CONTRACT NO. A932-187
FINAL REPORT
FEBRUARY 1994

A Survey and Analysis of Employee Responses to Employer-Sponsored Trip Reduction Incentive Programs

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

AIR RESOURCES BOARD
Research Division

A SURVEY AND ANALYSIS OF EMPLOYEE RESPONSES TO EMPLOYER-SPONSORED TRIP REDUCTION INCENTIVE PROGRAMS

Final Report

Contract No. A932-187

Prepared for:

California Air Resources Board
Research Division
2020 L Street
Sacramento, California 95814

Prepared by:

COMSIS Corporation
21311 Hawthorne Blvd., Suite 230
Torrance, California 90503

FEBRUARY 1994

The statements and conclusions in this report are those of the contractor and not necessarily those of the California Air Resources Board. The mention of commercial products, their source or their use in connection with material reported herein is not to be construed as either an actual or implied endorsement of such products.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the assistance and cooperation of several key agencies and organizations, including: South Coast Air Quality Management District, Southern California Association of Governments, County of Sacramento, Sacramento Metropolitan Air Quality Management District, City of Sacramento TSM Program, Sacramento Area Council of Governments, South Natomas Transportation Management Association, Central City Transportation Management Association and El Segundo Employers Association. Additionally, a special thanks to all the participating companies, and especially the Employee Transportation Coordinators, whose assistance was invaluable in collecting the necessary employer and employee survey information.

This report was prepared by Eric N. Schreffler, who served as project manager, and Jose Mortero of COMSIS Corporation. Technical input was provided by Rich Kuzmyak and Bill Allen. COMSIS was assisted by Tom Higgins of K.T. Analytics and John Stesney of NuStats.

This report was submitted in fulfillment of ARB Contract A932-187, "A Survey and Analysis of Employee Responses to Employer-Sponsored Trip Reduction Incentive Programs" by COMSIS Corporation under the sponsorship of the California Air Resources Board. The ARB Contract Manager was Fereidun Feizollahi. Work was completed as of June 30, 1993.

TABLE OF CONTENTS

LIST OF TABLES, FIGURES AND APPENDICES

Tables

Figures

Appendices

LIST OF ACRONYMNS USED IN THE REPORT

ARB	California Air Resources Board
ATM	Automated teller machines
AVR	Average vehicle ridership
CBD	Central business district
ECO	Employee commute option
ETC	Employee Transportation Coordinator
ETR	Employer trip reduction
ETRP	Employer trip reduction program
FHWA	Federal Highway Administration
IVT	In-vehicle (travel) time
OVT	Out-of-vehicle (travel) time
SACOG	Sacramento Area Council of Governments
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
TAZ	Traffic analysis zone
TDM	Travel demand management
TMA	Transportation management association
VMT	Vehicle miles of travel

SUMMARY AND CONCLUSIONS

SUMMARY AND CONCLUSIONS

This summary provides a broad overview of the research conducted by COMSIS Corporation for the California Air Resources Board, entitled "A Survey and Analysis of Employee Responses to Employer-sponsored Trip Reduction Incentive Programs."

Purpose of the Research

State and Federal legislation requires most large urban areas in California to adopt Employer Trip Reduction regulations aimed at shifting commuters from solo driving to shared ride (e.g. carpooling) and alternative work arrangements (e.g. 4/40 work weeks). The overall objective of the California mandates is to reduce vehicle miles of travel (VMT) in non-attainment areas, and therefore, mobile source emissions from the automobile.

Employers are generally required to submit trip reduction plans describing a proposed program of promotional activities and incentives that would induce employees to shift to these commute alternatives, sufficient to reach a stated target.

Employers and the plan reviewers at the regulating agencies need better information and tools to help determine the most effective incentives to be offered to employees. The stated objective of the research is "to quantify the emission reduction cost effectiveness for various possible trip reduction incentives that might influence employee travel behavior in California."

To do this, information on the trip reduction effectiveness and costs of existing employer programs was collected and analyzed. From this information, a predictive software package was developed to allow employers and plan reviewers to evaluate the likely effectiveness of proposed incentive programs.

Related Research

Related research has recently been performed in California and at the national level that confirms many of the ultimate findings of this research. Some specific research projects of interest involve research into the cost effectiveness of suburban employer programs in the San Francisco Bay Area (JHK, January 1993) and numerous studies of the effectiveness of programs fostered by the South Coast Air Quality Management District's Regulation XV Trip Reduction Rule.

That research (UCLA/USC, July 1992; COMSIS, October 1992; and Ernst & Young, August 1992) produced the following conclusions:

- the most popular incentives offered by employers were not always the most effective.

- the most effective incentives generally involved financial incentives (i.e. subsidies for using commute alternatives) or parking management (i.e. reducing the amount of parking or charging a fee).

- a survey of Regulation XV sites revealed an annual program cost per employee of $105, resulting in an average trip reduction of 5-10%. A survey of 20 employer sites around the country revealed a similar cost ($118) for programs that achieved an average trip reduction of 22%, the difference being the types of incentives offered. This led the researchers to conclude it is not necessarily how much employers spend, but how they spend their resources.

Research Approach

The approach utilized as part of this research included four basic elements:

1) Data collection - 45 employers in the South Coast and Sacramento Metropolitan Air Basins were interviewed and surveys collected from almost 2,500 employees. The surveys collected information on the incentives offered, employee use thereof and other travel, demographic and programmatic information.

2) Estimate "coefficients" - a disaggregate logit mode choice model was developed to quantify the relationships -- through "coefficients" -- between various incentives and travel behavior. Data on individual employees was critical to this estimation process, data not normally submitted by employers to regulatory agencies.

3) Develop predictive software - the coefficients were loaded into a spreadsheet software packaged called the ARB TDM Evaluation Program. This predictive tool allows employers, plan reviewers and others to evaluate the potential trip reduction of a variety of incentives.

4) Document results - a descriptive analysis of the employer and employee data was performed and a users guide developed for the software.

Data Collection

The data collection effort involved three basic steps, as follows:

1) Employer Interviews - some 66 employers participated in a formal interview about their program. One hour interviews were held at the employer's site with the Employee Transportation Coordinator and sometimes with management representatives. The interview included structured questions about the site, their incentives, how the program is administered and funded, and their opinion on the most and least cost effective incentives implemented to date. At that time, the employee survey process was described.

2) Employee Short Form Survey - a three-question employee "short form" survey was delivered to the coordinator at the time of the interview. The purpose of the short form was to gather a large sample of employees, from which to draw a smaller, stratified sample of employees to received a detailed "long form" survey. The short form asked about travel mode, occupation, and residential zip code. From this, a sample was drawn for each firm that oversampled non-drive alone employees to assure their behavior was being documented in sufficient numbers. Close to a 70% response rate was achieved.

3) Employee Long Form Survey - the long form survey consisted of an eight-page survey that was given to selected employees. It asked about their company's incentives, about themselves, their work hours, travel patterns yesterday and last week, where they parked, transit utilization and why they currently commuted the way they do. Over 70% of those receiving long form surveys returned them.

Due to attrition in the employer sample, 45 employers completed all three steps for a total sample of 2,437 long forms. This data was entered, geocoded (assigning "traffic analysis zones" to origins and destinations), cleaned and analyzed.

Key Findings

The findings revealed in this report tend to confirm the national research to date, which suggest financial incentives and parking management are among the most effective strategies for employer trip reduction programs.

When looking at those incentives which influence commuter choice, based on survey responses, the following incentives seem to be most effective:

- guaranteed ride home,
- company vanpools,
- preferential parking,
- reduced parking fees for carpools/vanpools,
- transportation allowance, and
- carpool subsidies.

The survey also allowed for an assessment of the relative success of incentives in attracting "part-time" users. The analysis revealed the following incentives were effective in inducing part-time use of the commute alternatives they target:

- cash prizes for carpoolers,
- carpool subsidies,
- bus pass sales on site,
- free/discounted bus pass, and
- bike racks.

If financial incentives and parking management are shown to be effective, national research suggests combining the two types of strategies may be most effective. Travel allowance or other comprehensive program can be designed that raises revenue via parking fees and uses these funds for administering the program and subsidizing users of commute alternatives.

The study intended to assess the cost effectiveness of various trip reduction incentives. However, as was the case with other research cited in the Introduction, costs could only be measured at the program level, and not allocated to individual strategies. The average annual program cost was $13,000, with $7,500 of that going to staffing the program. Higher alternative mode shares were correlated with higher program expenditures, and this is an intuitive finding, but one that contradicts some research that contends it is not the amount spent, but rather the types of incentives funded.

ARB Travel Demand Management Evaluation Program - Overview

The ARB Travel Demand Management (TDM) Evaluation Program is designed to be user-friendly and walks the user through a series of input and analysis "screens." The general steps involved in using the software are as follows:

1) enter data describing the *employer and site characteristics*, as well as *program administration and marketing costs*;
2) enter data on the *number of employees* currently using each commuting option;
3) enter data on *financial incentives* (modal subsidies/penalties and parking charges/subsidies);
4) enter data on *alternative work arrangements*;
5) enter data describing the existing and new *support incentives*;
6) enter data describing the use of *clean fuel vehicles* (if any);
7) save the input data to a file;
8) calculate the base and revised AVR (average vehicle ridership) and vehicles;
9) repeat steps 3, 4, and 5 if desired to test other incentives and levels; and,
10) create a report of the data and results.

A feature of the software is its ability to take awareness factor into account in determining incentive effectiveness. This is accomplished by using awareness models developed for incentives based on the employer's program costs (administration and marketing) and employee responses to awareness questions.

Each screen includes a help screen that can be pulled up to assist the user and provide additional information on the use of and inputs for the screen.

The determination of program effectiveness is presented as a simple table with beginning and modified employees, vehicles and AVR, target AVR, and the number of vehicles to be reduced if the proposed program does not meet the target. This final screen is colored red as long the target is not being met through the proposed program. When the target is met or exceeded, the screen turns green, adding to the ease of use.

The software was originally intended for distribution to California employers needing to comply with regional trip reduction requirements. ARB desired to provide a user-friendly tool to employers to help reduce the uncertainty in trip reduction program planning by providing estimates of the likely effectiveness of various trip reduction strategies that might be implemented by employers for their employees. The software does not require special computer skills or hardware and the inputs are available from the data required to be collected by most regulations in California. Therefore, it is well suited for use by employers. Likewise, ridesharing agencies, Transportation Management Associations, and consultants could use the software to advise members and clients of the needed program elements and incentive level to meet their target. The software was designed primarily as a plan review tool for air districts. However, its use as a planning and policy tool could include:

- providing employer guidance;
- developing sensitivity charts of the range of impacts of various incentives (see **Section 6.6**);
- developing "prototype" plans for different types of employers and situations; and,
- determining incentives to be prescribed or mandated if employers are not meeting their targets.

Recommendations and Future Research Needs

Based on the findings summarized above and the experience with collecting employer and employee data, the following recommendations are made for future research:

(1) Encourage air districts to collect employee and cost data. While regulators desire to keep the administrative burden on employers to a minimum and focus on

compliance rather than on process, it would be helpful to collect detailed data at the employee level and cost information reported by incentive. Two possible means of accomplishing this include sampling firms on a periodic basis or by having the public sector process the survey data, as is being done in Maricopa County (Phoenix). This would provide a rich data base of experience and cost effectiveness.

(2) Research the impact on trip chaining and access mode on VMT. The trip reduction regulations in California, and this research, assume when an employee arrives at the site in a non-solo mode, a trip is reduced. However, the statewide goal is a 25% reduction in regional VMT. Because of the unknown impact of trip chaining (e.g., driving to the dry cleaners and preschool after work), access mode to ridesharing and transit (driving to a park-and-ride lot to catch a bus), and secondary impacts of vehicles left at home (use of a car by a family member when the employee has been picked up by a vanpool), the impact of trip reduction programs on VMT is not well understood.

(3) Test the Use of the ARB TDM Evaluation Program - the use of the TDM evaluation software developed as part of this research should be tested among air districts, other agencies and ARB staff before disseminating to employers. Additionally, as more and new data and research on incentives and their cost effectiveness become available, the software and its attendant guidance should be modified to reflect this new information.

Considerable new research related to quantifying the cost effectiveness of employer-based trip reduction incentives has been initiated since this study was begun. More work is underway to provide solid guidance to employers, planners and regulators every day. Federal, state and regional air quality agencies are developing and testing predictive software of the type developed for this project. The ultimate challenge may be the need to standardize approaches and tools so that consistent and sound projections can be derived from this new generation of trip reduction evaluation tools.

1.0

INTRODUCTION

1.0 INTRODUCTION

1.1 Need for Research

The California Clean Air Act of 1988 and the Federal Clean Air Act Amendments of 1990 mandate employer trip reduction programs aimed at increasing the use of commute alternatives among employees traveling during the morning peak period within California's major urban areas, and therefore reducing trips and mobile source emissions. These Employer Trip Reduction (ETR) or Employee Commute Options (ECO) programs are undergoing increasing scrutiny by planners, policy makers and businesses. These groups are seeking to identify the most cost effective ETR strategies that would allow employers to meet required targets. The results of this and related research should help policy-makers and implementing organizations alike bring increased certainty to employer-based trip reduction planning and in so doing increase the effectiveness of the efforts and the ability of state and federal targets to be met.

ETR strategies include three general categories of techniques to reduce trips:

1) the provision or promotion of commute alternatives (e.g., vanpools);

2) the offering of incentives and disincentives (e.g., transit subsidies or parking charges); and,

3) the promotion of alternative work arrangements (e.g., compressed work weeks or telecommuting).

Many regulatory agencies generally refer to all trip reduction strategies as "incentives."

1.2 Purpose of the Research

The stated objective of this research is "to quantify the emission reduction cost-effectiveness for various possible trip reduction incentives that might influence employee travel behavior in California." The desired products of the research include:

1) a research database of related employer and employee information;

2) estimates of key relationships between various incentives and employee travel behavior; and,

3) a software package allowing regulators and regulated employers to predict the trip reduction potential of various incentives.

1.3 Overview of the Research

In order to fulfill the stated objective and develop the three products enumerated above, several key tasks were undertaken, including:

- Research Review - A review of other related research efforts was undertaken to provide a solid foundation from which to initiate this research effort.

- Survey of Employers and Employees - Information was collected from 45 employers and approximately 2,500 employees in the Sacramento Metropolitan and South Coast Air Basins.

- Individual Choice Analysis - A disaggregate logit mode choice model was developed to quantify relationships -- through "coefficients" -- between the various incentives and travel behavior.

- TDM Evaluation Software - The coefficients were used in a software package developed for ARB to allow plan reviewers to estimate the trip reduction potential of various incentives planned as part of an employer's proposed compliance plan. The software and user's guide are available as a separate package.

1.4 Other Related Research

One early task of the research project was to assess recent research in California related to determining the effectiveness and cost effectiveness of employer-based trip reduction incentives. Building on that assessment, four key studies shed valuable light on the results of this research. Each is briefly described below, highlighting the research findings of importance to this report.

- UCLA/USC Regulation XV Study - Researchers at UCLA and USC performed an analysis of some 1100 SCAQMD Regulation XV plans to determine the existing experience with programs fostered by Regulation XV and their trip reduction effectiveness. The study concluded that after one full year of implementation, overall average vehicle ridership increased from 1.22 to 1.25 for the sites studied. The drive alone rate for these sites dropped from 75.7% to 70.9% after one year, with the shift largely to carpooling. While the UCLA/USC research did not have individual employee data, nor the information necessary to directly correlate specific incentives to observed changes in behavior, it did provide a list of incentives offered by employers the most:

    - preferential parking for carpools and vanpools;
    - public transit subsidies;
    - guaranteed ride home programs;

- promotional prize drawings for ridesharers; and,
- installation of showers and lockers.

The analysis also identified those strategies present at sites with above average increases in AVR, for sites with low initial AVR. The incentives listed included vanpool provision, carpool subsidies, transit subsidies, and bicycle subsidies and facilities.

- TDM Cost Effectiveness Model - JHK & Associates performed a study for the City of Pleasanton and developed a spreadsheet "model" of employer-based programs at suburban sites. The research surveyed 58 suburban employers in the San Francisco Bay Area. The survey did not generate adequate data to quantify the cost effectiveness of individual incentives. Rather, the researchers relied on information found in the national literature to develop an equation for each incentive for which impact data was sufficient to do so. The strategies for which impacts could be calculated included:

    - transit pass subsidies;
    - home-based telecommuting;
    - compressed work weeks;
    - reduction of employer-subsidized parking;
    - bicycle lockers and showers;
    - direct monetary incentives for the use of commute alternative; and,
    - transportation allowances.

  For all other incentives, the user is required to estimate the likely impact, based on local experience, and apply this estimate to the proposed application.

- Ernst & Young and COMSIS Cost Effectiveness Studies - Ernst & Young performed a study for the SCAQMD to determine the cost per employee to employers implementing Regulation XV programs. The average annual expenditure per employee was estimated at $105, for over 1000 sites surveyed. Similar to the UCLA/USC study, the reported first year increase in AVR was from 1.20 to 1.24. This translates to about a 5-10% reduction of vehicle trips at the sites. COMSIS performed a cost effectiveness analysis as part of a study for the Federal Highway Administration and determined some 20 case studies reduced trips an average of 22% by implementing a trip reduction program at an average annual per employee cost of $118. These results suggest it is not how much employers spend on incentives, but rather how employers spend their resources. For approximately equivalent per employee costs, the sample of Regulation XV reduced one-fourth to one-half of the trips of the sites assessed in the FHWA study. The researchers concluded the absence of widespread adoption of parking management and direct financial incentives at Regulation XV sites was responsible for the difference in cost effectiveness.

- COMSIS Regulation XV Database Analysis - COMSIS analyzed the SCAQMD's Regulation XV data base, for that agency, to assess the effectiveness of trip reduction incentives being offered by employers. The analysis concluded two sets of factors had a somewhat weak but positive influence on AVR and use of particular modes: parking and some individual incentives. Parking costs and the number of parking spaces per employee seemed to affect AVR and mode use. Additional parking fees, carpool and transit subsidies and vanpool provision and subsidies seemed to have a positive impact on increasing AVR. Several other strategies had a positive, but very weak influence, including: guaranteed ride home, time off with pay, catalogue points, and prize drawing. Thus, the researchers concluded those program elements with direct and indirect financial incentives seemed to have the greatest impact.

References

Employer-Sponsored Trip Reduction Incentive Program Study, Technical Memo #1: Review of Recent Research and Survey Instruments, COMSIS Corporation, prepared for California Air Resources Board, March 15, 1991.

The Regulation XV Trip Reduction Program, Summary of Research, University of Southern California and University of California, Los Angeles, prepared for Transportation Research Board Committee on Transportation and Air Quality (A1F03) Annual Summer Meeting, July 6, 1992.

TDM Cost-Effectiveness Model for Suburban Employers, JHK & Associates, prepared for Presentation at Transportation Research Board 1993 Annual Meeting, January 1993.

South Coast Air Quality Management District Regulation XV Cost Survey, Ernst & Young, prepared for South Coast Air Quality Management District, August 1992.

Effective Travel Demand Management Measures, COMSIS Corporation, Georgia Institute of Technology, K.T. Analytics, Richard H. Pratt, Consultant, Inc., prepared for United States Department of Transportation, Federal Highway Administration, Federal Transit Administration, and Institute of Transportation Engineers, October 1992.

Development of Tools for Phase II Regulation XV Ministerial Plan Review Process Status Report, COMSIS Corporation, prepared for South Coast Air Quality Management District, October 14, 1992.

1.5 Organization of the Report

The study documentation comes in four separate volumes: **Main Report** and three **Technical Appendices**.

Main Report

The **Main Report** is organized into seven sections and three appendices. After the introductory section, **Section 2.0** provides an overview of the data collection activities associated with the employer and employee surveys. Copies of the survey instruments are included in **Appendix I.**

Section 3.0 provides a description of the employer data set and key characteristics therein, and a similar description of the employee data set.

Section 4.0 provides an overview of some of the key relationships between critical factors influencing commuter behavior and the use of incentives. This is a descriptive analysis based on simple cross-tabulations and correlations of survey data and is not based on the estimation of coefficients from the modeling exercise.

Section 5.0 provides a description and results of the disaggregate mode choice analysis and derivation of key coefficients.

Section 6.0 provides a description of the ARB TDM Evaluation Program developed for plan review evaluation. The input, analysis and help screens of the software are shown in **Appendix II** and the sensitivity charts that were developed using the program are shown in **Appendix III.**

Finally, **Section 7.0** provides a set of recommendations and future research needs.

Technical Appendices

Technical Appendix A contains detailed discussion of the model development and calibration effort, to supplement the summarized discussion in **Section 5.0.**

Technical Appendix B is the User's Guide for the ARB TDM Evaluation Program. A copy of the software and user's guide is available from ARB.

Technical Appendix C contains the frequencies and cross-tabulations which form the basis of the discussions in **Sections 3.0** and **4.0.** It also includes the survey forms, coding schemes, and variable lists that would be helpful in interpreting the tables. A copy of the analysis data sets is available from ARB.

2.0

SUMMARY OF DATA COLLECTION PROCESS

2.0 SUMMARY OF DATA COLLECTION PROCESS

2.1 Overview of Data Collection Plan

Central to the development of the interactive planning tools represented by the TDM evaluation software was the collection of employer and employee data from firms in Sacramento and southern California. Employer information was desired to determine the types and levels of incentives being offered as part of trip reduction programs. Employee information was desired to gauge the use of such incentives and various demographics that might explain travel behavior.

The collection of a disaggregate employee travel data base for purposes of developing an individual choice model had not been undertaken in California to date. Such data is collected from households for purposes of developing mode choice model for the regional travel demand forecasting process, but such a data base and predictive tool is a new application of individual choice models in the state.

COMSIS, and its data collection subcontractor, NuStats, developed a data collection scheme to collect employer and employee data in the two areas of the state, modeled after successful efforts elsewhere in the U.S. First, employers were interviewed to ascertain characteristics of their operation, location and trip reduction program. Employees were then surveyed in a two-step process. First, a short form survey was administered to all employees to ascertain mode, professional status, and location. This "short form" database was then used as a sampling frame from which a stratified sample of between 10-20% of employees was drawn to receive a detailed "long form", and in select instances, a travel diary. Using this process, information was collected from 45 firms and approximately 2,500 employees. A brief description of each element of the data collection process is provided below.

2.2 Employer Interviews

Initially, employers were drawn at random from company lists generated by the three regulatory agencies with trip reduction requirements in the areas of interest: the South Coast AQMD, the City of Sacramento and the County of Sacramento. A sampling frame was developed to stratify the sample by firm size, type, and location. Once drawn, letters were sent to the companies and telephone calls made to recruit the firms to participate in the research.

Overall, several hundred firms were contacted via letter and/or telephone. Some 94 firms agreed to participate. Of these, 66 firms (70%) participated in the formal interview. Among these, 47 produced employee short form surveys and 45 produced long forms. These two groups are not the same however: 13 firms produced short forms, but did not deliver long forms. Another 11 firms produced long forms without producing short forms. In these cases,

SCAQMD Regulation XV AVR survey results were used in lieu of short forms to allow the long forms to be properly weighted and utilized.

Several techniques were used to recruit firms. After an initial effort to send letters from the appropriate regulatory agency and follow-up with telephone calls, NuStats began drawing new firms and "cold-calling" the coordinators to solicit participation. A subsequent approach was to contact the executive directors of several Transportation Management Associations and solicit help in recruiting additional firms. Likewise, discussions with Caltrans and other agencies turned up some additional leads. Finally, the SCAQMD sent a letter to 30 prespecified employers, which resulted in an additional 10 sites participating.

The employer interviews lasted approximately one hour and used a standard form, found in **Appendix I.** The interview included questions on the company's trip reduction program, program costs, firm characteristics, parking, and other site characteristics. A copy of the company's most recent Regulation XV or the City or County of Sacramento's trip reduction plan was also requested. The interviewer also carefully observed the site and surrounding area to get a sense of the site characteristics that might be conducive to (or detract from) trip reduction (e.g., ease of walking to bus stop).

2.3 Employee Short Form Survey

For modeling purposes, it was unnecessary to sample all employees at all participating employers regarding their detailed travel. Hence a sample of only 20-30% was desired, but it was necessary to impose some control over the sample to avoid overselection of characteristics like driving alone. To accomplish this, a three-question survey form was distributed to all employees, asking mode used the day before, occupational category and address, cross-street or zip code. A copy of this short form is included in **Appendix I.** From this information, a sample of 20-30% of respondents was drawn from the short card responses, stratified by mode and occupation, and asked to complete the long form. Once the long form responses were received, the short card sample was used to weigh the sample back to the population of employees. An average response rate of 69.2% was achieved among the employee short form surveys.

For the 10 firms recruited with the assistance of the SCAQMD in early 1993 in an effort to complete the survey, this two-stage process was not used. Rather than use a short form, participants in the long form survey were selected randomly at-large by the employer. Copies of the firm's most recent Regulation XV plan were then requested, and the mode split information from the plans were used to weigh the long form sample back to the population. Since the earlier long forms were also weighted on mode, this procedural change is not expected to introduce a bias.

2.4 Employee Long Form Survey

The primary source of data for the estimation of coefficients for the TDM evaluation software was an extensive employee survey to gauge employee travel behavior in response to employer-provided trip reduction incentives. A copy of the 8-page employee survey form may be found in **Appendix I**. The survey was divided into several components:

- questions about their company's transportation program;
- questions about themselves;
- questions about their work hours;
- questions about how they got to work yesterday, and for the entire preceding week;
- questions about parking;
- questions about transit; and,
- questions about why they commute the way that they do.

The survey was extensively pre-tested via three methods:

1) Pre-test - All surveys were distributed to acquaintances of the project team to determine time necessary to complete and clarity of questions.

2) Focus groups - Focus groups were held in Los Angeles and Sacramento Counties in the spring of 1991 at formal focus group facilities. At the time, a travel diary was included within the survey and the purpose of the focus group was to gauge the ability to collect accurate information via a self-administered written travel diary and questionnaire.

3) Pilot - A formal pilot was conducted in the fall of 1991, to test all facets of the data collection methodology -- instruments, response rates, etc.

From this extensive pre-testing, final survey instruments were produced in English and Spanish. After the interview and collection of short forms, long form recipients were selected from the short form sample. Users of alternative commute modes were oversampled to assure key forms of travel behavior were "picked up" in sufficient quantity so as to estimate coefficients for related incentives.

Finally, long form participants were asked if they would be willing to complete a travel diary and provide the information via telephone to a professional interviewer. The response was very small, with some 80 out of the over 2,000 employees agreeing to participate in the travel diary. For this reason, travel diary information was deemed unusable.

2.5 Survey Response

The response rates for the various surveys are indicated below. The response rate for employers agreeing to participate in the research effort and an interview is an approximation, given recruitment was undertaken by both the consulting team and several other organizations, such as TMAs. The goal for the employee short form was 80% and the goal for the employee long form was 70%.

Survey	Response Rate
Employer Interviews	20.0%
Employee Short Form (Los Angeles)	68.4%
Employee Short Form (Sacramento)	70.6%
Employee Short Form (Total)	69.2%
Employee Long Form (Los Angeles)	64.2%
Employee Long Form (Sacramento)	77.3%
Employee Long Form (Total, 2-step)	70.6%
Employee Long Form (1-step)	20.1%

The final 10 companies in Southern California did not use the short form/long form methodology, but rather went directly to long forms. Therefore, surveys were distributed to all employees eligible for trip reduction incentives. The response rates reflect this broader distribution and, as mentioned above, the results were weighed back to the employee population using the most recent Regulation XV survey results. Efforts to maximize employee response rates included continual follow-up with the ETC and an offering of a $1 cash incentive stapled to the long form. A $5 cash incentive was paid to participants of the travel diary.

The name and location of the employers that participated in the employee long form survey are listed in **Tables 2.1** and **2.2**.

TABLE 2.1
SOUTH COAST EMPLOYERS PARTICIPATING IN ARB SURVEY

FIRM NAME	CITY
Aerospace Corp.	El Segundo
ARA Services	Los Angeles
Burbank City Hall - Municipal Services	Burbank
Carson Corporate Yard (City of)	Carson
Chiat/Day/Mojo in Advertising	Venice
Commercial Enameling Co., Inc.	Huntington Park
Crown Cork & Seal Co., Inc.	La Mirada
Custom Control Sensors, Inc.	Chatsworth
Foto-Kem Fototronics	Burbank
George Rice & Sons, Inc.	Los Angeles
Goodrich Co.	Santa Fe Springs
GTE California	Pomona
KCET/Community Television of So. Cal.	Los Angeles
Montgomery Ward, Rosemead	Rosemead
Montgomery Ward, Torrance	Torrance
Professional Community Management	Laguna Hills
Redlands Corporate Yard (City of)	Redlands
Renie Sunshine	Los Angeles
Russ Bassett Co.	Whittier
San Bernardino County Sun	San Bernardino
Sears Roebuck and Co.	Baldwin Hills
South Coast Medical Center	Laguna Beach
Southern California Gas Company	Los Angeles
Terrace Plaza Medical Center	Baldwin Park
Troy Lighting	City of Industry
Warner Center Hilton and Towers	Woodland Hills

TABLE 2.2
SACRAMENTO EMPLOYERS PARTICIPATING IN ARB SURVEY

FIRM NAME	CITY
Alta California Regional Center	Town & Country Village
Blomberg Building Materials	Sacramento
California Conservation Corps	Sacramento
CIGNA	Rancho Cordova
Clarion Hotel	Sacramento
Coca-Cola	North Highlands
Consumnes College	Sacramento
Dentists Insurance Company	Sacramento
El Camino Convalescent Hospital	Carmichael
G-Tech Corp	Sacramento
MCI	Sacramento
Raley's North Highlands	North Highlands
Rancho Murieta Country Club	Rancho Murieta
Sacramento Cable	Sacramento
Schools Federal Credit Union	Sacramento
The Graphics Center	Sacramento
VSP Optical Laboratory	Sacramento
Wemco Pump	Sacramento
Worthington Chevrolet	Sacramento

3.0

EMPLOYER AND EMPLOYEE CHARACTERISTICS

3.0 EMPLOYER AND EMPLOYEE CHARACTERISTICS

This section describes the characteristics of the 45 employers and their employees covered by the survey. The employer sample is first described in terms of employment and site characteristics, transport and parking availability, and their trip reduction programs. The second part describes the expanded employee population's personal and household characteristics, work hours, commute modes, and their awareness and use of incentives being offered by their employers. Detailed frequencies and cross tabulations are included in **Technical Appendix C**.

3.1 Employer Characteristics

3.1.1 Description of the Employer Sample

Geographic Distribution

26 sites were located in the Los Angeles region while the other 19 sites were in the Sacramento region. The employer addresses were also geocoded according to the traffic analysis zones (TAZs) of SCAG (Southern California Association of Governments) and SACOG (Sacramento Area Council of Governments) for purposes of model calibration.

TABLE 3.1
DISTRIBUTION OF EMPLOYERS BY REGION

Location	Number of Firms	Percent
Los Angeles Region	26	58
Sacramento Region	19	42
Total	45	100

Number of Employees

Most of the companies (35 sites) employed from 100 to 500 employees. Six sites had less than 100 employees while the remaining four sites had 500 or more employees.

The survey also indicated that 16 companies grew in size during the past five years, with a growth averaging about 20%. 20 companies experienced a reduction in workforce amounting to about 15%, while the size of eight companies remained stable. On the other hand, about half of the companies expected their workforce to remain stable in the future, while 14 companies

anticipated positive growth of about 17% and the seven other companies expected future reduction in their workforce averaging about 13%.

TABLE 3.2
DISTRIBUTION OF EMPLOYERS BY SIZE

Total Employees	Number of Firms	Percent
Less than 100	6	13
100-499	35	78
500 or more	4	9

Type of Business/Industry

Table 3.3 shows the distribution of the employer sample by industry based on their SIC classification. Many of the companies were in the manufacturing (14 sites) and services (12 sites) industries. The sample represented a diversity of businesses. It should be noted that type of business/industry was among the factors used to stratify the employer frame to get an even representation. However, due to the problems encountered in recruiting employers, this factor was compromised during the survey.

TABLE 3.3
DISTRIBUTION OF EMPLOYERS BY INDUSTRY

Industry	Number of Firms	Percent
Agriculture, etc.	1	2
Manufacturing	14	32
Transp/Comm/Utilities	4	9
Wholesale Trade	2	5
Retail Trade	4	9
Finance	3	7
Services	12	27
Non-business	4	9

3.1.2 Site Characteristics

Length of Time at the Site

The employers surveyed have been occupying their current site for an average of 21 years, although one firm was very new at the site and another one has been located at its current site for almost 90 years.

Type of Development

15 sites were located in industrial parks, and most of the rest were evenly distributed in the CBD (6), office parks (6), suburban activity centers (6), and other suburbs (7). Two of the companies were located in mixed-used development, and another two were at school campuses.

Land Use Adjacent to the Site

About half of the sites were adjacent to industrial and residential areas, while about 40% were adjacent to offices or retail sites/uses.

Retail Services Near the Site

34 sites have at least one type of retail services available within half a mile, as shown in **Figure 3.1**. The most commonly found retail services were restaurant/fast food (33 sites), convenience stores (22), video rental (19), bank/ATM (18), pharmacy/sundries (16) and dry cleaning (15). Four sites were close to a department store or a shopping mall. This is an important factor that affects employees' need to have an automobile for midday or other travel.

