Title

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Abstract

Advanced Traveler Information Systems (ATIS) offer benefits to travelers and may improve system performance in congested areas. An understanding of travelers' decisions may help in evaluating benefits and designing demand management strategies. The objective of this study is to understand how people deal with congestion and how might they respond to a multimodal ATIS. Travelers' route, departure time and mode selection decisions in response to incident and recurring congestion were investigated through a survey of Bay Area automobile commuters. This document summarizes the survey methodology, assesses representativeness of the sample and discusses the initial insights obtained from uni-variate and bi-variate analysis.

The survey allows exploration of the effects of various factors, such as source of congestion information (radio traffic reports versus observation), traveler and trip characteristics, route attributes and environmental conditions on traveler behavior. Further, by using stated preferences (hypothetical scenarios), we explore individuals' response to future ATIS technologies and their benefits. A unique feature of the survey is that it intertwines stated and reported preferences and by so doing, it enables us to judge the validity of the stated preference responses.

The initial results show that the currently available real-time traffic information broadcast through the electronic media provides a basis for making travel decisions. Further, individuals expressed a strong interest in the idea of an ***advanced*** traveler information system and changing their travel patterns in response to money incentives. There remains a need for accurate and clear information on delays and congestion. Some other interesting findings are:

- Analysis of ATIS user benefits indicates that by providing prescriptive information (advice on switching to public transit and taking alternate routes) in incident conditions, significant time savings can be achieved. These benefits accrue to a small but significant portion of individuals who are willing to change their travel decisions.
- People who change their travel decisions (on the following day) in response to joint occurrence of recurring and incident congestion do so more on the basis of recurring delay, whereas incident delay acts as a trigger.
- About **8%** of the respondents report that their usual commute route is longer than their alternate route. This suggests that they use criteria other than travel time for route selection.

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INTRODUCTION

Advanced Traveler Information Systems (ATIS) offer benefits in terms of improving the travel experience of individuals and enhancing system performance. They may be particularly useful in the context of incident-induced congestion and recurring congestion; however, the true potential of these systems has yet to be evaluated. This study develops a framework for assessing the impacts of ATIS technologies in both incident and recurring congestion conditions.

ATIS technologies will provide information which is likely to influence individuals' travel choices and consequently the network conditions. We need to understand the nature and extent of this influence. Thus, the key research issue is: how will ATIS impact individuals' travel choices and system performance?

This portion of the project is a survey about commuting behavior. Undertaken in the San Francisco Bay Area in the beginning of **1993,** the survey is part of a more comprehensive study intended to:

- Evaluate traveler behavior impacts of ATIS technology.
- Assess the impact of different information dissemination strategies on traveler behavior.
- Develop a taxonomy of ATIS dissemination technology.
- Assess system impacts of ATIS technologies at highway bottlenecks.
- Determine what travel condition information may be provided in ATIS field operational tests.

METHODOLOGY

The survey was the tool designed to examine traveler behavior. First we developed hypotheses regarding factors which influence behavior. Then we designed the questionnaire to test hypotheses.

The criteria for identifying the corridor and target population were as follows:

- *Automobile availability.* The availability of an automobile to survey respondents was important because multimodal real-time information in the Bay Area will encourage automobile users to switch to transit.
- *Transit accessibility.* Having an accessible transit system in the corridor was desirable for studying real mode choice alternatives.
- *Alternative route availability.* ATIS is expected to have a relatively strong impact on route diversion in incident conditions. Therefore, it was important to choose a corridor where several alternative routes were available.
- *Real-time traffic information availability.* The availability of real-time information was important because of the need to understand its impacts on behavior and explore potential for ATIS. This criterion was likely to be satisfied by selecting individuals who travel on freeways (where real-time information is often available).
- *Presence of congestion.* Traffic congestion is often worse during the peak period. Specifically, in addition to recurring congestion at bottlenecks, incident-induced congestion occurs frequently during the peak. It was desirable to intercept individuals who experience such congestion on a regular basis.

The Golden Gate Bridge was selected for survey distribution due to practical reasons and because it satisfied most of the above criteria. Although route options in the corridor are rather limited, this was accepted given time, resource and institutional constraints.

The questionnaires were first tested with residents of three Berkeley neighborhoods and consequently improved. The mail-back questionnaires were then distributed to peak period automobile commuters crossing the Golden Gate Bridge, in both the morning and the afternoon rush hours (6:00 AM to 10:00 AM and 4 PM to 6 PM) on February 16 and 17, **1993.** People were asked to respond only if they used a vehicle regularly (at least once a week) for work trips in the

Bay Area.

Money incentives (a drawing of 25 Golden Gate Bridge toll ticket books--each book good for 20 toll crossings, valued at $60.00), conditional on completion of the survey, were successful in achieving a good response rate: more than a third of the 9000 copies distributed were returned. A total of 3238 surveys were coded and error checked.

Our 62 questions fall into 5 categories:

1. *Normal travel patterns.* Normal patterns include day-to-day behaviors such as work schedule, route choice, and response to recurring congestion.
2. *Pre-trip response to unexpected congestion information.* When travelers know before entering their vehicle that road conditions are abnormal, they may choose to change certain decisions such as departure time and route choice.
3. ***En** route response to unexpected congestion information.* When travelers learn of abnormal road conditions while driving, they may change certain decisions to a limited extent.
4. *Willingness to change driving patterns.* Given some incentive, travelers are sometimes willing to leave early, take an alternate route, or participate in an experiment.
5. *Personal information.* Travelers' ages, occupations, and gender may influence certain behaviors.

In the interest of keeping the questionnaire short, not all questionnaires contained every question. We created two questionnaire forms: *Form 1* includes all questions from categories 1, 2, 4, and **5**, while *Form* **2** includes all questions from categories 1, 3, 4, and 5. Approximately 4500 copies of each form were distributed (see Appendix). In the following section, categories 1, 4, and 5 are discussed jointly, and categories 2 and **3** separately.

OVERVIEW OF THE SAMPLE

Respondents' primary transportation mode pattern

Table 1 shows the relative frequencies of respondents' primary transportation modes to work. More than 90% responded about their primary travel mode: the average respondent drives alone to work more than three times a week, and more than half of all travelers drive alone to work a full five times a week. Nearly *65%* do not use a carpool to work at all, and around 10%use carpool to work 5 days a week; in this sample, only 1.3% use public transit to work 5 days a week, and about 73% do not use public transit at all (which is not surprising, given that only automobile commuters received the surveys).

More than half of the respondents make two to five additional business-related trips per week.

The mean for driving alone to work in a week is 3.5, for carpooling is 1, and for using public transit is 0.5. The variability in driving alone is greater than carpool or transit. A majority drive alone, and there are some carpools and transit users as expected.

Non-work travel activities in a normal week

Table 2 gives a summary of the regular non-work travel activities. Activities such as shopping, running personal errands, and going out for pleasure occur only about once a week. Only around 18%need to drop off or pick up children 2 to ***5*** times a week, and more than 72% do not have to do it at all. Figure 1 shows the averages for regular travel activities in a week.

Departure and arrival time for the work trip

Table 3 is the departure and arrival time summary for the work trip. More than 90% of the travelers described their actual work schedules, which on average are what one would expect: they leave home between 7: 15 AM and 7:30 A M , arrive at work between 8:00 AM and 8:30 A M , and

leave work at 5:00 pm. In the hypothetical case of no traffic congestion, respondents would leave between 7:30 AM and 7:45 AM to arrive at work on time.

About 55% of the respondents have a fixed work time. Among them, nearly 90% begin their work between 7:00 AM and 9:30 AM. Among those who have flexible working hours (41%), about 81% begin their work between 7:00 AM and 9:30 AM. As expected, most people begin their work in the morning. And there is not much difference between work start time patterns of people who have fixed or flexible work schedules. A small portion (5%) of respondents' work shift changes from time to time.

Only 25% of the travelers reported having arrived early to work because of traffic congestion, this occurring 2 or 3 times in the previous month. 75% however, reported having arrived more than 10 minutes late to work because of traffic, this occurring once a week on average.

In this sample, nearly 80% do not work at home at all, and only 1.4% work at home more than 3 times a week.

Usual and alternate route characteristics

The route characteristics are shown in Table 4. Respondents' usual routes almost always include some freeway (97%), and have a travel time of about 45 minutes from home to work, and 49 minutes from work to home. The usual route to and from work takes between 20 and 50 minutes for nearly 60% of the respondents. Travel times tend toward the higher end of this interval for work to home trips. As expected, travel time on the usual route is longer from work to home than it is from home to work.

The usual route is generally somewhat congested at the traveler's normal commute time and less so a half-hour earlier. Most travelers estimated that travel time would decrease by about ten minutes if they were to depart a half-hour earlier.

From home to work, the mean and median of the travel time of the public transit is 74.8

and 70 minutes, respectively. As expected, this is significantly longer than the average travel time by car.

Fifty -three percent of the travelers reported that they had at least one alternate route in addition to their usual route. Among them, about 63% have a best alternate route which includes a highway. Around 58% think their best alternate route is usually either congested or heavily congested. In the past month, only 11% took alternate routes more than 5 times due to traffic congestion.

About 56% generally choose their route before getting into the car, and 44% choose their route while on the road.

From home to work, travel times on best alternate routes have a mean, median, and mode of 53.9, 50, and 45 minutes, respectively. **As** expected, travel times on best alternate routes are longer than those on usual routes, and shorter than those on public transit.

More than 20% of the travelers make stops on their way to work, as opposed to over half on the way home. In both cases, the number of stops is usually one. As expected, less people make stops on home to work trips (average is 0.3) than on work to home trips (average is 0.7).

Travelers receive information about traffic conditions on their usual route from several sources: 94% from radio traffic reports, 40.8% from observation (before it is too late to divert), 18.5% from television, and 12% from electronic message signs. Few people receive information from other sources such as printed matter, home/office phone, carphone, or conversations with other people (1***%-5%).***

Congestion at road bottlenecks

Table 5 shows the regularly occurring congestion at bottlenecks on the usual home to work trip. About 12% do not have a road bottleneck; more than 55% have bottlenecks at entrances to bridges, about **38%** at road narrowing, 13% at interchanges, 20% at on-ramps, 10% at off-ramps, and 11% at construction or roadwork sites. More than one half have more than one type of

bottleneck. Most people said that the bottlenecks which cause the longest delay from home to work are on highways.

Around 69% think the bottleneck usually adds 10 minutes or less to their work trip. The average delay at bottleneck is about 11 minutes. More than 50% *think* the bottleneck would take less time if they were to leave 30 minutes early, whereas 36% think the bottleneck would not be any different.

The average longest delay at bottleneck within the last 6 months is about 27 minutes, much longer than the usual average delay time. Figure 2 shows the usual and longest delays at the worst bottleneck. Due to the longest delay, around 78% did not change normal travel plans on the next day, 13% departed early, ***3.2%*** departed late, 1.9% took public transit, and 5.9% took alternate routes. Figure **3** shows these changes by the usual bottleneck delay. Among people who departed early or late, the average time changes were 33 and 19 minutes, respectively.

Pre-trip response to unexpected congestion information (form 1)

Of those who at least once had become aware of unexpected congestion *before* getting into their vehicles, more became aware at work than at home (Table 6). Travelers learned of congestion by observing it directly before entering their vehicles, or by radio and television reports. These travelers initially expected congestion to add about a half hour to their trips, and later found their experience to be somewhat shorter. Surprisingly, in spite of having advance information, 45% of the travelers did not change their travel plans. Those who did change their plans generally departed either earlier or later than usual (37%) and/or took an alternate route (20%); only 1% used public transportation. When faced with the hypothetical situation of having an ATIS device give them information, respondents were somewhat willing to use this information. Across various ATIS messages, 10-25% would leave earlier than usual, 10-20% would leave later, and 10% would take an alternate route (25% if the ATIS device specifically suggested to do so). Almost none (2%) were willing to take public transportation (18% if the device specifically suggested to do so).

En route response to unexpected congestion information (form 2)

Of the respondents who at least once became aware of unexpected congestion ***after*** beginning their trip, about half were on their way from home to work and half from work to home (Table 7). Half learned about the congestion by observation alone, while only one tenth from radio reports alone. Four tenths learned about the congestion from both sources. While travelers initially expected this congestion to add 20 minutes to their trip, in many cases this delay was actually as long as an hour. 20% had an opportunity to take an alternate route after learning of the congestion, and most of these took it. Half of those who took an alternate route eventually returned to their original route before completing the trip. Further, 3.5% could have taken public transit and only 0.5% did so. When faced with the hypothetical situation of having an ATIS device give them information, respondents were inclined not to change routes unless the device specifically advised this or gave specific information about delay times on the usual route.

