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Land Use and Travel Behavior: PART I

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
AIR RESOURCES BOARD
Research Division

LAND USE AND TRAVEL BEHAVIOR

Part I

Final Report

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The contents of this paper reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the State of California. The paper does not constitute a standard, specification, or regulation.

PREFACE

California's air quality in many metropolitan areas has deteriorated to the point that residents are concerned enough to rouse their legislators to protect and improve air quality through enaction of new legislation (The Clean Air Act of 1990). While the federal statutes place certain demands on improving California's air quality, California's air quality standards are more rigorous than the federal standards or any other state's standards. The major contributor to air pollution is vehicle emissions. This study focuses on the relationship among land use density, mixture, transit accessibility and vehicle use. The last item stems from travel behavior, which in turn reflects attitudes and behavior patterns. Our need to understand the underlying factors of travel decisions and the attitudes indicating which decision will be made has lead to the undertaking of this study.

We wish to gratefully acknowledge the support of the California Air Resources Board Staff as well as Chuck Purvis of the Metropolitan Transportation Commission (MTC) for providing the San Francisco Bay Area demographic and land use data base for this study. In addition we acknowledge all the graduate and undergraduate students who contributed to the endeavor, including: Ram Pendayala, Bagher Baharder, Sherri Hardiman, Francisca Mar, Prasuna DVG Dornadula, Brandy Olson, Jamie Rundgren, Tom Hoang, Catherine Kawachi, and Tzuoo-Ding (Roger) Lin. In addition we appreciate the logical order and questionnaire syntax suggested by Stephen Potter, of the Open University in London, England, and John Robinson of the University of Maryland. Thanks to Susan O'Bryant for her vigilant oversight of the budget and attention to a myriad of other administrative details.

ABOUT Part I and II

After completing the main report (Part I), we wished to distill some of its key descriptive and model results in a shorter paper for publication. The journal article in Part II is that paper, forthcoming in the *Transportation* journal. Most of the topics in the article are contained within the main report (although sometimes re-packaged in a more summary fashion). The main report, however, contains a great deal more detail. The article in Part II does slightly extend the analysis of the main report by conducting F-tests on the one-by-one exclusion of blocks of attitudinal, neighborhood, and socio-economic variables from a full model containing all types of variables (Table 11 of Part II)

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1. INTRODUCTION

As the air quality in many urban areas of California becomes a pressing issue, the need to reduce vehicular emissions has become more and more acute. Although a wide range of travel demand management (TDM) measures have been adopted to reduce urban vehicular traffic, it is doubtful whether these measures alone are sufficient in rapidly growing urban and suburban areas of California. From the fact that land use patterns are the primary determinants of the distribution of trip origins and trip destinations -- hence trip length and vehicle miles traveled (VMT)--and the fact that the viability of public transit critically depends on land use density, it follows that comprehensive emission reduction measures must embrace policies on land use development.

The understanding of the relationship between land use and travel behavior is unfortunately limited. Widely practiced forecasting procedures assume that household trip generation (the number of trips made by a household per day) is a function of its demographic and socio-economic attributes, while land use density and transit accessibility are assumed to have no impact. The effect of land use on trip generation is assumed to be indirect and is through vehicle ownership.

Unfortunately, models of vehicle ownership used by planning agencies are too simplistic to reflect land use density or transit accessibility. Although household vehicle ownership can be modeled using residential density as one of the explanatory variables, quite often such variables are not incorporated in vehicle ownership forecasting models in use. For example, a model for the Sacramento metropolitan area uses housing unit type as an explanatory variable, which accounts for land use characteristics to only a very limited extent. The effect of land use density and mixture at the neighborhood level has not been established as land use information has been available only at the traffic zone level in traditional transportation studies.

On the other hand, recent research supports the notion that higher population density results in lower vehicle miles traveled by residents (Holtzclaw, 1991). The intent of the Mobility and Livable Communities Study is to extend the past research and determine the independent effect of

land use upon travel behavior while incorporating into the scope of the analysis demographic, socio-economic, and transportation level-of-service (LOS) as well as detailed descriptors of land use patterns.

A report by the California Energy Commission (CEC, 1993) claims that over 70% of survey respondents would switch from automobile to walking or bicycling for shopping and personal business trips if the trips were reduced to 1/2 mile in length and bicycle paths and pedestrian walkways were provided. Furthermore, 70% of the people surveyed indicated that they would like to live in a more compact community with these features. The CEC report further noted that, "nationwide, 38% of all vehicle trips are for shopping or personal business. About 60% of these vehicle trips are between 1/2 mile and 5 miles in distance. If half of these trips were shortened to less than 1/2 mile and, subsequently, half of these short trips were made on foot instead of driving, the number of shopping and personal business trips would lessen by about 15%. Total vehicle trips would decline by over 5%. The reduction in VMT and gasoline savings would be closer to 1 - 2%, since shopping and personal business trips under 5 miles only represent about 7% of the total VMT".

Yet, there's no guarantee that these intentions stated by survey respondents in response to hypothetical questions accurately represent behaviors that would be exhibited when the hypothetical situation materializes. Furthermore, it is extremely dangerous to anticipate changes in behavior based on statistical relationships found in data; care must always be exercised to distinguish between "statistical association" and "causal relationship." Observed correlation between land use density and VMT reflects the effects of many interrelated contributing factors such as income, vehicle ownership, and household structure. Therefore increasing land use density may not lead to as much reduction in VMT as the statistical correlation suggests. For example, a planned neighborhood with a specific land use density and configuration may not attract an intended mix of residents, leading to a VMT reduction that differed from what was initially anticipated.

As a comprehensive approach to the relationship between land use and travel, a set of five neighborhoods in a California metropolitan area are selected in this study for in-depth analysis.

The study sites are chosen to produce systematic variations among them in factors such as land use density and mixture, access to freeways, and transit availability. The trip-making behavior of a sample of neighborhood residents is surveyed and correlated to the above factors as well as to demographic and socio-economic characteristics of the household. Sample residents' life-styles and attitudes toward transportation and environmental problems are also incorporated into the analysis. Through the analysis, the study intends to determine differences in travel behavior attributable to land use factors.

The approach of this study, which is a hybrid of the social-scientific case study and large-scale survey research, enables the acquisition of detailed descriptions of land use and transportation service levels, which are essential for the study. At the same time, it facilitates multi-variate statistical analysis based on large sample survey results. The purpose of this research project is to determine the quantitative relationship between the density and configuration of land uses and the emissions (due to vehicle-trips and vehicle-miles traveled) that result. The goal of this research effort is to provide information to suggest whether, and/or in what ways, land-use-related policies will be effective in reducing emissions.

The findings presented in this report were obtained by analysis of the following:

1. a three part mail out/mail back survey including
   - a request for participation,
   - a household questionnaire, and
   - an individual questionnaires with a personal trip diary,

   from a survey conducted as part of this study.
2. Land use maps, road maps, Metropolitan Transportation Commission land use data base, census data and other sources which were used to designate neighborhoods within the study area. These data are used to document the following:
   - study site demographic and socio-economic characteristics,
   - transit service levels,
   - highway accessibility, and
   - land use density and mixture.

3. Information from the site survey.

The main analysis of the study is based on a sample of 953 households chosen randomly from five San Francisco Bay Area communities (area of at least one square mile) within the Metropolitan Transportation Commission's jurisdiction.

2. DAVIS SITE PILOT SURVEY

The Mobility and Livable Communities survey was piloted in Davis, California during the months of June, July, August and September, 1992. The objectives of the pilot survey were to ascertain:

- the effectiveness of the questions in eliciting appropriate responses,
- the effectiveness of an incentive system to increase survey response,
- timing between mailing phases, and
- verification of expected response rates for the additional neighborhoods to be studied.

The final survey design reflects the outcome of the pilot study.

2.1. Survey Description

The pilot study consists of a four phase mail-out/mail-back survey. The purpose of each phase is as follows.

Phase-0 is a one page questionnaire asking the recipient to participate in the study as well as requesting some household demographic information.

Phase-1 consists of a background questionnaire asking for more demographic and socio-demographic information, and trip diaries distributed to household members who are 16 or older.

Phase-2 is concerned with residential history, factors affecting residential and job location choice, perception of the neighborhood, and perceived mode availability and use as reported by a person representing the household, and factual information on household members (those who did not keep diaries), parking, and vehicles available.

Phase-3 establishes the action space of each household member (16 and older), and the mental map by travel mode. Phase-3 also asks attitudinal questions.

One-thousand Phase-0, "Will You Participate", questionnaires were delivered in a predominantly middle-class residential neighborhood of Davis. As well as asking for the household's participation, Phase-0 asked for basic household demographic information. Four-hundred twenty-eight (428) households responded, and 360 households agreed to participate. Following the recruitment phase, 360 Phase-1, the Background questionnaire, and 549 Trip Diaries were mailed (an average of 1.5 persons per household agreed to participate). Three-hundred sixty (360) Phase-2 Household questionnaires were mailed and 264 were returned. In the final phase, Phase-3, 551 questionnaires were mailed and 409 were returned.

The response rate of households agreeing to participate in the Davis pilot was high at 36 percent (the number of households agreeing to participate as a percent of Phase-0 questionnaires mailed). Seventy-three (73) percent of households which agreed to participate completed all three phases of the survey, and 75 percent of the individuals agreeing to participate completed all three phases of the survey.

2.2. Description of the Survey Sample

The minimum age of the survey respondents is 16 and the maximum age is 87. The average household size is 2.66 persons, and the average number of persons per household over 16 years of age is 2.14. On average 1.86 persons per household are employed and there are 3.03 bicycles per household. Of those responding, 97.1% have a driver's license, about 50% work full time, and 23% work part time.

Tables 2.1 and 2.2 show that the sample responding to the survey is older and has higher incomes than would be expected from the census data for the study area. Likewise home ownership is found to be much higher than would be expected from census data. While this is typical for self-administered surveys oft his type, it indicates that the sample is not completely representative of the population as a whole. Gender, on the other hand, is relatively balanced (see Table 2.3) with females slightly over-represented in the sample.

Table 2.1
Comparison of Age Distributions: Davis Sample vs. Census

AGE	SURVEY DATA	1990 CENSUS DATA
16 to 24 years	15.9	40.2
25 to 34 years	14.6	20.8
35 to 44 years	23.9	19.2
45 to 54 years	21.0	10.9
55 to 64 years	12.0	4.8
> 64 years	12.6	4.0
TOTAL*	100.0	99.9
No. of Persons	548	6631

*Total may not add up to 100% due to rounding error.

Table 2.2
Comparison of Household Income Distributions: Davis Sample vs. Census

HOUSEHOLD INCOME	SURVEY DATA	1990 CENSUS DATA
$0 to $5,000	4.2	7.0
$5,001 to $10,000	6.0	10.7
$10,001 to $20,000	4.5	19.3
$20,001 to $35,000	13.6	19.5
$35,001 to $50,000	16.6	16.0
$50,001 to $75,000	21.8	14.5
$75,001 to $150,000	31.5	11.6
> $150,000	1.7	1.4
TOTAL*	99.9	100.0
No. of Households	403	17968

*Total may not equal 100% due to rounding error.

Table 2.3
Comparison of Gender Distribution: Davis Sample vs. Census

GENDER	SURVEY DATA	1990 CENSUS DATA
Male	46.0	49.0
Female	54.0	51.0
Total	100.0	100.0

A total of 416 respondents indicated their means of travel to work and another 123 indicated their means of travel to school. The survey respondents reported that 55.3% drive alone to work and 31.7% drive alone to school (Table 2.4).

Table 2.4
Distribution of Commute Travel Modes: Davis Pilot Survey

TRAVEL MODE	PERCENT EMPLOYED USING	PERCENT STUDENTS USING	TOTAL
Drive Alone	55.3	31.7	49.9
Car/Vanpool	10.6	9.8	10.4
Public Transportation	2.6	6.5	3.5
Bicycle	21.6	43.1	26.5
Walk	2.6	3.3	2.8
Work at Home	7.2	Not applicable	5.6
Ride School Bus	Not applicable	4.9	1.1
Other	0.0	0.8	0.2
TOTAL*	99.9	100.1	100
No. of Persons	416	123	539

*Total may not equal 100% due to rounding error.

2.3. Survey Re-design

Based on results of the Davis pilot survey, the survey instruments were re-designed for the main Bay Area neighborhood surveys. Phase 0 is very similar to the original Phase 0. However, Phases 1, 2 and 3 have been combined into two surveys: an individual survey and a household survey. The trip diary was redesigned to facilitate both completion by the survey participant and data entry. A number of subtle changes have also been made in the survey design based on the results of the Davis pilot survey. The redesigned surveys provide the same information with fewer questions and are easier for the respondents to complete. In addition, having only two main phases leads to a significant saving in the cost of incentives and lower attrition from the beginning to end of the series of surveys. The questionnaires used in both the Davis and Bay Area Surveys can be found in Appendix A. All database information may be found in Appendix C.

3. DESCRIPTION OF BAY AREA STUDY SITES

Detailed land use, roadway network, and public transit information was collected in this study in a set of carefully selected neighborhoods. Each study site is approximately one square mile and defined by major streets. This microscopic information was integrated with demographic, socio-economic, attitudinal, and travel behavior data collected through mail surveys of households in the same neighborhoods. Because only a limited number of neighborhoods could be studied, they needed to be selected through a careful experimental design to yield the maximum amount of information. The procedure of selecting study sites is described in detail in this chapter.

3.1. Site Selection Procedure

The selection procedure utilized the 700-zone land use data base for the nine-county San Francisco Bay Area supplied by the Metropolitan Transportation Commission (MTC). In addition, census data and geographical information available from land use maps, road maps, and other sources were used in the procedure. Factors that are often found to be associated with travel behavior, such as income and residential density, were used in the selection of study sites. In this study, BART access and land use mix were used as additional controlling factors.

The original MTC database was composed of 700 zones. Initial selection of sites for the survey was based on filtering for those zones whose employee population reflected a largely agricultural, manufacturing or retail base, then by performing cross tabulations on population density, median income, and employment. Agricultural, manufacturing and retail percentages were calculated by taking the total number of employees in each category, and dividing by the total number of employees in the zone. Population density was calculated as total population divided by total acres. Employment was calculated as the percentage of total employees per total population. Zones whose percentage of agricultural and manufacturing employment was greater than 5% were

dropped from the database, as were zones whose percentage of retail employment was greater than 35%.

In order to gain a set of study sites that facilitate efficient statistical analysis, a strategy was set to obtain study sites that represent extreme values in terms of the controlling factors. This was achieved through the following procedure. A simple univariate analysis was performed on employment, population density and income. Upper and lower bounds were set for zonal income and zonal population density, of one standard deviation from their respective means, and for zonal employment of .35 of a standard deviation from the mean. Cross-tabulations were performed using zonal income and population density to identify zones that lie outside these bounds in categories of: high income with high density, low income with high density, high income with low density, and low income with low density. The same procedure was repeated for employment. Twenty zones were randomly selected from these tables, choosing two or three zones from each table.

From the twenty candidate zones, final selection was performed by correlating the location of the zone with access to transit on a zone map. For example, since San Francisco has access to BART, San Jose was chosen as a contrasting area with low access to mass transit. Zones were chosen for San Francisco reflecting high density with low income, and low density with high income, and corresponding zones were identified and selected from the San Jose area. One zone was selected from San Francisco with high density and high income; no corresponding zone was available from San Jose.

In selecting these sites, it was recognized that land use mix as well as population density is a critical determinant of travel behavior. Site selection was consequently performed considering population density, land use mix, and BART access. Another critical factor, income, was incorporated into the selection procedure by screening out those zones whose median annual incomes lie outside the $28,000 to $34,700 bracket. This was to avoid confounded analysis arising from correlations between income and population density or land use mix across study sites. For example, if the only high-income zone studied were also a high-density zone, it would be difficult to separate the effects of income from density. Thus zonal income was held relatively

uniform across study sites while extremes were included in terms of population density and land use mix. Within each zone, however, income will vary across households, permitting the examination of the association between household income and travel behavior.

Nine sites were visited to examine their suitability for the study. A description of these candidate sites can be found in Table 3.1. The following are highlighted observations from the initial site surveys:

- With the exception of zone 266, all zones have a mix of high and low income housing.
- Zone 392 has very high income and very low income. Zone 266 is mostly very low to low income.
- Zone 541 - Daly City - diverse with very low income near the bottom of a hill and very high income in new developments along the ridges and hilltops bordering the San Bruno Mountains.
- The Pleasant Hill BART Station area was determined to be included in zone 98. However, the MTC demographic profile of zone 98 is not compatible with the observed characteristics of the area surrounding the station; specifically, the mean income for zone 98 is $22,585, while the newer multi-family dwellings in that area are, on average, $100.00 more per unit for a one-bedroom apartment than the rest of the neighborhood. We conjecture that the 1990 MTC data might not include information on newer developments, and thus may not reflect a change in mean income for this area.

Because of the difficulty in determining MTC zone boundaries on street maps, zone 392 was surveyed in error. The original zone to be surveyed was zone 393, which has a higher population and a much higher residential density, higher mixed use, and a lower mean income than zone 392.

In assessing relative densities within neighborhoods and between zones, square-footage parameters were used. These are summarized in Table 3.2.

Table 3.1
Bay Area Study Candidate Sites

SITE	BORDER	NAME	DENSITY		LAND USE[3]	MEAN ANNUAL HOUSE-HOLD INCOME ($)	BART ACCESS
			Population[1]	Residential[2]			
Concord 479	North East South West	Concord Blvd Farm Bureau Rd, Babel Ln Cowell Road Monument Blvd	9.5	15.6	0.6	29,187	Northwest corner
Pleasant Hill 98	North East South West	Oak Park Blvd, Mayhew Wy Bancroft Rd Contra Costa Canal Putnam St	7.0	36.2	3.0	22,585	BART in center of zone
North San Francisco 438	North East South West	California St Divisidaro St Fell St Stanyan St, Fulton (East-West), Arguello Blvd	41.4	80.1	.02	44,846	No BART station in zone. Access approximately 1.25 miles away at Civic Center Station.
South San Francisco 392	North East South West	Dewey Blvd, Woodside Ave O'Shaughnessy Blvd, Bosworth Ave Monterey Blvd Santa Clara Ave, Claremont Blvd	18.5	34.1	0.03	40,476	Far Southeast corner
San Jose 232	North East South West	Hillsdale Ave Almaden Dr Branham Ln Meridian Ave	9.	14.	0.	33,891	No BART access

Table 3.1 (continued)
Bay Area Study Candidates Sites

SITE	BORDER	NAME	DENSITY		LAND USE[3]	MEAN ANNUAL HOUSE-HOLD INCOME ($)	BART ACCESS
			Population[1]	Residential[2]			
South San Francisco 393	North East South West	17th St, 16th St Hwy 101 Woodside Ave, Portola Dr, Clipper St, Army St Laguna Honda, Clarendon Ave	21.8	52.0	1.07	29,096	Two access points Middle at South end and Middle at North end
Daly City 541	North East South West	Hillcrest Dr, Mission St, Brunswick St, Hanover, Bellevue Ave South Hill Blvd, Crocker, Hill Dr San Pedro Rd, E Market St, San Bruno Mtns Junipero Serra Blvd	24.9	51.0	0.03	29,700	Northwest corner
San Jose 266	North East South West	Story Rd Clayton Rd, Mt Pleasant Rd, Ruby Ave Tully Rd Capitol Expwy	16.6	29.8	0.06	29,640	No BART access
Castro Valley 181	North East South West	Fairmont Dr Lake Chabot Rd Castro Valley Blvd Foothill Blvd	10.3	17.1	0.05	34,155	No BART access

[1]Number of people per acre of land
[2]Number of people per acre of residential land
[3]Total retail & service employment per total population

Table 3.2
Relative Housing Density

DENSITY	LOT SIZE IN SQUARE FEET PER UNIT	
	SINGLE FAMILY	MULTI-FAMILY
High	6,000 to 8,500	1,000 to 1,500
Medium	10,000 to 15,000	2,000 to 2,500
Low	20,000 to 40,000	3,000

The range for mean zone annual income had originally been set at between $28,000 and $34,700 per year for middle income. However, it became necessary to inject more flexibility into the income range due to realtive purchasing power differences in parts of the Bay Area. The goal was to adhere to a certain standard of living as evidenced by housing and general neighborhood maintenance. Final selection includes the following are the five study sites:

North San Francisco (Zone 438)	Residential density, population density, mixed land use are all high with no BART access in the zone.
South San Francisco (Zone 392)	Residential density and population density are high, and mixed land use is low. There is immediate BART access in the zone. This site offers a good contrast study in land use to the North San Francisco site; its median income is similar to that of North San Francisco.
Concord (Zone 479)	Population density and residential density are low; mixed land use is high. There is BART access in the zone.
Pleasant Hill (Zone 98)	High residential density contrasts with low population density, indicating high degree of mixed use.
San Jose (Zone 232)	Population density and residential density are low; mixed land use is high, with no BART access. This again affords an excellent opportunity to study the effect of mixed land use on travel behavior as a contrast site to the Concord study site. Mean income is similar to Concord.

The experimental design established by these study sites is presented below in Table 3.3.

Table 3.3
Mixed Use, Population Density and BART Access by Zone

Mixed Use	Population Density		BART Access
	Low	High	
Low	Davis		No BART
High	San Jose	N. San Francisco	No BART
Low		S. San Francisco	BART
High	Concord	Pleasant Hill	BART

4. SITE SURVEY DESCRIPTION

Implicit in land use and transportation planning is the philosophy that cities are for people. However, we have continued to aspire to the American Dream of a suburban single-family house on a half-acre lot with a three car garage (Kitamura, 1991). Land development patterns which accommodate these aspirations have played a significant role in shifting the emphasis away from concern for pedestrian or bicycle circulation in favor of automobiles. While these urban development patterns have provided a high level of motor-mobility, walking has often been made unattractive and difficult (Levinson and Smith, 1975).

The automobile, or some form of personal transportation which allows the same freedom of mobility, is here to stay. The concern is to allow for alternate modes of transportation when possible and to ensure a safe environment and avoid congestion for all transportation modes. Street patterns contribute to both a safe environment and decreased traffic congestion. Two street patterns are commonly used in land use design. The first, and more traditional design, is a grid pattern where streets are constructed at approximately 90 degree angles to each other. The second, more recent, pattern is the cul-de-sac layout in which development occurs along a short street with only one entrance and egress, with many cul-de-sacs emptying onto a main arterial street.

Both street patterns have advantages and disadvantages. Some advantages of a grid pattern include: alternate routes are available, there is less congestion, there is not a single collector arterial, distances are shorter for all transportation modes. The disadvantages of a grid design include: vehicle traffic may travel faster than on a cul-de-sac, it may be more difficult for pedestrians or bicycles to cross streets, there is through traffic rather than only local traffic. Advantages of a cul-de-sac street pattern include slower local traffic, less traffic volume on the cul-de-sac than on a grid street or an arterial, no through traffic. Disadvantages include: all cul-de-sacs

empty onto an arterial, fewer or no alternate routes available, increased speed and congestion on collector arterial, longer pedestrian and bicycle routes, pedestrian and bicycle safety may be problematic on collector arterials and main arterials.

In this study, travel, attitudinal, and socio-economic data were collected from a random sample of residents in five San Francisco Bay area neighborhoods. Observed differences between neighborhoods in these travel and other characteristics are expected to be correlated in part with different land use characteristics of those neighborhoods. Therefore, site surveys were conducted for each of the neighborhoods to evaluate its attributes in relationship to a safe trip environment for all mode choices as well as to assess congestion potential. The specific elements surveyed included width of streets, frequency and condition of bus stops, Bart stations and train stations (if any), presence of carpool lots, presence and condition of bicycle lanes; presence and width of sidewalks including building setbacks, and visibility and condition of pedestrian crosswalks.

Descriptions of the five study sites are given in this section followed by descriptions of the site survey design and survey results which offer quantitative measures of the neighborhood characteristics at these study sites. A map of the San Francisco Bay Area containing the study sites and maps of the respective sites are given in Appendix B.

4.1. Site Descriptions

Concord

Land Uses: Lying in the San Ramon Valley, the Concord site consists of a flat, wedge-shaped section of primarily two disparate elements. A downtown business district occupies the small western end of the site, into which protrudes the eastern terminus of BART, while the remainder of the site is devoted mainly to single family dwellings.

Circulation: The Contra Costa canal slices unobtrusively southward through the middle of the site. Four streets—Galindo Street, Concord Boulevard, Clayton Road and Cowell Road—radiate from the business district. Clayton Road, however, serves as the site's main artery. Almost

bisecting the site, Clayton Road contains virtually all the commercial businesses (excluding downtown) and multi-family dwellings within this neighborhood. The nearest freeway, State Route 242, is one-half mile to the west. A single paved bike trail parallels the canal and, although Cowell Road is designated as a bike route, street markings are absent. Sidewalks, either missing from or discontinuous along many streets, make walking difficult and hazardous.

Pleasant Hill

Land Uses: The only site transected by both a freeway (I-680) and BART, Pleasant Hill lies on the same flat valley floor as the Concord site which is approximately three miles to the northeast. Around a central planned district, which apparently has been given over to office complexes and apartments, multi-family dwellings and commerce predominate. To the west of the freeway along North Main Street and, to a lesser extent, Oak Park Boulevard, neighborhood commercial establishments are allowed. To the east along Treat Boulevard and Buskirk Avenue large office complexes are prevalent. Single family dwellings occur in three distinct, unattached zones within the site. An area of low density multi-family dwellings, separated by the natural boundary of Candelero Creek, occupies the site's eastern corner. Ongoing construction along I-680 at both N. Main Street and Buskirk Avenue indicates that the integration of the freeway and the BART station into the neighborhood is not complete.

Circulation: The Contra Costa canal with a paved bike trail serves as the site's southern boundary and links this site to Concord, as does BART. In addition, the two sites share three bus routes. At both sites transit lines originate at the BART station. Pleasant Hill, however, exhibits a far more heterogenous, even fragmented, configuration. The freeway effectively divides the site and inhibits movement. Only Treat Boulevard allows total east-west flow.

North San Francisco

Land Uses: The most populous of the sites with over 10,000 households, the North San Francisco site also occupies a hillside which culminates in Laurel Heights to the north. Intensely urbanized, the site contains a university, numerous churches and hospitals, and the headquarters

for Muni. Without either a BART station or a freeway (I-80 is approximately one mile to the east), the site boasts 21 bus routes. Wide sidewalks accompany each block. The widespread commercial activity is channeled somewhat along Geary Boulevard, the primary east-west artery, and Divisadero Street The site displays the most variegated of land use patterns. Apartment districts tend to adjoin commercial areas and mid-sized apartments often intermix with single family dwellings.

Circulation: The long, linear streets form a rigid grid pattern, which facilitates, even encourages, movement as most streets are through streets. This site invites entry, which may have been the cause for the high level of mixed use. Only Golden Gate Park inhibits north-south traffic flow. North San Francisco furnishes a much different example of hillside adaptation than South San Francisco and of the use of a grid pattern than San Jose.

South San Francisco

Land Uses: In contrast to the previous three sites, the South San Francisco neighborhood wraps around the slopes of Mt. Davidson, whose heavily wooded peak forms a park. As in Concord and San Jose, single family dwellings predominate. Multi-family dwellings are confined to a narrow, disjointed strip at the base of Mt. Davidson along Monterey Boulevard where they intermix with commercial establishments. Other commercial activity occurs primarily in isolated sections near the perimeter, especially near the BART station and along a short stretch of Portola Dr. A few apartments dot the site's interior. Like San Jose, commercial developments are absent within this neighborhood, but are confined to the periphery.

Circulation: A BART station sits at the site's most eastern point and I-280 lies close enough to provide convenient freeway access. Portola Dr. is the site's main artery for there are very few through streets here. Traffic flow stays to the perimeter as in San Jose. The numerous curved streets, conforming to the mountain's slopes, impede movement and protect the neighborhood's seclusion. The rectilinear streets in the southeast contrast with this design and more properly belong with the grid pattern to the south. Also, a modified grid pattern emerges north of Portola Dr. where the land flattens.

San Jose

Land Uses: San Jose's most striking characteristic is its uniformity. Shaped like a rectangle, the San Jose site consists almost exclusively of single family dwellings. A short, narrow band of duplexes is adjacent to the site's eastern boundary, while within the site only schools and parks break up the homogeneity of the residential pattern. Commercial areas, small and discrete, are confined to three corners of the site and along Branham Ln., which acts as the main commercial artery.

Circulation: Capitol Expressway forms the eastern boundary so freeway access is immediate. A BART line is lacking, but a light-rail system runs three miles to the east of this site. Five bus routes service the site, but only along the perimeter. Only two streets, Jarvis Avenue and Cherry Avenue, transect the site north-south and none in an east-west direction, giving traffic flow a strong north-south bias. Streets are strikingly similar to each other in their characteristics and the overall configuration suggests a highly modified grid pattern.

4.2. Site Survey Design

The original site survey for the Davis study area furnished the basic format for the Bay Area site surveys. Since the Davis survey involved only 1,000 households and 10 streets, modifications of the survey design were necessary in order to analyze the far larger and more populous Bay Area sites in an efficient and comprehensive manner. Businesses and parks/schools were treated as separate categories. Due to the larger number of apartments and the time constraints of the survey, information on apartments included just the address and number of units. Detailed bus and BART schedules were obtained for each site and maps showing bus stops, bus routes, traffic signs and signals, and land use patterns were included, similar to the Davis survey (see Appendix B).

The street survey itself was altered substantially both to facilitate the formatting of the data and to focus on the specific characteristics of the street which were most relevant to the project's purposes. The sheer number of streets, businesses, apartments and transit schedules mandated that as much information as possible should be obtained and presented in an accessible, coherent format. Thus, the design of the site survey attempts to be comprehensive and readable by

employing eight major categories for describing a site and thirteen characteristics for delineating each street.

4.3. Site Survey

The site survey included a number of pre-survey preparations. Land use, zoning and road maps were obtained for each site, as well as transit maps and schedules. Additional information on apartments, bike trails, social and cultural amenities, open space and urban general plans was acquired whenever possible. From this information a survey route was designed in order to expedite data collection and identify possible complex areas.

The survey was conducted by teams of two persons mostly by driving through the study sites in a vehicle. Using maps to keep track of the survey's progress, each street in each site was traversed at least once. Highly commercial streets, wide arterial streets and areas of mixed land use were surveyed with two to four trips in order to collect adequately the high level of information. In some areas the survey was done on foot.

The survey concentrated on the following information: physical street characteristics, associated neighborhood features (sidewalks, lighting, etc.), traffic signs and signals, the location of bus stops, the identification of apartments and schools, parks and open space, and the tabulation of businesses by their primary activity. To simplify the survey process, street characteristics were recorded which prevailed along the length of the street. All observations were made during the day and each site was visited at least twice.

The tapes used to record information on each site were transcribed using the site survey format and, together with the previously amassed maps and site information, formed the core of the survey report for each site. Street length was measured from a map. BART and bus schedules furnished the data for transit routes and times. Businesses were grouped first by street and then by street number. The number of units in an apartment was determined by direct inspection on the street, from literature gathered at the site and with the aid of post office information. In addition, the telephone book was a useful tool in deciphering incomplete, missing or confusing addresses. The tapes supplied the information needed to construct maps of bus stops and traffic signals, while

the transit booklets served as reference for maps of bus lines. Land use maps were derived primarily from zoning maps and, to a smaller extent, the general plan for a site, when available.

4.4. Results of the Site Survey

The findings of the site survey for each case study are included as an appendix to this report and include a detailed physical description of every street in each site together with transit schedules, apartment and business listings, public facilities and maps showing bus stops, traffic signs, bus routes and zoning maps. This detailed, particular information in conjunction with a broader perspective provided by street configuration and land use patterns allows the analysis of neighborhood characteristics, traffic circulation and land use variations among the five sites. Summary information characterizing the five Bay Area study sites can be found in Table 4-1.

Even a cursory look at the zoning maps leads to several observations. Despite different street configurations, Concord, San Jose, and South San Francisco have large contiguous areas of single family dwellings. South San Francisco and North San Francisco each display different urban adaptations to a hillside environment. Regarding commercial uses and apartments, the Concord, San Jose and South San Francisco sites have small, concentrated pockets of commercial use and relatively few apartments. Both North San Francisco and Pleasant Hill have just the opposite characteristics -- long commercial zones along major streets and an abundance of apartments.

Street patterns vary widely: a strict grid in the North San Francisco site, short and winding streets befitting the hillside location of the South San Francisco site, primary streets radiating from a business hub in the Concord site, a rectangular variation of the grid system in the San Jose site, a lack of any prevailing pattern in the Pleasant Hill site.

Concord changes abruptly from its western business district, which is dominated by office complexes and a BART station with few directional and informational signs to the surrounding quiet neighborhoods. Since north-south movement is difficult within this neighborhood, the radial streets, especially Clayton Road, carry the traffic flow through the site (hierarchical street pattern). Concentrated retail and multi-family areas along one street further insulates the study site

neighborhood. Beginning near the BART station and moving eastward, the street pattern undergoes successive changes from a straightforward grid to an incomplete rectangular grid to long, linear streets with more curves and rounded angles. Similar changes occur in the northern part of the site and give rise to a succession of small, discrete neighborhoods protected by the overall configuration of the site and the prevailing land use patterns.

Table 4.1
Study Site Characteristics Summary

Site Characteristic	CONCORD	PLEASANT HILL	NORTH SAN FRANCISCO	SOUTH SAN FRANCISCO	SAN JOSE
Street Pattern	Radiating	Fragmented	Grid	Curved, rectilinear, grid	Discontinuous, grid
Topography	Flat	Flat	Hills	Hill, flat	Flat
Business Location	Western end of site	Central near BART and Freeway	Throughout the site	Monterey Blvd and near perimeter	3 Corners of site
Freeway Access	Hwy 242 1/2 mile west	I-680 transects site	I-80 one mile east	I-280 to east	Capitol Expressway on eastern boundary
BART Access	West side of site	Center site	None	Southeast corner of site	None
Bus Lines	Three routes	Three routes	21 bus routes	One route	Five routes along perimeter
Main Street Name(s)	Galindo, Concord, Clayton, Cowell	Treat Blvd	Geary, Divisadero	Portola Dr	Branham
Main Street Direction	East-West	East-West	North-South and East-west	North-South	North-South
Bike Trails	Parallel to Contra Costa Canal and along Cowell Rd No Street Markings	Parallel to Contra Costa Canal at southern boundary	None	None	None marked
Sidewalks	Missing, Discontinuous	Discontinuous	Wide	Narrow, Discontinuous	Missing
Walking	Hazardous	Hazardous	Common	Difficult	Hazardous

San Jose achieves a comparable isolation in a different manner. Retail activity, as well as a minor two-family zone, are relegated to the site's periphery, while apartments are completely absent. San Jose is the most uniform of the sites, with over 90% of the streets having the same characteristics except for street length. The variations in street length conceal the underlying grid pattern which has been dissolved into diverse rectangular shapes. Such an arrangement discourages movement into and within the site and instead directs flow to the boundary streets. North-south movement prevails and reflects the orientation of the expressway and the light-rail system 3 miles to the east. In maintaining the integrity of its homogeneous structure within the confines of four major arterial streets, the San Jose site functions like an island neighborhood in an urban sea.

South San Francisco, the third site with a large area devoted to single family dwellings, also confines both commercial and multi-family zones to the periphery. The only major through street, Portola Dr., cuts diagonally across the site to the north, rather than into it. The winding streets around Mt. Davidson conform to the hilly terrain and contrast sharply with the linear, gridded streets of North San Francisco. Movement is most convenient along the boundary streets, for this street configuration also impedes flow into the site and helps to secure a measure of tranquility and isolation for the neighborhood. Even the freeway and a BART station occupy inconspicuous locations at the site's eastern edge.

As noted earlier, the North San Francisco site exemplifies a simple but strict grid pattern which has been imposed on the hillside unlike the graceful adaptation of the South San Francisco site or the more irregular grid of the San Jose site. Such a configuration of linear through streets appears to facilitate movement which befits an area with large commercial and multi-family zones. Moreover, a university and hospitals demand easy access and rapid movement. The primary flow is east-west along California Street, Geary Boulevard, which also has seven bus lines, Turk Boulevard and Fulton Street. A freeway's terminus to the west causes traffic to spill onto Fell Street, Masonic Avenue and Divisadero Street are major arteries, while the barrier of Golden Gate Park diminishes north-south flow. The high degree of mixed use complements the open structure of the site and the predictability of a consistent grid pattern.

With an intrusive freeway and a centrally located BART station with limited facilities for pedestrian access, the Pleasant Hill site is more a collection of urban fragments than a neighborhood. The disconnected street configuration and the three disjoined single family zones add to this. The lack of a clear street pattern and the fragmented nature of its land use zones reflect the disruptive, uncertain transition that this site appears to be undergoing. Only one east-west street, Treat Boulevard/Geary Road, and only one north-south street, N. Main Street, allow movement through the site. High density multi-family zones and commercial areas are scattered about the central planned unit district which has been given over to office buildings and apartments. A low density retirement community sits in isolation on the site's eastern side.

5. ANALYSIS OF BAY AREA HOUSEHOLD DATA

Characteristics of the Bay Area sample households are presented in this chapter. The population representativeness of the sample households and individuals is examined first with respect to age, sex, education level, and income. Following this, housing characteristics are compared across the study sites. Finally, perceptual factors pertinent to residential choice behavior are explored.

5.1. Population Representativeness

The respondents of the travel diary survey reasonably represent the study area in terms of gender. The gender distribution is practically identical to that in the census in most study sites (Table 5.1). The small chi-square (χ^2) values and the large values of α shown in the table imply that there is no basis to reject the null hypothesis that the distributions in the survey sample are statistically identical to those in the census (The χ^2 statistics is a measure of the difference between two frequency distributions, in this case the gender distribution in the survey sample and that in the census data. The larger the χ^2 value, the more different are the two distributions. The value of α in the table represents the probability that a χ^2-value greater than the one shown above will be obtained under the null hypothesis that the two distributions are identical. A large α (i.e., close to 1.0) thus implies that one is likely to be correct when accepting the null hypothesis. When α is small (close to 0), on the other hand, the χ^2 value is unusually large and the sample distribution and the theoretical (in this case census) distribution are distinct. It is therefore appropriate to reject the null hypothesis. In this case, α represents the probability that one is incorrect when rejecting the null hypothesis, i.e., the event that the null hypothesis in fact is true despite the large χ^2 value.)

The sample age distribution adequately represents the population in South San Francisco, Pleasant Hill, and San Jose (Table 5.2). However, the tendency is clear that individuals in the

younger age groups (16 to 24 and 25 to 34) are under-represented in most study sites, especially in Concord, while oldest age groups tend to be over-represented.

Table 5.1
Comparison of Gender Distributions
Between Survey and Census Data

SITE	CONCORD		PLEASANT HILL		NORTH SAN FRANCISCO		SOUTH SAN FRANCISCO		SAN JOSE	
GENDER	Survey	Census	Survey	Census	Survey	Census	Survey	Census	Survey	Census
Female	49.0	51.0	55.0	52.5	52.7	50.5	46.7	52.5	53.7	50.0
Male	51.0	49.0	45.0	47.5	47.3	49.5	53.3	47.6	46.3	49.9
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.1	100.0	99.9
χ^2	.10		.12		.10		.67		.26	
α	.75		.73		.74		.41		.61	
Sample Size	192	9472	220	22105	224	33087	227	29715	244	9428

Table 5.2
Comparison of Age Distributions
Between Survey and Census Data

SITE	CONCORD		PLEASANT HILL		NORTH SAN FRANCISCO		SOUTH SAN FRANCISCO		SAN JOSE		TOTAL	
AGE	Survey	Census	Survey	Census	Survey	Census	Survey	Census	Survey	Census	Survey	Census
16 to 24	5.8	12.5	2.3	11.8	3.2	48.2	3.1	10.8	7.0	13.5	4.3	14.3
25 to 34	8.9	24.9	23.5	30.0	27.9	29.2	10.2	17.2	16.1	24.9	17.5	25.1
35 to 44	23.6	21.4	18.0	19.7	30.2	18.7	26.2	22.0	18.2	22.0	23.2	20.4
45 to 54	23.0	13.5	18.4	12.1	17.6	10.5	24.9	15.3	16.1	16.5	19.9	13.0
55 to 64	18.3	10.3	18.9	9.6	10.4	6.8	14.7	13.0	23.6	12.6	17.2	9.9
>64	20.4	17.3	18.9	16.7	10.8	15.8	20.9	21.8	19.0	10.5	18.0	17.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.00	100.0	100.0	100.0	100.0	100.0	100.0
χ^2	15.1		12.4		42.7		8.9		12.48		6.3	
α	.02		.05		.00		.18		.05		.39	
Sample Size	191	7596	217	14479	222	31148	225	24883	242	7312	1097	85418

The Bay Area sample shares the tendency of most mail surveys to over-represent individuals with higher education (Table 5.3). The sample distribution of education levels is significantly different (at $\alpha = 0.05$) from that in the census data for all study sites except Pleasant Hill. In all study sites, individuals without a high school diploma and individuals with a high school diploma as a terminal degree are noticeably under-represented in the survey sample. Likewise, low income households are under-represented in the survey sample (Table 5.4) as is commonly true for mail surveys.

