 3.1 Other (specify)

2. What is your home Zip Code? _____

3. What is your final destination on this trip?
   88.0 Downtown Dallas 1.3 Las Colinas 0.8 Galleria 0.9 Park Central
   1.1 Market Center 0 DFW Airport 7.9 Other (specify Zip Code)_____

4. Why did you choose to ride the bus? **(Please check all that apply.)**
   38.8 Employer pays part of fare 35.0 Free time to read/work 20.9 Environmental concerns
   52.2 Cheaper than driving 13.0 Time savings 6.5 Other (specify)_____
   51.5 More convenient than driving 31.5 No car available

5. How did you get to the location where you boarded the bus? **(Please check one.)**
   38.2 Drove alone to park-and-ride lot 41.2 Walked to bus stop
   6.4 Dropped off at park-and-ride lot 8.1 Dropped off at bus stop
   1.7 Carpooled to park-and-ride lot 4.4 Other (specify) _____

6. How many miles is it from your home to the park-and-ride lot or bus stop? 2.8 miles (mean)

7. How many blocks is your final destination from the stop where you get off the bus? 2.3 blocks (mean)

8. Have you ever carpooled or vanpooled on the East R. L. Thornton HOV lane?
   25.0 Yes, carpooled 1.6 Yes, vanpooled 73.5 No

9. How important is the East R. L. Thornton HOV lane in your decision to ride the bus?
   64.6 Very important 19.4 Somewhat important 16.0 Not important

10. If the HOV lane did not exist, would you be riding a bus now? 74.2 Yes 8.5 No 17.2 Not sure

11. How many minutes, if any, do you believe this bus saves by using the HOV lane instead of the regular traffic lanes? 13.4 (mean) Minutes in the morning 12.3 (mean) Minutes in the evening

12. How has construction of the Fair Park Bridge affected your travel times?
    7.3 Much longer 42.6 A little longer 46.0 Same 4.1 Shorter

13. How long have you been using the bus on the East R. L. Thornton HOV lane? 26.1 months (mean)

14. Before you began riding a bus on the East R. L. Thorton HOV lane, how did you normally make this trip? **(Please check one.)**
    24.1 Drove alone
    4.2 Carpooled
    0.3 Vanpooled
    20.1 Rode a park and ride bus on the regular freeway lanes.
    36.5 Rode a regular route or express bus.
    9.2 Did not make this trip prior to using the East R. L. Thornton HOV lane.
    5.5 Other (specify) _____

15. Does your employer provide any of the following? **(Please check all that apply.)**
    76.5 Pays part/all of bus pass.
    36.4 Allows some type of flexible work hours.
    2.9 Allows telecommuting.
    17.5 Pays part/all parking fees.
    2.0 Guaranteed ride home program.
    3.1 Rideshare matching program.
    5.9 Vanpool program.
    5.0 Preferential parking for carpools/vanpools.

16. Do you feel that the HOV lane is presently being sufficiently utilized?
    62.2 Yes 13.2 No 24.6 Not sure

17. A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches would you support to help address these concerns?

	Support	Neutral	Not Support
Expand bus service	82.6	15.4	2.0
More park-and-ride lots	57.8	38.6	3.7
Add more HOV lanes	75.4	20.6	3.9
Add HOV lane access points	58.9	29.0	12.1
Flexible work hour arrangements	62.7	31.2	6.1
Charging more for parking	9.0	25.8	65.2
Employer incentives for use of buses/ridesharing	82.0	14.1	4.0
Telecommuting	43.1	48.2	8.7
Charging for use of roads	8.7	20.0	71.3
Higher gasoline taxes	3.5	12.2	84.3

18. What is your . . . Age? 36.6 (mean) Sex? Male - 28.6 Female - 71.4 Occupation?____

19. What is the last level of school you completed? 12.39

Please use the back of this form to provide any additional comments.

THANK YOU FOR YOUR COOPERATION.

NORTHWEST HOV LANE CARPOOL/VANPOOL SURVEY

This survey is being undertaken by the Texas Transportation Institute for the Texas Department of Transportation in cooperation with the Metropolitan Transit Authority of Harris County. The survey is intended to obtain information about your use of the Northwest HOV lane. Please take a few minutes to answer the questions below and return the survey in the attached envelope. Thank you for your assistance.