Advanced traveler information experiment

Table 8 gives the summary of the advanced traveler information experiment. Individuals assessed the attributes of a hypothetical in-vehicle ATIS technology. Travelers were told that "We are planning to conduct a six-month experiment to test **a** computerized 'in-vehicle' information system. Each participant will receive a system (computer, video display, and antenna all mounted in the vehicle) that will provide travel information and electronic 'yellow pages' free of charge. This information may help you avoid congestion, reduce travel times, reduce stress, and increase your knowledge of travel and destination options."

The responses indicate that many people are interested in the advanced traveler information device. Around **63%** think it is useful if they can be informed about road construction and accidents by the device, and 78% prefer the device be insured against theft of the equipment and any related damage caused to the car. Figure **4** shows people's interest in the services by the

device, where 1 represents "does not influence my willingness (to participate)" and 5 represents "greatly increases my willingness (to participate)."

"Insured against theft of the equipment and any related damage caused to the car" is the highest incentive with the least deviation. People seem concerned about financial implications of in-vehicle ATIS devices.

Monetary incentives were offered to ATIS equipped travelers for following system optimal advice, particularly when the advice conflicts with their usual route and departure time selection. The potential participants for the ATIS experiment were told that "...we plan to offer money to participants who are willing to perform either of two optional tasks. Please indicate on a scale of 1 up to 4 how willing you would be to complete each task in exchange for the stated sums of money." Respondents showed a willingness to change route and departure time once a week. When offered $25, *$50*, $75, and $100 a month, about 20%, 29%, 42%, and 76%, respectively, would definitely leave 30 minutes earlier than normal once a week (Figure 5). People who have less congestion if they leave one-half hour earlier indicated a greater willingness to leave earlier. Similarly, about 27%, 34%, 46%, and *70%* would definitely take their best alternate route once a week if paid $25, **$50,** $75 and $100 a month, respectively. And people who have more alternate routes showed a slightly higher willingness to do so.

Overall, a significant portion of the travelers responded positively to ATIS technology attributes, and expressed a willingness to change routes and departure times when offered monetary incentives.

Socioeconomic Characteristics

Table 9 gives the respondents' personal and household information. Two thirds of the respondents are male. The average age is 40 years, and more than two thirds have received a bachelors, masters or doctoral degree. Occupations are primarily technical, professional, and managerial. Salaries range from below $20,000 to above $100,000, with more than 40% of the

respondents earning more than $80,000. The sample represents a well-educated, middle-aged, upper-middle-class section.

Table 10 is a summary of the respondents' home and job location. 76%, 12%, and 9% of the respondents live in Marin, Sonoma, and San Francisco counties, respectively, and 79%, 12%, and 5% work in San Francisco, Marin and San Mateo, respectively. As expected, a large portion of the respondents (about 59.2%) live in Marin county and work in San Francisco.

Eighty percent of respondents have lived in their current homes and have worked at their current jobs for less than 10 years. Households on average have two inhabitants, two motorized vehicles, and less than two persons employed.

Table 11 shows the respondents' characteristics related to travel. About 57% of the respondents like to discover new routes to get to someplace. Nearly 64% are willing to take unfamiliar routes to avoid traffic delays. Most people (76%) frequently listen to radio traffic reports.

COMPARISON OF TRAVEL MODES WITH 1990 CENSUS DATA

The sample was obtained by distributing questionnaires during the AM and PM peak period on the Golden Gate Bridge in the auto lanes (opposite to the transit lane). About 59.2% live in Marin county and work in San Francisco. Furthermore, the following origin-destination patterns have significant numbers: San Francisco-Marin (5.4%), Marin-San Mateo (3.5%), Sonoma-San Francisco (8.2%), and Sonoma-San Mateo (0.8%).

The 1990 Census Transportation Planning Package (CTPP) contains the county-to-county commute patterns by mode of transportation. The census data includes all travel modes, but we choose to compare only drive alone and carpool to assess the representativeness of this sample. Table 12-1, 12-2, and 12-3 show a comparison of the county-to-county travel mode distribution. The difference between this sample of automobile commuters and the census data is rather small except for San Francisco-Marin.

Table 13 shows the comparison of county-to-county average travel time of census data and this study. The differences between census and this sample for San Francisco-Marin and Marin-San Francisco are small, but for Sonoma-San Francisco, and Sonoma-San Mateo, they exceed 10%. This might arise from the fewer number of valid cases. Further observe, of course, that the travel times in the sample increase with increasing travel distance between counties.

The average travel time on the home to work trip is 44.4 minutes and return trip is 48.6 minutes. Although on the high side compared with the national average (19 minutes), it is consistent with Khattak (1991).

Overall, the sample compares reasonably well and is consistent with our expectations in terms of modes the travel times.

COMPARISON OF PERSONAL AND HOUSEHOLD CHARACTERISTICS WITH THE 1990 BAY AREA TRAVEL SURVEYS (BATS)

The 1990 Bay Area Travel Survey (BATS) was conducted by the Metropolitan Transportation Commission (MTC). The purpose of the survey was to collect demographic and travel behavior information from a representative set of households within the nine-county San Francisco Bay Area (these include Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara and Sonoma). BATS (1990) is a telephone survey of 12,500 randomly selected households. Therefore, it will contain a higher number of transit commuters and non-commuters.

In this study, most respondents live in Marin, San Francisco, and Sonoma counties. We compare the available data for number of motorized vehicles per household, number of persons per household, number of years at present home and work address, and occupations of respondents for these counties.

Table 14 shows the percentages of average number of motorized vehicles per household in BATS (1990) and this study. It is not surprising that this sample tends toward higher auto

ownership rates than BATS (1990) because of the way the questionnaire was distributed (only to drivers). Most respondents in this sample drive alone or carpool, while there is a relatively larger portion of public transit users in the BATS (1990) sample. Most respondents have at least one vehicle at their household in this study.

Table 15 presents the percentages of average number of persons per household. This sample has slightly larger household size than BATS (1990). All differences are within 15%, however. It seems that the main difference is in one-person households.

Table 16 and 17 present the percentages of average number of years at present home and work. Most differences are within 10%. Table 18 shows the distribution of occupations. The percentages of executives/managerial are larger in this study than in BATS (1990). Clearly, executive/managerial are over-represented in this sample.

There are more males (64.9%) compared with females in this sample. In a large number of similar surveys, the number of males is often higher (Haselkorn et al. 1989; Khattak 1991; Shirazi et al. 1988). We also conducted consistency checks regarding gender. It was expected that females are more likely to be younger, be clerical workers, and have lower income; further they would own fewer vehicles and would have smaller family size. These expectations were confirmed by statistical analysis. Overall, the sample represents an upper-middle-class, well-educated, middle aged segment with stable commute patterns. The sample did not show major discrepancies, and the relationships between variables were reasonable and consistent with our expectations. The socioeconomic and travel characteristics of this sample compare reasonably well with the Census data and the BATS (1990) study.

The sample may not be free from certain biases. For example, it is possible that travelers who feel strongly about traffic related issues were more likely to respond. Some biases are unavoidable due to the nature of survey research (and are accepted), however, others can be identified and sometimes corrected. We have checked for some identifiable biases and they are not apparent to us at this time. We will continue to look for biases during in-depth analysis of data.

SUMMARY AND FUTURE RESEARCH

The survey methodology was successful in achieving a high response rate (%). Moreover, the sample seems representative of Bay-Area automobile commuters and no obvious biases were found. The results suggest that automobile commuters' usual route is somewhat congested at the travelers normal commute time. Although they use the current travel information system for making trip decisions, including shifts to public transit, they seem interested in the idea of an ***advanced*** traveler information system. Further, a significant number of respondents expressed interest in taking longer alternate routes and changing departure times in response to monetary compensation. These data will help us develop information dissemination strategies for the TravInfo project.

We are analyzing the data in detail. Multivariate analysis techniques such as discrete choice and discriminant analysis are being used. Such techniques allow for interdependencies among explanatory variables. While conducting these analyses, some interesting results were found. For example, only about **2%** of the respondents took public transit in response to unexpected congestion information received at the pre-trip stage. However, 18% state that they would take transit if an advanced traveler information system suggested that they do so. We examined characteristics of these individuals and the results show that they tend to have fewer household constraints (e.g., taking children to school) and shorter transit travel time. Further, adverse weather seems to increase their chances of taking transit. More analysis will show the extent of benefits from mode shift.

About **8%** of those who have alternate routes report that their usual routes are longer than their alternates. This provides empirical evidence to support the hypothesis that route selection is not always based on travel time, but also on trip chaining requirements and route attributes such as scenery or variability of travel time. Further analysis showed that persons with shorter alternate routes do make statistically significant (5% level) larger numbers of stops than the rest of the

sample. We are exploring how various factors affect route selection.

Another finding relates to the combined effect of recurring and incident bottleneck congestion. People were more likely to change their mode, route and departure time choice due to *recurring* bottleneck delay, whereas *incidents* at bottlenecks act as triggers for change.

We are developing methods to assess benefits of ATIS (Khattak, Kanafani and Le Colletter 1993; Khattak and Le Colletter 1993). Further, models of traveler behavior are being combined with simulation of network performance (Khattak 1993; Khattak, Thananjeyan and Al-Deek 1993). The results will help design the public information databases and systems for communicating with travelers during pre-trip and en route stages.

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Table 1. Summary of Respondents' primary transportation modes to work

Sample Attributes		Frequency %
Drive alone by car to work a week	0 times	8.1
	> 0 and < 1	7.0
	1 time	6.3
	2 times	7.8
	3 times	8.5
	4 times	11.4
	5 times	50.9
Use carpool to work a week	0 times	65.3
	> 0 and < 1	7.0
	1 time	4.3
	2 times	4.1
	3 times	4.0
	4 times	5.3
	5 times	10.0
Use public transportation to work a week	0 times	73.3
	> 0 and < 1	10.3
	1 time	4.9
	2 times	4.3
	3 times	3.6
	4 times	2.3
	5 times	1.3

Table 2. Summary of Other Travel Activities in a Normal Week

Sample Attributes		Frequency %
Travel for work-related purposes	0 times	19.0
	> 0 and < 1	16.9
	1 time	13.0
	2 times	11.8
	3 times	9.3
	4 times	4.7
	5 times	25.3
Go grocery shopping	0 times	13.5
	> 0 and < 1	13.2
	1 time	27.7
	2 times	27.7
	3 times	12.0
	4 times	2.6
	5 times	3.3
Shop for other items	0 times	7.7
	> 0 and < 1	24.0
	1 time	32.1
	2 times	24.6
	3 times	8.0
	4 times	1.6
	5 times	2.0
Run personal errands	0 times	7.7
	> 0 and < 1	22.5
	1 time	28.4
	2 times	25.4
	3 times	9.6
	4 times	2.6
	5 times	3.8
Drop-off/pick-up children	0 times	72.1
	> 0 and < 1	6.0
	1 time	4.2
	2 times	4.9
	3 times	3.1
	4 times	1.8
	5 times	7.9

Go out for pleasure	0 times	3.8
	> 0 and < 1	13.6
	1 time	25.9
	2 times	30.2
	3 times	16.8
	4 times	5.0
	5 times	4.7
Make other trips	0 times	57.3
	> 0 and < 1	15.3
	1 time	11.8
	2 times	7.5
	3 times	3.7
	4 times	1.1
	5 times	3.3

Table 3. Summary of Departure and Arrival Time for the Work Trip

Sample Attributes		Frequency %
Work Schedule		
Required to start at (47.5% of respondents)	< 7:00 am	4.2
	7:00 - 7:29 am	15.1
	7:30 - 7:59 am	11.8
	8:00 - 8:29 am	29.1
	8:30 - 8:59 am	17.6
	9:00 - 9:29 am	15.1
	9:30 - 11:59 am	4.9
	>= 12:00 pm	2.2
Flexible, but usually start at (37.2% of respondents)	< 7:00 am	6.4
	7:00 - 7:29 am	14.4
	7:30 - 7:59 am	16.6
	8:00 - 8:29 am	18.9
	8:30 - 8:59 am	15.3
	9:00 - 9:29 am	15.8
	9:30 - 11:59 am	11.8
	>= 12:00 pm	0.8
Shift changes from (10.3% of respondents)	Day-to-day	62.7
	Week-to-week	9.9
	Every two weeks or less	27.4
Arrival flexibility at work	Doesn't matter	30.3
	0 - 5 minutes	8.8
	6 - 10 minutes	11.1
	11 - 15 minutes	16.3
	16 - 25 minutes	3.2
	26 - 30 minutes	21.3
	31 - 60 minutes	7.8
	> 60 minutes	1.2
Normally arrival time at work	< 7:00 am	11.2
	7:00 - 7:29 am	14.0
	7:30 - 7:59 am	18.4
	8:00 - 8:29 am	19.0
	8:30 - 8:59 am	14.6
	9:00 - 9:29 am	12.2
	9:30 - 11:59 am	8.8
	> = 12:00 pm	1.8
Arrival by more than 10 minutes earlier due to congestion during past month	0 time	75.3
	1 times	5.7
	2 times	7.8
	3 times	3.6
	4 times	1.6
	5 times	3.2
	> 5 times	2.8