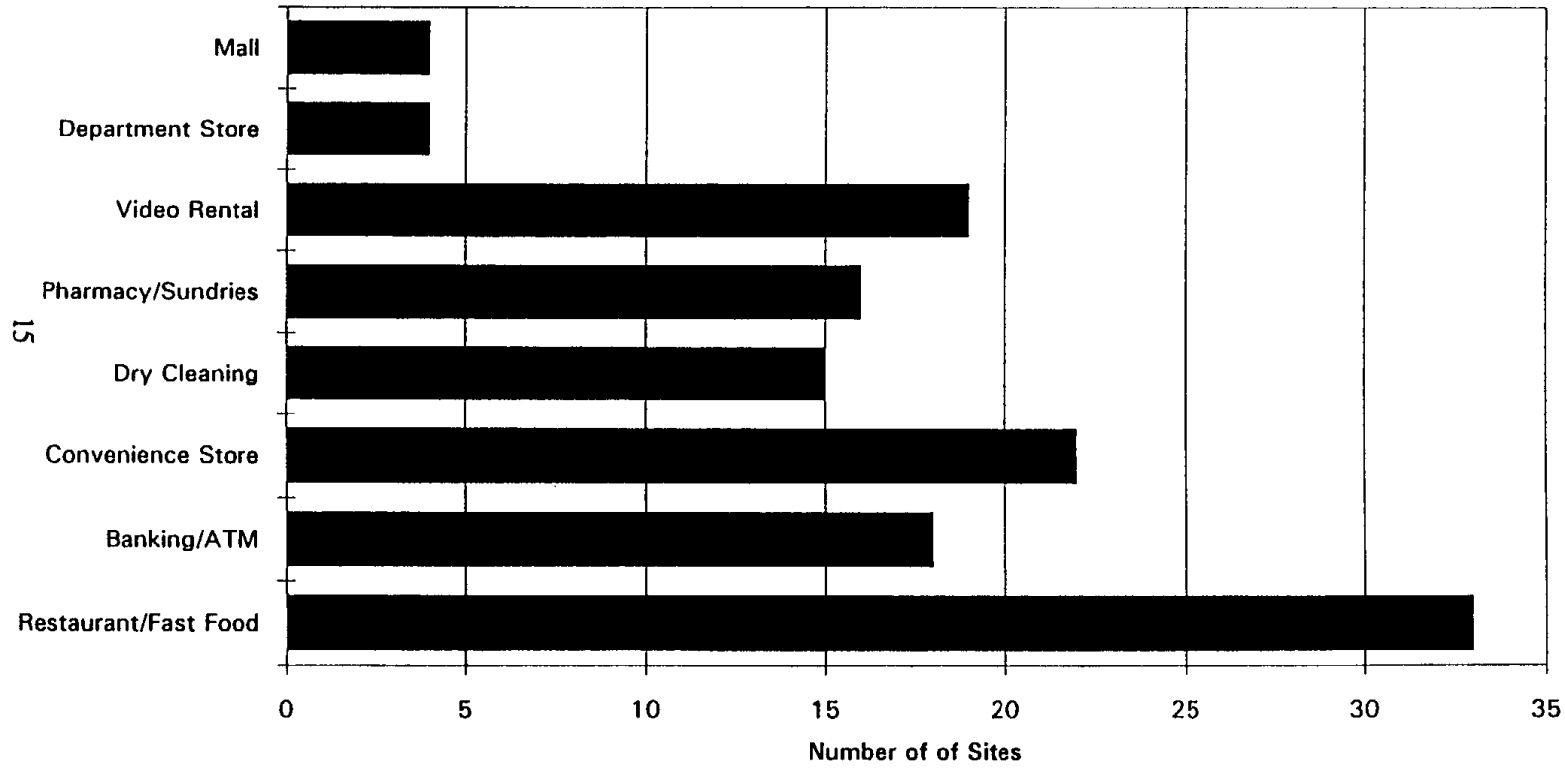
Office Type

55% of the sites were headquarters or single-site companies. The rest were branches of larger organizations.

Building Characteristics

33 employers occupied the buildings they were in as the sole tenant, while the 12 others shared the buildings with other tenants. The typical site had about three buildings, three floors in the tallest building, and occupying about 90,000 square feet of floor space. About 48% of the employers owned the building(s) or office spaces, 43% were leasing office space, while the others owned part and were leasing the other spaces they occupy. Half of the sites have buildings that were located at the center of the site, while about 40% have buildings directly fronting the streets.

Figure 3.1 Retail Services Available Near the Sites



3.1.3 Transportation Availability

The typical site was located about 1.6 miles from the nearest freeway. About half of the sites had access to HOV lanes on freeways and on ramps. The typical site was also being served by about four bus routes on the average. The nearest stop was about 1,300 feet from the site, while the nearest rail station (if available) is about 1.2 miles away. Half of the sites were in proximity to rail transit. Also, half of the sites had access to bike lanes.

3.1.4 Parking

Location of Parking at the Site

All but four sites offered on-site parking. Three sites had parking in adjacent garages, while one site did not have any on-site parking.

Number of Parking Spaces

The typical site had an average 350 on-site parking spaces, 30 of which were garage spaces while the rest were surface parking. There was a wide variation, though, with one site having no on-site parking at all and another site with about 4,000 on-site parking spaces.

Ratio of Parking Spaces to Number of Employees

Comparing the number of parking spaces to the number of employees (parking ratio), about 35% of the sites had more than one parking space per employee, and 18% had less than one space for every two employees (see **Figure 3.2**). The mean parking space ratio was 1.6. Thus, parking was plentiful at the sites and this likely affected mode choice.

Employers' Perception as to the Adequacy of Parking at the Site

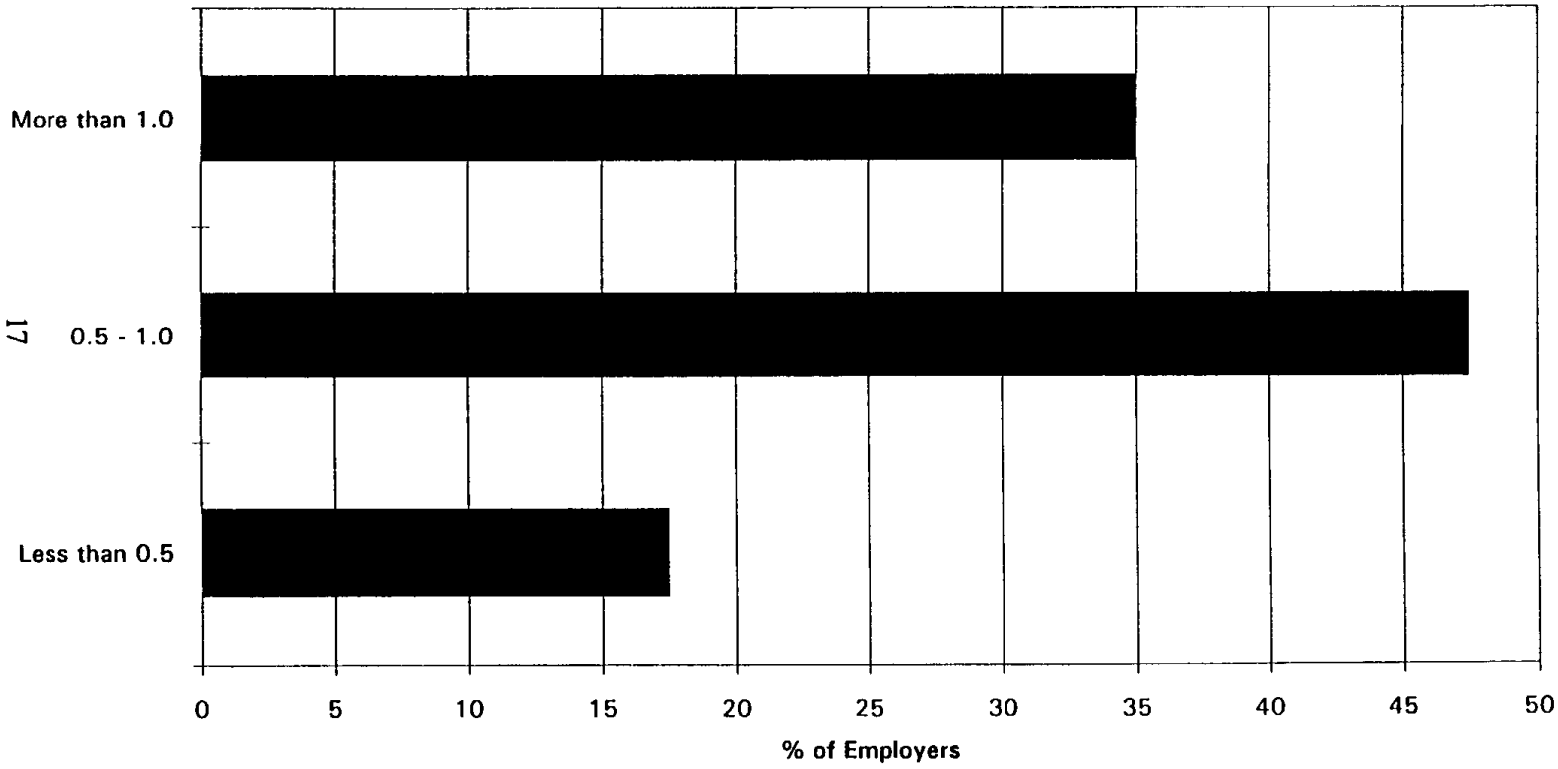
About 80% of the employers considered their parking supply as adequate now and in the future. Reasons cited for parking inadequacies were on-going constructions and overlap between shifts, both of which were temporary in nature.

Parking Charge

Ten sites were charging their employees for the use of company-provided parking spaces, with the parking charges averaging $35 per month. The maximum amount being charged was $95 per month at one site.

At 60% of the sites, employees had access to free on-street parking. Three sites had on-street parking meters, while off-street lot/garage was available to six sites.

Figure 3.2 Distribution of Employers by Parking Space Ratio



Parking Restrictions

About 60% of the sites restricted the use of company-provided parking spaces to certain groups of people. All of these 27 sites provided preferential parking for carpool/vanpool.

Parking restriction was usually enforced by means of parking stickers (14 sites). Other methods included verbal notice to employees (4 sites), a person (security guard, receptionist, ETC, or management) enforcing the restriction (5), or simply by marking the spaces (4).

Cost of Providing Parking Spaces

The cost of the parking spaces at 22 sites was either part of the building lease or internalized (i.e., the company built the parking lot). Ten sites leased all or part of their parking spaces. The average monthly parking cost per space as reported by employers was about $13 for surface parking.

3.1.5 Trip Reduction Program

41 companies, a vast majority of the sample, established their trip reduction programs because of employer regulations. A few others cited such reasons as parking constraint (3 sites) and environmental concerns (3).

Table 3.4 summarizes the trip reduction elements offered by different employers. Among the popular groups of incentives/elements were:

- ridematching services (40 sites),
- bike/walk incentives (40),
- support services and facilities (43),
- ridesharing support (35),
- transit incentives (37), and
- alternative work hour arrangements (38).

Only two sites offered transportation allowances, and vanpooling incentives were provided at five sites.

For direct financial subsidies, transit subsidies appeared to be the most popular (22 sites), followed by carpool subsidies (13). Eleven sites offered bike/walking subsidies, and 3 sites had on-going vanpool subsidies. As can be seen above, non-financial incentives were far more widespread than financial incentives.

TABLE 3.4
INCENTIVES/ELEMENTS OFFERED BY EMPLOYERS

Incentive/Element	Number of Firms	Percentage
Ridematching	40	89
On-site (Computerized)	4	9
On-site (By-hand)	25	56
Off-site (Outside Services)	22	49
Ridesharing Support	35	78
Preferential Parking	29	64
Company Cars for Ridesharers	6	13
Carpool Subsidies	13	29
Prizes	7	16
Coupon	4	9
Vanpooling	5	11
Vanpool Start-up	2	4
Ongoing Subsidy	3	7
Company Vans	1	2
Maintenance/Insurance Subsidy	2	4
Personal Use of Vans	1	2
Driver Training	2	4
Transit	37	82
Subsidy	22	49
Info	29	64
Pass Sales	15	33
Shuttle	5	11
Prizes	2	4

TABLE 3.4 (Continued)
INCENTIVES/ELEMENTS OFFERED BY EMPLOYERS

Incentive/Element	Number of Firms	Percentage
Bicycling/Walk	40	89
Bike Racks	26	58
Covered Bike Storage	16	36
Showers/Lockers	30	67
Subsidy	11	24
Coupon	4	9
Alternative Work Hour Arrangements	38	84
Flexible Hours	17	38
Compressed Work Week	16	36
Telecommuting	7	16
Staggered Hours	17	38
Support Services and Facilities	43	96
On-site Child Care	4	9
Guaranteed Ride Home	34	76
Cafeteria/Restaurant	17	38
Lunchroom Facilities	32	71
Convenience Shopping	9	20
ATM/Banking	7	16
Lunch Truck	5	11
Transportation Allowance	2	4

TABLE 3.4 (Continued)
INCENTIVES/ELEMENTS OFFERED BY EMPLOYERS

Incentive/Element	Number of Firms	Percentage
Marketing	44	98
ETC	35	78
On-site Info Center	17	38
Transportation Fairs	10	22
Newsletter	17	38
Employee Orientation	33	73
Prizes/Drawings	25	56
Direct/Targeted Mail	15	33
Bulletin Boards	36	80
Parties, rallies, meetings	4	9

Ridematching Services

Of the 40 sites offering ridematching services, 25 sites used manual (hand) methods and four sites used on-site computerized methods. 22 sites availed themselves of off-site ridematching services (of a regional ridematching organization).

Ridesharing Support

35 sites provided some form of support for ridesharers. Preferential parking is the most common, being offered at 29 sites. 13 employers offered subsidies for ridesharers.

Transit Incentives

29 companies provided transit information to employees to encourage them to use transit. 22 sites offered subsidies to transit users, and 15 employers offered discounted sale of transit passes.

Bicycling/Walking Incentives and Elements

Of the 40 sites with bike/walk incentives, 11 provided direct subsidies to walkers/bikers. 30 companies had showers/lockers for these people, and bike racks were provided in 26 sites. 16 sites had covered bike storage.

Alternative Work Hour Arrangements

Common arrangements indicated by the employers were flexible hours (17 sites), compressed work weeks (16) and staggered hours (17). Only seven sites had telecommuting arrangements for their employees.

On-Site Support Services and Facilities

Almost all employers provided on-site support services and facilities to encourage their employees to use alternative commute modes. The most common among these were guaranteed ride home (34 sites), lunchroom facilities (32) and cafeteria/restaurant (17). A few other sites offered on-site child care (4), convenience shopping (9), and ATM (7) within their work site.

Marketing of Incentives

Most of the employers promoted trip reduction incentives through their ETCs (35 sites), employee orientation (33), bulletin boards (36) and prize drawings (25). Marketing effort in most of the sites was being performed by one or two staff members, usually from the personnel or human resources section.

28 companies coordinated with other groups in providing the services or incentives in their trip reduction programs. All of these employed the services of a regional ridesharing agency; 10 employers coordinated with Transportation Management Associations (TMAs) in their areas, while a few of the employers worked with developers, local government or consultants.

Employers' Perception of the Incentive Effectiveness

There was no general consensus among the employers surveyed as to what strategies were most cost-effective. The most commonly cited elements were:

- prize drawings (7 sites),
- subsidies (6),
- guaranteed ride home (4) and
- preferential parking (4).

However, these were also viewed by some employers as among the least cost-effective elements of their programs.

Transit incentives were considered ineffective by seven companies, along with ridesharing support (6 sites) and bike/walk incentives (6).

Problems in Developing/Implementing Trip Reduction Programs

35 employers cited one or more problems in developing or implementing their trip reduction programs. The problems most often mentioned were generating employee interest (17 sites), budget limitation (13) and support from management (12).

Management Support

21 employee transportation coordinators (ETCs) who responded to the survey considered management as very supportive of their trip reduction programs. 16 others viewed the support as somewhat lukewarm, while seven ETCs did not think that the management was supporting them at all. Management support has been cited by many researchers as critical to the overall success of the program.

The ETCs were also asked what company policies tend to discourage or encourage trip reduction efforts. Most of the policies cited were related to work hour arrangements. Flexible hours was viewed in a positive light, while early start time and overtime were viewed negatively.

Program Costs

The survey asked information about the costs of implementing the trip reduction programs. The average program cost amounted to $13,000 per year. The average costs for the different components are shown in **Table 3.5**. This average annual expenditure equals about $35 per employee for all the firms surveyed. This is considerably below the estimates provided in the Introduction from past research, particularly the Regulation XV study that reported a annual cost of $105 per employee. This could be due to several factors: the inclusion of less aggressive programs in Sacramento, the types of programs captured in the LA sample, or the overreporting of costs in previous studies. The research conducted here queried coordinators as to the hours spent per week on the program. Many firms only reported a few hours a week, and from this we estimated staffing costs (since it was usually unavailable). In studies conducted for the SCAQMD, employers may have felt pressure to overestimate hours given the perceived amount expected by the air district.

TABLE 3.5
AVERAGE COSTS OF TRIP REDUCTION PROGRAM ELEMENTS

Program Element	Average Cost per Year
Administration (Staffing)	$7,500
Marketing and Promotions	$2,300
Subsidies/Incentives	$2,400
Facilities/Capital Costs	$ 600
All Elements	$13,000

3.2 Employee Characteristics

The employee long form survey yielded 2,437 respondents, which represented about 13,000 employees when weighed and expanded. Weights were obtained by company and by mode depending on the distribution of respondents in the long form and short form surveys according to mode used. This section describes the characteristics of this weighted sample of respondents. Detailed tabulations may be found in **Technical Appendix C**.

3.2.1 Personal Characteristics

Majority of the respondents were male (53%), married (59%) and white (72%). The most prevalent age group was 30-39 (32%), and the 40-49 age group came next at 24%. About 10% have children under two years old in daycare; 12% have children between two and five years in daycare. About 20% have children in elementary school, and the same proportion have children in junior or senior high school. These employees have been in their current work site for about eight years.

Table 3.6 shows the distribution of employees by occupation. About half were in the administrative and professional group.

TABLE 3.6
DISTRIBUTION OF EMPLOYEES BY OCCUPATION

Occupation	No. of Respondents	Percentage
Managerial/Administrative	2,181	17
Professional/Technical	4,803	37
Secretarial/Clerical	2,577	20
Sales/Associates	761	6
Services/Maintenance	777	6
Craftsman/Production	1,380	11
Others	382	3

3.2.2 Household Characteristics

The typical household of these employees consisted of about three household members, two of whom are employed and two are licensed. The typical household has two vehicles and two bicycles on the average.

About 30% of the employees have household incomes of $25,000-$49,999, 25% are in the $50,000-$74,999 income bracket, and 30% have household incomes of more than $75,000.

3.2.3 Work Hours

About 80% of the employees reported to work between 6 and 10 a.m., with most of these arriving at the worksite between 7 a.m. and 8 a.m. Also, about 80% left their workplaces between 3 p.m. and 7 p.m., with most of these leaving during the 4-5 p.m. period.

A large group of the employees (about 45%) worked fixed hours, while about 28% had flex time and can adjust their schedule daily. 16% indicated their work involved frequent trips to clients.

The employees were also asked the reasons for changing work schedules if they did so in the past. 37% of the respondents changed their work schedule to take care of personal business, while 31% changed their schedule to avoid traffic. Other reasons cited by a significant number of respondents were to ride in carpool/vanpool (23%), to drop off or pick up a child (20%), and work related - changed position, shift or schedule (24%).

3.2.4 Yesterday's Commute

Most of the respondents (67%) drove alone to work, and about 29% rode in carpools/vanpools. Only 2% used transit. (See **Figure 3.3**).

Of those who used carpools, vanpools or transit, about 40% drove alone to the stop or the meeting place, 35% were picked up, and 17% walked to the stop or meeting place. This is a particularly important finding, as the 4 out of 10 ridesharers who drove alone to a meeting place represented cold starts and therefore had a less positive impact on mobile source emissions.

84% of the respondents went to work five days a week. About half commuted to their work for 20 days a month.

3.2.5 Weekly Commute

Mode split did not vary by day of the week, as may be seen in **Figure 3.4**, except for a slight increase in the "other" category which is primarily due to compressed work weeks.

Figure 3.5a shows the number of times drive alone was used during the week, and **Figure 3.5b** refers to the carpooling mode. Of interest to note was the fact not all those who used a particular mode did so on a regular basis (i.e., five times a week). For example, while 60% drove alone during the entire week, the remaining 40% drove alone to work fewer than five days a week. "Part-time" use is more noticeable for carpooling, with about 55% carpooling for less than five days a week.

Figure 3.3 Mode Used Yesterday

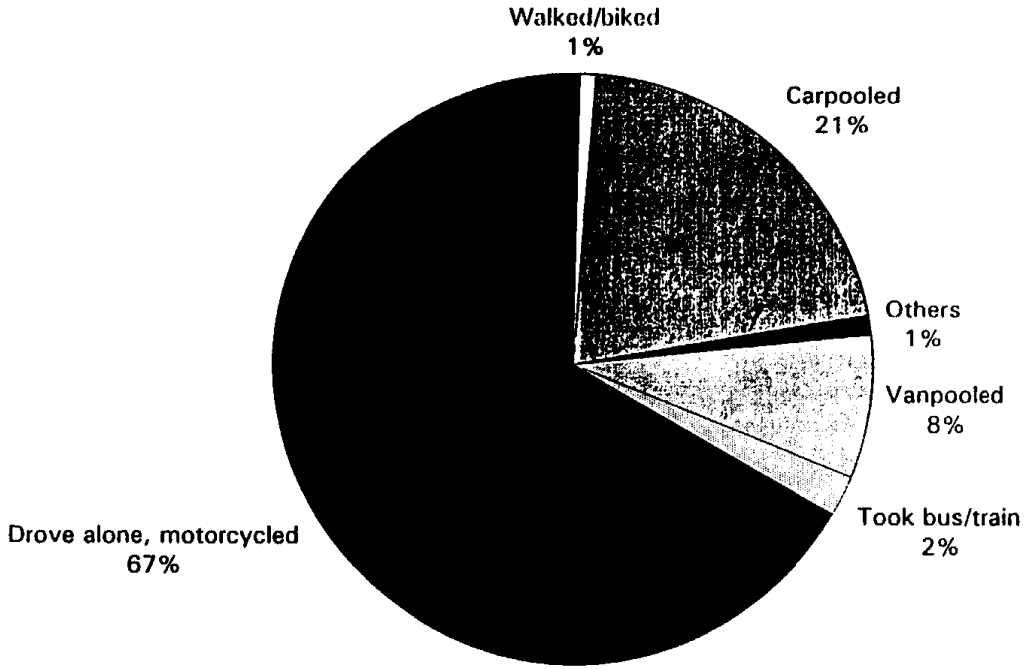


Figure 3.4 Mode Split During the Week

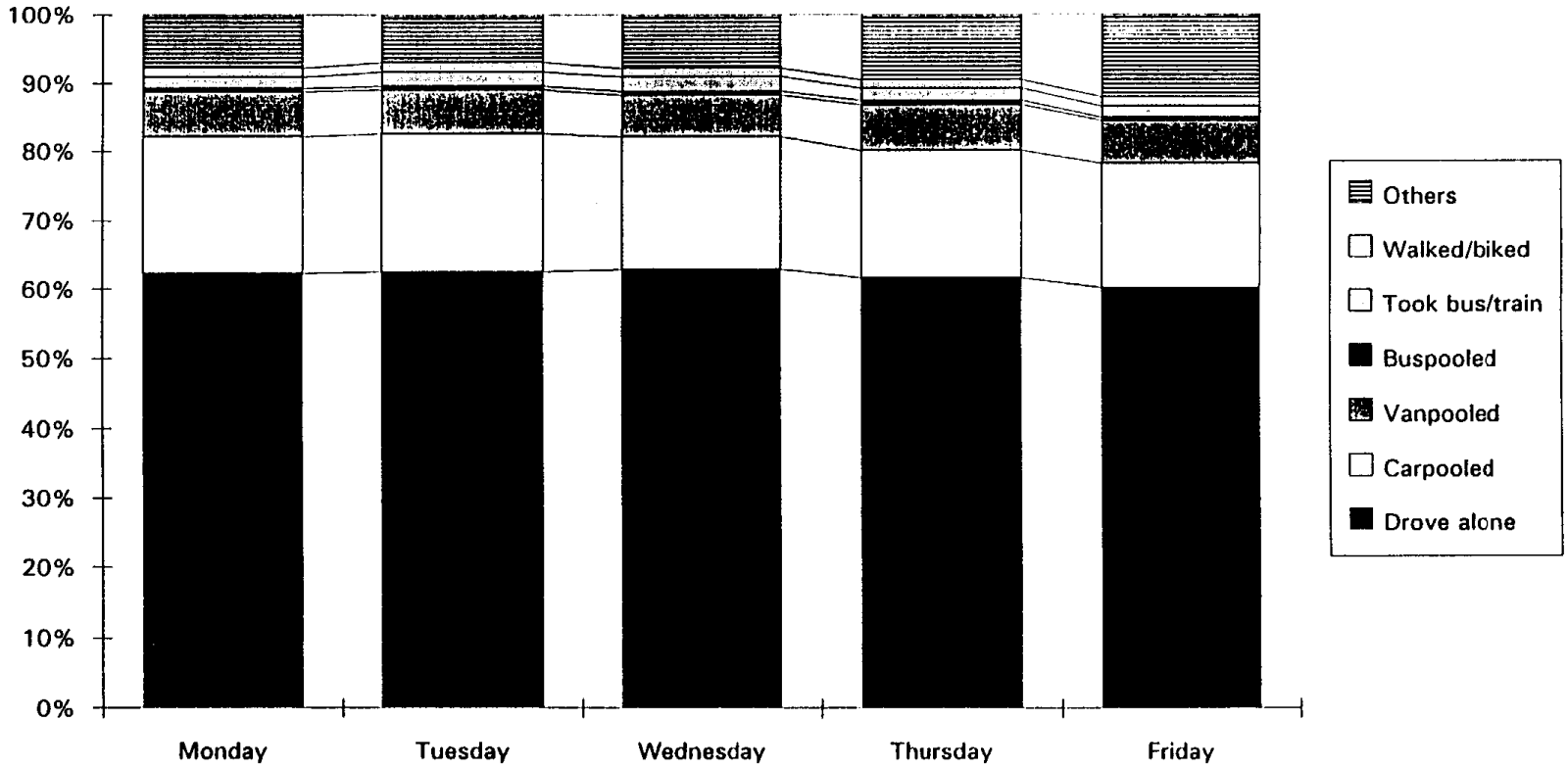


Figure 3.5a Frequency of Driving Alone During the Week

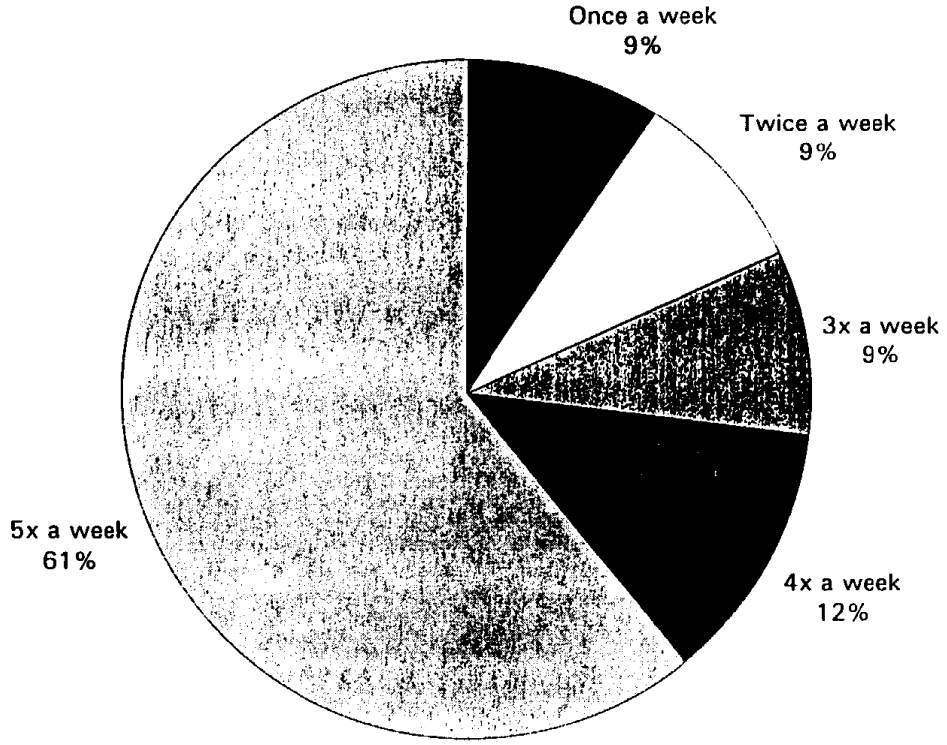
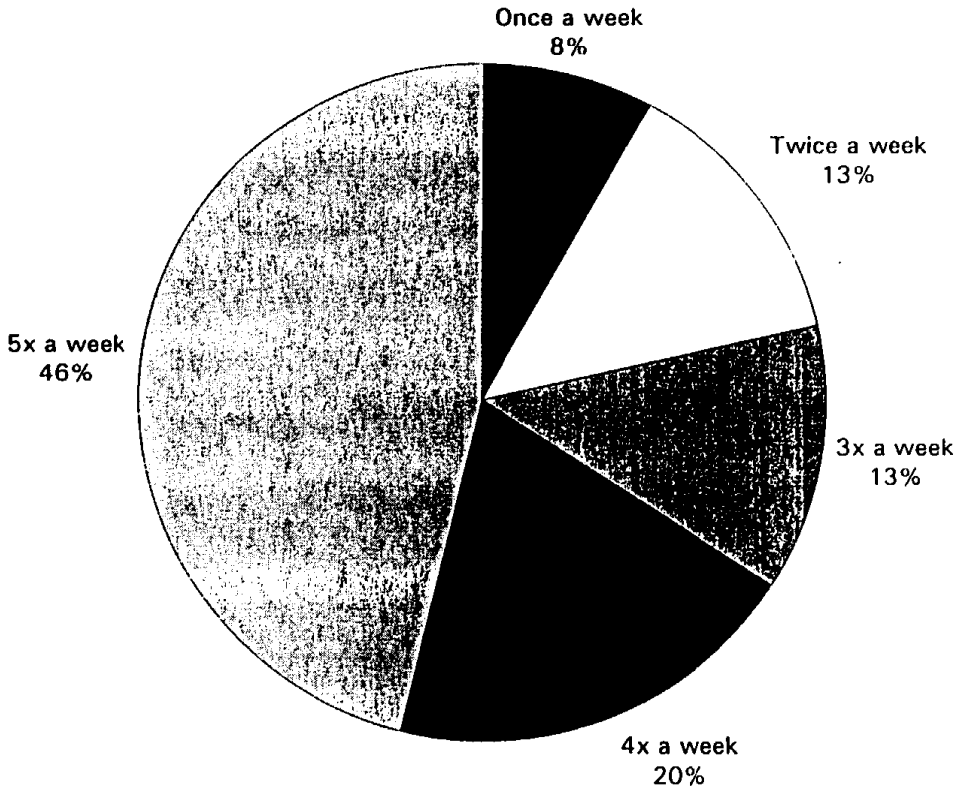


Figure 3.5b Frequency of Carpooling During the Week



3.2.6 Factors Considered in Selecting Commute Mode

The survey asked the employees to rank the three factors they considered most important in deciding how they get to work. The responses to this question are shown in **Figure 3.6.** "To be at work on time" stands out as the most important factor, being cited by 66% of the respondents to the question. Thus, if commute alternatives are unreliable or introduce considerable circuity into a route to work, then employees are less likely to consider using it. This was followed by "shortest travel time" which was mentioned by about 48% of those who responded to the question. Other factors with significant number of respondents include "personal safety", "allows flexible daily schedule", and "after work errands and shopping."

3.2.7 Parking

92% of the respondents parked (or would have parked) in a lot or garage on work premises. Another five percent parked on a street near their worksites. The employees walked for about 2.5 minutes from the parking space to the building.

If the usual parking lot or garage was not available, about half of the respondents would have gone to another lot or garage, and about one-third would have parked on the street. Only three percent would have considered using an alternative mode to work. This last finding is counter to recent literature that shows that restricting parking supply does increase the use of alternative modes.

About 64% considered it very easy to find parking at the work site. Parking was free to about 96% of the respondents. The employees who have to pay for parking paid an average of $30 a month.

3.2.8 Public Transit

Non-transit users were asked to rank the three reasons that discouraged them from using public transit. **Figure 3.7** shows that the most frequently cited reason was that transit "takes too long", confirming that time is a clear influence on travel behavior. Distance to transit stop, transfers, personal safety, service frequency and costs were also cited by a significant number of respondents.

For public transit users, average access time to/from the bus stop (both at the home-end and the work-end of the trip) was about 17 minutes.