---

1. Is your vehicle a carpool or a vanpool? 99.1 Carpool 0.9 Vanpool

2. What is the primary purpose of your A.M. carpool/vanpool trip? 94.7 Work 4.4 School 0.9 Other (specify)_____

3. How many members are regularly in your carpool/vanpool (including yourself)? 2.2

4. Who makes up your carpool/vanpool group? 67.8 Family Members 7.9 Neighbors 32.2 Co-Workers 3.2 Others **(Check all that apply.)**

5. Does your carpool/vanpool use a park & ride lot or a park & pool lot as a meeting area?
   19.1 Yes (please specify which lot you typically use) _____ 80.9 No

6. How long have you been a regular user of the Northwest HOV lane? 33.14 months (mean)

7. Which HOV lane entrance do you normally use to access the Northwest in the morning? **(Please check one.)**
   37.1 Northwest Freeway Mainlane 28.4 Northwest Transit Station 23.4 Little York 11.1 Pinemont ___ Dacoma

8. What time do you normally enter the HOV lane in the morning? _____ A.M.

9. What is your A.M. carpool/vanpool destination? 42.2 Downtown 31.9 Galleria/Post Oak area
   5.6 Greenway Plaza 5.6 Texas Medical Center 14.5 Other (specify Zip Code)_____

10. How long has your current carpool/vanpool existed? 29.6 months or _____ years

11. How did you form your carpool/vanpool? **(Please check one.)**
    1.8 Employer Program 61.4 Family Member 33.1 Friend/Co-worker 0 METRO Rideshare Program
    3.6 Other

12. Why do you choose to carpool/vanpool rather than drive alone or ride the bus? **(Please check all that apply.)**
    7.4 Employer incentives 14.9 Parking cost/availability 37.5 Companionship
    54.8 Cheaper than driving alone 72.0 Time savings 29.5 Environmental concerns
    47.0 More convenient than driving alone 5.7 No car available to drive alone 13.4 Other (specify)_____

13. How important is the Northwest HOV lane in your decision to carpool/vanpool?
    82.0 Very important 11.8 Somewhat important 6.2 Not important

14. If the Northwest HOV lane did not exist, would you be carpooling/vanpooling now?
    47.3 Yes 29.3 No 23.4 Not Sure

15. Prior to carpooling/vanpooling on the Northwest HOV lanes, how did you normally make this trip?
    (Please check one.)
    12.5 On the HOV lane: 81.8 Bus 3.0 Vanpool 15.2 Carpool
    77.5 On the Northwest Freeway regular traffic lanes: 0.98 Bus 0.49 Vanpool 21.0 Carpool 77.5 Drove alone
    9.4 On a parallel street or highway: 0 Bus 0 Vanpool 40 Carpool 60 Drove alone
    1.1 Did not make this trip

16. How many minutes, if any, do you believe your carpool/vanpool saves by using the Northwest HOV lane instead of the regular traffic lanes? 20.54 (mean) Minutes in the morning 20.06 (mean) Minutes in the evening

17. Do you feel that the Northwest HOV lane is currently sufficiently utilized? 83.1 Yes 16.9 No

18. Does your employer provide any of the following? **(Please check all that apply.)**
    28.9 Pays part/all of bus pass.
    63.9 Allows some type of flexible work hours.
    8.3 Allows telecommuting.
    43.3 Pays part/all parking fees.
    19.4 Guaranteed ride home program.
    13.3 Rideshare matching program.
    11.1 Vanpool program.
    15.0 Preferential parking for carpools/vanpools.

19. A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches would you support to help address these concerns?

	Support	Neutral	Not Support
Expand bus service	47.9	40.8	11.3
More park-and-ride lots	41.9	50.2	7.9
Add more HOV lanes	70.8	22.9	6.3
Add HOV lane access points	50.3	29.1	20.6
Flexible work hour arrangements	78.3	19.2	2.6
Charging more for parking	3.0	28.3	68.7
Employer incentives for use of buses/ridesharing	74.9	19.0	6.1
Telecommuting	50.7	42.9	6.4
Charging for use of roads	4.3	12.5	83.2
Higher gasoline taxes	5.0		7.9 87.1

20. What is your . . . Age? 38.55 (mean) Sex? Male - 53.0 Female - 47.0 Occupation? _____

21. What is the last level of school you completed? 15.07

22. What is your home Zip Code? _____

Please use the back of this form for additional comments.