Arrival by more than 10 minutes later due to congestion during past month	0 time	28.7
	1 times	10.8
	2 times	14.7
	3 times	10.6
	4 times	8.3
	5 times	10.9
	> 5 times	16.0
Departure time from home to work	< 6:00 am	8.5
	6:00 - 6:29 am	13.0
	6:30 - 6:59 am	15.2
	7:00 - 7:29 am	20.5
	7:30 - 7:59 am	15.8
	8:00 - 8:29 am	12.4
	8:30 - 8:59 am	6.8
	9:00 - 11:59 am	5.4
	>= 12:00 pm	2.4
Departure time from work	< 12:00 pm	2.5
	12:00 - 3:59 pm	11.4
	4:00 - 4:29 pm	9.7
	4:30 - 4:59 pm	11.0
	5:00 - 5:29 pm	21.6
	5:30 - 5:59 pm	14.2
	6:00 - 6:29 pm	15.3
	6:30 - 6:59 pm	6.1
	>= 7:00 pm	8.2
Departure time from home to work if no traffic congestion	< 6:00 am	5.8
	6:00 - 6:29 am	8.5
	6:30 - 6:59 am	12.2
	7:00 - 7:29 am	18.5
	7:30 - 7:59 am	19.1
	8:00 - 8:29 am	14.9
	8:30 - 8:59 am	9.1
	9:00 - 11:59 am	5.6
	>= 12:00 pm	6.3
Frequency of work at home (all day) in a week	Never	78.4
	< 2 times	16.4
	2 times	2.8
	3 times	1.0
	> 3 times	1.4

Table 4. Summary of Route Information

Sample Attributes		Frequency %
When route is chosen	Before getting into the car	56.1
	While on the road	43.9
Number of stops from home to work	0 stop	76.5
	1 stop	18.8
	2 stops	3.8
	> 2 stops	0.9
Number of stops from work to home	0 stops	46.8
	1 stops	38.3
	2 stops	11.8
	> 2 stops	3.1
Travel time from home to work by the usual route	0 - 10 minutes	1.0
	11 - 20 minutes	6.3
	21 - 30 minutes	22.3
	31 - 40 minutes	21.6
	41 - 50 minutes	23.9
	51 - 60 minutes	12.2
	> 60 minutes	12.8
Travel time from work to home by the usual route	0 - 10 minutes	0.8
	11 - 20 minutes	5.3
	21 - 30 minutes	18.0
	31 - 40 minutes	17.6
	41 - 50 minutes	24.6
	51 - 60 minutes	15.7
	> 60 minutes	18.0
Travel time from home to work if left home 30 minutes early by the usual route	0 - 10 minutes	1.7
	11 - 20 minutes	10.4
	21 - 30 minutes	26.9
	31 - 40 minutes	22.0
	41 - 50 minutes	19.0
	51 - 60 minutes	10.6
	> 60 minutes	9.3
Travel time from home to work by public transportation	0 - 10 minutes	0.3
	11 - 20 minutes	0.3
	21 - 30 minutes	3.2
	31 - 40 minutes	5.3
	41 - 50 minutes	15.3
	51 - 60 minutes	23.2
	> 60 minutes	52.5

Usual route type	Highway	96.7
	Road (arterial local street)	2.6
	Both	0.7
Congestion on usual route	Not congested (free flow)	42.4
	Congested	48.9
	Heavily congested (stop and go)	8.7
Information sources for traffic conditions on the usual route*	Radio traffic reports	93.8
	Conversations with other people	5.3
	Printed matter	1.0
	Home/office telephone	1.4
	Carphone	2.6
	Electronic message signs	12.3
	Television	18.5
	Observation	40.8
	Other	2.1
Number of alternate routes known	0	47.3
	1	25.2
	2	17.9
	3	6.3
	4+	3.3
Best alternate route type	Highway	63.0
	Road	36.9
	Both	0.1
Travel time from home to work by the best alternate route	0 - 10 minutes	1.2
	11 - 20 minutes	4.1
	21 - 30 minutes	11.8
	31 - 40 minutes	17.6
	41 - 50 minutes	22.6
	51 - 60 minutes	16.7
	> 60 minutes	26.1
Congestion on the best alternate route	Not congested (free flow)	41.1
	Congested	49.3
	Heavily congested (stop and go)	9.5
Frequency of taking alternate routes due to traffic congestion during past month	0 time	32.8
	1 times	19.2
	2 times	15.6
	3 times	7.3
	4 times	5.5
	5 times	8.3
	> 5 times	11.3

* Multiple response permitted (Percentages do not add up to 100%)

Table 5. Summary of Regularly Occurring Congestion at Bottlenecks on the Usual Commute Route (Home to Work Trip)

Sample Attributes		Frequency %
Bottleneck locations on usual route*	None	11.9
	Entrances to bridges	55.4
	Road narrowing	38.3
	Interchanges	12.8
	Off-ramps	9.6
	On-ramps	19.7
	Construction/roadwork	11.3
	Other	23.7
Location of bottleneck which usually causes the longest delay	Highway	88.8
	Road	11.1
	Both	0.1
Time bottleneck adds to trip	0-5 minutes	30.2
	6 - 10 minutes	38.6
	11 - 15 minutes	17.5
	16 - 20 minutes	7.5
	> 20 minutes	6.2
Time bottleneck would take if left 30 minutes early	More time	13.4
	Less time	50.3
	No difference	36.3
Time bottleneck would *add* if left 30 minutes early	0-5 minutes	21.3
	6-10 minutes	34.6
	11-15 minutes	23.1
	> 15 minutes	21.0
Time bottleneck would *save* if left 30 minutes early	0-5 minutes	38.3
	6-10 minutes	36.6
	11-15 minutes	15.4
	> 15 minutes	9.7

Answer to previous question based on:	Past experience	95.0
	Word-of-mouth	3.2
	Guessing	9.0
	Radio traffic reports	8.2
	Television	1.4
	Telephone	0.1
Longest bottleneck delay within the last 6 months	0-5 minutes	6.0
	6 - 10 minutes	13.9
	11 - 15 minutes	15.8
	16 - 20 minutes	17.5
	21 - 30 minutes	21.9
	31 - 40 minutes	5.0
	41 - 50 minutes	7.4
	51 - 60 minutes	9.4
	> 60 minutes	3.1
Changes in travel decisions *the* ***next day*** due to the longest delay*	Departed early	3.2
	Departed late	12.7
	Used public transit	1.9
	Took alternate route	5.9
	Added intermediate stops	0.5
	Canceled intermediate stops	0.7
	Did not change normal travel plans	77.8
	Other changes	1.9
Extent of early departure due to the longest delay	1-10 minutes	36.1
	11-20 minutes	36.3
	21-30 minutes	21.4
	> 30 minutes	6.2
Extent of late departure due to the longest delay	1-10 minutes	13.0
	11-20 minutes	18.2
	21-30 minutes	41.6
	> 30 minutes	27.3

* Multiple response permitted (Percentages do not add up to 100%)

Table 6(a). Summary of Most Recent Unexpected Congestion on the Usual Commute Route (Pretrip) -- Reported Behavior

Sample Attributes		Frequency %
Awareness of unexpected congestion on usual route before trip begins	Yes	62.5
	No	37.5
When did most recent unexpected congestion occur	Less than one week ago	9.6
	1-2 weeks ago	12.4
	2'-4 weeks ago	35.1
	1-2 months ago	32.6
	More than 2 months ago	10.2
Trip direction	Home	59.9
	Work	40.1
Reason for congestion*	Disabled vehicle	5.4
	Accident	41.3
	Bad weather	50.0
	Constructiodroad work	4.2
	Don't know the reason	7.5
	Due to some other reason	17.4
Weather conditions	Clear	20.0
	Cloudy	9.0
	Rainy	69.8
	Windy	0.3
	Foggy	0.9
Source for congestion information*	By observing congestion	32.8
	Through radio traffic reports	66.7
	Through television	16.8
	By telephone	4.9
	By computer	0.0
	Through word-of-mouth	10.9
	From other sources	4.2

Expected length of delay	0 - 5 minutes	2.5
	6 - 10 minutes	11.5
	11 - 15 minutes	17.2
	16 - 20 minutes	16.8
	21 - 30 minutes	29.2
	31 - 40 minutes	2.9
	41 - 50 minutes	5.9
	51 - 60 minutes	13.4
	> 60 minutes	0.6
Experienced length of delay	0 - 5 minutes	4.8
	6 - 10 minutes	15.1
	11 - 15 minutes	13.7
	16 - 20 minutes	14.9
	21 - 30 minutes	24.4
	31 - 40 minutes	5.5
	41 - 50 minutes	9.3
	51 - 60 minutes	8.1
	> 60 minutes	4.2
Response to delay*	Left early	22.1
	Left late	15.0
	Take an alternative route	20.8
	Use public transportation	1.6
	Go on bike or foot	0.2
	Cancel trip	1.9
	Add unintended inter-stops	3.3
	Cancel intended inter-stops	1.8
	Not change normal travel plans	45.0

* Multiple response permitted (Percentages do not add up to 100%)

Table 6(b). Summary of Most Recent Unexpected Congestion on the Usual Commute Route (Pretrip) -- Stated Behavior

Sample Attributes		Frequency %
Imagine that you are starting this trip again (on the day of the most recent unexpected congestion) but this time you have a special device (at home or at work) which gives you accurate traffic information. You are not aware of any congestion until the device gives you one of the following messages 15 minutes before your departure. In each case, will you change any of the following decision?		
Response to qualitative delay information	Leave early	36.8
	Leave late	19.5
	Take alternate route	15.2
	Use public transportation	4.6
	Go on bike or foot	0.0
	Cancel trip altogether	0.2
	Can't say	23.7
Response to prescriptive information - take best alternate route	Leave early	21.9
	Leave late	11.8
	Take alternate route	43.3
	Use public transportation	4.0
	Go on bike or foot	0.1
	Cancel trip altogether	0.7
	Can't say	18.3
Response to prescriptive information - take public transportation	Leave early	19.4
	Leave late	14.0
	Take alternate route	19.7
	Use public transportation	18.3
	Go on bike or foot	0.3
	Cancel trip altogether	5.1
	Can't say	23.3
Response to quantitative real-time delay information	Leave early	37.7
	Leave late	28.7
	Take alternate route	15.2
	Use public transportation	3.8
	Go on bike or foot	0.2
	Cancel trip altogether	1.3
	Can't say	13.2
Response to predictive real-time delay information	Leave early	37.3
	Leave late	28.6
	Take alternate route	14.9
	Use public transportation	4.4
	Go on bike or foot	0.0
	Cancel trip altogether	0.2
	Can't say	14.5

Table 7(a). Summary of Last Unexpected Congestion on the Usual Commute Route (En mute) -- Reported Preferences

Sample Attributes		Frequency %
Aware of unexpected congestion on usual route while on road	Yes	74.4
	No	25.6
When did most recent unexpected congestion occur	Less than one week ago	14.9
	1-2 weeks ago	22.2
	2'-4 weeks ago	29.8
	1-2 months ago	24.3
	More than 2 months ago	8.8
Trip direction	From home to work	55.4
	From work to home	44.6
Reason for congestion*	Disabled vehicle	11.8
	Accident	36.2
	Bad weather	36.2
	Constructiodroad work	10.4
	Don't know the reason	17.3
	Due to some other reason	13.5
Weather conditions	Clear	**31.7**
	Cloudy	15.0
	Rainy	52.2
	Windy	0.2
	Foggy	0.9
Source for congestion information*	Only by observing congestion	47.9
	First by observing then traffic reports	23.9
	Only through traffic reports	11.2
	First by traffic reports then observing	22.7
	From other sources	1.8
Expected length of delay	0 - 5 minutes	7.4
	6 - 10 minutes	21.0
	11 - 15 minutes	23.1
	16 - 20 minutes	15.7
	21 - 30 minutes	23.2
	> 30 minutes	9.6