Figure 3.6 Ranking of Factors in Selecting Commute Mode

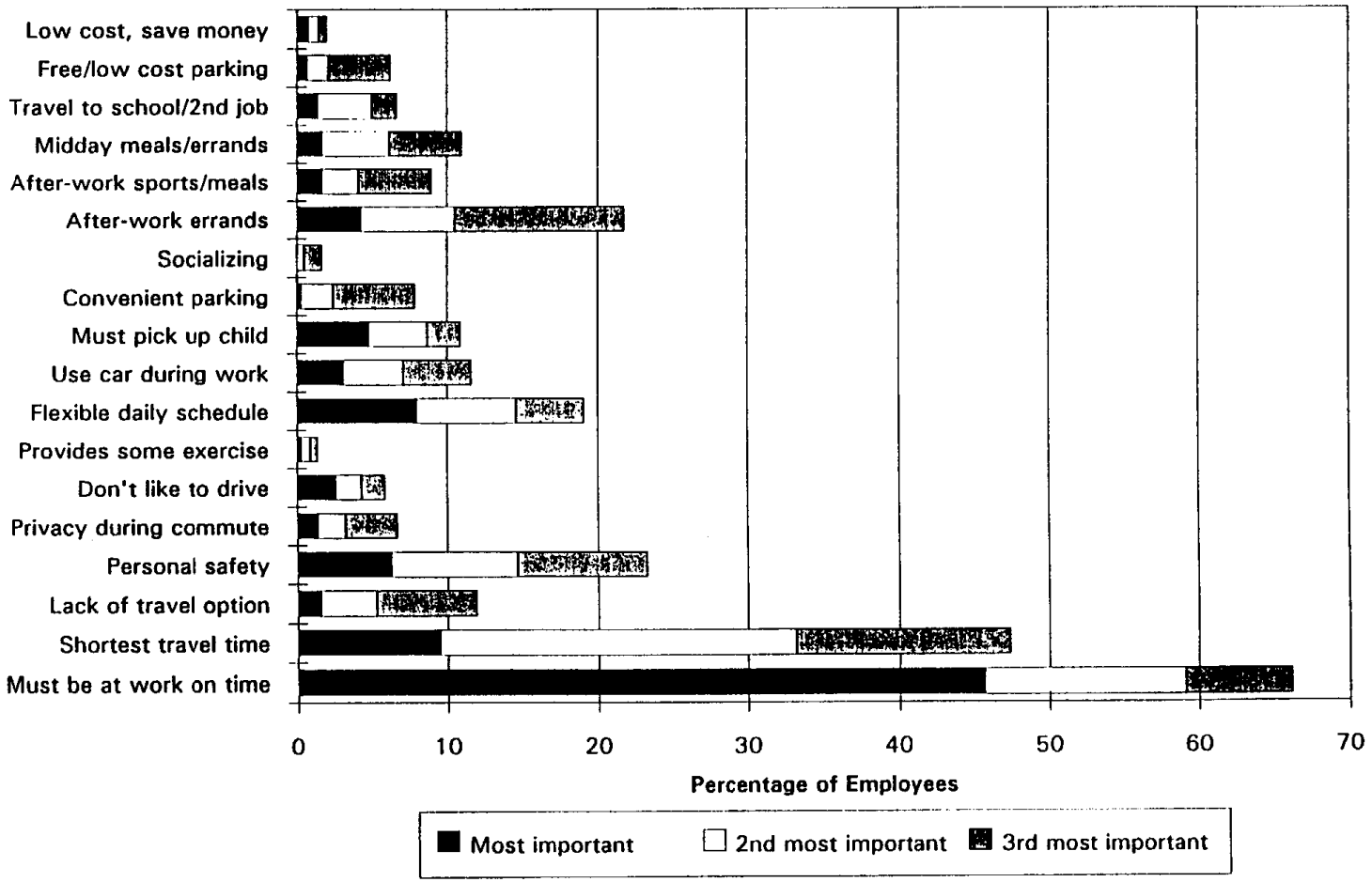
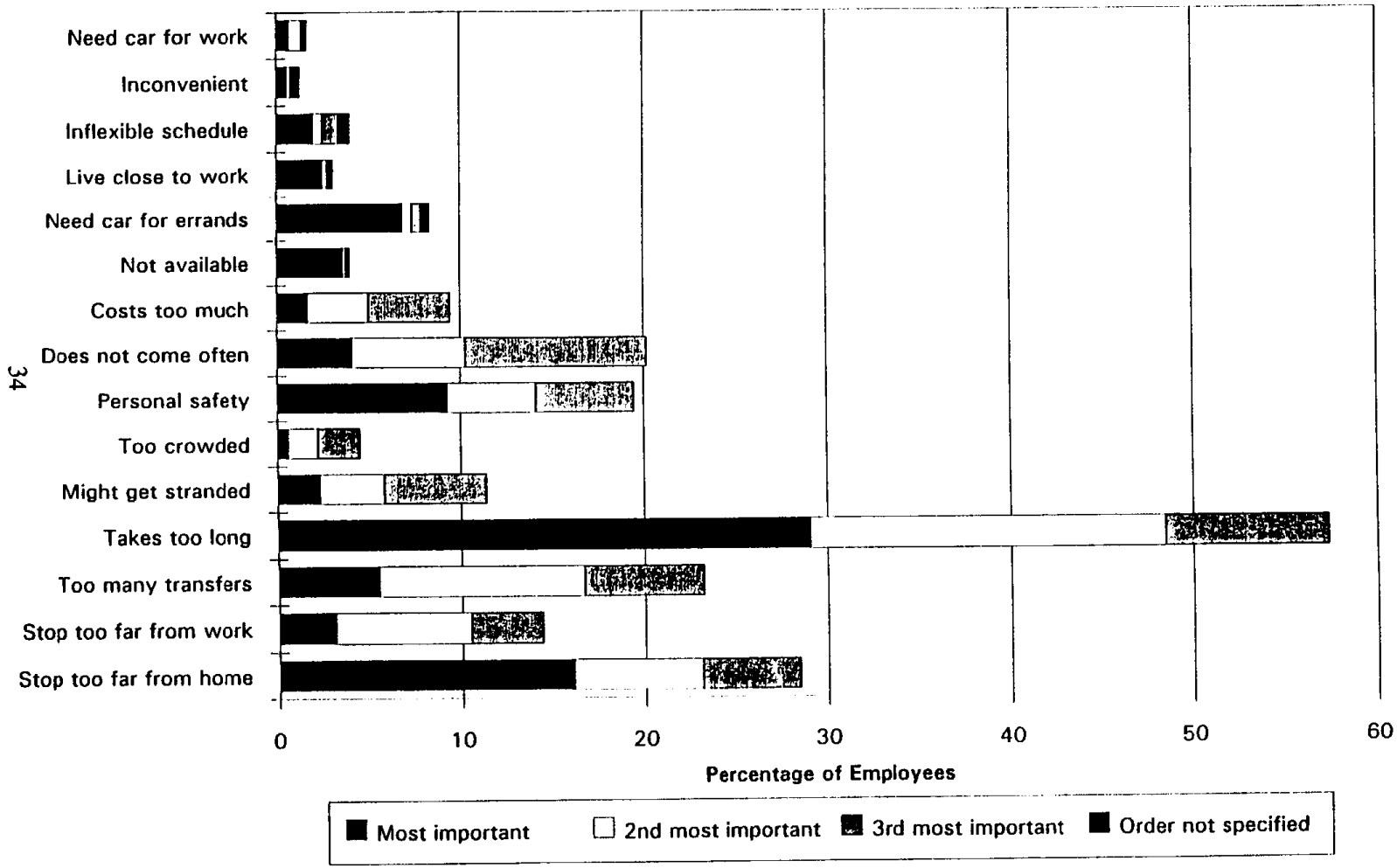


Figure 3.7 Ranking of Reasons for Not Using Transit



3.2.9 Awareness and Use of Incentives

Table 3.7 shows the responses of the employees surveyed to questions about their knowledge of different incentives being offered by their employers (column 2), and whether they have tried or used such incentives (column 3). The incentives well-known among the majority of employees surveyed are free parking (80%), carpool matching/information (72%), and preferential parking for carpools/vanpools (63%). On the other hand, very few employees knew about telecommuting (5%), buspool/subscription bus (9%) and transportation allowances (11%).

These results compare well with the results from the employer survey (reproduced as column 5 in the table) which indicated ridematching services and ridesharing support among the most popular incentives offered by employers, while only a few offered transportation allowances (see **Section 3.1.5 Trip Reduction Program**). While the results in column 3 appear to present very poor utilization of incentives, column 4 presents a more accurate picture by indicating the utilization rate of an incentive as a percentage of those who knew of such incentive. It could be seen that the use of incentives among those who were aware of their availability ranges from 20-40%. Carpool matching was used by about 50% of the employees aware of the incentive. Of interest to note is while only 11% of the employees knew about transportation allowances, 32% of these used the incentive.

TABLE 3.7
AWARENESS AND USE OF INCENTIVES

	Incentive	Percent Aware	Percent Use (as % of Total)	Percent Use (as % of Aware)	Percent of Firms Offering
	(1)	(2)	(3)	(4)	(5)
1	Carpool matching/information	72	36	49	89
2	Commuter assistance office	40	12	29	38
3	ETC	48	13	27	78
4	Preferential parking for pools	63	20	32	64
5	Free parking	80	61	76	60
6	Reduced/free parking for pools	20	7	33	64
7	Cash prizes for carpoolers	36	9	25	16
8	Company vanpools	37	13	33	2
9	Carpool subsidies	11	4	36	29
10	Vanpool subsidies	12	1	9	7
11	Showers/lockers	34	8	22	67
12	Bike racks	48	5	20	58
13	Buspool	9	1	15	-
14	Bus pass sale	21	3	15	33
15	Free/discounted bus pass	16	3	17	-
16	Transportation fairs	17	5	26	22
17	Telecommuting	5	1	18	16
18	Guaranteed ride home	34	6	18	76
19	Transportation allowance	11	4	32	4

Notes: (2) Percentage of respondents who indicated that their employers offered the incentive.
(3) Percentage of respondents who indicated that they tried or used the incentive.
(4) Percentage of those who knew the incentive that actually used the incentive.
(5) Percentage of firms offering the incentive.

3.3 Summary

This section presented the characteristics of the employer sample and of the expanded employee sample. Key characteristics are summarized below.

Employer Characteristics

The employers included in the survey were located in the metropolitan regions of Los Angeles and Sacramento with a 60-40 split. Majority of the companies were in the manufacturing and services sector, employing between 100 to 500 employees.

The firms have been occupying their current site for an average of 21 years. Most of the sites were located in industrial parks, with access to retail services within half a mile. Majority of the firms were sole tenants in the building/s they occupy. The firms were equally divided between owners and lessees. The typical site configuration consisted of three buildings, three floors at the tallest building, with a floor area of about 90,000 square feet. The sites were served by an average of four bus routes, with the nearest stop about 1,300 feet away. The nearest freeway was about 1.6 miles from the site, and the nearest rail station serving half of the sites was located about 1.2 miles from the site. Half of the sites had access to bike lanes.

Parking at the sites surveyed was generally considered adequate. All but four sites had on-site parking with an average of 350 spaces. Majority had free on-street parking. The ratio of parking spaces to number of employees was about 1.6, which roughly translates to about three spaces for every two employees. Ten sites were charging their employees about $35 a month for parking. Most of the employers restricted the use of parking to certain group of employees, generally preferential parking for carpools/vanpools. The cost of parking space for half of the firms was either part of the building lease or internalized (i.e., the company built the parking lot). Ten sites were leasing parking spaces at an average cost of $13/month/space.

Almost all firms established their trip reduction programs due to employer regulations. Among the most popular incentives being offered were guaranteed ride home, preferential parking, transit information, showers/lockers, and lunchroom facilities. Transportation allowance and vanpool incentives were the least popular. Many employers considered the following incentives as effective: prize drawings, subsidies, guaranteed ride home and preferential parking. Among the ineffective incentives groups according to employers were transit incentives, ridesharing support, and bike/walk incentives. Trip reduction programs were generally marketed by the employer transportation coordinator (ETC), through employee orientation and by means of bulletin boards. The problems generally encountered by employers in implementing their programs were generating employee interest, budget, and management support. About half of the companies considered management support as very good, while the other half considered it lukewarm or none at all. The average program cost per employer was $13,000 per year, with over half of that allocated to staffing the program.

Employee Characteristics

Majority of employees surveyed were male, married, and white, with ages ranging from 30 to 50. About 20% had children in daycare, elementary school, or junior high school. On the average, the employee has been working at the current site for about eight years. Half of the employees were in the managerial/administrative and professional/technical positions.

The typical household of the employee consisted of three members, two of whom were employed, and two were licensed drivers. The average income was about $55,000. The household had two vehicles and two bicycles available to household members.

Most of the employees went to work by driving alone. About 30% used carpools and/or vanpools. A very small number used transit and other modes. However, there were employees who drove alone or carpooled not on a regular, five-day basis. The survey results showed about 40% of those who drove alone and about 55% of those who carpooled, did so less than 5 days a week. Finally, 40% of ridesharers accessed their alternative mode by driving alone, thus creating a cold start, and thereby reducing much of the emission benefits.

Among the factors considered by employees as important in selecting their commute modes were: the need to be at work on time, personal safety, and after-work errands/shopping. Employees who did not use transit cited the following factors as discouraging them from using the mode: takes too long, stops too far from home, too many transfers, does not come often enough, and personal safety.

Most of the employees knew their employers were offering carpool matching/information and preferential parking. Very few knew about telecommuting, buspool or transit allowance being offered. Generally, the incentives were being used by 20-40% of those who knew of their availability.

4.0

INFLUENCES ON TRAVEL BEHAVIOR

4.0 INFLUENCES ON TRAVEL BEHAVIOR

A number of characteristics of employers and employees were compared against mode split to determine significant factors affecting commuter behavior. The first part examines the impact of employer and site characteristics on mode split. The influence of employee characteristics is then examined in the second part. The third part attempts to examine the effectiveness of incentives with respect to the use of modes targeted by these incentives. To facilitate the analysis and enable us to easily see possible relationships, the various commute modes were grouped into four categories as follows: drive alone, rideshare, transit and bike/walk. Detailed tabulations are included in **Technical Appendix C**.

4.1 Impact of Employer and Site Characteristics

Mode Split vs. Number of Employees

Drive alone rates were very similar (about 73%) for small firms (with less than 50 employees) and intermediate companies (with 100-500 employees). Larger companies (with 500 or more employees) had a significantly lower percentage (62%) of drive alones. On the other hand, rideshare mode splits are lower for small and intermediate firms (about 25%) but is significantly higher for larger firms (37%).

Mode Split vs. Location of the Site

Drive alone share was higher for Sacramento (81%) than for LA (64%). On the other hand, the LA sample had a higher proportion of ridesharers (33%). The drive alone share reported by the UCLA/USC researchers for second year Regulation XV sites (LA) was 70.9% and even less in year three, so this share may be fairly representative of regulated sites.

Mode Split vs. Industry

High incidence of drive alone was found in the transportation and communications sector (74%), wholesale trade (79%), agriculture (82%) and non-business entities (79%). Drive alone rate was lowest in the services sector (62%). On the other hand, the percentage of ridesharing was greatest in the services (35%) and manufacturing (26%), and lowest in the retail trade (15%). Transit shares were markedly higher for retail and finance sectors (both at 8%).

Mode Split vs. Parking Cost

Only transit shares showed a clear and direct relationship with parking cost, with transit share increasing as parking cost increases. Existing parking costs to employers differs from fees imposed on employees.

Mode Split vs. Program Cost

A direct relationship apparrently exists between mode shares and total program costs, as depicted in **Figure 4.1**. With increasing program costs, drive alone rates decrease, and the percentages for ridesharing, transit and bike/walk increased. This finding seems intuitive, but is actually counter to most research that does not find a direct correlation between dollars spent and trips reduced.

4.2 Employee Characteristics

Mode Split vs. Sex

Drive alone rate was higher among female employees (69%) than among males (66%), while rideshare rate was higher among males (30%) than females (26%).

Mode Split vs. Marital Status

Drive alone rate was also higher among unmarried employees (76%) than among married employees (62%). Married employees also tended to rideshare more (36%) than unmarried employees (19%). Transit share for unmarried employees was twice that for married employees, and bike/walk share was also higher for unmarried employees.

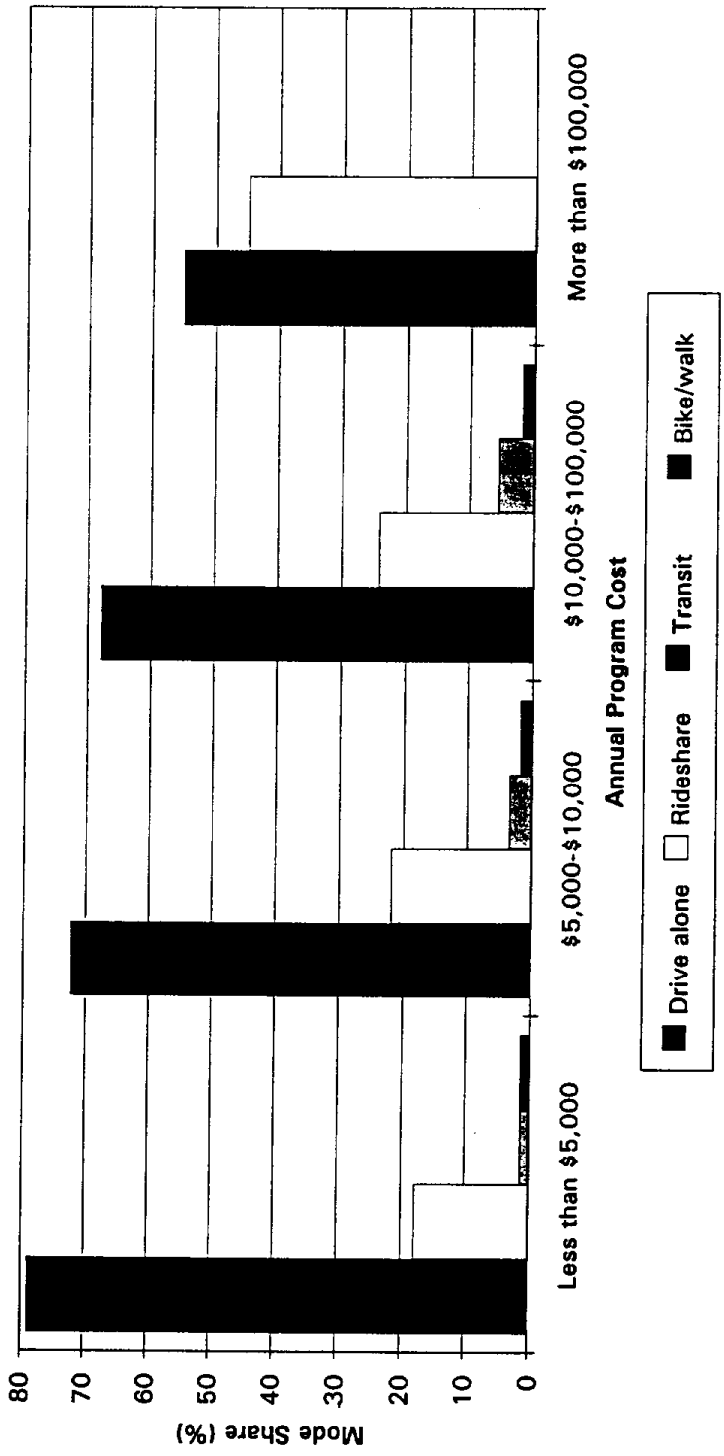
Mode Split vs. Racial Background

There are indications that mode share is influenced by the racial background of employees. As **Table 4.1** indicates, drive alone shares were higher among black (72%) and white (71%) employees, while the corresponding shares are lower for Asian (56%) and Hispanic (54%) employees. On the other hand, ridesharing rates were relatively high among Asians (43%) and Hispanic (36%) employees.

TABLE 4.1
MODE SPLIT AND RACIAL BACKGROUND

Mode	White	Black	Asian	Hispanic
Drive alone	71	72	56	54
Rideshare	27	25	43	36
Transit	1.4	2.4	.4	8
Bike/walk	1.3	1.4	.8	2.5

Figure 4.1 Mode Split vs. Program Cost



Mode Split vs. Age

A low drive alone percentage was observed among old (more than 60 years) employees (50%) while the highest share was found among the 30-39 age bracket (72%). On the other hand, rideshare rate was highest for the old employees (36%) and lowest for the 30-39 age group (24%).

Mode Split vs. Occupation

Drive alone share was high among managerial and administrative employees (72%), and clerical employees (69%). On the other hand, it was lowest among service/maintenance workers (59%). The opposite pattern was observed for the ridesharing rate which was high for the service/maintenance workers (32%) and professionals (32%) but lowest for sales staff (22%). This may be due to the relatively stable schedule of service/maintenance workers and the uncertainty of sales.

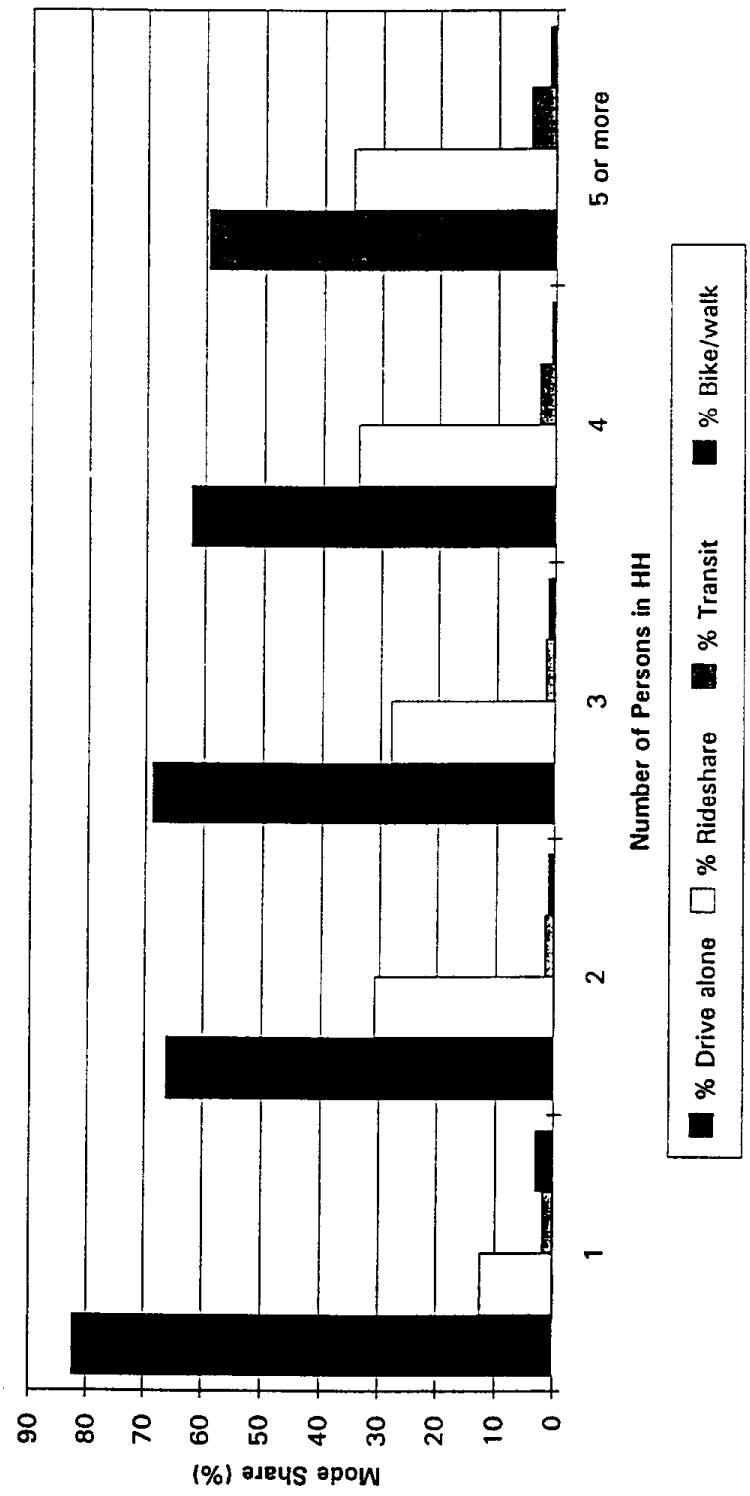
Mode Split vs. Number of Household Vehicles

Drive alone share was significantly higher for households with at least one vehicle (68%) than for zero vehicle households (45%), although there seems to be no relationship between drive alone rate and the actual number of vehicles in the household.

Mode Split vs. Household Size

The results of the survey indicated a strong relationship exists between mode split and number of persons in the household, as depicted in **Figure 4.2**. Drive alone rates showed a decreasing pattern, while rideshare and transit rates increased with household size.

Figure 4.2 Mode Split vs. Household Size



4.3 Impact of Incentives

This part explores the impact of different incentives on commuter behavior. However, before discussing the results of the survey, it is important to note the difficulties involved so the results are properly interpreted. First, it is difficult to attribute the use of one mode to one particular incentive. A combination of incentives might have prompted an employee to use an alternative mode. Second, some incentives (like transportation fairs and commuter assistance) are aimed at increasing the share of not just one mode but several alternative modes (carpool, vanpool, transit, bike, walk, etc.). A third difficulty is the existence of "part-time" users (i.e., they use a combination of modes during the work week, such as a person joining carpool once or twice a week).

The methodology used to examine the effectiveness of incentives was a "funnel" process applied to each incentive. The underlying rationale of the process is as follows. An incentive is intended to attract people to use certain modes (targeted modes). The incentive is successful if those who used the incentive actually used any of the targeted modes. The proportion of the people who used the incentive and actually used the targeted modes may then be considered as a measure of success for the incentive. Based on this rationale, the methodology was applied in the following manner. First, the number of employees who knew of the incentive was determined. Second, among these employees, those who used the incentive were segregated. Third, the mode(s) actually used by the employees were determined. This information was available in terms of the mode used by the employee "yesterday", and the modes used during the work week. The latter information was translated into the number of times the mode was used during the week. The effectiveness of the incentive was viewed here in terms of the proportion of those who knew and used the incentive AND actually used the modes targeted by the incentive. For example, an incentive such as carpool matching/information would be considered ineffective if most of the people who used it never carpooled even once a week.

The results are shown in **Table 4.2**. From this table, the following incentives may be considered to be "effective" and are generally consistent with the findings cited from other research as outlined in the Introduction:

- guaranteed ride home,
- company vanpools,
- preferential parking,
- reduced parking fees for carpools/vanpools,
- transportation allowance, and
- carpool subsidies.

This may be seen in column (4), which indicates the percentage of those who used the incentive and actually used the modes targeted by the incentive. Vanpool subsidies did not appear as effective, with only 42% of the users of the incentive actually vanpooling during the previous day. The table also indicates that the provision of showers/lockers did not really encourage biking or walking but was introduced more as an amenity for all employees.

The differences between columns (4) and (5) of **Table 4.2** could be indicative of the relative success of the incentive in attracting "part-time" users, if the mode used "yesterday" could be considered as the typical mode of the employee. For example, among those who used the incentive "cash prizes for carpoolers", only 38% actually carpooled the previous day while 66% carpooled at least once during the week. The same observation could possibly apply to carpool subsidies, bus pass sale, free/discounted bus pass, bike racks, etc. in that they appeared to be more successful in attracting "part-time" users of their targeted modes.

TABLE 4.2
EFFECTIVENESS OF INCENTIVES

Incentive (1)	No. of Users (2)	Targeted Modes (3)	% Used yester day (4)	% Used at least once (5)
Carpool matching/information	4,439	Carpool/Vanpool	28	25
Commuter assistance office	1,434	Alternative	55	-
ETC	1,612	Alternative	48	-
Preferential parking for pools	2,522	Carpool/Vanpool	61	68
Reduced/free parking for pools	818	Carpool/Vanpool	60	55
Cash prizes for carpoolers	1,114	Carpool	38	66
Company vanpools	1,545	Vanpool	62	63
Carpool subsidies	493	Carpool	51	64
Vanpool subsidies	146	Vanpool	42	37
Showers/lockers	933	Walk/Bike	9	2
Bike racks	667	Bike	3	15
Buspool	165	Bus	2	9
Bus pass sale	407	Bus	18	30
Free/discounted bus pass	323	Bus	18	28
Transportation fairs	553	Alternative	41	-
Guaranteed ride home	753	Pools/Bus/Train	69	-
Transportation allowance	442	Pools/Bus/Train	57	-

Note: (1) List of incentives in the employee long form.
(2) Weighted number of respondents who indicated that they tried/used the incentive.
(3) The modes targeted by the incentive. "Alternative" refers to alternative modes to drive alone: carpool, vanpool, bus, train, walk, bike.
(4) Percentage of respondents who used the targeted modes yesterday.
(5) Percentage of respondents who used the targeted modes at least once a week.

4.4 Summary

This section examined the influence of employer characteristics, employee characteristics, and incentives on mode shares. Although the study did not attempt to examine the relationships in more detail by using involved statistical method, some interesting insights were provided by the simple cross-tabulations.

Employer/Site Characteristics

There was a significant difference in mode shares between the Los Angeles and Sacramento areas. Drive alone share was about 15% higher in Sacramento than in L.A. On the other hand, ridesharing rate was about 15% higher in L.A., but this was consistent with the mode split for regulated sites as researched by the UCLA/USC team.

Mode split appeared to be influenced by the number of employees and the type of business or industry of the company. There is good evidence that the total amount spent by the employer for their trip reduction programs had impact on the modes used by their employees. The data showed decreasing drive alone shares and increasing shares for alternative modes as employers spend more on their programs.

Employee Characteristics

Personal characteristics of the employee also appeared to influence the use of alternative modes. These included sex, marital status, racial background, age and occupation.

Except for household size which showed a clear relationship with mode shares, other household characteristics such as income and number of vehicles did not show any significant influence. However, there was a significant difference in mode shares between car-owning households and non-car-owning households.

Incentives

The effectiveness of incentives was examined in terms of the modes actually used by the people who used the incentives. The underlying rationale is that an incentives is offered to attract people to use certain modes (targeted modes); the incentive is successful if those who used the incentive actually used any of the targeted modes. The proportion of the people who used the incentive and actually used the targeted modes may then be considered as a measure of success for the incentive.

Based on the foregoing discussion, a number of incentives were found to be "effective." These included guaranteed ride home, company vanpools, preferential parking and reduced/free parking for carpoolers/vanpoolers, transportation allowances, commuter assistance office, and carpool subsidies. More than half of the users of these incentives actually used the modes targeted by the incentive. There were indications that cash prizes for carpoolers were effective in attracting "part-time" users.

5.0

A MODEL OF INDIVIDUAL TRAVEL BEHAVIOR

5.0 A MODEL OF INDIVIDUAL TRAVEL BEHAVIOR

This section describes the development and calibration of employee mode choice model using employer and employee data described in the previous sections. The resulting model and its characteristics are also discussed. The analyses described in **Section 4.0** suggested relevant variables to be examined for inclusion in the model. The coefficients of the resulting model were then used in the TDM evaluation software (described in **Section 6.0**) to determine changes in mode shares and AVR resulting from changes in financial and support incentives proposed by an employer in its trip reduction plan. A detailed description of the model calibration effort may be found in **Technical Appendix A**.

5.1 Introduction

One of the stated purposes of this research is to determine key relationships between various incentives and employee travel behavior. This was approached by developing a model that tries to explain the commuter's choice of travel mode in terms of various attributes of the employee, the transportation system, and the workplace. This approach is a significant departure from most of the previous efforts in southern California to understand commuter behavior. Almost all of the earlier efforts focused on estimating a work site's Average Vehicle Ridership (AVR) as a function only of the aggregate employer data that is contained in the South Coast Air Quality Management District's (SCAQMD) Regulation XV database.

The current effort is based on the concept that it is more appropriate to seek to understand the behavior of the individual commuter and attempt to model the probability that an employee will choose each of the available travel modes, than to explain and model the AVR or the aggregate shares of different modes. If the probability that an employee will choose a certain mode could be computed, then the sum of these probabilities for all employees in a given worksite would constitute the likely proportion of employees commuting to the site using that mode, or mode share. Once the share of each travel mode is calculated, they can be used to readily derive the AVR.

This approach, known as *disaggregate mode choice modeling*, is presently the most common method of analyzing individual travel behavior. A calibrated mode choice model provides a good understanding of the behavior of travellers. The model's structure and parameters offer considerable insight into what factors are important in influencing travel mode selection, as well as the sensitivity of travellers to changes in those factors.

5.2 Input Data and Preparation for Calibration

Two major surveys formed the primary data base for model development. The first survey covered 45 employers in Southern California and the Sacramento area, and the second

covered 2,437 employees at the surveyed work sites. The employer survey provided information on the characteristics of the employer, the work location, and the type of TDM incentives that were offered to employees. The employee survey provided data on the characteristics of the employee, his household, commuting habits, and the type of TDM incentives that he was offered and used. The survey procedures and results were discussed in the previous sections of this report.

A number of steps were undertaken to convert the employer and employee files into a form suitable for the calibration of the disaggregate mode choice model. First, the employer and employee files were merged so that each employee record also contained the relevant information from that employee's corresponding employer survey. Next, the employee's home and work locations were defined ("geocoded") in terms of the traffic analysis zone (TAZ) systems being used by the Southern California Association of Governments (SCAG) and the Sacramento Area Council of Governments (SACOG). The TAZs are geographic areas delineated by considering land uses, transportation network and barriers, geographic features, political and census boundaries, and other factors. SCAG and SACOG use the TAZs in their modeling activities. Data were obtained from these agencies describing the typical trip information between all pairs of zones in the region by single-occupant auto, high-occupancy auto, and transit. These include travel times (in-vehicle, out-of-vehicle, and access times), distances, and transit fare.

Various transformations and recodes were then made. New variables were created, such as auto operating cost (= distance over the highway network multiplied by 14 cents per mile). Dummy variables were created with binary (0/1) values; for example, the Income1Dummy is 1 if the employee's response to the income question was "1" (the lowest income bracket), otherwise Income1Dummy is 0. Furthermore, various techniques were used to infer a value for key variables that have missing values, since the calibration program disregards any record that has even one missing value. Finally, weights were developed for each mode to remove potential bias due to the deliberate oversampling of alternative modes. As mentioned earlier, oversampling was resorted to in order to ensure enough observations for those modes that have relatively low shares.

5.3 Model Specifications

In the context of this research, a model is a set of mathematical relationships that estimates a dependent variable (travel behavior) in terms of various independent or explanatory variables (travel time and cost, employee characteristics, TDM incentives, etc.). The mathematical relationship would be expressed as an equation with the dependent variable on the left side and the independent variables and coefficients on the right-hand side. In order to fully define the relationship, it is necessary to (a) specify the form that the equation will have (model structure), (b) specify or hypothesize the set of independent variables, and (c) determine the values of the coefficients or parameters associated with the independent variables (model calibration).