Thank you for your cooperation.

Please return this form at your earliest convenience in the postage-paid envelope provided.

KATY HOV LANE CARPOOL/VANPOOL SURVEY

This survey is being undertaken by the Texas Transportation Institute for the Texas Department of Transportation in cooperation with the Metropolitan Transit Authority of Harris County. The survey is intended to obtain information about your use of the Katy HOV lane. Please take a few minutes to answer the questions below and return the survey in the attached envelope. Thank you for your assistance.

1. Is your vehicle a carpool or a vanpool? 94.5 Carpool 5.5 Vanpool

2. What is the primary purpose of your A.M. carpool/vanpool trip? 88.3 Work 8.0 School 3.7 Other (specify)_____

3. How many members are regularly in your carpool/vanpool (including yourself)? 2.56

4. Who makes up your carpool/vanpool group? 70.1Family Members 6.4Neighbors 30.5Co-Workers 10.2Others **(Check all that apply.)**

5. Does your carpool/vanpool use a park & ride lot or a park & pool lot as a meeting area?
22.6Yes (please specify which lot you typically use)_____ 77.4No

6. How long have you been a regular user of the Katy HOV lane? 31.1 months (mean)

7. Which HOV lane entrance do you normally use to access the Katy in the morning?
32.4Katy Freeway Mainlane 46.7Addicks 20.9Gessner

8. What time do you normally enter the HOV lane in the morning? _____A.M.

9. What is your A.M. carpool/vanpool destination? 65.8Downtown 3.3Galleria/Post Oak area
1.6Greenway Plaza 4.9Texas Medical Center 24.5Other (specify Zip Code)_____

10. How long has your current carpool/vanpool existed? 27.9 months or _____ years

11. How did you form your carpool/vanpool? **(Please check one.)**
5.0 Employer Program 61.3 Family Member 31.5 Friend/Co-worker 0.6 METRO Rideshare Program 1.7 Other

12. Why do you choose to carpool/vanpool rather than drive alone or ride the bus? **(Please check all that apply).**
4.3 Employer incentives 14.6 Parking cost/availability 28.1 Companionship
42.7 Cheaper than driving alone 72.4 Time savings 18.9 Environmental concerns
46.5 More convenient than driving alone 3.8 No car available to drive alone 17.3 Other (specify)_____

13. How important is the Katy HOV lane in your decision to carpool/vanpool?
81.5 Very important 13.0 Somewhat important 5.4 Not important

14. If the Katy HOV lane did not exist, would you be carpooling/vanpooling now?
40.1 Yes 38.5 No 21.4 Not Sure

15. Prior to carpooling/vanpooling on the Katy HOV lanes, how did you normally make this trip? **(Please check one.)**
22.5 On the HOV lane: 76.5 Bus 5.9 Vanpool 17.6 Carpool
65.6 On the Katy Freeway regular traffic lanes: 0 Bus 1.0 Vanpool 18.2 Carpool 80.8 Drove alone
11.3 On a parallel street or highway: 5.9 Bus 11.8 Vanpool 29.4 Carpool 52.9 Drove alone
0.7 Did not make this trip

16. How many minutes, if any, do you believe your carpool/vanpool saves by using the Katy HOV lane instead of the regular traffic lanes? 24.8 (mean) Minutes in the morning 25.3 (mean) Minutes in the evening

17. Do you feel that the Katy HOV lane is currently sufficiently utilized to justify the project? 87.7 Yes 12.3 No

18. Does your employer provide any of the following? **(Please check all that apply.)**
42.4 Pays part/all of bus pass.
71.7 Allows some type of flexible work hours.
3.0 Allows telecommuting.
35.4 Pays part/all parking fees.
19.2 Guaranteed ride home program.
11.1 Rideshare matching program.
19.2 Vanpool program.
24.2 Preferential parking for carpools/vanpools.