Experienced length of delay	0 - 5 minutes	6.2
	6 - 10 minutes	16.2
	11 - 15 minutes	19.4
	16 - 20 minutes	17.1
	21 - 30 minutes	19.2
	31 - *50* minutes	11.4
	> 50 minutes	10.5
Opportunity to take alternative route	Yes	18.2
	No	81.8
Opportunity to take public-transit	Yes	3.5
	No	96.5
Response to delay*	Took an alternative route	16.3
	Used public transportation	0.5
	Added unintended intermediate stop	4.0
	Canceled intended intermediate stop	4.7
	Didn't change normal travel plans	78.3
Return to usual route	Yes	58.1
	No	41.9

* Multiple response permitted (Percentages do not add up to 100%)

Table 7(b). Summary of Last Unexpected Congestion on the Usual Commute Route (En mute) -- Stated Preferences

Sample Attributes		Frequency %
Now imagine that you are starting this trip again (on the day of the most recent unexpected congestion) but this time you have a special device in your vehicle which gives you accurate traffic information. You are not aware of any congestion until you enter your vehicle and the device gives you one of the following messages. In each case. which route would you take?		
Response to qualitative delay information	Definitely take usual route	39.0
	Might take usual route	17.0
	Might take best alternate route	10.1
	Definitely take alternate route	17.3
	Can't say	16.6
Response to prescriptive information - take best alternate route	Definitely take usual route	20.9
	Might take usual route	8.8
	Might take best alternate route	18.4
	Definitely take alternate route	43.2
	Can't say	8.7
Response to quantitative real-time delay information	Definitely take usual route	26.4
	Might take usual route	11.6
	Might take best alternate route	13.5
	Definitely take alternate route	37.7
	Can't say	10.8
Response to predictive real-time delay information	Definitely take usual route	24.3
	Might take usual route	10.0
	Might take best alternate route	14.0
	Definitely take alternate route	41.0
	Can't say	10.7
Response to quantitative real-time delay information on best alternate route	Definitely take usual route	19.1
	Might take usual route	6.3
	Might take best alternate route	17.5
	Definitely take alternate route	39.9
	Can't say	17.2

Table 8(a). Summary of Advanced Traveler Information Experiment

Sample Attributes		Frequency %
We are planning to conduct a six-month experiment to test a computerized "in-vehicle" information system. Each participant will receive a system (computer, video display, and antenna all mounted in the vehicle) that will provide travel information and electronic "yellow pages" free of charge. This information may help you avoid congestion, reduce travel times, reduce stress, and increase your knowledge of travel and destination options.		
If the device could inform about road construction and accidents on a priority basis	Does not influence willingness	13.9
		6.6
		16.4
		16.7
	Greatly increases willingness	46.4
If car could be located (in case of theft)	Does not influence willingness	12.6
		7.3
		12.0
		13.2
	Greatly increases willingness	55.0
If police/ambulance could be called in emergencies	Does not influence willingness	11.8
		5.6
		11.6
		14.5
	Greatly increases willingness	56.5
If device was insured against theft of the equipment and any related damage caused to the car	Does not influence willingness	9.5
		4.0
		9.0
		14.0
	Greatly increases willingness	63.5

Table 8(b). Monetary incentives for changing travel decisions

Sample Attributes		Frequency %
We plan to offer money to participants who are willing to perform up to two optional **tasks.** Please indicate on a scale of 1 to **4** how willing you would be to complete each **task** in exchange for the stated sums of money.		
Once a week, leave home for work 30 minutes earlier than normal in exchange for the sum of		
$25 per month	Definitely would not leave early	46.1
		17.0
		8.8
	Definitely would leave early	19.9
	Can't say	8.2
$50 per month	Definitely would not leave early	22.4
		25.4
		16.3
	Definitely would leave early	28.6
	Can't say	7.2
$75 per month	Definitely would not leave early	15.2
		5.7
		29.9
	Definitely would leave early	42.1
	Can't say	7.1
$100 per month	Definitely would not leave early	9.2
		2.2
		6.3
	Definitely would leave early	76.1
	Can't say	6.2
Once a week, take the best alternate route in exchange for the sum of		
$25 per month	Definitely would not take alternate route	38.5
		13.8
		8.3
	Definitely would take alternate route	26.7
	Can't say	12.7

$50 per month	Definitely would not take alternate route	22.9
		17.9
		13.6
	Definitely would take alternate route	33.6
	Can't say	11.9
$75 per month	Definitely would not take alternate route	17.2
		4.7
		20.6
	Definitely would take alternate route	46.0
	Can't say	11.5
$100 per month	Definitely would not take alternate route	12.4
		1.6
		4.8
	Definitely would take alternate route	70.3
	Can't say	10.9

Table 9. Summary of Socio-Economic Characteristics

Sample Attributes		Frequency %
Gender	Male	64.9
	Female	35.1
Age	Under 18 years	0.2
	18 - 29 years	11.4
	30 - 39 years	31.1
	40 - 49 years	33.7
	50 - 64 years	21.4
	65 and over	2.2
Highest level of education	High school or less	4.3
	Some college	21.2
	Vocational or technical school	1.3
	Graduated college (Bachelors degree)	40.1
	Post graduate (Master or Doctoral degree)	33.1
Occupation	Clerical/Secretary	3.5
	ExecutiveManagerial	33.1
	Retired	0.5
	Professional/Technical	35.3
	Service	3.0
	Student	1.0
	Salesperson/Buyer	7.8
	Construction	3.3
	Production/Manufacturing	0.4
	Skilled crafts	2.9
	Other	9.2
Number of motorized vehicles in household	1	19.0
	2	49.1
	3	21.6
	4 and more	10.3
Persons in household	1	14.3
	2	43.4
	3	19.2
	4	16.8
	5 and more	6.3

Persons in household employed full-time	1	**42.3**
	2	52.4
	3 and more	5.2
Personal annual income from all sources before taxes	Under $20,000	3.1
	$20,000-$40,000	18.3
	$40,001-$60,000	23.0
	$60,001-$80,000	14.2
	$80,001-$100,000	14.2
	Over $100,000	27.2

Table 10. Summary of Home and Job location

Sample Attributes		Frequency %
Home location (county)	Alameda	0.3
	Contra Costa	0.5
	Marin	75.7
	Napa	0.5
	Sacramento	0.1
	San Francisco	9.3
	San Mateo	0.7
	Santa Clara	0.1
	Solano	0.7
	Sonoma	12.0
	Lake	0.1
Work location (county)	Alameda	1.5
	Contra Costa	0.7
	Marin	11.5
	Napa	0.0
	Sacramento	0.1
	San Francisco	79.0
	San Mateo	5.3
	Santa Clara	0.8
	Solano	0.1
	Sonoma	1.1
Live at the present home location	1 year and less	15.7
	2 years	13.0
	3 years	11.5
	4 years	7.8
	5 years	8.5
	6 - 10 years	20.5
	11 - 15 years	8.8
	16 - 20 years	7.3
	> 21 years	6.9
Work at the present job location	1 year and less	15.4
	2 years	11.7
	3 years	12.7
	4 years	7.0
	5 years	8.2
	6 - 10 years	22.2
	11 - 15 years	9.8
	16 - 20 years	6.0
	> 21 years	7.0

Table 11. Summary of Respondents' Characteristics Related to Travel

Sample Attributes		Frequency %
Frequently listen to radio traffic reports (3209)	Strongly disagree	5.9
	Disagree	6.1
	Neutral	12.2
	Agree	14.1
	Strongly agree	61.7
Like discovering new routes to get to someplace (3187)	Strongly disagree	9.8
	Disagree	10.0
	Neutral	23.2
	Agree	20.8
	Strongly agree	36.2
Willing to take unfamiliar routes to avoid traffic delays (3186)	Strongly disagree	9.0
	Disagree	9.8
	Neutral	17.2
	Agree	22.2
	Strongly agree	41.8

Table 12-1. County to county travel mode - 1990 census*

County of Residence	County of Work	Drive Alone(%)	Carpool(%)	Other Modes(%)	Share of Workers(%)
S.F.	Marin	68.2	17.7	14.1	100
Marin	S.F.	51.3	17.6	31.1	100
Marin	San Mateo	79.7	15.8	4.5	100
Sonoma	S.F.	48.2	26.3	25.5	100
Sonoma	San Mateo	69.0	21.6	9.4	100

*Source: Table 4.1, The Journey-to-Work in the San Francisco Bay Area, 1990 Census, Census Transportation Planning Package (Statewide Element), Working Paper *#5,* Planning Section, Metropolitan Transportation Commission, April 1993

Table 12-2. County to county travel mode - this study

County of Residence	County of Work	Drive Alone(%)	Carpool(%)	Transit(%)	Valid Cases	Share of Commuters(%)
S.F.	Marin	90.8	8.7	0.6	173	100
Marin	S.F.	69.2	20.6	10.2	1897	100
Marin	San Mateo	87.4	11.7	0.9	111	100
Sonoma	S.F.	62.7	27.4	9.9	263	100
Sonoma	San Mateo	76.0	24.0	0.0	25	100

Table 12-3. Comparison of mode choice between drive alone and carpool for various origins and destinations

County of		Drive Alone			Carpool		
Residence	Work	Census(%)	This study(%)	Difference(%)	Census(%)	This study(%)	Difference(%)
S.F.	Marin	79.4	91.3	-11. 6	20.6	8.7	11.86
Marin	S.F.	74.5	77.1	-2.60	25.5	22.9	2.60
Marin	San Mateo	83.5	88.2	-4.74	16.5	11.8	4.74
Sonoma	S.F.	64.7	69.6	-4.89	35.3	30.4	4.89
Sonoma	San Mateo	76.2	76.0	0.16	23.8	24.0	-0.16

Note: share of drive alone and carpool add up to 100%

Table 13. County to county average travel time (minutes)

County of Residence	County of Work	Drive Alone			
		Census*	This study	Difference	Valid cases
S.F.	Marin	31.7	29.8	1.9	155
Marin	S.F.	37.9	39.1	-1.2	1295
Marin	San Mateo	45.1	54.5	-9.4	97
Sonoma	S.F.	61.7	74.4	-12.7	165
Sonoma	San Mateo	67.2	83.7	-16.5	19

'Source: Table 4.1, The Journey-to-Work in the San Francisco Bay Area, 1990 Census, Census Transportation Planning Package (Statewide Element), Working Paper #5, Planning Section, Metropolitan Transportation Commission, April 1993

Table 14. Number of motorized vehicles per household

Number of vehicles	County of Residence								
	Marin			San Francisco			Sonoma		
	BATS	This study	Difference	BATS	This study	Difference	BATS	This study	Difference
0	2.8	0.0	2.8	26.2	0.0	26.2	3.2	0.0	3.2
1	33.4	17.9	15.5	43.5	43.9	-0.4	32.2	9.0	23.2
2	42.1	50.2	-8.1	23.6	37.5	-13.9	39.4	49.3	-9.9
3	13.9	22.2	-8.3	5.3	12.2	-6.9	17.0	26.1	-9.1
4 plus	7.8	9.7	-1.9	1.4	6.4	-5.0	8.2	15.6	-7.4

Table 15. Number of persons per household

Number of persons	County of Residence								
	Marin			San Francisco			Sonoma		
	BATS	This study	Difference	BATS	This study	Difference	BATS	This study	Difference
1	22.7	14.6	8.1	33.8	23.1	10.7	20.5	6.6	13.9
2	38.4	44.1	-5.7	34.2	46.6	-12.4	34.4	37.2	-2.8
3	18.5	19.2	-0.7	14.0	16.3	-2.3	18.3	21.6	-3.3
4 plus	20.4	22.1	-1.7	18.0	14.0	4.0	26.8	34.6	-7.8

Table 16. Number of years at present home address

Number of Years	County of Residence								
	Marin			San Francisco			Sonoma		
	BATS	This study	Difference	BATS	This study	Difference	BATS	This study	Difference
0-2	27.8	27.1	0.7	37.0	44.6	-7.6	30.4	27.3	3.1
3-5	21.6	26.9	-5.3	19.4	28.1	-8.7	22.8	30.3	-7.5
6-14	23.0	26.7	-3.7	21.1	18.2	2.9	23.1	29.2	-6.1
15 plus	27.6	19.3	8.3	22.5	9.1	13.4	23.7	13.2	10.5