The analysis of this section points to the need to develop appropriate weights that are to be applied to the sample households or individuals so that results derived from the sample will properly represent the population. This is not performed in the analyses presented in this report and remains as a future task.

Table 5.3
Comparison of Education Levels
Between Survey and Census Data

HIGHEST EDUCATION LEVEL	CONCORD		PLEASANT HILL		NORTH SAN FRANCISCO		SOUTH SAN FRANCISCO		SAN JOSE	
	Survey	Census	Survey	Census	Survey	Census	Survey	Census	Survey	Census
< High School Diploma	4	14	2	8	1	15	5	12	3	13
High School Diploma	16	32	8	17	5	16	4	18	10	24
Some College	38	34	33	35	29	28	25	29	41	38
Bachelor's Degree	32	15	38	29	41	27	37	24	33	20
Advanced Degree	11	5	18	11	25	15	28	17	13	6
TOTAL	101	100	99	100	101	101	99	100	100	101
Sample Size	298	7454	295	14282	234	25226	293	24217	341	7044
χ^2	19.57		9.25		24.15		16.99		18.27	
α	.00061		.05747		.00007		.00194		.00109	

Table 5.4
Comparison of Household Income Distributions
Between Survey and Census Data

INCOME	CONCORD		PLEASANT HILL		NORTH SAN FRANCISCO		SOUTH SAN FRANCISCO		SAN JOSE	
	Survey	Census	Survey	Census	Survey	Census	Survey	Census	Survey	Census
1 to 5,000	0.0	2.1	1.0	1.8	1.71	6.2	0.6	2.6	1.6	1.24
5,001 to 10,000	1.1	7.0	1.0	3.6	1.7	9.5	0.6	5.2	0.5	3.4
10,001 to 20,000	6.7	13.7	6.7	8.4	6.9	14.6	3.3	7.0	5.3	9.5
20,001 to 35,000	21.9	19.2	23.0	20.5	21.7	24.1	10.4	14.9	13.8	9.4
35,001 to 50,000	22.5	20.5	27.3	24.5	26.9	18.1	16.9	16.0	21.2	15.4
50,001 to 75,000	27.5	23.0	23.9	21.9	24.0	16.0	29.5	24.4	33.3	27.8
75,001 to 150,000	19.7	13.6	16.8	17.1	13.1	9.3	32.2	23.2	23.8	32.2
>150,000	0.6	0.9	0.5	2.2	4.0	2.3	6.6	6.8	0.5	1.2
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Sample Size	178	2460	209	7211	175	16074	183	11445	189	1375

5.2. Housing Characteristics

Housing characteristics in the five Bay Area study sites are examined in this section to gain further insights into each neighborhood and the differences among them. The distribution of monthly rents is given by study site in Table 5.5. The number of missing observations shown in the table approximately represents the number of households that do not rent their homes. Most sample households own their homes in Concord, South San Francisco, and San Jose, while the North San Francisco sample consists largely of renters and the Pleasant Hill sample also contains a significant fraction of renters. The rent distribution for North San Francisco is very dispersed, suggesting the availability of a wide range of housing units in the area. This contrasts sharply with the tight distribution found for the Pleasant Hill site which contains many large apartment complexes.

Table 5.5
Distribution of Reported Monthly Rents

RENT ($/Month)	CONCORD	PLEASANT HILL	NORTH S.F.	SOUTH S.F.	SAN JOSE	TOTAL
<350	2	1	7	2	2	14
351 to 500	3	1	16	3	3	26
501 to 700	8	31	34	2	1	76
701 to 1,000	7	28	44	8	10	97
1,001 to 1,400	0	9	14	8	3	34
>1,400	0	1	3	0	0	4
Missing*	163	142	65	166	179	715
TOTAL	183	213	183	189	198	966

*The row titled "Missing" contains those people who own their own homes.

The distributions of reported home values (Table 5.6) confirm the observation from the site surveys that the San Jose study site is very homogeneous, with over 95% of reported home values falling in the range of $180,000 to $375,000. The South San Francisco site, on the other hand, exhibits a much wider spread with its mode in the $250,000 to $375,000 range. The North San Francisco site shows a similar distribution with a mode in the $375,000 to $575,000 range. The number of missing observations is quite high for North San Francisco presumably due to the higher fraction of renters in this study sites. Pleasant Hill and Concord have distributions with lower reported home values, with modes in the $180,000 to $250,000 range.

As one may expect from the distributions of home values and rents, the San Jose site is very homogeneous in terms of the number of bedrooms, with 93.8 of the sample households having either three or four bedrooms. The Concord site is also relatively homogeneous with 60.2 of the sample households having three bedrooms. The North San Francisco and Pleasant Hill sites have more disperse distributions that are skewed toward fewer numbers of bedrooms, probably a reflection of the higher fractions of renters in these sites. The South San Francisco sample exhibits a disperse distribution with a mode at three bedrooms.

Table 5.6
Distribution of Reported Home Values

HOME VALUE	CONCORD		PLEASANT HILL		NORTH SAN FRANCISCO		SOUTH SAN FRANCISCO		SAN JOSE		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
<80,000	0	0.0	3	1.4	0	0.0	1	0.5	0	0.0	4	0.3
80,000 to 120,000	8	4.4	21	9.8	0	0.0	2	1.1	1	0.5	35	3.0
120,000 to 180,000	49	26.8	31	14.5	6	3.3	4	2.1	5	2.5	125	10.7
180,000 to 250,000	79	43.2	55	25.7	7	3.8	18	9.5	72	36.4	306	26.2
250,000 to 375,000	25	13.7	29	13.6	14	7.7	76	40.2	98	49.5	319	27.3
375,000 to 575,000	1	0.6	4	1.9	22	12.0	43	22.8	2	1.0	87	7.5
575,000 to 775,000	0	0.0	0	0.0	6	3.3	16	8.5	0	0.0	22	1.9
>775,000	0	0.0	0	0.0	5	2.7	6	3.2	0	0.0	11	0.9
Missing	21	11.5	71	33.2	123	67.2	23	12.2	20	10.1	258	22.1
TOTAL	183		214		183		189		198		1167	100.0

The results of this section in general confirm the findings from the site survey and add to them that the North San Francisco site, and the Pleasant Hill site to a lesser extent, contain large fractions of renters. The San Jose site is very homogeneous in terms of housing value and housing unit size, while the South San Francisco site is very diverse. The Pleasant Hill and North San Francisco households tend to have smaller housing units in terms of the number of bedrooms. The Concord site is also relatively homogeneous, and shares with the Pleasant Hill site a distribution with lower home values, on average, than the other areas.

Table 5.7
Distribution of the Number of Bedrooms

NO. OF BEDROOMS	CONCORD	PLEASANTON	NORTH SAN FRANCISCO	SOUTH SAN FRANCISCO	SAN JOSE	% OF TOTAL
0	0.0	0.0	2.9	0.0	0.0	0.5
1	2.2	17.5	34.5	4.3	0.5	11.3
2	17.7	38.7	37.4	31.6	2.6	25.0
3	60.2	35.4	14.6	45.5	44.3	39.3
4	18.2	7.6	7.6	17.1	49.5	19.7
5	1.1	0.9	1.8	1.1	3.1	1.6
6	0.6	0.0	0.0	0.5	0.0	0.2
7	0.0	0.0	1.2	0.0	0.0	0.2
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
Sample Size	183	214	183	189	198	967

5.3. Residential Location

"Housing cost," "quiet neighborhood" and "safety and security" are indicated most frequently as the most important reasons why the sample households chose their current homes (Table 5.8a). Those indicated as the second and third most important reasons are shown in Tables 5.8b and 5.8c, respectively. The frequency distribution of the three most important reasons collectively, is shown in Table 5-9 for the 10 most often cited reasons.

Table 5.9 shows that, following these three reasons, proximity to public transit, work, and shops and services are indicated as important reasons for residential location. Affordability ("housing cost") appears to be the most decisive factor, followed by the living quality of the neighborhood ("quiet neighborhood" and "safety and security"), and accessibility ("close to transit," "close to work" and "close to shops and services'). Amenities ("style of housing units" and "spacious residential neighborhood") and "good school" follow. The proximity to freeways is

ranked low partly because some neighborhoods in the study sites do not have good freeway access. The fact that the sample households from the Concord and San Jose study sites that are well served by freeways also rank the factor low, however, suggests that freeway access is taken either for granted or not important in urban residents' residential choice.

The Concord sample shows a frequency distribution that approximates the combined distribution for all sites. In this sense the Concord sample is representative of all sites. "Safety and security," however, is ranked low, and despite the proximity to BART, proximity to transit is also ranked rather low.

The Pleasant Hill respondents are unique in that a large number of them indicated proximity to transit (95 respondents) and proximity to freeways (35 respondents) as one of the three most important reasons for residential location. In fact, proximity to transit is the second most frequently cited reason after housing cost among the Pleasant Hill respondents. It may be concluded that mobility is a major consideration for those who chose to live in Pleasant Hill.

Being in a "quiet neighborhood," which is the second most frequent reason, is only the sixth most frequent reason among the respondents from the North San Francisco site. "Close to transit," "close to work" and "close to shops and services" are all almost as frequently cited as "safety and security." The North San Francisco sample residents appear to have preferred accessibility to opportunities over quietness in the neighborhood. "Quiet neighborhood," on the other hand, is most frequently cited by the South San Francisco residents. "Spacious residential neighborhood" is also more frequently indicated by this group.

The San Jose site is unique because "close to transit" is least frequently cited by its sample respondents. After the same three most frequent reasons as in the sample-wide distribution, "style of housing units" is the fourth most frequent reason. This is followed by "close to shops and services" and "good school," suggesting the family-orientation of the San Jose sample.

Table 5.8a
First Most Important Reason for Selecting the Current Home

RESPONSES	CONCORD		PLEASANT HILL		NORTH SAN FRANCISCO		SOUTH SAN FRANCISCO		SAN JOSE		TOTAL	
No Response	6	3.3	5	2.3	1	0.6	9	4.8	13	6.6	34	3.5
Quiet Neighborhood	37	20.2	24	11.2	19	10.6	32	17.0	33	16.7	145	15.1
Safety and Security	7	3.8	27	12.6	28	15.6	27	14.4	21	10.6	110	11.4
Close to Work	11	6.0	20	9.4	7	3.9	6	3.2	6	3.0	50	5.2
Close to Transit	7	3.8	28	13.1	6	3.4	10	5.3	1	0.5	52	5.4
Nicely Landscaped Area	0	0.0	1	0.5	0	0.0	1	0.5	5	2.5	7	0.7
Housing Cost	68	37.2	63	29.4	64	35.8	52	27.7	70	35.4	317	33.0
Lively Neighborhood	1	0.6	0	0.0	1	0.6	0	0.0	1	0.5	3	0.3
Good School	8	4.4	5	2.3	6	3.4	6	3.2	5	2.5	30	3.1
Close to Freeway	1	0.6	5	2.3	2	1.1	1	0.5	2	1.0	11	1.1
Close to Shops and Services	1	0.6	2	0.9	11	6.2	1	0.5	1	0.5	16	1.7
Spacious Res. Neighborhood	10	5.5	6	2.8	0	0.0	13	6.9	3	1.5	32	3.3
Liked Style of Housing Units	10	5.5	12	5.6	8	4.5	14	7.5	21	10.6	65	6.8
Other	8	4.4	8	3.7	13	7.3	3	1.6	7	3.5	39	4.1
Lot/housing Availability	0	0.0	0	0.0	1	0.6	0	0.0	0	0.0	1	0.1
Investment Value	0	0.0	2	0.9	0	0.0	1	0.5	2	1.0	5	0.5
Shared Community Values	1	0.6	1	0.5	2	1.1	2	1.1	0	0.0	6	0.6
Close to Park, Grnblt, Bike	0	0.0	0	0.0	1	0.6	1	0.5	0	0.0	2	0.2
Lot Size	1	0.6	2	0.9	0	0.0	0	0.0	0	0.0	3	0.3
Close to Family/friends	2	1.1	2	0.9	3	1.7	1	0.5	3	1.5	11	1.1
Allows Pets	0	0.0	0	0.0	1	0.6	0	0.0	0	0.0	1	0.1
Family/child Home/nbrhd	3	1.6	0	0.0	1	0.6	1	0.5	2	1.0	7	0.7
Character of Nbrhd/ngbrs	1	0.6	1	0.5	2	1.1	3	1.6	2	1.0	9	0.9
View	0	0.0	0	0.0	2	1.1	2	1.1	0	0.0	4	0.4
TOTAL	183	100.0	214	100.0	179	100.0	186	98.9	198	100.0	960	99.8

Table 5.8b
Second Most Important Reason for Selecting the Current Home

RESPONSES	CONCORD		PLEASANT HILL		NORTH SAN FRANCISCO		SOUTH SAN FRANCISCO		SAN JOSE		TOTAL	
Not applicable	0	0.0	1	0.5	7	3.9	2	1.1	3	1.5	13	1.4
No Response	7	3.8	6	2.8	0	0.0	8	4.3	11	5.6	32	3.3
Quiet Neighborhood	26	14.2	26	12.2	14	7.8	30	16.0	34	17.2	130	13.5
Safety and Security	12	6.6	29	13.6	23	12.9	34	18.1	38	19.2	136	14.1
Close to Work	29	15.9	18	8.4	28	15.6	15	8.0	11	5.6	101	10.5
Close to Transit	16	8.7	29	13.6	27	15.1	30	16.0	0	0.0	102	10.6
Nicely Landscaped Area	4	2.2	3	1.4	1	0.6	4	2.1	4	2.0	16	1.7
Housing Cost	28	15.3	22	10.3	24	13.4	22	11.7	30	15.2	126	13.1
Lively Neighborhood	2	1.1	0	0.0	2	1.1	0	0.0	1	0.5	5	0.5
Good School	11	6.0	13	6.1	2	1.1	8	4.3	20	10.1	54	5.6
Close to Freeway	5	2.7	13	6.1	4	2.2	5	2.7	4	2.0	31	3.2
Close to Shops and Services	13	7.1	22	10.3	21	11.7	9	4.8	16	8.1	81	8.4
Spacious Residential Nbrhood	10	5.5	5	2.3	3	1.7	12	6.4	2	1.0	32	3.3
Liked the Style of Housing Units	14	7.7	17	7.9	12	6.7	6	3.2	13	6.6	62	6.4
Other	4	2.2	6	2.8	4	2.2	2	1.1	7	3.5	23	2.4
Lot/housing Availability	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Investment Value	0	0.0	0	0.0	0	0.0	0	0.0	1	0.5	1	0.1
Shared Community Values	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Close to Park, Grnbelt, Bike Tr.	0	0.0	1	0.5	3	1.7	0	0.0	0	0.0	4	0.4
Lot Size	1	0.6	1	0.5	0	0.0	0	0.0	0	0.0	2	0.2
Close to Family/friends	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Allows Pets	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Family/childhood Home/nbrhood	0	0.0	0	0.0	2	1.1	0	0.0	0	0.0	2	0.2
Character of Nbrhood, Neighbors	1	0.6	2	0.9	1	0.6	0	0.0	3	1.5	7	0.7
View	0	0.0	0	0.0	1	0.6	1	0.5	0	0.0	2	0.2
TOTAL	183	100.0	214	100.0	179	100.0	188	100.0	198	98.5	962	100.0

Table 5.8c
Third Most Important Reason for Selecting the Current Home

RESPONSES	CONCORD		PLEASANT HILL		NORTH SAN FRANCISCO		SOUTH SAN FRANCISCO		SAN JOSE		TOTAL	
Not Applicable	0	0.0	1	0.5	7	3.9	2	1.1	3	1.5	13	1.4
No Response	7	3.8	6	2.8	0	0.0	8	4.3	11	5.6	32	3.3
Quiet Neighborhood	26	14.2	26	12.2	14	7.8	30	16.0	34	17.2	130	13.5
Safety and Security	12	6.6	29	13.6	23	12.9	34	18.1	38	19.2	136	14.1
Close to Work	29	15.9	18	8.4	28	15.6	15	8.0	11	5.6	101	10.5
Close to Transit	16	8.7	29	13.6	27	15.1	30	16.0	0	0.0	102	10.6
Nicely Landscaped Area	4	2.2	3	1.4	1	0.6	4	2.1	4	2.0	16	1.7
Housing Cost	28	15.3	22	10.3	24	13.4	22	11.7	30	15.2	126	13.1
Lively Neighborhood	2	1.1	0	0.0	2	1.1	0	0.0	1	0.5	5	0.5
Good School	11	6.0	13	6.1	2	1.1	8	4.3	20	10.1	54	5.6
Close to Freeway	5	2.7	13	6.1	4	2.2	5	2.7	4	2.0	31	3.2
Close to Shops and Services	13	7.1	22	10.3	21	11.7	9	4.8	16	8.1	81	8.4
Spacious Residential Neighborhood	10	5.5	5	2.3	3	1.7	12	6.4	2	1.0	32	3.3
Liked the Style of Housing Units	14	7.7	17	7.9	12	6.7	6	3.2	13	6.6	62	6.4
Other	4	2.2	6	2.8	4	2.2	2	1.1	7	3.5	23	2.4
Lot/housing Availability	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Investment Value	0	0.0	0	0.0	0	0.0	0	0.0	1	0.5	1	0.1
Shared Community Values	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Close to Park, Grnbelt, Bike Tr.	0	0.0	1	0.5	3	1.7	0	0.0	0	0.0	4	0.4
Lot Size	1	0.6	1	0.5	0	0.0	0	0.0	0	0.0	2	0.2
Close to Family/friends	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Allows Pets	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Family/childhood Home/neighborhood	0	0.0	0	0.0	2	1.1	0	0.0	0	0.0	2	0.2
Character of Neighborhood, Neighbors	1	0.6	2	0.9	1	0.6	0	0.0	3	1.5	7	0.7
View	0	0.0	0	0.0	1	0.6	1	0.5	0	0.0	2	0.2
TOTAL	183	100.0	214	100.0	179	100.0	188	100.0	198	98.5	962	100.0

Table 5.9
The Three Most Important Reasons for Selecting Current Home

	CONCORD	PLEASANT HILL	NORTH SAN FRANCISCO	SOUTH SAN FRANCISCO	SAN JOSE	TOTAL
Housing Cost	113	107	95	83	118	516
Quiet Neighborhood	97	75	45	97	99	413
Safety and Security	33	70	64	87	76	330
Close to Transit	41	95	61	65	8	270
Close to Work	54	47	60	35	31	227
Close to Shops and Services	35	51	62	31	46	225
Style of Housing Units	33	46	37	28	49	193
Good School	30	23	12	16	43	124
Spacious Res. Neighborhood	31	17	6	34	8	96
Close to Freeway	11	35	13	17	13	89
TOTAL	183	214	179	188	198	962

6. ASSOCIATION BETWEEN STUDY AREA CHARACTERISTICS AND TRIP RATES BY MODE

The analysis of this section focuses on the association between selected measures of individuals' travel behavior obtained from the three-day travel diary and various measures of study area characteristics. Both objective measures of neighborhood characteristics obtained by the research team and subjective measures reported by the respondents are included in the analysis. The objective of this section is to quantitatively assess how much land use characteristics, transit accessibility and other neighborhood characteristics affect travel demand, in particular vehicular travel demand.

As measures of travel demand, the analysis of this section focuses on:

- total number of person trips,
- number of transit trips,
- number of non-motorized trips,
- fraction of automobile trips,
- fraction of transit trips, and
- fraction of non-motorized trips.

The individual, not the household, is used in the analysis of this study because of the advantage that attributes specific to individuals can be incorporated into the analysis, in particular the attitudes toward transportation, environment and energy problems or other pertinent aspects of urban life (see Chapter 8). Note that the analysis is for those individuals who were over 16 years old at the time of the survey and from whom trip-diary data are available.

Quantitative models are developed to explain the variations in, and predict the future values of, these travel demand measures using demographic and socio-economic attributes of the sample households and their members, along with the following measures of land use characteristics:

- study area dummy variables,
- macroscopic area descriptors,
- pedestrian/bicycle facilities indicators,
- housing choice indicators,
- microscopic accessibility indicators, and
- perceptions of living quality.

Note that these measures are by no means independent of each other, but tend to represent the same or overlapping aspects of land use in different manners. These land use descriptors are explained below.

Study Area Dummy Variables

These are 0-1 dummy variables that identify which study area each respondent is from. Variable names used in the analysis are:

North San Francisco
South San Francisco
Concord
Pleasant Hill
San Jose

Each variable takes on a value of 1 if the respondent comes from the study area indicated by the variable name; otherwise the variable will take on a value of 0. For example, the variable, "North San Francisco" will equal 1 if the respondent is from the North San Francisco study area. The variable for San Jose is omitted in all models because of the linear dependency among these variables. This is equivalent to setting the model coefficient for San Jose as 0 as a reference point.

Macroscopic Area Descriptors

The variables included in this group are:

BART Access
Mixed Land Use
High Density

These variables are also 0-1 dummy variables that are defined based on the factors considered during the site selection process. As Table 3.3 of Chapter 3 indicates, BART Access is 1 for South San Francisco, Concord and Pleasant Hill respondents, and 0 for North San Francisco and San Jose respondents. Mixed Land Use is 1 for North San Francisco, Concord, Pleasant Hill, and San Jose respondents, and 0 for those from South San Francisco. Finally High Density is 1 for North San Francisco, South San Francisco, Pleasant Hill, and 0 for Concord and San Jose.

Pedestrian/Bicycle Facilities

This group consists of the following two variables,

Sidewalk
Bike Path

The first variable is a 0-1 dummy variable defined in terms of the response to the following question (Q. 9) in Phase 1, Household Questionnaire, Part B, "Are there sidewalks in your neighborhood?" and takes on a value of 1 if the response is affirmative. The second variable is also a 0-1 dummy variable defined based on the response to "Are there bike paths in your neighborhood?" (Q. 10, Part B, Household Questionnaire).

Housing Choice Indicators

This group comprises the following three 0-1 dummy variables:

Backyard
Parking Spaces Available
Own Home

The first variable is defined by the response to "Do you have a private backyard?" and the third variable by the response to "Do you own your home?" (Q. 10 and Q. 11, Part A, Household Questionnaire). The second variable, Parking Spaces Available, is defined by their response to "How many parking spaces are available exclusively for your household use? Include your garage and driveway" (Q. 14, Part B, Household Questionnaire).

Microscopic Accessibility Indicators

Included in this group are:

Distance to Nearest Bus Stop
Distance to Nearest Rail Station
Distance to Nearest Grocery Store
Distance to Nearest Gas Station
Distance to Nearest Park

These variables are respectively defined based on the responses to the following five questions (Q. 7, Q. 8, and Q. 16a, 16b and 16c) in Part B of the Household Questionnaire:

"How far away, to the nearest tenth of a mile, is the bus stop nearest your home?"

"How far away, to the nearest tenth of a mile, is the BART, Amtrak, CalTrain, or light rail station nearest to your home?"

"Approximately how far (in miles) is your home from the nearest:

a. Grocery store?
b. Gas station?
c. Park or playground?"

All measurements are in miles.

Perceptions of Living Quality

The following six variables are in this group:

No Reason to Move
Streets Pleasant for Walking
Cycling Pleasant
Good Local Transit Service
Enough Parking
Problems of Traffic Congestion

The first variable, no reason to move, is a 0-1 dummy variable that takes on a value of 1 if the respondent responded with "No reason to move at this time" to the question, "Given your current neighborhood situation, which of the following reasons may make you consider moving to a different area? (Check all that apply.)" (Q. 5, Part A, Household Questionnaire). The following five variables are also 0-1 dummy variables and are defined respectively based on the responses to the questions (Q. 1 through Q. 5, Part B, Household Questionnaire):

"Are the streets in your neighborhood pleasant for walking or jogging?"
"Is cycling pleasant in your neighborhood?"
"Is there good local public transit service in your neighborhood?"
"Is there enough parking near your home?" and
"Are there problems of traffic congestion in your neighborhood?"

In the rest of this section, models formulated for the measures of travel demand listed above are discussed. In the discussion, a "base model" is presented for each measure, the effects of the above six groups of variables are individually examined, then a best model is presented. Both the base models and best models are developed considering a wide range of variables representing the characteristics of the household, individual, and the neighborhood. The base models are constructed using only household and person demographic and socio-economic attributes, while the best models incorporate selected variables from the above six variable groups. The best models were, however, formulated independent of the estimation results using the six variables groups. Consequently there are occasions where the "best" model does not have the best goodness of fit. The set of variables considered in model development is given in Table 6.1.

Total Number of Person Trips

The base model explains slightly below 15% of the total variation in the number of person trips made by an individual over a three-day period (see Table 6.2). Despite the fact that the dependent variable of the model is the number of trips made by individuals, household size and number of persons over 16 years old turned out to be factors that significantly affect personal trip generation. The coefficients of these two variables together indicate that an individual over 16 years old from a household with an individual younger than 16 years old tends to make 2.62 more trips than one from a household without individuals in the younger age group; while an individual from a household with another individual of 16 years old or over tends to make 0.35 fewer (= 2.618 - 2.966) trips.

Table 6.1
Variables Used in the Analysis of Section 6

Household size
Number of persons over 16 years old
Number of cars
Number of cars per persons over 16 years old
Annual household income in $10,000
Square root of annual household income in $10,000
Number of years lived in the Bay Area
Drivers license holding
Age in years divided by 10
Square root of age divided by 10
Female dummy variable
Employment dummy variable
Homemaker dummy variable
Student dummy variable
Professional dummy variable
Low education dummy variable (up to high school diploma)
College education dummy variable
High education dummy variable (some graduate school or graduate degree)
Graduate education dummy variable (completed graduate degree)
Personal income dummy variables
Apartment dummy variable
Single family home dummy variable (including duplexes and triplexes)

Note: The variables in the six variable groups discussed earlier in the section are not included in this table.

Table 6.2
Linear Regression Models of the Total Number of Person Trips

	Base Model		Area Dummy Variables		Macro Area Descriptors		Pedestrian/ Bike Facilities	
	Coef.	t	Coef.	t	Coef.	t	Coef.	t
Intercept	2.308		1.230		1.348		1.795	
Household Size	2.618	8.92	2.755	9.29	2.722	9.19	2.614	8.89
Persons Over 16 Yrs. Old	-2.966	-6.68	-2.976	-6.66	-2.991	-6.69	-2.954	-6.63
Cars per Person	-0.094	-0.17	0.084	0.15	0.045	0.08	-0.129	-0.23
Driver's License	2.473	2.27	2.522	2.32	2.455	2.26	2.452	2.25
Age Divided by 10	-0.225	-2.53	-0.249	-2.79	-0.239	-2.68	-0.226	-2.53
Employment Dummy Variable	0.369	0.59	0.226	0.36	0.238	0.38	0.343	0.54
Student Dummy Variable	3.565	2.77	3.404	2.65	3.445	2.68	3.556	2.76
High Education Dummy Variable	0.658	1.31	0.586	1.17	0.579	1.15	0.654	1.30
Household Income (in $10,000)	-0.887	-2.53	-0.977	-2.77	-0.959	-2.72	-0.894	-2.54
(Household Income)$^{1/2}$	5.282	2.95	5.697	3.18	5.636	3.14	5.345	2.98
North San Francisco			2.312	2.64				
South San Francisco			0.257	0.37				
Concord			-0.223	-0.33				
Pleasant Hill			0.361	0.53				
BART Access					-0.880	-1.67		
Mixed Land Use					0.430	0.65		
High Density					1.215	2.22		
Sidewalk							0.347	0.56
Bike Path							0.348	0.74
Backyard								
Parking Spaces Available								
Own Home								
Distance to Nearest Bus Stop								
Distance to Nearest Rail Station								
Dist. to Nearest Grocery Store								
Dist. to Nearest Gas Station								
Dist. to Nearest Park								
No Reason to Move								
Streets Pleasant for Walking								
Cycling Pleasant								
Good Local Transit Service								
Enough Parking								
Problems of Traffic Congestion								
R^2	0.1471		0.1572		0.1544		0.1479	
F	13.37		10.28		10.85		11.18	
D.F.	10, 775		14, 771		13, 772		12, 773	
α	< 0.00005		< 0.00005		< 0.00005		< 0.00005	
F for the Group	-		2.308		2.221		0.358	
D.F.	-		4, 771		3, 772		2, 773	
Significance (* = 5%, ** = 1%)	-							

Table 6.2 (Continued)

	Housing Choice		Accessibility		Perception of Living Quality		Best Model	
	Coef.	t	Coef.	t	Coef.	t	Coef.	t
Intercept	1.879		2.599		1.933		2.022	
Household Size	2.682	9.03	2.610	8.84	2.599	8.71	2.835	9.62
Persons Over 16 Yrs. Old	-2.908	-6.55	-2.963	-6.59	-2.932	-6.52	-3.013	-7.07
Cars per Person	0.251	0.44	-0.098	-0.17	-0.122	-0.22		
Driver's License	2.615	2.41	2.549	2.33	2.442	2.23	2.805	2.66
Age Divided by 10	-0.220	-2.49	-0.229	-2.54	-0.214	-2.38	-0.232	-2.64
Employment Dummy Variable	0.276	0.44	0.378	0.60	0.241	0.38		
Student Dummy Variable	3.327	2.60	3.497	2.71	3.441	2.65	3.260	2.56
High Education Dummy Variable	0.608	1.22	0.655	1.30	0.672	1.33		
Household Income (in $10,000)	-0.937	-2.68	-0.907	-2.58	-0.933	-2.64	-0.979	-2.81
(Household Income)$^{1/2}$	5.552	3.11	5.379	3.00	5.520	3.06	5.791	3.27
North San Francisco							1.863	2.39
South San Francisco								
Concord								
Pleasant Hill								
BART Access								
Mixed Land Use								
High Density								
Sidewalk								
Bike Path								
Backyard	1.253	1.67						
Parking Spaces Available	-0.320	-3.18					-0.261	-2.73
Own Home	-0.766	-1.16						
Distance to Nearest Bus Stop			0.075	0.07				
Distance to Nearest Rail Station			-0.026	-0.15				
Dist. to Nearest Grocery Store			-0.420	-0.91				
Dist. to Nearest Gas Station			-0.208	-0.47				
Dist. to Nearest Park			0.066	0.21				
No Reason to Move					-0.560	-1.18		
Streets Pleasant for Walking					0.088	0.11		
Cycling Pleasant					0.215	0.41		
Good Local Transit Service					0.572	0.99		
Enough Parking					-0.320	-0.53		
Problems of Traffic Congestion					0.079	0.16		
R^2	0.1613		0.1496		0.1510		0.1622	
F	11.42		9.03		8.55		16.69	
D.F.	13, 772		15, 770		16, 769		9, 776	
α	< 0.00005		< 0.00005		< 0.00005		< 0.00005	
F for the Group	4.342		0.452		0.574		-	
D.F.	3, 772		5, 770		6, 769		-	
Significance (* = 5%, ** = 1%)	**						-	

Quite importantly, the model estimation results indicate that household vehicle ownership, here represented by the number of automobile per person over 16 years old, is not significantly associated with the number of trips per person, made by household members of over 16 years of age. The results also show that employment does not significantly affect trip generation either. Nor did high education dummy variable, which was introduced to the model to account for possible correlation between trip reporting and education, turn out to be significant.

Holding a driver's license is positively associated with person trip generation. Age, on the other hand, is negatively associated with person trip rates with the number of person trips tending to decrease as the person's age increases. The two income coefficients together imply a non-linear income effect which is concave and reaches its maximum at around an annual income of $90,000.

The study area dummy variables as a group contribute an additional 1% to the total variation explained. North San Francisco dummy variable has a positive and significant coefficient; other things being equal, a North San Francisco resident would make 2.31 trips more per three days than does a counterpart in the San Jose study area, whose dummy variable is suppressed from the model to facilitate model estimation. With an F-statistic of 2.31 with degrees of freedom of (4, 771), these variables as a group is significant at $\alpha = 10\%$ but not at $\alpha = 5\%$.

Estimation results indicate that respondents form the high density study areas on average reported 1.22 trips more per three days than did their counterparts in the low density study areas. The indicator of land use mix has an insignificant coefficient, while that of BART access is negative and significant at $\alpha = 10\%$. These variables are as a group is not significant $\alpha = 5\%$. The indicators of the presence of pedestrian and bicycle facilities, constructed based on the respondents' reports, turned out to be insignificant at any rate. Thus the number of trips generated by a person inclusive of all modes, is not associated with the presence of these facilities as perceived by the respondents.

The number of person trips is strongly and negatively associated with the number of parking spaces available to the household. The coefficient of backyard dummy variable is positive and significant at $\alpha = 10\%$, indicating that a person from a household with a backyard tend to

make more trips. Home ownership has a negative coefficient estimate, which turned out to be insignificant at $\alpha = 10\%$. This set of variables as a group is significant at $\alpha = 1\%$.

None of the microscopic accessibility indicators is significant. As a group, they have an F-statistic of 0.452 with degrees of freedom of (15, 770), a value that indicates that their effect is not at all statistically significant. The results here thus support the notion that person trip generation is not a function of the proximity to opportunity or accessibility to public transit. Some of the analysis presented below, on the other hand, indicate that the same cannot be said for trip generation by mode and for modal split.

None of the variables that represent perceptions of living quality is individually significant at $\alpha = 10\%$, nor are they significant as a group.

The best model selected for the total number of person trips contains as its explanatory variables: household size, number of persons over 16 years old, driver's license holding, age, student dummy variable, annual household income, square root of annual household income, North San Francisco dummy variable, and number of parking spaces available. Altogether the model explains 16.2% of the total variation in the dependent variable and is highly significant.

The coefficient estimates of these explanatory variables are relatively stable across the models presented in the table. As before, the model coefficients indicate that individuals from households with persons below 16 years old tend to make more trips, while those from households with persons over 16 years tend to make fewer trips. The number of trips tends to decrease with age, while those with a driver's license tend to make more trips. Students on average make 3.26 trips more over a three-day period than their non-student counterparts. Again, the effect of annual household income is non-linear and concave, peaking at approximately $90,000 per year. Other things being equal, North San Francisco residents make on average 1.86 trips more over three days than their counterparts from the other study areas, and those with more parking spaces available exclusively to their households tend to make fewer trips.

Number of Transit Trips

The models formulated for the number of transit trips are summarized in Table 6.3. Unlike the case for the total number of person trips, household size has an insignificant coefficient, while number of cars and driver's license holding both have significant negative coefficients. Transit trip generation appears to decrease slightly with age, but with a t-statistic of -1.41, the coefficient estimate is not significant. Employment and education are both correlated with transit trip generation, with employment dummy variable, professional dummy variable and high personal income dummy variable having positive coefficient estimates, while graduate school dummy variable having a negative coefficient. Another significant variable is the number of years lived in the Bay Area, which has a highly significant and negative coefficient estimate. Other things being equal, those individuals from households that had been in the Bay Area longer tended to make fewer transit trips. This is against the expectation that those who lived longer in the Bay Area tend to have more information about public transit and would tend to use it more frequently. It could be argued that those who moved to the area recently are more motivated to actively seek information about public transit and use it.

The study area dummy variables improves the percentage of the variation explained from 11.84% of the base model to 12.99%. All four dummy variables in the model have similar coefficient estimates and significant at $\alpha = 5\%$, except for North San Francisco dummy variable which is significant at $\alpha = 10\%$. They indicate that, other things being equal, residents from these four study areas tend to make about 0.45 transit trip more than do their counterparts from San Jose. As noted earlier, a dummy variable for San Jose is excluded from the model to avoid linear dependency. For interpreting the values of the four coefficient estimates, it can be assumed that the coefficient for San Jose is set to 0 as a reference point. The study area dummy variables as a group are significant at $\alpha = 5\%$.

Among the macro area descriptors, BART access dummy variable has a positive and significant (at $\alpha = 5\%$) coefficient estimate. This group of variables as a set is significant at $\alpha = 5\%$. The pedestrian/bike facilities variables have positive coefficient estimates but are not significant. Turning to the housing choice indicators, estimation results indicate that those from households with a backyard tended to make fewer transit trips (the coefficient estimate significant at $\alpha = 5\%$).

Table 6.3
Linear Regression Models of the Number of Transit Trips

	Base Model		Area Dummy Variables		Macro Area Descriptors		Pedestrian/ Bike Facilities	
	Coef.	t	Coef.	t	Coef.	t	Coef.	t
Intercept	2.154		1.592		1.532		1.998	
Household Size	-0.059	-0.72	-0.037	-0.45	-0.044	-0.53	-0.058	-0.71
Persons Over 16 Yrs. Old	0.293	2.17	0.296	2.16	0.300	2.19	0.307	2.26
No. of Cars	-0.526	-6.34	-0.489	-5.77	-0.494	-5.83	-0.536	-6.40
Driver's License	-0.740	-2.46	-0.692	-2.30	-0.705	-2.35	-0.749	-2.48
Age Divided by 10	-0.035	-1.41	-0.032	-1.27	-0.029	-1.18	-0.035	-1.40
Employment Dummy Variable	0.309	1.59	0.295	1.52	0.300	1.55	0.314	1.60
Professional Dummy Variable	0.320	2.02	0.314	1.99	0.306	1.94	0.315	1.99
Graduate School Dummy Variable	-0.408	-2.79	-0.411	-2.81	-0.401	-2.81	-0.405	-2.77
High Personal Income Dummy Variable	0.384	2.53	0.367	2.39	0.369	2.40	0.399	2.62
Years in Bay Area Divided by 10	-0.144	-4.05	-0.136	-3.73	-0.140	-3.86	-0.142	-3.99
North San Francisco			0.427	1.72				
South San Francisco			0.456	2.38				
Concord			0.436	2.34				
Pleasant Hill			0.555	2.90				
BART Access					0.320	2.18		
Mixed Land Use					0.154	0.84		
High Density					0.229	1.48		
Sidewalk							0.085	0.48
Bike Path							0.147	1.14
Backyard								
Parking Spaces Available								
Own Home								
Distance to Nearest Bus Stop								
Distance to Nearest Rail Station								
Dist. to Nearest Grocery Store								
Dist. to Nearest Gas Station								
Dist. to Nearest Park								
No Reason to Move								
Streets Pleasant for Walking								
Cycling Pleasant								
Good Local Transit Service								
Enough Parking								
Problems of Traffic Congestion								
R^2	0.1184		0.1299		0.1287		0.1199	
Standard Error of Estimation	1.727		1.720		1.720		1.728	
F	10.30		8.13		8.68		8.69	
D.F.	10, 767		14, 763		13, 764		12, 765	
α	< 0.00005		< 0.00005		< 0.00005		< 0.00005	
F for the Group	-		2.524		3.019		0.675	
D.F.	-		4, 763		3, 764		2, 765	
Significance (* = 5%, ** = 1%)	-		*		*			

Table 6.3
(Continued)

	Housing Choice		Accessibility		Perception of Living Quality		Best Model	
	Coef.	t	Coef.	t	Coef.	t	Coef.	t
Intercept	2.414		2.521		1.930		2.858	
Household Size	-0.004	-0.05	-0.069	-0.84	-0.060	-0.73		
Persons Over 16 Yrs. Old	0.258	1.90	0.284	2.11	0.269	1.97	0.258	2.42
No. of Cars	-0.466	-5.41	-0.506	-6.08	-0.502	-5.93	-0.476	-5.75
Driver's License	-0.714	-2.38	-0.722	-2.41	-0.759	-2.52	-0.650	-2.20
Age Divided by 10	-0.032	-1.28	-0.031	-1.25	-0.039	-1.55		
Employment Dummy Variable	0.247	1.27	0.320	1.66	0.304	1.56		
Professional Dummy Variable	0.318	2.01	0.304	1.94	0.345	2.16	0.395	2.79
Graduate School Dummy Variable	-0.424	-2.91	-0.396	-2.72	-0.408	-2.79	-0.417	-2.90
High Personal Income Dummy Variable	0.417	2.72	0.359	2.37	0.333	2.18	0.370	2.47
Years in Bay Area Divided by 10	-0.114	-3.02	-0.154	-4.34	-0.140	-3.69	-0.139	-3.97
North San Francisco								
South San Francisco								
Concord								
Pleasant Hill								
BART Access								
Mixed Land Use								
High Density								
Sidewalk								
Bike Path								
Backyard	-0.414	-1.98					-0.593	3.13
Parking Spaces Available	-0.041	-1.45						
Own Home	-0.046	-0.25						
Distance to Nearest Bus Stop			-0.372	-1.12				
Distance to Nearest Rail Station			-0.124	-2.50			-0.141	-3.01
Dist. to Nearest Grocery Store			-0.155	-1.21				
Dist. to Nearest Gas Station			0.163	1.29				
Dist. to Nearest Park			-0.126	-1.44			-0.211	-2.52
No Reason to Move					0.012	0.08		
Streets Pleasant for Walking					0.314	1.48		
Cycling Pleasant					-0.203	-1.37		
Good Local Transit Service					0.305	1.91		
Enough Parking					-0.097	-0.58		
Problems of Traffic Congestion					-0.135	-0.99		
R^2	0.1282		0.1371		0.1271		0.1386	
Standard Error of Estimation	1.720		1.714		1.725		1.707	
F	8.64		8.07		6.92		12.34	
D.F.	13, 764		15, 762		16, 761		10, 767	
α	< 0.00005		< 0.00005		< 0.00005		< 0.00005	
F for the Group	2.884		3.308		1.267		-	
D.F.	3, 764		5, 762		6, 761		-	
Significance (* = 5%, ** = 1%)	*		**				-	

The microscopic accessibility indicators substantially improves the model's fit to an R^2-value of 13.71%. All variables have negative coefficient estimates as expected, indicating that transit trip generation increases as the proximity to transit stops or that to opportunities increases (the latter represents both land use density and mixture). The most significant variable is distance to nearest rail station (significant at $\alpha = 5\%$). The fact that these variables as a group contribute substantially to the model's fit while individually they have insignificant t-values, implies the presence of multi-collinearity among these variables. The F-statistic for the group of variables indicates that they as a group are significant at $\alpha = 1\%$.