19. A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches would you support to help address these concerns?

	Support	Neutral	Not Support
Expand bus service	44.2	42.4	13.3
More park-and-ride lots	31.9	56.2	11.9
Add more HOV lanes	66.2	23.8	10.0
Add HOV lane access points	56.0	25.2	18.9
Flexible work hour arrangements	75.6	20.2	4.2
Charging more for parking	4.6	23.0	72.4
Employer incentives for use of buses/ridesharing	67.7	23.8	8.5
Telecommuting	47.4	42.1	10.5
Charging for use of roads	10.3	16.8	72.9
Higher gasoline taxes	5.8		9.0 85.3

20. What is your . . . Age? 38.5 (mean) Sex? Male - 48.4 Female - 51.6 Occupation? _____

21. What is the last level of school you completed? 15.08

22. What is your home Zip Code? _____

Please use the back of this form for additional comments.

Thank you for your cooperation.

Please return this form at your earliest convenience in the postage-paid envelope provided.

EAST R. L. THORNTON HOV LANE CARPOOL/VANPOOL SURVEY

This survey is being undertaken by the Texas Transportation Institute for the Texas Department of Transportation in cooperation with Dallas Area Rapid Transit (DART). The survey is intended to obtain information about your use of the East R. L. Thornton HOV lane. Please take a few minutes to answer the questions below and return the survey in the attached envelope. Thank you for your assistance.

1. Is your vehicle a carpool or a vanpool? 94.2 Carpool 5.8 Vanpool

2. What is the primary purpose of your A.M. carpool/vanpool trip? 91.9 Work 5.3 School 2.9 Other (specify)_____

3. How many members are regularly in your carpool/vanpool (including yourself)? 2.24

4. Who makes up your carpool/vanpool group? 70.5Family Members 8.1Neighbors 32.4Co-Workers 4.3Others **(Check all that apply.)**

5. Does your carpool/vanpool use a park & ride lot or a park & pool lot as a meeting area?
   6.3 Yes (please specify which lot you typically use)_____ 93.7No

6. How long have you been a regular user of the East R. L. Thornton HOV lane? 33.27 months (mean)

7. Which HOV lane exit do you normally use? **(Please check one.)**
   73.2 Downtown 26.8 East R. L. Thornton Freeway

8. What time do you normally enter the HOV lane in the morning? _____ A.M.

9. What is your A.M. carpool/vanpool destination?
   70.7 Downtown Dallas 3.4 Las Colinas 1.0 Galleria ___ Park Central
   3.8 Market Center 0.5 DFW Airport 20.7 Other (specify Zip Code)_____

10. How long has your current carpool/vanpool existed? 41.99 (mean) months or _____ years

11. How did you form your carpool/vanpool? **(Please check one.)**
    1.0 Employer Program 65.4 Family Member 29.8 Friend/Co-worker 2.0 DART Rideshare Program
    2.0 Other

12. Why do you choose to carpool/vanpool rather than drive alone or ride the bus? **(Please check all that apply).**
    4.8 Employer incentives 28.5 Parking cost/availability 32.4 Companionship
    54.1 Cheaper than driving alone 47.8 Time savings 24.6 Environmental concerns
    35.3 More convenient than driving alone 13.5 No car available to drive alone 20.3 Other (specify)_____

13. How important is the East R. L. Thornton HOV lane in your decision to carpool/vanpool?
    63.9 Very important 18.8 Somewhat important 17.3 Not important

14. If the East R. L. Thornton HOV lane did not exist, would you be carpooling/vanpooling now?
    72.9 Yes 14.0 No 13.0 Not Sure

15. Prior to carpooling/vanpooling on the East R. L. Thornton HOV lanes, how did you normally make this trip? **(Please check one.)**
    12.8 On the HOV lane: 47.8 Bus 0 Vanpool 52.2 Carpool
    67.8 On the East R. L. Thornton Freeway regular traffic lanes: 3.3 Bus 7.3 Vanpool 46.7 Carpool 42.6 Drove alone
    19.4 On a parallel street or highway: 2.9 Bus 2.9 Vanpool 62.9 Carpool 31.4 Drove alone
    0 Did not make this trip

16. How many minutes, if any, do you believe your carpool/vanpool saves by using the East R. L. Thornton HOV lane instead of the regular traffic lanes?
    15.6 (mean) Minutes in the morning 13.08 (mean) Minutes in the evening

17. How has construction of the Fair Park Bridge affected your travel times?
    8.2 Much longer 46.6 A little longer 41.3 Same 3.8 Shorter

18. Do you feel that the East R. L. Thornton HOV lane is currently sufficiently utilized to justify the project?
    95.0 Yes 5.0 No

19. Does your employer provide any of the following? **(Please check all that apply.)**

47.2 Pays part/all of bus pass.	1.9 Guaranteed ride home program.
50.9 Allows some type of flexible work hours.	2.8 Rideshare matching program.
4.7 Allows telecommuting.	17.0 Vanpool program.
37.7 Pays part/all parking fees.	15.1 Preferential parking for carpools/vanpools.