Table 17. Number of years at present work address

Number of Years	County of Residence								
	Marin			San Francisco			Sonoma		
	BATS	This study	Difference	BATS	This study	Difference	BATS	This study	Difference
0-2	31.9	24.7	7.2	39.8	50.8	-11.0	33.2	23.4	9.8
3-5	25.4	28.0	-2.6	29.5	30.8	-1.3	25.5	26.5	-1.0
6-14	28.7	30.9	-2.2	21.4	13.2	8.2	27.1	33.1	-6.0
15 plus	14.0	16.4	-2.4	9.3	5.2	4.1	14.2	17.0	-2.8

Table 18. Occupations of respondents

Occupation	County of Residence								
	Marin			San Francisco			Sonoma		
	BATS	This study	Difference	BATS	This study	Difference	BATS	This study	Difference
Exec/Man	20.2	36.2	-16.0	13.0	26.3	-13.3	14.9	20.9	-6.0
Prof/Tec	36.8	35.5	1.3	32.3	35.3	-3.0	33.8	34.7	-0.9
Sales	9.4	8.1	1.3	10.1	10.4	-0.3	8.4	5.0	3.4
Others	33.6	20.2	13.4	44.6	28.0	16.6	42.9	39.4	3.5

Figure 1. Average number of regular travel activities in a week

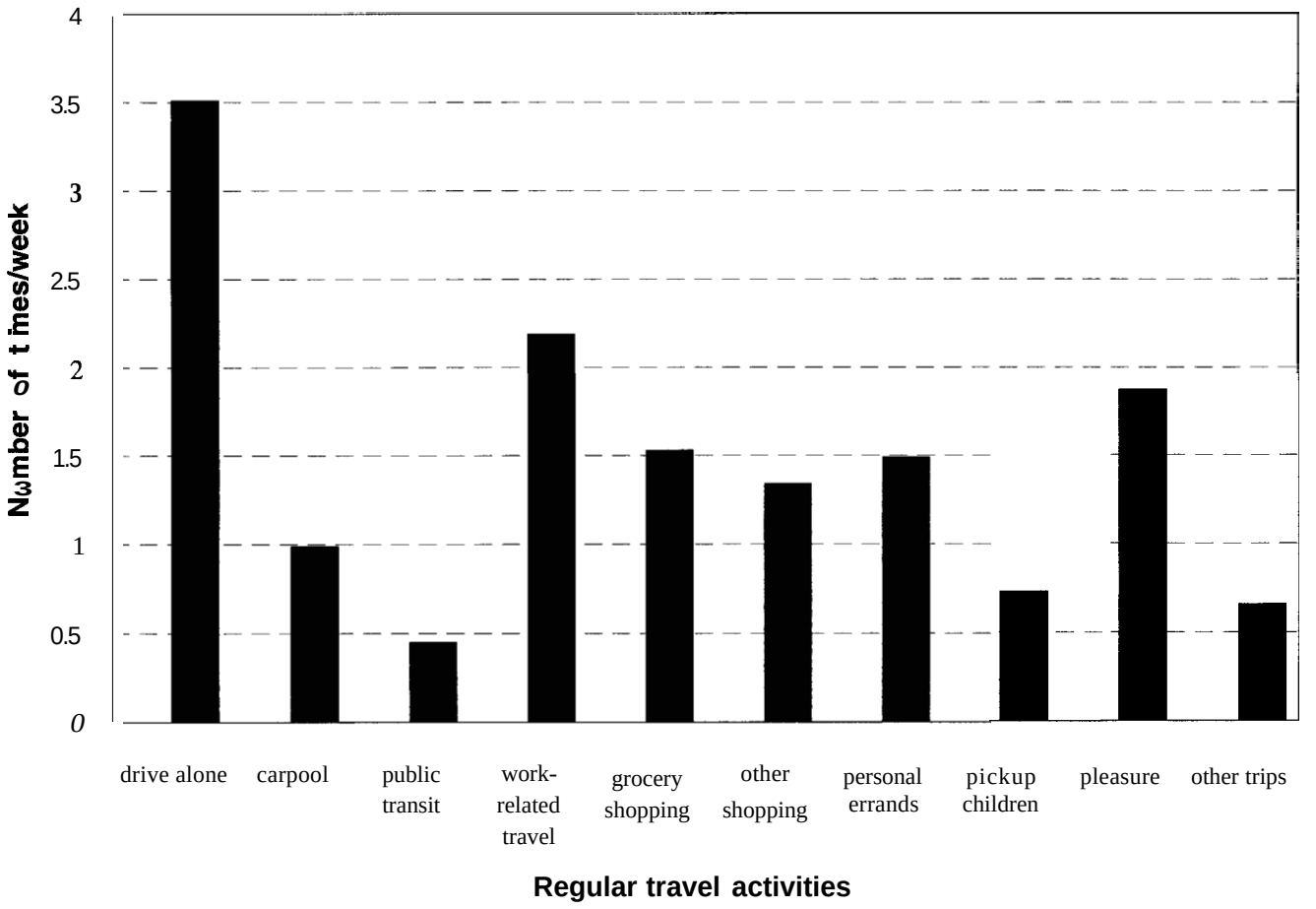


Figure 2. Usual and longest delays at the worst bottleneck to work

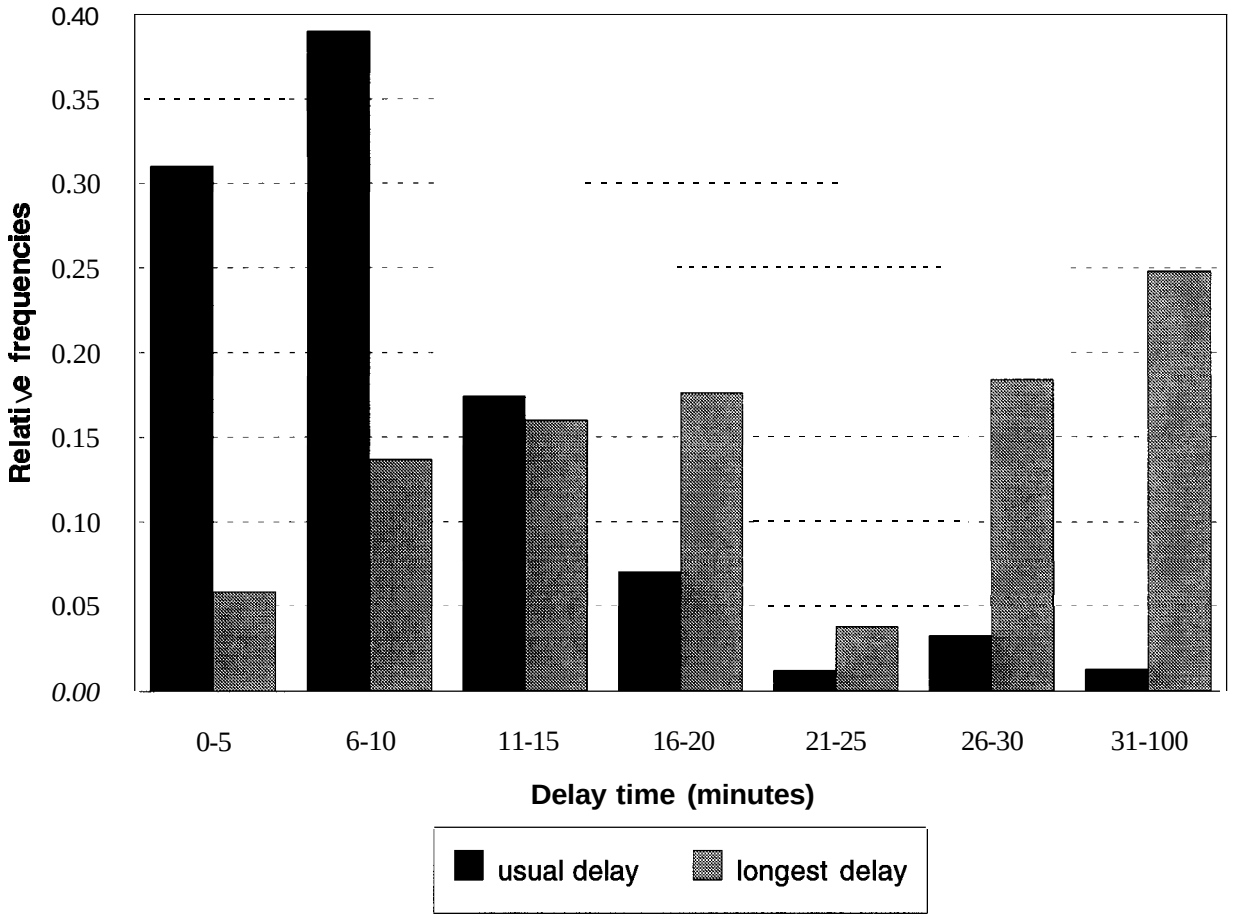


Figure 3. Change of travel decision on the next day of the longest delay

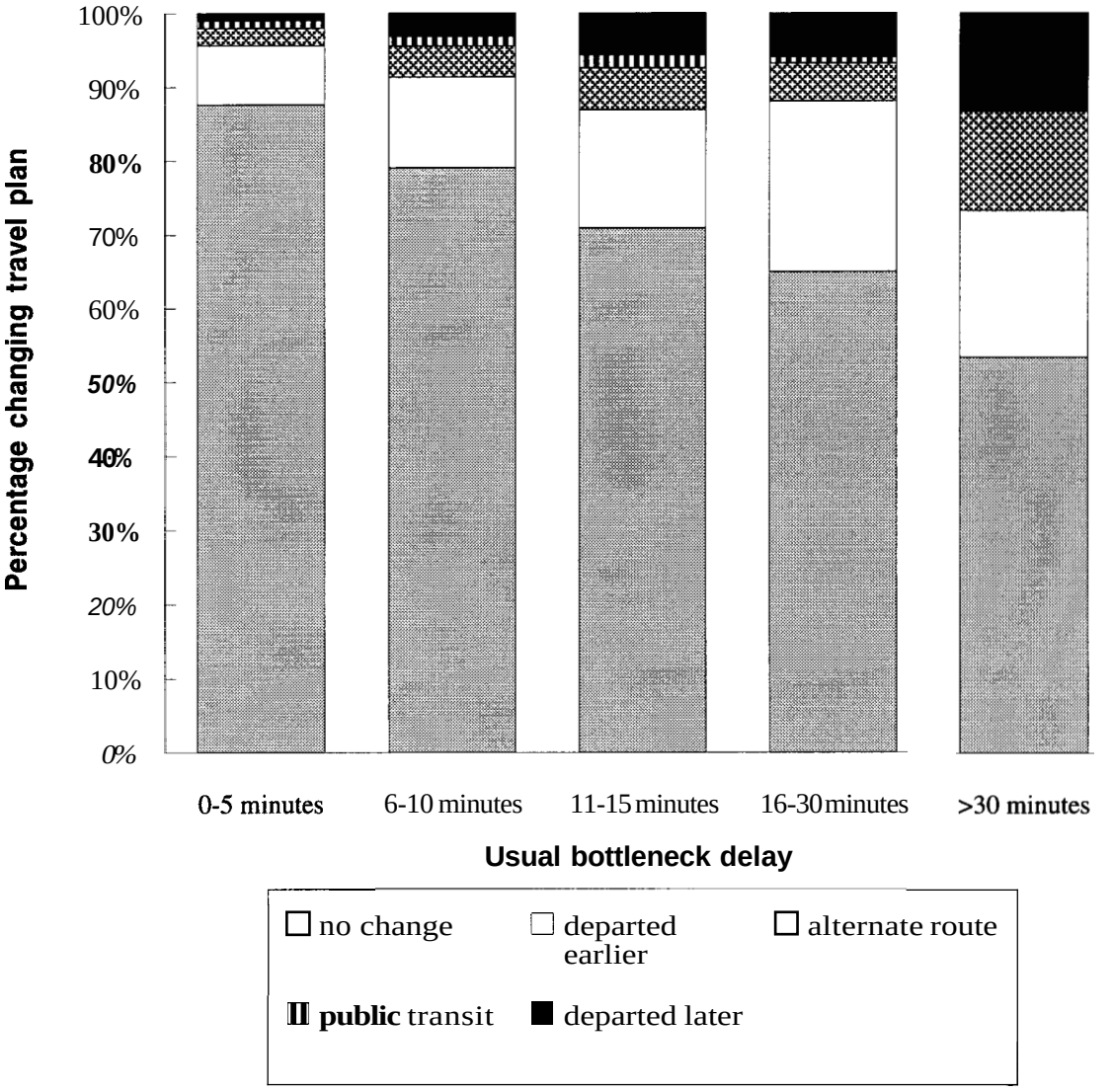


Figure 4. Average influence of services on willingness to participate in ATIS

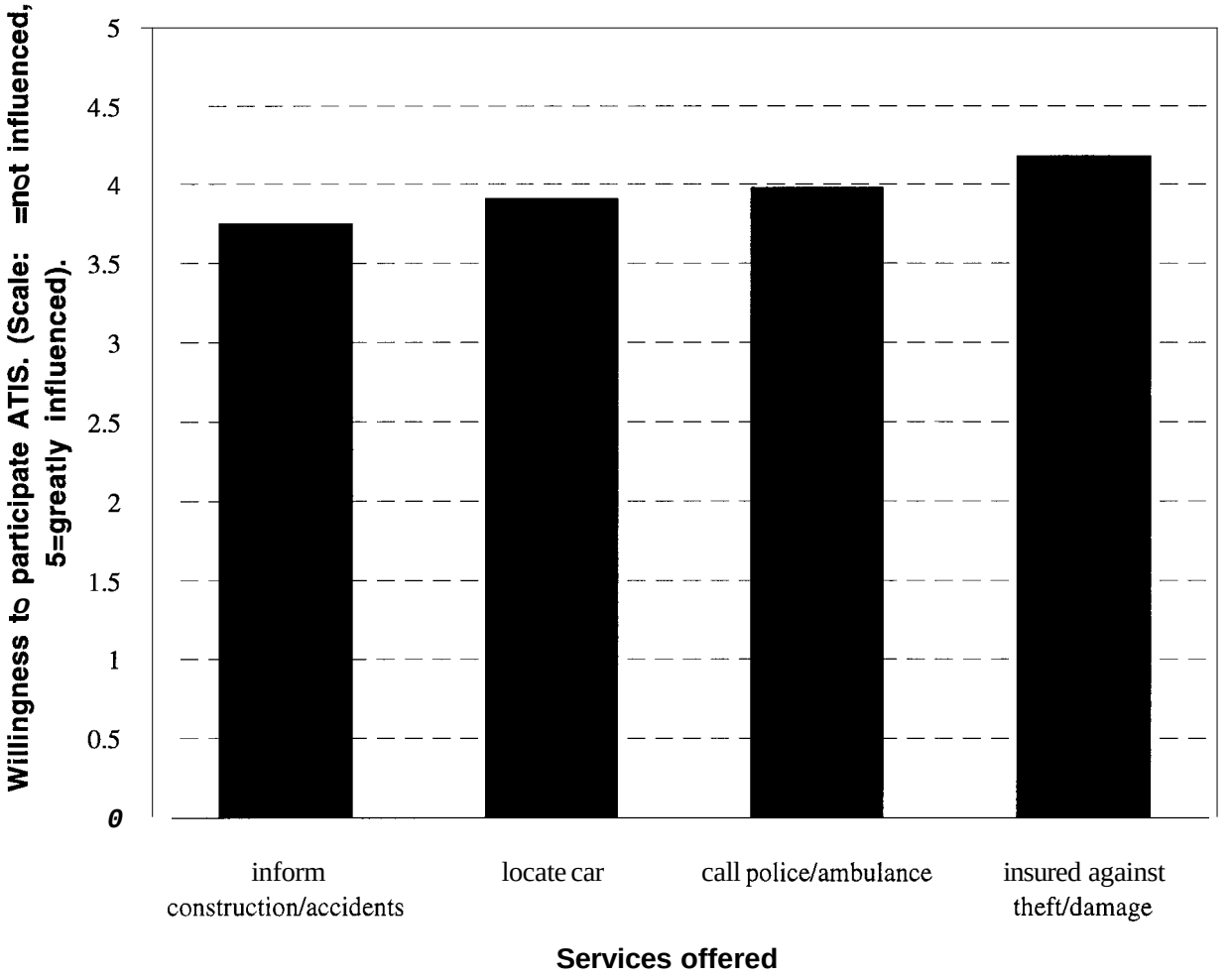
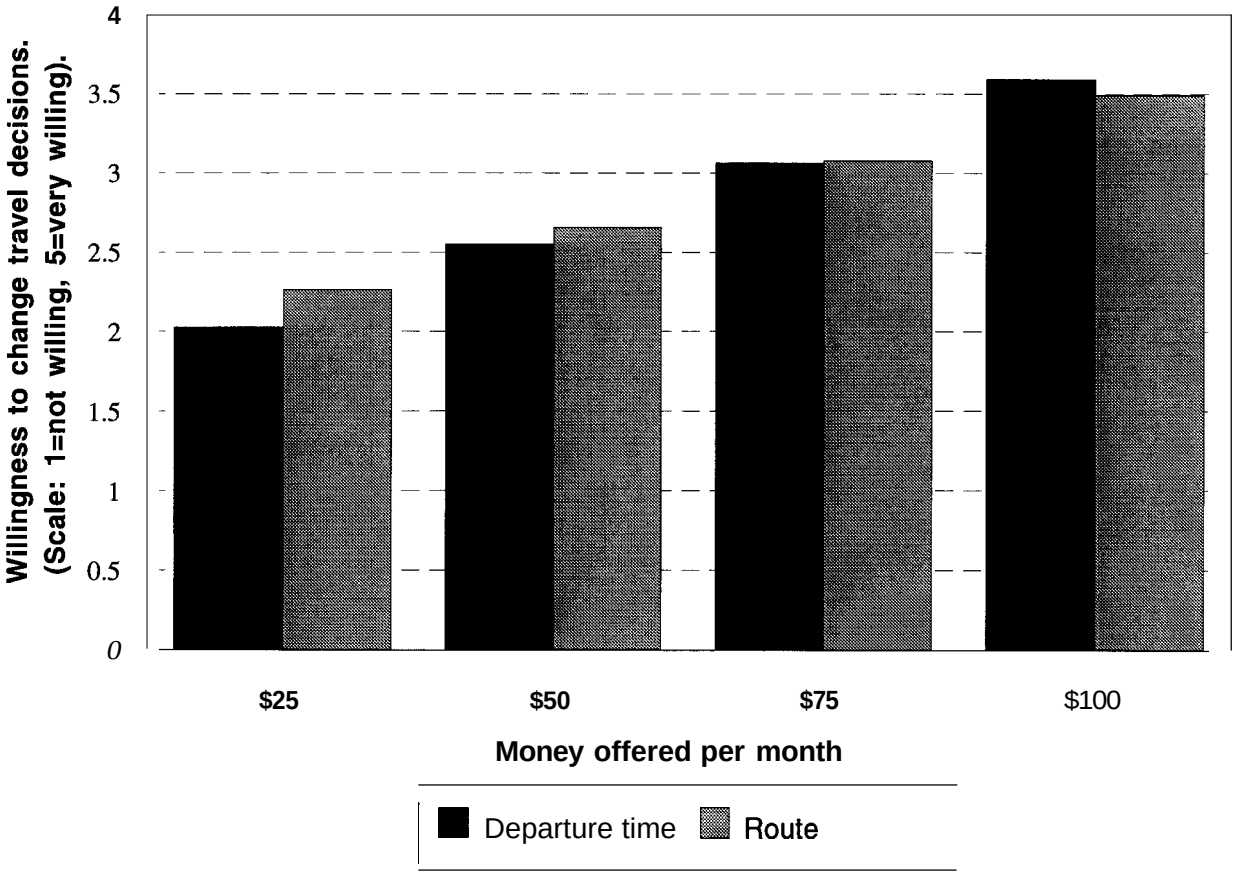


Figure 5. Average willingness to changing travel decisions once a week



Appendix

UNIVERSITY OF CALIFORNIA, BERKELEY

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO

SANTA BARBARA • SANTA CRUZ

INSTITUTE OF TRANSPORTATION STUDIES
109 McLAUGHLIN HALL
BERKELEY, CALIFORNIA 94720

Dear Bay Area Traveler,

The California Department of Transportation (CALTRANS) and the Institute of Transportation Studies at UC-Berkeley are studying ways to reduce traffic congestion. Specifically, we are evaluating impacts of an exciting new technology: a computerized travel information device for the car. The device will inform travelers of traffic conditions so that they may avoid congestion. You can help us plan for this new information system, and reduce traffic congestion in the Bay Area, by completing the enclosed questionnaire.

Please complete the entire questionnaire only if you use a vehicle regularly (at least once a week) for your work trips in the Bay Area. Otherwise, complete only the last section "aboutyourself" on Page 7 and return the survey.

To show our appreciation for your participation in this study, we will enter your name in a drawing for **25 Golden Gate Bridge toll ticket books--each book good for 20 toll crossings, valued at $60.00.** Please return the questionnaire promptly along with the "Ticket Book Drawing Form" in the pre-paid envelope.

Your responses will be kept strictly confidential. If you have any questions, please feel free to contact me at (510) 642-9208.

Thank you.

Sincerely yours,

Asad Jan Khattak

Asad Khattak, PhD
Research Engineer

UNIVERSITY OF CALIFORNIA

Institute of Transportation Studies

BERKELEY

Ticket Book Drawing Form

Dear Traveler,