5.3.1 Model Structure

The model structure selected for this project is a disaggregate model called multinomial logit model that is used in almost all urban area mode choice models in the U.S. Disaggregate models are so-called because of their use of data collected from individual persons, which is in contrast to the practice of aggregating individual data for a site or an area and using this aggregate numbers to develop the model. The multinomial logit model has the following form:

$$P_i = \frac{e^{U_i}}{\sum_m e^{U_i}} \qquad (1)$$

where: P_i = the probability of using mode *i*

U_i = the "disutility" of mode $i = C_0 + C_1Var_1 + \ldots + C_nVar_n$

$Var_1, \ldots, Var_n$ = influential variables (time, cost, etc.)

$C_0, C_1, \ldots, C_n$ = calibrated coefficients

e = exponential constant

Σ = summation over all available modes *m*.

The logit model estimates the probability that a commuter will choose a particular mode as directly proportional to the attractiveness of that mode (the numerator of equation (1)) compared to the overall attractiveness of all available modes (the denominator of equation (1)). "Attractiveness" is computed as the exponential of the disutility function, which is usually a linear combination of those attributes of a mode that travellers do not like. The logit equation yields the S-shaped curve shown in **Figure 5.1**. This curve signifies that as the disutility of a mode increases, the use of that mode will decline. It is important to note that the slope of this curve (i.e., its sensitivity) is not constant, but varies with the disutility value itself. That is, at the far left of the curve, mode X's disutility is low and its usage is correspondingly high. The curve is also fairly flat it that area, indicating that it would be difficult to persuade travellers not to use mode X. Similarly, at the far right side, the curve is also flat, indicating that it would be difficult to persuade those travellers to use mode X. The curve is steepest in the middle, meaning that travellers in this area are most sensitive to changes in mode X's characteristics. These relationships are reasonably descriptive of actual mode usage in most urban areas and this is why the logit model is so widely used.

The model describes the disutility of each mode in terms of its important, measurable attributes. Typically, the disutility function of each mode is a linear combination of the mode's characteristics:

$$U_i = C_0 + C_1Var_1 + \ldots + C_nVar_n \qquad (2)$$

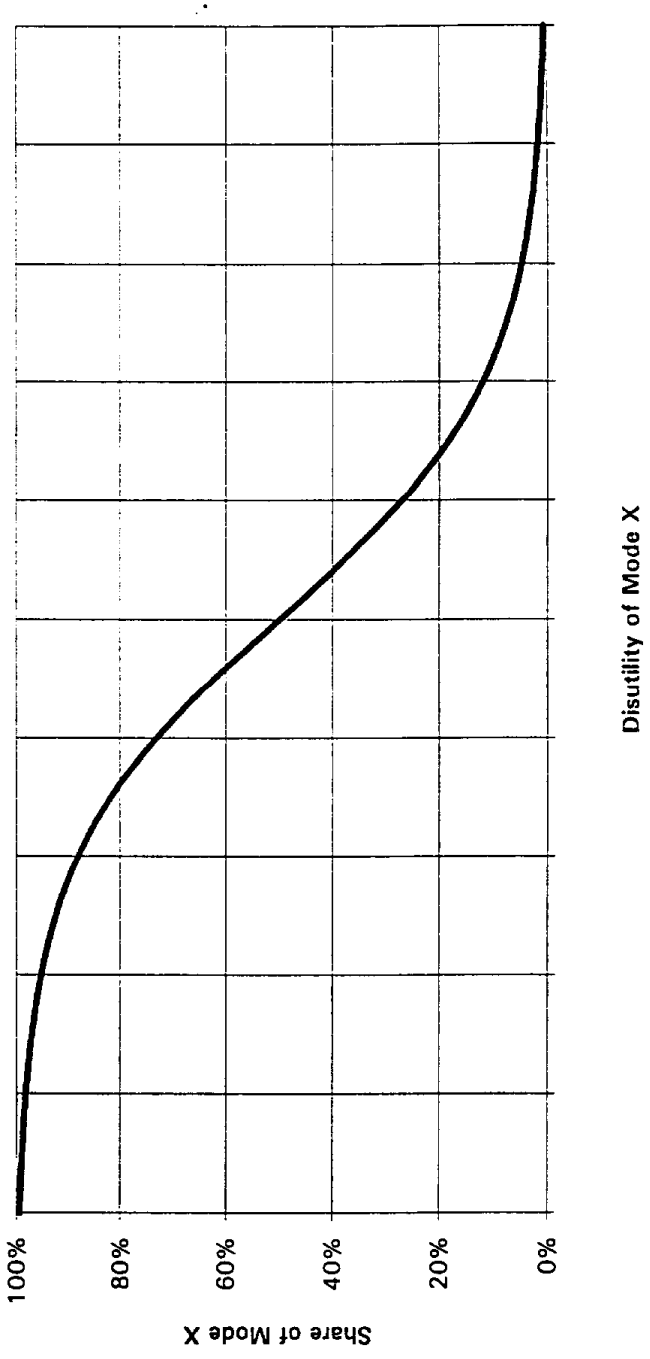


Figure 5.1 Typical Logit Curve

The **Var** terms in equation **(2)** are the characteristics of mode *i* and the C_x terms are the coefficients (or weights) of these characteristics. The coefficients represent the sensitivity of the logit model to the characteristics or variables to which they are associated. C_0 is a special coefficient called the bias coefficient or bias constant that represents the average effect of those characteristics that cannot be measured and included in the model (such as comfort and reliability). Since the coefficients are generally negative, an increase in the variable's value leads to a larger (i.e., more negative) disutility, which according to equation **(1)** leads to a smaller probability of using that mode.

5.3.2 Variables Used in the Model

The variables in the disutility equation can include any measurable aspect of a mode, but are usually limited to travel times and costs, measured for each employee's trip to work. Disutility equations also often include variables that are not specific to the mode, but that nonetheless affect a commuter's perceptions of a mode's attractiveness. These include characteristics of the household (e.g., income), of the employee (e.g., age), and of the work site (e.g., surrounding land uses). Since the emphasis of this study is on workplace incentives to use an alternative mode, it is hypothesized that the presence of such incentives exerts an influence that can be measured. Although the calibration file contained more than 200 variables, the project's schedule did not permit the testing of all possible variables. Experience with other mode choice models and the results of the early tests and SAS cross tabulations suggested appropriate directions for subsequent calibration runs.

Because of the nature of the calibration program used, the analyst must first hypothesize one or more initial models, use the calibration program, review the results, and decide how to proceed from there. Experience suggests that it is best to start with a "small" model (i.e., one with few variables) and then add variables in specific increments until the desired results are achieved. In this project, groups of variables were added according to the following hierarchy:

1. Transportation system variables: travel time, travel cost, parking cost
2. Employee variables: occupation, gender, age, etc.
3. Household variables: vehicles per licensed driver, income, etc.
4. Workplace variables: SIC code, land use, parking spaces per employee, etc.
5. TDM incentives: carpool preferential parking, guaranteed ride home, bus pass sales on site, etc.

5.3.3 The Calibration Software and Goodness-of-Fit Measures

Model calibration was done using the microcomputer program ALOGIT (version 3.2) developed by the Hague Consulting Group. ALOGIT reads an ASCII calibration data file and a proposed model specification as input. It then calculates the coefficient values that best fit the data and provides various evaluation statistics to indicate how good the fit is. The calculation

of the coefficient values is based on maximizing the likelihood function, which is the estimated probability that the mode actually used would be the mode chosen by the model.

Three tests examine the significance of a variable in influencing the choice of travel mode. The first is the simple inspection of the *sign* of the variable's coefficient. If the sign produces a counter-intuitive result, then the model must be modified, usually by eliminating the offending variable. An example of a counter-intuitive result is a positive coefficient on transit fare - this would suggest that higher fares lead to greater use of transit.

The second test indicates the degree to which we are certain that the variable indeed plays a role in mode choice behavior. This test uses the *t-statistic*, which is defined as the coefficient divided by the coefficient's standard error. For t-values above 2.0, there is a 95% chance that the variable is a significant determinant of mode choice. As a coefficient's t-value drops below 2.0, the uncertainty associated with it increases. Coefficients with t-values below 1.0 are usually dropped from the model unless there is compelling evidence that they should remain.

The third test examines the change in the *likelihood statistic*, which is an indicator of the overall improvement in the explanatory power of one model compared to another. The best possible value for this statistic is zero, which represents a model that perfectly predicts the choice actually made by each commuter in the calibration file. This objective is unattainable, so all models generate negative likelihood values. Better models have algebraically larger likelihood values (i.e., closer to zero). (The negative values make it important to remember that -1 is a larger number than -2.) By itself, the likelihood statistic has no units and no physical meaning. Consequently, this statistic is used only in a relative sense to compare one model to another and to compare a model to a "base" model composed only of modal constants.

5.4 The Final Model

Seventeen major model types were examined and several variations on each type were tested, leading to more than 100 ALOGIT runs. **Table 5.1** presents the final model resulting from this calibration effort. This model has excellent calibration statistics and was judged to include a very useful set of variables and reasonable coefficient values. The following sections offer some observations about these values.

5.4.1 Transportation System Variables

The time and cost coefficients are similar to those of other mode choice models, as shown in **Table 5.2**. The lower coefficients on transit in-vehicle time (IVT) and out-of-vehicle time (OVT) compared to auto suggest that travel time is a less important influence on transit use. Conversely, the higher coefficient on transit fare compared to auto operating cost indicates that fare is relatively more important to potential transit users. As can be seen from the table, the time and cost coefficients of the final model generally fall within the range of coefficients from

TABLE 5.1
FINAL MODE CHOICE MODEL

Variable	Drive Alone	Carpool	Vanpool	Transit	Bike/Walk
Mode-Specific Constants		-1.517	-7.070	-3.048	-2.135
Transportation System Variables					
In-Vehicle Time	-0.0399	-0.0399	-0.0399	-0.0110	
Out-of-Vehicle Time				-0.0165[a]	-0.0441
Operating Cost, Fare	-0.0034	-0.0034	-0.0034	-0.0061	
Parking Costs	-0.0086	-0.0086	-0.0086		
Bike Lanes?					1.220
Employee Variables					
Laborer?		0.3999		0.9367	
Professional?		-0.2666	0.9054		
Manager?				-1.064	
Gender(1=male)					0.8727
Elderly?		-0.5262	0.4355[b]	0.9089	
Midday Business Travel?		-0.7745			
Staggered Work Hours?				0.8148	
Part-time Worker?				0.5377[b]	
Household Variables					
1 Worker/HH?		-1.027			
Employee Married?			0.9944		
Work Site Variables					
Parking Spaces/Employee				-0.4155[b]	
SAC/Campus/Inst. LU?[d]		-0.8150			
No. of Adjacent Retail Land Uses		0.1069		0.1069	
TDM Incentives					
Transportation Coordinator AND Rideshare Matching Program		0.0777[c]	0.0777[c]		
Preferential Parking for Ridesharers		0.1214[b]	0.1214[b]		
Transit Info. Center AND Buss Pass Sales				1.083	
Bike Racks OR Showers/Lockers					0.4056[b]
Guaranteed Ride Home		0.4476	0.4476	0.4476	0.4476
Modal Subsidy		0.0125	0.0125		0.0125
Prizes, Free Meals, Certificates[e]		0.0826	0.0826	0.0826	
Use of Company Vehicles by Poolers		0.7861	0.7861		
Company-Provided Vans			2.586		

Notes:

a Value constrained to equal 1.5 times the in-vehicle time coefficient.
b Coefficient value statistically significant at the 80% confidence level.
c Coefficient value not statistically significant at the 80% confidence level.
d Is work site a Suburban Activity Center, Campus, or Institutional land use?
e Coefficient derived from other sources.

Unless otherwise noted, all coefficients are statistically significant at the 95% confidence level.
Negative coefficients mean that increasing values of the variable are associated with lower use of the mode.
Positive coefficients mean that increasing values of the variable are associated with higher use of the mode.
Variables shown with a question mark are binary variables, with values: 0 = No, 1 = Yes.
All times are in minutes; all costs are in cents(1992 dollars).

TABLE 5.2
COMPARISON OF TIME AND COST COEFFICIENTS

Urban Area	In-Vehicle Time*	Transit Out of-Vehicle Time	Auto Operating Cost	Transit Fare	Parking Cost
TDM Program	-0.0399	-0.0165	-0.0034	-0.0061	-0.0086
Atlanta (suburbs)	-0.0145	-0.0488	-0.0037	-0.0037	-0.0079
Cincinnati	-0.019	-0.028	-0.004	-0.004	
Dallas	-0.030	-0.055	-0.0050	-0.0050	-0.0120
Minneapolis-St. Paul	-0.031	-0.044	-0.014	-0.014	
New Orleans	-0.0145	-0.0332	-0.0078	-0.0078	-0.0214
Phoenix	-0.0145	-0.0769	-0.0078	-0.0078	
San Francisco	-0.025	-0.058	-0.003	-0.003	
Seattle(1977)	-0.040	-0.044	-0.014	-0.014	-0.012
Seattle TDM(1991)	-0.0170	-0.0340	-0.0021	-0.0021	-0.0043
Washington, D.C.	-0.0173	-0.0583	-0.0035	-0.0044	-0.0094

* For the TDM Program, the auto in-vehicle time coefficient is shown. The transit in-vehicle time coefficient is -0.0110.

Note: the similarity of some of these coefficients is not coincidental. Some of these models were calibrated from survey data, while others were created by adapting model coefficients from other cities. For example, the Phoenix coefficients were derived from those of New Orleans.

Sources: Various model calibration reports.

logit mode choice models in other urban areas. The only exception is that the coefficient on transit in-vehicle time is below any of those of other areas. This may reflect the more dispersed nature of the Los Angeles metropolitan area, which leads to somewhat longer transit travel times.

The bike/walk time coefficient is higher than the auto in-vehicle time value, which is logical, since the time spent walking or biking is more onerous than driving. This coefficient would probably be even higher, if it were not for the fact that bikers and walkers are, as a practical matter, limited to short distances from the work site. The parking cost coefficient is 2.5 times the auto operating cost coefficient, indicating that motorists are more sensitive to parking cost than auto operating cost (gas, maintenance, etc.). It is fairly common for the parking cost coefficient to be approximately twice as high as the operating cost coefficient.

One measure of the coefficient values is the ratio of the time coefficient to the cost coefficient. This ratio (for the auto modes) is 11.7, implying that 11.7 cents is equivalent to 1 minute, in terms of the influence on mode choice. The average annual household income of the surveyed respondents is $54,300, which is equivalent to 43.5 cents/minute. Thus, the implied value of travel time is 27% (=11.7/43.5) of the average income. This ratio is typically within the range of 25-35%, and so is an acceptable value.

One anomaly in the model's coefficient is the ratio of the OVT coefficient to the IVT coefficient. Typically, this is 1.5 to 3.0, with values around 2.0 being most common. In this project, the survey data suggested that OVT is no more important than IVT in influencing mode choice. Because this is a rather unusual outcome, it was decided to fix the OVT coefficient at 1.5 times the IVT coefficient. This is a commonly used procedure.

5.4.2 Employee and Household Variables

Usually, either income level or auto ownership is used to represent the socioeconomic status of the traveller. In this model, both indicators were tested, but slightly better results were achieved by using the occupational class of the respondent. This suggests that there is an element of an individual's status related to occupation that goes beyond his income or auto ownership level. The results discussed in **Section 4.2** regarding significant differences in mode shares between occupational groups tend to support this hypothesis.

Other characteristics of the employee are reflected in the model. One is that men are much more likely to walk or bike to work than women. It is unclear if there is a true behavioral reason for this or whether it is just reflective of this particular sample, but the effect is unmistakable. It is also clear from this data that elderly employees (defined here as age 60 and above) do not particularly like to drive alone and, other things being equal, prefer to use transit, which confirms the results of **Section 4.2** on the influence of age on mode split.

Certain types of work schedules have logical associations with mode choice as well. Employees who must make midday business trips (e.g., to call upon clients) are inclined not to carpool, which seems obvious. Employees who work staggered hours or are on a part-time schedule are inclined to use transit. Staggered hours may provide more flexibility to adapt one's work hours to transit schedules, while part-time effect may be associated with lower income levels.

Of the various household variables, the presence of only one worker in the household had a strong negative association with carpool use. This is logical, since some surveys indicate that many carpools are composed of persons living in the same household. Similarly, being married is associated with increased vanpool use. This may reflect the need to leave an auto at home for the spouse's use. The strong influence of household size on ridesharing as noted in **Section 4.2** also supports these results.

5.4.3 Work Site Variables

The physical attributes of the work site did not exert a strong influence on modal use. This could be because after accounting for the characteristics of the trip, the tripmaker, and the tripmaker's family, there is not much additional effect to be explained. Still, a few such variables remain in the model. The number of parking spaces per employee is negatively associated with transit use, although the association is statistically weak. Nevertheless, the relationship is sensible: the fewer spaces there are per employee, the more difficult it is to find a space, and the more likely employees will be to use transit. The type of development at the work site also has an influence: if the work site is in a suburban activity center or a campus or institutional setting, employees are less likely to carpool. This is probably because the lower density of trip ends makes it more difficult to match rides. Finally, the number of different nearby retail land uses (restaurant, video store, convenience store, dry cleaner, etc., within 1/2 mile) was a positive influence on carpooling and transit use. Apparently, if employees can run midday errands on foot, they are less likely to need an auto at work and are thus more likely to use an alternative mode.

5.4.4 TDM Incentives

Table 5.3 defines the TDM incentives that are included in the model. One general comment that can be made about these incentives is that they all have the proper sign: the presence of each incentive does tend to increase the use of the mode which it is intended to. Obviously, the relative influence of each incentive is related to the size of the coefficient. The relatively higher coefficients for company vanpools, guaranteed ride home and preferential parking seem to reflect the relative "effectiveness" of these incentives as observed in **Section 4.3**. The fairly large coefficient on company-provided vans should be viewed with some caution - only one employer in the survey actually provided vans to its employees, and so this coefficient is based on a limited number of observations.

TABLE 5.3
TDM INCENTIVES DEFINITION

Transit Information Center PLUS Bus Pass Sales
The employer would provide a central location where employees could obtain transit routes, schedule, and fare information. In addition, the employer would sell transit passes at the work site (if the employer also discounts the passes, the discount is reflected as a modal subsidy). Obviously, this is only applicable if the work site is (or will shortly be) served by a transit route. This incentive affects the transit mode.

Use of Company Vehicles by Ridesharers
Employers which maintain a fleet of vehicles would make them available for use by ridesharers for midday errands, lunch trips, etc. This incentive affects all ridesharing modes (carpool and vanpool).

Bike Racks/Storage OR Showers and Lockers
The employer would provide either a) a place where employees could shower and change clothes after riding a bicycle or walking to work, or b) a convenient, covered place where employees who bicycle to work could store their bicycles during the day. Enough spaces must be set aside to accommodate all bicyclists. This incentive affects the bike/walk mode.

Guaranteed Ride Home
The employer would provide a means of transporting employees home if they did not drive to work alone that day. They might need this service to return home for midday emergencies or if they are required to work late at night and miss their ride or the last bus. Usually, taxicabs or employer fleet vehicles are used for this purpose. This incentive affects all alternative modes.

Preferential Parking for Ridesharers
The employer would reserve parking spaces close to the building entrance for use exclusively by carpools and vanpools. This is particularly effective if such spaces are clearly marked as being reserved, and are under cover. Enough spaces must be set aside to accommodate all ridesharing vehicles. This incentive affects all ridesharing modes (carpool and vanpool).

Transportation Coordinator PLUS Rideshare Matching
One of the usual requirements of an ETR program is for employers to designate an Employee Transportation Coordinator (ETC) whose job is to facilitate the use of alternative modes by employees. This project's research indicated that an ETC is most effective if the employer also provides a rideshare matching program. Partial credit is not available for this incentive - both elements must be provided. This incentive affects all ridesharing modes (carpool and vanpool).

Company-Provided Vanpools
The employer would provide vans to facilitate the formation of vanpools. This consists of purchasing or leasing the vehicles, and arranging for insurance and maintenance. Vanpool riders would pay a monthly fare that would cover these costs. By providing the vans, the employer is merely enhancing the convenience of vanpooling. (If the employer also subsidizes all or part of the fare, this would be reflected as a modal subsidy, as discussed above.) This incentive affects the vanpool mode.

Prizes, Free Meals, Certificates
The employer would offer prizes, free meals, or gift certificates on a regular basis to employees who rideshare or use transit. These are assumed to be items of nominal value - if valuable items are involved, it may be appropriate to establish the cash value of the item and enter it as a financial incentive. This incentive affects the ridesharing and transit modes.

The TDM incentive coefficients must also be viewed in terms of employees' awareness that such incentives exist. The coefficient values in the logit model assume that employees are completely familiar with these incentives. However, the results of the surveys indicate that this is a poor assumption. As a result, it is necessary to discount the coefficients by including a factor that represents the proportion of employees who are offered the incentive and who are aware that the incentive exists. This is discussed further in **Section 5.6 Awareness Sub-Model.**

5.5 Model Validation

Table 5.4 presents a comparison of observed and estimated trips by mode. This indicates the model provides a good overall fit to this data. Of course, given the use of modal bias constants, this result (in total) is to be fully expected. The more difficult test of a model's fit comes when a similar comparison is made, stratified by values of exogenous variables (independent factors that are not directly represented in the model). Such comparisons are shown in **Table 5.5**. The stratified comparisons also indicate very close correspondence between observed and estimated trips by mode. The only anomaly is that transit trips by low income commuters are overestimated, while they are underestimated for high income commuters. This suggests that it might have been productive to further investigate income level as a descriptor of the traveller's "wealth." The comparisons by workplace zip code reveal no major differences.

TABLE 5.4
OBSERVED/ESTIMATED TRIP COMPARISON

Travel Mode	Observed Trips	Estimated Trips
Drive Alone	1,434	1,433.3
Carpool	580	580.0
Vanpool	127	127.3
Transit	119	119.4
Bike/Walk	81	81.0

TABLE 5.5
STRATIFIED OBSERVED/ESTIMATED TRIPS COMPARISONS

Variable	Ridesharing Obs.	Ridesharing Est.	Transit Obs.	Transit Est.	Bike/Walk Obs.	Bike/Walk Est.
Trip Distance (miles)						
4.9 or less	138	128	26	25	65	67
5.0 - 9.9	152	158	41	34	14	13
10.0 - 19.9	207	212	32	36	2	1
20.0 - 29.9	70	76	13	12	0	0
30.0 or more	140	133	7	12	0	0
Annual Household Income						
$24,999 or less	115	114	56	31	22	20
$25,000 - 49,999	204	194	22	32	26	26
$50,000 - 74,999	185	187	19	26	17	16
$75,000 or more	203	212	22	30	16	19
Workplace Zip Code						
90xxx (L.A.)	391	388	65	68	35	42
91xxx (L.A.)	125	129	29	20	11	10
92xxx (L.A.)	48	59	9	8	10	6
956xx (Sacramento)	34	37	2	4	4	6
958xx (Sacramento)	109	95	14	19	21	17

5.6 The Awareness Sub-Model

A model can reflect only what commuters perceive their options to be. In other mode choice models, it is implicitly assumed that travellers accurately perceive and understand all factors which might influence their choice of mode, such as the travel times and costs for all potential modes. In practice, this is probably not true, but mode choice models are typically unable to cope with traveller perception or awareness as a variable, and so analysts tend to assume that over time, people will become sufficiently familiar with the true attributes of all modes and will make a reasonably informed choice of travel mode. While it might be acceptable to make this assumption with respect to, say, travel time, it is less clear that it is appropriate for a TDM incentive. In many cases, TDM incentives are not "hard facts" but "policies" or "programs." For example, an auto commuter can consult a bus schedule to determine the time he will likely spend waiting for and riding the bus to work. But that same commuter might not be aware that if he did ride the bus to work, his employer would sell him a bus pass at a discount and provide a taxi ride home if he missed the last bus.

This project's surveys were designed to analyze this issue by asking employers what kinds of alternative mode incentives were provided to employees and by asking employees what kinds of incentives they reported as having available. The tabulations of these responses, as discussed in earlier sections, suggest that there is a substantial gap between the reported reality and perception of TDM incentives. Research for this project and for a similar TDM study in Seattle have identified that employer-provided alternative mode incentives are not effective unless employees are *aware* that such incentives exist. The biggest improvement in AVR are invariably associated with employers who not only offer reasonable TDM incentives, but who also advertise and promote them to their employees.

Because awareness is such an important issue, it was decided to attempt to model the percent awareness for the eight support TDM incentives that were included in the mode choice model. Several survey variables were examined to determine their relationship to awareness, including the number of employer trip reduction (ETR) program staff, number of staff hours, annual ETR marketing expenses, and annual ETR administration expenses. It was theorized that increases in any of these variables should lead to increases in employee awareness of TDM incentives. Plots of percent awareness against these independent variables indicated that annual ETR marketing plus administrative cost per employee provided the best explanation of variations in awareness and so this variable was selected as the primary variable. These costs include brochures, fairs, and other forms of advertising and promotion, as well as salaries, benefits, and other costs of program administration.

The awareness sub-model was calibrated using linear and non-linear "least squares" fitting. In some cases, separate curves were used for large and small employers, where the data suggested that this would be appropriate. A separate equation was calculated for each TDM incentive, as shown in **Table 5.6**. Some of these equations are linear, while others use the logit function. These equations produce awareness estimates that range generally from 30% to 80%. In actual application, the linear equations results are capped at 90%, while the logit equations'

TABLE 5.6
AWARENESS SUB-MODELS

Incentive	Model Equation
transit pass sales/info. center	$P = 0.1056 + 0.0064x$
bike racks or showers/lockers	$P = 0.5035 + 0.0007x$
guaranteed ride home	$P = \frac{0.78}{1 + e^{(0.7880-0.0267x)}}$ for SIC $\geq$ 4800 or employees $\geq$ 300
	$P = 0.0011x$ for SIC < 4800 and employees < 300
carpool preferential parking	$P = \frac{0.80}{1 + e^{(0.900-0.800x)}}$
rideshare matching	$P = \frac{0.92}{1 + e^{(0.7267-0.1149x)}}$ for employees $\geq$ 200
	$P = 0.2663 + 0.0015x$ for employees < 200
company-provided vanpools*	$P = 0.0047x$
rideshare prizes	$P = \frac{0.80}{1 + e^{(0.900-0.0800x)}}$

Notes:

No survey data were available on the awareness of "use company car by ridesharers". Thus, the estimated awareness for this incentive is the arithmetic average of the awareness values calculated for the other seven incentives.

P = estimated proportion of employees who are aware of incentive (0.0 - 1.0)
x = annual ETRP cost (marketing cost plus administrative cost) per employee

* Use with caution; based on only one observation.

Results of linear equations are capped at 0.90 (90%).

results are self-limited to the value in the numerator of the equation. In the survey data, the value of the independent variable - ETR marketing and administration cost per employee - ranged from about $1.00 to $180.00, with an average of about $32.00.

The awareness sub-model was used subsequently to modify the coefficients of the logit model depending on the incentives being offered. As discussed earlier, the sensitivity of the logit model to the variables is represented by the coefficient values. The sensitivity of commuters to the eight TDM incentives is related to their awareness of each incentive, and so the coefficients are multiplied by the awareness proportions in order to reflect the (lower) sensitivity that is associated with less than 100% awareness. This is done in two ways. First, the *change* in awareness from existing to future condition is used to give additional "credit" for any incentives that are already in place. In effect, this reflects a greater influence of existing incentives, if the employer increases his annual budget for marketing and/or administering the ETR program. Second, the forecasted awareness values are used to determine the sensitivity of employees to any new incentives that are proposed. This reflects the fact that without a substantial marketing effort, it is likely that many employees will remain unaware of new incentives, and thus their impact will not be significant.

6.0

ARB TRAVEL DEMAND MANAGEMENT EVALUATION PROGRAM

6.0 ARB TRAVEL DEMAND MANAGEMENT EVALUATION PROGRAM

This section provides a description of the Travel Demand Management (TDM) Evaluation Program developed for the California Air Resources Board and for use by air districts in California. The software utilizes the coefficients derived from the employer and employee data set, as described in **Section 5.0**. An overview of the software is provided, its intended uses defined, inputs and outputs described, and the specific trip reduction incentives tested are enumerated. **Appendix II** contains "hard copy" version of the software input, analysis and help screens. References are made to these screens in the following subsections. Readers are referred to **Technical Appendix B** for the *User's Guide*.

6.1 Overview of the TDM Evaluation Program

As stated in the Introduction, the primary product developed as part of this project is a user-friendly software package allowing employers and regulators to predict the trip reduction effectiveness of various incentives that might be offered to employees. COMSIS has considerable experience in developing such a tool, having developed a "TDM Evaluation Model" for Federal Highway Administration and Federal Transit Administration, now available in the public domain from FHWA. That predictive tool interfaces with microcomputer-based transportation planning packages and tests the trip reduction effectiveness of various government and employer provided strategies. The TDM Evaluation Model can use "trip tables" or mode split as its primary inputs and the user can specify various packages of TDM measures. The software is based on a "pivot point" model, meaning the existing transportation system and travel behavior are captured in these trip tables or mode split, and the model tests the incremental change in behavior based on incremental change in the TDM strategies available to commuters. Therefore, the user does not have to describe the starting conditions in terms of incentives offered and the transportation system available.

The ARB TDM Evaluation Program is similar to the TDM Evaluation Model in that it "pivots" off of existing conditions and predicts incremental changes in travel behavior based on incremental changes in the incentives offered by employers to employees. As a basic input, mode split or Regulation XV-type survey results are fed into the software. Incremental changes are specified for financial incentives and high and low support incentives. "Incremental" means changes to existing incentives are only characterized by the amount of the change. For example, if an employer increases a bus pass subsidy from $0.50 per day to $0.75 per day, the effect of the $0.25 increase in the subsidy is measured and its effect on reducing trips and increasing Average Vehicle Ridership (AVR) is gauged. The software reports results in terms of change in AVR or vehicles reduced.

The ARB TDM Evaluation Program is designed to be user-friendly and walks the user through a series of input and analysis "screens." The software includes a title screen and two introductory screens (see screens 1 and 2 in **Appendix II**). The second introductory screen

enumerates the program's primary input screens and provides a general sequence of steps. These steps are as follows:

1) enter data describing the *employer and site characteristics*, as well as *program administration and marketing costs*;
2) enter data on the *number of employees* currently using each commuting option;
3) enter data on *financial incentives* (modal subsidies/penalties and parking charges/subsidies);
4) enter data on *alternative work arrangements*;
5) enter data describing the existing and new *support incentives*;
6) enter data describing the use of *clean fuel vehicles* (if any);
7) save the input data to a file;
8) calculate the base and revised AVR (average vehicle ridership) and vehicles;
9) repeat steps 3, 4, and 5 if desired to test other incentives and levels; and,
10) create a report of the data and results.

A feature of the software is its ability to take awareness factor into account in determining incentive effectiveness. This is accomplished by using awareness models developed for incentives based on the employer's program costs (administration and marketing) and employee responses to awareness questions.

Each screen includes a help screen that can be pulled up to assist the user and provide additional information on the use of and inputs for the screen.

The determination of program effectiveness is presented as a simple table with beginning and modified employees, vehicles and AVR, target AVR, and the number of vehicles to be reduced if the proposed program does not meet the target. This final screen is colored red as long the target is not being met through the proposed program. When the target is met or exceeded, the screen turns green, adding to the ease of use.

6.2 Intended Uses of the ARB TDM Evaluation Program

The software was originally intended for distribution to California employers needing to comply with regional trip reduction requirements. ARB desired to provide a user-friendly tool to employers to help reduce the uncertainty in trip reduction program planning by providing estimates of the likely effects of various trip reduction strategies that might be implemented by employers for their employees. The software does not require special computer skills or hardware and the inputs are available from the data required to be collected by most regulations in California. Therefore, it is well suited for use by employers. Likewise, ridesharing agencies, Transportation Management Associations and consultants could use the software to advise members and clients of the needed program elements and incentive level to meet their target.

However, it is recommended that the software first be adapted, tested and promulgated by each air district intending to use it. Adaptations may be necessary if the particular regulator does not define AVR, or commute options, or clean fuel credits in the same manner as used in the software. The overall purpose of the software was to develop a generic, but complete tool that could be adapted by various users around the state.

In terms of employer use, interviews with employers as part of this project revealed that many stated they would not use such a tool, even if it were free. This is because of a certain "mystic" associated with predictive models. While employers can use the tool to perform "what if" analysis of various packages, **the primary use of the software will be by air districts to evaluate the effectiveness of programs submitted by employers and quantify the ability of the plan to meet the trip reduction target.** The software is fast enough and simple enough that it could be used interactively. If a determination is made that the proposed employer program is inadequate, the plan reviewer and preparer can use the tool interactively to explore revisions to the proposed program that would meet the target. For example, if an employer proposes a new $0.25 per ride transit subsidy and the software shows it to still fall short of the target, the plan reviewer might test different subsidy levels and suggest a $0.50 subsidy would be needed to meet the necessary vehicle reduction.

Finally, the software could be used for planning and policy making by regulatory agencies. This planning and policy making support could take various forms, including:

- Employer Guidance - The software could be used to develop sensitivity charts for various incentives and packages of strategies. This involves running the software for a range of incentive levels, starting conditions and targeted users. Examples of such sensitivity charts are shown and discussed in **Section 6.6**. This information could be provided to employers and others in the form of written guidance on incentive effectiveness.

- Prototype Plans - The software could develop "standard" packages of incentives appropriate for a given situation and starting conditions. Thus, employers, who

might be reluctant to use the software, could be given written guidance or a form to be completed, based on estimates from the software.

- Prescribing Measures - While most trip reduction regulations in California allow the employer to propose a set of incentives, many regulators are contemplating a more prescriptive approach. In such a case where the regulator requires employers to implement certain measures or requires measures as contingencies if the target is not met, the software could be used to determine, for various situations, the most effective incentive or package of incentives.