20. A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches would you support to help address these concerns?

	Support	Neutral	Not Support
Expand bus service	26.1	46.2	27.7
More park-and-ride lots	29.8	58.0	12.2
Add more HOV lanes	82.1	14.9	3.1
Add HOV lane access points	60.8	20.1	19.0
Flexible work hour arrangements	66.3	29.7	4.0
Charging more for parking	2.3	17.5	80.1
Employer incentives for use of buses/ridesharing	59.9	31.9	8.2
Telecommuting	43.2	48.5	8.3
Charging for use of roads	4.0	10.8	85.2
Higher gasoline taxes	1.7		5.2 93.1

21. What is your . . . Age? 41.2 (mean) Sex? Male - 44.7 Female - 55.3 Occupation?_____

22. What is the last level of school you completed? 14.1

23. What is your home Zip Code? _____

Please use the back of this form for additional comments.

Thank you for your cooperation.

Please return this form at your earliest convenience in the postage-paid envelope provided.

NORTHWEST FREEWAY MOTORIST SURVEY

This survey is being undertaken by the Texas Transportation Institute, for the Texas Department of Transportation, in cooperation with the Metropolitan Transit Authority of Harris County. The survey is intended to obtain information about your use of the Northwest Freeway. Please take a few minutes to answer the questions below and return the survey in the attached envelope. Thank you for your assistance.

---

1. What was the purpose of your trip? 93.7 Work 1.9 School 4.4 Other (specify)_____

2. What are your reasons for driving your car on the freeway mainlanes, rather than traveling in a bus, carpool, or vanpool on the HOV lane? **(Please check all that apply.)**
   - 39.2 Need car for job
   - 52.8 Car is more convenient and flexible
   - 38.2 No convenient bus, vanpool, or carpool available
   - 48.4 Work irregular hours
   - 30.4 Parking is free
   - 1.9 Gas is paid for
   - 1.8 Company car
   - 16.5 Other (please specify)_____

3. How many days per week do you normally make this trip? 4.55 (mean)

4. How do you usually make this trip? **(Please check one.)**
   - 91.3 Drive alone
   - 3.8 Vanpool
   - 0.7 Carpool
   - 0.8 Bus
   - 3.4 Other (specify)_____

5. How many people (including yourself) were in your vehicle for this trip? 1.12 (mean)

6. Which on-ramp did you use to enter the freeway for this trip? _____

7. What was the destination of your trip?
   - 14.9 Downtown
   - 6.0 Texas Medical Center
   - 56.1 Other (specify Zip Code below)
   - 5.7 Greenway Plaza
   - 17.2 Galleria area

8. Based on your observation of the number of vehicles currently using the Northwest HOV lanes, do you feel that it is being sufficiently utilized? 30.6 Yes 41.1 No 28.3 Not sure

9. Based on your perception of the number of persons currently being moved on the Northwest HOV lanes, do you feel that it is being sufficiently utilized? 24.7 Yes 43.0 No 32.2 Not sure

10. Do you feel that the Northwest HOV lane is a good transportation improvement?
    64.4 Yes 14.3 No 21.3Not sure

11. Does your employer provide any of the following? **(Please check all that apply.)**
    - 12.7 Pays part/all of bus pass.
    - 57.8 Allows some type of flexible work hours.
    - 6.4 Allows telecommuting.
    - 53.8 Pays part/all parking fees.
    - 10.4 Guaranteed ride home program.
    - 9.8 Rideshare matching program.
    - 12.1 Vanpool program.
    - 17.1 Preferential parking for carpools/vanpools.