Thank you for filling out the questionnaire.

You can participate in the drawing for *25* Golden Gate Bridge toll ticket books--each book good for 20 toll crossings, valued at $60.00. We will notify the winners by mail within two months.

Please provide the information below and insert this form in your return envelope.

Name:_____ _____
(Last) (First) (M.I.)

Address:_____
(Number and Street Name)

_____ _____ _____
(City) **(State)** **(Zip Code)**

Telephone: ( ) --

SURVEY OF TRAFFIC CONGESTION IN THE BAY AREA

Caltrans

California Department of Transportation
&
PATH Program, University of California at Berkeley

● YOUR NORMAL TRAVEL PATTERNS ◆

Please complete the entire questionnaire only if you use a vehicle regularly (at least once a week) for your work trips in the Bay Area. Otherwise, complete only the last section "about yourself" on Page 6.

Please tell us about your regular travel activities.

1. In a typical week how often do you:

	0	less than 1	1	2	3	4	5+
(i) Drive alone to work by car	O	O	O	O	O	O	O
(ii) Go to work in a carpool (as a passenger or driver)	O	O	O	O	O	O	O
(iii) Go to work using public transportation (BART, bus, *etc.*)	O	O	O	O	O	O	O
(iv) Travel for work-related purposes (meetings, *etc.*)	O	O	O	O	O	O	O
(v) Go grocery shopping	O	O	O	O	O	O	O
(vi) Shop for other items	O	O	O	O	O	O	O
(vii) Run personal errands (doctor's visit, bank)	O	O	O	O	O	O	O
(viii) Drop-off/pick-up children	O	O	O	O	O	O	O
(ix) Go out for pleasure (sports, movies, visit family)	O	O	O	O	O	O	O
(x) Make other trips *(please specify)*	O	O	O	O	O	O	O

Please tell us about departure and arrival times for your *work* trips.

2. Which of the following best describes your work schedule?
   (a) I **am required** to *start* work at____:____(Time) AM/PM *(circle one)*
   (b) The time I begin work is **flexible** and normally I prefer **to** arrive at____:____(Time) AM/PM *(circle one)*
   (c) My work **shift** changes from: ❑ Day-to-day ❑ Week-to-week ❑ Every two weeks or less frequently

3. How late can you *arrive at work* without it mattering much?_____**(Minutes)** ❑ **Doesn't** matter how late I arrive

4. What time **do** you normally arrive at work?____:____ AM/PM *(circle one)*

5. During the past month, how many times did traffic congestion cause you to arrive at work:
(i) more than 10 minutes **earlier** than your desired arrival time?_____(Number of times)
(ii) more than **10** minutes **later** than your desired arrival time?_____(Number of times)

6. What time do you normally: (i) leave home for work?_____:_____ AM/PM *(circle one)*
(ii) leave work?_____:_____ AM/PM *(circle one)*

7. If there were no traffic congestion on your route, when would you leave home for work?_____:_____ AM/PM (*circle one*)

8. How often do you work at home (all day) instead of going to your workplace?
❑ Never ❑ Less than 2 times a week ❑ 2 times a week ❑ *3* times a week ❑ More than *3* times a week

Many people have a *usual* route to work and some *alternate* routes as well. Please tell us about your routes.