The variables representing perceptions of living quality are not significantly associated with public transit trip generation. Among the explanatory variables included in the best model, number of cars have the largest t-statistic value and its association with public transit generation is strongly negative. The variables selected from the six groups are: backyard dummy variable, distance to nearest rail station, and distance to nearest park. It is clear from the estimation results that public transit use is closely associated with the proximity to transit stops. The significance of backyard dummy variable and distance to nearest park suggests that residential density and mixture are also associated with transit use.

Number of Non-Motorized Trips

The inclusion of this particular mobility measure as a dependent variable of the analysis is motivated by the desire to assess the effect of land use characteristics and pedestrian and bicycle facilities on the generation of non-motorized trips. It was believed that the results of the analysis would aid in the development of guidelines for the creation of neighborhoods that are conducive of walking and bicycle trips and thereby produce less needs for vehicular trips.

As the small R^2 values and F-statistics of these models indicate (Table 6.4), this dependent variable is difficult to model. The base model indicates that the number of automobiles available to the household is negatively associated with the number of non-motorized trips (significant at $\alpha = 5\%$). The number of years in the Bay Area is also negatively associated with non-motorized trip

generation (significant at α = 10%). The effect of annual household income is again non-linear and concave with a peak at around $55,000.

The study area dummy variables substantially improve the model's fit to an R^2 of 4.73%. They as a group are significant at α = 1%. North San Francisco dummy variable has the largest coefficient estimate of 1.488; other things being equal, North San Francisco residents tend to make about 1.5 walking or bicycle trips more per three days than do San Jose residents. It can be safely inferred that the high density in the North San Francisco area does contribute to this high non-motorized trip generation rate. Note that the effects of auto ownership, household size and other demographic and socio-economic factors are accounted for in the model. Therefore the effects implied by the coefficients of the study area dummy variables are not due to differences in these demographic and socio-economic factors across the areas.

Among the macroscopic area descriptors, high density dummy variable has a significant (at α = 5%) positive coefficient, supporting the above observation of the contribution of high land use density to the generation of non-motorized trips. As a group, they are not significant at α = 5%.

Of the pedestrian/bicycle facilities indicators, sidewalk dummy variable is significant (at α = 10%) and positive. The two variables as a group are also significant α = 5%. The model thus offers evidence that having sidewalks in the neighborhood does contribute to the generation of non-motorized trips.

The model with the housing choice indicators suggests that residents in low density suburban areas tend to make fewer non-motorized trips. Likewise the microscopic accessibility indicators indicate that residents in high accessibility areas tend to make more non-motorized trips. Although individual t-statistics are small, these variables as a group substantially contribute to the model's explanatory power.

As was the case in the previous models, the variables representing perceptions of living quality tend to be insignificant and do not very much contribute to the model's fit. There is an indication that those who perceive that they have good local transit service tend to make more non-motorized trips, but the coefficient estimate of good local transit service dummy variable is not significant at α = 10%.

The best model suggests that the North San Francisco study area possesses characteristics that are conducive of non-motorized trips. The fact that this area indicator is included implies that other contributing factors, such as residential density, mixed land use, or accessibility, do not have large enough a contribution individually, but that the North San Francisco area has a combination of these factors that lead to a large enough and unique contributing force. Sidewalk dummy variable is significant in this model; other things being equal, residents in neighborhood with sidewalks tend to make nearly 0.6 non-motorized trip more over three days than do their counterparts in neighborhoods without sidewalks. The coefficient estimate of BART access dummy variable also indicates that residents in the study areas with BART access (South San Francisco, Concord and Pleasant Hill) tend to make more non-motorized trips.

The analysis of this dependent variable indicates that neighborhood characteristics, such as the presence of sidewalks, do affect the generation of non-motorized trips. The effects of demographic and socio-economic attributes of the household or individual do not have dominating effects on the generation of walk or bicycle trips. The results suggest that urban residents' travel behavior may be modified to some extent by site planning that encourage walking or the use of bicycles.

Fraction of Automobile Trips

The models used for this and the two dependent variables that follow take on the form,

$$n/N = 1/[1 + \exp(-\beta'X)]$$

where

- n = number of trips of interest, in this case the number of automobile trips,
- N = total number of trips,
- β = vector of coefficients, and
- X = vector of explanatory variables.

This can be transformed to yield

$$ln(n/(N - n)) = \beta'X$$

where *ln* is the natural-log transformation. This will take on the form of a linear regression model if $ln(n/(N - n))$ is used as the dependent variable. This, however, creates difficulty when either n is

Table 6.4
Linear Regression Models of the Number of Non-motorized Trips

	Base Model		Area Dummy Variables		Macro Area Descriptors		Pedestrian/Bike Facilities	
	Coef.	t	Coef.	t	Coef.	t	Coef.	t
Intercept	0.395		0.663		0.217		0.428	
Household Size	0.145	1.49	0.205	2.07	0.175	1.77	0.152	1.56
No. of Cars	-0.302	-2.76	-0.237	-2.13	-0.254	-2.26	-0.311	-2.81
Driver's License	-0.189	-0.43	-0.083	-0.19	-0.153	-0.35	-0.206	-0.47
Age Divided by 10	-0.013	-0.35	-0.027	-0.75	-0.018	-0.50	-0.017	-0.45
Student Dummy Variable	-0.506	-0.95	-0.590	-1.12	-0.583	-1.10	-0.529	-1.00
Professional Dummy Variable	0.254	1.27	0.269	1.35	0.238	1.19	0.225	1.13
Household Income (in $10,000)	-0.231	-1.61	-0.275	-1.93	-0.258	-1.80	-0.249	-1.73
(Household Income)$^{1/2}$	1.106	1.51	1.281	1.77	1.216	1.67	1.224	1.68
Years in Bay Area Divided by 10	-0.097	-1.88	-0.058	-1.10	-0.073	-1.39	-0.086	-1.66
North San Francisco			1.488	4.14				
South San Francisco			0.588	2.06				
Concord			0.341	1.26				
Pleasant Hill			0.426	1.51				
BART Access					-0.197	-0.92		
Mixed Land Use					0.096	0.35		
High Density					0.594	2.63		
Sidewalk							0.558	2.20
Bike Path							0.372	1.95
Backyard								
Parking Spaces Available								
Own Home								
Distance to Nearest Bus Stop								
Distance to Nearest Rail Station								
Dist. to Nearest Grocery Store								
Dist. to Nearest Gas Station								
Dist. to Nearest Park								
No Reason to Move								
Streets Pleasant for Walking								
Cycling Pleasant								
Good Local Transit Service								
Enough Parking								
Problems of Traffic Congestion								
R^2	0.0256		0.0473		0.0350		0.0343	
Standard Error of Estimation	2.583		2.560		2.575		2.574	
F	2.305		2.998		2.373		2.541	
D.F.	9, 789		13, 785		12, 786		11, 787	
α	0.0147		0.0003		< 0.00005		0.0037	
F for the Group	-		4.466		2.538		3.541	
D.F.	-		4, 785		3, 786		2, 787	
Significance (* = 5%, ** = 1%)	-		**				*	

Table 6.4
(Continued)

	Housing Choice		Accessibility		Perception of Living Quality		Best Model	
	Coef.	t	Coef.	t	Coef.	t	Coef.	t
Intercept	0.356		0.905		0.083		-0.149	
Household Size	0.173	1.75	0.132	1.36	0.143	1.45		
No. of Cars	-0.240	-2.12	-0.311	-2.81	-0.283	-2.52		
Driver's License	-0.117	-0.27	-0.131	-0.30	-0.181	-0.41		
Age Divided by 10	-0.010	-0.28	-0.010	-0.28	-0.016	-0.44		
Student Dummy Variable	-0.582	-1.09	-0.522	-0.99	-0.580	-1.08		
Professional Dummy Variable	0.261	1.30	0.265	1.33	0.257	1.27		
Household Income (in $10,000)	-0.242	-1.69	-0.248	-1.73	-0.252	-1.75		
(Household Income)$^{1/2}$	1.212	1.66	1.176	1.61	1.203	1.64		
Years in Bay Area Divided by 10	-0.055	-0.99	-0.103	-1.98	-0.093	-1.66		
North San Francisco							1.494	4.43
South San Francisco								
Concord								
Pleasant Hill								
BART Access							0.662	2.90
Mixed Land Use								
High Density								
Sidewalk							0.584	2.29
Bike Path								
Backyard	0.066	0.21						
Parking Spaces Available	-0.079	-1.90						
Own Home	-0.435	-1.55						
Distance to Nearest Bus Stop			-0.677	-1.42				
Distance to Nearest Rail Station			-0.002	-0.03				
Dist. to Nearest Grocery Store			-0.145	-0.76				
Dist. to Nearest Gas Station			-0.182	-0.96				
Dist. to Nearest Park			-0.211	-1.61				
No Reason to Move					0.020	0.09		
Streets Pleasant for Walking					0.055	0.17		
Cycling Pleasant					-0.097	-0.44		
Good Local Transit Service					0.364	1.54		
Enough Parking					-0.117	-0.48		
Problems of Traffic Congestion					-0.065	-0.32		
R^2	0.0348		0.0428		0.0292		0.0306	
Standard Error of Estimation	2.576		2.568		2.588		2.566	
F	2.360		2.501		1.569		8.376	
D.F.	12, 786		14, 784		15, 783		3, 795	
α	0.0055		0.0017		0.0764		< 0.00005	
F for the Group	2.488		2.807		0.479		-	
D.F.	3, 786		5, 784		6, 783		-	
Significance (* = 5%, ** = 1%)			*				-	

0 or N - n is 0 since the logarithm cannot be defined in that case. To avoid this, a small value, say 0.5, can be added to the numerator and denominator. Thus the regression models here use as their dependent variable the natural log of the number of automobile trips plus 0.5, divided by the number of non-automobile trips plus 0.5.

Cars per person and driver's license holding are the dominant explanatory variables of the base model, associated positively with the fraction of auto trips (Table 6.5). Other variables do not have significant coefficients.

The study area dummy variables are highly significant (at α = 1% as a group). They together improves the R^2 value from 9.65% of the base model to 13.97%. North San Francisco and South San Francisco have the largest negative coefficients, with Concord and Pleasant Hill following them in that order. As before, San Jose is excluded from the model and have a reference coefficient value of 0. The income variables have significant coefficients in this model. The income effect implied by the coefficients is non-linear and convex; annual household income contributes negatively first until it reaches about $65,000, beyond which point income starts contributing positively to the fraction of auto trips.

Of the macroscopic area descriptors, high density dummy variable has a significant negative coefficient estimate. They as a group are significant at α = 1%.

The pedestrian/bicycle facilities indicators are insignificant and contribute very little to the model's explanatory power.

Among the housing choice indicators, parking spaces available has a positive and very significant (at α = 1%) coefficient. Own home dummy variable is also significant (at α = 10%). Consistent with the earlier indication by high density dummy variable, home owners with ample parking spaces, who tend to live in low density suburbs, are more inclined to make auto trips. This set of variables is significant as a group at α = 1%.

Table 6.5
Linear Regression Models of the Fraction of Car Trips

	Base Model		Area Dummy Variables		Macro Area Descriptors		Pedestrian/ Bike Facilities	
	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Intercept	-0.721		0.176		-0.477		-0.663	
Cars per Person	0.636	4.14	0.506	3.31	0.532	3.44	0.620	4.01
Driver's License	2.263	6.92	2.134	6.65	2.194	6.75	2.243	6.85
Age Divided by 10	0.007	0.28	0.020	0.75	0.010	0.37	0.010	0.36
Employment Dummy Variable	0.069	0.37	0.123	0.67	0.114	0.61	0.083	0.44
Student Dummy Variable	0.185	0.49	0.219	0.59	0.205	0.54	0.192	0.50
High Education Dummy Variable	0.073	0.49	0.148	1.01	0.144	0.98	0.084	0.56
Household Income (in $10,000)	0.142	1.36	0.207	2.01	0.192	1.84	0.150	1.43
(Household Income)$^{1/2}$	-0.704	-1.33	-0.960	-1.84	-0.902	-1.71	-0.729	-1.37
North San Francisco			-1.357	-5.41				
South San Francisco			-0.946	-4.67				
Concord			-0.512	-2.63				
Pleasant Hill			-0.366	-1.87				
BART Access					0.053	0.34		
Mixed Land Use					0.279	1.43		
High Density					-0.424	-2.68		
Sidewalk							-0.106	-0.57
Bike Path							0.108	0.77
Backyard								
Parking Spaces Available								
Own Home								
Distance to Nearest Bus Stop								
Distance to Nearest Rail Station								
Dist. to Nearest Grocery Store								
Dist. to Nearest Gas Station								
Dist. to Nearest Park								
No Reason to Move								
Streets Pleasant for Walking								
Cycling Pleasant								
Good Local Transit Service								
Enough Parking								
Problems of Traffic Congestion								
R^2	0.0965		0.1397		0.1146		0.0979	
Standard Error of Estimation	1.877		1.837		1.862		1.878	
F	10.39		10.47		9.12		8.42	
D.F.	8, 778		12, 774		11, 775		10, 776	
α	< 0.00005		< 0.00005		< 0.00005		< 0.00005	
F for the Group	-		9.709		5.278		0.588	
D.F.	-		4, 774		3, 775		2, 776	
Significance (* = 5%, ** = 1%)	-		**		**			

Table 6.5
(Continued)

	Housing Choice		Accessibility		Perception of Living Quality		Bus Mode	
	Coeff.	t-Test	Coeff.	t-Test	Coeff.	t-Test	Coeff.	t-Test
Intercept	-0.970		-1.244		-0.720		-2.064	
Cars per Person	0.473	3.05	0.618	4.06	0.574	3.72	0.504	3.31
Driver's License	2.194	6.80	2.250	6.97	2.299	7.07	2.224	7.08
Age Divided by 10	0.003	0.12	0.002	0.09	0.010	0.36		
Employment Dummy Variable	0.188	1.00	0.041	0.22	0.078	0.41		
Student Dummy Variable	0.243	0.65	0.174	0.46	0.330	0.87		
High Education Dummy Variable	0.133	0.91	0.041	0.28	0.083	0.56	0.117	0.83
Household Income (in $10,000)	0.169	1.64	0.128	1.25	0.173	1.66		
(Household Income)$^{1/2}$	-0.905	-1.73	-0.589	-1.13	-0.825	-1.56		
North San Francisco								
South San Francisco								
Concord								
Pleasant Hill								
BART Access								
Mixed Land Use								
High Density								
Sidewalk								
Bike Path								
Backyard	0.001	0.00						
Parking Spaces Available	0.120	4.07					0.119	4.28
Own Home	0.378	1.92						
Distance to Nearest Bus Stop			1.142	3.65			0.880	3.31
Distance to Nearest Rail Station			0.037	0.70				
Dist. to Nearest Grocery Store			0.017	0.12				
Dist. to Nearest Gas Station			-0.153	-1.17				
Dist. to Nearest Park			0.235	2.54			0.239	2.77
No Reason to Move					0.109	0.78		
Streets Pleasant for Walking					-0.463	-2.02		
Cycling Pleasant					0.434	2.75		
Good Local Transit Service					-0.307	-1.80		
Enough Parking					0.426	2.42		
Problems of Traffic Congestion					0.186	1.30		
R^2	0.1271		0.1280		0.1190		0.1429	
Standard Error of Estimation	1.849		1.850		1.861		1.826	
F	10.26		8.73		7.45		21.67	
D.F.	11, 775		13, 773		14, 772		6, 780	
α	< 0.00005		< 0.00005		< 0.00005		< 0.00005	
F for the Group	9.064		5.579		3.279		-	
D.F.	3, 775		5, 773		6, 772		-	
Significance (* = 5%, ** = 1%)	**		**		**		-	

Turning to the microscopic accessibility indicators (significant at $\alpha = 1\%$ as a group), distance to nearest bus stop and distance to nearest park are both significant and positive. Those residing in areas where bus stops are sparsely located tend to have larger fractions of auto trips. The positive coefficient of distance to the nearest park suggests that residents of exclusively residential areas tend to show auto-dominated modal split.

Unlike the cases for the other dependent variables, many of the variables representing perceptions of living quality are significant here. These variables as a group are significant at $\alpha = 1\%$. The coefficients of cycling pleasant dummy variable and enough parking dummy variable are both positive and significant at $\alpha = 5\%$. Those who think cycling is pleasant and there are enough parking spaces in their neighborhoods are more likely to have larger fractions of their trips made by auto. The coefficient of streets pleasant for walking dummy variable is, on the other hand, negative. A possible interpretation is that the perception that walking is not pleasant leads to more frequent use of the auto for possibly safety or security reasons (therefore a negative coefficient for streets pleasant for walking dummy variable). The perception that cycling is pleasant, on the other hand, may be associated with wide streets without excessive on-street parking, which is characteristics of low-density suburban neighborhoods. Good local transit service dummy variable has a negative coefficient that is significant at $\alpha = 10\%$; those who think they have good transit service tends to have smaller fractions of auto trips.

The fact that many of the perception variables turned out to be significant for this dependent variable suggests that automobile use is strongly associated with the perception, or the assessment, of the conditions in the neighborhood. As will be discussed later, this is not the case for the fraction of transit trips or the fraction of non-motorized trips.

The best model comprises: cars per person, driver's license holding, high education dummy variable, parking spaces available, distance to nearest bus stop, and distance to nearest park. All variables except high education dummy variable are highly significant, and the model explains 14.29% of the variations in this dependent variable. Auto vs. non-auto modal split is primarily a function of auto availability, parking availability and accessibility to opportunities.

Demographic and other socio-economic attributes of households and individuals do not appear to exert appreciable effects on this modal split.

Fraction of Transit Trips

Models for the fraction of transit trips are summarized in Table 6.6. Significant variables in the base model are: household size, number of persons over 16 years old, number of cars, driver's license, graduate school dummy variable, high personal income dummy variable, and years in Bay Area. Over 13% of the total variation in the dependent variable is explained by the model.

Indicators of vehicle availability, number of cars and driver's license, are strongly and negatively correlated with the fraction of transit trips (significant at $\alpha = 1\%$). The coefficients of household size and number of persons over 16 years together imply that individuals from larger households with persons over 16 years old tend to have larger fractions of transit trips, while those from larger households with younger persons tend to have smaller fractions. The presence of children in the household appears to lead to a shift in modal split toward the automobile.
Individuals with graduate education tend to have smaller fractions of transit trips, while those with higher personal incomes tend to have larger fractions. As in the case for the number of transit trips, the number of years that the household had been in the Bay Area is negatively associated with the fraction of transit trips.

The study area dummy variables for South San Francisco, Concord and Pleasant Hill have significant positive coefficients, indicating that respondents from these study areas were more inclined to use public transit. All these study areas have BART access. The coefficient for North San Francisco is positive but not significantly different from 0. As before, the coefficient for San Jose is set as 0, which, like the case for the number of transit trips, turned out to be the lowest among the five areas. This set of variables as a group is significant at $\alpha = 5\%$.

Consistent with the above finding, the coefficient estimate for BART access is significant (at $\alpha = 1\%$) and positive. None of the other macroscopic area descriptors is significant. These variables as a group are significant at $\alpha = 5\%$.

Table 6.6
Linear Regression Models of the Fraction of Transit Trips

	Base Model		Area Delivery Variables		Micro Area Descriptors		Pedestrian/ Bike Facilities	
	Coef.	t	Coef.	t	Coef.	t	Coef.	t
Intercept	-1.200		-1.487		-1.420		-1.255	
Household Size	-0.222	-4.11	-0.223	-4.06	-0.226	-4.14	-0.222	-4.09
No. of Persons Over 16 Yrs. Old	0.410	4.59	0.417	4.62	0.419	4.64	0.414	4.62
No. of Cars	-0.353	-6.43	-0.335	-5.98	-0.338	-6.03	-0.356	-6.44
Driver's License	-0.936	-4.71	-0.908	-4.57	-0.914	-4.61	-0.940	-4.72
Age Divided by 10	-0.001	-0.01	0.004	0.24	0.005	0.31	-0.001	0.00
Employment Dummy Variable	0.093	0.73	0.099	0.77	0.102	0.79	0.094	0.73
Professional Dummy Variable	0.085	0.82	0.072	0.69	0.068	0.65	0.083	0.80
Graduate School Dummy Variable	-0.307	-3.18	-0.304	-3.15	-0.304	-3.15	-0.306	-3.16
High Personal Income Dummy Variable	0.227	2.26	0.205	2.02	0.206	2.03	0.232	2.31
Years in Bay Area Divided by 10	-0.065	-2.77	-0.067	-2.78	-0.069	-2.89	-0.064	-2.73
North San Francisco			0.110	0.67				
South San Francisco			0.310	2.46				
Concord			0.315	2.56				
Pleasant Hill			0.264	2.08				
BART Access					0.254	2.62		
Mixed Land Use					-0.018	-0.15		
High Density					0.007	0.06		
Sidewalk							0.029	0.25
Bike Path							0.053	0.54
Backyard								
Parking Spaces Available								
Own Home								
Distance to Nearest Bus Stop								
Distance to Nearest Rail Station								
Dist. to Nearest Grocery Store								
Dist. to Nearest Gas Station								
Dist. to Nearest Park								
No Reason to Move								
Streets Pleasant for Walking								
Cycling Pleasant								
Good Local Transit Service								
Enough Parking								
Problems of Traffic Congestion								
R^2	0.1319		0.1426		0.1418		0.1324	
Standard Error of Estimation	1.140		1.136		1.136		1.141	
F	11.66		9.06		9.71		9.73	
D.F.	10, 767		14, 763		13, 764		12, 765	
α	< 0.00005		< 0.00005		< 0.00005		< 0.00005	
F for the Group	-		2.368		2.942		0.198	
D.F.	-		4, 763		3, 764		2, 765	
Significance (* = 5%, ** = 1%)	-		*		*			

Table 6.6
(Continued)

	Housing Choice		Accessibility		Perception of Living Quality		Best Model	
	Coef.	t	Coef.	t	Coef.	t	Coef.	t
Intercept	-1.012		-0.995		-1.234		-0.728	
Household Size	-0.191	-3.45	-0.225	-4.17	-0.221	-4.03		
No. of Persons Over 16 Yrs. Old	0.398	4.44	0.400	4.49	0.390	4.34	0.203	2.86
No. of Cars	-0.328	-5.78	-0.341	-6.20	-0.337	-6.03	-0.335	-6.09
Driver's License	-0.914	-4.61	-0.931	-4.70	-0.942	-4.73	-0.919	-4.68
Age Divided by 10	0.001	0.09	0.004	0.24	-0.003	-0.19		
Employment Dummy Variable	0.053	0.41	0.102	0.79	0.085	0.66		
Professional Dummy Variable	0.080	0.76	0.075	0.72	0.107	1.01	0.099	1.05
Graduate School Dummy Variable	-0.306	-3.17	-0.299	-3.11	-0.306	-3.16	-0.306	-3.20
High Personal Income Dummy Variable	0.270	2.66	0.209	2.09	0.201	1.98	0.195	1.96
Years in Bay Area Divided by 10	-0.043	-1.71	-0.071	-3.04	-0.059	-2.36	-0.039	-1.67
North San Francisco								
South San Francisco								
Concord								
Pleasant Hill								
BART Access								
Mixed Land Use								
High Density								
Sidewalk								
Bike Path								
Backyard	-0.299	-2.17					-0.489	-3.88
Parking Spaces Available	0.001	0.05						
Own Home	-0.135	-1.09						
Distance to Nearest Bus Stop			-0.209	-0.95				
Distance to Nearest Rail Station			-0.081	-2.46			-0.084	-2.70
Dist. to Nearest Grocery Store			-0.025	-0.29				
Dist. to Nearest Gas Station			0.081	0.97				
Dist. to Nearest Park			-0.097	-1.67			-0.140	-2.52
No Reason to Move					-0.009	-0.10		
Streets Pleasant for Walking					0.117	0.83		
Cycling Pleasant					-0.116	-1.18		
Good Local Transit Service					0.171	1.61		
Enough Parking					-0.086	-0.78		
Problems of Traffic Congestion					-0.136	-1.52		
R^2	0.1420		0.1468		0.1396		0.1415	
Standard Error of Estimation	1.136		1.134		1.140		1.134	
F	9.73		8.74		7.72		12.64	
D.F.	13, 764		15, 762		16, 761		10, 767	
α	< 0.00005		< 0.00005		< 0.00005		< 0.00005	
F for the Group	3.008		2.665		1.138		-	
D.F.	3, 764		5, 762		6, 761		-	
Significance (* = 5%, ** = 1%)	*		*				-	

The pedestrian/bicycle facilities indicators again exhibit statistically insignificant association with the dependent variable.

Of the housing choice indicators, backyard has a significant (at α = 5%) negative coefficient, suggesting auto-oriented modal split in suburbs.

Distance to nearest rail station has a significant (at α = 2%) negative coefficient. The coefficient of distance to nearest park is also negative and significant at 10%. These microscopic accessibility indicators together increase the R^2 from 13.19% of the base model to 14.68%, and are as a group significant at α = 5%. Clearly accessibility to transit stops is an important factor that is associated with the fraction of transit trips.

Unlike the case of the fraction of auto trips, the variables representing perceptions of living quality are not significant and as a group only marginally contribute to the model's goodness of fit. Although not significant at α = 10%, good local transit service dummy variable has a positive coefficient and problems of traffic congestion dummy variable has a negative coefficient. Their weak (not significant at a 10% level) association with the dependent variable suggests that perceptions and actual mode choice behavior are not so strongly correlated for public transit as for the automobile.

In addition to the selected seven demographic and socio-economic variables, the best model includes backyard dummy variable, distance to nearest rail station, and distance to nearest park. Backyard dummy variable can be viewed as an indicator of residential density. The best model thus suggests that neighborhood characteristics are important determinants of the fraction of public transit trips. Unlike the case for auto vs. non-auto modal split, many socio-economic attributes are significantly associated with transit vs. non-transit modal split.

Table 6.7
Linear Regression Models of the Fraction of Non-motorized Trips

	Base Model		Area Dummy Variables		Macro Area Descriptors		Pedestrian/ Bike Facilities	
	Coef.	t	Coef.	t	Coef.	t	Coef.	t
Intercept	-1.480		-1.993		-1.756		-1.721	
Household Size	-0.068	-1.61	-0.048	-1.12	-0.058	-1.37	-0.066	-1.56
No. of Cars	-0.057	-1.21	-0.018	-0.38	-0.024	-0.49	-0.060	-1.25
Driver's License	-0.674	-3.56	-0.620	-3.30	-0.645	-3.42	-0.679	-3.58
Age Divided by 10	0.023	1.45	0.019	1.21	0.022	1.41	0.022	1.38
Student Dummy Variable	-0.443	-1.93	-0.485	-2.13	-0.483	-2.11	-0.449	-1.96
Professional Dummy Variable	0.066	0.77	0.057	0.66	0.046	0.53	0.058	0.67
Household Income (in $10,000)	-0.008	-0.14	-0.032	-0.52	-0.026	-0.42	-0.014	-0.22
(Household Income)$^{1/2}$	-0.058	-0.18	0.026	0.08	0.003	0.01	-0.023	-0.07
Years in Bay Area Divided by 10	-0.006	-0.28	0.007	0.29	0.001	0.05	-0.003	-0.13
North San Francisco			0.570	3.68				
South San Francisco			0.417	3.40				
Concord			0.201	1.71				
Pleasant Hill			0.280	2.29				
BART Access					0.012	0.13		
Mixed Land Use					-0.047	-0.40		
High Density					0.257	2.64		
Sidewalk							0.164	1.49
Bike Path							0.110	1.33
Backyard								
Parking Spaces Available								
Own Home								
Distance to Nearest Bus Stop								
Distance to Nearest Rail Station								
Dist. to Nearest Grocery Store								
Dist. to Nearest Gas Station								
Dist. to Nearest Park								
No Reason to Move								
Streets Pleasant for Walking								
Cycling Pleasant								
Good Local Transit Service								
Enough Parking								
Problems of Traffic Congestion								
R^2	0.0475		0.0690		0.0611		0.0515	
Standard Error of Estimation	1.113		1.104		1.108		1.113	
F	4.38		4.48		4.26		3.88	
D.F.	9, 789		13, 785		12, 786		11, 787	
α	< 0.00005		< 0.00005		< 0.00005		< 0.00005	
F for the Group	-		4.532		3.779		1.639	
D.F.	-		4, 785		3, 786		2, 787	
Significance (* = 5%, ** = 1%)	-		**		**			

Table 6.7
(Continued)

	Housing Choice		Accessibility		Perception of Living Quality		Best Model	
	Coef.	t	Coef.	t	Coef.	t	Coef.	t
Intercept	-1.459		-1.189		-1.512		-1.518	
Household Size	-0.054	-1.25	-0.075	-1.80	-0.067	-1.57	-0.089	-2.38
No. of Cars	-0.037	-0.76	-0.055	-1.16	-0.050	-1.03		
Driver's License	-0.652	-3.43	-0.646	-3.43	-0.670	-3.53	-0.649	-3.51
Age Divided by 10	0.024	1.54	0.025	1.57	0.020	1.26		
Student Dummy Variable	-0.469	-2.04	-0.442	-1.94	-0.492	-2.13		
Professional Dummy Variable	0.061	0.70	0.069	0.80	0.072	0.82		
Household Income (in $10,000)	-0.011	-0.18	-0.013	-0.21	-0.017	-0.27	-0.031	-0.51
(Household Income)$^{1/2}$	-0.025	-0.08	-0.047	-0.15	-0.026	-0.08	0.032	0.10
Years in Bay Area Divided by 10	0.010	0.42	-0.011	-0.48	-0.007	-0.27		
North San Francisco								
South San Francisco								
Concord								
Pleasant Hill								
BART Access								
Mixed Land Use								
High Density							0.280	3.37
Sidewalk								
Bike Path								
Backyard	-0.081	-0.60						
Parking Spaces Available	-0.018	-1.01						
Own Home	-0.128	-1.06						
Distance to Nearest Bus Stop			-0.347	-1.69			-0.393	-2.12
Distance to Nearest Rail Station			-0.034	-1.08				
Dist. to Nearest Grocery Store			-0.083	-1.01				
Dist. to Nearest Gas Station			-0.020	-0.25				
Dist. to Nearest Park			-0.107	-1.90			-0.138	-2.57
No Reason to Move					0.041	0.45		
Streets Pleasant for Walking					0.061	0.45		
Cycling Pleasant					-0.070	-0.75		
Good Local Transit Service					0.111	1.09		
Enough Parking					-0.099	-0.95		
Problems of Traffic Congestion					-0.097	-1.12		
R^2	0.0526		0.0688		0.0523		0.0666	
Standard Error of Estimation	1.113		1.104		1.115		1.101	
F	3.63		4.14		2.88		8.07	
D.F.	12, 786		14, 784		15, 783		7, 791	
α	< 0.00005		< 0.00005		0.0002		< 0.00005	
F for the Group	1.388		3.584		0.659			
D.F.	3, 786		5, 784		6, 783			
Significance (* = 5%, ** = 1%)			**					

Fraction of Non-Motorized Trips

Like the number of non-motorized trips, the fraction of non-motorized trips is difficult to model as indicated by the small R^2's and F-statistics in Table 6.7. Number of cars has a negative coefficient but not significant (at $\alpha = 10\%$) in the base model. Nor are the two income variables included in the model. Its significant coefficients indicate that those with a driver's license and students tend to have smaller fractions of non-motorized trips. The former variables is significant at $\alpha = 1\%$, and the latter at $\alpha = 10\%$.

The study area dummy variables considerably improve the model's fit, adding more than 2% to the R^2 value. They as a group are significant at $\alpha = 1\%$. The estimated coefficient values indicate that North and South San Francisco respondents on average had the largest fractions of non-motorized trips, followed by Pleasant Hill. North and South San Francisco have coefficients that are significantly different from 0 at $\alpha = 1\%$, while the coefficients of Pleasant Hill and Concord are significant at 5% and 10%, respectively. Average respondents from the four study areas including Concord all have fractions of non-motorized trips that are greater than that of an average respondent from San Jose, which has as before a reference coefficient value of 0.

High density dummy variable has a significant positive coefficient among the macroscopic area descriptors, while BART access dummy variable and mixed land use dummy variable are not at all significant for this dependent variable. These variables as a group are significant at $\alpha = 1\%$. The pedestrian/bicycle facilities indicators, which had significant coefficients in the model for the number of non-motorized trips, have positive coefficients which are not significant at $\alpha = 10\%$ in this model.

Unlike the models for the fraction of auto trips and the fraction of transit trips, none of the housing choice indicators is significant at $\alpha = 10\%$.

The microscopic accessibility indicators offer an R^2 value of 6.88%. They are as a group significant at $\alpha = 1\%$. All distance measures have negative coefficient estimates as expected, with distance to nearest park having the most significant negative coefficient (at $\alpha = 10\%$). As before, due to multi-collinearity these variables individually have t-statistics that often indicate that they are insignificant, but collectively they significantly contribute to the model's explanatory power.

The variables for perceptions of living quality are individually not significant, nor are they significant as a group. The best model for this dependent variable indicates that individuals from larger households and those with a driver's license tend to have smaller fractions of non-motorized trips. Importantly the model offers evidence that residential density is strongly associated with the fraction of non-motorized trips. It is also shown that neighborhood characteristics as represented by the proximity to transit stops and proximity to parks and playgrounds are also significantly associated with it. Note that these variables are introduced in addition to pertinent demographic and socio-economic variables, therefore the effects their coefficients represent are not an artifact of variations in household and person attributes across the study areas.

7. ATTITUDINAL VARIATIONS AMONG THE FIVE STUDY AREA RESPONDENTS

One important hypothesis of the study concerns the roles of attitudes that urban residents have toward energy and material consumption, environment, urban transportation, and life in general. It is conceivable that these attitudes affect urban residents' travel behavior more profoundly than do their measured attributes such as income and education. While attitudes are formed over time through direct and indirect experiences, it is likely that attitudes affect urban residents' decisions in ways that reinforce the attitudes that have been formed. It is then likely that urban residents in neighborhoods of different levels of density, land use mix, transit accessibility, or "pedestrian friendliness," have different attitudes partly because their attitudes contributed to the selection of the neighborhoods they live in, and partly because the environment they live in leads to the formation of certain attitudes.

7.1. Analysis of 39 Attitudinal Questions

The analysis of this section focuses on the responses to Part B of Phase Two, the Individual Questionnaire. A total of 39 questions were asked, each presented a statement and soliced a response on a five-point strongly agree to strongly disagree scale. These questions are divided into eight groups: Private Automobile, Ridesharing, Public Transportation, Transportation, Time, Environment, Housing and Economy.

Most respondents indicated that driving provides freedom (Table 7.1). Of the 1,444 respondents who responded, 783 (54.2%) indicated "strongly agree" and 540 (37.4%) "agree" to the statement, "Driving allows me freedom." The fraction of individuals who disagreed with this statement is less than 3%. It is evident that these urban residents perceive that the door-to-door mobility offered by the automobile allows "freedom." The association between the attitudinal response and study sites is significant with South San Francisco respondents showing a strong tendency of disagreeing with the statement. Overall, however, the association is relatively weak.

Table 7.1
Attitudes toward the Private Automobile: Agreement with the Statement, "Driving Allows Me Freedom."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	1	0.4	6	2.6	18	7.9	80	35.1	123	54.0	228	100.0
S. San Francisco	5	1.7	13	4.5	22	7.6	90	31.1	159	55.0	289	100.0
Concord	1	0.3	3	1.0	19	6.5	123	42.0	147	50.2	293	100.0
Pleasant Hill	1	0.3	3	1.0	12	4.1	121	41.3	156	53.2	293	100.0
San Jose	4	1.2	3	0.9	10	2.9	126	37.0	198	58.1	341	100.0
Total	12	0.8	28	1.9	81	5.6	540	37.4	783	54.2	1,444	100.0

χ^2 = 38.5 (35.6), df = 16 (12), α = 0.0013, Minimum expected cell value = 1.89 (6.32)
( ): Columns 1 and 2 merged. The second number in each cell is the percentage to the row total

Likewise, nearly 90% of the respondents either strongly agreed or agreed with the statement, "Driving allows me to get more done" (Table 7.2). Again, overall the respondents are appreciative of the convenience offered by the automobile. As before, South San Francisco respondents disagree with the statement more often than statistically expected. But otherwise no noteworthy differences across the study areas are present. Again, the overall association between the attitudinal response and study area is relatively weak.

These perceptions of the utility of the automobile are not inconsistent with the responses to "Too many people drive alone." Nearly 80% of the respondents agreed with this statement, suggesting the thinking that what provides convenience and freedom tends to be overused (Table 7.3). North San Francisco respondents strongly agreed with this statement with a rate higher than statistically expected; South San Francisco respondents tended not to strongly disagree or disagree; Concord respondents tended to strongly disagree or disagree and not to strongly agree; while San Jose respondents neither agreed nor disagreed more often than expected.

Table 7.2
Attitudes toward the Private Automobile: Agreement with the Statement, "Driving Allows Me to Get More Done."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	1	0.4	11	4.8	23	10.0	92	40.0	103	44.8	230	100.0
S. San Francisco	4	1.4	14	4.9	24	8.4	109	38.0	136	47.4	287	100.0
Concord	4	1.4	3	1.0	19	6.5	138	46.9	130	44.2	294	100.0
Pleasant Hill	1	0.3	5	1.7	30	10.2	123	41.8	135	45.9	294	100.0
San Jose	2	0.6	8	2.3	20	5.9	130	38.0	182	53.2	342	100.0
Total	12	0.8	41	2.8	116	8.0	592	40.9	686	47.4	1,447	100.0

χ^2 = 38.5 (24.2), df = 16 (12), α = 0.0013, Minimum expected cell value = 1.89 (8.42)
( ): Columns 1 and 2 merged.