6.3 Data Inputs

The user needs to utilize three screens (screens 3-5 out of 10) to input the necessary data on employer and employee characteristics necessary to produce the estimated reduction of vehicles or AVR. Printouts of each screen are included in **Appendix B.**

- Screen 3: General Employer Information includes the employer's address, site identification code, SIC Code, review date, reviewer name and other comments. The target AVR is also inputted. Some air districts may have this data in a comprehensive data base and the site identifier can be used to directly import data from another data base. The only input item used for calculation purposes is the AVR target.

- Screen 4: Site Information includes total employees, employees reporting in the regulated window (e.g., 6-10 a.m.), total parking spaces, ETR program marketing and administration cost, and number of retail land uses nearby. This information is inputted for the current situation (base) and for any changes that might occur between the base and the next review date (plan). The information on ETR program costs is used by the model to determine an awareness factor for the support incentives that are currently being offered, and an increase in program costs results in increased awareness and, hence, greater impact of these incentives.

- Screen 5: Base Employee/Vehicle Calculation allows the user to input the number of weekly employee trips in each commuting option category (e.g., drive alone, 3 person carpool, bicycle, 4/40 work week, etc.). This information is generally derived from the required employee survey and is inputted as aggregate weekly totals.

6.4 Incentives Tested

The software can estimate the vehicle trip reduction effectiveness of four basic categories of incentives: cost elements, support elements, other elements, and clean fuel credits. Each is described below. It should be noted again, however, that the software can only quantify the impacts of those incentives for which coefficients could be estimated from the employer and employee survey data. For those incentives that cannot be quantified and classified as cost or support elements, a flexible screen is provided to allow the user to estimate the impact of the other measures by using professional judgement to determine an equally effective incentive and applying its estimated impact to the other measure.

- Screen 6: Cost Incentives refers to any incentive or disincentive that can be expressed in terms of a change in the cost of using various commute options, in terms of subsidies or charges. Direct modal subsidies are expressed as a change (over the current program) in the monthly per person amount, while parking charges are expressed as changes in costs per day per vehicle. In order to determine the timing of program impacts, the user inputs the "days implemented after plan approval." Cost elements such as parking charges and travel allowances or transit subsidies may be straightforward, but in some cases the employer must report or reviewer convert less definitive costs into a daily or monthly amount, whichever is appropriate. For example, many employers offer free gas to carpoolers from the companies motor pool. The user must estimate the market rate for gasoline and estimate the average cost savings per month of this subsidy.

- Support Elements refer to the eight support incentives for which coefficients were estimated and can therefore be tested by the model. These include transit information center, bus pass sales, use of company vehicles, bike racks/storage, showers and lockers, guaranteed ride home, preferential parking, ridematching, company-provided vanpools, prizes, free meals and certificates. Screen 7: Existing Support Elements allows the user to indicate the incentives that are currently offered. Screen 8: Proposed Support Elements allows the user to describe *new* incentives in terms of number of eligible employees and the "days implemented after plan approval". In addition, alternative work arrangements such as telecommuting and compressed work schedules can also be tested.

- Screen 9: Other Elements refer to incentives for which an impact is not quantifiable. The user describes the incentive, the number of employees eligible, the days after plan approval implemented and the modes the incentive will likely benefit. The user then estimates the relative effectiveness from 1-10, based on comparing the incentive to those in the high and low support categories. The user is provided guidance to this end in the TDM Evaluation Program User's Guide, but is warned that the results are based on self-imposed professional

judgement, and not on the standardized approach available from the previous three screens.

- Screen 10: Clean Fuel Credits can be included in the AVR calculation for credits provided as part of the regulation. In the case of the ARB software, the user can specify the number of LPG, Methanol, CNG, and Electric vehicles that will be used.

6.5 Calculation and Outputs

At any place in the software, the user can save the data to a specific file and calculate the reduction of vehicle trips or increase in AVR from the incentives inputted. Through a "hot key," the user can calculate the estimated results of the proposed incentives and view the results as in the following exemplary table (**Table 6.1**). As can be seen from this example, the primary outputs are beginning and ending AVR and vehicles.

The TDM Evaluation Program uses two techniques to estimate the likely effects of TDM strategies, a rather straightforward method for alternative work arrangements (telecommuting and compressed work hours), and a more complex method for true commuting travel mode options. In addition, a third procedure is used to estimate the awareness of employees to TDM incentives.

For each alternative work arrangement option, the number of employees that will use the option is computed in proportion to the number of eligible workers in the plan and base conditions. If the employer did not offer the option in the base condition, the program uses a default "participation rate" for each option. These participation rates were obtained from the analysis of the Regulation XV database. This calculation is done first before any mode shift adjustments are applied.

The TDM Program then estimates an awareness factor for each incentive included in the model, as a function mainly of ETR program marketing and administration costs per employee. This is done by means of the awareness sub-models discussed in **Section 5.6.** The estimated awareness is used to adjust the sensitivity (coefficient) of the model to the presence of the eight soft incentives. This is done in two ways. First, the change in awareness from Base to Plan is used to give additional credit for any soft incentives that are already in place. In effect, this reflects a greater influence of existing incentives, if the employer increases his annual budget for marketing and/or administering the ETR program. Second, the estimated Plan awareness values are used to determine the sensitivity of employees to any new incentives that are proposed. This reflects the fact that without a substantial marketing effort, it is likely that many employees will remain unaware of new incentives, and thus their impact will not be significant.

TABLE 6.1
EXAMPLE OF SOFTWARE OUTPUT

Average Vehicle Ridership Planning Form

	- B A S E -	- P L A N -
Total Employee Trips	8678	8678
Adjusted Commuting Vehicles	6644	5999
Calculated AVR	1.31	1.45
Target AVR	1.50	1.50
Allowable Vehicles/Week	5785	5785
Necessary Vehicle Reduction	859	214
Daily Vehicle Reduction Needed	121	42

After the alternative work arrangement usage has been accounted for, the program next estimates any shifts among the actual travel modes. This shift is calculated by applying the logit model in *pivot point* (also called *incremental*) fashion. The most significant feature of this approach is that the complete characteristics of the employer, employee and travel conditions need not be known. All that is necessary is to have a starting mode share (provided by the employee survey) and the change in travel disutility for the site that would result from implementing the ETR plan under consideration. The change in travel disutility is simply the product of the logit coefficient(s) and the change(s) in travel conditions. In this case, travel conditions that are most easily influenced by the employer are cost and the presence of certain incentives.

The software also calculates the needed vehicle reduction if the target is not met. The software can also produce a report providing the user a written record of the employer and employee inputs, the incentives tested and the results.

Details of the calculation method described above may be found in the **TDM Evaluation Program User's Guide** which accompanies this report as **Technical Appendix B.**

6.6 Sensitivity Charts

The ARB TDM Evaluation Program can be used to develop sensitivity charts that would show the effects on AVR and mode shares of changes in employer and site characteristics, and in the elements of the trip reduction program. The chart could be developed by changing the value of the variable of interest (such as carpool subsidy) while using constant inputs for other factors (such as employer characteristics, incentives, etc.). Theoretically, a sensitivity chart can be developed for each of the employer/site characteristics, financial and support incentives, alternative work arrangements, and clear air vehicle types, and various combinations of these variables. However, the impact of an individual factor (such as the support incentives) may be very slight, and packaging these factors together may be necessary to effect a substantial change in AVR or mode shares.

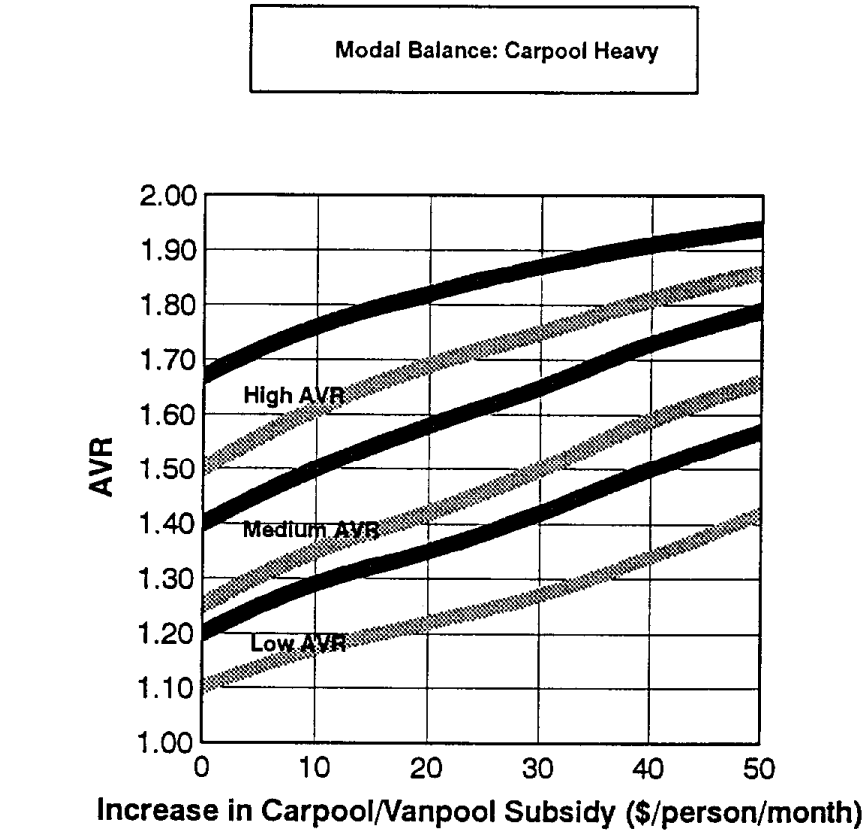
Figure 6.1 is an example of a sensitivity chart that can be developed using the ARB TDM Evaluation Program. Actually, the chart is a composite of six set of conditions, each of which is represented by one line in the chart. The sample chart has been developed for an average-sized employer (about 300 employees), a carpool-heavy modal balance (i.e., most of the non-drive alones are using carpool), with six combinations of starting AVR (3 levels: low, medium, high) and levels of supporting incentives (2 levels: with and without support incentives). Only two levels of support are shown in the chart, one representing no support incentives, the other one assuming all support incentives are to be implemented. This would bracket the minimum and maximum effects that could be derived from support incentives, and any other combination would have a result in between.

As an example of the use of the sensitivity chart, **Figure 6.1** shows that without any supporting incentives, a medium-sized company with a starting AVR of 1.25 would require a carpool subsidy increase of about $30 dollars to reach a target AVR of 1.50. If all of the support incentives included in the model are to be implemented, the required subsidy increase drops to $10. On the other hand, a company starting at a low 1.10 AVR could implement all support incentives included in the model plus a $40-dollar increase in carpool/vanpool subsidy to reach the target AVR of 1.50.

This and similar charts can be used to guide employers on the anticipated effects of trip reduction incentives. Charts for other financial incentives are included in **Appendix III**. These charts show the sensitivity of AVR and Percent Vehicle Reduction to changes in trip reduction incentives.

Figure 6.1
Sample Sensitivity Chart

Sensitivity of AVR to Increase in Carpool/Vanpool Subsidy
By Starting AVR, Modal Balance and Level of Support



7.0

RECOMMENDATIONS & FUTURE RESEARCH NEEDS

7.0 RECOMMENDATIONS AND FUTURE RESEARCH NEEDS

7.1 Key Findings

The findings revealed in **Sections 3.0** and **4.0** tend to confirm the national research to date, which suggest financial incentives and parking management are among the most effective strategies for employer trip reduction programs.

When looking at those incentives which influence commuter choice, based on survey responses, the following incentives seem to be most effective:

- guaranteed ride home,
- company vanpools,
- preferential parking,
- reduced parking fees for carpools/vanpools,
- transportation allowance, and
- carpool subsidies.

The survey also allowed an assessment of the relative success of incentives in attracting "part-time" users. The analysis revealed the following incentives were effective in inducing part-time use of the commute alternatives they target:

- cash prizes for carpoolers,
- carpool subsidies,
- bus pass sales on site,
- free/discounted bus pass, and
- bike racks.

One substantial difference in the approach used in this research, as compared to past research, is that the survey allowed the researcher to link the use of commute alternatives directly to the use of specific incentives targeted to that mode. Past research simply inferred connections between the existence of an incentive and the use of particular alternatives. The "funneling" analysis process described in **Section 4.3** allowed the researchers to more directly attribute behavioral changes to the offering of specific incentives.

If financial incentives and parking management are shown to be effective, national research suggests that combining the two types of strategies may be most effective. Travel allowance or other comprehensive program can be designed to raise revenue via parking fees which in turn can be used for administering the program and subsidizing users of commute alternatives.

The study intended to assess the cost effectiveness of various trip reduction incentives. However, as was the case with other research cited in the Introduction, costs could only be

measured at the program level, and not allocated to individual strategies. The average annual program cost was $13,000, with $7,500 of that going to staffing the program. Higher alternative mode shares were correlated with higher program expenditures, and this is an intuitive finding, but one that contradicts some research that contends it is not the amount spent, but rather the types of incentives funded.

It should be noted that this report is the product of descriptive analyses of the employer and employee data sets. The TDM Evaluation Program allows for sensitivity analyses to be performed for a range of incentives, levels and conditions. Sensitivity charts produced for this research can provide employers and planners with sound guidance on the relative effectiveness of trip reduction incentives.

7.2 Limitations of the Research and the Data

While this study has been able to quantify the impacts of numerous trip reduction incentives, the research was unable to address several key issues that will remain research priorities. The inability to address these issues is related to the focused scope of the study and the inability to collect all the data researchers might desire in one survey effort.

Some of the limitations of the current research include:

- VMT Reductions - The research focused on the ability of incentives to reduce trips *as observed at the work place*. If a trip to work involves more than one mode or stop, it is assumed the *entire trip* has been reduced, even though some VMT and vehicle trip elements may still have occurred. For example, if a transit rider drove half way to work to a park-and-ride lot, the methods used assumed that an entire trip has been reduced at the work place, even though the VMT reduction would be less than the entire trip and a "cold start" would still have occurred. The survey revealed that 40% of ridesharers (carpoolers, vanpoolers and transit riders) access that mode by driving alone.

- Quantifying All Incentives - Employers have offered scores of incentives to employees. Our ability to quantify the impact of each of these incentives is limited by two factors. First, our analysis of the Regulation XV database revealed that a large proportion of incentives -- primarily "soft" support elements like information exchange and ride matching -- had little or no impact, and hence our estimate of impact was overshadowed by the range of error. Second, our ability to quantify any incentive is somewhat dependent on its incidence among the survey population; therefore, if only a few employees used a certain incentive, we may not have been able to estimate a coefficient value.

- Household Level Information - By conducting a written survey at a worksite and focusing on employees, the ability of the research to tie into background

household travel patterns and interactions is extremely limited. Information of this type is found in Caltrans' 1991 Origin-Destination Survey, which covers the entire state and the two urban areas of interest to this research, though it is not directly relatable to the ARB survey database.

- Voluntary vs. Mandatory Environments - One of the objectives of the research was to assess the effectiveness of employer-based incentives as implemented in areas with and without mandatory requirements. Los Angeles and Sacramento, respectively, were to represent these contrasting environments. Unfortunately, by the time the survey was fielded, Sacramento did not represent a voluntary environment due to the fact that the city and county both had employer trip reduction ordinances in place -- precursors to the Sacramento Metropolitan AQMD's rule. Because of this and sample size considerations, the Los Angeles and Sacramento data sets were combined for model estimation and plan review software development.

- Cost Effectiveness - The research intended to quantify the cost effectiveness of various trip reduction incentives offered by employers. Most employers, however, do not keep detailed budget by incentive and little solid information was available to develop a cost allocation model. The impact of total resources expended on the program was explored and the results showed increasing effectiveness with additional dollars spent.

Some of the lessons learned from the data collection effort included the ability to recruit and retain employers into the sample. Firms were recruited in the spring of 1991, with the intent of collecting the survey data in the fall. However, the complexity of the survey instruments necessitated extensive pre-testing (via focus groups and full pilots) that required the surveying be delayed until the beginning of 1992.

When firms were recontacted to confirm participation, a large proportion opted to withdraw. Firm refusals and withdrawals were caused by several factors, which should be of note to future research efforts of this type:

- Staff Turnover - The coordinator positions, which were heavily relied upon for support, experienced significant turnover during the course of the project. New coordinators were reluctant to take on a time consuming project.

- Management Support - Our principal contact was the employee transportation coordinator (ETC) within the firm. Often, we received a positive response from the ETC, only to have higher management oppose the effort. This happened well into the process with several employers.

- Over-Surveying - With ridematching registrations, Average Vehicle Ridership (AVR) surveys, research surveys, and internal human resources surveys,

employers and employees in California, especially southern California, are "surveyed out."

- Survey Complexity - Since the survey was a two step process of short forms and long forms, many ETCs withdrew participation once they realized the amount of work needed to complete the effort. Even the offering of cash incentives to ETCs and employees did not seem to improve this situation dramatically.

- California Economy - Our later efforts to recruit new firms was hindered by the general state of the economy. Down-sizing and needed increases in productivity caused many employers to refuse or withdraw participation due to lack of staff resources.

7.3 Recommendations and Future Research Needs

Based on the findings summarized above and the experience with collecting employer and employee data, the following recommendations are made for future research:

(1) Encourage air districts to collect employee and cost data. While regulators desire to keep the administrative burden on employers to a minimum, and focus on compliance rather than process, it would be helpful to collect detailed data at the employee level and cost information reported by incentive. Two possible means of accomplishing this include sampling firms on a periodic basis or by having the public sector process the survey data, as is being done in Maricopa County (Phoenix). This would provide a rich data base of experience and cost effectiveness.

(2) Research the impact on trip chaining and access mode on VMT. The trip reduction regulations in California, and this research, assume that when an employee arrives at the site in a non-solo mode, a trip is reduced. However, the statewide goal is a 25% reduction in regional VMT. Because of the unknown impact of trip chaining, access mode to ridesharing and transit, and secondary impacts of vehicles left at home, the impact of trip reduction programs on VMT is not well understood.

(3) Test the use of the ARB TDM Evaluation Program. The use of the TDM evaluation software developed as part of this research should be tested among air districts, other agencies and ARB staff before disseminating to employers. Additionally, as more and new data and research on incentives and their cost effectiveness becomes available, the software and its attendant guidance should be modified to reflect this new information.

Considerable new research related to quantifying the cost effectiveness of employer-based trip reduction incentives has been initiated since this study was begun. More work is underway to provide solid guidance to employers, planners and regulators every day. Federal, state and regional air quality agencies are developing and testing predictive software of the type developed for this project. The ultimate challenge may be the need to standardize approaches and tools so that consistent and sound projections can be derived from this new generation of trip reduction evaluation tools.

Appendix I

SURVEY INSTRUMENTS

EMPLOYER INTERVIEW FORM

EMPLOYER INTERVIEW QUESTIONNAIRE

ARB TRIP REDUCTION INCENTIVES PROJECT

Employer Name: _____

Coordinator Name: _____

Coordinator Phone #: _____

Date of Interview: _____

Pick-Up Short Forms: _____

COMSIS Corporation
2615 Pacific Coast Highway
Suite 330
Hermosa Beach, CA 90254

EMPLOYER INTERVIEW QUESTIONNAIRE

ARB TRIP REDUCTION INCENTIVES PROJECT

SECTION 1 PRE-INTERVIEW DATA (Complete this section from initial calls, the most recent trip reduction plan, direct observation on-site, or other sources prior to interview. Augment as necessary during site visit.)

EMPLOYER BACKGROUND

Organization Name: _____

Office Street Address: _____

_____

_____

Headquarters Office ____ Branch Office ____

SIC Code (from plan or ask) _____

ETC Contact Person: _____ Phone: _____

Management Contact: _____ Phone: _____

SITE BACKGROUND

Site Description:

Development Type:

____ Office park ____ Suburban activity center

____ Other suburb ____ Campus/Institution

____ CBD ____ Mixed-use _____

____ Industrial park ____ Other _____

Type of Building:

____ Single-tenant Bldg. ____ Multi-tenant Bldg.

Building Size:

_____ Square feet _____ Floors

Location of Building on Site:

____ Center ____ Fronting street Other:_____

_____

Location of Parking At Site:

____ No parking on-site ____ Adjacent garage ____ Lot behind bldg.
____ Lot in front of bldg ____ Lots surrounding bldg ____ Mixture of lots/garages
____ Other: _____

Internal Pedestrian Circulation (e.g. walk to bus stop):

____ Easy walk to bus ____ Difficult walk to bus
____ Good internal circulation ____ Poor internal circulation
____ Does not apply ____ Other:_____

Description: _____
_____

Internal vehicle circulation:

____ Good access ____ Poor access
____ Good circulation ____ Poor circulation
____ Does not apply ____ Other: _____

Description: _____
_____

Retail services within 1/2 mile (not on-site, in building):

____ Restaurant/fast food ____ Banking/ATM ____ Convenience store
____ Dry cleaning ____ Pharmacy/Sundries ____ Video rental
____ Other: _____

Adjacent land uses:
____ Office ____ Retail ____ Residential ____ Industrial
____ Other: _____
_____

Other site information: _____

_____

_____

Transportation Availability (from plan)

Major highways serving site: _____

_____

_____

HOV Access (lanes, on-ramps, etc): _____

_____

_____

Bus Transit:	Route	Provider	From	To	Frequency
(Use general description if specifics unavailable)					

Location of nearest transit stop(s): _____

_____

_____

Rail Transit (Amtrak, Light rail): _____

_____

_____

Bicycle/Pedestrian (Bike routes, trails): _____

_____

_____

Other Transportation Services or Facilities: _____

_____

_____

SECTION 2 SITE VISIT INTERVIEW (Complete as much as possible before interview from prior information collected, add details as necessary during interview. Italics indicate interviewer question.) Begin interview with background on project, data collection process and ultimate software for use by employers. Note that employee survey timing and responsibilities will be discussed at the end of the interview.

TRIP REDUCTION (TSM) PROGRAM INFORMATION

I'd like to start by learning more about your trip reduction (or TSM) program. From my information I know you offer (give example). Please describe the other elements in your program. (Prompt for more information if necessary, based on screening call. Ask about specific elements if needed.)

Trip reduction (or TSM) Program Elements:

Ridematching:

____ None
____ On-site (computerized) ____ On-site (by hand)
____ Off-site (outside service) ____ Other: _____

Details: _____

Ridesharing (RS) Support:

____ Preferential parking ____ Company cars for RS
____ Carpool subsidies _____
____ Other _____

Details: _____
_____

Vanpooling:

____ Vanpool start-up ____ Company use of vans
____ Empty seat subsidies ____ Ongoing subsidy
____ Company vans ____ Maintenance/insurance subsidy
____ Personal use of vans ____ Driver training
____ Other _____

Number of vans/routes _____

Details: _____
_____

Transit:

____ Subsidy ____ Info (schedules, etc.) ____ Pass sales
____ Shuttle _____
____ Buspool/subscription bus _____
____ Other _____

Details: _____
_____

Bicycling/walk:

____ Bike racks ____ Covered bike storage
____ Showers/lockers ____ Subsidy
____ Other _____

Details: _____
_____

Alternative Work Hour Arrangements:

____ Flexible hours ____ Compressed weeks
____ Telecommuting ____ Staggered hours (shifts)
____ Other: _____

Details: _____
_____

Support Services and Facilities:

____ On-site child care ____ Guaranteed Ride Home
____ Cafeteria/Restaurant ____ Lunchroom facilities
____ Convenience shopping (dry cleaners, sundries, video rental, etc.)
____ ATM, banking
____ Other facilities or on-site services _____
_____
____ Other _____

Details: _____
_____

Transportation Allowance:

$ _____ All employees $ _____ Ridesharers only

Details: _____

_____

Other Program Features (other than marketing): _____

_____

_____

_____

Program Marketing and Corporate Support:

How are trip reduction (or TSM) incentives marketed?

____ ETC
____ Transportation fairs
____ Employee orientation
____ Direct/targeted mail
____ Other _____

____ On-site info center
____ Newsletter
____ Prizes/drawings
____ Bulletin boards

Details: _____

_____

_____

How is the program is staffed and where is it housed?

Number of staff _____ Location _____

Other Relevant Info _____

_____

Coordination with Other Groups:

Are any of these services or incentives provided by or through other groups:

____ No ____ Yes (If yes) *What groups and services?*

____ Regional ridesharing agency _____
____ Developer _____
____ TMA _____

____ Other partnership _____
____ Local government _____
____ Consultant _____
____ Other _____

Does (company name) work with any of these groups on other transportation issues?

____ No ____ Yes (If yes) How? _____
_____
_____

Employer's Perception of Their Program:

Which trip reduction (or TSM) strategies do you feel have been the most cost effective and why?

_____
_____
_____

Which have been the least cost effective and why?

_____
_____
_____

Have you encountered problems in developing or implementing the trip reduction (or TSM) program or specific incentives?

____ Budget limitations ____ Generating employee interest
____ Publicizing program ____ Union opposition
____ Support from management ____ Impact on benefits package
____ Other _____

Details: _____

(If yes) *How have you resolved these problems?*

How supportive is top management of trip reduction (or TSM) activities at (company name)?

____ Very supportive ____ Somewhat ____ Not at all

Describe any company policies or management actions that encourage or discourage trip reduction activities? (ex. no meetings after 3:30)

Do you feel traffic congestion, air quality problems, or other transportation conditions affect your company's operations, costs, or productivity?

____ No ____ Yes (If yes, prompt) *In what way?*

____ Labor accessibility ____ Recruiting/retaining employees
____ Access to customers ____ Employee absenteeism/productivity
____ Cost of deliveries ____ Cost of other business-related travel
____ Other _____

Program Evolution and Planning:

*When was your trip reduction (or TSM) program initiated:*_____

What led (company name) to establish the program (check all) *?*

____ Employer regulation
____ Traffic congestion
____ Employee benefit
____ Parking constraint
____ Developer regulation
____ Access to labor
____ Company relocation
____ Energy crisis
____ Other _____

Details:_____
_____
_____

How has the program changed since it was begun?

____ No changes
____ Added incentives
____ Expanded eligibility
____ Incr. mgmt. support
____ Deleted incentives
____ Limited eligibility
____ Decr. mgmt. support
____ Other _____

Details:_____
_____
_____

(If yes) *What led to the changes?*

____ Budget increase
____ Regulation
____ Company relocation
____ Company growth
____ External economic factors
____ Budget decrease
____ Under/over utilization of incentives
____ Company consolidation
____ Company downsized
____ Other _____

Details:_____
_____
_____

Program Costs

In order for us to determine the cost of reducing a trip through a trip reduction (or TSM) program, we need some information on the cost of your program and any costs associated with specific incentives. We are not looking for proprietary information on salaries or benefits, just annual costs of program budget elements. These costs are generally broken down into administration, marketing, subsidies, and facilities. I'll ask about each:

Administration (staff, benefits, office supplies, etc.)

$_____ per year

Specific elements or costs: _____
_____

Marketing and Promotion (brochures, fairs, prizes)

$_____ per year

Specific elements or costs: _____
_____

Subsidies/Incentives/Service Contracts (transit passes, vanpool subsidies, GRH contracts)

$_____ per year

Specific elements or costs: _____
_____

Facilities/Capital Costs (bicycle lockers, vanpool lease/purchase)

$_____ per year

Specific elements or costs: _____
_____

Other Costs: _____
_____
_____

Have you realized any savings from your program, for example, reduced parking leases, or do you derive any revenue from the program to off-set costs, such as vanpool fares.

_____ No _____ Yes

If yes, please describe type and amount of savings or revenue

_____
_____
_____

Plan Preparation

How do you currently prepare your trip reduction (TSM) plan?

____ ETC prepares
____ Consultant prepares
____ RS agency prepares
____ other: _____

_____ Other department prepares
_____ Consultant does survey
_____ RS agency does survey

Do you use a microcomputer to analyze the survey or prepare the plan?

No _____ Yes _____

If yes, what software do you use and how do you use it for plan preparation?

_____ spreadsheet
_____ word processing
_____ statistical package
_____ trip reduction software
_____ ridematching data base
_____ other: _____

Would you use an software package that enabled you to analyze employee survey data and assess the trip reduction effectiveness of various incentives and program elements?

No, why: _____

Yes, why: _____

EMPLOYER/SITE CHARACTERISTICS

Finally, I'd like to ask a few questions about the company's employment and office setting.

Type of Business (confirm if not obvious): _____

How many employees work at this site on a given day?

_____ Full-time ____ Part-time ____ Contract ____ Other

How many employees typically work off-site on a given day?

_____ employees

What is the breakdown of employees by job classification:

____% Managerial
____% Other professional
____% Laborer/shop worker
____% Clerical support staff
____% Other _____

Has the companies employment grown in the past five years and if so by how much?

____ Yes: Grew by _____%
____ No: Stable _____
Shrunk by _____%

Do you anticipate the company will grow over the next five years?

____ Yes: Grow by _____%
____ No: Stable _____
Shrink by _____%

Do you anticipate a move for any reason in the next few years? ____ No ____ Yes

Details:_____
_____

What is the company's work hours policy and about what proportion of employees use these various arrangements on a given day?

_____ Fixed hours:		___ : ___ to ___ : ____	_____% employees
_____ Work shifts:	morning	___ : ___ to ___ : ____	_____% employees
	afternoon	___ : ___ to ___ : ____	_____% employees
	graveyard	___ : ___ to ___ : ____	_____% employees
_____ Staggered shifts			_____% employees
_____ Flexible hours			_____% employees
_____ Compressed work weeks			_____% employees
_____ Telecommuting			_____% employees

Why did the company institute these arrangements?

_____ trip reduction regulation
_____ site access problems
_____ parking problems
_____ new employee benefit
_____ other: _____

Building Occupancy

Does the company own or lease the office space? ____ Own ____ Lease

When did the company move into the building? How long have you been at this site?

____ years

What was the reason for the move to this site?

____ Accommodate growth ____ Consolidation ____ New company
____ Other _____

Where did the firm relocate from? (if not new firm or new site)

_____(city, type of area)

Was transportation an issue in your decision to locate here?

____ No ____ Yes

(If yes) *In what way* _____

_____

Has it become an issue? ____ No ____ Yes

(If yes) *In what way* _____

_____

Parking

How many parking spaces does the company provide for employee use?

Surface _____ On-site _____ Off-site
Garage _____ On-site _____ Off-site
Other: _____

Do you restrict availability of or access to parking to particular groups or at particular times of the day: ____ No ____ Yes

(If yes) Describe _____

_____

How are parking restrictions enforced?

____ Parking stickers/access cards ____ Gates on parking lots/garages
____ Attendant inspection at entrance to lot/garage
____ Other _____

Is parking adequate now? ____ No ____ Yes
If no, *why*: _____

Do you expect it to be adequate in the future? ____ No ____ Yes
If no, *why*: _____

Is other parking available to employees, such as on-street or other public lots?

_____ No _____ Yes

If yes, *What kind of parking is it and is there a charge to park?*

____ on-street meters: charge $ _____ hour/day/mo
____ on-street (free)
____ off-street lot/structure: charge $ _____ hour/day/mo
____ off-street (free)

Do employees pay for company-provided parking: ____ No ___ Yes

(If yes) *What are the fees?*

$_____ SOV $_____ 4P carpool
$_____ 2P carpool $_____ Vanpool
$_____ 3P carpool $_____ Other _____

What is cost of parking to company?

_____ Part of building lease, buried cost
_____ Company built lot, cost internalized
$_____ per surface space (yr/mo)
$_____ per garage space (yr/mo)
$_____ Other _____

Does the company lease all or part of its parking on a monthly or annual basis?

No _____ Yes _____

If yes, *Does the lease allow the company to reduce number of spaces?*

No _____ Yes _____

(If yes) *At reduced cost to the company?* ____ No ____ Yes

Thank you again for your time and attention. The purpose of the interview is to collect information on your companies trip reduction (TSM) program and the incentives and other factors that impact its effectiveness. Looking over my description of the transportation services available to employees, have I adequately captured the options available to employees? Is the site adequately serviced by highways, transit, etc.? What changes in the system might benefit your employees? Finally, is there anything we left out, in terms of program elements or factors that impact the commuting habits of your employees?

EMPLOYEE SHORT FORM

California Employee Transportation Mini-Survey

015095

1 How did you get to work yesterday? (*Check any that apply. If yesterday was a weekend or holiday, think of the last day you went to work*)

- ☐ Drove alone.
- ☐ Was a carpool driver
- ☐ Was a carpool passenger.
- ☐ Was a vanpool driver
- ☐ Was a vanpool passenger.
- ☐ Took the bus.
- ☐ Took the train.
- ☐ Rode a bicycle.
- ☐ walked.
- ☐ Worked from home
- ☐ Did not report to work

2. What is your occupation? (*Check only one.*)

- ☐ Clerical/clerk
- ☐ Manager/Administrator
- ☐ Shop worker/General laborer
- ☐ Other professional
- ☐ Other _____

3. What is your home address?(*This information will be used to calculate the length of your trip. No one will visit your home.*)

Your street address _____

The nearest cross-street _____

City/County/Zip _____

EMPLOYEE LONG FORM

CALIFORNIA EMPLOYEE TRANSPORTATION SURVEY

PLEASE READ THE FOLLOWING INFORMATION BEFORE YOU BEGIN.

We'd like to thank you in advance for participating in this very important survey. The survey will help us understand how daily travel patterns affect air quality, which in turn affects all of us. The research information will be used to help employers develop transportation benefit programs that better meet the needs of their employees.

You are one of only a small percentage of people in the state who are being asked to complete this questionnaire. You will be representing other people like yourself. For this reason, we urge you to answer the questions as accurately as you can.

This survey covers:

- general information about transportation programs,
- information about your trip to work YESTERDAY,
- and general information about yourself.

If you did not work yesterday, please answer the questions in terms of the last day you worked.

We would like to emphasize the CONFIDENTIAL nature of this survey. The information will be used for statistical purposes only. It will not be used for sales calls or become part of any permanent records that are kept by your employer.