12. A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches:

	Would you support to address these concerns?			Would influence you to change travel behavior?	
	Support	Neutral	Not Support	Would	Would Not
Expand bus service	46.0	37.6	16.4	28.1	71.9
More park-and-ride lots	39.1	43.9	17.0	20.8	79.2
Add more HOV lanes	28.9	39.0	32.1	16.7	83.3
Add HOV lane access points	46.1	33.3	20.6	27.3	72.7
Flexible work hour arrangements	68.2	22.1	9.7	49.0	51.0
Charging more for parking	4.4	18.4	77.2	12.3	87.7
Employer incentives for use of buses/ridesharing	56.0	28.7	15.4	41.4	58.6
Telecommuting	44.0	42.3	13.7	38.3	61.7
Charging for use of roads	4.0	9.4	86.6	26.4	73.6
Higher gasoline taxes	3.2	6.8	90.0	18.7	81.3

13. What is your . . . Age? 42.0 (mean) Sex? Male - 56.5 Female - 43.5 Occupation?

14. What is the last level of school you completed? 14.35

15. What is your home Zip Code? _____

Please use the back of this form for additional comments.

Thank you for your cooperation.

Please return this form at your earliest convenience in the postage-paid envelope provided.

KATY FREEWAY MOTORIST SURVEY

This survey is being undertaken by the Texas Transportation Institute, for the Texas Department of Transportation, in cooperation with the Metropolitan Transit Authority of Harris County. The survey is intended to obtain information about your use of the Katy Freeway. Please take a few minutes to answer the questions below and return the survey in the attached envelope. Thank you for your assistance.

---

1. What was the purpose of your trip? 91.4 Work 2.1 School 6.4 Other (specify)_____

2. What are your reasons for driving your car on the freeway mainlanes, rather than traveling in a bus, carpool, or vanpool on the HOV lane? **(Please check all that apply.)**
   - 44.0 Need car for job
   - 49.9 Car is more convenient and flexible
   - 41.4 No convenient bus, vanpool, or carpool available
   - 47.0 Work irregular hours
   - 26.7 Parking is free
   - 3.5 Gas is paid for
   - 3.5 Company car
   - 14.6 Other (please specify)_____

3. How many days per week do you normally make this trip? 4.5 (mean)

4. How do you usually make this trip? **(Please check one.)**
   - 91.8 Drive alone
   - 2.4 Carpool
   - 0.8 Vanpool
   - 1.3 Bus
   - 3.7 Other (specify)_____

5. How many people (including yourself) were in your vehicle for this trip? 1.1 (mean)

6. Which on-ramp did you use to enter the freeway for this trip? _____

7. What was the destination of your trip?
   - 12.9 Downtown
   - 2.3 Greenway Plaza
   - 3.1 Texas Medical Center
   - 13.3 Galleria area
   - 68.5 Other (specify Zip Code below)
   - _____

8. Based on your observation of the number of vehicles currently using the Katy HOV lanes, do you feel that it is being sufficiently utilized? 20.6 Yes 62.4 No 17.0 Not sure

9. Based on your perception of the number of persons currently being moved on the Katy HOV lanes, do you feel that it is being sufficiently utilized? 19.0 Yes 59.1 No 22.0 Not sure

10. Do you feel that the Katy HOV lane is a good transportation improvement?
    65.7 Yes 20.8 No 13.5 Not sure

11. Does your employer provide any of the following? **(Please check all that apply.)**
    - 12.2 Pays part/all of bus pass.
    - 66.1 Allows some type of flexible work hours.
    - 7.9 Allows telecommuting.
    - 49.7 Pays part/all parking fees.
    - 8.5 Guaranteed ride home program.
    - 6.9 Rideshare matching program.
    - 6.6 Vanpool program.
    - 11.9 Preferential parking for carpools/vanpools.

12. A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches:

	Would you support to address these concerns?			Would influence you to change travel behavior?	
	Support	Neutral	Not Support	Would	Would Not
Expand bus service	46.7	38.5	14.8	25.5	74.5
More park-and-ride lots	34.2	48.2	17.7	15.7	84.3
Add more HOV lanes	32.6	33.2	34.2	22.5	77.5
Add HOV lane access points	50.6	27.4	22.0	29.8	70.2
Flexible work hour arrangements	64.6	25.3	10.2	44.2	55.8
Charging more for parking	3.1	22.3	74.7	10.8	89.2
Employer incentives for use of buses/ridesharing	50.5	31.7	17.8	34.9	65.1
Telecommuting	42.4	43.9	13.7	34.4	65.6
Charging for use of roads	7.5	11.8	80.7	25.2	74.8
Higher gasoline taxes	3.0	8.2	88.8	15.6	84.4

13. What is your . . . Age? 41.87 (mean) Sex? Male - 60.2 Female - 39.8
Occupation? _____

14. What is the last level of school you completed? 14.99

15. What is your home Zip Code? _____

Please use the back of this form for additional comments.