Table 7.3
Attitudes toward the Private Automobile: Agreement with the Statement, "Too Many People Drive Alone."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	2	0.9	7	3.1	43	18.8	94	41.1	83	36.2	229	100.0
S. San Francisco	1	0.4	4	1.4	44	15.2	150	51.9	90	31.1	289	100.0
Concord	4	1.4	13	4.4	50	17.1	159	54.3	67	22.9	293	100.0
Pleasant Hill	5	1.7	10	3.4	52	17.6	148	50.2	80	27.1	295	100.0
San Jose	4	1.2	5	1.5	81	23.6	159	46.4	94	27.4	343	100.0
Total	16	1.1	39	2.7	270	18.6	710	49.0	414	28.6	1,449	100.0

χ^2 = 32.2 (30.6), df = 16 (12), α = 0.0095, Minimum expected cell value = 2.53 (8.69)
( ): Columns 1 and 2 merged.

Attitudes toward traffic congestion as a consequence of the overuse of the automobile again show slight differences across the study areas. Overall 63.6% of the respondents strongly disagreed or disagreed to the statement, "Getting stuck in traffic doesn't bother me too much" (Table 7.4).

San Jose respondents strongly disagreed with the statement significantly less often, and agreed or strongly agreed with it significantly more often than statistically expected. On the other hand, North San Francisco respondents strongly disagreed with it more often than expected. Obviously respondents from more suburban San Jose are more tolerant of traffic congestion, while residents from high-density, pedestrian-oriented North San Francisco exhibit distaste toward it.

Table 7.4
Attitudes toward the Private Automobile: Agreement with the Statement, "Getting Stuck in Traffic Doesn't Bother Me Too Much."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	69	30.1	92	40.2	32	14.0	33	14.4	3	1.3	229	100.0
S. San Francisco	80	27.9	123	42.9	37	12.9	38	13.2	9	3.1	287	100.0
Concord	66	22.5	118	40.1	53	18.0	49	16.7	8	2.7	294	100.0
Pleasant Hill	72	24.5	112	38.1	45	15.3	59	20.1	6	2.0	294	100.0
San Jose	63	18.5	123	36.2	57	16.8	82	24.1	15	4.4	340	100.0
Total	350	24.2	568	39.3	224	15.5	261	18.1	41	2.8	1,444	100.0
$\chi^2 = 33.8$, df = 16, $\alpha = 0.0058$, Minimum expected cell value = 6.50												

Responses are almost symmetric to the statement, "I like someone else to do the driving," with 30.5% responding with "neither agree nor disagree" (Table 7.5). South San Francisco respondents tended to strongly agree, Concord respondents tended not to disagree, while San Jose respondents strongly disagreed and tended not to agree with the statement. The responses of the San Jose respondents are consistent with their attitudes toward traffic congestion.

Differences across the study areas are not statistically significant (at the 5% level) for the statement, "I am not comfortable riding with strangers" (Table 7.6). San Jose residents show the tendency of strongly agreeing and not disagreeing more often than statistically expected. However, overall the table is not significant and suggests that there is no statistical association between the response to this question and the study areas.

Table 7.5
Attitudes toward Ridesharing: Agreement with the Statement, "I Like Someone Else to Do the Driving."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	24	10.8	45	20.2	63	28.3	71	31.8	20	9.0	223	100.0
S. San Francisco	27	9.4	49	17.1	84	29.4	84	29.4	42	14.7	286	100.0
Concord	19	6.5	80	27.5	82	28.2	79	27.2	31	10.7	291	100.0
Pleasant Hill	19	6.6	63	22.0	91	31.8	88	30.8	25	8.7	286	100.0
San Jose	47	13.9	73	21.6	118	34.9	68	20.1	32	9.5	338	100.0
Total	136	9.6	310	21.8	438	30.8	390	27.4	150	10.5	1,424	100.0
$\chi^2 = 39.3$, df = 16, $\alpha = 0.0010$, Minimum expected cell value = 21.3												

Attitudes toward public transportation tend to differ substantially across the study areas. Table 7.7 shows this for the statement, "I can read and do other things when I use public transportation." North San Francisco respondents show a strong tendency to strongly disagree or disagree, and not to strongly agree with the statement, more frequently than statistically expected. Contrary to this, Pleasant Hill respondents tend to strongly agree with the statement. This could be due to the difference in the public transit services available to the two locales. Respondents from the Pleasant Hill study site which has good BART access, probably considered BART when responding to this question, while North San Francisco respondents may have considered the bus which is the predominant public transit mode for them. Respondents from San Jose, on the other hand, exhibit a much-higher-than-expected frequency of responding with a "neither disagree nor agree." This presumably represents the fact that San Jose respondents tended not to use public transit and therefore were not able to respond definitively to this question.

Nearly half of the respondents either strongly disagreed or disagreed with the statement, "It costs more to use public transportation than it does to drive a car" (Table 7.8). Respondents from both North and South San Francisco tended to disagree with the statement, while those from

Concord and Pleasant Hill tended to agree with it much more often than statistically expected. As for the earlier statement, San Jose respondents tended to be neutral. The differences across the study sites are all highly significant with a chi-square value of 112.0 with 16 degrees of freedom. These differences, again, may be attributable to the perceptions people may have of the relative costs of BART versus bus, with BART traversing long distances at a high speed with fares that are not much different from those of the bus which tend to cover short distances with a lower speed.

Table 7.6.
Attitudes toward Ridesharing: Agreement with the Statement, "I Am Not Comfortable Riding with Strangers."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	13	5.8	51	22.9	66	29.6	60	26.9	33	14.8	223	100.0
S. San Francisco	9	3.2	50	17.5	93	32.6	94	33.0	39	13.7	285	100.0
Concord	6	2.1	53	18.5	93	32.4	99	34.5	36	12.5	287	100.0
Pleasant Hill	14	4.9	66	23.2	81	28.4	89	31.2	35	12.3	285	100.0
San Jose	13	3.9	49	14.5	96	28.5	118	35.0	61	18.1	337	100.0
Total	55	3.9	269	19.0	429	30.3	460	32.5	204	14.4	1,417	100.0
$\alpha\chi^2 = 23.9$, df = 16, $\alpha = 0.093$, Minimum expected cell value = 8.66												

Table 7.7
Attitudes toward Public Transportation: Agreement with the Statement, "I Can Read and Do Other Things When I Use Public Transportation."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	19	8.1	43	18.4	31	13.3	108	46.2	33	14.1	234	100.0
S. San Francisco	7	2.4	24	8.4	52	18.1	144	50.2	60	20.9	287	100.0
Concord	5	1.7	19	6.5	47	16.0	158	53.9	64	21.8	293	100.0
Pleasant Hill	4	1.4	11	3.8	39	13.3	151	51.5	88	30.0	293	100.0
San Jose	12	3.6	28	8.3	81	24.1	149	44.4	66	19.6	336	100.0
Total	47	3.3	125	8.7	250	17.3	710	49.2	311	21.6	1,443	100.0
$\chi^2 = 92.9$, df = 16, $\alpha < 0.00005$, Minimum expected cell value = 7.62												

Table 7.8
Attitudes toward Public Transportation: Agreement with the Statement, "It Costs More to Use Public Transportation Than It Does to Drive a Car."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	57	24.4	95	40.6	43	18.4	30	12.8	9	3.9	234	100.0
S. San Francisco	62	21.5	120	41.7	63	21.9	35	12.2	8	2.8	288	100.0
Concord	26	8.9	84	28.7	101	34.5	63	21.5	19	6.5	293	100.0
Pleasant Hill	28	9.7	87	30.1	95	32.9	68	23.5	11	3.8	289	100.0
San Jose	35	10.6	96	29.1	137	41.5	54	16.4	8	2.4	330	100.0
Total	208	14.5	482	33.6	439	30.6	250	17.4	55	3.8	1,434	100.0
$\chi^2 = 112.0$, df = 16, $\alpha < 0.00005$, Minimum expected cell value = 8.97												

The same can be said about the response to the statement, "Public transportation is unreliable" (Table 7.9). Although not as strong as for the previous statement, South San Francisco respondents show the tendency of agreeing with the statement, with Pleasant Hill respondents disagreeing with it. San Jose respondents again tended to be neutral, and not to disagree with this statement. Overall, the fraction of respondents who either strongly disagreed or disagreed with this statement (36.6%) is greater than that of those who either agreed or strongly agreed with it (31.1%), suggesting an overall positive perception of the reliability of public transit.

The responses to the statement, "Buses and trains are pleasant to travel in," are split with 35.2% either agreeing or strongly agreeing, 34.1% neither agreeing nor disagreeing, and 30.7% either strongly disagreeing or disagreeing with it (Table 7.10). As before, respondents from San Francisco tended to be negative about public transit, while those from Pleasant Hill were positive. Unlike the cases for the previous statements on public transit, San Jose respondents do not have an over-representation of those responding with a "neither agree nor disagree" for this question.

Only a small fraction of the respondents agreed (13.2%) or strongly agreed (3.3%) with the statement, "I use public transportation when I cannot afford to drive" (Table 7.11). North

San Francisco respondents are agreeing with the statement most frequently, but the association between the response and study area is significant only at a 3% level. For many of the respondents of this survey, using public transit would be a choice over the automobile. The large percentage of those neither agreeing nor disagreeing, however, could be an indication that they felt this statement not applicable to them as they did not use public transit.

Table 7.9
Attitudes toward Public Transportation: Agreement with the Statement, "Public Transportation Is Unreliable."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	11	4.7	76	32.5	64	27.4	61	26.1	22	9.4	234	100.0
S. San Francisco	10	3.5	88	30.6	72	25.0	85	29.5	33	11.5	288	100.0
Concord	12	4.1	100	34.1	111	37.9	57	19.5	13	4.4	293	100.0
Pleasant Hill	18	6.2	123	42.1	90	30.8	51	17.5	10	3.4	292	100.0
San Jose	8	2.4	82	24.3	130	38.6	90	26.7	27	8.0	337	100.0
Total	59	4.1	469	32.5	467	32.3	344	23.8	105	7.3	1,444	100.0

$\chi^2 = 66.2$, df = 16, $\alpha < 0.00005$, Minimum expected cell value = 9.56

Table 7.10
Attitudes toward Public Transportation: Agreement with the Statement, "Buses and Trains Are Pleasant to Travel In."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	13	5.6	79	33.8	85	36.3	49	20.9	8	3.4	234	100.0
S. San Francisco	32	11.2	77	26.8	91	31.7	74	25.8	13	4.5	287	100.0
Concord	19	6.5	62	21.2	100	34.1	95	32.4	17	5.8	293	100.0
Pleasant Hill	17	5.9	48	16.6	107	36.9	106	36.6	12	4.1	290	100.0
San Jose	18	5.3	77	22.9	109	32.3	117	34.7	16	4.8	337	100.0
Total	99	6.9	343	23.8	492	34.1	441	30.6	66	4.6	1,441	100.0

$\chi^2 = 46.6$, df = 16, $\alpha = 0.0001$, Minimum expected cell value = 10.72

Table 7.11
Attitudes toward Public Transportation: Agreement with the Statement, "I Use Public Transportation When I Cannot Afford to Drive."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	28	12.2	47	20.5	102	44.5	36	15.7	16	7.0	229	100.0
S. San Francisco	36	12.8	68	24.1	130	46.1	38	13.5	10	3.6	282	100.0
Concord	39	13.5	74	25.6	126	43.6	40	13.8	10	3.5	289	100.0
Pleasant Hill	39	13.8	89	31.5	114	40.3	36	12.7	5	1.8	283	100.0
San Jose	55	16.5	81	24.3	156	46.7	37	11.1	5	1.5	334	100.0
Total	197	13.9	359	25.3	628	44.3	187	13.2	46	3.3	1,417	100.0

$\chi^2 = 28.1$, df = 16, $\alpha = 0.031$, Minimum expected cell value = 7.43

Table 7.12
Attitudes toward Urban Transportation: Agreement with the Statement, "Traffic Congestion Will Take Care of Itself Because People Will Make Adjustments."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	90	39.0	110	47.6	19	8.2	8	3.5	4	1.7	231	100.0
S. San Francisco	80	27.4	147	50.3	39	13.4	15	5.1	11	3.8	292	100.0
Concord	77	26.1	153	51.9	38	12.9	22	7.5	5	1.7	295	100.0
Pleasant Hill	107	37.2	139	48.3	26	9.0	15	5.2	1	0.4	288	100.0
San Jose	109	32.3	172	50.9	37	11.0	15	4.4	5	1.5	338	100.0
Total	463	32.1	721	49.9	159	11.0	75	5.2	26	1.8	1,444	100.0

$\chi^2 = 31.3$, df = 16, $\alpha = 0.0125$, Minimum expected cell value = 4.16

An overwhelming majority of the respondents strongly disagreed (32.1%) or disagreed (49.9%) to the statement, "Traffic congestion will take care of itself because people will make adjustments" (Table 7.12). Variations across the study areas are relatively small for this question, suggesting the presence of a consensus in all study areas that the problem of traffic congestion cannot be left alone.

Building more roadways, however, is not necessarily viewed as a solution to the congestion problem. In fact 11.2% of the respondents strongly disagreed and 32.6% disagreed with the statement, "We need to build more roads to help decrease congestion" (Table 7.13). These exceed the percentage of respondents agreeing (24.0%) or strongly agreeing (6.4%) with the statement. San Jose has much fewer than expected respondents who strongly disagreed with the statement, while both North and South San Francisco show more than expected numbers of respondents strongly disagreeing with it. The results are consistent with the indications so far that San Jose respondents tend to be more automobile oriented than respondents from the other study areas, especially those from San Francisco. The differences in attitudes across the study areas are significant at a 2% level.

Table 7.13
Attitudes toward Urban Transportation: Agreement with the Statement, "We Need to Build More Roads to Help Decrease Congestion."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	35	15.2	82	35.7	44	19.1	54	23.5	15	6.5	230	100.0
S. San Francisco	43	14.9	86	29.8	71	24.6	68	23.5	21	7.3	289	100.0
Concord	26	8.8	99	33.6	82	27.8	70	23.7	18	6.1	295	100.0
Pleasant Hill	38	13.2	97	33.7	72	25.0	67	23.3	14	4.9	288	100.0
San Jose	19	5.6	105	31.0	104	30.7	87	25.7	24	7.1	339	100.0
Total	161	11.2	469	32.6	373	25.9	346	24.0	92	6.4	1,441	100.0
$\chi^2 = 30.7$, df = 16, $\alpha = 0.0148$, Minimum expected cell value = 14.68												

Strong differences exist across the study areas in attitudes towards high occupancy vehicle (HOV) lanes. Overall, 36.0% of respondents agreed and 9.3% strongly agreed with the statement, "More lanes should be set aside for carpools and buses," while 4.9% strongly disagreed and 21.9% disagreed (Table 7.14). Again, San Jose respondents gave responses that are significantly different from those of the other study areas, with much significantly larger than expected numbers

strongly disagreeing or disagreeing with the statement. Both North and South San Francisco respondents strongly agreed with the statement

more often than expected. Consistent with the results so far, San Jose respondents in this table show their orientation toward single-occupant vehicles (SOVs).

Table 7.14
Attitudes toward Urban Transportation: Agreement with the Statement, "More Lanes Should Be Set Aside for Carpools and Buses."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	6	2.6	35	15.2	62	27.0	97	42.2	30	13.0	230	100.0
S. San Francisco	9	3.1	66	22.9	81	28.1	95	33.0	37	12.9	288	100.0
Concord	9	3.0	59	19.9	87	29.4	119	40.2	22	7.4	296	100.0
Pleasant Hill	18	6.2	57	19.7	84	29.1	111	38.4	19	6.6	289	100.0
San Jose	29	8.6	98	28.9	90	26.6	96	28.3	26	7.7	339	100.0
Total	71	4.9	315	21.8	404	28.0	518	35.9	134	9.3	1,442	100.0
$\chi^2 = 53.3$, df = 16, $\alpha < 0.00005$, Minimum expected cell value = 11.32												

Strong variations of similar nature can be observed across the study areas regarding the statements, "Stricter vehicle smog control laws should be introduced and enforced," and "We should provide incentives to people who use electric or other clean-fuel vehicles" (Tables 7.15 and 7.16). Both North and South San Francisco residents support the former statement more than any other study areas, with significantly fewer respondents strongly disagreeing or disagreeing with it, and significantly more strongly agreeing with it, than statistically expected. Concord respondents show the strongest tendency of disagreeing with the statement, with more respondents strongly disagreeing or disagreeing than expected. San Jose has significantly fewer respondents strongly agreeing with the statement. Similar tendencies can be found for the latter statement, although the differences across the areas are statistically not as strong.

The same conclusions can be drawn from the distribution of responses to the statement, "Environmental protection is good for California's economy" (Table 7.17). Both North and South

San Francisco respondents exhibit pro-environmental attitudes with significantly more than expected responding strongly agreeing with the statement. Concord, on the other hand, has fewer than expected respondents strongly agreeing with it. San Jose shows a similar tendency as Concord but to a much weaker extent. Pleasant Hill has a distribution that is similar to the overall distribution. The variations are statistically highly significant (at a 0.01% level).

Table 7.15
Attitudes toward Urban Transportation: Agreement with the Statement, "Stricter Vehicle Smog Control Laws Should Be Introduced and Enforced."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	8	3.5	19	8.2	42	18.1	85	36.6	78	33.6	232	100.0
S. San Francisco	6	2.1	23	7.9	60	20.6	116	39.9	86	29.6	291	100.0
Concord	30	10.1	60	20.3	79	26.7	83	28.0	44	14.9	296	100.0
Pleasant Hill	17	5.9	50	17.2	60	20.7	108	37.2	55	19.0	290	100.0
San Jose	23	6.8	55	16.2	91	26.8	120	35.3	51	15.0	340	100.0
Total	84	5.8	207	14.3	332	22.9	512	35.3	314	21.7	1,449	100.0

$\chi^2 = 95.9$, df = 16, $\alpha < 0.00005$, Minimum expected cell value = 13.45

Table 7.16
Attitudes toward Urban Transportation: Agreement with the Statement, "We Should Provide Incentives to People Who Use Electric or Other Clean-Fuel Vehicles."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	1	0.4	3	1.3	36	15.5	105	45.3	87	37.5	232	100.0
S. San Francisco	1	0.3	14	4.8	46	15.8	147	50.5	83	28.5	291	100.0
Concord	3	1.0	30	10.2	69	23.4	133	45.1	60	20.3	295	100.0
Pleasant Hill	5	1.7	14	4.8	59	20.3	138	47.6	74	25.5	290	100.0
San Jose	8	2.4	13	3.9	72	21.4	176	52.2	68	20.2	337	100.0
Total	18	1.3	74	5.1	282	19.5	699	48.4	372	25.7	1,445	100.0

$\chi^2 = 59.8$ (49.4), df = 16 (12), $\alpha < 0.00005$, Minimum expected cell value = 1.89 (14.77).
( ): Columns 1 and 2 merged.

Table 7.17
Attitudes toward Environment: Agreement with the Statement, "Environmental Protection Is Good for California's Economy."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	3	1.3	15	6.4	51	21.9	98	42.1	66	28.3	233	100.0
S. San Francisco	2	0.7	24	8.3	74	25.4	119	40.9	72	24.7	291	100.0
Concord	11	3.7	41	13.9	82	27.7	123	41.6	39	13.2	296	100.0
Pleasant Hill	10	3.5	38	13.2	86	30.0	104	36.2	49	17.1	287	100.0
San Jose	14	4.1	39	11.5	85	25.1	147	43.4	54	15.9	339	100.0
Total	40	2.8	157	10.9	378	26.1	591	40.9	280	19.4	1,446	100.0
$\chi^2 = 48.8$, df = 16, $\alpha < 0.00005$, Minimum expected cell value = 6.45												

Relatively small fractions of respondents agreed (12.6%) or strongly agreed (3.3%) with the statement, "Environmentalism hurts minority and small businesses" (Table 7.18). Again, South San Francisco residents show pro-environmental attitudes with significantly (at 5%) more respondents strongly disagreeing or disagreeing with the statement. Concord exhibits an opposite orientation with significantly (at 1%) fewer respondents strongly disagreeing with it. With respect to attitudes toward environment, the results so far consistently indicate that, relatively speaking, San Francisco respondents are overall pro-environment, while Concord respondents are on average anti-environment.

Table 7.18
Attitudes toward Environment: Agreement with the Statement, "Environmentalism Hurts Minority and Small Businesses."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	38	16.3	85	36.5	87	37.3	20	8.6	3	1.3	233	100.0
S. San Francisco	47	16.4	120	41.8	87	30.3	28	9.8	5	1.7	287	100.0
Concord	18	6.2	89	30.5	129	44.2	42	14.4	14	4.8	292	100.0
Pleasant Hill	34	11.7	96	33.1	105	36.2	41	14.1	14	4.8	290	100.0
San Jose	38	11.2	110	32.5	130	38.4	50	14.8	11	3.2	339	100.0
Total	175	12.1	500	34.7	538	37.3	181	12.6	47	3.3	1,441	100.0
$\chi^2 = 47.2$, df = 16, $\alpha = 0.0001$, Minimum expected cell value = 7.60												

Attitudinal variations across the study areas are extremely significant with respect to the statement, "I need to have space between me and my neighbors" (Table 7.19). Substantially more respondents from North San Francisco either strongly disagreed or disagreed with the statement (61 observed as opposed to 25.2 expected under the null hypothesis that there is no variation in attitudes across the study areas). North San Francisco respondents have fewer respondents agreeing or strongly agreeing, and significantly fewer South San Francisco respondents strongly disagreeing with the statement. Concord respondents, on the other hand, subscribe to the statement with significantly fewer than expected strongly disagreeing or disagreeing (11 observed as opposed to 32.0 expected), or neither agreeing nor disagreeing, and significantly more agreeing or strongly agreeing. San Jose offers a similar but much weaker tendency, while Pleasant Hill, as for many other statements, shows a distribution that well agrees with the overall distribution.

Table 7.19
Attitudes toward Housing: Agreement with the Statement, "I Need to Have Space Between Me and My Neighbors."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	7	3.0	54	23.3	49	21.1	86	37.1	36	15.5	232	100.0
S. San Francisco	4	1.4	34	11.7	58	19.9	150	51.6	45	15.5	291	100.0
Concord	0	0.0	11	3.7	26	8.8	170	57.8	87	29.6	294	100.0
Pleasant Hill	1	0.4	36	12.5	59	20.5	122	42.4	70	24.3	288	100.0
San Jose	0	0.0	10	3.0	41	12.1	193	56.9	95	28.0	339	100.0
Total	12	0.8	145	10.0	233	16.1	721	49.9	333	23.1	1,444	100.0

χ^2 = 155.1 (149.4), df = 16 (12), $\alpha < 0.00005$, Minimum expected cell value = 1.89 (25.22)
( ): Columns 1 and 2 merged.

Such intense variations cannot be found across the study areas with respect to "It's important for children to have a large backyard for playing" (Table 7.20). Over half of the respondents either agreed or strongly agreed with the statement. Concord respondents again show the strongest tendency to agree with it. Interestingly, North San Francisco respondents have a distribution that is not significantly different from the overall distribution, while a more than

expected number of Pleasant Hill respondents strongly disagreed or disagreed with the statement. Also interestingly and unlike the cases for many other statements, a significantly fewer than expected number of San Jose respondents responded with a "neither agree nor disagree" to this statement.

Table 7.20
Attitudes toward Housing : Agreement with the Statement, "It's Important for Children to Have a Large Backyard for Playing."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	3	1.3	26	11.2	74	31.9	96	41.4	33	14.2	232	100.0
S. San Francisco	2	0.7	28	9.7	107	36.9	109	37.6	44	15.2	290	100.0
Concord	0	0.0	14	4.8	51	17.4	166	56.5	63	21.4	294	100.0
Pleasant Hill	6	2.1	35	12.1	86	29.7	111	38.3	52	17.9	290	100.0
San Jose	2	0.6	28	8.3	64	18.9	174	51.3	71	20.9	339	100.0
Total	13	0.9	131	9.1	382	26.4	656	45.4	263	18.2	1,445	100.0

χ^2 = 75.7 ( ), df = 16 (12), $\alpha < 0.00005$, Minimum expected cell value = 2.09 ( )
( ): Columns 1 and 2 merged.

Table 7.21
Attitudes toward Housing: Agreement with the Statement, "Having Shops and Services within Walking Distance of My Home Would Be Important to Me."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	2	0.9	16	6.9	19	8.2	112	48.1	84	36.1	233	100.0
S. San Francisco	3	1.0	23	7.9	45	15.5	160	55.0	60	20.6	291	100.0
Concord	4	1.4	51	17.3	62	21.0	147	49.8	31	10.5	295	100.0
Pleasant Hill	3	1.0	40	13.8	60	20.6	151	51.9	37	12.7	291	100.0
San Jose	6	1.8	47	13.8	92	27.0	156	45.8	40	11.7	341	100.0
Total	18	1.2	177	12.2	278	19.2	726	50.0	252	17.4	1,451	100.0

χ^2 = 116.7 (115.6), df = 16 (12), $\alpha < 0.00005$, Minimum expected cell value = 1.89 (31.3)
( ): Columns 1 and 2 merged.

Slightly over half of the respondents agreed to the statement, "Having shops and services within walking distance of my home would be important to me," and an additional 17.4% strongly agreed with it (Table 7.21). Respondents from high-density, mixed-land-use North San Francisco most strongly agreed with the statement, while respondents from Concord and San Jose tended to disagree with it. Attitudes exhibited here by the respondents appear to be well correlated with the characteristics of their residence areas and conform to their residential choice. The variations across the study areas are highly significant.

Responses to the statement, "I would only live in a multiple family unit (apartment, condo, etc.) as a last resort," are strongly correlated with the distribution of housing unit types and home ownership in the respective study areas. Respondents from North San Francisco and Pleasant Hill, where home ownership levels are the lowest and the fractions of multiple housing units are the highest among the study areas, exhibit overwhelming tendencies to disagree with the statement (Table 7.22). Respondents from Concord and San Jose, on the other hand, tend to agree with the statement. Differences across the study areas are extremely significant.

Table 7.22
Attitudes toward Housing: Agreement with the Statement, "I Would Only Live in a Multiple Family Unit (Apartment, Condo, etc.) as a Last Resort."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	43	18.5	79	34.1	48	20.7	43	18.5	19	8.2	232	100.0
S. San Francisco	12	4.1	74	25.3	56	19.2	101	34.6	49	16.8	292	100.0
Concord	16	5.4	30	10.2	40	13.6	115	39.0	94	31.9	295	100.0
Pleasant Hill	38	13.2	103	35.6	46	15.9	64	22.2	38	13.2	289	100.0
San Jose	16	4.7	55	16.1	46	13.5	125	36.7	99	29.0	341	100.0
Total	125	8.6	341	23.5	236	16.3	448	30.9	299	20.6	1,449	100.0

$\chi^2 = 203.6$, df = 16, $\alpha < 0.00005$, Minimum expected cell value = 20.0

Nearly one half of the respondents either agreed or strongly agreed, while only a little over 20% of the respondents either strongly disagreed or disagreed with the statement, "Too much valuable agricultural land is consumed to supply housing" (Table 7.23). Unlike the preceding four statements regarding housing which yielded large and statistically significant variations across the study areas, only slight variations can be found with this statement.

Responses to the statement, "I would be willing to pay a toll to drive on an uncongested road," are rather evenly split between those agreeing and those disagreeing, with 10.4% of the respondents strongly disagreeing, 26.1% disagreeing, 21.2% neither agreeing nor disagreeing, 36.5% agreeing, and 5.7% strongly agreeing (Table 7.24). Although the fraction of respondents who strongly disagreed is larger than that of those who strongly agreed, overall there are more respondents who either agreed or strongly agreed with the statement than there are respondents who either strongly disagreed or disagreed. Of the five study areas, South San Francisco respondents are most favorably disposed to the idea of congestion tolls, while Concord residents are least favorable.

Table 7.23
Attitudes toward Housing: Agreement with the Statement,
"Too Much Valuable Agricultural Land Is Consumed to Supply Housing."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	9	3.9	43	18.5	96	41.2	56	24.0	29	12.5	233	100.0
S. San Francisco	5	1.7	48	16.6	85	29.3	98	33.8	54	18.6	290	100.0
Concord	5	1.7	48	16.3	83	28.1	100	33.9	59	20.0	295	100.0
Pleasant Hill	9	3.1	49	16.9	97	33.5	96	33.1	39	13.5	290	100.0
San Jose	10	2.9	74	21.7	102	29.9	105	30.8	50	14.7	341	100.0
Total	38	2.6	262	18.1	463	32.0	455	31.4	231	15.9	1,449	100.0
$\chi^2 = 29.2$, df = 16, $\alpha = 0.0229$, Minimum expected cell value = 6.11												

A majority of the respondents agreed with the statement, "Vehicle emissions increase the need for health care" (Table 7.25). Consistent with their responses to earlier statements on the

environment, San Francisco respondents agreed with this statement more strongly, with North San Francisco showing a significantly more than expected number of its respondents strongly agreeing, and South San Francisco having a significantly less than expected number of its respondents strongly disagreeing or disagreeing with the statement. A more than expected number of respondents form Concord, on the other hand, disagreed with the statement.

Table 7.24
Attitudes toward Urban Transportation: Agreement with the Statement, "I Would Be Willing to Pay a Toll to Drive on an Uncongested Road."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	17	7.3	50	21.6	57	24.6	93	40.1	15	6.5	232	100.0
S. San Francisco	27	9.3	61	21.0	51	17.5	130	44.7	22	7.6	291	100.0
Concord	34	11.5	95	32.2	68	23.1	84	28.5	14	4.8	295	100.0
Pleasant Hill	30	10.4	79	27.3	50	17.3	113	39.1	17	5.9	289	100.0
San Jose	43	12.7	92	27.1	80	23.6	109	32.2	15	4.4	339	100.0
Total	151	10.4	377	26.1	306	21.2	529	36.6	83	5.7	1,446	100.0

$\chi^2 = 37.4$, df = 16 , $\alpha = 0.0018$, Minimum expected cell value = 13.32

Table 7.25
Attitudes toward Economy: Agreement with the Statement, "Vehicle Emissions Increase the Need for Health Care."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	0	0.0	14	6.0	53	22.8	118	50.6	48	20.6	233	100.0
S. San Francisco	3	1.0	9	3.1	69	23.7	169	58.1	41	14.1	291	100.0
Concord	3	1.0	25	8.5	100	34.0	138	46.9	28	9.5	294	100.0
Pleasant Hill	5	1.7	26	9.0	78	27.1	155	53.8	24	8.3	288	100.0
San Jose	6	1.8	24	7.1	102	30.1	173	51.0	34	10.0	339	100.0
Total	17	1.2	98	6.8	402	27.8	753	52.1	175	12.1	1,445	100.0

$\chi^2 = 47.7$ (44.1), df = 16 (12), $\alpha = 0.0001$, Minimum expected cell value = 2.74
( ): Columns 1 and 2 merged.

The notion that "Using tax dollars to pay for public transportation is a good investment," also received widespread support from the respondents with 53.6% of them agreeing and another 19.4% strongly agreeing with it (Table 7.26). Again, San Francisco respondents, particularly those from North San Francisco, showed the strongest agreement, while Concord had a more than expected number of disagreeing respondents, and San Jose had a less than expected number strongly agreeing with the statement.

Table 7.26
Attitudes toward Economy: Agreement with the Statement,
"Using Tax Dollars to Pay for Public Transportation is a Good Investment."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	1	0.4	7	3.0	26	11.2	125	53.7	74	31.8	233	100.0
S. San Francisco	4	1.4	11	3.8	37	12.7	172	59.1	67	23.0	291	100.0
Concord	8	2.7	40	13.6	65	22.0	137	46.4	45	15.3	295	100.0
Pleasant Hill	4	1.4	28	9.7	47	16.3	160	55.6	49	17.0	288	100.0
San Jose	10	2.9	39	11.5	65	19.1	181	53.2	45	13.2	340	100.0
Total	27	1.9	125	8.6	240	16.6	775	53.6	280	19.4	1,447	100.0

$\chi^2 = 83.4$, df = 16, $\alpha < 0.00005$, Minimum expected cell value = 4.35

Table 7.27
Attitudes toward Economy: Agreement with the Statement,
"Environmental Protection Costs Too Much."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	56	24.1	86	37.1	57	24.6	25	10.8	8	3.5	232	100.0
S. San Francisco	48	16.5	117	40.2	80	27.5	38	13.1	8	2.8	291	100.0
Concord	27	9.2	87	29.5	97	32.9	68	23.1	16	5.4	295	100.0
Pleasant Hill	45	15.6	107	37.2	80	27.8	45	15.6	11	3.8	288	100.0
San Jose	41	12.1	109	32.3	106	31.4	65	19.2	17	5.0	338	100.0
Total	217	15.0	506	35.0	420	29.1	241	16.7	60	4.2	1,444	100.0

$\chi^2 = 51.6$, df = 16, $\alpha < 0.00005$, Minimum expected cell value = 9.64

The statement, "Environmental protection costs too much," was disagreed with by half of the respondents, with 15.0% strongly disagreeing (Table 7.27). Again, North San Francisco shows the most pro-environmental stance with a significantly more than expected number strongly disagreeing with the statement. Concord residents showed more reservations about environmentalism with a larger than expected number agreeing with the statement.

An almost symmetric distribution of responses can be found to the statement, "We should raise the price of gasoline to reduce congestion and air pollution" (Table 7.28). San Francisco respondents again demonstrated pro-environmental attitudes with most strongly agreeing with the statement among the five study areas. This time, however, South San Francisco respondents showed stronger levels of agreement. Concord, on the other hand, disagreed with the statement most strongly, and San Jose followed this. As often is the case, Pleasant Hill respondents showed a distribution of responses that are in good agreement with the overall distribution with all study areas pooled.

Table 7.28
Attitudes toward Economy: Agreement with the Statement, "We Should Raise the Priceof Gasoline to Reduce Congestion and Air Pollution."

	Strongly Disagree		Disagree		Neither		Agree		Strongly Agree		Total	
N. San Francisco	16	6.9	53	22.8	47	20.3	69	29.7	47	20.3	232	100.0
S. San Francisco	22	7.6	62	21.3	61	21.0	90	30.9	56	19.2	291	100.0
Concord	56	19.1	110	37.4	52	17.7	51	17.4	25	8.5	294	100.0
Pleasant Hill	30	10.4	91	31.5	62	21.5	70	24.2	36	12.5	289	100.0
San Jose	62	18.3	109	32.2	67	19.8	70	20.7	31	9.1	339	100.0
Total	186	12.9	425	29.4	289	20.0	350	24.2	195	13.5	1,445	100.0

$\chi^2 = 90.7$, df = 16, $\alpha < 0.00005$, Minimum expected cell value = 29.9

The attitudinal responses to these statements have produced consistent pictures that portray the characteristics of the five study areas. This issue is further pursued in the next section using factor analysis.

7.2. Attitude Factors

Factor analysis was applied to the responses to the 39 attitudinal questions with the intent of reducing the dimensionality of the information contained in them. The first eight factors, which collectively explain 43.3% of the total variance in the data, are discussed here. Rotated factor loadings are summarized in Table 7.29 with absolute factor loadings of less than 0.25 suppressed for simplicity in presentation.

The first factor is primarily defined by responses to statements concerning environment: "Environmental protection costs too much" (negative loading), "Environmental protection is good for California's economy," "Environmentalism hurts minority and small businesses" (negative loading), "People and jobs are more important than the environment" (negative loading), and "Stricter vehicle smog control laws should be introduced and enforced." Other statements include: ""We need to build more roads to help decrease congestion" (negative loading), "We should provide incentives to people who use electric or other clean-fuel vehicles," "We should raise the price of gasoline to reduce congestion and air pollution," "Vehicle emissions increase the need for health care," "Whoever causes environmental damage should repair the damage," and "Using tax dollars to pay for public transportation is a good investment." Clearly this factor represents the respondents environmental orientation and is named as a "pro-environment" factor. The fact that this dimension emerged as the first factor implies that environmental concerns constitute the dimension which varies most substantially across respondents.

Responses to the statements, "Buses and trains are pleasant to travel in," "I can read and do other things when I use public transportation," and "Public transportation is unreliable" (negative loading), are the primary elements that define the second factor. This factor can be thus termed as a "pro-transit" factor. Other variables that constitute this factor include responses to: "Ridesharing saves money," "It costs more to use public transportation than it does to drive a car"

Table 7.29
Rotated Factor Loadings: Attitudinal Factors

Statement for Agree/Disagree Semantic Scale	FACTOR							
	1	2	3	4	5	6	7	8
Environmental protection costs too much.	0.792							
Environmental protection is good for California's economy.	-0.744							
Environmentalism hurts minority and small businesses.	0.709							
People and jobs are more important than the environment.	0.687							
Stricter vehicle smog control laws should be introduced and enforced.	-0.549						0.307	
We should raise the price of gasoline to reduce congestion & air pollution.	-0.492						0.255	
Vehicle emissions increase the need for health care.	-0.478					0.408		
Using tax dollars to pay for public transportation is a good investment.	-0.404	0.278				0.291		
We should provide incentives to people who use electric ... vehicles.	-0.398					0.306	0.356	
Whoever causes environmental damage should repair the damage.	-0.360		0.253					
Buses and trains are pleasant to travel in.		0.634						
I can read and do other things when I use public transportation.		0.600						
Public transportation is unreliable.		-0.580						
I need to have space between me and my neighbors.			0.756					
I would only live in a multiple family unit as a last resort.			0.658					
It's important for children to have a large backyard for playing.			0.641					
High density residential development should be encouraged.			-0.513			0.332		
Driving allows me to get more done.				0.753				
Driving allows me freedom.				0.727				
I would rather drive an electric vehicle than give up driving.				0.624				

Table 7.29
(Continued)

Statement for Agree/Disagree Semantic Scale	FACTOR							
	1	2	3	4	5	6	7	8
Getting stuck in traffic doesn't bother me too much.					-0.658			
I would like to have more time for leisure.					0.584			
I feel that I am wasting time when I have to wait.		-0.267		0.260	0.564			
Having shops and services within walking distance ... would be important.						0.578		
Too much valuable agricultural land is consumed to supply housing.						0.562	-0.268	
I would be willing to pay a toll to drive on an uncongested road.							0.575	
More lanes should be set aside for carpools and buses.							0.513	
I like to spend most of my time working.					-0.265			0.717
When ... busy at work, I get more done by cutting back on personal time.								0.656
... I would be willing to give up a day's pay to get a day off work.							0.305	-0.319
I use public transportation when I cannot afford to drive.						0.404		
Ridesharing saves money.		0.460						
Traffic congestion will take care of itself because people will adjust.		-0.286			-0.334			
I am not comfortable riding with strangers.		-0.368						
We need to build more roads to help decrease congestion.	0.357						0.449	
The rideshare car or van is often late.		-0.378				0.298		
I like someone else to do the driving.		0.367						
Too many people drive alone.		0.382			0.362			
It costs more to use public transportation than ... to drive a car.		-0.417					0.255	

(negative loading), "Too many people drive alone," "The rideshare car or van is often late" (negative loading), "I am not comfortable riding with strangers" (negative loading), "I like someone else to do the driving," "Traffic congestion will take care of itself because people will make adjustments" (negative loading), and "Using tax dollars to pay for public transportation is a good investment." This factor thus reflects the orientation towards ridesharing as well as public transit.

The third factor can be named as a "suburbanite" factor. Its primary determinants are responses to: "I need to have space between me and my neighbors," "I would only live in a multiple family unit ... as a last resort," "It's important for children to have a large backyard for playing," and "High density residential development should be encouraged" (negative loading). This factor thus represents an individual's orientation toward the consumption of land for his/her living space.

The primary determinants of the fourth factor are responses to: "Driving allows me to get more done," "Driving allows me freedom," and "I would rather drive an electric or other clean-fuel vehicle than give up driving." There is one more variable with an absolute factor loading that exceeds 0.25, "I feel that I am wasting time when I have to wait." This factor thus represents one's orientation toward the apt and ubiquitous mobility provided by the automobile. This factor will be named a "automotive mobility" factor.

The fifth factor is defined principally by responses to: "Getting stuck in traffic doesn't bother me too much" (negative loading), "I would like to have more time for leisure," and "I feel I am wasting time when I have to wait." This factor may be appropriately named as a "time pressure" factor.