THANK YOU AGAIN.

Employer Transportation Program

1. **Does your employer offer any of the following transportation programs?** (*Check any that apply.*)

- ☐ Carpool matching/information
- ☐ Commuter assistance office
- ☐ Transportation coordinator
- ☐ Preferential parking for carpools/vanpools
- ☐ Free parking for all employees
- ☐ Reduced price or free parking for carpools/vanpools
- ☐ Cash prizes for carpooling
- ☐ Company vanpools
- ☐ Carpool subsidies
- ☐ Vanpool subsidies
- ☐ Showers and lockers
- ☐ Bike racks/storage
- ☐ Buspool/subscription bus
- ☐ Bus pass sales on site
- ☐ Free/discounted bus passes
- ☐ Transportation fairs
- ☐ Telecommuting
- ☐ Guaranteed ride home
- ☐ Transportation allowance
- ☐ Nothing
- ☐ Other _____

2. **Which of these programs have YOU tried or used?** (*Check any that apply.*)

- ☐ Carpool matching/information
- ☐ Commuter assistance office
- ☐ Transportation coordinator
- ☐ Preferential parking for carpools/vanpools
- ☐ Free parking for all employees
- ☐ Reduced price or free parking for carpools/vanpools
- ☐ Cash prizes for carpooling
- ☐ Company vanpools
- ☐ Carpool subsidies
- ☐ Vanpool subsidies
- ☐ Showers and lockers
- ☐ Bike racks/storage
- ☐ Buspool/subscription bus
- ☐ Bus pass sales on site
- ☐ Free/discounted bus passes
- ☐ Transportation fairs
- ☐ Telecommuting
- ☐ Guaranteed ride home
- ☐ Transportation allowance
- ☐ Nothing
- ☐ Other _____

3. **Are any of these other programs or services available to you?** (*Check any that apply.*)

- ☐ Regional ridematching service
- ☐ Private vanpools or club bus
- ☐ Express bus service
- ☐ Regular bus service
- ☐ Commuter rail
- ☐ Park and ride lots
- ☐ Carpool lane at freeway on-ramp
- ☐ Carpool lane on freeway
- ☐ Guaranteed ride home
- ☐ Bike lanes, bikepaths
- ☐ Transit pass discounts
- ☐ Other _____

4. **Which of these have YOU tried or used?** (*Check any that apply.*)

- ☐ Regional ridematching service
- ☐ Private vanpools or club bus
- ☐ Express bus service
- ☐ Regular bus service
- ☐ Commuter rail
- ☐ Park and ride lots
- ☐ Carpool lane at freeway on-ramp
- ☐ Carpool lane on freeway
- ☐ Guaranteed ride home
- ☐ Bike lanes, bikepaths
- ☐ Transit pass discounts
- ☐ Other _____

About Yourself

5. **Are you:** ☐ Male ☐ Female

6. **Are you:** ☐ Married ☐ Unmarried

7. **What is your age?** ☐ Under 21 ☐ 21-29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ 60+

8. **Are you:** ☐ White, not Hispanic ☐ Black ☐ Asian ☐ Hispanic ☐ Other_____

9. **Do you have any children:**

	Yes	No		Yes	No
a. under 2 years old in daycare	☐	☐	c. in elementary school	☐	☐
b. between 2 and 5 in daycare	☐	☐	d. in Jr. or Sr. high school	☐	☐

10. **What is your occupation?** (*Check only one.*)
☐ Manager/administrator ☐ Craftsman/production
☐ Professional/technical ☐ Service/maintenance
☐ Secretary/clerical ☐ Sales & associates
☐ Other _____

11. **How long have you been working at your current work location?**
_____ Years _____ Months

12. **How many people, including yourself, live in your household?** _____ Total persons

13. **Of the total number, how many have a driver's license?** _____ Licensed drivers

14. **Of the total number in your household, how many work outside the home, including yourself?** _____ Workers

15. **How many vehicles (including cars, pick-ups, and motorcycles) and adult bicycles are in running order and owned or available for regular use by your household?**
_____ Motor vehicles _____ Bicycles

16. **Please check your approximate annual HOUSEHOLD income category last year before taxes.**
☐ Less than $5,000 ☐ $25,000 - $49,999
☐ $5,000 - $9,999 ☐ $50,000 - $74,999
☐ $10,000 - $24,999 ☐ $75,000 or more

17. **Please fill this out! The following information will be used for computing statistics only, but is extremely important for this study.**

Your street address_____

The nearest cross-street_____

City/County/Zip_____

Your Work Hours

18. **What time did you arrive at work yesterday?** _____:_____ AM / PM

19. **What time did you leave work yesterday?** _____:_____ AM / PM

20. **Which of the statements below best matches your schedule?** (*Check any that apply.*)

- ☐ I have flex-time and can adjust my schedule daily.
- ☐ I can work from home.
- ☐ I can work a modified (4/40 or 9/80) schedule. ☐ 4/40 ☐ 9/80
- ☐ I can work a staggered, shift schedule.
- ☐ I'm a part-time employee.
- ☐ My work involves frequent travel to clients and other job sites.
- ☐ I work a set, inflexible schedule.---->SKIP TO QUESTION 22
- ☐ I don't know if I can adjust my schedule. ---->SKIP TO QUESTION 22

21. **If you have changed your schedule in the past year, why did you do so?** (*Check any that apply.*)

- ☐ to avoid traffic
- ☐ to ride in a carpool or vanpool
- ☐ to ride the bus or train
- ☐ to drop off or pick up a child
- ☐ to take care of personal business
- ☐ Other _____

Your Commute Yesterday

If yesterday was not a workday, please answer the questions in terms of your last workday.

22. **How did you get to work yesterday?** (*Check one*)

- ☐ Drove alone, motorcycled
- ☐ Carpooled (with _____other people)
- ☐ Vanpooled (with _____other people)
- ☐ Took bus
- ☐ Took train
- ☐ Walked
- ☐ Worked from home
- ☐ Reported to another worksite
- ☐ Didn't go (compressed work week)
- ☐ Didn't go (sick)
- ☐ Didn't go (vacation)
- ☐ Bicycled

23. **If you carpooled or vanpooled, or took the bus or train, how did you get to your stop or the meeting place?** (*Check one*)

- ☐ Walked
- ☐ Got dropped off
- ☐ Drove myself
- ☐ Was picked up at home

24. **How many days per WEEK do you usually travel from home to work?** ☐ days

25. **How many days per MONTH do you travel from home to work?** ☐ days

Your Commute This Week

Please answer the questions below for the last complete calendar work week (Monday–Friday).

26. **How did you get to work on MONDAY?** (*Check one*)

- ☐ Drove alone, motorcycled
- ☐ Carpooled (with _____other people)
- ☐ Vanpooled (with _____other people)
- ☐ Buspooled
- ☐ Took public bus/train
- ☐ Walked/Biked
- ☐ Worked from home
- ☐ Reported to another worksite
- ☐ Didn't work (compressed work week)
- ☐ Didn't go (sick, vacation)

27. **How did you get to work on TUESDAY?** (*Check one*)

- ☐ Drove alone, motorcycled
- ☐ Carpooled (with _____other people)
- ☐ Vanpooled (with _____other people)
- ☐ Buspooled
- ☐ Took public bus/train
- ☐ Walked/Biked
- ☐ Worked from home
- ☐ Reported to another worksite
- ☐ Didn't work (compressed work week)
- ☐ Didn't go (sick, vacation)

28. How did you get to work on WEDNESDAY? (*Check one*)

- ☐ Drove alone, motorcycled
- ☐ Carpooled (with _____other people)
- ☐ Vanpooled (with _____other people)
- ☐ Buspooled
- ☐ Took public bus/train
- ☐ Walked/Biked
- ☐ Worked from home
- ☐ Reported to another worksite
- ☐ Didn't work (compressed work week)
- ☐ Didn't go (sick, vacation)

29. How did you get to work on THURSDAY? (*Check one*)

- ☐ Drove alone, motorcycled
- ☐ Carpooled (with _____other people)
- ☐ Vanpooled (with _____other people)
- ☐ Buspooled
- ☐ Took public bus/train
- ☐ Walked/Biked
- ☐ Worked from home
- ☐ Reported to another worksite
- ☐ Didn't work (compressed work week)
- ☐ Didn't go (sick, vacation)

30. How did you get to work on FRIDAY? (*Check one*)

- ☐ Drove alone, motorcycled
- ☐ Carpooled (with _____other people)
- ☐ Vanpooled (with _____other people)
- ☐ Buspooled
- ☐ Took public bus/train
- ☐ Walked/Biked
- ☐ Worked from home
- ☐ Reported to another worksite
- ☐ Didn't work (compressed work week)
- ☐ Didn't go (sick, vacation)

31. How many times per week, *while at work or on the way to and from work*, do you use a private vehicle to:

a. Drop off/ pick up child/dependent from school, day care, or other scheduled activity? _____ times

b. Shop or run errands? _____ times

c. Eat Lunch? _____ times

d. Attend meetings? _____ times

e. Conduct personal business? (Dr. appointment, haircut, etc.) _____ times

f. Engage in social/recreational activity? _____ times

Your Opinions

32. **What things are most important to you in deciding how to get to work?** (*Pick the three main things and number them 1,2 and 3, in order of importance.*)

- ☐ Must be at work on time
- ☐ Shortest travel time
- ☐ Lack of travel options
- ☐ Personal safety
- ☐ Privacy during commute
- ☐ Don't like to drive
- ☐ Provides some exercise
- ☐ Allows flexible daily schedule
- ☐ Use car during work
- ☐ Must pick up child at certain time
- ☐ Convenient parking available
- ☐ Socializing during commute
- ☐ After-work errands & shopping
- ☐ After-work sports/meals/activities
- ☐ Mid-day meals/errands/meetings
- ☐ Travel to school or second job
- ☐ Have free/low cost parking at work
- ☐ Other_____

Parking

Please tell us about the parking where you work. IF YOU DO ONLY PARKING AT WORK, NOT PARK & RIDE, CONTINUE even if you do not usually park at work.

33. **Which of the following best describes where you parked (or would have parked) YESTERDAY?** (*Check only one.*)

- ☐ In a GARAGE or in a LOT on work premises
- ☐ In a GARAGE or in a LOT not on work premises
- ☐ There is no parking available to me
- ☐ On a STREET near work
- ☐ Other _____

34. **How easy is it (or would it be) to find a parking space where you work? Please rate from 1 (very easy) to 9 (very hard).** (*Circle one*)

Very easy 1 2 3 4 5 6 7 8 9 Very hard

35. **How much did (or would have) parking cost you?** (*Please complete the appropriate box. If no cost, check the FREE box.*)

- ☐ per day
- ☐ per month
- ☐ per week
- ☐ FREE parking

36. **How many minutes did it (or would it) take to walk from the parking space to the work entrance?**

☐ Minutes

37. **Where would you have parked yesterday, if the usual parking garage or lot was not available for the day?**

- ☐ In another GARAGE or LOT
- ☐ On the STREET
- ☐ I don't know where I would have parked
- ☐ I would have traveled to work by some means other than driving alone

Public Transit

If you don't use public transit to get to work, please answer questions 38–41. If you do use transit, please answer questions 42–43.

38. Have you ever used public transit to go from your CURRENT home to your CURRENT work place?

- ☐ Yes
- ☐ No

39. Was it possible for you to travel to work YESTERDAY by bus or train?

- ☐ Yes
- ☐ No
- ☐ I don't know

40. Which of the following pieces of public transit information have you looked for and found? (*Check any that apply.*)

- ☐ The routes you would travel from home to work
- ☐ The location of the stop where you would board a bus or train
- ☐ The bus or train fare

41. Which, if any of these reasons discourage you from using public transit to commute? (*Check from 1 to 3 in order of importance.*)

- ☐ Stop too far from home
- ☐ Stop too far from work
- ☐ Too many transfers
- ☐ Takes too long
- ☐ Might get stranded
- ☐ Too crowded/can't sit down
- ☐ Personal safety
- ☐ Doesn't come often enough
- ☐ Costs too much
- ☐ Other _____

Answer These Questions If You Use Public Transit

42. If you use public transit to got to work, how long does (or would) it take to get from your home to the bus stop?

☐ Minutes

43. And how long does (or would) it take to get from your last stop to work?

☐ Minutes

Appendix II

ARB TDM EVALUATION PROGRAM SCREENS

Air Resources Board

Travel Demand Management

Evaluation Program

Press Any Key to Continue

PLEASE REFER TO THE "CONDITIONS OF USE" PAGE OF THE USER'S GUIDE PRIOR TO USING THIS SOFTWARE

[1 of 10]

Introduction Screen 1 (of 2)

Welcome to the Air Resources Board TDM Evaluation Program 1.2

This interactive program allows you to test a wide range of travel demand management policies for a particular employment site. The program offers a set of screens, where you describe the actions you wish to evaluate.

First, you enter some information about the employer and the Base number of weekly employees for each commuting option. Next, you identify the employer's current Travel Demand Management (TDM) incentives. Then, you describe the NEW incentives that the employer proposes to implement in the future. These incentives must be described in some detail in order for the program to provide an accurate estimate of their likely effects. After all this information is entered, press the F2 key to calculate the estimated new Average Vehicle Ratio (AVR) and display the results on the screen.

You will use certain 'hot keys' to move around the program and perform certain functions. At any point, press F10 to see the list of hot keys.

Press PgDn to Continue

F2=Calc PgUp=Prev PgDn=Next F10=HotKeys

[2 of 10]

Introduction Screen 2 (of 2)

Here is a list of the program's main input screens:

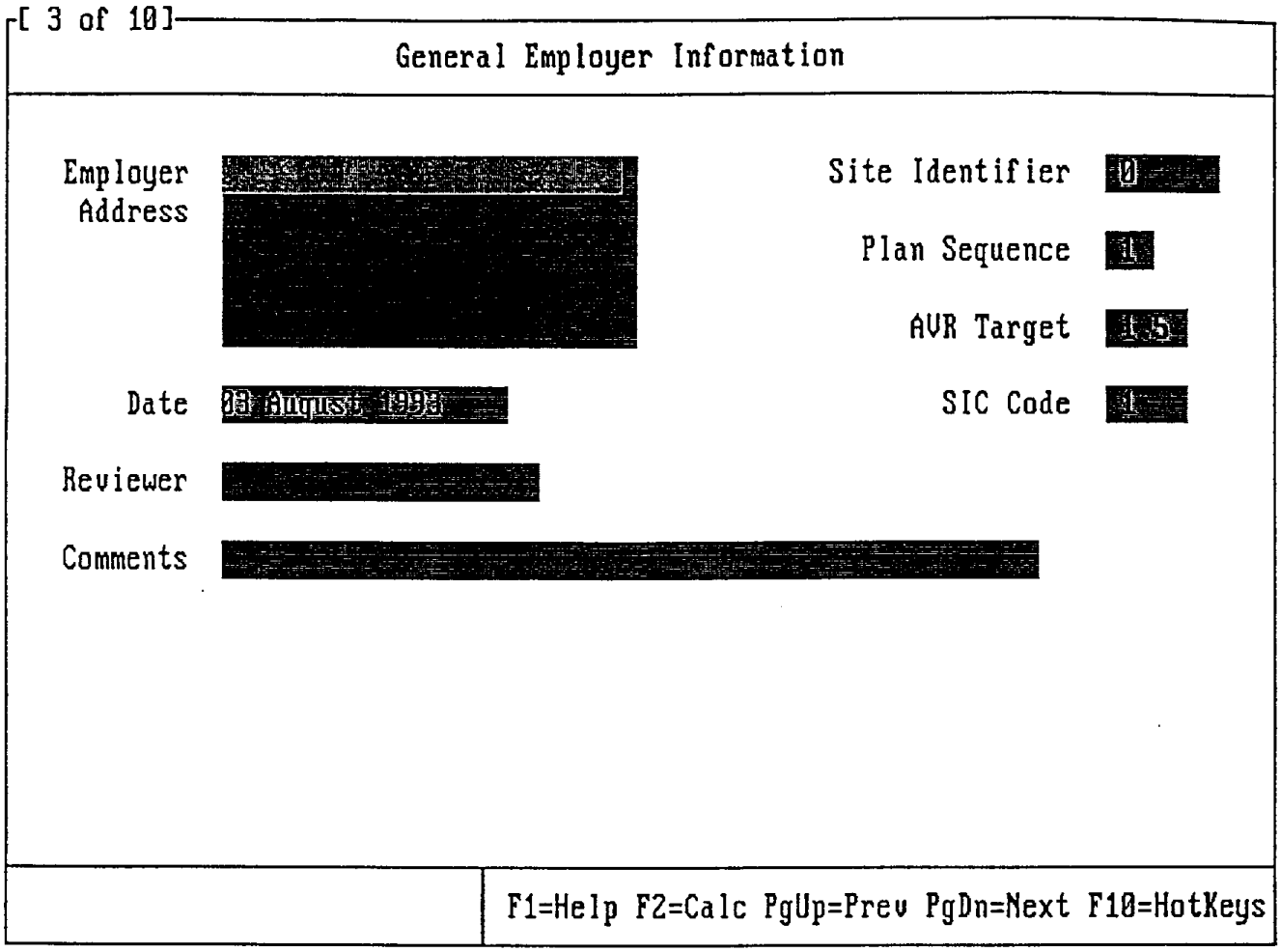
# 1	Introduction Screen 1	# 7	Enter Existing Incentives
# 2	Introduction Screen 2	# 8	Enter Proposed Incentives & Alt. Hrs.
# 3	Enter Gen. Employer Info.	# 9	Enter Other Incentives
# 4	Enter Site Characteristics	#10	Enter Clean Fuel Vehicle Data
# 5	Enter Employees by Mode		
# 6	Enter Cost Incentives		

The usual sequence of steps in using this program is as follows:

A) Enter data describing employer and site characteristics.
B) Enter data for the Base number of employees by commuting option.
C) Enter data describing the Base and Plan incentives and other programs.
D) Enter data describing the use of clean fuel vehicles (if any).
E) Press F4 and provide a file name to save the data on disk.
F) Press F2 to calculate the base and estimated new AVR.
G) Perhaps repeat Step C to test additional incentives (F4 to save).
H) Press F5 to create a report of the estimated data and results.

Press PgDn to Continue

F2=Calc PgUp=Prev PgDn=Next F10=HotKeys



Help 1

Enter some general information describing this employer/site.
Employer: employer/site name, up to 25 characters
Address: up to 4 lines of 25 characters each
Date: today's date is automatically inserted (you may enter another date)
(If you Load a Plan's data, the date that plan was saved is inserted.)
Reviewer: your name or initials (max. 17 characters)
Comments: up to 50 characters of general identification
Site Identifier: the 6-digit code for this employer's site ID (max.: 999999)
Plan Sequence: the current plan sequence number (range: 1 - 99)
AVR Target: the AVR target value for this employer (range: 1.0 - 2.0)
SIC Code: this employer's 4-digit Standard Industrial Classification code

Press Any Key to Continue

[4 of 10]

Site Information

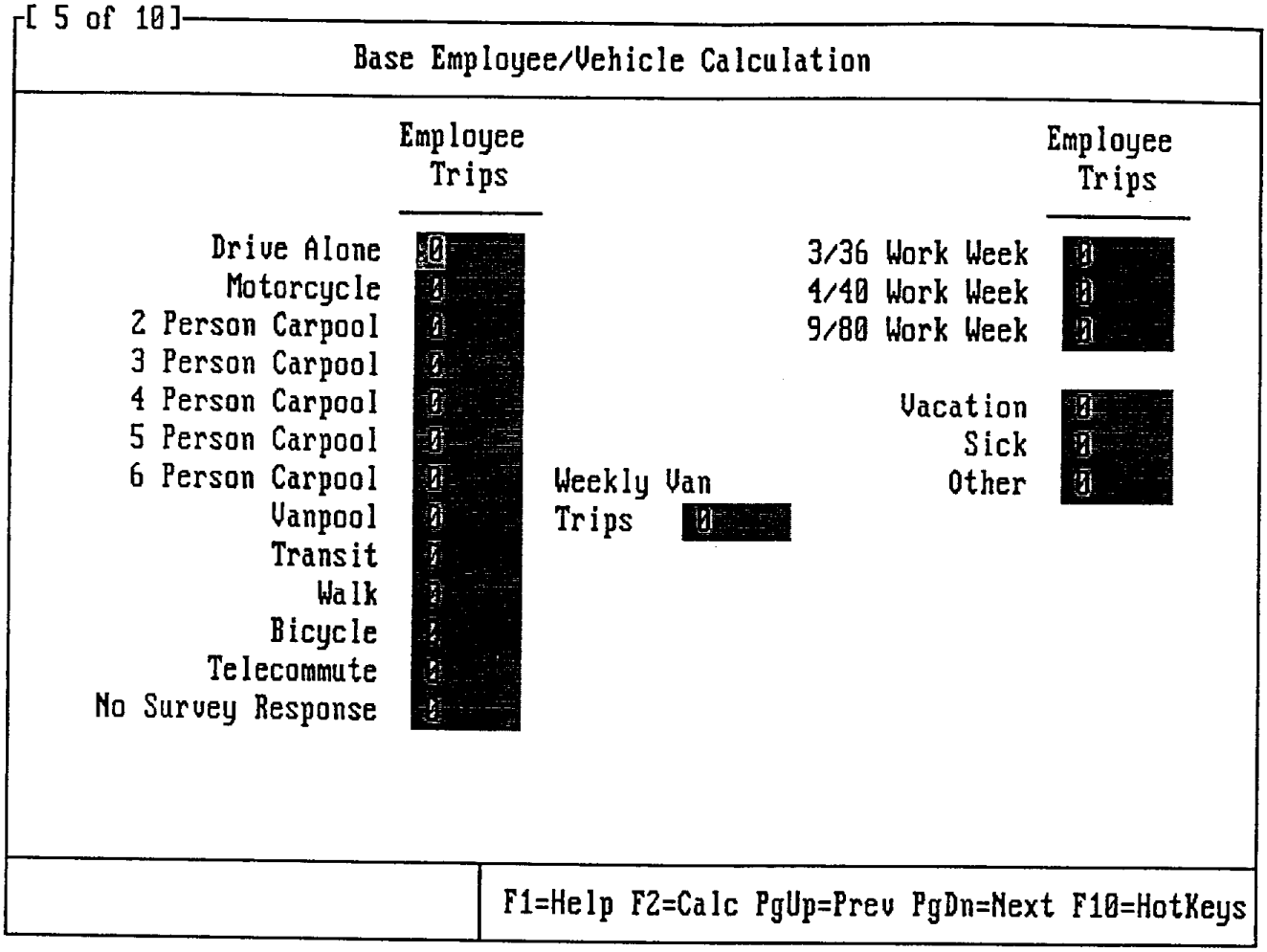
	- B A S E -	- P L A N -
Total Employees	0	0
Employees Reporting 6-10 AM	0	0
Total Parking Spaces	0	0
Marketing Cost of ETR Pgm. ($/yr)	0	0
Administrative Cost of ETR Pgm. ($/yr)	0	0
No. of Retail Land Uses On-Site	0	0

F1=Help F2=Calc PgUp=Prev PgDn=Next F10=HotKeys

Help 2

Enter some more information about this employer and site.
"BASE" means the existing condition, "PLAN" means what the employer estimates will occur by the time of the next plan review.
Total Employees: the total employment at this site.
Employees Reporting 6-10 AM: number of employees who start work 6:00-10:00 AM (must be less than or equal to the Total Employment).
Total Parking Spaces: total number of employee spaces owned or leased by the employer, whether on-site or nearby off-site (must be 1 or more)
Marketing Cost of ETR Pgm.: Annual funds expended to market, promote, or advertise the Employee Trip Reduction program to employees.
Administrative Cost of ETR Pgm.: Annual funds expended to administer the ETR program (salaries, benefits, supplies, etc.).
No. of Retail Land Uses On-Site: "Retail land uses" include a bank, dry cleaner, convenience store, video store, department store, pharmacy, restaurant, or shopping center (count each of these as one "land use").

Press Any Key to Continue



Help 3

Enter the number of employees per week who use each of these commuting choices. For the Vanpool mode, also enter the number of vehicles involved. This is the same information shown on the SCAQMD Weekly Employee/Vehicle Calculation Form IV-3.

Keep in mind that the weekly commuting information must include the proper accounting for the employees who do not commute to the site every day.

Press Any Key to Continue

[6 of 10]

Cost Incentives

Travel Mode	Change in Subsidy or Penalty per MONTH	Days Implemented After Plan Approval	Change in Parking Cost per DAY per Vehicle	Days Implemented After Plan Approval
Drive Alone	$ 0.00	1	DA $ 0.00	1
Motorcycle	$ 0.00	1	MC $ 0.00	1
2 Person Carpool	$ 0.00	1	2P $ 0.00	1
3 Person Carpool	$ 0.00	1	3P $ 0.00	1
4 Person Carpool	$ 0.00	1	4P $ 0.00	1
Vanpool	$ 0.00	1	VP $ 0.00	1
Transit	$ 0.00	1		
Walk	$ 0.00	1		
Bicycle	$ 0.00	1		

(Here, 4 Person Carpool includes 5- and 6-Person Carpools.)

F1=Help F2=Calc PgUp=Prev PgDn=Next F10=HotKeys

Help 4

Under "Modal Subsidy", enter the CHANGE in penalty or subsidy per person, per month, in dollars and cents. Penalties for using a particular mode are entered as a positive cost, while subsidies to use a mode are entered as a negative change in cost. Maximum input value is $300.00.

Under "Parking Cost", enter the CHANGE in the parking cost per vehicle, per day, in dollars and cents. Additional parking costs are entered as positive values, while parking subsidies are entered as negative values. Maximum input value is $10.00.

Taking away a subsidy is the same as adding that subsidy to the trip's cost.

Under "Days Implemented", enter the number of days after which each change will be implemented. This must range from 1 to the number of days until the next plan review is scheduled to occur.

Entries in the "4 Person Carpool" field apply to the 5-Person and 6-Person Carpool modes also.

Press Any Key to Continue

[7 of 10]

Existing Support Elements

Incentive Element	Is Incentive Offered Now? (y/n)
Transit Info Center PLUS Bus Pass Sales	n
Use of Company Vehicles by Ridesharers	n
Bike Racks OR Showers/Lockers	n
Guaranteed Ride Home	n
Preferential Parking for Ridesharers	n
Transp. Coordinator PLUS Rideshare Matching	n
Company-Provided Vanpools	n
Prizes, Free Meals, Certificates	n

F1=Help F2=Calc PgUp=Prev PgDn=Next F10=HotKeys

Help 6

For each of the incentives shown, indicate if the employer already provides that incentive by entering a y or Y in the column. In general, "already provides" means that the incentive was in place during the week the employees were surveyed and was applicable to all employees (there is no "partial credit" in this screen). See the User's Guide for more detailed descriptions of these incentives. Use your judgement to determine whether or not an employer already provides each of these incentives.

Press Any Key to Continue

[8 of 10]

Proposed Support Elements

Incentive Element	Number of Employees Eligible BASE	Number of Employees Eligible PLAN	Days Impl. After Plan Approval
Telecommuting	0	0	1
Alternative Work Schedule: 3/36	0	0	1
Alternative Work Schedule: 4/40	0	0	1
Alternative Work Schedule: 9/80	0	0	1
Transit Info Center PLUS Bus Pass Sales		0	1
Use of Company Vehicles by Ridesharers		0	1
Bike Racks OR Showers/Lockers		0	1
Guaranteed Ride Home		0	1
Preferential Parking for Ridesharers		0	1
Transp. Coordinator PLUS Rideshare Matching		0	1
Company-Provided Vanpools		0	1
Prizes, Free Meals, Certificates		0	1

F1=Help F2=Calc PgUp=Prev PgDn=Next F10=HotKeys

Help 7

Enter the total number of employees at this site who are eligible to receive each incentive. Note that this is the number of employees who are ELIGIBLE TO USE each benefit, NOT the number who WILL USE each benefit. In most cases, this will be all employees at the site.
The "Number of Employees" must not exceed the number of Plan total employees entered on Screen 4 (although it may exceed the number of Base total employees and may exceed the number of employees arriving 6-10 AM).
You may take an incentive away by entering a negative Number of Employees, representing the number of employees who will lose that incentive.
Under "Days Implemented", enter the number of days after which each change will be implemented. This must range from 1 to the number of days until the next plan review is scheduled to occur.
For the first 4 items (Alternative Work Hours) you must also enter the Base (i.e., existing) number of employees who are eligible for each AWH option, if any such employees are shown on Screen 5.

Press Any Key to Continue

[9 of 10]

Other Elements

Element Description	User-Estimated Effectiveness (1 - 10)	Number of Employees Eligible	Days Implemented After Plan Approval	Modes That Are Affected
	1 1 1 1 1	0 0 0 0 0	1 1 1 1 1	

F1=Help F2=Calc PgUp=Prev PgDn=Next F10=HotKeys

Help 8

You may enter up to 5 more incentive types, to cover programs that do not fit into any of the other categories. For each type, enter the following:

Element Name: a description of the incentive (max. 24 characters)

User-Estimated Effectiveness: On a scale of 1 to 10 (1 = least effective, 10 = most effective), give your estimate of the likely effectiveness of this incentive (see the User's Guide for more guidance on this).

Number of Employees Eligible: As in the other screens, enter the number of total employees which will be eligible to benefit from this incentive. You may take an incentive away by entering a negative Number of Employees, representing the number of employees who will lose that incentive.

Days Implemented: As in the other screens, the number of days after which this change will be implemented.

Modes That Are Affected: List the abbreviated codes of the modes that should be affected by this incentive. Up to 4 codes are allowed, separated by commas, for example: 2p,tr,vp. Case and order are not important. Codes:

DA = drive alone	4P = 4-6 person pool	WK = walk
MC = motorcycle	VP = vanpool	BK = bicycle
2P = 2-person pool	CP = ALL carpool modes (2P, 3P, and 4P)	
3P = 3-person poool	TR = public transit	

[10 of 10]

Clean Fuels Credit Worksheet

	- B A S E -	- P L A N -
LPG Vehicles	0	0
Methanol Vehicles	0	0
CNG Vehicles	0	0
Electric Vehicles	0	0

===== W A R N I N G ! ! ! =====

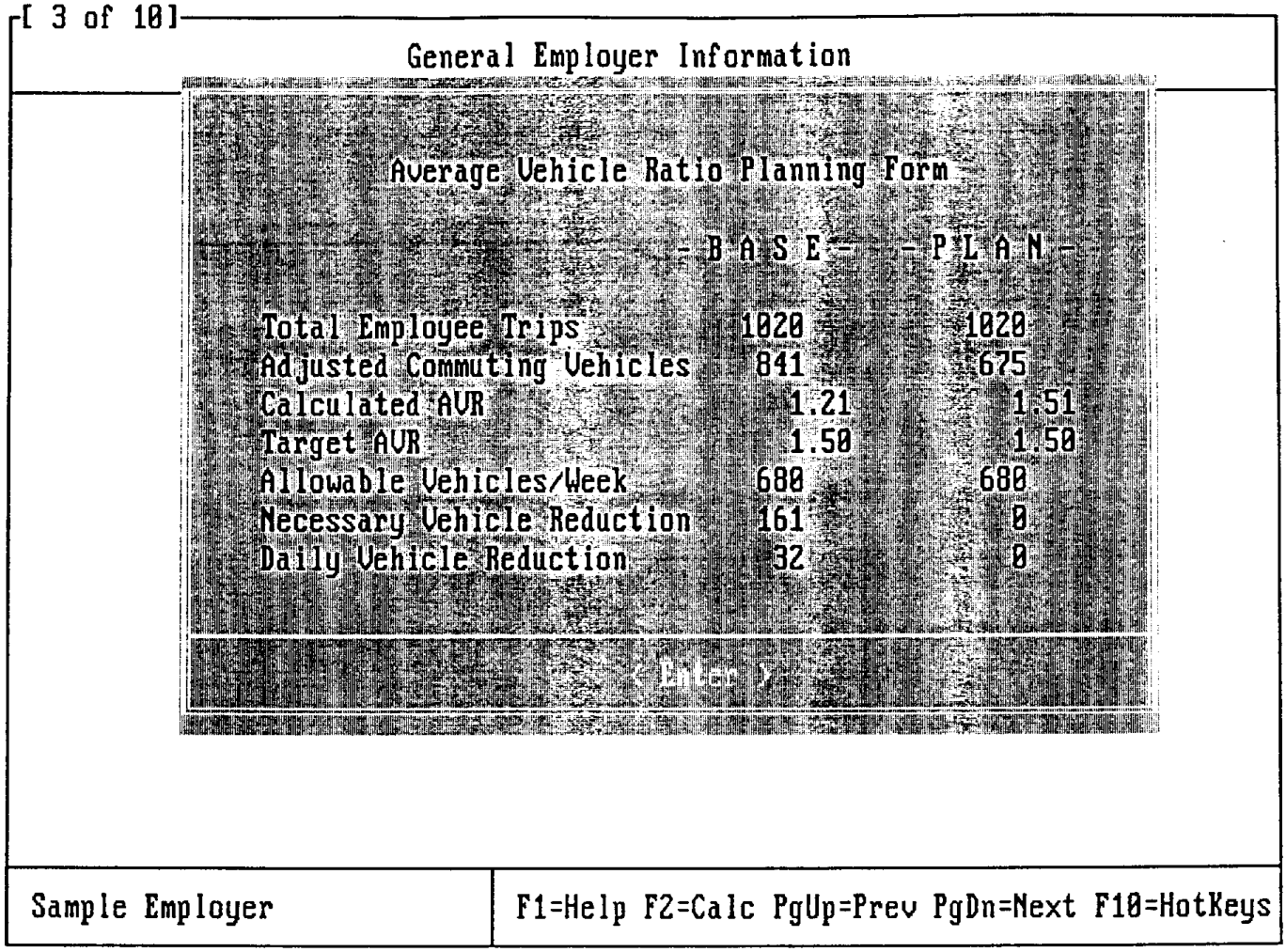
After 1994, the inclusion of clean fuel vehicles is likely to be no longer allowed. Before entering data on this screen you are advised to confirm that taking credit for the inclusion of clean fuel vehicles is allowed for your air quality district, for the time frame of your analysis.