Thank you for your cooperation.

Please return this form at your earliest convenience in the postage-paid envelope provided.

EAST R. L. THORNTON FREEWAY MOTORIST SURVEY

This survey is being undertaken by the Texas Transportation Institute, for the Texas Department of Transportation, in cooperation with Dallas Area Rapid Transit (DART). The survey is intended to obtain information about your use of the East R. L. Thornton Freeway. Please take a few minutes to answer the questions below and return the survey in the attached envelope. Thank you for your assistance.

---

1. What was the purpose of your trip? 92.4 Work 2.0 School 5.6 Other (specify)_____

2. What are your reasons for driving your car on the freeway mainlanes, rather than traveling in a bus, carpool, or vanpool on the HOV lane? **(Please check all that apply.)**
   37.6 Need car for job
   56.4 Car is more convenient and flexible
   39.7 No convenient bus, vanpool, or carpool available
   45.7 Work irregular hours
   26.6 Parking is free
   2.1 Gas is paid for
   1.2 Company car
   13.5 Other (please specify)_____

3. How many days per week do you normally make this trip? 4.5 (mean)

4. How do you usually make this trip? **(Please check one.)**
   92.9 Drive alone
   2.7 Carpool
   0.7 Vanpool
   0.1 Bus
   3.5 Other (specify)_____

5. How many people (including yourself) were in your vehicle for this trip? 1.16 (mean)

6. Which on-ramp did you use to enter the freeway for this trip? _____

7. What was the destination of your trip?
   26.5 Downtown Dallas
   9.2 Las Colinas
   0.6 Galleria
   0.5 Park Central
   7.2 Market Center
   2.8 DFW Airport
   53.1 Other (specify Zip Code)_____

8. Based on your observation of the number of vehicles currently using the East R. L. Thornton HOV lanes, do you feel that it is being sufficiently utilized? 47.5 Yes 32.1 No
   20.4 Not sure

9. Based on your perception of the number of persons currently being moved on the East R. L. Thornton HOV lanes, do you feel that it is being sufficiently utilized?
   37.9 Yes 38.9 No 23.2 Not sure

10. Do you feel that the East R. L. Thornton HOV lane is a good transportation improvement?
    66.0 Yes 20.2 No 13.8 Not sure

11. How has construction of the Fair Park Bridge affected your travel times?
    14.0 Much longer 59.8 A little longer 22.5 Same 3.7 Shorter

12. Does your employer provide any of the following? **(Please check all that apply.)**
    11.9 Pays part/all of bus pass.
    64.5 Allows some type of flexible work hours.
    3.3 Allows telecommuting.
    43.5 Pays part/all parking fees.
    0.8 Guaranteed ride home program.
    4.4 Rideshare matching program.
    6.4 Vanpool program.
    9.1 Preferential parking for carpools/vanpools.

13. A number of ideas have been suggested for addressing traffic congestion and air quality concerns. Which of the following approaches:

	Would you support to address these concerns?			Would influence you to change travel behavior?	
	Support	Neutral	Not Support	Would	Would Not
Expand bus service	36.5	42.2	21.3	22.6	77.4
More park-and-ride lots	36.3	48.8	14.8	19.3	80.7
Add more HOV lanes	40.6	29.8	29.6	20.9	79.1
Add HOV lane access points	41.2	34.7	24.1	21.3	78.7
Flexible work hour arrangements	57.7	34.6	7.7	42.1	57.9
Charging more for parking	4.5	22.0	73.5	13.9	86.1
Employer incentives for use of buses/ridesharing	48.6	37.2	14.2	34.9	65.1
Telecommuting	39.6	46.1	14.3	38.2	61.8
Charging for use of roads	4.3	9.3	86.5	29.4	70.6
Higher gasoline taxes	2.8	6.2	91.1	21.0	79.0

14. What is your . . . Age? 41.7 (mean) Sex? Male - 54.2 Female - 45.8 Occupation? ____

15. What is the last level of school you completed? 14.17

16. What is your home Zip Code? _____

Please use the back of this form for additional comments.

Thank you for your cooperation.

Please return this form at your earliest convenience in the postage-paid envelope provided.