Responses to "Having shops and services within walking distance of my home would be important to me," and "Too much valuable agricultural land is consumed to supply housing" are the primary determinants of the sixth factor, followed by those to: "Too many people drive alone," "Traffic congestion will take care of itself because people will make adjustments" (negative loading), "High density residential development should be encouraged," and "I like to spend most of my time working" (negative loading). People with high ratings on this factor would be oriented

toward a pedestrian-oriented, high-density urban environment, leading lifestyles where work is not the dominating concern. This factor will be thus named an "urban villager" factor.

The dominant variables that define the seventh factor are responses to: "I would be willing to pay a toll to drive on an uncongested road," and "More lanes should be set aside for carpools and buses," followed by "We need to build more roads to help decrease congestion," "We should provide incentives to people who use electric or other clean-fuel vehicles," "Stricter vehicle smog control laws should be introduced and enforced," "Occasionally, I would be willing to give up a day's pay to get a day off work," "Too much valuable agricultural land is consumed to supply housing" (negative loading), and "We should raise the price of gasoline to reduce congestion and air pollution." People with high values of this factor would tend to believe in transportation control measures and regulations to resolve transportation and other urban problems. They would also tend to be positive about the expansion of facilities and tend not to have reservations about urban expansion. This factor will therefore be termed an "TCM" factor.

The final factor is defined by responses to: "I like to spend most of my time working," "When things are busy at work, I get more done by cutting back on personal time," and "Occasionally, I would be willing to give up a day's pay to get a day off work" (negative loading). This factor can be unequivocally named a "workaholic" factor.

In sum, much of the information contained in the attitudinal responses to the 39 statements can be summarized into eight dimensions:

1. pro-environment,
2. pro-transit,
3. suburbanite,
4. automotive mobility,
5. time pressure,
6. urban villager,
7. TCM, and
8. workaholic.

Differences in respondents' attitudes across the five study areas are summarized using these factors in Tables 7.30 through 7.37.

Table 7.30
Descriptive Statistics by Study Area of Factor 1: Pro-Environment

	Sample Size	Mean	S.D.	Min.	Max.
North San Francisco	141	0.340	1.022	-3.536	2.770
South San Francisco	199	0.251	0.963	-2.652	2.456
Concord	195	-0.262	0.969	-2.754	2.276
Pleasant Hill	214	-0.019	0.945	-3.536	2.166
San Jose	235	-0.092	1.053	-3.500	2.368

Table 7.31
Descriptive Statistics by Study Area of Factor 2: Pro-Transit

	Sample Size	Mean	S.D.	Min.	Max.
North San Francisco	141	-0.238	1.003	-3.428	1.846
South San Francisco	199	-0.088	0.972	-2.663	3.154
Concord	195	0.204	0.991	-2.497	2.876
Pleasant Hill	214	0.238	0.902	-2.047	2.638
San Jose	235	-0.054	1.082	-4.135	2.487

Table 7.32
Descriptive Statistics by Study Area of Factor 3: Suburbanites

	Sample Size	Mean	S.D.	Min.	Max.
North San Francisco	141	-0.466	1.113	-3.441	1.794
South San Francisco	199	-0.247	0.955	-2.939	2.332
Concord	195	0.425	0.834	-2.199	2.600
Pleasant Hill	214	-0.216	1.063	-3.079	2.029
San Jose	235	0.281	0.859	-2.391	2.127

Table 7.33
Descriptive Statistics by Study Area of Factor 4: Automotive Mobility

	Sample Size	Mean	S.D.	Min.	Max.
North San Francisco	141	-0.134	1.090	-4.989	1.935
South San Francisco	199	-0.027	1.093	-3.775	1.726
Concord	195	-0.042	0.885	-3.175	2.859
Pleasant Hill	214	-0.014	0.920	-3.024	2.211
San Jose	235	0.144	0.961	-2.886	2.186

Table 7.34
Descriptive Statistics by Study Area of Factor 5: Time Pressure

	Sample Size	Mean	S.D.	Min.	Max.
North San Francisco	141	0.136	1.016	-2.619	3.053
South San Francisco	199	0.030	0.925	-2.366	2.376
Concord	195	-0.015	1.014	-2.912	3.053
Pleasant Hill	214	0.089	1.068	-2.966	2.807
San Jose	235	-0.118	0.988	-2.780	2.364

Table 7.35
Descriptive Statistics by Study Area of Factor 6: Urban Villagers

	Sample Size	Mean	S.D.	Min.	Max.
North San Francisco	141	0.186	1.077	-2.491	3.448
South San Francisco	199	0.105	0.899	-2.198	2.448
Concord	195	0.001	0.890	-2.765	2.227
Pleasant Hill	214	-0.098	1.078	-5.408	3.597
San Jose	235	-0.048	0.961	-4.262	2.737

Table 7.36
Descriptive Statistics by Study Area of Factor 7: TCM

	Sample Size	Mean	S.D.	Min.	Max.
North San Francisco	141	0.352	0.818	-1.676	2.264
South San Francisco	199	0.159	0.966	-2.502	2.969
Concord	195	-0.195	1.015	-2.941	3.238
Pleasant Hill	214	-0.129	0.942	-3.513	2.570
San Jose	235	-0.189	0.951	-3.215	2.332

Table 7.37
Descriptive Statistics by Study Area of Factor 8: Workaholics

	Sample Size	Mean	S.D.	Min.	Max.
North San Francisco	141	-0.223	1.076	-3.568	2.208
South San Francisco	199	0.058	1.026	-5.006	2.943
Concord	195	-0.005	0.931	-2.209	2.472
Pleasant Hill	214	0.038	1.014	-2.704	3.216
San Jose	235	0.108	0.909	-2.392	2.568

8. ASSOCIATION BETWEEN ATTITUDE FACTORS AND TRIP RATES BY MODE AND MODAL SPLIT

The analysis of the previous section has identified factors that are associated with trip rates by mode and modal split through an examination of a wide range of variables including the characteristics of the neighborhoods in which the respondents resided. Excluded from the pool of explanatory variables for that analysis are the attitude factors that were identified in Chapter 6. There are several reasons for this, most important of which is that attitudes are, like travel behavior itself, elements that are to be explained, but not necessarily to be used to explain behavior. In fact there are competing hypotheses regarding the relationship between attitudes and behavior: attitudes are formed through experience as a result of behavior; attitudes prompt certain types of behavior; and interactive, two-way relationships exist between attitudes and behavior. In this chapter, the analysis of the previous chapter is extended by introducing the attitude factors into the model as explanatory variables. The intent of the section is not to identify causal relationships that may exist between attitudes and behavior, but to measure the extent of association between attitudes and behavior, in this case trip rates by mode and modal split. If the attitude factors turn out to be significantly associated with these behavioral measures, then further analysis is warranted as a future effort to inspect causal relationships between the two.

Table 8.1 shows the same best model for the total number of person trips, but re-estimated for a new sub-sample of 654 respondents for whom complete attitude scores are available. Also presented in the table is a model that includes the eight attitude factors as explanatory variables in addition to those in the best model. As the F-statistic for the attitude factors indicates, the factors as a group are significant at $\alpha = 1\%$, and improve the R^2 value from the best model's 14.33% to 17.18%. Comparison of this F-statistic with those of the models presented later would, however, show that the association between the total number of person trips and the attitude factors is relatively weak. Of the eight factors, the automotive mobility factor is significant at $\alpha = 1\%$ and the pro-transit factor at $\alpha = 2\%$. Both factors are positively associated with the number of person

trips. The pro-environment factor is significant at $\alpha = 10\%$, and is also positively associated with the dependent variable.

Table 8.1
Associations between Attitude Factors and the Total Number of Person Trips

	Number of Trips			
	Base Model		With Attitude Factors	
	Coef.	t	Coef.	t
Intercept	4.537		5.373	
Household Size	2.598	8.26	2.670	8.45
Persons Over 16 Yrs. Old	-3.080	-6.70	-3.024	-6.61
Driver's License	2.254	1.80	1.846	1.47
Age Divided by 10	-0.311	-3.11	-0.278	-2.77
Student Dummy Variable	2.489	1.75	2.090	1.46
Household Income (in $10,000)	-0.849	-2.16	-0.713	-1.80
(Household Income)$^{1/2}$	4.983	2.50	4.207	2.09
North San Francisco	2.101	2.50	1.981	2.32
Parking Spaces Available	-0.236	-2.32	-0.209	-2.01
Factor 1: Pro-Environment			0.466	1.86
Factor 2: Pro-Transit			0.617	2.56
Factor 3: Suburbanite			-0.184	-0.73
Factor 4: Automotive Mobility			0.754	3.01
Factor 5: Time Pressure			0.371	1.48
Factor 6: Urban Villager			0.201	0.79
Factor 7: TCM			0.008	0.03
Factor 8: Workaholic			-0.140	-0.55
R^2	0.1433		0.1718	
Standard Error of Estimation	6.204		6.138	
F	11.97		7.76	
D.F.	9, 644		17, 636	
α	< 0.00005		< 0.00005	
F for the Attitude Factors	-		2.732	
D.F.	-		8, 636	
Significance (* = 5%, ** = 1%)	-		**	

Table 8.2
Associations between Attitude Factors and the Number of Transit Trips

	Number of Transit Trips			
	Best Model		With Attitude Factors	
	Coef.	t	Coef.	t
Intercept	3.051		2.736	
Persons Over 16 Yrs. Old	0.332	2.83	0.276	2.39
No. of Cars	-0.551	-5.87	-0.491	-5.26
Driver's License	-0.741	-2.10	-0.504	-1.45
Professional Dummy Variable	0.388	2.48	0.302	1.98
Graduate School Dummy Variable	-0.518	-3.31	-0.501	-3.26
High Personal Income Dummy Variable	0.438	2.60	0.462	2.78
Years in Bay Area Divided by 10	-0.160	-3.90	-0.137	-3.26
Backyard	-0.544	-2.62	-0.602	-2.92
Distance to Nearest Rail Station	-0.138	-2.70	-0.094	-1.88
Dist. to Nearest Park	-0.239	-2.51	-0.204	-2.15
Factor 1: Pro-Environment			0.042	0.61
Factor 2: Pro-Transit			0.311	4.74
Factor 3: Suburbanite			-0.101	-1.46
Factor 4:Automotive Mobility			-0.318	-4.65
Factor 5: Time Pressure			0.080	1.15
Factor 6: Urban Villager			0.076	1.08
Factor 7: TCM			-0.022	-0.32
Factor 8: Workaholic			0.043	0.62
R^2	0.1503		0.2110	
Standard Error of Estimation	1.730		1.677	
F	11.37		9.44	
D.F.	10, 643		18, 635	
α	< 0.00005		< 0.00005	
F for the Group	-		6.104	
D.F.	-		8, 635	
Significance (* = 5%, ** = 1%)	-		**	

The number of transit trips made by the respondent is as expected associated positively with the pro-transit factor and negatively with the automotive mobility factor (Table 8.2). Interestingly, with a t-statistic of 0.61, the pro-environment factor is statistically not at all significant. The model estimation results thus suggest that the attitudes one has towards the environment are not associated with his or her use of public transit.

Contrary to this, the number of non-motorized trips shows in Table 8.3 strong positive associations with the pro-environment factor and the pro-transit factor (both significant at $\alpha = 1\%$), and also with the urban villager factor (significant at $\alpha = 10\%$). The automotive mobility exhibits a strong negative association (significant at $\alpha = 1\%$). Clearly making walking and cycling trips is strongly and consistently associated with the attitudes one has toward the environment, public transit, and the door-to-door mobility provided by the automobile. The eight attitude factors together add more than 6 percentage points (200%) to the model's explanatory power to yield an R^2-value of 9.46%.

With a t-statistic value of 6.23, the automotive mobility factor is a dominant factor in the model for the fraction of auto trips (Table 8.4). The pro-environment and pro-transit factors have significant (at $\alpha = 1\%$) negative coefficients. The time pressure and urban villager factors also have significant negative coefficients (at 5% and 10%, respectively). The coefficient of the time pressure factor is negative, presumably because those who primarily use the automobile are less time pressured. The attitude factors are collectively highly significant with an F-statistic value of 12.64. These attitude factors add to the model's explanatory power and, adding to the variance explanation of 13.50% offered by the factors in the best model such as the distance to the nearest bus stop and distance to the nearest park or playground, they increase the R^2 value to 21.25%.

Like in the model for the number of transit trips the automotive mobility and pro-transit factors are significant (both at $\alpha = 1\%$) in the model for the fraction of transit trips (Table 8.5). Again, the pro-environment factor is not at all significant.

The automotive mobility factor has a large negative coefficient (significant at $\alpha = 1\%$) in the model for the fraction of non-motorized trips (Table 8.6). As in the model for the number of non-motorized trips, the pro-environment and pro-transit factors are significant, but their coefficient values and t-statistics are both much smaller relative to those of the automotive mobility factor. The urban villager factor has a significant ($\alpha = 5\%$) positive coefficient, while the time pressure factor is not significant in this model.

Table 8.3
Associations between Attitude Factors and the Number of Non-Motorized Trips

	Number of Non-Motorized Trips			
	Best Model		With Attitude Factors	
	Coef.	t	Coef.	t
Intercept	-0.259		-0.259	
North San Francisco	1.669	4.31	1.641	4.17
BART Access	0.695	2.70	0.590	2.29
Sidewalk	0.589	2.02	0.760	2.56
Factor 1: Pro-Environment			0.355	3.43
Factor 2: Pro-Transit			0.313	3.08
Factor 3: Suburbanite			-0.012	-0.12
Factor 4: Automotive Mobility			-0.391	-3.76
Factor 5: Time Pressure			0.137	1.35
Factor 6: Urban Villager			0.202	1.91
Factor 7: TCM			-0.130	-1.24
Factor 8: Workaholic			0.086	0.82
R^2	0.0340		0.0946	
Standard Error of Estimation	2.650		2.582	
F	7.62		6.10	
D.F.	3, 650		11, 642	
α	0.0001		< 0.00005	
F for the Attitude Factors	-		5.374	
D.F.	-		8, 642	
Significance (* = 5%, ** = 1%)	-		**	

Table 8.4
Associations between Attitude Factors and the Fraction of Auto Trips

	Fraction of Auto Trips			
	Best Model		With Attitude Factors	
	Coef.	t	Coef.	t
Intercept	-2.169		-1.611	
Cars per Person	0.551	3.15	0.387	2.26
Driver's License	2.275	6.13	2.005	5.54
High Education Dummy Variable	0.118	0.77	0.138	0.91
Parking Spaces Available	0.104	3.52	0.098	3.33
Distance to Nearest Bus Stop	1.137	3.31	0.765	2.28
Dist. to Nearest Park	0.259	2.61	0.224	2.31
Factor 1: Pro-Environment			-0.148	-2.05
Factor 2: Pro-Transit			-0.222	-3.25
Factor 3: Suburbanite			0.075	1.04
Factor 4: Automotive Mobility			0.445	6.23
Factor 5: Time Pressure			-0.138	-1.98
Factor 6: Urban Villager			-0.120	-1.65
Factor 7: TCM			0.027	0.38
Factor 8: Workaholic			0.120	1.67
R^2	0.1350		0.2125	
Standard Error of Estimation	1.829		1.756	
F	16.83		12.32	
D.F.	6, 647		14, 639	
α	< 0.00005		< 0.00005	
F for the Attitude Factors	-		12.64	
D.F.	-		5.642	
Significance (* = 5%, ** = 1%)	-		**	

Table 8.5
Associations between Attitude Factors and the Fraction of Transit Trips

	Fraction of Transit Trips			
	Base Model		With Attitude Factors	
	β	t	β	t
Intercept	-0.975		-1.161	
Persons Over 16 Yrs. Old	0.262	3.57	0.232	3.04
No. of Cars	-0.364	-5.85	-0.338	-5.46
Driver's License	-0.727	-3.10	-0.521	-2.27
Professional Dummy Variable	0.086	0.83	0.047	0.47
Graduate School Dummy Variable	-0.306	-2.95	-0.279	-2.75
High Personal Income Dummy Variable	0.228	2.04	0.246	2.24
Years in Bay Area Divided by 10	-0.040	-1.47	-0.037	-1.32
Backyard	-0.492	-3.58	-0.549	-4.02
Distance to Nearest Rail Station	-0.081	-2.38	-0.054	-1.63
Dist. to Nearest Park	-0.113	-1.79	-0.101	-1.60
Factor 1: Pro-Environment			0.004	0.08
Factor 2: Pro-Transit			0.135	3.11
Factor 3: Suburbanite			-0.016	-0.35
Factor 4: Automotive Mobility			-0.274	-6.04
Factor 5: Time Pressure			0.001	0.03
Factor 6: Urban Villager			0.046	0.98
Factor 7: TCM			-0.036	-0.80
Factor 8: Workaholic			0.047	1.04
R^2	0.1287		0.1916	
Standard Error of Estimation	1.147		1.112	
F	9.50		8.36	
D.F.	10, 643		18, 635	
α	< 0.00005		< 0.00005	
F for the Attitude Factors	-		6.173	
D.F.	-		8, 635	
Significance (* = 5%, ** = 1%)	-		**	

The six models estimated here have made it evident that the attitude factors are strongly associated with the travel demand measures used in this analysis. They contribute to the models' explanatory power in addition to the demographic, socio-economic and neighborhood characteristics variables that are in the best models developed in Chapter 7. The number of trips by travel mode is strongly associated with factors that represent individuals' attitudes toward the environment, public transit, automotive mobility, urban forms, and time. An important next step of analysis is to determine how these attitudes are formed, how they interact with travel experience, and how these attitudes affect the choice of residential and job location, housing unit, and vehicle ownership.

9. CONCLUSION

The objective of this project has been to identify the relationship between land use and travel demand, in particular, the relationship between land use density and mixture, and vehicle use. To this end, a set of five neighborhoods was selected in the San Francisco Bay Area, where mail surveys were conducted to collect information on household demographics and socio-economics, travel patterns, life styles, and attitudes towards urban transportation, housing and environment. Three-day travel diaries were used to collect the attributes of trips made by household members of over 16 years old. In addition, detailed land use data were collected through site surveys. The analyses presented in this report are based on the results of these surveys.

Limitations of the Study

One of the important features of this research study has been the use of an extensive set of variables to examine the relationship between land use and travel demand, including perceived distance to transit facilities, perceived availability of pedestrian and bicycle facilities, various attitude measures, trip diary data, and demographic, socio-economic and land use variables. The analyses have identified many important relationships among these variables. The analyses so far, however, are limited in several ways. Firstly, the household surveys were self-administered mail surveys, which in general produce lower response rates, higher item non-responses and response errors, compared to more costly face-to-face interview or telephone interview surveys. Weights can be developed and missing variables may be imputed to correct some of these problems. These remain as future tasks. Secondly, trip diary data have not been fully utilized because geo-coding of trip origins and destinations has not been performed because it requires a significant amount of resources. Consequently the analyses contained in this report are limited in their spatial content. Thirdly, the results of the site surveys have not been fully integrated with the results of the household surveys. The analyses so far, therefore, incorporate site characteristics only to some

limited extent. Fourthly, causal relations among the factors pertaining to land use, travel demand and attitudes have not been identified within the project. Finally, the analyses presented in this report are based on portions of the rich information contained in the data collected in the project. It remains as a future task to more fully utilize the data set.

Results Summary

Despite these limitations, the analyses of the data set have offered a number of valuable findings. Consistent with previous findings in the literature, the results of the regression analyses of this study indicated that vehicle ownership is not associated with the number of person trips itself, but is strongly associated with the use of travel modes. Quite importantly, the results have shown that respondents from the high density study areas on average reported 1.22 trips more per three days than did their counterparts in the low density study areas. It has also been shown that mixed land use is positively associated with the number of person trips. The analyses have thus offered evidence that land use characteristics are associated with person trip generation.

The number of cars per person and driver's license holding are the dominant explanatory variables in the model developed to explain the fraction of car trips in total person trips. The analyses also show that respondents from the North San Francisco and South San Francisco study sites tend to have smaller fractions of car trips. The distance from home to the nearest bus stop was found to be positively associated with the fraction of car trips, implying that the farther one lives from a bus stop, the larger the fraction of car trips. The analyses has also shown that those who felt that the streets were pleasant for walking in their neighborhoods, tended to have smaller fractions of car trips.

Car availability — the number of cars and driver's license holding — were both negatively associated with the number of transit trips and the fraction of transit trips. BART access and a more general measure, the distance to the nearest rail station, were both found to be strongly associated with transit trip generation and transit modal split. Clearly accessibility to transit stops is an important factor associated with transit use.

With the intent of assessing the effect of land use characteristics and pedestrian and bicycle facilities on the generation of non-motorized trips, the number of non-motorized trips and the fraction of these trips were analyzed in the study. As expected, car availability was found to be negatively associated with non-motorized trip generation. The results indicate that, other things being equal, residents in the North San Francisco study site tend to make about 1.5 walking or bicycle trips more per three days than do those in the San Jose study site. It can be safely inferred that the high density in the North San Francisco area contributes to this high non-motorized trip generation rate. The results also offer support to the conjecture that high land use density positively contributes to the generation of non-motorized trips; that having sidewalks in the neighborhood contributes to the generation of non-motorized trips; and that residents in low density suburban areas tend to make fewer non-motorized trips.

The analysis of the number and fraction of non-motorized trips indicates that neighborhood characteristics, such as residential density and the presence of sidewalks, do affect the generation of non-motorized trips. Demographic and socio-economic attributes of the household or individual do not have dominating effects on the generation of walk or bicycle trips. The results suggest that urban residents' travel behavior may be modified to some extent by site planning that encourages walking or the use of bicycles.

Future Research

Together with the importance of attitudes found in Chapter 8, the study results point to the need for further analysis of the inter-relationship among attitudes, demographic and socio-economic factors, transit accessibility and pedestrian/bicycle facilities, and land use characteristics. As future effort, it is important that the microscopic measurements of site characteristics be better integrated with the results of the household surveys and causal relations among pertinent factors, including urban residents' attitudes, be rigorously analyzed. It is also important that results of this study be validated and generalized through the use of more extensive data that can be obtained by conducting similar surveys for a wider range of neighborhoods.

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Land Use and Travel Behavior: Attitudes and Mobility PART II

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

AIR RESOURCES BOARD
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LAND USE AND TRAVEL BEHAVIOR: Attitudes and Mobility

Part II

Final Report

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1. Introduction

Ample evidence exists that land use and travel demand are strongly associated. Study after study has shown that household automobile ownership is correlated with residential density (Pushkarev & Zupan, 1977; Mogridge, 1985) and residential density has been found to be associated with public transit service level, household size and household income (Alonso, 1964; Muth, 1969). As a result, an urban area often exhibits a negative correlation between residential density and automobile use; residents in the central area tend to rely on public transit and non-motorized modes of travel, while suburbanites tend to live auto-oriented lifestyles. It has also been hypothesized that not only the intensity but the mixture of land uses is associated with travel demand as measured in terms of trip frequency by mode and travel distance (Levinson & Wynn, 1963; Pushkarev & Zupan, 1977; Goodwin, 1975; Cervero, 1989).

Based on the compelling evidence of association between land use and travel, we tend to conclude that travel demand can be affected by land use. In other words, we are inclined to infer causality on the basis of observed association, and conjecture that land use policies can be deployed to curb travel demand, in particular automobile use. The following question, however, is critical to that conjecture: Is the observed association between travel and land use real, or is it an artifact of the association between land use and the multitude of demographic, socio-economic, and transportation supply characteristics which also are associated with travel? High density in general means smaller housing units, lower automobile ownership levels, smaller household sizes, lower incomes, a mixture of land use types, higher accessibility to opportunities, and better transit service. An apparent association between land use and travel, therefore, may not imply that land use genuinely affects travel. Then one may ask: Can we really change travel behavior by changing land use characteristics? One could argue that certain types of land use patterns attract residents with certain demographic and socio-economic attributes, attitudes and values, and that these attributes of residents are the true determinants of their travel behavior. Spatial segregation of socio-economic classes and resulting relative homogeneity within each residential neighborhood are consistent with this view. If this is in fact the case, then altering land use characteristics by itself would

not affect the residents' travel behavior; travel characteristics would change only after new residents are attracted by the new land use and move into the area while old residents who find the land use unsuitable eventually move out. In the case of new developments, given the increasingly unaffordable cost of single-family dwellings in major metropolitan areas, the demand for higher-density housing may be for many people due to its lower cost, not due to a lifestyle preference for a higher-density environment. If so, then selection of a home in a higher-density neighborhood may not be accompanied by the same travel characteristics that have historically been associated with such residential locations. That is, auto ownership and use may not be as low in the future for these types of developments as has been the case in the past. It is then unclear how effective or desirable it would be to attempt to manage travel demand through land use policy.

This study is an effort to analyze whether land use indeed affects travel and therefore whether properly formulated land use policies will serve to help control travel demand. Because of this orientation it is imperative for this study that the relationship between land use and travel demand be discussed within a comprehensive framework that takes all pertinent factors into account. The following have been identified in this study as such factors:

- demographic and socio-economic attributes,
- transit and highway accessibility,
- pedestrian/bicycle facilities,
- accessibility to opportunities,
- reasons for residential choice,
- perception of the quality of the residential neighborhood, and
- attitudes toward urban transportation, environment and other aspects of urban life.

Subjective factors as well as objectively measured variables are included in the analysis.

Since no data sets were readily available that contain these types of information, surveys of households were conducted at five selected neighborhoods in the San Francisco Bay Area. These

neighborhoods, each approximately one-square-mile in area, were selected on the basis of residential density, land use mix and rail transit accessibility. Site surveys were conducted and supplementary data were collected to obtain detailed characteristics of each neighborhood. The resulting data set used for this study thus contains micro-scale measures of land use characteristics, roadway and transit service characteristics, and attitudinal and perception measures in addition to the more traditional census data, trip diary information and household demographics and socio-economics.

The resulting data set is used to examine the significance of the association between the variables from the above groups and travel demand, expressed in terms of: the number of trips, the number of transit trips, the number of non-motorized trips, the fraction of automobile trips, the fraction of transit trips, and the fraction of non-motorized trips. The individual, not the household, is used as the unit of analysis because attitudes and perceptions, which are considered as determinants of travel behavior, are associated with individuals. Linear regression models of these measures of travel demand are developed and effects of land use and other factors on travel demand are evaluated. Factor scores representing individuals' attitudes toward various aspects of urban life are then introduced into the model to evaluate how such subjective factors are associated with travel demand and to determine whether genuine association exists between land use and travel after attitudes and other factors are accounted for. Based on the results, inferences are made on the effectiveness of land use policy in shaping travel demand, and directions for future research are proposed.

This paper is organized as follows. In the next section, related recent studies in the literature are reviewed (a large body of literature exists on the subject of land use and travel; some of this general literature is reviewed in Hanson & Schwab, 1987, Giuliano, 1989, and Handy, 1992). The approach taken in this study is summarized in Section 3. The association between neighborhood characteristics and travel is discussed in Section 4. Attitudinal factors are introduced into the analysis in Section 5. Section 6 is a summary and recommendations.

2. Recent Related Research

There is a growing body of literature built around tests of the hypothesis that traditional neighborhood developments (TNDs), or similar land use patterns, lead to a reduction in vehicular trips and distance traveled. One study (Howard/Stein-Hudson Associates, 1993) involved modeling hypothetical scenarios for the Middlesex-Somerset-Mercer region of New Jersey. Year 2010 projected population growth was redirected to three types of configurations: transit-oriented, short-drive oriented, and walk-oriented. The outcome was that these higher-density configurations reduced vehicle use and increased transit use over the baseline case.

In another study (McNally & Ryan, 1993), two hypothetical transportation networks -- one representing a conventional community, the other a neo-traditional one -- were designed and their travel characteristics modeled. Holding activity levels constant, longer trips and greater congestion resulted from the conventional design. While small, this study is of interest in that densities and mixtures of land uses were not modeled -- the noted result is due only to the differences in configuration of the transportation network between the two types of communities (more cul-de-sacs and less connectivity in the conventional network).

Several studies have empirically compared existing travel behavior across different types of areas within the same region. A study of two neighborhoods in the City of Portsmouth, New Hampshire (White Mountain Survey Co., 1991) found that for the multi-use neighborhood, trip generation rates were considerably lower than the general averages contained in the ITE Trip Generation Handbook. Further, it appeared that a higher proportion of the trips that were generated remained internal to the study area than would normally be the case. These results did not hold for the second, primarily residential neighborhood, even though it also was considered to have "traditional" character.

Handy (1993) developed measures of local and regional accessibility to shopping opportunities for 34 superdistricts in the San Francisco Bay Area. Using the 1981 Metropolitan Transportation Commission travel survey data, she analyzed shopping travel by these geographic divisions, and

concluded that high levels of either local and regional accessibility were associated with shorter trip lengths but not with fewer trips.

In Ewing, et al. (1994), trip records for six Palm Beach, Florida communities exhibiting a variety of land use configurations were examined for differences in trip frequency, mode choice, trip chaining, trip length, and overall vehicular travel. The "sprawling suburban" community generated almost two-thirds more vehicle hours of travel per person than the "traditional city" community, with the others falling in between these two endpoints. The authors observe that "[d]ensity, mixed use, and a central location all appear to depress vehicular travel" (p. 19).

Using a variety of techniques in a variety of regions, then, the literature is virtually unanimous in concluding that the higher densities and mixed land uses characteristic of traditional neighborhood developments are associated with reductions in vehicular travel. Whether TND configurations actually cause those reductions is seldom addressed explicitly but is generally implicitly assumed.

There is, however, at least one study that is critical of using land use strategies to reduce congestion and improve air quality. Wachs (1993) cites earlier aggregate studies (e.g. Newman and Kenworthy, 1989a, 1989b) finding that higher-density urban forms are correlated with lower energy consumption and greater use of transit, shared ride, and non-vehicular modes of travel. He argues, however, that the direction even in very high-density cities such as Hong Kong and New York is toward lower densities and greater use of the automobile and that it is unreasonable to expect to "reverse [that] steady, worldwide trend" (p. 9). Further, he points out that these higher-density cities, while achieving lower vehicular and energy use per capita, still experience higher levels of congestion in the aggregate precisely because they are higher density. Other studies (e.g. Gordon, et al., 1991) appear to support the hypothesis that "lower density development ... diffuses traffic and provides far less overall congestion..." (Wachs, p. 10). Also, he notes the inconsistency between policies supporting job - housing balance and those supporting rail transit development, which rely for their success on considerable imbalance between job and housing locations.

Finally, there is at least one study dealing with the association between personality characteristics and residential location and travel patterns. Prevedouros (1992) found that extroverts tended to make more non-work trips than introverts, that materialists tended to devote a higher proportion of their incomes to owning automobiles than utilitarian respondents, and that urbanites were more likely to live in higher-density areas than respondents having personality traits more commonly associated with suburban living. Although these findings were based on a relatively limited set of variables, they lend support to the premise of this paper, namely, that lifestyle choices are relevant to the selection of a residential neighborhood and to travel behavior.

3. Approach

The approach taken in this study is to collect micro-scale land use, roadway network, and public transit information in a set of carefully selected neighborhoods. This information is integrated with demographic, socio-economic, attitudinal, and travel behavior data collected through mail surveys of households in the same neighborhoods. The resulting database is used in multivariate statistical analyses to test various study hypotheses.

Because only a limited number of neighborhoods could be studied they were selected through a careful experimental design to yield the maximum amount of information. The selection procedure utilized the 700-zone land use data base for the nine-county San Francisco Bay Area supplied by the Metropolitan Transportation Commission (MTC). In addition, census data and geographical information available from land use maps, road maps, and other sources were used in the site selection to obtain data on neighborhood characteristics. Access to the Bay Area Rapid Transit (BART) system and land use mix were used as controlling factors in addition to median household income and residential density.

In order to gain a set of study sites that facilitates efficient statistical analysis, a strategy was set to obtain MTC zones that represent extreme values in terms of land use density and mixtures. On the other hand, zones with medium income ranges were desired to control for the effect of income on travel.

Thus median zonal income was held relatively uniform across study sites while extremes were included in terms of population density and land use mix. Within each zone, however, income varies considerably across households, permitting the examination of the association between household income and travel behavior. This led to a candidate pool of twenty zones. Following the selection of the 20 candidate zones, a tentative set of study sites was selected and site visits were made to determine their individual suitability. Final selection was performed by examining the access to rail transit on zone maps. Five study sites in all were then defined using major streets as boundaries, each to cover an approximately one square mile area.

Site surveys were conducted at each of the five study sites to obtain micro-scale measurements of (a) street characteristics (street width, presence of sidewalks and bike lanes, speed limits and other traffic regulations, etc.), (b) public transit service (location of bus stops, service frequency, etc.), (c) location and types of commercial establishments, (d) parks and other public facilities, and (e) general observation of neighborhood characteristics. Table 1 summarizes the characteristics of the five study sites. Details can be found in Kitamura, et al. (1994).

Households in these study sites were randomly selected based on address listings and household members were surveyed by mail. The survey consisted of the following three phases:

1. Recruitment. Participation in the survey was solicited following several questions on basic household attributes.
2. Trip Diary and Household Survey. Three-day trip diaries were distributed to household members at least 16 years old along with a household questionnaire that collected information on perceived neighborhood characteristics as well as demographic and socio-economic attributes of the households.
3. Person Survey. Personal questionnaires were distributed to gain detailed information on individuals' commute trip alternatives, action space, attitudes towards various aspects of urban life, leisure activities and lifestyles.

Due to resource constraints, mail was the only feasible survey medium for the study. This led to a low response rate of 17.6% for the first survey phase. In the subsequent two phases, however, more than 60% of the respondents were retained.[1] The survey results were integrated with the results of site surveys, MTC land use data, census data and information from other sources to form the database used in the analyses described in the following sections.

Table 1
Study Site Characteristics Summary

Site Characteristic	NORTH SAN FRANCISCO	SOUTH SAN FRANCISCO	CONCORD	PLEASANT HILL	SAN JOSE
Density	High	High	Low	High	Low
Land Use	Mixed	Residential	Mixed	Mixed	Mixed
Street Pattern	Grid	Curved, rectilinear, grid	Radiating	Fragmented	Discontinuous, grid
Topography	Hills	Hill, Flat	Flat	Flat	Flat
Business Locations	Throughout the site	Monterey Blvd and near perimeter	Western end of site	Central near BART and Freeway	3 corners of site
Freeway Access	I-80 one mile east	I-280 to east	Hwy 242 1/2 mile west	I-680 transects site	Capitol Expressway on eastern boundary
BART Access	None	Southeast corner of site	West side of site	Center of site	None
Bus Lines	21 bus routes	One route	Three routes	Three routes	Five routes along perimeter
Main Street Name(s)	Geary, Divisadero	Portola Dr.	Galindo, Concord, Clayton, Cowell	Treat Blvd.	Branham
Main Street Direction	North-South and East-West	North-South	East-West	East-West	North-South
Bike Trails	None	None	Parallel to Contra Costa Canal and along Cowell Rd. No street markings	Parallel to Contra Costa Canal at southern boundary	None marked
Sidewalks	Wide	Narrow, Discontinuous	Missing, Discontinuous	Discontinuous	Missing
Walking	Common	Difficult	Hazardous	Hazardous	Hazardous

[1]This low response rate led to under-representation of individuals younger than 35 years old, individuals without college education, and households with annual incomes of less than $20,000 (see Kitamura, et al., 1994). This is not considered to present problems for this analysis because (a) hypotheses are tested and inferences are made in the study by modeling relationships among variables, not by tabulating descriptive statistics from the sample, and (b) measurements of individuals' perceptions and attitudes, which may be associated with the decision to participate or not to participate in the survey, are incorporated into the analysis.

4. Association Between Study Area Characteristics and Travel

This section focuses on the association between various measures of study area characteristics and selected measures of individuals' travel behavior obtained from the three-day travel diary. Both objective measures of neighborhood characteristics obtained by the research team and subjective measures reported by the respondents are included in the analysis. The objective of this section is to quantitatively assess how much land use characteristics, transit accessibility and other neighborhood characteristics are associated with travel demand, in particular vehicular travel demand.

Prior to the analysis, it is useful to review descriptive statistics of travel behavior from the five neighborhoods (Table 2). Because of the way the neighborhoods are selected they exhibit substantial differences in travel characteristics among themselves. North San Francisco is unique in its low vehicle ownership, high fractions of walk/bicycle trips and bus trips, and low fraction of auto driver trips. Concord and San Jose, on the other hand, have high levels of vehicle ownership and a more auto-dominated modal split. Like North San Francisco, South San Francisco shows a relatively low level of vehicle ownership. They both have substantially shorter mean trip lengths than those of the other three neighborhoods. The three neighborhoods with BART access, South San Francisco, Concord and Pleasant Hill, have higher fractions of rail trips. These statistics indicate the diversity that exists among the selected study sites ranging from the high-density, pedestrian-oriented neighborhood of North San Francisco to the suburban, auto-oriented neighborhood of San Jose.

The statistical analyses reported in the rest of this section focus on the following measures of mobility:

- total number of person trips,
- number of transit trips,
- number of non-motorized trips,
- fraction of automobile trips,
- fraction of transit trips, and
- fraction of non-motorized trips.

The distance traveled is not analyzed in this study because only reported trip distance is available while a rigorous analysis of person-miles traveled and miles traveled by mode would require geo-coding of trip ends.[1]

The individual, not the household, is chosen as the unit of analysis in this study because of the advantage that attributes specific to individuals can be incorporated into the analysis, in particular the attitudes toward transportation, environment, energy and other aspects of urban life. Note that the analysis of this study is for those individuals who were over 16 years old at the time of the survey and from whom trip-diary data are available.

Table 2
Vehicle Ownership and Trip Characteristics of the Five Study Sites

a. Number of Vehicles per Household†

	N	0	1	2	3	≥ 4	Total
North San Francisco	229	12.7	47.2	31.4	5.2	3.5	100.0
South San Francisco	284	1.1	27.5	52.8	14.1	4.6	100.0
Concord	259	1.2	18.1	49.8	18.5	12.4	100.0
Pleasant Hill	298	.3	38.9	44.0	13.1	3.7	100.0
San Jose	310	.0	7.4	52.3	27.1	13.2	100.0
Total	1,380	2.6	27.0	46.7	16.2	7.6	100.0

b. Number of Vehicles per Driver†

	N	0	< 0.5	< 1.0	= 1.0	> 1.0	Total
North San Francisco	220	12.7	22.7	6.8	50.5	7.3	100.0
South San Francisco	280	1.1	19.3	14.3	53.6	11.8	100.0
Concord	253	1.2	11.1	3.6	57.7	26.5	100.0
Pleasant Hill	292	.3	17.1	5.8	62.7	14.0	100.0
San Jose	306	.0	3.6	5.6	67.6	23.2	100.0
Total	1,351	2.6	14.3	7.3	59.0	16.9	100.0

Data missing for 29 cases.

†The table represents the distribution for individual respondents, not households. N is the sample size for each study area. The remaining Numbers are the percentages of N which fall into each category.

[1]Geo-coding of the trip data is among the tasks that would be desirable for future research.

Table 2
(Continued)

c. Reported Trip Distance (Miles)

	Mean	S.D.	N
North San Francisco	6.57	59.9	2,821
South San Francisco	6.73	21.6	3,476
Concord	8.90	25.3	3,162
Pleasant Hill	8.69	16.8	3,540
San Jose	9.09	56.8	3,763
Total	8.06	40.1	16,762

Data missing for 8 cases.

d. Distribution of Travel Modes

	N	Walk Bicycle	Auto Driver	Auto Pass.	Bus	Rail	Other	Total
North San Francisco	2,768	22.6	52.2	9.2	13.8	.7	1.6	100.0
South San Francisco	3,370	9.6	70.6	8.1	4.3	5.5	1.9	100.0
Concord	3,020	9.3	77.2	8.4	.7	4.3	.2	100.0
Pleasant Hill	3,492	7.9	77.8	6.5	.8	6.9	.1	100.0
San Jose	3,696	3.8	86.5	7.7	1.0	.1	.8	100.0
Total	16,346	10.1	73.8	7.9	3.7	3.5	.9	100.0

Auto driver includes motorcycle. Data missing for 424 cases.