F1=Help F2=Calc PgUp=Prev PgDn=Next F10=HotKeys

Help 9

Enter the number of clean fuel vehicles per day in each fuel category. Enter the current number of such vehicles in the Base column and the projected number of such vehicles in the Plan column.

Press Any Key to Continue

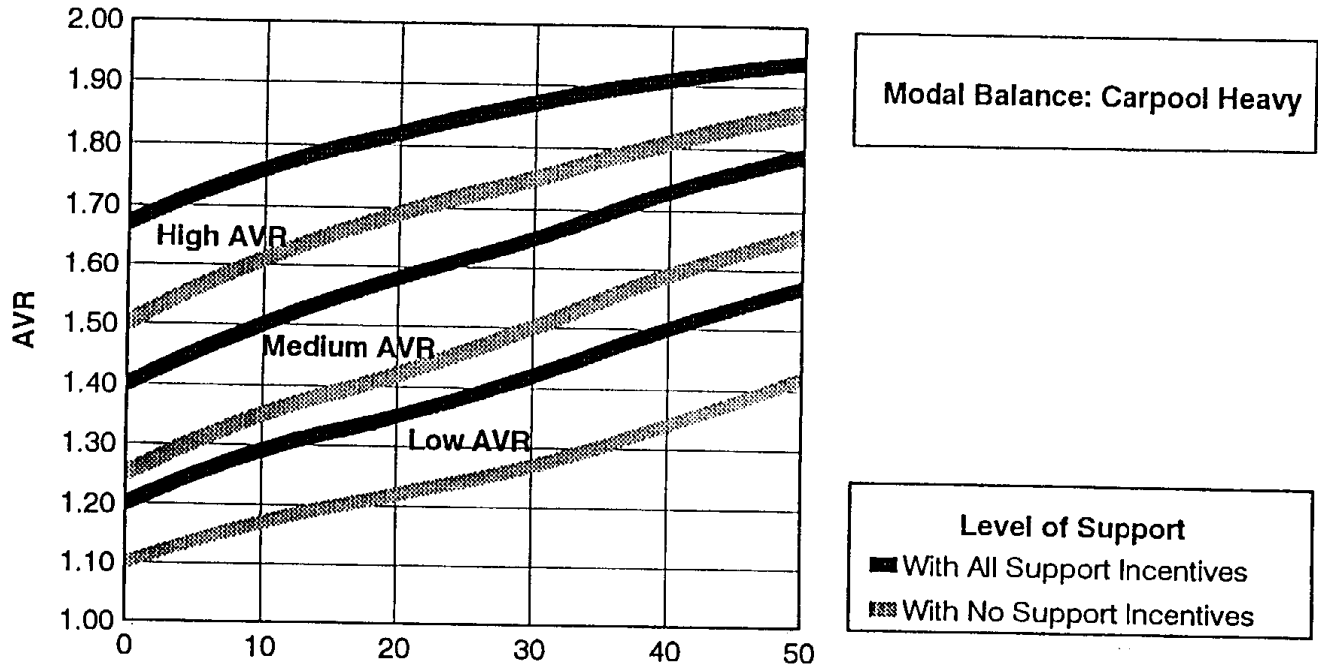

[3 of 10]
General Employer Information
Average Vehicle Ratio Planning Form
- B A S E -
- P L A N -
Total Employee Trips 1020 1020
Adjusted Commuting Vehicles 841 675
Calculated AVR 1.21 1.51
Target AVR 1.50 1.50
Allowable Vehicles/Week 680 680
Necessary Vehicle Reduction 161 0
Daily Vehicle Reduction 32 0
< Enter >
Sample Employer
F1=Help F2=Calc PgUp=Prev PgDn=Next F10=HotKeys

Appendix III

SENSITIVITY CHARTS

Sensitivity of AVR to Increase in Carpool/Vanpool Subsidy

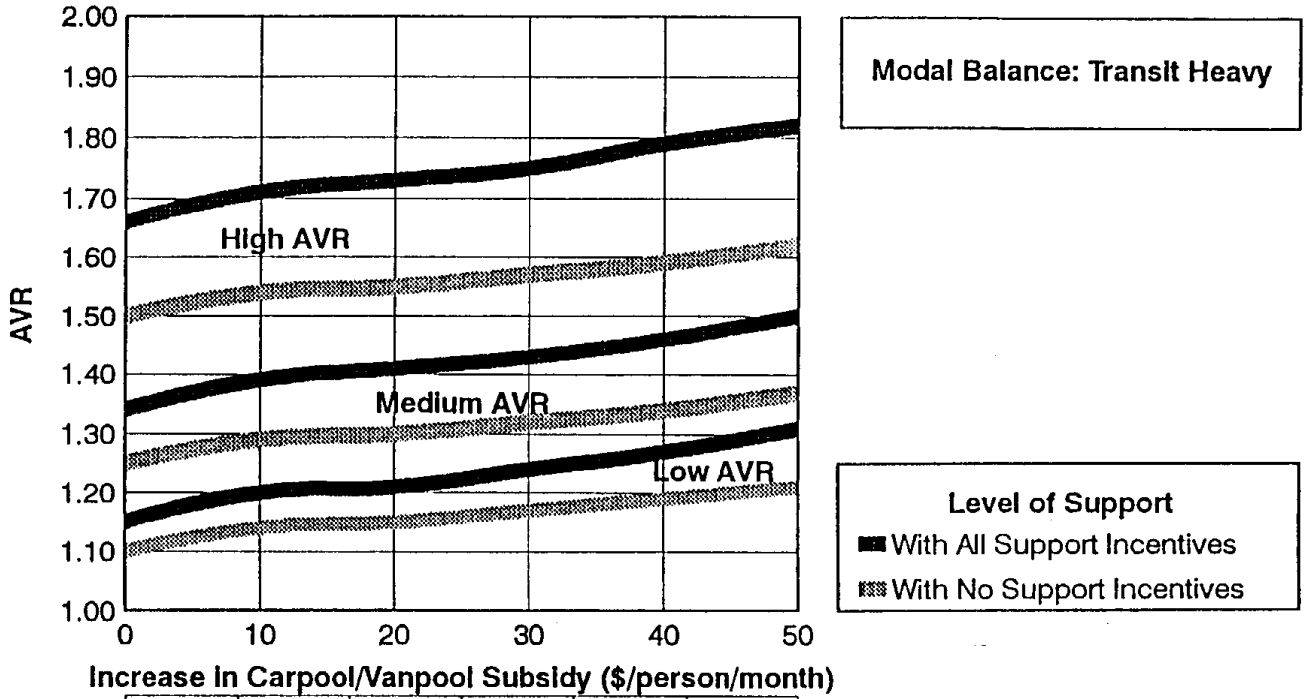
By Starting AVR, Modal Balance and Level of Support



	0	10	20	30	40	50
High AVR - All Support	1.67	1.76	1.82	1.87	1.91	1.94
High AVR - No Support	1.50	1.61	1.69	1.75	1.81	1.86
Medium AVR - All Support	1.40	1.50	1.58	1.65	1.73	1.79
Medium AVR - No Support	1.25	1.35	1.42	1.50	1.59	1.66
Low AVR - All Support	1.20	1.29	1.35	1.42	1.50	1.57
Low AVR - No Support	1.10	1.17	1.22	1.27	1.34	1.42

Sensitivity of AVR to Increase in Carpool/Vanpool Subsidy

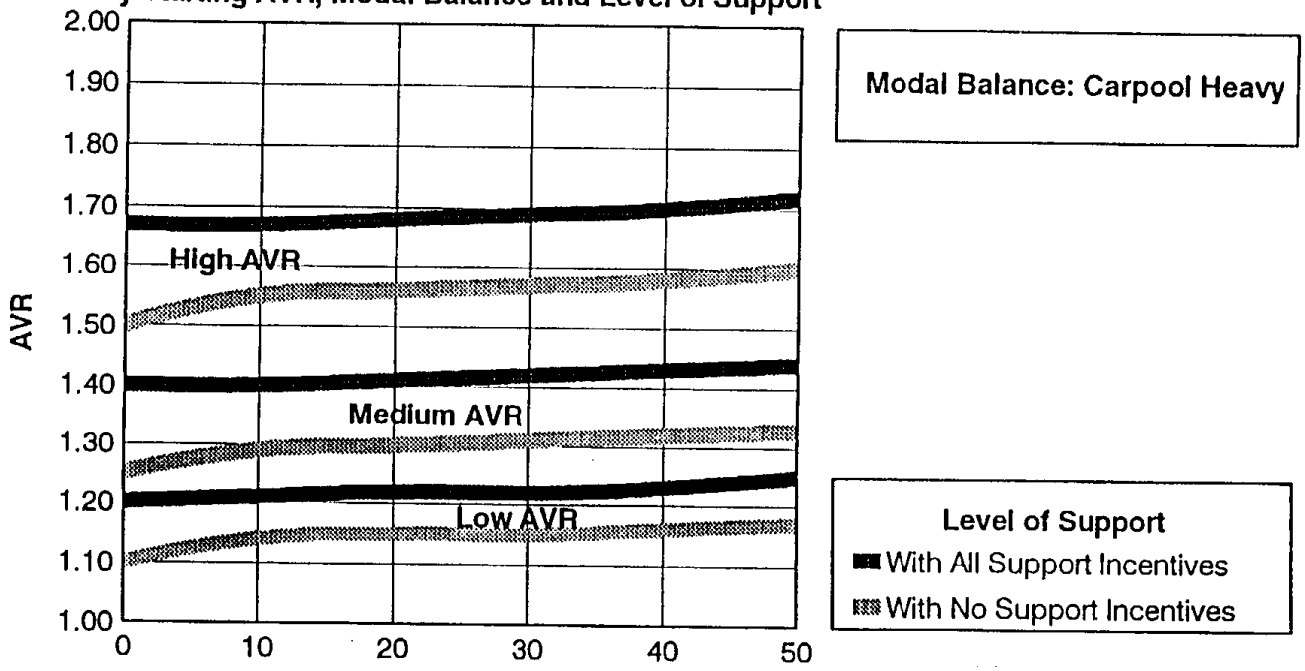
By Starting AVR, Modal Balance and Level of Support



	0	10	20	30	40	50
High AVR - All Support	1.66	1.71	1.73	1.75	1.79	1.82
High AVR - No Support	1.50	1.54	1.55	1.57	1.59	1.62
Medium AVR - All Support	1.34	1.39	1.41	1.43	1.46	1.50
Medium AVR - No Support	1.25	1.29	1.30	1.32	1.34	1.37
Low AVR - All Support	1.15	1.20	1.21	1.24	1.27	1.31
Low AVR - No Support	1.10	1.14	1.15	1.17	1.19	1.21

Sensitivity of AVR to Increase in Transit Subsidy

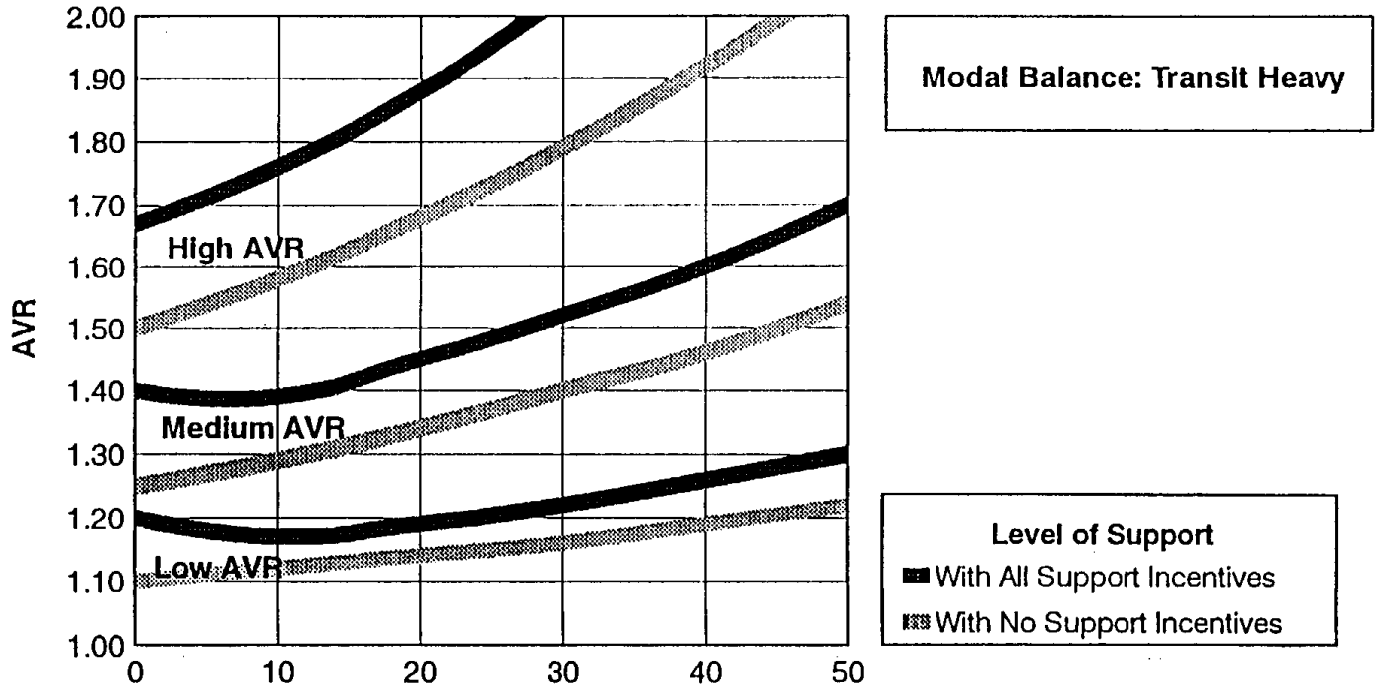
By Starting AVR, Modal Balance and Level of Support



	0	10	20	30	40	50
High AVR - All Support	1.67	1.67	1.68	1.69	1.70	1.72
High AVR - No Support	1.50	1.55	1.56	1.57	1.58	1.60
Medium AVR - All Support	1.40	1.40	1.41	1.42	1.43	1.44
Medium AVR - No Support	1.25	1.29	1.30	1.31	1.32	1.33
Low AVR - All Support	1.20	1.21	1.22	1.22	1.23	1.25
Low AVR - No Support	1.10	1.14	1.15	1.15	1.16	1.17

Sensitivity of AVR to Increase in Transit Subsidy

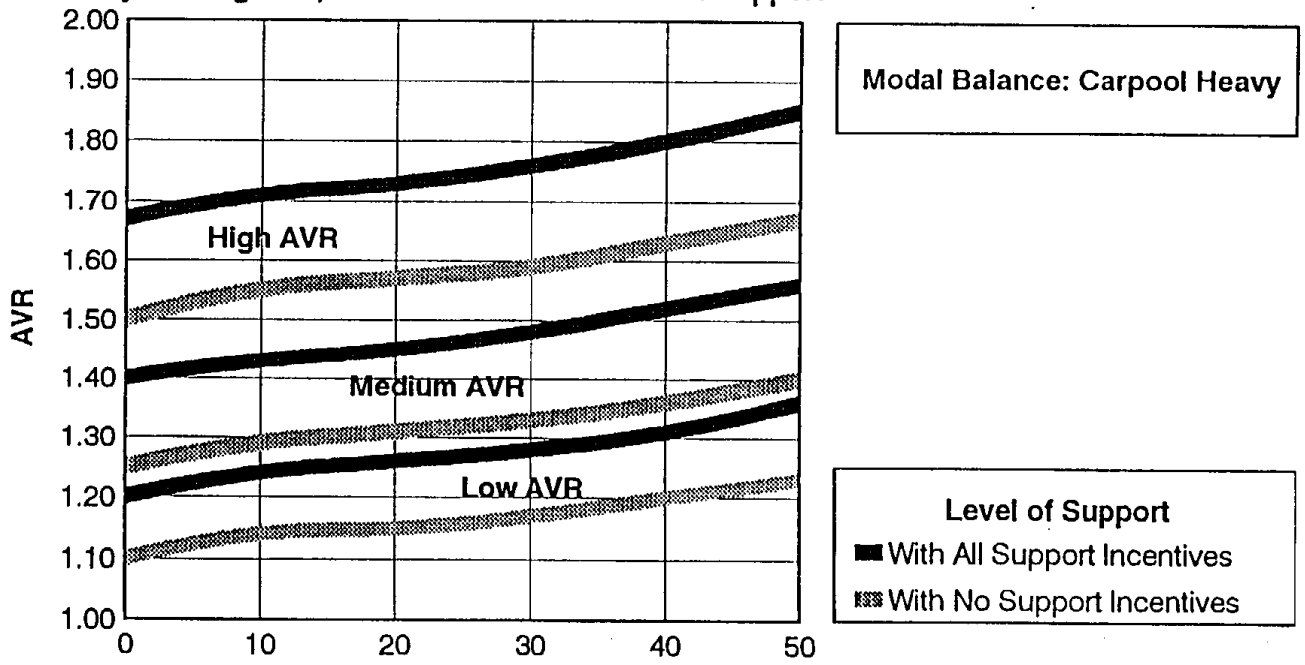
By Starting AVR, Modal Balance and Level of Support



	0	10	20	30	40	50
High AVR - All Support	1.67	1.76	1.88	2.03	2.16	2.38
High AVR - No Support	1.50	1.58	1.68	1.79	1.92	2.07
Medium AVR - All Support	1.40	1.39	1.45	1.52	1.60	1.70
Medium AVR - No Support	1.25	1.29	1.34	1.40	1.46	1.54
Low AVR - All Support	1.20	1.17	1.19	1.22	1.26	1.30
Low AVR - No Support	1.10	1.12	1.14	1.16	1.19	1.22

Sensitivity of AVR to Increase in Bike/Walk Subsidy

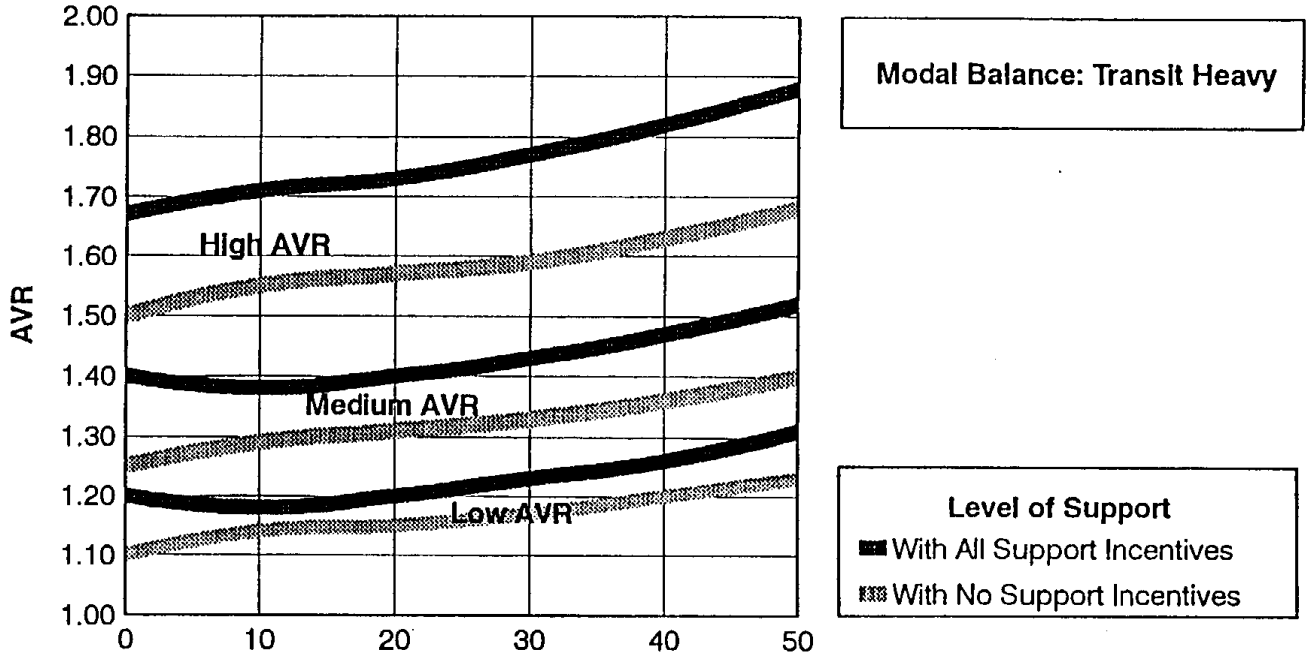
By Starting AVR, Modal Balance and Level of Support



	0	10	20	30	40	50
High AVR - All Support	1.67	1.71	1.73	1.76	1.80	1.85
High AVR - No Support	1.50	1.55	1.57	1.59	1.63	1.67
Medium AVR - All Support	1.40	1.43	1.45	1.48	1.52	1.56
Medium AVR - No Support	1.25	1.29	1.31	1.33	1.36	1.40
Low AVR - All Support	1.20	1.24	1.26	1.28	1.31	1.36
Low AVR - No Support	1.10	1.14	1.15	1.17	1.20	1.23

Sensitivity of AVR to Increase in Bike/Walk Subsidy

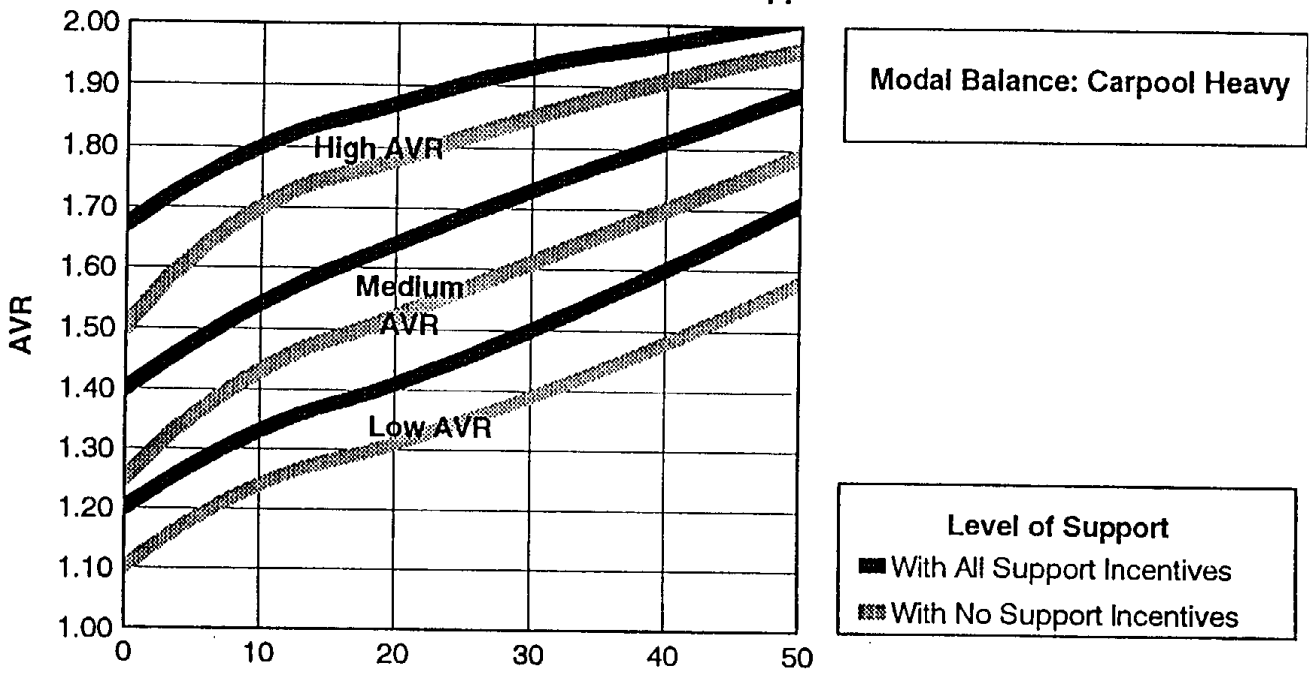
By Starting AVR, Modal Balance and Level of Support



	0	10	20	30	40	50
High AVR - All Support	1.67	1.71	1.73	1.77	1.82	1.88
High AVR - No Support	1.50	1.55	1.57	1.59	1.63	1.68
Medium AVR - All Support	1.40	1.38	1.40	1.43	1.47	1.52
Medium AVR - No Support	1.25	1.29	1.31	1.33	1.36	1.40
Low AVR - All Support	1.20	1.18	1.20	1.23	1.26	1.31
Low AVR - No Support	1.10	1.14	1.15	1.17	1.20	1.23

Sensitivity of AVR to Subsidy Increase for Alternative Modes

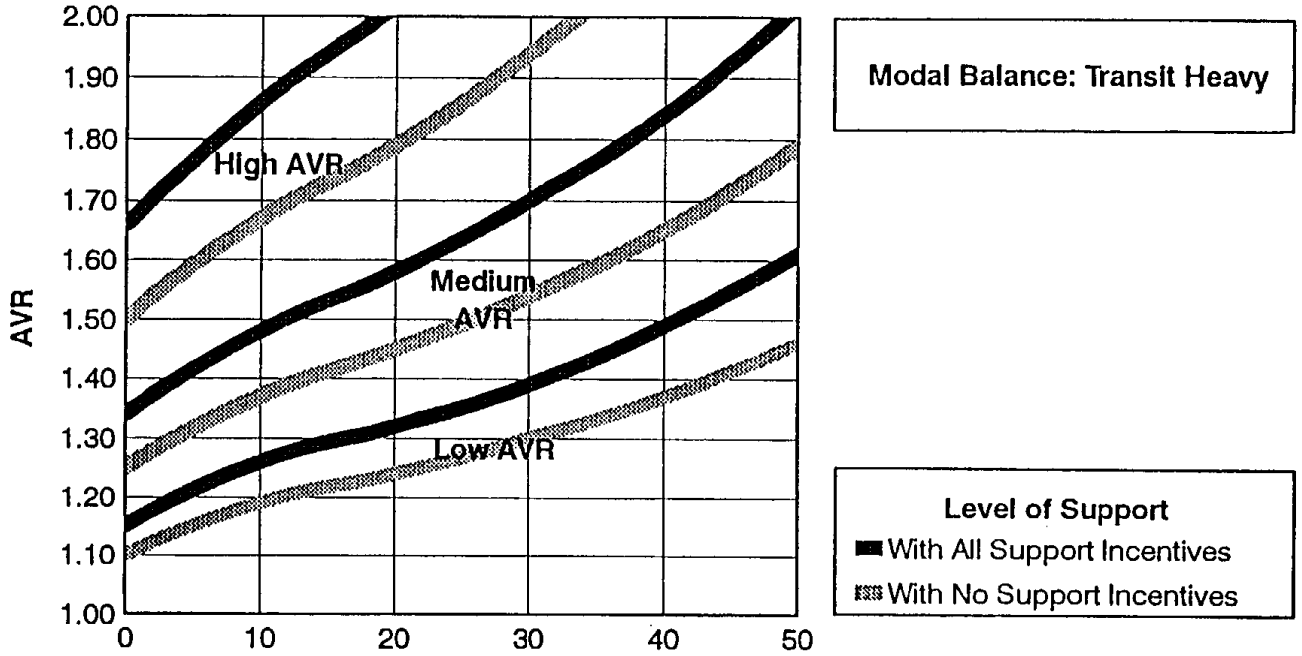
By Starting AVR, Modal Balance and Level of Support



	0	10	20	30	40	50
High AVR - All Support	1.67	1.80	1.87	1.93	1.97	2.01
High AVR - No Support	1.50	1.70	1.78	1.85	1.91	1.96
Medium AVR - All Support	1.40	1.54	1.64	1.73	1.81	1.89
Medium AVR - No Support	1.25	1.43	1.52	1.61	1.70	1.79
Low AVR - All Support	1.20	1.33	1.41	1.50	1.60	1.71
Low AVR - No Support	1.10	1.24	1.31	1.39	1.48	1.58

Sensitivity of AVR to Subsidy Increase for Alternative Modes

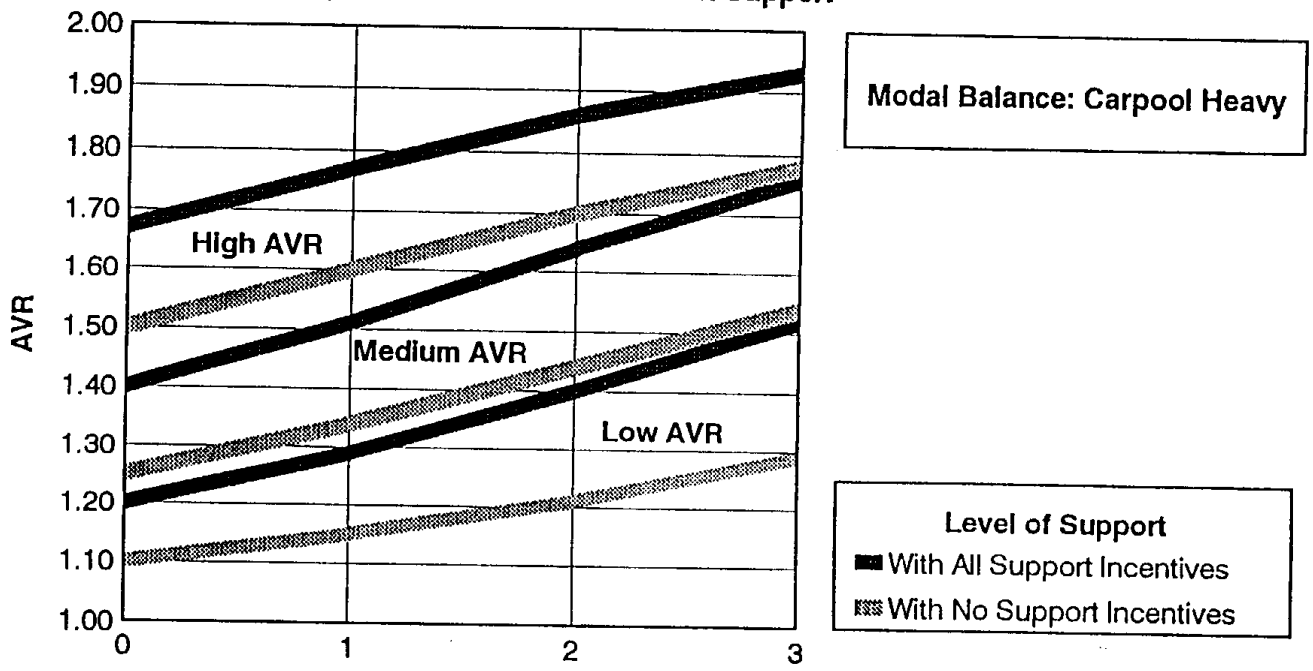
By Starting AVR, Modal Balance and Level of Support



	0	10	20	30	40	50
High AVR - All Support	1.66	1.86	2.02	2.21	2.43	
High AVR - No Support	1.50	1.67	1.79	1.94	2.12	2.33
Medium AVR - All Support	1.34	1.48	1.58	1.70	1.84	2.02
Medium AVR - No Support	1.25	1.37	1.45	1.54	1.65	1.79
Low AVR - All Support	1.15	1.26	1.32	1.39	1.49	1.61
Low AVR - No Support	1.10	1.19	1.24	1.30	1.37	1.46

Sensitivity of AVR to Increase in Parking Charge

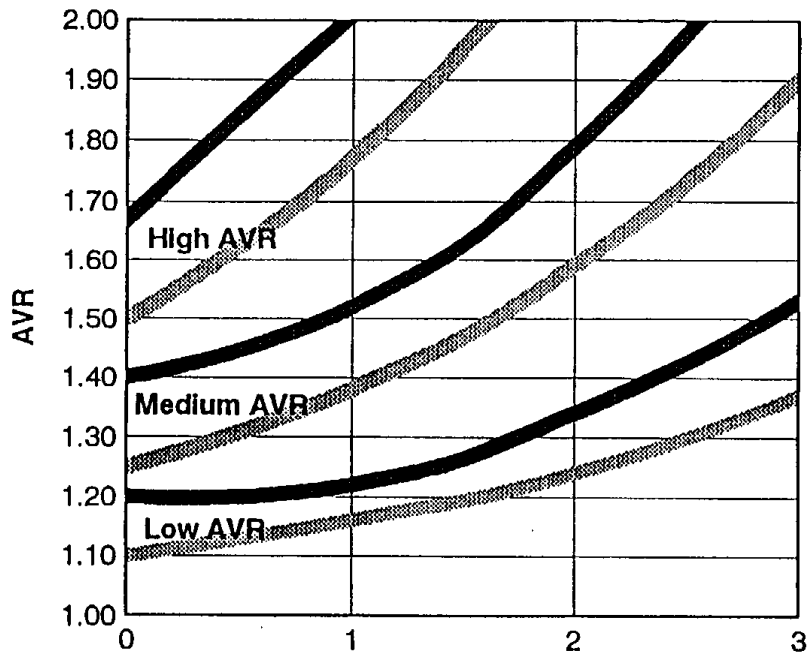
By Starting AVR, Modal Balance and Level of Support



	0	1	2	3
High AVR - All Support	1.67	1.77	1.86	1.93
High AVR - No Support	1.50	1.60	1.70	1.78
Medium AVR - All Support	1.40	1.51	1.64	1.76
Medium AVR - No Support	1.25	1.34	1.44	1.54
Low AVR - All Support	1.20	1.29	1.40	1.52
Low AVR - No Support	1.10	1.15	1.21	1.29