9. When do you generally choose your route? ❑ Before getting into your car ❑ While you are on the road

10. How many intermediate stops (*e.g.*, to run errands) do you normally make when: (i) going to work? _____ (**# of stops**)
(ii) coming from work? _____ (**# of** stops)

(Hours) (Minutes)

11. Excluding intermediate stops, how long does your **usual** route normally take from: (i) home to work?_____ _____
(ii) work to home?_____ _____

12. If you left **home** 30 minutes **earlier** than normal, how much time would your usual route take? _____ _____

13. How long does public transportation (BART, bus, Muni, *etc.*) take between your home and work? _____

14. What are the names of **main roadway(s)** on your usual route?_____

15. Under normal conditions (no accidents or bad weather), how congested is your usual route traveling from home to work?
❑ Not congested (free flow) ❑ Congested ❑ Heavily congested (stop and go)

16. From which sources do you normally receive information about traffic conditions on your usual route? *(check all that apply)*
❑ Radio traffic reports ❑ Conversations with other people ❑ Printed matter (e.g., maps, newspapers)
❑ Home/office telephone ❑ Carphone ❑ Electronic message signs
❑ Television ❑ Observation (before it's too late to switch routes) ❑ Other *(please specify)*_____

17. How many different **alternate** routes (excluding your usual route) between your home and work have you taken **in** the **past?**
❑ None ☛ ***(skip to Question 22 below)*** ❑ 1 Route ❑ 2 Routes ❑ 3 Routes ❑ **4** Routes or more

18. What are the names of **main roadways** on your **best** alternate route?_____

19. How long does your best alternate route normally take from home to work?_____ (Hours) _____ (Minutes)

20. Under normal conditions (no accidents or bad weather), how congested is your best alternate route traveling from home to work?
❑ Not congested (free flow) ❑ Congested ❑ Heavily congested (stop and go)

21 Due to traffic congestion, how many times have you taken alternate routes in the past month (about 20 working days)?_____ (Number of times)

Certain locations on roadways act as "bottlenecks," slowing down traffic. Please tell us about regularly occurring congestion at such bottlenecks on your usual commute route.

22. What "bottleneck" locations on your usual route are normally congested during your **home to work** trip?
❑ None ☛ ***(skip to Question 29)*** ❑ Entrances to bridges ❑ Road narrowing (*e.g.*, lane drops)
❑ Interchanges (*e.g.*, 1-80 and I-580) ❑ Off-ramps ❑ On-ramps
❑ Construction/roadwork ❑ Other ***(please specify)***_____

23. Give the name and location of the bottleneck which usually causes the **longest** delay on your usual route during your **home to work** trip.
_____ **(*e.g.*, 1-80 at University Ave. on-ramp)**

24. How much time does ***this*** bottleneck **usually add** to your work trip?_____**(Minutes)**

25. If you were to leave 30 minutes **earlier** on your work trip, would the congestion at this bottleneck be any different?
❑ yes; congestion would increase and would **add** _____minutes to my total trip time ***(fill in the blank)***
❑ yes; congestion would decrease and I would **save** _____minutes on my total trip time ***(fill in the blank)***
❑ no; congestion would not **be** any different

26. On what basis did you answer the previous question? *(check **all that apply**)*
❑ Past experience ❑ Word-of-mouth ❑ Guessing ❑ Radio traffic reports ❑ Television ❑ Telephone

27. What is the **longest delay** that you remember occurring at this location within the past **6** months?_____**(Minutes)**

28. Due to this longest delay, did you change your normal travel plans on the following day? *(check all that apply)*

- ❑ Departed_____minutes EARLIER *(fill in the blank)*
- ❑ Used public transportation (BART, bus, Muni, *etc.*)
- ❑ Added intermediate stop(s), *e.g.*, to run errands
- ❑ Did not change normal travel plans
- ❑ Departed_____minutes **LATER** *(fill in the blank)*
- ❑ Took alternate route(s)
- ❑ Canceled intermediate stop(s)
- ❑ Other changes *(please specify)*_____

● UNEXPECTED CONGESTION ON YOUR USUAL COMMUTE ROUTE ●

Sometimes congestion can occur unexpectedly; please tell us about your experience with such situations.

29. Within the past three months, did you ever become aware of unexpected congestion on your usual route **while at home or at work** (before getting into your vehicle)?

- ❑ Yes ☛ *(please tell us about your **most recent** experience by answering the following questions)*
- ❑ No ☛ *(please skip to the next section, Question 39)*

30. How long ago did the most recent unexpected congestion occur?

❑ Less than one week ago ❑ 1-2 weeks ago ❑ **2+-4** weeks ago ❑ 1-2 months ago ❑ More than 2 months ago

31. Where were you when you first became aware of your most recent unexpected congestion? ❑ Home ❑ Work

32. What was the cause of this unexpected congestion?

- ❑ Disabled vehicle
- ❑ Accident
- ❑ Bad weather
- ❑ Constructiodroad work
- ❑ Don't know
- ❑ Other *(please specify)*_____

33. What was the weather like at that time? ❑ Clear ❑ Cloudy ❑ Rainy ❑ Windy ❑ Foggy

34. How did you learn about the congestion? *(check all that apply)*

- ❑ By observing congestion
- ❑ Through radio traffic reports
- ❑ Television
- ❑ Telephone
- O Computer
- ❑ Word-of-mouth
- ❑ From other sources *@lease specify)* _____

35. When you first learned about this congestion, how much time did you expect it **to** add to your trip? _____(Minutes)

36. How much time did the congestion actually add to your trip? _____(Minutes)

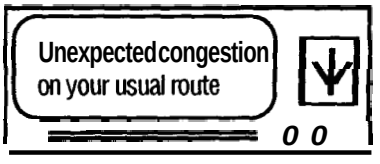
37. What did you do in response to the unexpected congestion? *(check all that apply)*

- ❑ Leave_____minutes **EARLIER** *(fill in the blank)*
- ❑ Take an alternate route (using automobile)
- ❑ Go on bike or foot
- ❑ Add unintended intermediate stop(s), *e.g.*, to run errands
- ❑ Did not change normal travel patterns
- ❑ Leave_____minutes **LATER** *(fill in the blank)*
- ❑ Use public transportation (BART, bus, Muni, *etc.*)
- ❑ Cancel trip altogether
- ❑ Cancel intended intermediate stop(s)

38. Now **imagine** that you are starting this trip again (on the day of the **most** recent unexpected congestion) but this time you have a special device (at home or at work) which gives you accurate traffic information. **You** are not aware of any congestion until the device gives you one of the following messages 15 minutes before your departure. In each case, will you change any of the following decisions?

Note: To interpret these messages, use what you remember of the actual traffic conditions on the day of the most recent congestion and what you ***know*** *about traffic conditions on* ***your*** *best alternate route.*

(i) The device knows your usual route and gives you the following message:



	Leave earlier	Leave later	Take alternate route using auto	Use public transportation	Go on bike or foot	Cancel trip altogether	Can't say
but does not tell you how much of a delay **this** congestion is causing_____	O	O	O	O	O	O	[ ]
(ii) The device gives you the same message **as** above and suggests that you take your best alternate route_____	O	O	O	O	O	O	[ ]
(iii) The device gives you the same message **as** above and suggests that you use public transportation instead of your car_____	O	O	O	O	O	O	[ ]
(iv) The device tells you the expected **length of delay** on your usual route (your response **to** Question 35 above) at the present time _____	O	O	O	O	O	O	[ ]
(v) The device tells you the length of delay at the present time, and accurately *predicts* the length of delay it *will* cause **15** and 30 minutes into the future—	O	O	O	O	O	O	[ ]

We are planning to conduct a six-month experiment to test a computerized "in-vehicle" information system. Each participant will receive a system (computer, video display, and antenna all mounted in the vehicle) that will provide travel information and electronic "yellow pages" free of charge. This information may help you avoid congestion, reduce travel times, reduce stress, and increase your knowledge of travel and destination options.

39. Suppose that you are considering participating in the experiment. Please indicate on a scale of 1 to 5 how the following benefits would influence your willingness to participate.

	Does not influence my willingness 1	2	3	4	Greatly increases my willingness 5
(i) **You** will be informed about road construction and accidents on a priority basis	O	O	O	O	O
(ii) This system will allow you to locate your car **at** any time (in case **of** theft, for example)	O	O	O	O	O
(iii) You will be able to call **for** police/ambulance in emergencies	O	O	O	O	O
(iv) You will be insured against theft of the information system equipment and any related damage caused to your car	O	O	O	O	O

In addition, we plan to offer money to participants who are willing to perform any of two optional tasks. Please indicate on a scale of **1** to **4** how willing you would he to complete each task in exchange for the stated **sums of** money.

40. Optional Task A
Once a week, leave home for work 30 minutes earlier than normal in exchange for the sum of:

	Definitely would **not** leave earlier 1	2	3	Definitely would leave earlier 4	Can't say
• $25 per month	O	O	O	O	[ ]
• $50 per month	O	O	O	O	[ ]
• $75 per month	O	O	O	O	[ ]
• $100 per month	O	O	O	O	[ ]

41. Optional Task **B**
Once a week, take your best "alternate" route in exchange for the sum of:

	Definitely would **not** take alternate route 1	2	3	Definitely would take alternate route 4	Can't say
• $25 per month	O	O	O	O	[ ]
• $50 per month	O	O	O	O	[ ]
• $75 per month	O	O	O	O	[ ]
• $100 per month	O	O	O	O	[ ]

◆ ABOUT YOURSELF ◆

The following information is requested for statistical purposes only.

42. Please indicate your level of agreement or disagreement with the following statements.

	Strongly disagree 1	2	3	4	Strongly agree 5
(i) I frequently listen to radio traffic reports	O	O	O	O	O
(ii) I like discovering new routes to get someplace	O	O	O	O	O
(iii) I am willing to take unfamiliar routes to avoid traffic delays	O	O	O	O	O

43. Gender: ❑ Male ❑ Female

44. Age: ❑ Under 18 years ❑ 18-29 years ❑ 30-39 years ❑ 40-49 years ❑ 50-64 years ❑ 65 and over

45. What is the highest level of education you have completed?

❑ High school or less ❑ Some college ❑ Vocational or technical school
❑ Graduated college (Bachelors degree) ❑ Post graduate (Masters or Doctoral degree)

46. What best describes your occupation?

❑ Clerical/Secretary ❑ ExecutiveManagerial ❑ Retired
❑ Professional/Technical ❑ Service ❑ Student
❑ Salesperson/Buyer ❑ Construction ❑ Production/Manufacturing
❑ Skilled crafts ❑ Other *(please specify)*_____

47. What is your: (i) home zip code? _____
(ii) work zip code? _____

48. How long have you: (i) lived at your present home location? _____(Years)
(ii) worked at your present job location?_____(Years)

49. How many motorized vehicles (cars, vans, trucks, two wheelers) does your household have?_____ (Number of vehicles)

50. How many persons, including yourself, live in your household?_____ (Number **of persons)**

51. **How** many persons in your household, including yourself, are employed full-time?_____(Number of employed persons)

52. What is your personal annual income from all sources before taxes? (this information will be strictly confidential)

- ❑ Under $20,000
- ❑ $20,000 - $40,000
- ❑ $40,001 - $60,000
- ❑ $60,001 - $80,000
- ❑ $80,001 - $100,000
- ❑ Over $100,000

Thank you very much! Please return the completed questionnaire within two weeks. No postage is required.

Comments (optional):_____

SURVEY OF TRAFFIC CONGESTION IN THE BAY AREA

Caltrans

California Department of Transportation
&
PATH Program, University of California at Berkeley

◆ ◆ YOUR NORMAL TRAVEL PATTERNS ◆ ◆

Please complete the entire questionnaire only if you ***use a vehicle regularly (at least once a week) for your work trips in the Bay Area. Otherwise, complete only the last section "about yourself" on Page 6.***

Please tell us about your regular travel activities.

1. In a typical week how often do you:

	0	less than 1	1	2	3	4	5+
(i) Drive alone to work by ***car***	O	O	O	O	O	O	O
(ii) Go to work in a carpool **(as** a passenger or driver)	O	O	O	O	O	O	O
(iii) Go to work using public transportation (BART, bus, ***etc.)***	O	O	O	O	O	O	O
(iv) Travel for work-related purposes (meetings, ***etc.)***	O	O	O	O	O	O	O
(v) Go grocery shopping	O	O	O	O	O	O	O
(vi) **Shop** for other items	O	O	O	O	O	O	O
(vii) Run personal errands (doctor's visit, bank)	O	O	O	O	O	O	O
(viii) Drop-off/pick-up children	O	O	O	O	O	O	O
(ix) Go out for pleasure **(sports,** movies, visit family)	O	O	O	O	O	O	O
(x) Make other trips ***(please specify)***	O	O	O	O	O	O	O

Please tell us about departure and arrival times for your *work* trips.