Quantitative models are developed to explain the variations in, and predict the future values of, these mobility measures. These models use as explanatory variables demographic and socio-economic attributes of the sample households and their members, along with the following measures of neighborhood characteristics:

- study area dummies,
- macro-scale area descriptors,
- pedestrian/bicycle facility indicators,
- housing choice indicators,
- micro-scale accessibility indicators, and
- perceptions of the quality of the residential neighborhood.

Note that these measures are by no means independent of each other, but tend to represent similar or overlapping aspects of land use in different manners. Table 3 presents the definition of these variables.

Table 3
Neighborhood Descriptors Used in the Study

Study Area Dummies: 0-1 dummy variables that identify the study area in which each respondent lives

- North San Francisco (NSF)
- South San Francisco (SSF)
- Concord (CON)
- Pleasant Hill (PH)
- San Jose (SJ)

Macro-scale Area Descriptors: 0-1 dummy variables defined based on the factors considered during the site selection process

- BART Access (1 for SSF, CON and PH)
- Mixed Land Use (1 for NSF, CON, PH and SJ)
- High Density (1 for NSF, SSF and PH)

Pedestrian/Bicycle Facilities: 0-1 dummy variables based on responses to the survey questions: "Are there sidewalks in your neighborhood?"; and "Are there bike paths in your neighborhood?"

- Sidewalk
- Bike Path

Housing Choice Indicators: 0-1 dummy variables based on responses to: "Do you have a private backyard?"; "How many parking spaces are available exclusively for your household use? Include your garage and driveway"; and "Do you own your home?"

- Backyard
- Parking Spaces Available
- Own Home

Micro-scale Accessibility Indicators: Based on responses to: "How far away, to the nearest tenth of a mile, is the bus stop nearest your home?" etc.

- Distance to Nearest Bus Stop
- Distance to Nearest Rail Station
- Distance to Nearest Grocery Store
- Distance to Nearest Gas Station
- Distance to Nearest Park

Perceptions of Neighborhood Quality: 0-1 dummy variables based on responses to: "Given your current neighborhood situation, which of the following reasons may make you consider moving to a different area? (Check all that apply.)"; "Are the streets in your neighborhood pleasant for walking or jogging?"; "Is cycling pleasant in your neighborhood?"; "Is there good local public transit service in your neighborhood?"; "Is there enough parking near your home?" and "Are there problems of traffic congestion in your neighborhood?"

- No Reason to Move
- Streets Pleasant for Walking
- Cycling Pleasant
- Good Local Transit Service
- Enough Parking
- Problems of Traffic Congestion

Base models are first developed for the six measures of mobility using the demographic and socio-economic descriptors of the individual listed in Table 4.[2] The neighborhood descriptors from each variable group in Table 3 are introduced into these base models one at a time to examine the association between the mobility measures and these neighborhood descriptors. The intensity of the association between each variable group and the mobility measures is first examined. "Best" models are then

Table 4
Variables Used in the Base Regression Models of Mobility Measures

Household size
Number of persons over 16 years old
Number of vehicles
Number of vehicles per persons over 16 years old
Annual household income in $10,000
Square root of annual household income in $10,000
Number of years lived in the Bay Area
Driver's license holding
Age in years divided by 10
Square-root of age divided by 10
Female (0-1 dummy variable)
Employment (0-1 dummy variable)
Homemaker (0-1 dummy variable)
Student (0-1 dummy variable)
Professional (0-1 dummy variable)
Low education (up to high school diploma; 0-1 dummy variable)
College education (0-1 dummy variable)
High education (some graduate school or graduate degree; 0-1 dummy variable)
Graduate degree (completed graduate degree; 0-1 dummy variable)
High personal income (over $50,000 annually; 0-1 dummy variables)
Middle personal income (between $30,001 and $50,000; 0-1 dummy variable)
Apartment (0-1 dummy variable)
Single family home (including duplexes and triplexes; 0-1 dummy variable)

Note: The variables in the six explanatory variable groups discussed earlier in the section are shown in Table 3.

[2]For the dependent variables representing the fraction of trips by mode, models are developed using as the dependent variables the logit, $\ln(N_m/(N - N_m))$, where N is the total number of trips and N_m is the number of trips by mode m.

developed considering all the neighborhood descriptors as well as demographic and socio-economic variables. Genuine effects of neighborhood characteristics are inferred based on the results.

Base Models: Estimation results summarized in Table 5 indicate that the fraction of variation explained (R^2) varies substantially across the mobility measures, with number of person trips having the highest R^2 of 0.147 and number of non-motorized trips having the lowest, 0.0256.[1] Household

Table 5
Base Linear Regression Models of Mobility Measures

	Number of Person Trips		Number of Transit Trips		Number of Non-Motorized Trips	
	Coef.	t	Coef.	t	Coef.	t
Intercept	2.308		2.154		0.395	
Household Size	2.618	8.92	-0.059	-0.72	0.145	1.49
Persons Over 16 Yrs. Old	-2.966	-6.68	0.293	2.17		
No. of Vehicles			-0.526	-6.34	-0.302	-2.76
Vehicles per Person	-0.094	-0.17				
Driver's License	2.473	2.27	-0.740	-2.46	-0.189	-0.43
Age Divided by 10	-0.225	-2.53	-0.035	-1.41	-0.013	-0.35
Employment Dummy	0.369	0.59	0.309	1.59		
Professional Dummy			0.320	2.02	0.254	1.27
Student Dummy	3.565	2.77			-0.506	-0.95
High Education Dummy	0.658	1.31				
Graduate Degree Dummy			-0.408	-2.79		
Household Income (in $10,000)	-0.887	-2.53			-0.231	-1.61
(Household Income)$^{1/2}$	5.282	2.95			1.106	1.51
High Personal Income Dummy			0.384	2.53		
Years in Bay Area Divided by 10			-0.144	-4.05	-0.097	-1.88
R^2	0.1471		0.1184		0.0256	
F	13.37		10.30		2.305	
D.F.	10, 775		10, 767		9,789	
α	< 0.00005		< 0.00005		0.0147	

[1]The base models do not necessarily represent what one might consider "correct" specifications. Some insignificant variables are left in the model to facilitate the comparison of the variables' effects across the models.

Table 5 (Continued)

	Fraction of Auto Trips		Fraction of Transit Trips		Fraction of Non-Motorized Trips	
	Coef.	t	Coef.	t	Coef.	t
Intercept	-0.721		-1.200		-1.480	
Household Size			-0.222	-4.11	-0.068	-1.61
Persons Over 16 Yrs. Old			0.410	4.59		
No. of Vehicles			-0.353	-6.43	-0.057	-1.21
Vehicles per Person	0.636	4.14				
Driver's License	2.263	6.92	-0.936	-4.71	-0.674	-3.56
Age Divided by 10	0.007	0.28	-0.001	-0.01	0.023	1.45
Employment Dummy	0.069	0.37	0.093	0.73		
Professional Dummy			0.085	0.82	0.066	0.77
Student Dummy	0.185	0.49			-0.443	-1.93
High Education Dummy	0.073	0.49				
Graduate Degree Dummy			-0.307	-3.18		
Household Income (in $10,000)	0.142	1.36			-0.008	-0.14
(Household Income)$^{1/2}$	-0.704	-1.33			-0.058	-0.18
High Personal Income Dummy			0.227	2.26		
Years in Bay Area Divided by 10			-0.065	-2.77	-0.006	-0.28
R^2	0.0965		0.1319		0.0475	
F	10.39		11.66		4.38	
D.F.	8,778		10, 767		9, 789	
α	< 0.00005		< 0.00005		< 0.00005	

vehicle ownership (expressed as the number of vehicles and vehicles per person) and driver's license holding are significantly associated with these measures of mobility. As expected, vehicle ownership and license holding are both positively associated with vehicle use and negatively associated with the use of public transit and non-motorized modes. Notable is the result that vehicle ownership is <u>not</u> associated with number of person trips.Number of person trips generated by a household member is associated with household size and number of household members over 16 years old; the coefficient estimates for these two variables imply that a person from a larger household tends to make more trips, especially when there are members below 16 years old. The two income coefficients together imply a non-linear income

effect which is concave and reaches its maximum at around an annual income of $90,000. The results also show associations between occupational categories and the mobility measures.

Neighborhood Descriptors: Contributions of the six groups of neighborhood descriptors to the goodness-of-fit of the base models are summarized in Table 6. It is evident from the table that these descriptors do contribute to the models' explanatory power; association between travel demand and land use and other neighborhood characteristics is not an artifact of the correlation between neighborhood characteristics and the residents' demographic and socio-economic attributes. Study area dummies,

Table 6
Contribution of Individual Neighborhood Descriptor Groups to the Fit of the Base Models of Mobility Measures

	Base Model	Area Dummy	Macro Descrip-tors	Ped/Bike Facilities	Housing Choice	Accessi-bility	Neigh-borhood Quality
Number of Person Trips	.1471	.1572	.1544	.1479	.1613	.1496	.1510
		1.01%	.73%	.08%	1.42%	.25%	.39%
Number of Transit Trips	.1184	.1299	.1287	.1199	.1282	.1371	.1271
		1.15%	1.03%	.15%	.98%	1.87%	.87%
Number of Non-Motorized Trips	.0256	.0473	.0350	.0343	.0348	.0428	.0292
		2.17%	.94%	.87%	.92%	1.72%	.36%
Fraction of Auto Trips	.0965	.1397	.1146	.0979	.1271	.1280	.1190
		4.32%	1.81%	.14%	3.06%	3.15%	2.25%
Fraction of Transit Trips	.1319	.1426	.1418	.1324	.1420	.1468	.1396
		1.07%	.99%	.05%	1.01%	1.49%	.77%
Fraction of Non-Motorized Trips	.0475	.690	.0611	.0515	.0526	.0688	.0523
		2.15%	1.36%	.40%	.51%	2.13%	.48%

The top number in each cell is an R^2 value and the bottom number represents the contribution of the variable group to the R^2 value (the absolute difference is shown in percent). The differences that are statistically significant at $\alpha = 5\%$ are underlined, and those significant at $\alpha = 1\%$ are double-underlined.

macro-scale area descriptors, and micro-scale accessibility indicators most often contribute to the models' fit. Pedestrian/bicycle facilities, on the other hand, are as a group significant only in the model for the number of non-motorized trips.

The neighborhood descriptors are most significant in the models of fraction of car trips and fraction of non-motorized trips. On the other hand only housing choice indicators are significant as a

group in the model of total number of person trips. We may conclude that person trip generation is largely determined by demographic and socio-economic factors and is not strongly associated with land use characteristics. Generation of transit and non-motorized trips, and consequently modal split, however, is strongly associated with land use characteristics.

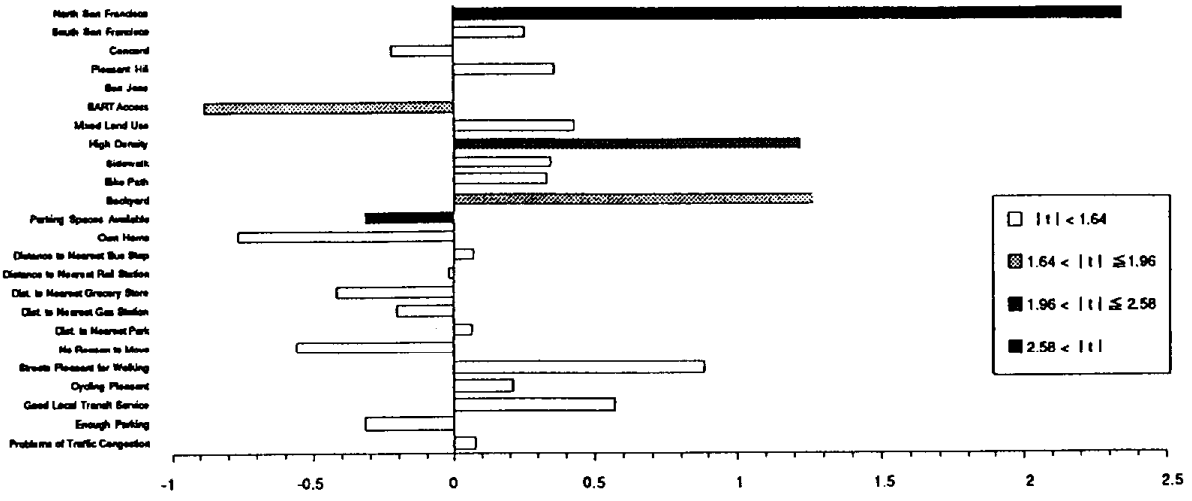
Analysis of Neighborhood Descriptors by Group: The coefficient estimates of the individual neighborhood descriptors are presented in Figure 1.[2] The coefficient estimates of study area dummies indicate that South San Francisco, Concord and Pleasant Hill are most transit oriented, both in terms of the number and the fraction of transit trips. San Jose, on the other hand, is least transit oriented. North San Francisco and South San Francisco have higher non-motorized trip generation, and these two study areas plus Pleasant Hill have significant positive coefficients in the model for fraction of non-motorized trips. Quite notable is the result that North San Francisco has a significant coefficient estimate in the model of total number of person trips. This may be due to the high non-motorized trip rates shown by the respondents from this study area.

The coefficient estimates of macro-scale area descriptors indicate that BART access is associated with higher transit trip generation and higher fractions of transit trips. High density is found to be associated with more person trips, non-motorized trips, lower fractions of auto trips, and higher fractions of non-motorized trips. There is no indication from this study that mixed land use is associated with travel. This, however, may be due to the ambiguity inherent in the term; whether a household resides among mixed land uses depends on how the neighborhood is geographically defined. The micro-scale accessibility indicators of this study may be considered as more suitable measures of land use mix.

[2]Recall that these coefficient estimates are obtained by introducing the descriptor groups into the base models one at a time. Because the descriptors are not uncorrelated across the groups, the coefficient estimates may reflect the association between the mobility measures and neighborhood descriptors from other groups.

Figure 1
Coefficient Estimates of Neighborhood Descriptions in Models of Mobility Measures

Total Number of Person Trips



Number of Transit Trips

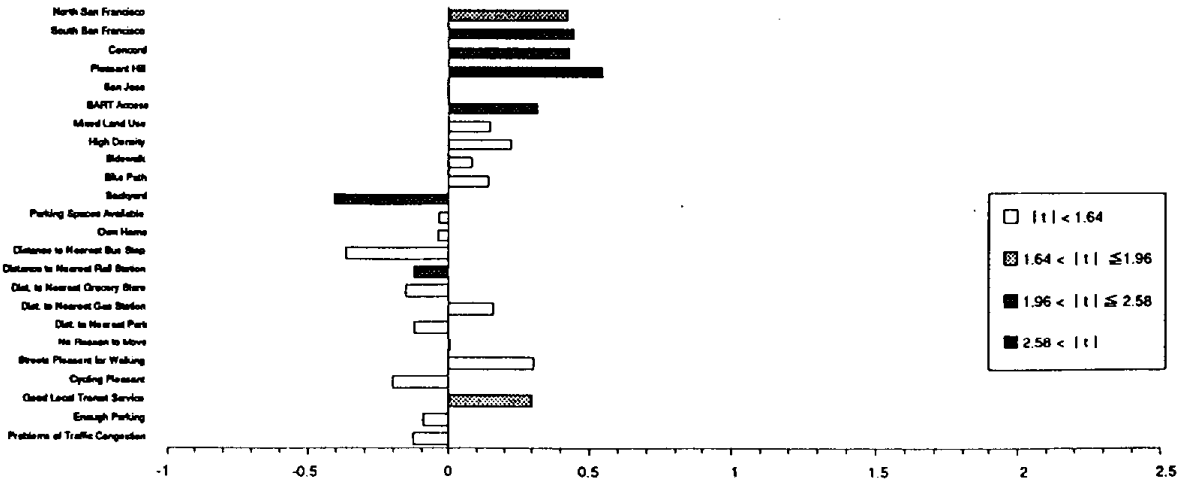
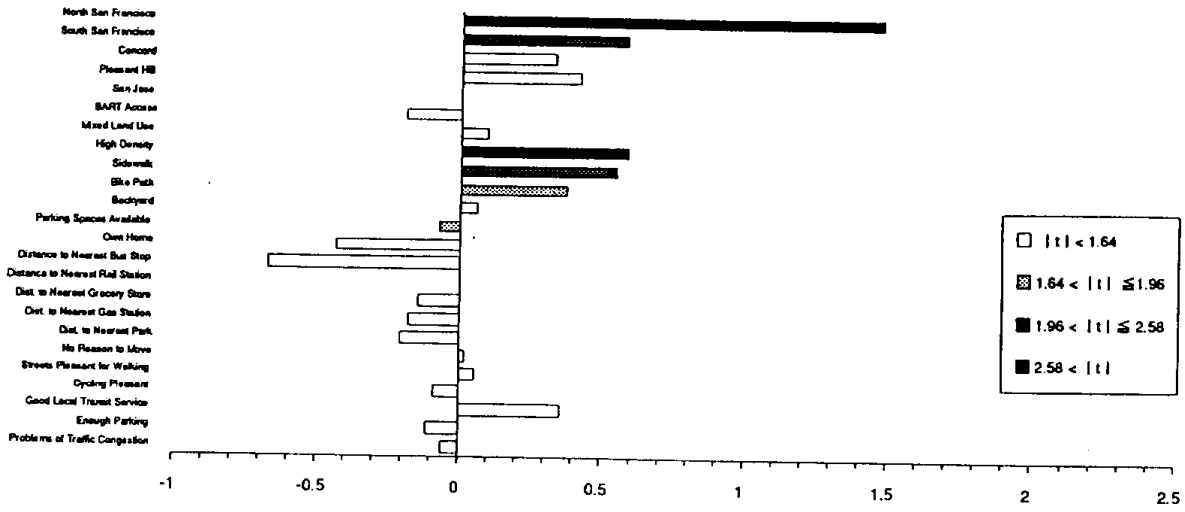


Figure 1
(continued)
Coefficient Estimates of Neighborhood Descriptions in Models of Mobility Measures

Number of Non-Motorized Trips



Fraction of Car Trips

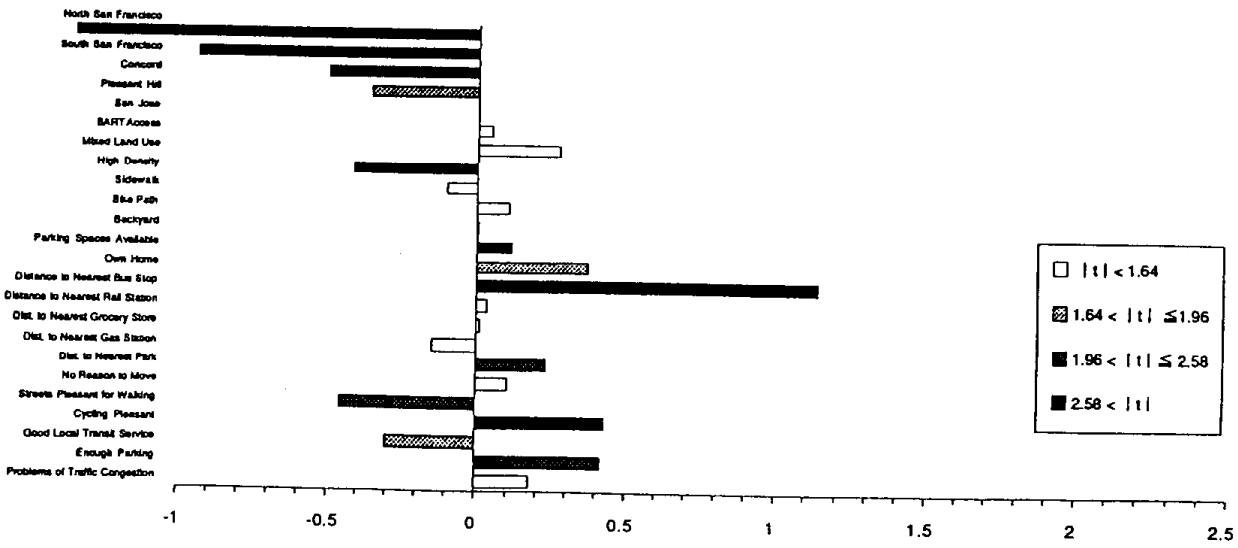
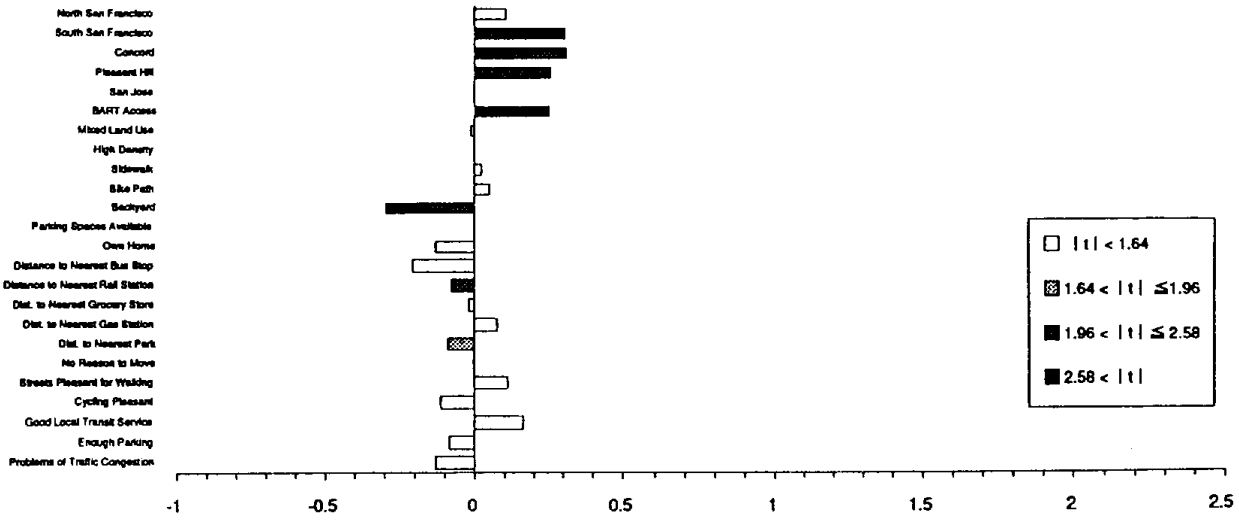
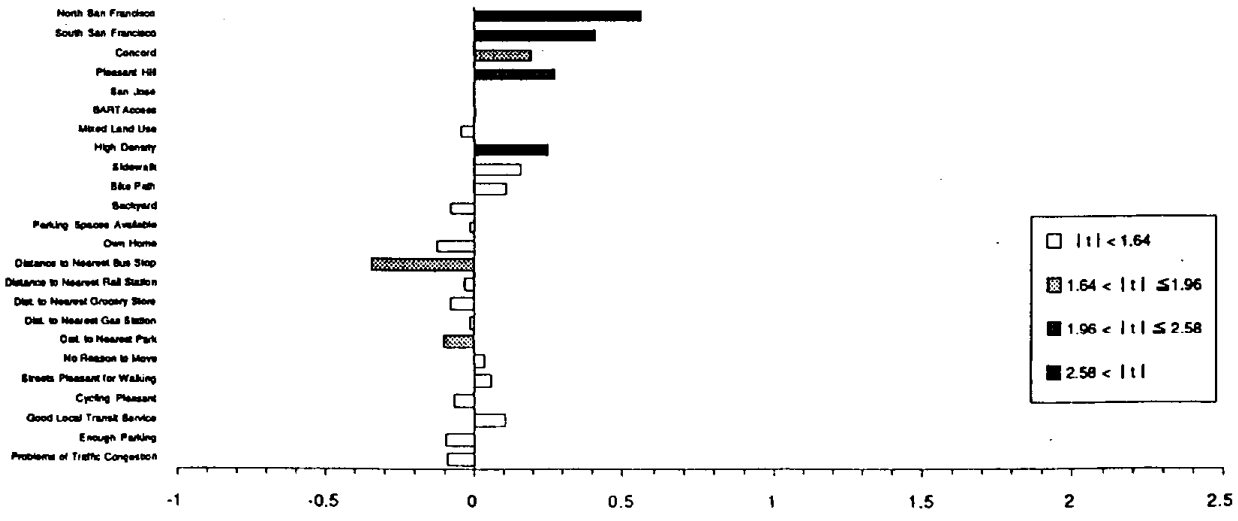


Figure 1
(continued)
Coefficient Estimates of Neighborhood Descriptions in Models of Mobility Measures

Fraction of Transit Trips



Fraction of Non-Motorized Trips



As noted earlier, the variables representing pedestrian/bicycle facilities are not significant in these models, except for the model of number of non-motorized trips. Housing choice indicators in general exhibit an association between housing choice and mode use. Members of households which reside in housing units with larger numbers of parking spaces tend to make more auto trips, while those who make more transit trips tend to live in housing units without a backyard. Another indication of the association between housing choice and travel is given by the coefficient of parking spaces available in the model for total number of person trips, which is highly significant and negative. This is counter-intuitive. One interpretation is that those with more parking spaces tend to use the automobile and make fewer trips than those who use non-motorized modes. The latter individuals may make more short trips.

Micro-scale accessibility indicators have no significant coefficients in the model of total number of person trips. Consistent with the earlier result, person trip generation appears to be independent of accessibility or land use. This group of variables indicates that transit trip generation and fraction of transit trips are both associated with the distance to the nearest rail station (but not significantly with the distance to the nearest bus station), while fraction of car trips is associated with the distances to the nearest bus stop and the nearest park. The result with car trips suggests highly auto-oriented travel patterns of residents of exclusively residential neighborhoods.

Perceptions of the quality of the neighborhood are in general insignificant. The only exception can be found in the model for fraction of car trips. The perception that streets are pleasant for walking is associated with smaller fractions of auto trips, while the perception that cycling is pleasant in the neighborhood is associated with larger fractions of auto trips. The latter may represent the higher safety standards of neighborhood streets which are typically found in recently developed suburban subdivisions.

Best Models: The above analysis by variable groups have offered many findings on the association between neighborhood characteristics and travel. Based on these results, models of the mobility measures are developed again considering all neighborhood descriptors shown in Table 3 and the demographic and socio-economic variables of Table 4. Results are summarized in Table 7.

Table 7
Best Models of Mobility Measures

	Total Number of Person Trips		Number of Transit Trips		Number of Non-Motorized Trips	
	Coef.	t	Coef.	t	Coef.	t
Intercept	2.022		2.858		-0.149	
Socio-Demographic Variables						
Household Size	2.835	9.62				
Persons Over 16 Yrs. Old	-3.013	-7.07	0.258	2.42		
Number of Vehicles			-0.476	-5.75		
Driver's License	2.805	2.66	-0.650	-2.20		
Age Divided by 10	-0.232	-2.64				
Professional (0-1)			0.395	2.79		
Student (0-1)	3.260	2.56				
Graduate Degree (0-1)			-0.417	-2.90		
High Personal Income (0-1)			0.370	2.47		
Household Income (in $10,000)	-0.979	-2.81				
(Household Income)$^{1/4}$	5.791	3.27				
Years in Bay Area Divided by 10			-0.139	-3.97		
Neighborhood Descriptor Variables						
North San Francisco	1.863	2.39			1.494	4.43
BART Access					0.662	2.90
Sidewalk					0.584	2.29
Backyard			-0.593	3.13		
Parking Spaces Available	-0.261	-2.73				
Distance to Nearest Rail Station			-0.141	-3.01		
Distance to Nearest Park			-0.211	-2.52		
R^2	0.1622		0.1386		0.0306	
F	16.69		112.34		8.376	
D.F.	9, 776		10, 767		3, 795	
α	< 0.00005		< 0.00005		< 0.00005	

Table 7 (Continued)

	Fraction of Auto Trips		Fraction of Transit Trips		Fraction of Non-Motorized Trips	
	Coef.	t	Coef.	t	Coef.	t
Intercept	-2.064		-0.728		-1.633	
Socio-Demographic Variables						
Household Size					-0.094	-2.51
Persons Over 16 Yrs. Old			0.203	2.86		
Number of Vehicles			-0.335	-6.09		
Vehicles per Person	0.504	3.31				
Driver's License	2.224	7.08	-0.919	-4.68	-0.698	-3.80
Professional (0-1)			0.099	1.05		
High Education (0-1)	0.117	0.83				
Graduate Degree (0-1)			-0.306	-3.20		
High Personal Income (0-1)			0.195	1.96		
Middle Personal Income (0-1)					0.195	2.32
Years in Bay Area Divided by 10			-0.039	-1.67		
Neighborhood Descriptor Variables						
High Density					0.260	3.15
Backyard			-0.489	-3.88		
Parking Spaces Available	0.119	4.28				
Distance to Nearest Bus Stop	0.880	3.31			-0.418	-2.23
Distance to Nearest Rail Station			-0.084	-2.70		
Distance to Nearest Park	0.239	2.77	-0.140	-2.52	-0.132	-2.46
R^2	0.1429		0.1415		0.0664	
F	21.67		12.64		9.28	
D.F.	6, 780		10, 767		6, 783	
α	< 0.00005		< 0.00005		< 0.00005	

The model for total number of person trips includes the North San Francisco and parking spaces available dummies from the neighborhood descriptor pool. The former reflects the uniqueness of the study area which has dense and mixed land uses and is strongly pedestrian oriented. The model of number of transit trips indicates that transit trip generation increases with the accessibility to rail stations (as indicated by the negative coefficient estimate of distance to nearest rail station) and is associated with residential density (as indicated by the coefficient estimates of backyard and distance to nearest park).

The model for the number of non-motorized trips comprises three neighborhood descriptors alone: North San Francisco, BART access, and sidewalk. Age and other demographic variables which may have been hypothesized as determinants of non-motorized trip generation, turned out to be insignificant in this

study. The coefficient estimates again indicate the pedestrian orientation of North San Francisco. Respondents from study areas with BART access tend to make more non-motorized trips. This may not be exclusively due to the characteristics of these study area neighborhoods, but may imply that the use of BART for commuting tends to generate non-motorized trips both at the work and home ends. The significant coefficient of sidewalk in this model is important. This study offers statistical evidence that the presence of sidewalks is positively associated with the number of non-motorized trips.

The neighborhood descriptors that appear in the model for fraction of auto trips (parking spaces available, distance to nearest bus stop, and distance to nearest park) indicate the auto-dominated modal split in residential suburbs. Those in the model for fraction of transit trips indicate that residential density (as represented by backyard), rail accessibility (distance to nearest rail station), and mixed land uses (distance to nearest park) are associated with transit modal split. Residential density (high density), bus accessibility (distance to nearest bus stop) and mixed land uses are associated with fraction of non-motorized trips.

The best models confirm the earlier results that neighborhood characteristics are associated with residents' travel. With the extensive range of variables used in this study, vehicle ownership and other attributes of residents vary greatly across the five study areas. Differences in their travel, however, cannot be explained solely by the differences in demographic and socio-economic attributes; differences in neighborhood characteristics -- in particular residential density, public transit accessibility, mixed land use (as represented by the distance to the nearest park) and the presence of sidewalks -- are significantly associated with trip generation by mode and modal split. Finally, North San Francisco, with its dense and highly mixed land uses, emerged as a neighborhood which is extremely pedestrian oriented.

5. Association between Attitudes and Travel

This section addresses the possibility that the apparent association between land use and travel is a fallacy. That is, attitudinal factors, which are typically not included in studies of land use effects, are correlated

with land use characteristics and produce the apparent association between land use and travel; the true determinants of travel, however, are attitudes. If this is the case, then changing land use characteristics through land use policy will not alter travel behavior unless either land use policy or resulting land use characteristics can change attitudes. This section presents an initial attempt to address this issue.

To measure respondents' attitudes toward various aspects of urban life, a total of 39 questions are included in the survey, each presenting a statement and soliciting a response on a five-point agree-disagree semantic scale. These questions are divided into eight groups: (1) private automobile, (2) ridesharing, (3) public transit, (4) urban transportation, (5) time, (6) environment, (7) housing and (8) economy. Responses to these questions are discussed in detail in Kitamura et al. (1994).

Factor analysis was applied to the responses to these attitudinal questions with the intent of reducing their dimensionality. The first eight factors, which collectively explain 43.3% of the total variation in the data, are discussed here. Statements that principally define each factor are listed in Table 8.

Attitude Factors: The first factor is primarily defined by responses to statements concerning the environment such as: "Environmental protection costs too much" (negative loading), "Environmental protection is good for California's economy," and "Environmentalism hurts minority and small businesses" (negative loading). This factor represents the respondents' environmental orientation and is named "pro-environment."

The second factor can be termed "pro-transit" and reflects the individual's orientation towards ridesharing as well as public transit. The third factor will be called the "suburbanite" factor. It is primarily defined by responses to: "I need to have space between me and my neighbors," "I would only live in a multiple family unit ... as a last resort," "It's important for children to have a large backyard for playing," and "High density residential development should be encouraged" (negative loading). This factor thus represents an individual's orientation toward the consumption of land for his/her living space.

Table 8
Primary Variables that Define Eight Attitude Factors

Statement for Agree/Disagree Semantic Scale	
Factor 1: Pro-Environment	
Environmental protection costs too much.	-
Environmental protection is good for California's economy.	+
Environmentalism hurts minority and small businesses.	-
People and jobs are more important than the environment.	-
Stricter vehicle smog control laws should be introduced and enforced.	+
We should raise the price of gasoline to reduce congestion and air pollution.	+
Vehicle emissions increase the need for health care.	+
Using tax dollars to pay for public transportation is a good investment.	+
We should provide incentives to people who use electric ... vehicles.	+
Whoever causes environmental damage should repair the damage.	+
Factor 2: Pro-Transit/Ridesharing	
Buses and trains are pleasant to travel in.	+
I can read and do other things when I use public transportation.	+
Public transportation is unreliable	-
Ridesharing saves money	+
I am not comfortable riding with strangers	-
The rideshare car or van is often late	-
I like someone else to do the driving	+
Too many people drive alone	+
It costs more to use public transportation than ... to drive a car	-
Factor 3: Suburbanite	
I need to have space between me and my neighbors.	+
I would only live in a multiple family unit as a last resort.	+
It's important for children to have a large backyard for playing.	+
High density residential development should be encouraged.	-
Factor 4: Automotive Mobility	
Driving allows me to get more done.	+
Driving allows me freedom.	+
I would rather drive an electric vehicle than give up driving.	+
Factor 5: Time Pressure	
Getting stuck in traffic doesn't bother me too much.	-
I would like to have more time for leisure.	+
I feel that I am wasting time when I have to wait.	+
Traffic congestion will take care of itself because people will adjust.	-
Factor 6: Urban Villager	
Having shops and services within walking distance ... would be important.	+
Too much valuable agricultural land is consumed to supply housing.	+
I use public transportation when I cannot afford to drive.	+
Factor 7: TCM	
I would be willing to pay a toll to drive on an uncongested road.	+
More lanes should be set aside for carpools and buses.	+
We need to build more roads to help decrease congestion.	+
Factor 8: Workaholic	
I like to spend most of my time working.	+
When ... busy at work, I get more done by cutting back on personal time.	+
... I would be willing to give up a day's pay to get a day off work.	-

The fourth factor represents the individual's orientation toward the ubiquitous mobility provided by the automobile and shall be named "automotive mobility." The fifth factor is defined principally byresponses to: "Getting stuck in traffic doesn't bother me too much" (negative loading), "I would like to have more time for leisure," and "I feel I am wasting time when I have to wait." This can be appropriately called a "time pressure" factor.

Responses to "Having shops and services within walking distance of my home would be important to me," and "Too much valuable agricultural land is consumed to supply housing" are the primary determinants of the sixth factor. Individuals with high ratings on this factor would be inclined toward a pedestrian-oriented, high-density urban environment, leading lifestyles where work may not be the primary concern. This will be thus named the "urban villager" factor.

The dominant variables that define the seventh factor are responses to: "I would be willing to pay a toll to drive on an uncongested road," and "More lanes should be set aside for carpools and buses," followed by "We need to build more roads to help decrease congestion." Other variables that define this factor (but are not shown under this factor as they are load more heavily on other factors) include: "We should provide incentives to people who use electric or other clean-fuel vehicles," and "Stricter vehicle smog control laws should be introduced and enforced." People with high values on this factor would tend to believe in transportation control measures and regulations to resolve transportation and other urban problems. However they would also tend to be positive about the expansion of facilities and tend not to have reservations about urban expansion. Based on its primary constituents, this factor will be termed a "TCM" factor. The final factor is defined by responses to: "I like to spend most of my time working," "When things are busy at work, I get more done by cutting back on personal time," and "Occasionally, I would be willing to give up a day's pay to get a day off work" (negative loading). This can be unequivocally named a "workaholic" factor.

Comparison of Attitude Scores across the Study Neighborhoods: Differences in respondents' attitudes across the five study areas are summarized in terms of the means and standard deviations of

scores on these factors in Table 9. Factor scores are normalized to have means of zero and variances of unity across the entire sample.

Table 9
Means and Standard Deviations of Attitude Factor Scores by Study Site

		North San Francisco (141)	South San Francisco (199)	Concord (195)	Pleasant Hill (214)	San Jose (235)
Factor 1: Pro-Environment	μ	.340	.251	-.262	-.019	-.092
	σ	1.022	.963	.969	.945	1.053
Factor 2: Pro-Transit	μ	-.238	-.088	.204	.238	-.054
	σ	1.003	.972	.991	.902	1.082
Factor 3: Suburbanites	μ	-.466	-.247	.425	-.216	.281
	σ	1.113	.955	.834	1.063	.859
Factor 4: Automotive Mobility	μ	-.134	-.027	-.042	-.014	.144
	σ	1.090	1.093	.885	.920	.961
Factor 5: Time Pressure	μ	.136	.030	-.015	.089	-.118
	σ	1.016	.925	1.014	1.068	.988
Factor 6: Urban Villager	μ	.186	.105	.001	-.098	-.048
	σ	1.077	.899	.890	1.078	.961
Factor 7: TCM	μ	.352	.159	-.195	-.129	-.189
	σ	.818	.966	1.015	.942	.951
Factor 8: Workaholic	μ	-.223	.058	-.005	.038	.108
	σ	1.076	1.026	.931	1.014	.909

As hypothesized earlier, attitude factor scores vary substantially across the five study areas in ways that tend to be consistent with the travel patterns associated with them. North and South San Francisco both have high mean pro-environment factor scores while Concord has the lowest mean score on this factor. The two communities embracing BART stations, Concord and Pleasant Hill, exhibit the highest pro-transit factor scores while, unexpectedly, North San Francisco has the lowest mean score on this factor. The result suggests that being pro-environment may not automatically imply being pro-transit and vice versa. That the North San Francisco site is not served by rail while the available bus service may be of lesser quality due to traffic congestion in the densely developed area, also suggests that attitudes are formed interactively with experience.

Concord happens to score the highest on the suburbanite factor followed by San Jose. As expected, North San Francisco has the lowest score. Automotive mobility and time pressure have relatively small variations in their means across the five neighborhoods. The former exhibits the same tendency as modal split; San Jose is most auto-oriented and North San Francisco is least auto-oriented. Interestingly, the least auto-oriented North San Francisco scores highest and San Jose scores lowest on the time pressure factor.

The urban villager and TCM factors split between the high density neighborhoods of North and South San Francisco, and the more suburban Concord, Pleasant Hill and San Jose, with the former group containing more positive scores on both factors. The workaholic factor, on the other hand, does not exhibit the same split. On this factor, North San Francisco again stands alone, having a negative mean score while scores for the other five areas are either positive or (for Concord) essentially zero.

This comparison of mean factor scores across the five neighborhoods has shown that attitudes vary reflecting neighborhood characteristics and that there are clear associations between the factor scores and travel patterns. Examined next is the hypothesis that given the attitudes of an individual, neighborhood characteristics do not offer additional explanation of his/her travel.

Association between Attitude Factors and Travel: Measures of personal attitudes are not often used in the analysis of travel demand. There are several reasons for this. Among the most important reasons are the various difficulties encountered when measuring and forecasting attitudes. Also important is the view that attitudes are, like travel behavior itself, elements that are to be explained, but not to be used to explain behavior. In fact there are competing hypotheses regarding the relationship between attitudes and behavior: attitudes are formed through experience as a result of behavior; attitudes prompt certain types of behavior; and interactive, two-way relationships exist between attitudes and behavior (Tardiff, 1977; Dobson, et al., 1978; Tischer & Phillips, 1978; Lyon, 1984; Pendyala, 1993).