Sensitivity of AVR to Increase in Parking Charge

By Starting AVR, Modal Balance and Level of Support



Modal Balance: Transit Heavy

Level of Support

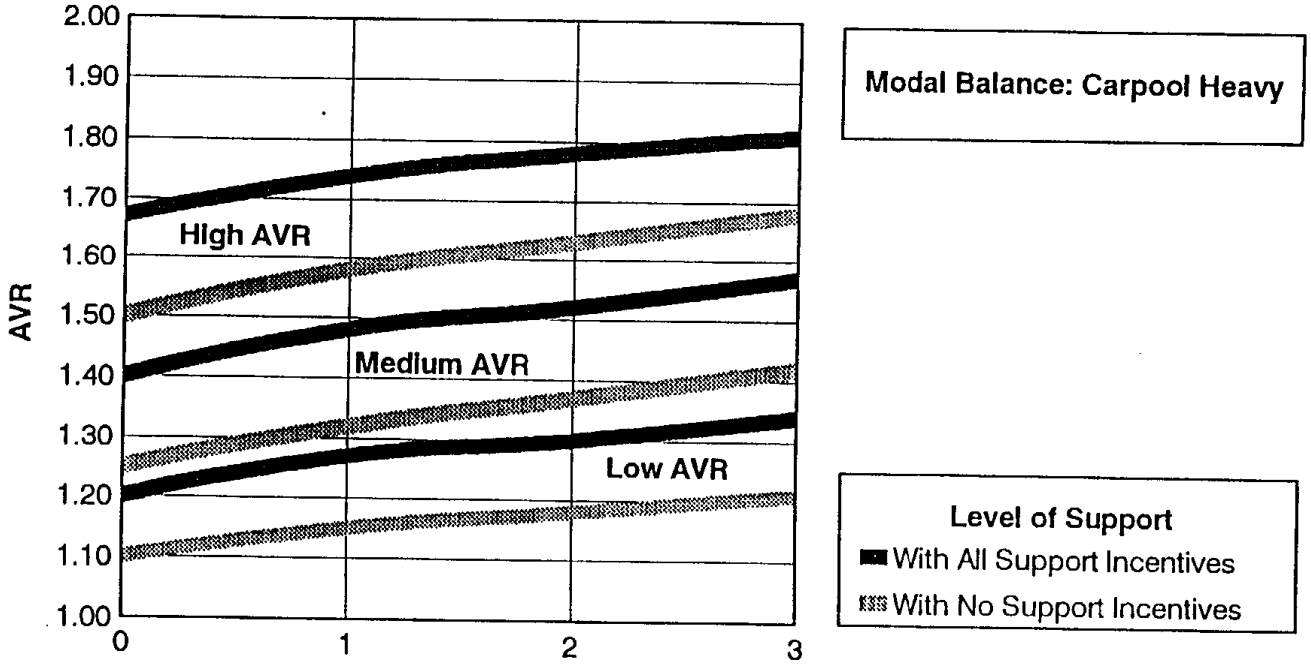
With All Support Incentives

With No Support Incentives

	0	1	2	3
High AVR - All Support	1.67	2.01		
High AVR - No Support	1.50	1.77	2.18	
Medium AVR - All Support	1.40	1.52	1.79	2.21
Medium AVR - No Support	1.25	1.38	1.59	1.90
Low AVR - All Support	1.20	1.22	1.34	1.53
Low AVR - No Support	1.10	1.16	1.24	1.37

Sensitivity of AVR to Increase in Parking Subsidy

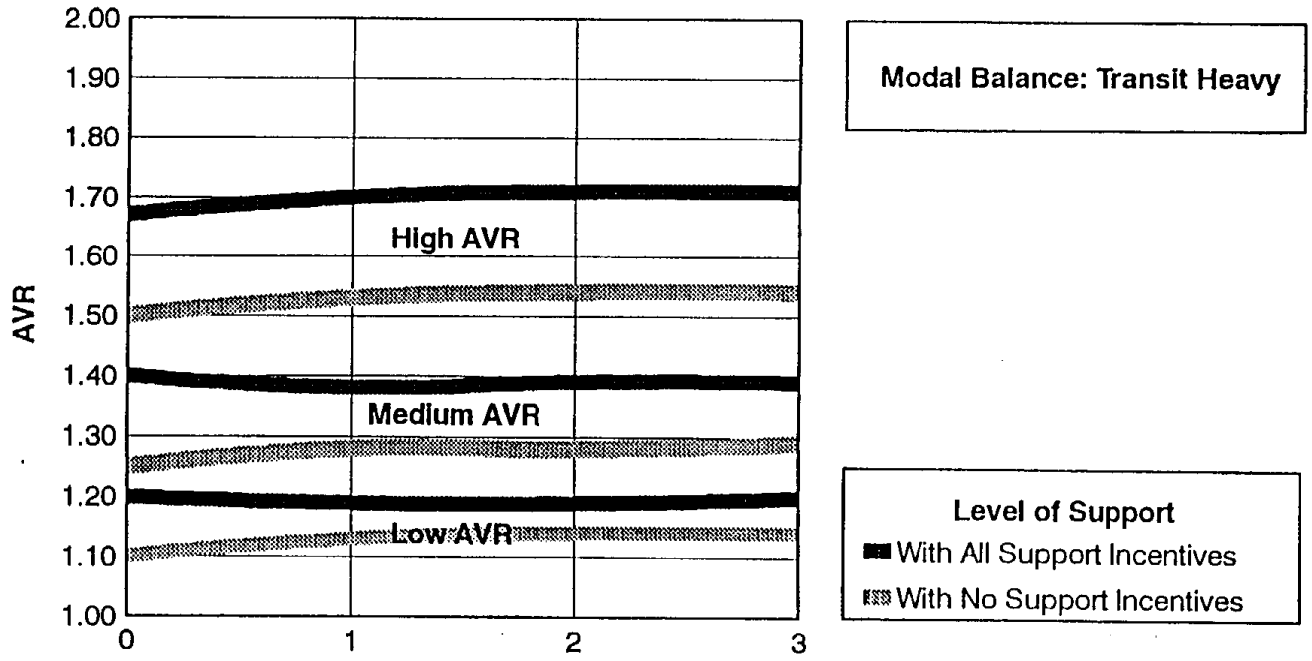
By Starting AVR, Modal Balance and Level of Support



	0	1	2	3
High AVR - All Support	1.67	1.74	1.78	1.81
High AVR - No Support	1.50	1.58	1.63	1.68
Medium AVR - All Support	1.40	1.48	1.52	1.57
Medium AVR - No Support	1.25	1.32	1.37	1.42
Low AVR - All Support	1.20	1.27	1.30	1.34
Low AVR - No Support	1.10	1.15	1.18	1.21

Sensitivity of AVR to Increase in Parking Subsidy

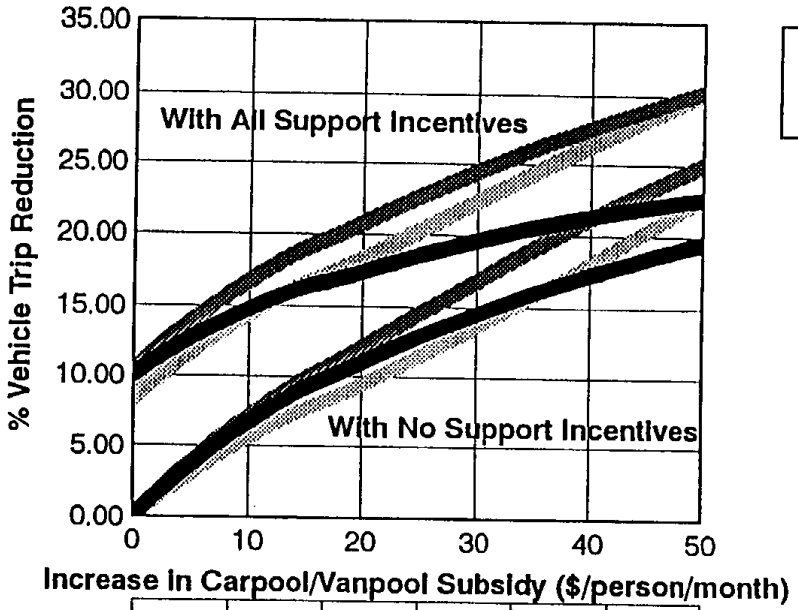
By Starting AVR, Modal Balance and Level of Support



	0	1	2	3
High AVR - All Support	1.67	1.70	1.71	1.71
High AVR - No Support	1.50	1.53	1.54	1.54
Medium AVR - All Support	1.40	1.38	1.39	1.39
Medium AVR - No Support	1.25	1.28	1.28	1.29
Low AVR - All Support	1.20	1.19	1.19	1.20
Low AVR - No Support	1.10	1.13	1.14	1.14

Percent Vehicle Trip Reduction due to Increase in Carpool/Vanpool Subsidy

By Starting AVR, Modal Balance and Level of Support



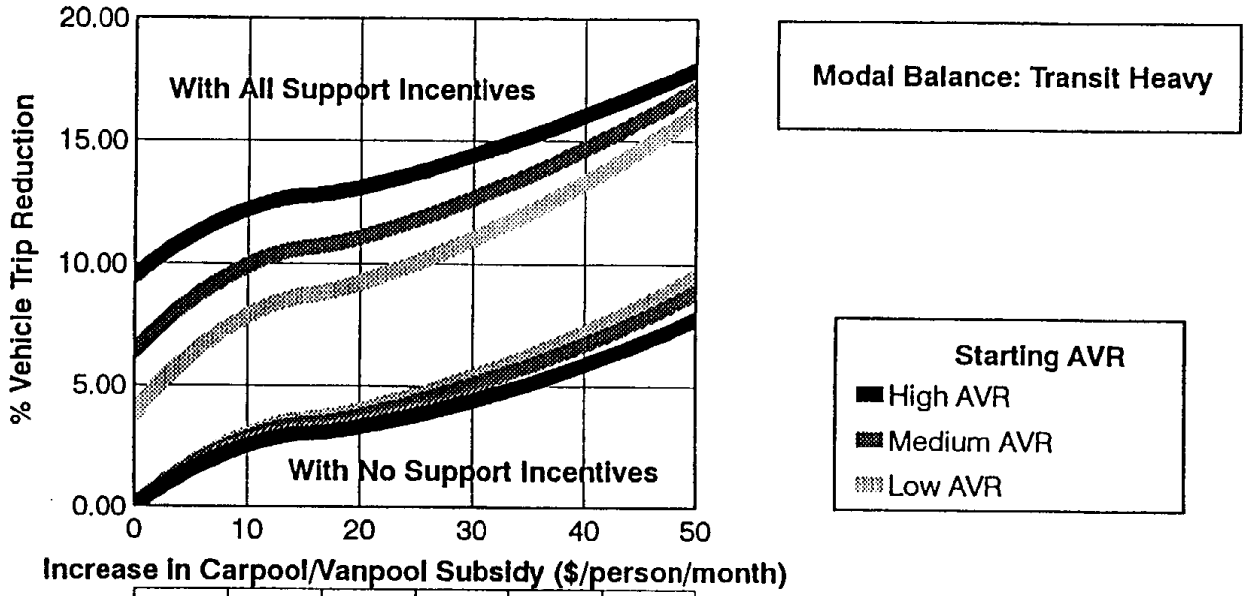
Modal Balance: Carpool Heavy

Starting AVR
- High AVR
- Medium AVR
- Low AVR

	0	10	20	30	40	50
High AVR - All Support	10.00	14.80	17.40	19.60	21.30	22.60
High AVR - No Support	0.00	6.70	11.00	14.50	17.30	19.50
Medium AVR - All Support	10.33	16.75	20.75	24.42	27.58	30.25
Medium AVR - No Support	0.00	7.08	12.08	16.83	21.17	25.00
Low AVR - All Support	8.30	14.46	18.28	22.32	26.36	30.18
Low AVR - No Support	0.00	5.58	9.40	13.58	18.06	22.69

Percent Vehicle Trip Reduction due to Increase in Carpool/Vanpool Subsidy

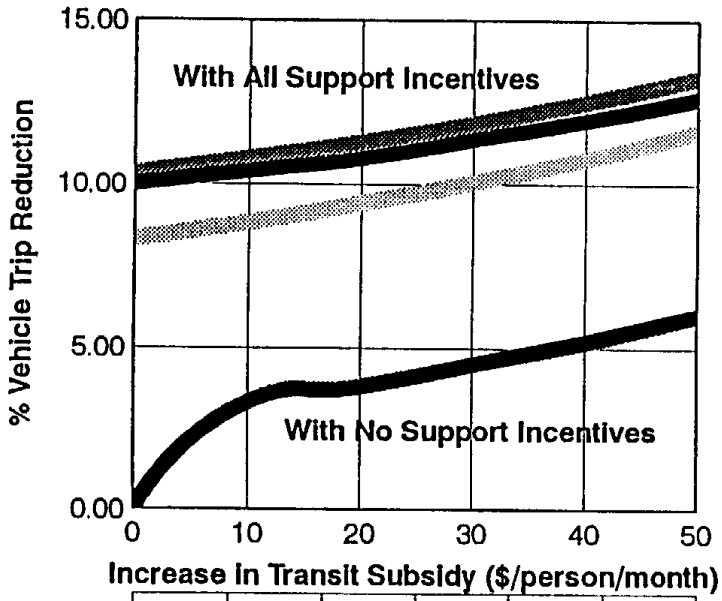
By Starting AVR, Modal Balance and Level of Support



	0	10	20	30	40	50
High AVR - All Support	9.50	12.20	13.10	14.40	16.00	17.90
High AVR - No Support	0.00	2.50	3.30	4.40	5.90	7.80
Medium AVR - All Support	6.42	9.92	11.08	12.67	14.67	17.08
Medium AVR - No Support	0.00	2.83	3.75	5.08	6.75	8.92
Low AVR - All Support	3.82	7.87	9.26	11.03	13.31	16.10
Low AVR - No Support	0.00	3.01	4.04	5.44	7.28	9.56

Percent Vehicle Trip Reduction due to Increase in Transit Subsidy

By Starting AVR, Modal Balance and Level of Support



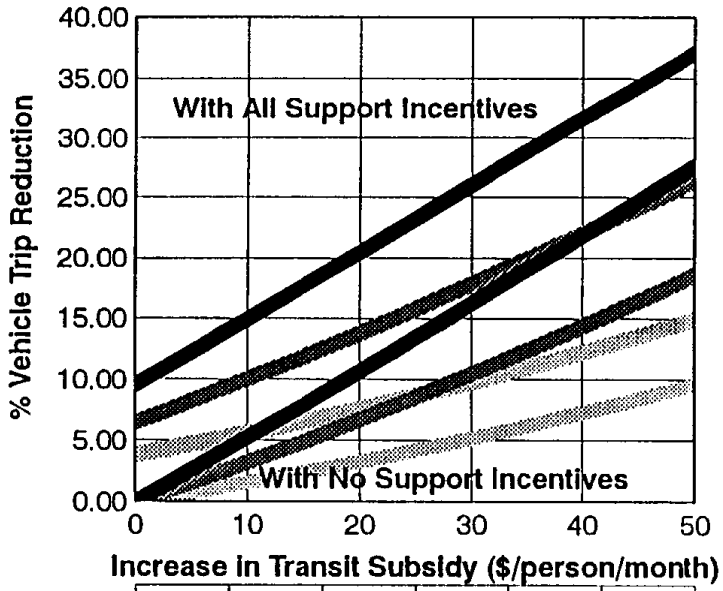
Modal Balance: Carpool Heavy

Starting AVR
- High AVR
- Medium AVR
- Low AVR

	0	10	20	30	40	50
High AVR - All Support	10.00	10.40	10.80	11.40	12.00	12.70
High AVR - No Support	0.00	3.30	3.80	4.50	5.20	6.00
Medium AVR - All Support	10.33	10.83	11.33	11.92	12.58	13.33
Medium AVR - No Support	0.00	3.33	3.83	4.50	5.17	6.00
Low AVR - All Support	8.30	8.81	9.40	10.06	10.79	11.67
Low AVR - No Support	0.00	3.30	3.82	4.48	5.14	5.95

Percent Vehicle Trip Reduction due to Increase in Transit Subsidy

By Starting AVR, Modal Balance and Level of Support



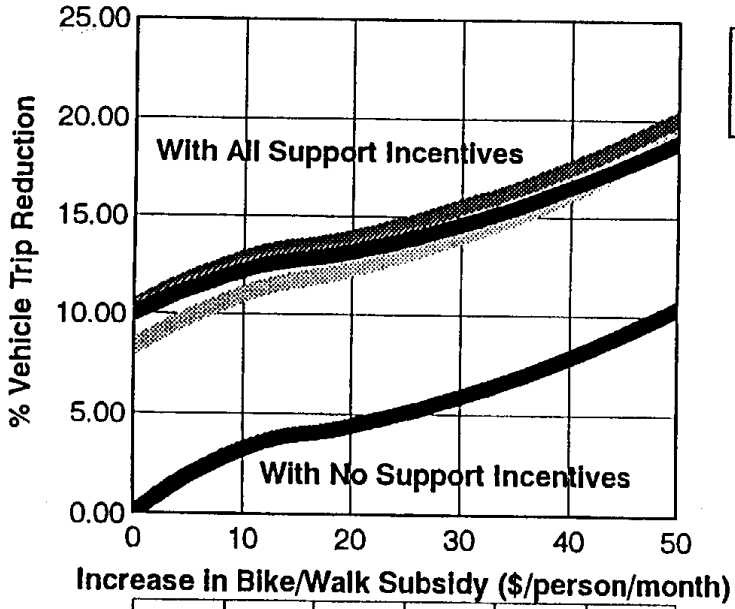
Modal Balance: Transit Heavy

Starting AVR
- High AVR
- Medium AVR
- Low AVR

	0	10	20	30	40	50
High AVR - All Support	9.50	14.90	20.40	26.00	31.60	37.10
High AVR - No Support	0.00	5.20	10.60	16.20	21.80	27.60
Medium AVR - All Support	6.42	10.00	13.75	17.83	22.00	26.42
Medium AVR - No Support	0.00	3.17	6.67	10.42	14.33	18.58
Low AVR - All Support	3.82	5.59	7.57	9.78	12.21	14.93
Low AVR - No Support	0.00	1.54	3.24	5.15	7.28	9.63

Percent Vehicle Trip Reduction due to Increase in Bike/Walk Subsidy

By Starting AVR, Modal Balance and Level of Support



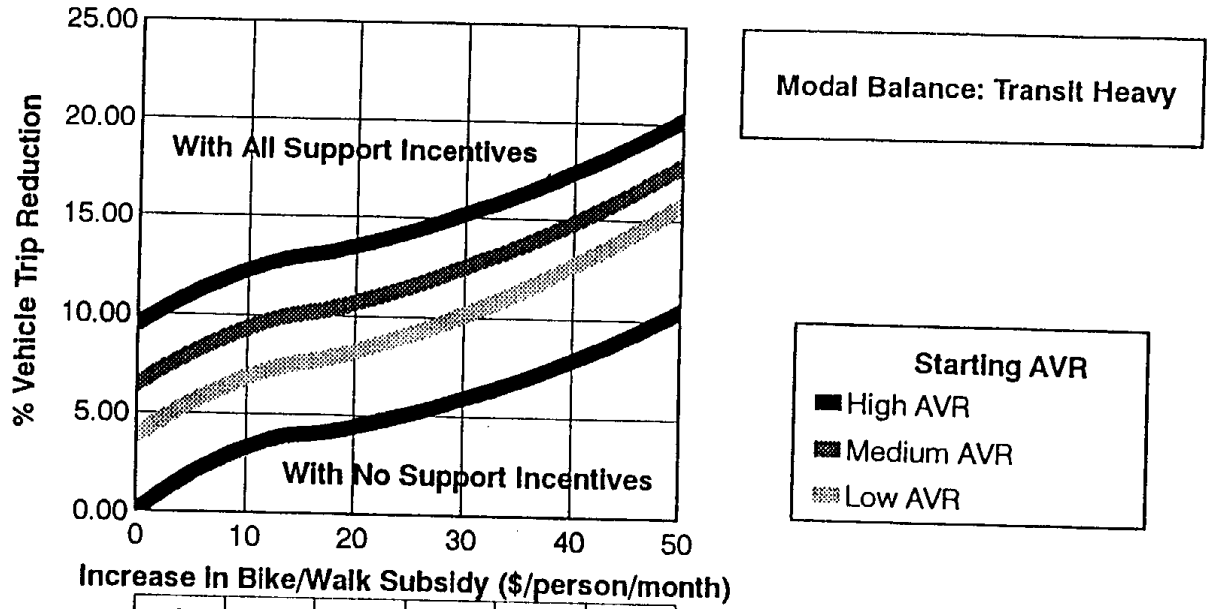
Modal Balance: Carpool Heavy

Starting AVR
- High AVR
- Medium AVR
- Low AVR

	0	10	20	30	40	50
High AVR - All Support	10.00	12.20	13.20	14.60	16.50	18.80
High AVR - No Support	0.00	3.20	4.40	5.90	7.90	10.40
Medium AVR - All Support	10.33	12.83	13.92	15.50	17.50	20.08
Medium AVR - No Support	0.00	3.25	4.42	5.92	7.92	10.42
Low AVR - All Support	8.30	11.01	12.33	14.02	16.23	19.09
Low AVR - No Support	0.00	3.23	4.33	5.87	7.86	10.43

Percent Vehicle Trip Reduction due to Increase in Bike/Walk Subsidy

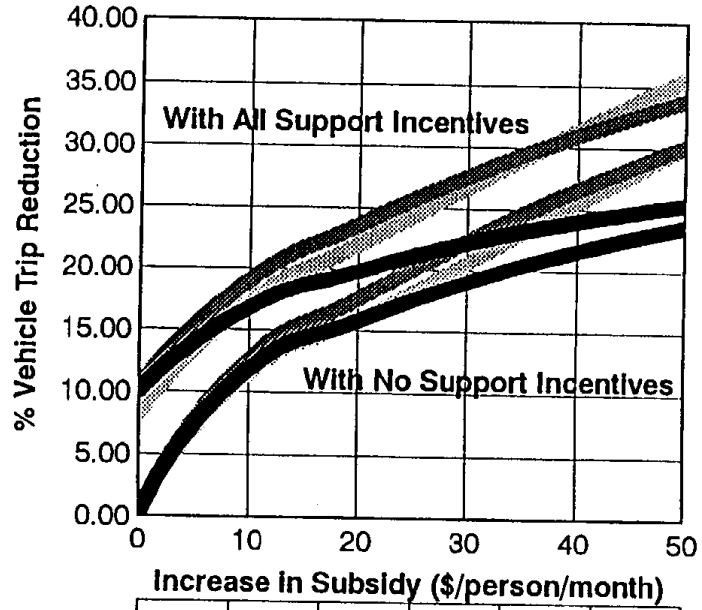
By Starting AVR, Modal Balance and Level of Support



	0	10	20	30	40	50
High AVR - All Support	9.50	12.20	13.50	15.20	17.40	20.20
High AVR - No Support	0.00	3.30	4.40	5.90	7.90	10.50
Medium AVR - All Support	6.42	9.33	10.67	12.50	14.83	17.83
Medium AVR - No Support	0.00	3.25	4.42	5.92	7.92	10.50
Low AVR - All Support	3.82	6.84	8.24	10.15	12.65	15.81
Low AVR - No Support	0.00	3.24	4.41	5.88	7.87	10.51

Percent Vehicle Trip Reduction due to Increase in Subsidy for Alternative Modes

By Starting AVR, Modal Balance and Level of Support



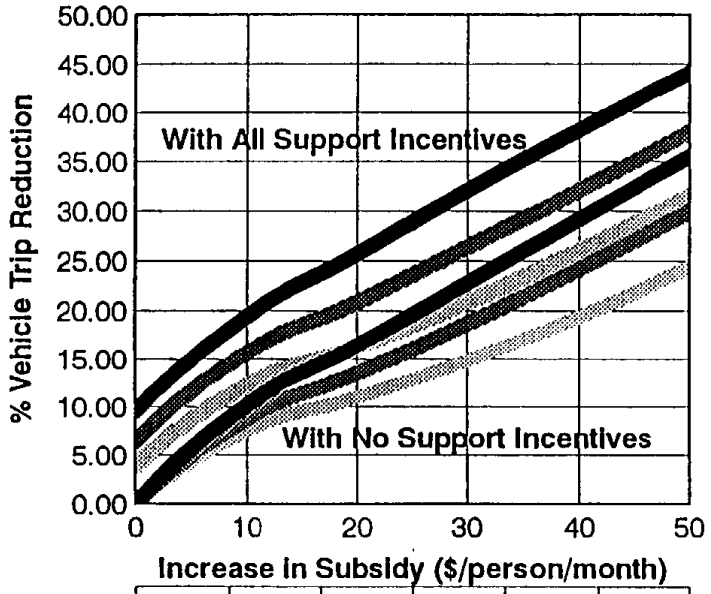
Modal Balance: Carpool Heavy

Starting AVR
- High AVR
- Medium AVR
- Low AVR

	0	10	20	30	40	50
High AVR - All Support	10.00	16.80	19.80	22.20	24.00	25.40
High AVR - No Support	0.00	11.80	15.80	19.00	21.60	23.60
Medium AVR - All Support	10.33	19.00	23.58	27.58	31.00	33.83
Medium AVR - No Support	0.00	12.58	17.58	22.33	26.58	30.17
Low AVR - All Support	8.30	17.18	21.95	26.73	31.35	35.61
Low AVR - No Support	0.00	11.45	15.86	20.56	25.40	30.10

Percent Vehicle Trip Reduction due to Increase in Subsidy for Alternative Modes

By Starting AVR, Modal Balance and Level of Support



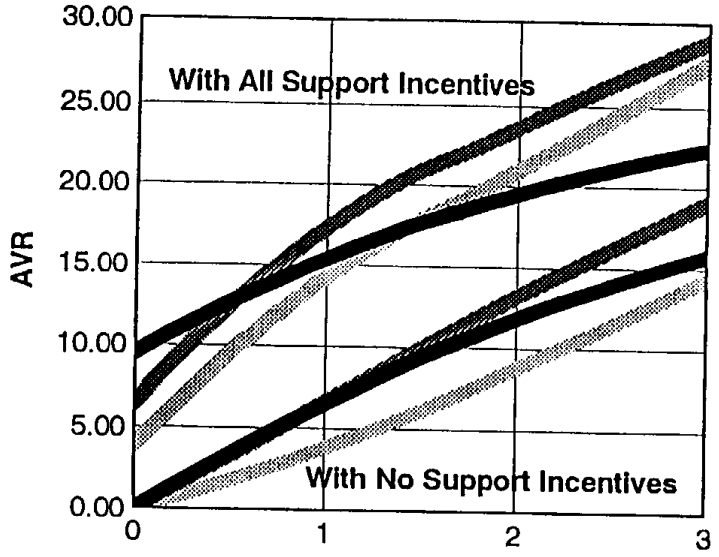
Modal Balance: Transit Heavy

Starting AVR
- High AVR
- Medium AVR
- Low AVR

	0	10	20	30	40	50
High AVR - All Support	9.50	19.40	25.70	32.10	38.20	44.10
High AVR - No Support	0.00	10.20	16.40	22.80	29.20	35.50
Medium AVR - All Support	6.42	15.67	20.83	26.42	32.08	38.00
Medium AVR - No Support	0.00	8.75	13.50	18.67	24.17	30.00
Low AVR - All Support	3.82	12.21	16.25	20.88	26.03	31.47
Low AVR - No Support	0.00	7.50	10.96	14.85	19.34	24.41

Percent Vehicle Trip Reduction due to Increase in Parking Charge

By Starting AVR, Modal Balance and Level of Support



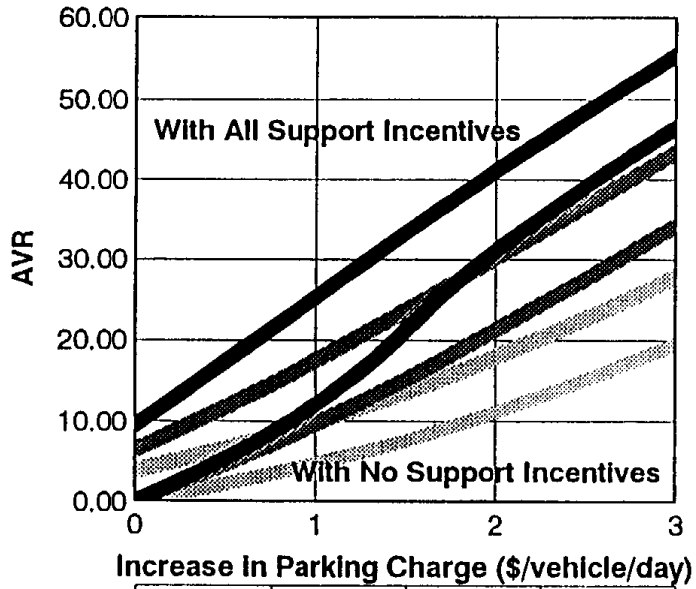
Modal Balance: Carpool Heavy

Starting AVR
- High AVR
- Medium AVR
- Low AVR

	0	1	2	3
High AVR - All Support	9.50	15.40	19.50	22.40
High AVR - No Support	0.00	6.50	11.80	15.80
Medium AVR - All Support	6.42	17.33	23.67	28.92
Medium AVR - No Support	0.00	6.58	13.17	19.08
Low AVR - All Support	3.82	14.26	20.96	27.65
Low AVR - No Support	0.00	3.82	8.75	14.34

Percent Vehicle Trip Reduction due to Increase in Parking Charge

By Starting AVR, Modal Balance and Level of Support



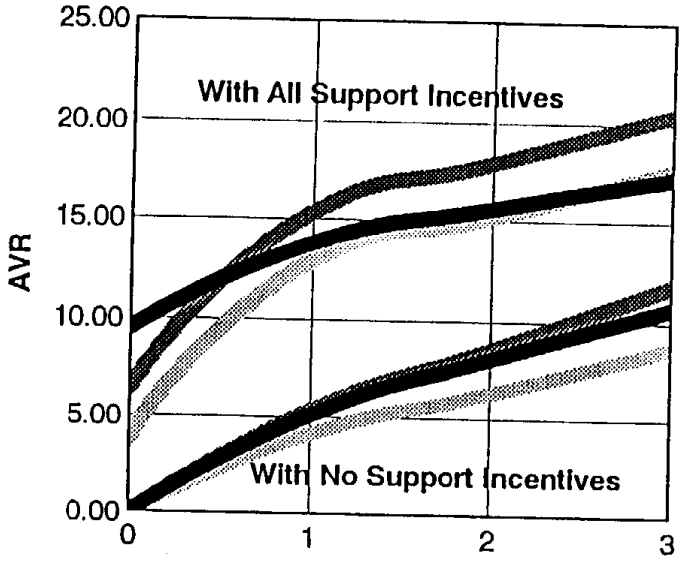
Modal Balance: Transit Heavy

Starting AVR
- High AVR
- Medium AVR
- Low AVR

	0	1	2	3
High AVR - All Support	9.50	25.30	41.10	55.50
High AVR - No Support	0.00	12.10	31.10	46.50
Medium AVR - All Support	6.42	17.50	30.17	43.42
Medium AVR - No Support	0.00	9.67	21.25	34.25
Low AVR - All Support	3.82	9.93	17.94	27.79
Low AVR - No Support	0.00	4.71	11.18	19.56

Percent Vehicle Trip Reduction due to Increase in Parking Subsidy

By Starting AVR, Modal Balance and Level of Support



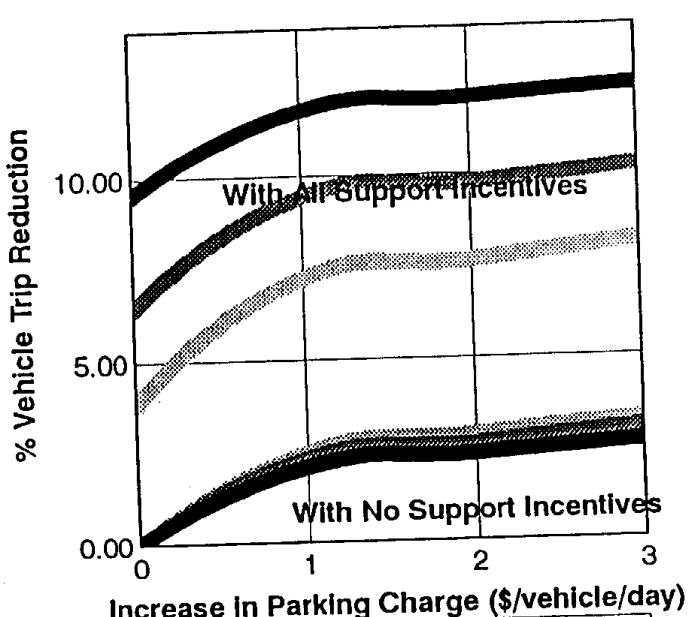
Modal Balance: Carpool Heavy

Starting AVR
- High AVR
- Medium AVR
- Low AVR

	0	1	2	3
High AVR - All Support	9.50	13.80	15.60	17.20
High AVR - No Support	0.00	5.10	8.10	10.70
Medium AVR - All Support	6.42	15.33	17.92	20.50
Medium AVR - No Support	0.00	5.33	8.58	11.83
Low AVR - All Support	3.82	12.94	15.22	17.57
Low AVR - No Support	0.00	4.12	6.32	8.75

Percent Vehicle Trip Reduction due to Increase in Parking Subsidy

By Starting AVR, Modal Balance and Level of Support



Modal Balance: Transit Heavy

Starting AVR
- High AVR
- Medium AVR
- Low AVR

	0	1	2	3
High AVR - All Support	9.50	11.80	12.10	12.40
High AVR - No Support	0.00	2.10	2.40	2.70
Medium AVR - All Support	6.42	9.42	9.75	10.17
Medium AVR - No Support	0.00	2.33	2.67	3.08
Low AVR - All Support	3.82	7.21	7.65	8.16
Low AVR - No Support	0.00	2.50	2.94	3.31