2. Which of the following **best** describes your work schedule?
   (a) **I am required** to **start** work at____:____ **(Time)** AM/PM ***(circle one)***
   (b) The time **I** begin work is **flexible** and normally I prefer to arrive at____:____ **(Time)** AM/PM ***(circle one)***
   (c) My work **shift** changes from: ❑ Day-to-day ❑ Week-to-week ❑ Every two weeks **or less** frequently

3. How late *can* you ***arrive at work*** without it mattering much?_____ **(Minutes)** ❑ Doesn't matter how late I arrive

4. What time **do** you normally arrive at work?____:____ AM/PM ***(circle one)***

5. During the past month, how many times did traffic congestion cause you *to* arrive at work:
(i) more than **10** minutes **earlier** than your desired arrival time?_____(Number **of** times)
(ii) more than **10** minutes **later** than your desired arrival time?_____(Number of times)

6. What time do you normally: (i) leave home for work?_____:_____ AM/PM (*circle one*)
(ii) leave work?_____:_____ AM/PM (*circle one*)

7. If there were no traffic congestion on your route, when would you leave home for work?_____:_____ AM/PM (*circle one*)

8 How often do you work at home (all day) instead of going **to** your workplace?
❑ Never ❑ **Less than 2** times a week ❑ 2 times a week ❑ **3** times a week ❑ More **than** 3 times a week

Many people have a *usual* route *to* work and some *alternate* routes as well. Please tell us about your routes.

9. When do you generally choose your route? ❑ Before getting into your car ❑ While you are on the road

10. How many intermediate stops (*e.g.*, to run errands) do you normally make when: (i) going to work? _____ (# of **stops)**
(ii) coming from work? _____ (# of stops)

(Hours) (Minutes)
11. Excluding intermediate stops, how long does your **usual** route normally take from: (i) home to work?_____ _____
(ii) work to home?_____

12. If you left **home 30** minutes **earlier** than normal, how much time would your usual route take? _____

13. How long does public transportation (BART, bus, Muni, *etc.*) take between your home and work? _____

14. What are the names of **main roadway(s)** on your usual route?_____

15. **Under** normal conditions (no accidents or bad weather), how congested is your usual route traveling from home to work?
❑ Not congested (free flow) ❑ Congested ❑ Heavily congested (stop and go)

16. From which sources do you normally receive information about traffic conditions on your usual route? *(check all that apply)*
O Radio traffic reports ❑ Conversations with other people ❑ Printed matter (e.g., maps, newspapers)
❑ Home/office telephone ❑ Carphone ❑ Electronic message signs
❑ Television ❑ Observation (before it's too late to switch routes) ❑ Other (*please specify)*_____

17. How many different **alternate routes** (excluding your usual route) between your home and work have you taken in the past?
❑ None ☛ ***(skip to Question 22 below)*** ❑ 1 Route ❑ 2 Routes ❑ **3** Routes ❑ **4** Routes or more

18. **What are the names of main roadways on your best alternate route?**_____

19. How long does your best alternate route normally take from home to work?_____ **(Hours)** _____ (Minutes)

20. Under **normal** conditions (no accidents or bad weather), how congested is your best alternate route traveling **from** home **to** work?
❑ Not congested (free flow) ❑ Congested ❑ Heavily congested (stop and **go)**

2 1. Due **to** traffic congestion, how many times have you taken alternate routes **in** the past month (about **20** working days)?_____ **(Number of** times)

Certain locations on roadways act as "bottlenecks," slowing down traffic. Please tell us about regularly occurring congestion at such bottlenecks on your usual commute route.

22. What "bottleneck" locations on your usual route are normally congested during your **home to work** trip?
❑ None ☛ ***(skip to Question 29)*** ❑ Entrances to bridges ❑ Road narrowing (*e.g.*, lane **drops)**
❑ Interchanges (*e.g.*, 1-80 and I-580) ❑ Off-ramps ❑ On-ramps
❑ Construction/roadwork ❑ Other ***(please specify)***_____

23. Give the name and location of the bottleneck which usually causes the **longest** delay on your usual route during your **home to work** trip.
_____(*e.g.*, 1-80 **at** University Ave. on-ramp)

24. How much time does ***this*** bottleneck **usually add** to your work trip?_____(Minutes)

25. If you were to leave **30** minutes **earlier** on your work trip, would the congestion at this bottleneck **be** any different?
❑ yes; congestion would increase and would **add** _____minutes **to** my total trip time *(fill **in the blank)***
❑ yes; congestion would decrease and I would **save** _____minutes on my total trip time ***(fill in the blank)***
❑ no; congestion would not be any different

26. On what basis did you answer the previous question? ***(check all that apply)***
❑ Past experience ❑ Word-of-mouth ❑ Guessing ❑ Radio traffic reports ❑ Television ❑ Telephone

27. What **is** the **longest delay** that you remember occurring at this location within the past **6** months?_____(Minutes)

28. Due to this longest delay, did you change your normal travel plans on the following day? *(check all that apply)*

- ❑ Departed_____minutes EARLIER *(fill in the blank)*
- ❑ Used public transportation (BART, bus, Muni, *etc.)*
- ❑ Added intermediate stop(s), *e.g.*, to run errands
- ❑ Did not change normal travel plans
- ❑ Departed _____minutes LATER *(fill in the blank)*
- ❑ **Took** alternate route(s)
- ❑ Canceled intermediate stop(s)
- ❑ Other changes *(please specify)*_____

◆◆ UNEXPECTED CONGESTION ON YOUR USUAL COMMUTE ROUTE ◆◆

Sometimes congestion can occur unexpectedly; please tell us about your experience with such situations.

29. Within the past three months, did you ever become aware **of** unexpected congestion on your usual route **while you were traveling** (in your vehicle)?

- ❑ Yes ☛ *(please **tell us** about **your must recent** experience by answering the following questions)*
- ❑ No **(please skip to the next section, i.e., Question 41)*

30. How long **ago** did the most recent unexpected congestion occur?

❑ Less than one week ago ❑ 1-2 weeks ago ❑ 2+-4 weeks ago ❑ 1-2 months ago ❑ More than 2 months ago

31. Were you on your way from: ❑ Home **to** work ❑ Work to home

32. What was the cause **of this** unexpected congestion?

- ❑ Disabled vehicle
- ❑ Accident
- ❑ Bad weather
- ❑ Construction/road work
- ❑ Don't know
- ❑ Other *(please specify)*_____

33. What was the weather like at that time? ❑ Clear ❑ Cloudy ❑ Rainy ❑ Windy ❑ Foggy

34. How did you learn about the congestion?

- ❑ Only by observing congestion
- ❑ First by observing congestion then through traffic reports
- ❑ Only through traffic reports
- ❑ First through traffic reports then by observing congestion
- ❑ **From** other sources *(please specify)* _____

35. When you first learned about this congestion, how much time did you expect it to add to your trip? _____ **(Minutes)**

36. How much time did the congestion actually add to your trip? _____ **(Minutes)**

37. After finding out about the congestion, did you have: (i) an opportunity to take an alternate route? ❑ Yes ❑ No
(ii) an opportunity to take public transportation (BART, bus, Muni, *etc.)?* ❑ Yes ❑ No

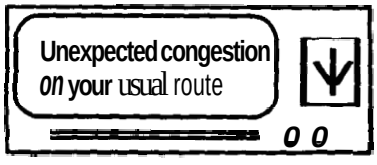
38. What did you do in response to the unexpected congestion? *(check all that apply)*
❑ Take your alternate route
❑ **Add** unintended intermediate stop(s), *e.g.*, stop at a store
❑ Did not change normal travel plans
❑ Use public transportation after parking the vehicle
❑ Cancel intended intermediate stop(s)

39. If you took an alternate route, did you return *to* your originally planned (usual) route?
❑ Yes ❑ No (continued on alternate route to the final destination)

40. Now imagine that you are starting this **trip** again (on the day of the most recent unexpected congestion) but this time you have a special device in your vehicle which gives you accurate traffic information. You are not aware of any congestion until you enter your vehicle and the device gives you one of the following messages. In each case, which route would you take?

*Note: To interpret these messages, use what you remember of the actual traffic conditions on the day of the most recent congestion and what you **know** about traffic conditions on your best alternate route.*

(i) The device knows your usual route and gives you the following message:



	Definitely take my usual route 1	2	3	Definitely take my best alternate route 4	Can't say
but does not tell you how much of a delay this congestion is causing_____	O	O	O	O	[ ]
(ii) The device gives you the same message as above and suggests that you take your best alternate route_____	O	O	O	O	[ ]
(iii) The device tells you the expected length **of** delay on your usual route (your response to Question 35) at the present time _____	O	O	O	O	[ ]
(iv) The device tells you the length of delay at the present time, and accurately *predicts* the length of delay it *will* cause **15** and 30 minutes into the future—	O	O	O	O	[ ]
(v) The device tells you the length of delay at the present t i e , and provides information regarding *present* travel times on your best alternate route ——	O	O	O	O	[ ]

◆ ● ADVANCED TRAVELER INFORMATION EXPERIMENT ◆ ◆

We are planning to conduct a six-month experiment to test a computerized "in-vehicle" information system. Each participant will receive a system (computer, video display, and antenna all mounted in the vehicle) that will provide travel information and electronic "yellow pages" free of charge. This information may help gnu avoid congestion, reduce travel times, reduce stress, and increase your knowledge of travel and destination options.

41. Suppose that you are considering participating in the experiment. Please indicate on a scale of 1 to 5 how the following benefits would influence your willingness to participate.

	Does not influence my willingness 1	2	3	4	Greatly increases my willingness 5
(i) You will be informed about road construction and accidents on a priority basis	O	O	O	O	O
(ii) This system will allow you to locate your car at any time (in case of theft, for example)	O	O	O	O	O
(iii) You will be able to call for police/ambulance in emergencies	O	O	O	O	O
(iv) You will be insured against theft of the information system equipment and any related damage caused to your car	O	O	O	O	O

In addition, we plan to offer money to participants who are willing to perform any of two optional tasks. Please indicate on a scale of 1 to 4 how willing you would be to complete each task in exchange for the stated sums of money.

42. Optional Task A
Once a week, leave home for work 30 minutes earlier than normal in exchange for the sum of:

	Definitely would not leave earlier 1	2	3	Definitely would leave earlier 4	Can't say
• $25 per month	O	O	O	O	[ ]
• $50 per month	O	O	O	O	[ ]
• $75 per month	O	O	O	O	[ ]
• $100 per month	O	O	O	O	[ ]

43. Optional Task B
Once a week, take your best "alternate" route in exchange for the sum of:

	Definitely would not take alternate route 1	2	3	Definitely would take alternate route 4	Can't say
• $25 per month	O	O	O	O	[ ]
• $50 per month	O	O	O	O	[ ]
• $75 per month	O	O	O	O	[ ]
• $100 per month	O	O	O	O	[ ]

◆◆ ABOUT YOURSELF ◆◆

The following information is requested for statistical purposes only.

44. Please indicate your level of agreement or disagreement with the following statements.

	Strongly disagree 1	2	3	4	Strongly agree 5
(i) I frequently listen to radio traffic reports	O	O	O	O	O
(ii) I like discovering new routes to get someplace	O	O	O	O	O
(iii) I am willing to take unfamiliar routes to avoid traffic delays	O	O	O	O	O

45. Gender: ❑ Male ❑ Female

46. Age: ❑ Under 18 years ❑ 18-29 years ❑ 30-39 years ❑ 40-49 years ❑ 50-64 years ❑ 65 and over

47. What is the highest level of education you have completed?

❑ High school or less O Some college ❑ Vocational or technical school
❑ Graduated college (Bachelors degree) ❑ Post graduate (Masters or Doctoral degree)

48. What best describes your occupation?

❑ Clerical/Secretary ❑ ExecutiveManagerial ❑ Retired
❑ Professional/Technical ❑ Service ❑ Student
O Salesperson/Buyer ❑ Construction ❑ Production/Manufacturing
❑ Skilled crafts ❑ Other *(please specify)*_____

49. What is your: (i) home zip code? _____
(ii) work zip code? _____

50. How long have you: (i) lived at your present home location?_____(Years)
(ii) worked at your present job location?_____(Years)

51. How many motorized vehicles (cars, vans, trucks, two wheelers) does your household have?_____ (Number of vehicles)

52. How many persons, including yourself, live in your household?_____ (Number of persons)

53. How many persons in your household, including yourself, are employed full-time?_____(Number of employed persons)

54. What is your personal annual income from all sources before taxes? (this information will be strictly confidential)

❑ **Under** $20,000	❑ $20,000 - $40,000	❑ $40,001 - $60,000
❑ $60,001 - $80,000	❑ **$80,001** - $100,000	❑ Over $100,000

Thank you very much! Please return the completed questionnaire within two weeks. No postage is required.

Comments (optional):_____