In the rest of this section, the analysis of the previous section is extended by introducing the attitude factors into the model as explanatory variables. The intent here is not to identify causal relationships that may exist between attitudes and behavior. Rather, the purpose is to assess the relative intensity of the relationship between attitudes and travel behavior. If attitudes dominate neighborhood characteristics in explaining travel behavior, then it would lend support to the notion that land use policy would not alter travel demand unless it can change residents' attitudes. If, on the other hand, neighborhood characteristics are associated with travel beyond the association between attitudes and travel, then it could be interpreted as evidence that travel demand can be modified by changing land use characteristics. In either case, if attitude factors are significantly associated with travel, then further analysis is warranted into causal relationships that involve attitudes.

The eight attitude factor scores are introduced into the best models for the six mobility measures. The contributions of the attitude factors to the models' goodness-of-fit are summarized in Table 10. The coefficient estimates of the attitude factors are summarized in Figure 2.[1] The best model re-estimated for the subsample of the attitude analysis and the model with the attitude factors are summarized in Table 11 for the fraction of auto trips, the mobility measure for which the attitude factors are most significant.

A quick inspection of Table 10 indicates that these attitude factors are strongly associated with the mobility measures. They are highly significant as a group as the F-statistics indicate, and they substantially improve the "best" models' R^2s (the R^2 values of the base models of Table 6 and those of the best models of Table 7 are repeated in Table 10 for comparison purposes). Although the neighborhood descriptors introduced into the best models do improve the models' fit, the contributions of the attitude factors are in general greater than those of the neighborhood descriptors in the best model. Note that the improvements made by the attitude factors are in addition to those

[1]Models are estimated with approximately 640 respondents for whom complete factor scores are available. No elaborate techniques are employed in this study to account for the missing data problem.

made by the neighborhood descriptors. It is evident that individuals' attitudes are tightly linked to their travel behavior as represented by the mobility measures of this study.

Table 10
Contributions of Attitude Factors to the Goodness-of-Fit of the "Best" Models of Mobility Measures

		Number of			Fraction of		
		Person Trips	Transit Trips	Non-Motorized Trips	Auto Trips	Transit Trips	Non-Motorized Trips
Base Models of Table 6	R^2	.1471	.1184	.0256	.0965	.1319	.0475
	k	10	10	10	10	10	10
Best Models of Table 7	R^2	.1622	.1386	.0306	.1429	.1415	.0664
	k	9	10	3	6	10	6
Best Models Re-estimated with Attitude Data	R^2	.1433	.1503	.0340	.1350	.1287	.0656
	k	9	10	3	6	10	6
Best Models with Attitude Factors	R^2	.1718	.2110	.0946	.2125	.1916	.1308
	k	17	18	11	14	18	14
F of Attitude Factors		2.73	6.10	5.37	7.87	6.17	6.00
d.f.		8, 636	8, 635	8, 642	8, 639	8, 635	8, 639
Significance (* = 5%, ** = 1%)		**	**	**	**	**	**

k = number of slope coefficients in the model.
The base models of Table 6 and the best models of Table 7 are not nested.

The coefficient estimates of these attitude factors summarized in Figure 2 indicate that attitudes and behavior in fact form coherent relationships. For example, in the model for number of transit trips the coefficient of the pro-transit factor is positive and significant (α = 1%) while that of the automotive mobility factor is negative and significant (α = 1%). The pro-environment factor and pro-transit factor both have positive and significant (α = 1%) coefficients and that of automotive mobility is again negative and significant (α = 1%) in the model for number of non-motorized trips. Similar consistent results can be found for the models of fraction of auto trips, fraction of transit trips, and fraction of non-motorized trips. In the last model, the urban villager factor and the pro-environment factor both have significant (at α = 5%) positive coefficients. The results indicate that making walking and cycling trips is strongly and consistently associated with the attitudes one has

toward the environment, public transit, and the door-to-door mobility provided by the automobile. Quite interestingly the pro-environment factor is not associated with transit use.

Table 11

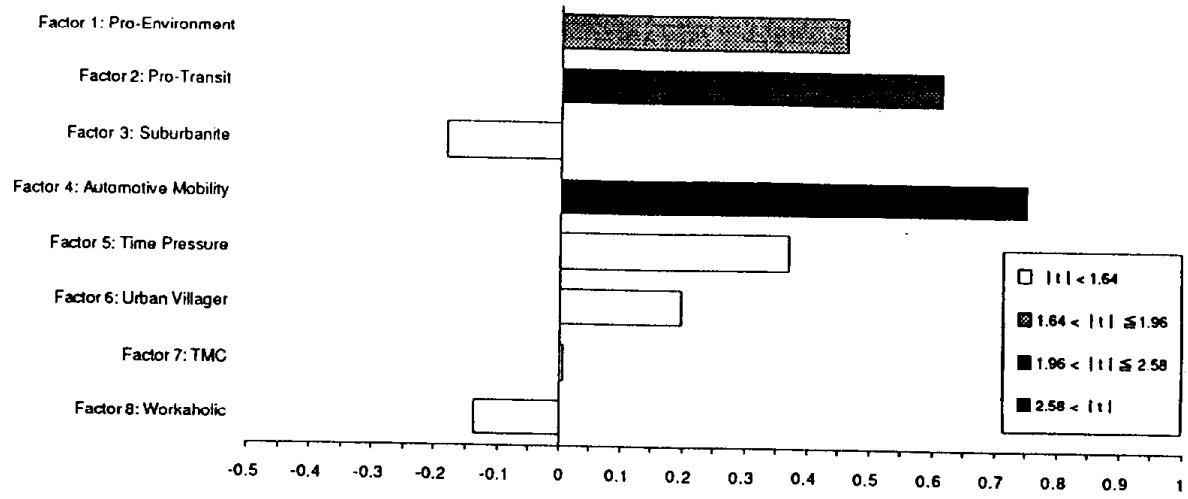
Relative Effects of Socio-Economic Factors, Neighborhood Descriptors, and Attitude Factors in the Model for Fraction of Auto Trips

	1. Best Model of Table 7 (re-estimated)		2. Neighborhood Descriptors Excluded		3. Socio-Economic Factors Excluded		4. All Factors	
	Coef.	t	Coef.	t	Coef.	t	Coef.	t
Intercept	-2.169		-1.005		0.726		-1.611	
Cars per Person	0.551	3.15	0.453	2.64			0.387	2.26
Driver's License	2.275	6.13	2.004	5.45			2.005	5.54
High Education Dummy	0.118	0.77	0.156	1.02			0.138	0.91
Parking Spaces Available	0.104	3.52			0.111	3.70	0.098	3.33
Distance to Nearest Bus Stop	1.137	3.31			0.823	2.39	0.765	2.28
Distance to Nearest Park	0.259	2.61			0.193	1.94	0.224	2.31
Factor 1: Pro-Environment			-0.217	-3.01	-0.166	-2.26	-0.148	-2.05
Factor 2: Pro-Transit			-0.230	-3.32	-0.235	-3.34	-0.222	-3.25
Factor 3: Suburbanite			0.157	2.22	0.062	.85	0.075	1.04
Factor 4: Automotive Mobility			0.472	6.53	0.519	7.14	0.445	6.23
Factor 5: Time Pressure			-0.146	-2.07	-0.115	-1.62	-0.138	-1.98
Factor 6: Urban Villager			-0.145	-1.98	-0.163	-2.18	-0.120	-1.65
Factor 7: TCM			-0.008	-0.11	0.021	0.29	0.027	0.38
Factor 8: Workaholic			0.130	1.79	0.112	1.52	0.120	1.67
R^2	0.1350		0.1818		0.1612		0.2125	
Standard Error of Estimation	1.829		1.785		1.808		1.756	
F	16.83		12.97		11.22		12.32	
D.F.	6, 647		11, 642		11, 642		14, 639	
α	< 0.00005		< 0.00005		< 0.00005		< 0.00005	
F of the Excluded Group	7.87		8.37		13.88		-	
D.F.	8, 639		3, 639		3, 639		-	
Significance (* = 5%, ** = 1%)	**		**		**		-	

The relative effects of the base demographic and socio-economic factors, neighborhood descriptors, and attitude factors are examined using the model for fraction of auto trips for which the attitude factors as a group are most significant. The purpose of this analysis is to show that the neighborhood descriptors do have their own contributions to the model's explanatory power. Yet, their relative effects may be limited.

Figure 2
Coefficients of Attitude Factors

Number of Trips



Number of Transit Trips

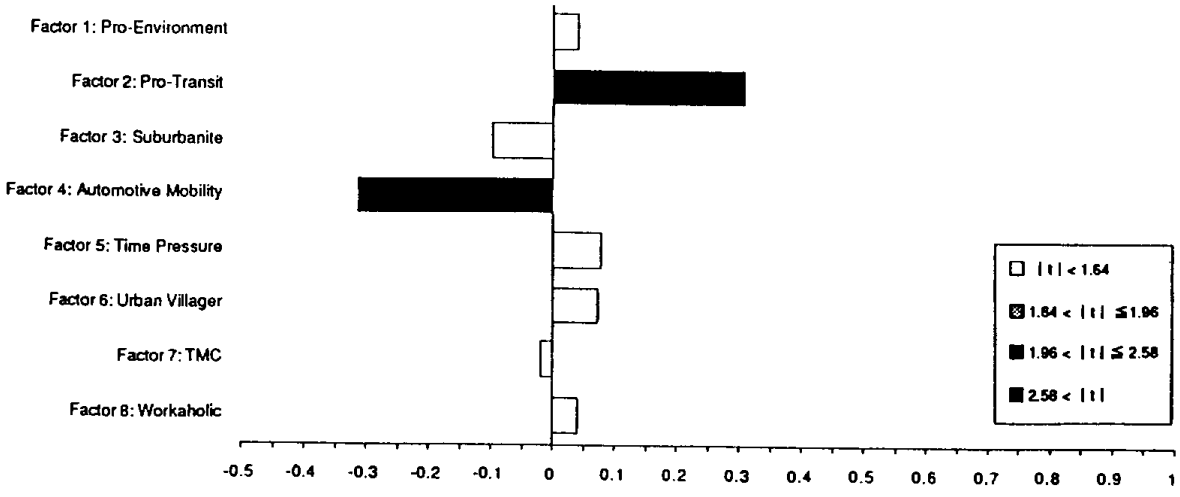
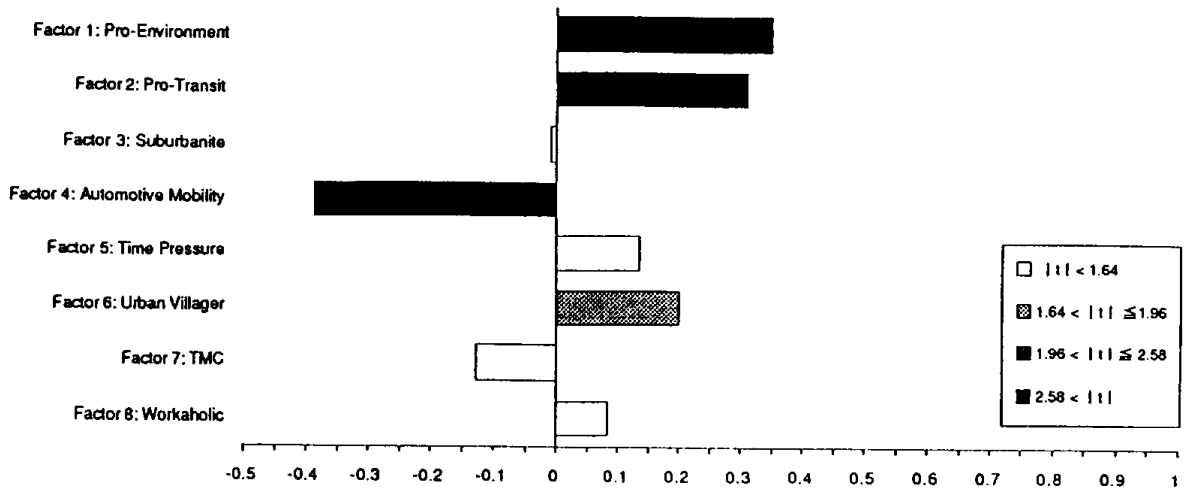


Figure 2
(continued)

Number of Non-Motorized Trips



Fraction of Auto Trips

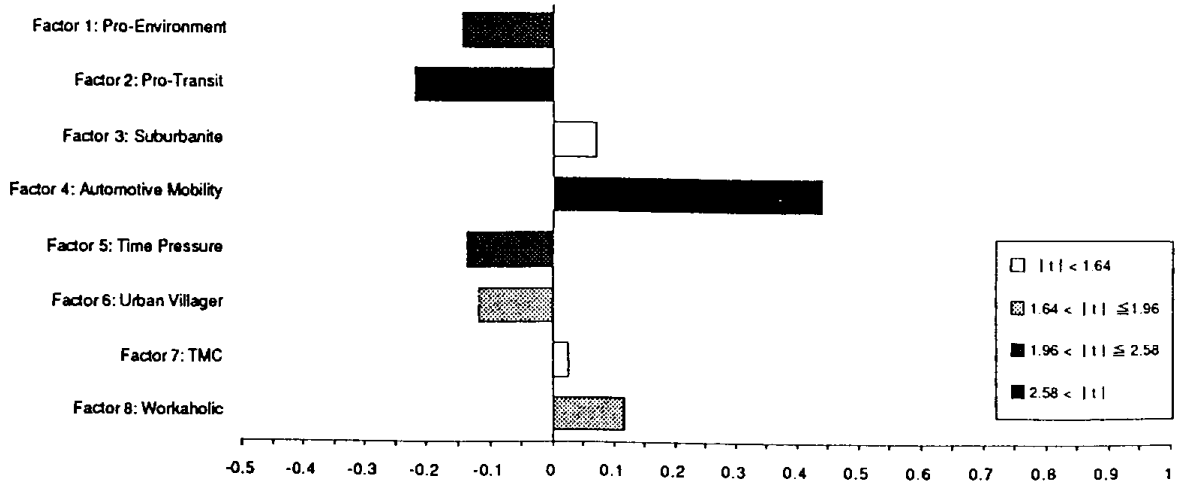
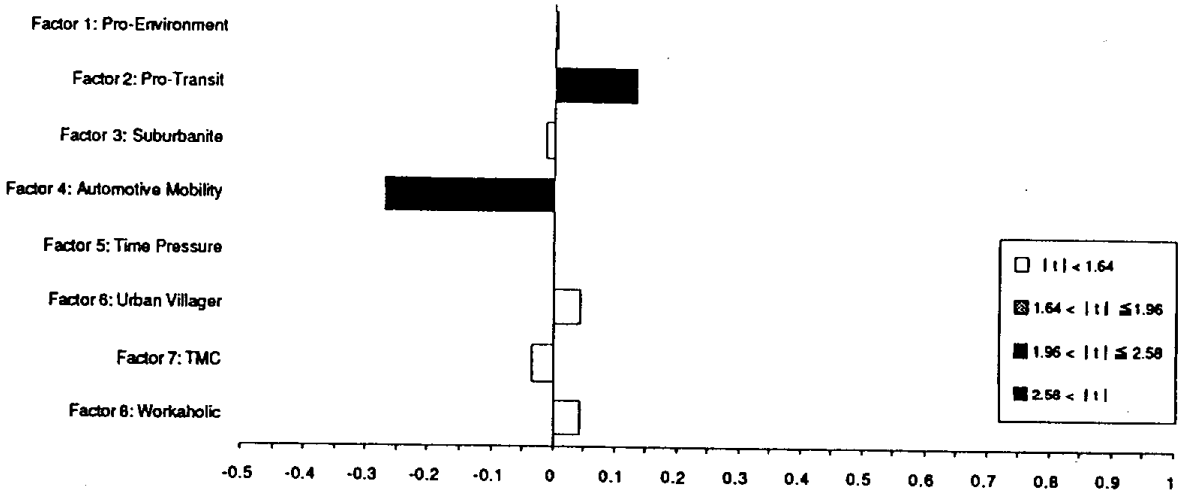
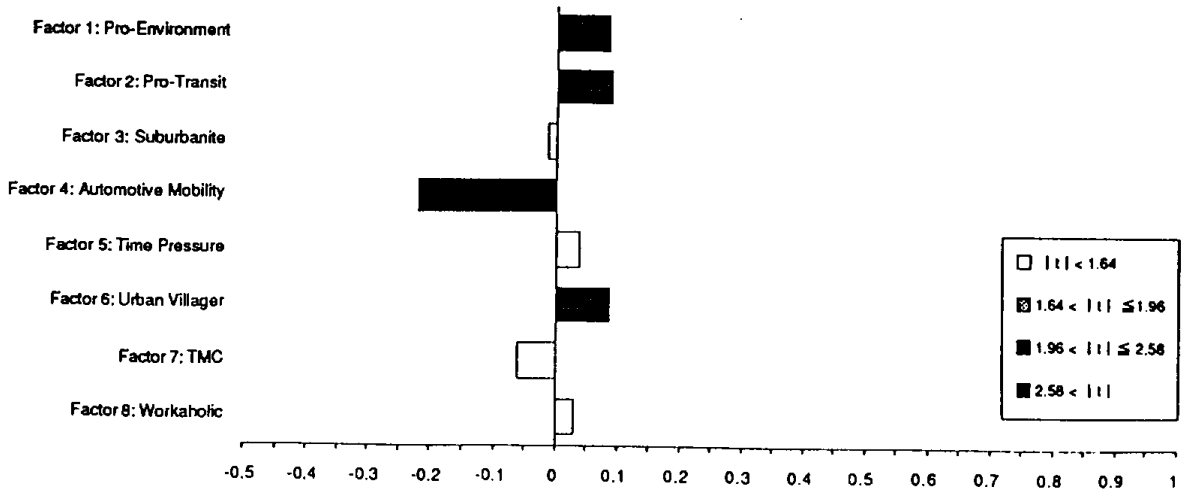


Figure 2
(continued)

Fraction of Transit Trips



Fraction of Non-Motorized Trips



The F-statistics obtained by dropping one variable group at a time from the model with all factors (the last columns) indicate that the socio-economic attributes, the neighborhood descriptors, and the attitude factors are each significant as a group. The explanatory power of the neighborhood descriptors, however, is relatively small. Comparing Model 1 and Model 2 indicates that the neighborhood descriptors account for a much smaller portion of the total variation than do the attitude factors. Comparing Model 2 and Model 3 indicates that the socio-economic variables of the best model account for a larger fraction of variation than do the neighborhood descriptors. Neighborhood descriptors do have their own association with the mobility measure, but the strength of the association is weak relative to that of socio-economic attributes or attitude factors.

The analyses here have made it evident that attitude factors are strongly associated with the travel demand measures used in this study. They contribute significantly to the models' explanatory power in addition to the demographic, socio-economic and neighborhood characteristics variables that are in the best models of Table 7. In particular, the number of trips by travel mode and modal split are both strongly associated with factors that represent individuals' attitudes toward the environment, public transit, automotive mobility, urban forms, and time.

Land use characteristics as represented by the neighborhood descriptors are associated with mobility and offer some explanation of the variation in the mobility measures in addition to that offered by the attitude factors. Their associations with the mobility measures, however, tend to be weaker compared with the associations shown by the attitude factors. One may conclude that attitudes are at least more strongly, and perhaps more directly, associated with travel than are land use characteristics.

6. Summary and Conclusions

This study examined the effects of land use and attitudinal characteristics on travel behavior for five diverse San Francisco Bay Area neighborhoods. The data collected for this project form a rich basis from which these types of effects can be explored. A number of items on the surveys used, not discussed here,

relate to lifestyle and activity choices that are likely to be associated with travel behavior and possibly residential location. Other items relate to reasons for using or not using modes other than driving alone to commute to work, reasons for choosing the current residential location, and type of location preference. The travel diary database, which in this study was analyzed with respect to numbers of trips and distributions of trips across modes, can be further analyzed with respect to vehicle-miles traveled, and distribution of trips across purpose, time of day, and geographical location. This paper has reported the results of initial analyses of this rich data base. They can be summarized as follows.

First, socio-economic and neighborhood characteristics were regressed against number and proportion of trips by various modes. The best models for each measure of travel behavior confirmed earlier studies' findings that neighborhood characteristics are statistically associated with amounts of travel and mode split, and add significant explanatory power when socio-economic differences are controlled for:

- Parking availability was negatively associated with the total number of person trips.
- Having a backyard and the distances to the nearest rail station and park were negatively correlated with both the number and fraction of transit trips.
- Access to BART and having sidewalks were positively associated with the number of non-motorized trips.
- High density was positively, and distances to the nearest bus stop and park were negatively, correlated with the fraction of non-motorized trips.
- Parking availability and the distances to the nearest bus stop and park were positively associated with the fraction of auto trips.

In two of the six best models, those for number of person trips and number of non-motorized trips, a dummy variable for the North San Francisco neighborhood was significant and positive, indicating the unique nature of this area. For the most part, these relationships are consistent with prior hypotheses.

Second, 39 attitude statements relating to urban life were factor analyzed into eight factors: pro-environment, pro-transit, suburbanite, automotive mobility, time pressure, urban villager, TCM, and workaholic. Scores on these factors were introduced into the six best models discussed above. The

relative contributions of the socio-economic, neighborhood, and attitudinal blocks of variables were assessed. While each block of variables offers some significant explanatory power to the models, the power of the attitudinal variables was the strongest, i.e. they explained the highest proportion of the variation in the data.

It may be concluded that attitudes are certainly more strongly, and perhaps more directly, associated with travel than are land use characteristics. This suggests that land use policies promoting higher densities and mixtures may not alter travel demand materially unless residents' attitudes are also changed. It will be important in the future, then, to determine:

- how these attitudes are formed,
- how they interact with travel experience,
- how they are related to the choice of residential and job location, housing unit, and vehicle ownership,
- how the observed associations between attitudes and neighborhood characteristics are formed, and
- how attitudes can be affected by land use policy.

The questions raised above are not all new. Yet the analytical results of this study point to the urgent need to revisit these issues for a more thorough understanding of the relationship between land use and travel. Such an understanding is central to the formation of effective land use policy directed toward the improvement of the environment and mobility.

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Land Use and Travel Behavior

Appendix A: Survey Instruments

Contents:

UCD USE ONLY

MOBILITY AND LIVABLE COMMUNITIES STUDY
INSTITUTE OF TRANSPORTATION STUDIES
UNIVERSITY OF CALIFORNIA, DAVIS, CA 95616

Phase 1
Background Questionnaire

1. Your first name: _____

2. Are you ❑ Female ❑ Male ?

3. How old are you? _____ years old

4. Do you have a driver's license? ❑ No ❑ Yes

5. Are you employed?

   ❑ No → **Go to Question 11 on Next Page**
   ❑ Yes

   • Work Location _____ *(Nearest intersection or street address)*, _____ *(city)*

   • One-way home to work distance: _____ miles (enter "0" if you work at home)

6. Do you work ❑ Full time ❑ Part time ?

7. How would you describe your job?

   ❑ Administrative Support/Clerical
   ❑ Professional/Technical
   ❑ Managerial
   ❑ Sales
   ❑ Farming/Forestry/Fishing
   ❑ Services/Maintenance/Repair
   ❑ Self-employed
   ❑ Production/Construction/Craft
   ❑ Other _____ *(specify)*

8. What is your primary means of travel to work?

   ❑ Drive alone
   ❑ Car/van pool
   ❑ Public transportation
   ❑ Bicycle
   ❑ Walk
   ❑ Work at home
   ❑ Other _____ *(specify)*

9. How frequently do you share a ride to work? (Include informal ride-sharing with other employed family members or friends as well as formal car/van pools, but not public transportation)

   ❑ Never
   ❑ Less than once a month
   ❑ 1-3 times a month
   ❑ Once a week
   ❑ More than once a week

10. How frequently do you ride public transportation (bus, train, etc.) to work?

   ❑ Never
   ❑ Less than once a month
   ❑ 1-3 times a month
   ❑ Once a week
   ❑ More than once a week

11. Do you go to school?

   ❑ No → **Go to Question 16 on Next Page**
   ❑ Yes

   • School Location _____, _____
   (Nearest intersection or street address) *(city)*

   • One-way home to school distance: _____ miles

12. Do you go to school ❑ Full time ❑ Part time ?

13. What is your primary means of travel to school?

   ❑ Drive alone
   ❑ Car/van pool
   ❑ Public transportation
   ❑ Bicycle
   ❑ School Bus
   ❑ Walk
   ❑ Other _____ *(specify)*

14. How frequently do you share a ride to school? (Include informal ride-sharing with other family members or friends as well as formal car/van pools, but not school bus)

    ❑ Never
    ❑ Less than once a month
    ❑ 1-3 times a month
    ❑ Once a week
    ❑ More than once a week

15. How frequently do you ride public transportation (for example, bus or train) to school? (Do not include school bus)

    ❑ Never
    ❑ Less than once a month
    ❑ 1-3 times a month
    ❑ Once a week
    ❑ More than once a week

16. What is your educational background?

    ❑ Some grade school or high school
    ❑ High school diploma
    ❑ Some college or technical school
    ❑ Four-year college or technical school degree
    ❑ Some graduate school
    ❑ Completed graduate degree(s)

17. In case we have questions on your responses, may we contact you by phone?

    ❑ No ❑ Yes; Daytime phone number _____

We would value any comments you may have regarding the subject of this study. Please feel free to write them on the back of this page. Thank you for mailing back your completed travel diary together with this questionnaire.

COMMENTS

MOBILITY AND LIVABLE COMMUNITIES STUDY
INSTITUTE OF TRANSPORTATION STUDIES
UNIVERSITY OF CALIFORNIA, DAVIS, CA 95616

PHASE 1
PERSONAL TRAVEL DIARY

Please read the instructions on the green sheet before beginning to fill out your diary. For ease of reference a summary description of the trip purposes is provided on the back of every page of this diary.

Travel Survey Days: June 3, 4, and 5

Check this box if you do not make any trips at all during this three-day period ☐

Your Name: _____

☐☐☐☐☐☐
UCD USE ONLY

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UNIVERSITY OF CALIFORNIA, DAVIS, CA 95616

Please list all the vehicles you drive. Then, for any driving trips you make, use this numbering to indicate which vehicle you used. If you do not drive, please begin recording your trips on the next page.

Vehicle #1

Make _____
Model _____
Year _____

Vehicle #2

Make _____
Model _____
Year _____

Vehicle #3

Make _____
Model _____
Year _____

Vehicle #4

Make _____
Model _____
Year _____

DESCRIPTION OF TRIP PURPOSES

TRANSFER TO DIFFERENT MEANS OF TRAVEL	Trips made to change your means of travel on your way to a final destination (for example, driving to a park-and- ride lot to join a vanpool).
RETURN HOME	A trip ending at home. Not necessarily the last trip of the day.
WORK	All trips made to your usual work place.
WORK RELATED	Trips made to carry out work business at locations other than the main work place (for example, attending business meetings, calling on customers).
SCHOOL	Trips made to attend classes.
SHOPPING	Trips for shopping or browsing.
DROP OFF/ PICK UP PASSENGERS	If the main reason for your trip is to drop off or pick up someone, then it falls in this category.
PERSONAL BUSINESS	These include trips made to carry out personal business such as going to the bank, post office, or the mechanic.
SOCIAL/ RECREATION	For example, a social visit to a friend or relative, a trip to participate in or watch a ball game, a trip to the movies or theater, and so on.
EAT MEAL	Trips made to a restaurant or fast food place to dine or carry-out.
MEDICAL/ DENTAL	A trip to a doctor, dentist, or medical or dental clinic.
OTHER	If you feel that the trip does not fall into any one of the above categories, check this box and try to specify the kind of trip.

Enter Today's Date: ____/____/____ (month / day / year)

Did you make trips today?

- ☐ No → Begin tomorrow's trips on the next page
- ☐ Yes → Continue below

Trip Began ☐☐:☐☐ ☐ am ☐ pm

At ☐ Home ☐ Work ☐ School ☐ Other

_____, _____
(Address or cross streets) (city)

Trip Ended ☐☐:☐☐ ☐ am ☐ pm

At ☐ Home ☐ Work ☐ School ☐ Other

_____, _____
(Address or cross streets) (city)

Purpose of Trip

- ☐ Transfer to Different Means of Travel
- ☐ Return Home
- ☐ Work
- ☐ Work Related
- ☐ School
- ☐ Shopping
- ☐ Drop off/pick up passengers
- ☐ Personal Business
- ☐ Social/Recreation
- ☐ Eat Meal
- ☐ Medical/Dental
- ☐ Other_____ (specify)

Means of Travel

- ☐ Drove Vehicle #____
- ☐ Rode in car/truck/van
- ☐ Carpool/Vanpool
- ☐ Motorcycle/Moped
- ☐ Bicycle
- ☐ Other _____ (specify)
- ☐ Light Rail
- ☐ Amtrak
- ☐ Bus
- ☐ School Bus
- ☐ Walk
- ☐ Taxi

Number of Persons in Vehicle _____
(include yourself)

Location of Parking

- ☐ On-site lot/garage
- ☐ Off-site lot/garage
- ☐ On-street
- ☐ Not applicable

Parking or Transit Cost

☐ Free ☐ Paid $_____ ☐ Not applicable

Toll Paid for this Trip

☐ Paid $_____ ☐ Not applicable

Approximate Total Length of Trip: ____ miles

Distance on Freeway: _____ miles

MOBILITY AND LIVABLE COMMUNITIES STUDY
INSTITUTE OF TRANSPORTATION STUDIES
UNIVERSITY OF CALIFORNIA, DAVIS, CA 95616

HOW TO FILL OUT YOUR TRAVEL DIARY

WHO SHOULD FILL OUT THE DIARY? All members of your household who are age 16 or older are requested to fill out the blue background questionnaire and the travel diary. If there are not enough background questionnaires or travel diaries, please call the ITS office at 752-1914 and request additional copies.

FIRST, THE COVER AND YELLOW PAGE. Please write in your **first name** on the diary cover. Then list the vehicles you drive on the first page (the yellow page).

THEN THE DIARY, ONE PAGE PER TRIP. Please record in your travel diary **all trips** you make in the three day period, **June 3, 4, and 5. A trip is a one-way movement from one place to another, whatever the purpose or means of travel might be.** For example, a commute from home to work is a trip. A short walk to a store or a bike ride to a friend's house is also a trip.

However you need not record movements made within the same premises (a building, a shopping center, or a college campus). For example, you would not record the trips to all the stores you visited within the same shopping mall--only record the trips to the mall and from the mall.

HOW TO COUNT TRIPS? Each stop means an end of a trip and a beginning of a new trip. Use one travel diary page for each trip, and fill in all the information about the trip. When a new trip starts, begin a new diary page. For example, suppose you drove to work in the morning; walked to a nearby restaurant during the lunch break; walked back to the workplace; left work and stopped at a grocery store on the way; then returned home. There are altogether 5 trips:

1. Trip from home to work *(Work)*
2. From work to restaurant *(Eat Meal)*
3. From restaurant to work *(Work)*
4. From work to grocery store *(Shopping)*
5. From grocery store to home *(Return Home)*

TRIP PURPOSE CATEGORIES. What you see in the parentheses above are trip purposes for each trip. A summary description of trip purpose categories is shown on the back of this leaflet and also on the back of every diary page. Please mark the trip purpose category that best describes the purpose of each trip.

- **If you just go for a walk or a bike ride** in the evening, the purpose of the trip is "Social/Recreation", and you would record the origin and destination as "Home" (see inside page of this leaflet).
- **If you drive a personal vehicle** to make a trip, indicate which vehicle you drove using the numbering you gave on the yellow page.
- **If you use up all diary pages,** please stop recording and mail back the diary along with the other material.
- **If you do not travel at all during this three-day period** (for example, due to vacation or illness), then please check the box on the cover of your travel diary and mail it back along with the other material.

YOUR DIARY DAYS ARE JUNE 3, 4, AND 5.

You can find item-by-item instructions for the travel diary on the following pages.

MOBILITY AND LIVABLE COMMUNITIES STUDY
INSTITUTE OF TRANSPORTATION STUDIES
UNIVERSITY OF CALIFORNIA, DAVIS, CA 95616

ITEM-BY-ITEM INSTRUCTIONS FOR TRAVEL DIARY

Detailed instructions for each item in the diary page are given below.

A At the top of the travel diary page, enter the date (month/day/year).

B Then indicate whether you traveled on that particular day at all. If not, then start the next day on a new page. You need to do this only when a new day begins.

C Please fill in the exact time at which the trip started.

D Check the box corresponding to the place where your trip began. **If you check "OTHER", then give its location.**

E Please fill in the exact time at which the trip ended.

F Check the box corresponding to the place where your trip ended. If you check OTHER, then give its location. **Note that the end place of one trip is the start place of the next trip.**

G The purpose of the trip is defined by the **main** activity at the place where your trip ends. Check the appropriate box for the trip purpose. Explanations of trip purposes are provided on the back of each diary page.

H Check the box corresponding to the means of travel you used for the trip. If you drove a vehicle, then write in the number for the vehicle as shown in the list you made on the yellow page of the diary. **Note that bicycle and walk trips should also be reported.**

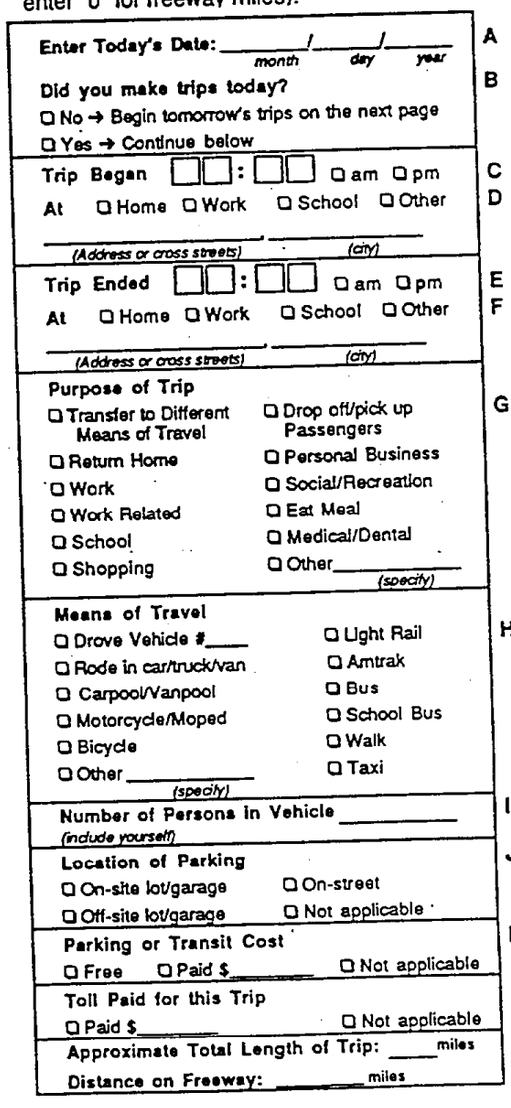
I If you used a personal vehicle or carpooled, write down the total number of persons in the vehicle including yourself.

J If you parked a vehicle, specify the type of parking location. Otherwise check "NOT APPLICABLE".

K If you used a personal vehicle or car/van pool, indicate the cost of parking. If you used public transportation or taxi, write down the fare. Otherwise check "NOT APPLICABLE".

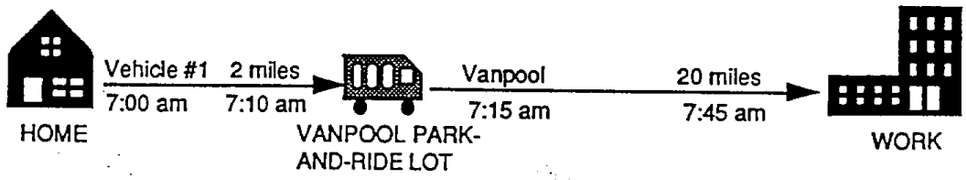
L Enter any amount you paid as toll(s) in the specified trip.

M Finally, provide the approximate **total length of the trip in miles** and the **distance covered on any freeway.** (If the trip did not involve any freeway use, enter "0" for freeway miles).



Example of Completed Travel Diary

On May 29, at 7:00 am, Mary drives in vehicle #1 to the park-and-ride lot to catch her vanpool to work. This drive is 2 miles, and involves no freeway. Mary arrives at 7:10 am. She waits for 5 minutes and then rides in the vanpool to work. This ride is 20 miles, of which 15 miles are on the freeway. The van is parked in the lot at her place of work. There is no charge for parking. She arrives at work at 7:45 am.



This journey to work is made up of TWO trips and should be recorded on TWO separate diary pages as shown below:

Enter Today's Date: 05 / 29 / 92 (month / day / year)

Did you make trips today?
- ☐ No → Begin tomorrow's trips on the next page
- ☒ Yes → Continue below

Trip Began 07 : 00 ☒ am ☐ pm
At ☒ Home ☐ Work ☐ School ☐ Other
_____ (Address or cross streets) _____ (city)

Trip Ended 07 : 10 ☒ am ☐ pm
At ☐ Home ☐ Work ☐ School ☒ Other
I-80 & Watt (Address or cross streets) Sac'to. (city)

Purpose of Trip
- ☒ Transfer to Different Means of Travel
- ☐ Return Home
- ☐ Work
- ☐ Work Related
- ☐ School
- ☐ Shopping
- ☐ Drop off/pick up passengers
- ☐ Personal Business
- ☐ Social/Recreation
- ☐ Eat Meal
- ☐ Medical/Dental
- ☐ Other _____ (specify)

Means of Travel
- ☒ Drove Vehicle # 1
- ☐ Rode in car/truck/van
- ☐ Carpool/Vanpool
- ☐ Motorcycle/Moped
- ☐ Bicycle
- ☐ Other _____ (specify)
- ☐ Light Rail
- ☐ Amtrak
- ☐ Bus
- ☐ School Bus
- ☐ Walk
- ☐ Taxi

Number of Persons in Vehicle 1 (include yourself)

Location of Parking
- ☒ On-site lot/garage
- ☐ Off-site lot/garage
- ☐ On-street
- ☐ Not applicable

Parking or Transit Cost
- ☒ Free
- ☐ Paid $ _____
- ☐ Not applicable

Toll Paid for this Trip
- ☐ Paid $ 0
- ☐ Not applicable

Approximate Total Length of Trip: 2 miles
Distance on Freeway: 0 miles

Enter Today's Date: ____ / ____ / ____ (month / day / year)

Did you make trips today?
- ☐ No → Begin tomorrow's trips on the next page
- ☐ Yes → Continue below

Trip Began 07 : 15 ☒ am ☐ pm
At ☐ Home ☐ Work ☐ School ☒ Other
I-80 & Watt (Address or cross streets) Sac'to. (city)

Trip Ended 07 : 45 ☒ am ☐ pm
At ☐ Home ☒ Work ☐ School ☐ Other
_____ (Address or cross streets) _____ (city)

Purpose of Trip
- ☐ Transfer to Different Means of Travel
- ☐ Return Home
- ☒ Work
- ☐ Work Related
- ☐ School
- ☐ Shopping
- ☐ Drop off/pick up passengers
- ☐ Personal Business
- ☐ Social/Recreation
- ☐ Eat Meal
- ☐ Medical/Dental
- ☐ Other _____ (specify)

Means of Travel
- ☐ Drove Vehicle # ____
- ☐ Rode in car/truck/van
- ☒ Carpool/Vanpool
- ☐ Motorcycle/Moped
- ☐ Bicycle
- ☐ Other _____ (specify)
- ☐ Light Rail
- ☐ Amtrak
- ☐ Bus
- ☐ School Bus
- ☐ Walk
- ☐ Taxi

Number of Persons in Vehicle 8 (include yourself)

Location of Parking
- ☒ On-site lot/garage
- ☐ Off-site lot/garage
- ☐ On-street
- ☐ Not applicable

Parking or Transit Cost
- ☒ Free
- ☐ Paid $ _____
- ☐ Not applicable

Toll Paid for this Trip
- ☐ Paid $ 0
- ☐ Not applicable

Approximate Total Length of Trip: 20 miles
Distance on Freeway: 15 miles

THANK YOU! PLEASE MAIL BACK YOUR DIARY AND THE BLUE BACKGROUND QUESTIONNAIRE IN THE BUSINESS REPLY ENVELOPE (ALONG WITH THOSE FROM OTHER MEMBERS OF YOUR HOUSEHOLD, IF YOU HAVE OTHER HOUSEHOLD MEMBERS PARTICIPATING IN THE SURVEY) .

DESCRIPTION OF TRIP PURPOSES

TRANSFER TO DIFFERENT MEANS OF TRAVEL	Trips made to change your means of travel on your way to a final destination (for example, driving to a park-and-ride lot to join a vanpool).
RETURN HOME	A trip ending at home. Not necessarily the last trip of the day.
WORK	All trips made to your usual work place.
WORK RELATED	Trips made to carry out work business at locations other than the main work place (for example, attending business meetings, calling on customers).
SCHOOL	Trips made to attend classes.
SHOPPING	Trips for shopping or browsing.
DROP OFF/PICK UP PASSENGERS	If the main reason for your trip is to drop off or pick up someone, then it falls in this category.
PERSONAL BUSINESS	These include trips made to carry out personal business such as going to the bank, post office, or the mechanic.
SOCIAL/ RECREATION	For example, a social visit to a friend or relative, a trip to participate in or watch a ball game, a trip to the movies or theater, and so on.
EAT MEAL	Trips made to a restaurant or fast food place to dine or carry-out.
MEDICAL/DENTAL	A trip to a doctor, dentist, and medical or dental clinic.
OTHER	If you feel that the trip does not fall into any one of the above categories, check this box and try to specify the kind of trip.

MOBILITY AND LIVABLE COMMUNITIES STUDY
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PHASE 2
Household Questionnaire

Please enter your first name here: _____

PART A
TRANSPORTATION FACILITIES IN YOUR NEIGHBORHOOD

In this part the questions concern transportation facilities and related issues in your neighborhood.

1. Are streets in your neighborhood pleasant for walking or jogging? ☐ Yes ☐ No

2. Are there sidewalks in your neighborhood? ☐ Yes ☐ No

3. Are there easily accessible bike paths in your neighborhood? ☐ Yes ☐ No

4. Is public transit (such as bus or light rail) easily accessible? ☐ Yes ☐ No

5. Is there enough parking space near your residence? ☐ Yes ☐ No

6. Do you or your household members regularly park your vehicle on the street? ☐ Yes ☐ No

7. How many parking spaces are available exclusively for your household use? Include your garage and driveway. _____

8. Does your household pay separately for a parking space(s) at (or near) your residence? ☐ Yes ☐ No

   ↓

   How much per month? _____ for _____ space(s)

9. Approximately how much does your household pay each **month** for?

   a. Gasoline and other vehicle fuel _____

   b. Public transportation _____

   c. Parking at work _____

   d. Tolls _____

PART B
YOUR HOME AND NEIGHBORHOOD

In this section the importance of the reasons for choice of residence is emphasized. Please think of the time you chose to live in your current residence.

1. What are the reasons that you chose the neighborhood you live in now? (Mark as many as apply.)

   ☐a Quiet neighborhood
   ☐b Lively neighborhood
   ☐c Safety and security
   ☐d Good school
   ☐e Close to work
   ☐f Close to the freeway
   ☐g Close to transit
   ☐h Close to shops and services
   ☐i Nicely landscaped area
   ☐j Spacious residential neighborhood
   ☐k Housing cost
   ☐l Liked the style of housing units
   ☐m Other (Please specify.) _____

2. Of the reasons you marked above, please indicate up to the three most important reasons: (by letter)

   Most important _____

   Second most important _____

   Third most important _____

3. Where did you live before you moved into your current residence?

   City _____ State/Country _____

   For how long? _____

4. How would you describe the place you lived before you moved to your current residence?

- ☐1 A large city
- ☐2 A suburb of a large city
- ☐3 A medium sized city or its suburbs
- ☐4 A small city
- ☐5 A town or village
- ☐6 The countryside

5. Approximately how far (in miles) is your home from the nearest?

a. Grocery store _____

b. Gas station _____

c. Park or playground _____

6. Do you plan to move within the next 12 months?

☐ Yes ☐ No → **Please go to Question 8 below.**

↓

7. What is the major reason for your plan?

- ☐a Job related
- ☐b Finishing school
- ☐c More residential space needed
- ☐d Too much space
- ☐e Cost of housing
- ☐f Health/retirement
- ☐g Children left home
- ☐h Married/divorced
- ☐i Dissatisfaction with the neighborhood
- ☐j Other (Please specify.) _____

8. Given your current neighborhood situation, which of the following reasons may make you consider moving to a different area? (Mark as many as apply.)

- ☐a Crime
- ☐b Traffic
- ☐c Noise
- ☐d Parking
- ☐e Distance to shops and services
- ☐f Distance to work
- ☐g Neighbor(s)
- ☐h Cost of housing
- ☐i Other reasons (Please specify.) _____
- ☐j No reason to move at this time

9. In what type of area would you prefer to live?

- ☐1 The same type of area
- ☐2 A large city
- ☐3 A suburb near a large city
- ☐4 A medium sized city or its suburbs
- ☐5 A small city
- ☐6 A town or village
- ☐7 The countryside

10. How many square feet are there in your current residence? _____

11. How many bedrooms are there in your current residence? _____

12. Which of the following do you have in your current residence? (Please mark as many as apply.)

- ☐1 Separate living and family room
- ☐2 Dining room
- ☐3 Private office area
- ☐4 Private backyard
- ☐5 Basement

13. Do you own your home?

☐ Yes ☐ No → **Please go to Question 15 below**

14. What is the approximate value of your home? (Please check the appropriate box.)

- ☐a Under $50,000
- ☐b $50,001 to $80,000
- ☐c $80,001 to $120,000
- ☐d $120,001 to $180,000
- ☐e $180,001 to $250,000
- ☐f $250,001 to $350,000
- ☐g $350,001 to $500,000
- ☐h More than $500,000

Please go to PART C, next page.

15. If you are renting your residence, what is the rent of the unit per month ? (Please check the appropriate box.)

- ☐a Under $350
- ☐b $351 to $500
- ☐c $501 to $700
- ☐d $701 to $1,000
- ☐e $1,001 to $1,400
- ☐f More than $1,400

16. Does the rent include the following? (Mark as many as apply.)

☐a Lawn service	☐b A swimming pool
☐c A club house	☐d A gym

☐e Other (Please specify.): _____

PART C
ABOUT YOUR HOUSEHOLD

In this part we are asking very general questions, some of them about your household interests. The reason we ask these questions is the fact that in many previous studies, travel and transportation habits of the people have been connected to their other interests. We continue the effort to understand the connection between the two. However, we cannot do this without asking some personal questions. We assure all participants of their privacy and confidentiality of the information they provide.

If you are interested in the findings, preliminary results of the study will be available in the ITS office in December 1992. You may contact the office by calling (916) 752-1914.

1. Please check the items you have at your residence.

☐a Microwave oven	☐b Dishwasher	☐c Washer & dryer
☐d VCR	☐e CD player	☐f Answering machine
☐g Camcorder	☐h Cable TV	☐i Big screen TV
☐j Personal computer	☐k Fax machine	☐l Swimming pool
☐m Fitness equipment	☐n Boat	☐o RV
☐p Spa	☐q Chest or stand-alone freezer	

2. What best describes the way you usually spend your weekends? (Please mark as many as apply.)

☐a Yard work	☐b Cook	☐c Stay home and relax
☐d Do chores	☐e Visit friends	☐f Entertain people
☐g Read	☐h Hobbies	☐i Go shopping
☐j Exercise	☐k Work	☐l Religious activities
☐m Volunteer activities	☐n Study	☐o Take short vacation trips
☐p Outdoor/sports	☐q Cultural activities	☐r Dining out/movies

☐s Other (Please specify.) _____

3. In the last 12 months how many holiday trips did you take? _____

4. How many of your holiday trips where one week or longer? _____

5. To what newspaper(s) does your household subscribe? (Please list all.)

_____

6. To what newsweekly(ies) does your household regularly subscribe? (Please list all.)

_____

7. Is there a recycling program in your neighborhood? ☐ Yes ☐ No

8. Do you participate in any recycling program? ☐ Yes ☐ No

9. Do you hire somebody to do yard work? ☐ Yes ☐ No

10. Do you hire somebody to clean the house? ☐ Yes ☐ No

11. To confirm the information in the earlier phase of survey, please fill in the blanks below:

    a. Including yourself, how many people are in your household? _____

    b. Including yourself, how many are 16 years **or older**? _____

    c. How many have a driver's license? _____

    d. How many people in your household are employed? _____

    e. How many usable bicycles does your household have? _____

    f. How many usable mopeds does your household have? _____

12. Please indicate the normally operational vehicles available to your household.

Vehicle A:

Make: _____ Model: _____ Year: _____

Acquired: ❑1 Used ❑2 New in 19 _____

Fuel type: ❑1 Gasoline ❑2 Diesel ❑3 Other _____ (specify)

Ownership: ❑1 Own ❑2 Lease ❑3 Company car

❑4 Other (Please specify.) _____

Vehicle B:

Make: _____ Model: _____ Year: _____

Acquired: ❑1 Used ❑2 New in 19 _____

Fuel type: ❑1 Gasoline ❑2 Diesel ❑3 Other _____ (specify)

Ownership: ❑1 Own ❑2 Lease ❑3 Company car

❑4 Other (Please specify.) _____

Vehicle C:

Make: _____ Model: _____ Year: _____

Acquired: ❑1 Used ❑2 New in 19 _____

Fuel type: ❑1 Gasoline ❑2 Diesel ❑3 Other _____ (specify)

Ownership: ❑1 Own ❑2 Lease ❑3 Company car

❑4 Other (Please specify.) _____

Vehicle D:

Make: _____ Model: _____ Year: _____

Acquired: ❑1 Used ❑2 New in 19 _____

Fuel type: ❑1 Gasoline ❑2 Diesel ❑3 Other _____ (specify)

Ownership: ❑1 Own ❑2 Lease ❑3 Company car

❑4 Other (Please specify.) _____

13. Please indicate the age, gender, and employment status of the members of your household who ***did not*** fill out the travel diary in phase one of this survey (Please include children under 16 years old):

Person #1

Age: _____ Gender: ❑1 Female ❑2 Male

Employment status:

❑1 Employed full time ❑2 Employed part time ❑3 Student

❑4 Homemaker ❑5 Retired ❑6 Not applicable

Person #2

Age: _____ Gender: ❑1 Female ❑2 Male

Employment status:

❑1 Employed full time ❑2 Employed part time ❑3 Student

❑4 Homemaker ❑5 Retired ❑6 Not applicable

Person #3

Age: _____ Gender: ❑1 Female ❑2 Male

Employment status:

❑1 Employed full time ❑2 Employed part time ❑3 Student

❑4 Homemaker ❑5 Retired ❑6 Not applicable

Person #4

Age: _____ Gender: ❑1 Female ❑2 Male

Employment status:

❑1 Employed full time ❑2 Employed part time ❑3 Student

❑4 Homemaker ❑5 Retired ❑6 Not applicable

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PHASE 3
TRANSPORTATION AND URBAN LIFE

Please enter your first name here:_____

Your neighborhood is important to you in your everyday routine. And you are an integral part of that neighborhood community. In Phase 3 we ask you some questions about your neighborhood, what you do there, and how you feel about current issues. Your opinions are extremely valuable. Please answer each question in a way that accurately represents your opinions. Again, thank you for your help.

PART A
NEIGHBORHOOD INFORMATION

In this part of the questionnaire we are concerned with your opinions and knowledge about your neighborhood, the places you visit and how you get there.

1. As a place to live, my neighborhood has just about everything I want. ☐$_1$ Yes ☐$_2$ No

Please answer questions 2 through 4 about public transit even if you don't use it.

2. How far away, to the nearest tenth of a mile, is the bus stop:

   Nearest your home? _____ (miles) ☐$_{-9}$ Don't know

   Nearest your work/school? _____ (miles) ☐$_{-9}$ Don't know

3. How far away is the Amtrak or CalTrain station:

   Nearest your home? _____ (miles) ☐$_{-9}$ Don't know

   Nearest your work/school? _____ (miles) ☐$_{-9}$ Don't know

4. How would you *(do you usually)* get to the public transit stop/station *(check up to two)?*

   ☐$_1$ Walk ☐$_2$ Bicycle ☐$_3$ Drive alone ☐$_4$ Drive or ride with others

   ☐$_5$ Other *(please specify):* _____

PLEASE CONTINUE ON THE NEXT PAGE.

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The following questions ask about the types of transportation you use to travel to the places you routinely visit.

5. How often during the past **two weeks** did you go to a grocery store?

☐$_1$ None ☐$_2$ 1 - 2 ☐$_3$ 3 - 5 ☐$_4$ 6 - 10 ☐$_5$ More often

6. List up to five grocery stores where you shop *(please list the most frequently visited one first).*

☐$_1$ **Check here if you do not go grocery shopping.**

	Name of Store	Street Store is On	How you usually get there *(walk, drive, bus, etc.)*
a.			
b.			
c.			
d.			
e.			

7. List up to five stores where you go clothes shopping most often *(please list the most frequently visited one first).*

☐$_1$ **Check here if you do not go clothes shopping.**

	Name of Store	Street Store is On	How you usually get there *(walk, drive, bus, etc.)*
a.			
b.			
c.			
d.			
e.			

PLEASE CONTINUE ON THE NEXT PAGE.

8. How often during the past **two weeks** did you go to a shopping mall *(a shopping mall includes a collection of stores in one location that is known as a mall)?*

☐$_1$ None ☐$_2$ 1 ☐$_3$ 2 ☐$_4$ 3 - 4 ☐$_5$ More often

9. List up to three major shopping malls you often visit.

☐$_1$ **Check here if you do not visit a mall.**

	Name of Mall	Street Mall is On	How you usually get there *(walk, drive, bus, etc.)*
a.			
b.			
c.			

10. How often during the past **month** did you shop at a discount, membership store or factory outlet store *(such as Home Base, Office Club, Home Depot, Price Club, etc)?*

☐$_1$ None ☐$_2$ 1 ☐$_3$ 2 ☐$_4$ 3 - 4 ☐$_5$ More often

11. List up to three membership stores or discount stores where you often shop.

☐$_1$ **Check here if you do not visit a membership or discount store.**

	Name of Store	Street Store is On	How you usually get there *(walk, drive, bus, etc.)*
a.			
b.			
c.			

12. How often during the past **two weeks** did you buy vehicle fuel *(gasoline, diesel, liquid propane gas, or other fuel)*?

☐$_1$ None ☐$_2$ 1 ☐$_3$ 2 ☐$_4$ 3 - 4 ☐$_5$ More often

PLEASE CONTINUE ON THE NEXT PAGE.

13. Below is a list of familiar activities in which you may participate. As with the questions above, we are interested in how you get to the places you go *(please check as many as apply).*

Codes for columns below:

Seldom	= Seldom or never attend/visit
Bike	= Bicycle or other non-motorized means
Transit	= Bus or other public transportation
Rideshare	= Drive or ride with at least one other person including family members
Walk	= Walk
Taxi	= Taxi
Drive	= Drive Alone

		Seldom	Bike	Transit	Rideshare	Walk	Taxi	Drive
a.	Video rental store	☐1	☐2	☐3	☐4	☐5	☐6	☐7
b.	Laundromat	☐1	☐2	☐3	☐4	☐5	☐6	☐7
c.	Medical/dental appointment	☐1	☐2	☐3	☐4	☐5	☐6	☐7
d.	Banking and other personal business	☐1	☐2	☐3	☐4	☐5	☐6	☐7
e.	Lawn & garden store or hardware store	☐1	☐2	☐3	☐4	☐5	☐6	☐7
f.	School functions or activities	☐1	☐2	☐3	☐4	☐5	☐6	☐7
g.	Religious meeting *(Church, Synagogue, Mosque, Temple, etc.)*	☐1	☐2	☐3	☐4	☐5	☐6	☐7
h.	Visit friends or family	☐1	☐2	☐3	☐4	☐5	☐6	☐7
i.	Community event, club or association meeting	☐1	☐2	☐3	☐4	☐5	☐6	☐7
j.	Park or playground	☐1	☐2	☐3	☐4	☐5	☐6	☐7
k.	Gym or exercise club	☐1	☐2	☐3	☐4	☐5	☐6	☐7
l.	Eating out *(restaurant or fast food restaurant)*	☐1	☐2	☐3	☐4	☐5	☐6	☐7
m.	Museum or art gallery	☐1	☐2	☐3	☐4	☐5	☐6	☐7
n.	Movies	☐1	☐2	☐3	☐4	☐5	☐6	☐7
o.	Other - please specify other types of places you visit regularly *(please do not include grocery shopping, clothes shopping or discount stores here):*							
	_____	☐1	☐2	☐3	☐4	☐5	☐6	☐7
	_____	☐1	☐2	☐3	☐4	☐5	☐6	☐7
	_____	☐1	☐2	☐3	☐4	☐5	☐6	☐7

PLEASE CONTINU -IE NEXT PAGE.

PART B
TRANSPORTATION AND URBAN LIFE

In Part B we ask what you think about urban travel. Your answers will improve policy makers' understanding of people's feelings, opinions and travel patterns. This will help them make informed decisions.

There are no right or wrong answers to the following questions. Please select the responses that best reflect your opinions or feelings. It's your opinions that are important here.

1. Do you work outside the home?

☐₁ Yes ⇓ Go to Q. 2

☐₂ No ⇓ Go to Q. 11 Next page

2. Do you ever walk or bicycle **to work**?

☐₁ Yes ⇓ Go to Q. 3

☐₂ No ⇓ Go to Q. 6 Next page

3. During the last month, how often did you walk or bicycle **to work**?

☐₁ Several times a week
☐₂ Once or twice a week
☐₃ Several times a month
☐₄ Once or twice a month
☐₅ None

4. Comparing last month to the preceding January, did you walk or bicycle to work:

☐₁ As often? ☐₂ More often? ☐₃ Less often?

5. I walk or bicycle **to work** because *(please check all that apply)*:

☐₁ I don't have a vehicle
☐₂ For exercise
☐₃ It saves money
☐₄ I live close to work
☐₅ There's not enough parking
☐₆ Parking is expensive
☐₇ Other *(please specify)*: _____

(PLEASE GO TO QUESTION 7 ON THE NEXT PAGE.)

6. I never walk or bicycle **to work** because *(please check all that apply)*:

- ☐ 1 I don't have a bicycle
- ☐ 2 Physical impairment
- ☐ 3 It's too far
- ☐ 4 I have too much to carry
- ☐ 5 I don't dress for it
- ☐ 6 I take child(ren) to child care
- ☐ 7 I do personal errands
- ☐ 8 I use my car for work
- ☐ 9 Wind, weather, hilly, heat or cold
- ☐ 10 I don't like to walk/bicycle
- ☐ 11 I don't like to be sweaty when I arrive
- ☐ 12 There are no showers
- ☐ 13 There are no bike lockers or racks
- ☐ 14 My route is through an unsafe area
- ☐ 15 Some drivers are not careful
- ☐ 16 I work after dark
- ☐ 17 There are no sidewalks, bike paths, or bike lanes
- ☐ 18 Other *(please specify)*: _____

7. Do you ever ride public transit such as a bus or rail to work?

☐ 1 Yes ⇩ Go to Q. 8 ☐ 2 No ⇩ Go to Q. 10

8. How do you get to the stop or station? _____

9. I use public transit to get **to work** because *(please check all that apply)*:

- ☐ 1 I don't have a vehicle available
- ☐ 2 It's as fast as or faster than driving and parking
- ☐ 3 It saves wear and tear on my vehicle
- ☐ 4 I have time to read and relax
- ☐ 5 It's cheaper than driving and parking
- ☐ 6 Other *(please specify)*: _____

(PLEASE GO TO QUESTION 11 BELOW.)

10. I do not use public transportation to get **to work** because *(please check all that apply)*:

- ☐ 1 None available
- ☐ 2 It doesn't stop near my home
- ☐ 3 There is no stop near my destination
- ☐ 4 I have to transfer to get to my destination
- ☐ 5 There is no comfortable place to wait
- ☐ 6 The stop or station is unsafe
- ☐ 7 None available at the right time
- ☐ 8 It's too expensive
- ☐ 9 Transit is too crowded
- ☐ 10 The vehicle is uncomfortable
- ☐ 11 It's too slow
- ☐ 12 I use my car for work
- ☐ 13 I use my car for errands
- ☐ 14 I take child(ren) to child care
- ☐ 15 I have too much to carry
- ☐ 16 It doesn't run on time
- ☐ 17 Other *(please specify)*: _____

11. Do you ever use public transit other than for commuting to work?

☐ 1 Yes ☐ 2 No

PLEASE CONTINUE IE NEXT PAGE.

Below are general statements about a variety of subjects. Please indicate how much you agree or disagree with the following statements by checking your response to each. Your opinions are important even if you feel you're not very familiar with the topics.

12. PRIVATE AUTOMOBILE

		STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
a.	Driving allows me freedom.	☐1	☐2	☐3	☐4	☐5
b.	Too many people drive alone.	☐1	☐2	☐3	☐4	☐5
c.	I would rather drive an electric or other clean-fuel vehicle than give up driving.	☐1	☐2	☐3	☐4	☐5
d.	Driving allows me to get more done.	☐1	☐2	☐3	☐4	☐5
e.	I often get stuck in traffic.	☐1	☐2	☐3	☐4	☐5

13. RIDESHARING (CARPOOL OR VANPOOL)

		STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
a.	I like someone else to do the driving.	☐1	☐2	☐3	☐4	☐5
b.	Ridesharing saves money.	☐1	☐2	☐3	☐4	☐5
c.	I am not comfortable riding with strangers.	☐1	☐2	☐3	☐4	☐5
d.	The rideshare car or van is often late.	☐1	☐2	☐3	☐4	☐5
e.	It takes too long to collect everyone in the car or vanpool.	☐1	☐2	☐3	☐4	☐5

14. PUBLIC TRANSPORTATION

		STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
a.	I can read and do other things when I use public transportation.	☐1	☐2	☐3	☐4	☐5
b.	It costs more to use public transportation than it does to drive a car.	☐1	☐2	☐3	☐4	☐5
c.	Public transportation is unreliable.	☐1	☐2	☐3	☐4	☐5
d.	Public transportation is for poor people.	☐1	☐2	☐3	☐4	☐5
e.	Buses and trains are pleasant to travel in.	☐1	☐2	☐3	☐4	☐5

15. TRANSPORTATION PLANNING

		STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
a.	Traffic congestion will take care of itself because people will make adjustments.	☐1	☐2	☐3	☐4	☐5
b.	Stricter vehicle smog control laws should be introduced and enforced.	☐1	☐2	☐3	☐4	☐5
c.	We need to build more roads to help decrease congestion.	☐1	☐2	☐3	☐4	☐5
d.	More lanes should be set aside for carpools and buses.	☐1	☐2	☐3	☐4	☐5
f.	We should provide incentives to people who use electric or other clean-fuel vehicles.	☐1	☐2	☐3	☐4	☐5

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16. TIME

		STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
a.	Occasionally, I would be willing to give up a day's pay to get a day off work.	☐1	☐2	☐3	☐4	☐5
b.	I would like to have more time for leisure.	☐1	☐2	☐3	☐4	☐5
c.	I like to spend most of my time working.	☐1	☐2	☐3	☐4	☐5
d.	When things are busy at work, I get more done by cutting back on leisure time.	☐1	☐2	☐3	☐4	☐5
e.	When things are busy at work, I get more done by cutting back on sleep.	☐1	☐2	☐3	☐4	☐5

17. ENVIRONMENTAL DECISION MAKING

		STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
a.	Environmental protection is good for California's economy.	☐1	☐2	☐3	☐4	☐5
b.	People and jobs are more important than the environment.	☐1	☐2	☐3	☐4	☐5
c.	Whoever causes environmental damage should repair the damage.	☐1	☐2	☐3	☐4	☐5
d.	High density residential development should be encouraged.	☐1	☐2	☐3	☐4	☐5
e.	Environmentalism hurts minority and small businesses.	☐1	☐2	☐3	☐4	☐5

18. HOUSING

		STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
a.	I need to have space between me and my neighbors.	☐1	☐2	☐3	☐4	☐5
b.	Having shops and services within walking distance of housing is important.	☐1	☐2	☐3	☐4	☐5
c.	It's important for children to have a large backyard for playing.	☐1	☐2	☐3	☐4	☐5
d.	I would only live in a multiple family unit, (apartment, condo, etc.) as a last resort.	☐1	☐2	☐3	☐4	☐5
e.	Too much valuable agricultural land is consumed to supply housing.	☐1	☐2	☐3	☐4	☐5

19. ECONOMICS

		STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
a.	I would be willing to pay a toll to drive on an uncongested road.	☐1	☐2	☐3	☐4	☐5
b.	Vehicle emissions increase the need for health care.	☐1	☐2	☐3	☐4	☐5
c.	Using tax dollars to pay for public transportation is a good investment.	☐1	☐2	☐3	☐4	☐5
d.	Environmental protection costs too much.	☐1	☐2	☐3	☐4	☐5
e.	We should raise the price of gasoline to reduce congestion and air pollution.	☐1	☐2	☐3	☐4	☐5

PLEASE CONTINUE TO THE NEXT PAGE.

PART C
LIFESTYLE

Part C asks general interest questions about the types of things you like to do and how you spend your leisure time. We once again assure that all responses will be kept strictly anonymous. This information is useful to indicate the demand for transportation and other urban facilities.

1. From the following lists, check all that you have done within the last 12 months.

A. Outdoors/Sports

- ☐ Attended a professional sports event
- ☐ Went rafting/canoeing
- ☐ Went fishing
- ☐ Participated in a sports event
- ☐ Went scuba diving
- ☐ Went on a picnic
- ☐ Used an off-road vehicle
- ☐ Went to a shooting range
- ☐ Went skiing
- ☐ Went horseback riding
- ☐ Went hiking/backpacking/camping
- ☐ Went hunting
- ☐ Went mountain climbing
- ☐ Went sailing
- ☐ Participated in motorcross
- ☐ Played tennis/golf
- ☐ Went bird watching

☐ Other *(please specify):* _____

B. Entertainment/Events

- ☐ Went wine/beer tasting
- ☐ Went to a horse race
- ☐ Attended the ballet
- ☐ Attended the theater
- ☐ Went to a bar/night club
- ☐ Went to a casino
- ☐ Attended an auto show
- ☐ Attended an auto race
- ☐ Attended a concert/symphony
- ☐ Attended a parade
- ☐ Went to a state or county fair
- ☐ Went to a tradeshow/exhibit

☐ Other *(please specify):* _____

C. Travel

- ☐ Visited a National Park or Historic Site
- ☐ Took a cruise
- ☐ Visited a beach
- ☐ Visited a wild animal park
- ☐ Visited a State Park or Historic Site
- ☐ Went to a theme park/amusement park
- ☐ Visited another state
- ☐ Traveled to another country
- ☐ Visited a wildlife refuge
- ☐ Visited an aquarium
- ☐ Visited a local or regional park
- ☐ Went to a zoo/wild animal park

☐ Other *(please specify):* _____

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D. Do It Yourself/Education/Hobbies

- ☐ 1 Took a class or short course
- ☐ 2 Made house improvements myself
- ☐ 3 Did automobile service/repair myself
- ☐ 4 Sewed (made clothes, quilts, etc.)
- ☐ 5 Painted/wrote
- ☐ 6 Volunteered to help the community
- ☐ 7 Put in flower/vegetable garden
- ☐ 8 Built/refinished furniture myself
- ☐ 9 Made household repairs myself
- ☐ 10 Taught a class
- ☐ 11 Did needlework/embroidery
- ☐ 12 Took/developed photographs
- ☐ 13 Entertained friends/family at home
- ☐ 14 Participated in community event(s)

☐ 15 Other *(please specify):* _____

2. What types of subjects do you read most often *(check all that apply)?*

- ☐ 1 Art/architecture
- ☐ 2 Business/finance
- ☐ 3 Children's (stories)
- ☐ 4 Cooking/recipes
- ☐ 5 Computer
- ☐ 6 Decorating
- ☐ 7 Entertainment
- ☐ 8 Environmental
- ☐ 9 Fashion
- ☐ 10 Gardening
- ☐ 11 History
- ☐ 12 Home improvement
- ☐ 13 Horror stories
- ☐ 14 Humor
- ☐ 15 Men's
- ☐ 16 Military
- ☐ 17 News/politics
- ☐ 18 Outdoors
- ☐ 19 Pets and pet care
- ☐ 20 Photography
- ☐ 21 Religion
- ☐ 22 Romance
- ☐ 23 Sailing
- ☐ 24 Science fiction
- ☐ 25 Science/nature
- ☐ 26 Sports/exercise/health
- ☐ 27 Trade/professional
- ☐ 28 Westerns/adventure
- ☐ 29 Women's

☐ 30 Other *(please indicate):* _____

Please use the space below for comments.

PLEASE CONTINUE ON THE NEXT PAGE.

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PART D
THE LAST QUESTIONS

The end of the survey is in sight! Part D requests some information about yourself to make sure we have a balanced mixture of people in our survey.

1. Have you been employed?

☐₁ Yes ⇩ Go to Q. 2 ☐₂ No ⇩ Go to Q. 4

2. Please check the category of your occupation *(if retired, please indicate occupation before retiring)*:

☐₁ **Check here if retired.**

☐₂ Management/administration
☐₃ Service/repair
☐₄ Sales
☐₅ Homemaker
☐₆ Student
☐₇ Professional/technical
☐₈ Clerical/administrative support
☐₉ Production/construction/crafts
☐₁₀ Military

☐₁₁ Other *(please specify)*: _____

3. Which of the following best describes the type of business or industry in which you work or worked?

☐₁ Agriculture/fishing
☐₂ Banking/finance/investment
☐₃ Business/technical service
☐₄ Construction, architectural
☐₅ Communication/transportation/utilities
☐₆ Computer services
☐₇ Education services
☐₈ Food service/restaurant
☐₉ Government
☐₁₀ Health/hospital/medical services
☐₁₁ Insurance
☐₁₂ Legal services
☐₁₃ Manufacturing consumer goods
☐₁₄ Manufacturing industrial goods
☐₁₅ Natural resources/energy
☐₁₆ Mining/forestry
☐₁₇ Publishing/media/advertising
☐₁₈ Real estate
☐₁₉ Retail/distribution trade
☐₂₀ Research and non-profit organization
☐₂₁ Wholesale trade

☐₂₂ Other *(please specify)*: _____

4. Estimate your combined annual **household** income *(please check the appropriate box)*.

☐₁ No income
☐₂ $ 1 to $ 5,000
☐₃ $ 5,001 to $ 10,000
☐₄ $ 10,001 to $ 20,000
☐₅ $ 20,001 to $ 35,000
☐₆ $ 35,001 to $ 50,000
☐₇ $ 50,001 to $ 75,000
☐₈ $ 75,001 to $ 150,000
☐₉ More than $ 150,000

Thank you very much.

MOBILITY AND LIVABLE COMMUNITIES STUDY
INSTITUTE OF TRANSPORTATION STUDIES
UNIVERSITY OF CALIFORNIA, DAVIS, CA 95616

Please use this space for any comments you wish to make.

Thank you very much.

March 1, 1994

Dear Survey Participant:

Thank you for agreeing to participate in the Mobility and Livable Communities Study. Your responses to our survey will be of great importance in learning about the daily travel of people in different types of neighborhoods.

We have enclosed a Personal Travel Diary and a Household Questionnaire. In addition we have enclosed $2 bill as a small token of our appreciation for your participation. Please make be sure to write your name on your Personal Travel Diary.

By completing the survey, you will be providing us with information that will help us to make improvements in transportation in the Bay Area.

YOUR INFORMATION COUNTS!!

No matter how much or how little you travel, YOU ARE IMPORTANT. You are one of the few people picked to help us study daily travel patterns in the Bay Area. Please fill in the Personal Travel Diary and respond to the Household questionnaire.

QUESTIONS? Call us at 1-800-303-1103

After completing this survey, please your Personal Travel Diary and your Household Questionnaire in the enclosed business reply envelope. No postage is needed. In about two weeks you will receive your Individual Survey. Once again, we thank you for your cooperation.

Sincerely,

R. Kitamura
Professor

P.L. Mokhtarian
Assistant Professor

Mobility and Livable Communities Study
Institute of Transportation Studies
University of California, Davis, CA 95616

Your responses to the questions on this page will greatly help us extend our results to the general population.

1. Has this questionnaire been delivered to a business address?
   ☐ 1 Yes → Please return unanswered. Thank you.
   ☐ 2 No
   ↓
   Please continue.

2. How many years have you lived in the Bay Area? _____

3. Including yourself, how many people are in your household? _____
   (include roommates)

4. Of these, how many are age 16 or older? _____

5. How many vehicles are available to your household (motorcycles, cars, vans, and light duty trucks)? _____

6. In what type of housing unit do you live?

   ☐ Single family home or duplex/halfplex
   ☐ Condominium or Townhouse
   ☐ Apartment
   ☐ Other _____
   (specify)

7. How many in your household who are 16 or older, will participate in the survey? _____

Please mail your completed questionnaire to us in the enclosed, postage-paid, business reply envelope (even if you are not able to participate in the survey).

To receive incentives, return by January 15, 1993.

Please print any name or address correction below:
(Include apartment number if applicable.)

THANK YOU FOR YOUR COOPERATION!!

MOBILITY AND LIVABLE COMMUNITIES STUDY
INSTITUTE OF TRANSPORTATION STUDIES
UNIVERSITY OF CALIFORNIA, DAVIS, CA. 95616

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Household Questionnaire

Who should fill this out? Please have one adult member of the household answer this questionnaire for the entire household. Other household members should be consulted for responses and opinions.

PART A
YOUR NEIGHBORHOOD

Your neighborhood is important to you in your everyday routine. And you are an integral part of that neighborhood community. In this section we ask you some questions about your neighborhood, what you do there, and how you feel about current issues. Your opinions are extremely valuable. Please answer each question in a way that accurately represents your opinions. Again, thank you for your help.

In this section we would like your views on your home and what your neighborhood is like.

1. As a place to live, my neighborhood has

   ☐$_1$ More or less everything I want
   ☐$_2$ Provides a lot of what I want
   ☐$_3$ Provides some of what I want
   ☐$_4$ Doesn't have much of what I want

2. What are the reasons that you chose the neighborhood you live in now? (Mark as many as apply.)

   ☐$_a$ Quiet neighborhood
   ☐$_b$ Safety and security
   ☐$_c$ Close to work
   ☐$_d$ Close to transit
   ☐$_e$ Nicely landscaped area
   ☐$_f$ Housing cost
   ☐$_g$ Lively neighborhood
   ☐$_h$ Good school
   ☐$_i$ Close to the freeway
   ☐$_j$ Close to shops and services
   ☐$_k$ Spacious residential neighborhood
   ☐$_l$ Liked the style of housing units
   ☐$_m$ Other (please specify) _____

3. Of the reasons you marked above, please indicate the 3 most important reasons (by number):

Most important _____

Second most important _____

Third most important _____

4. What type of dwelling unit did you live in before your current residence?

☐1 Lived in the current unit all my life
☐2 Single family home, duplex/halfplex
☐3 Condominium or townhouse
☐4 Apartment
☐5 Other_____ *(specify)*

5. How would you describe the area you lived in before you moved to your current residence?

☐1 Lived in this area all my life
☐2 The countryside
☐3 A town or village
☐4 A small city
☐5 A medium sized city or its suburbs
☐6 A suburb of a large city
☐7 A large city

6. Given your current neighborhood situation, which of the following reasons may make you consider moving to a different area? (Check all that apply.)

☐1 No reason to move at this time
☐2 Crime
☐3 Noise
☐4 Distance to shops and services
☐5 Neighbors
☐6 Traffic
☐7 Parking
☐8 Distance to work
☐9 Cost of housing
☐10 Other _____ *(specify)*

7. In what type of area would you prefer to live?

☐1 The same type of area
☐2 The countryside
☐3 A town or village
☐4 A small city
☐5 A medium sized city or its suburbs
☐6 A suburb of a large city
☐7 A large city

8. About how large is your home (square feet)? _____

9. How many bedrooms are there in your current residence? _____

10. Do you have a private backyard? ☐1 Yes ☐2 No

11. Do you own your home?

☐1 Yes → PLEASE ANSWER QUESTION 12 BELOW.

☐2 No → PLEASE SKIP TO QUESTION 13 BELOW.

12. What is the approximate value of your home? (Please check the appropriate box.)

☐1 Under $80,000
☐2 $80,001 to $120,000
☐3 $120,001 to $180,000
☐4 $180,001 to $250,000
☐5 $250,001 to $375,000
☐6 $375,001 to $575,000
☐7 $575,001 to $775,000
☐8 More than $775,000

If you answered question 12, please go to PART B, next page.

13. If you are renting/leasing your residence, what is your monthly rent? (Please check the appropriate box.)

☐1 Under $350
☐2 $351 to $500
☐3 $501 to $700
☐4 $701 to $1,000
☐5 $1,001 to $1,400
☐6 More than $1,400

14. Does the rent/lease include any of the following? (Check all that apply.)

☐1 Lawn service
☐2 A club house
☐3 A swimming pool
☐4 A gym or exercise room
☐5 Other (specify): _____

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PART B
VIEWS ON TRANSPORTATION

In this part of the questionnaire we are asking about your neighborhood.

		Yes	No	Not Sure
1.	Are the streets in your neighborhood pleasant for walking or jogging?	☐ 1	☐ 2	☐ -3
2.	Is cycling pleasant in your neighborhood?	☐ 1	☐ 2	☐ -3
3.	Is there good local public transit service in your neighborhood?	☐ 1	☐ 2	☐ -3
4.	Is there enough parking space near your home?	☐ 1	☐ 2	☐ -3
5.	Are there problems of traffic congestion in your neighborhood?	☐ 1	☐ 2	☐ -3

6. About how much does your household AS A WHOLE pay each month for:

   a. Gasoline and diesel _____

   b. Parking costs _____

   c. Tolls _____

   d. Public transportation _____

Please answer the following two questions about public transit even if you don't use it.

7. How far away, to the nearest tenth of a mile, is the bus stop nearest your home?

   _____ (miles) ☐ -3 Don't know

8. How far away, to the nearest tenth of a mile, is the BART, Amtrak, CalTrain, or light rail station nearest to your home?

   _____ (miles) ☐ -3 Don't know

9. Are there sidewalks in your neighborhood? ☐ 1 Yes ☐ 2 No

10. Are there bike paths in your neighborhood?

☐₁ Yes → GO TO QUESTION 11.

☐₂ No → SKIP TO QUESTION 12.

11. Are the bike paths convenient to use? ☐₁ Yes ☐₂ No

12. Is public transit (such as bus, light rail, or BART) convenient? ☐₁ Yes ☐₂ No

13. Do you or your household members regularly park your vehicle on the street? ☐₁ Yes ☐₂ No

14. How many parking spaces are available exclusively for your household use? Include your garage and driveway. _____

15. Does your household pay separately for a parking space(s) at (or near) your residence?

☐₁ Yes → How much per month? _____ For _____ space(s).

☐₂ No → SKIP TO QUESTION 16.

16. Approximately how far (in miles) is your home from the nearest?

a. Grocery store _____

b. Gas station _____

c. Park or playground _____

PART C
YOUR HOUSEHOLD

In this section we ask very general questions, some of them about your household's interests. We ask these questions because in many previous studies, travel and transportation habits have been connected to other interests of the household. We continue the effort to understand the connection between the two for a better living environment. We assure all participants of their privacy and confidentiality of the information they provide.

1. Please check the items you have at your residence.

☐ 1	Microwave oven	☐ 7	Dishwasher	☐ 13	Washer & dryer
☐ 2	VCR	☐ 8	CD player	☐ 14	Answering machine
☐ 3	Camcorder	☐ 9	Cable TV	☐ 15	Big screen TV
☐ 4	Personal computer	☐ 10	Fax machine	☐ 16	Swimming pool
☐ 5	Fitness equipment	☐ 11	Boat	☐ 17	RV
☐ 6	Spa	☐ 12	Chest or stand alone freezer		

2. To which newspaper(s) does your household subscribe? (Please list all.)

_____

3. To which newsweekly(ies) does your household regularly subscribe? (Please list all.)

_____

4. Is there a recycling program in your neighborhood? ☐ 1 Yes ☐ 2 No

5. Does your household participate in any recycling program? ☐ 1 Yes ☐ 2 No

6. Does your household hire somebody to do yard work? ☐ 1 Yes ☐ 2 No

7. Does your household hire somebody to clean the house? ☐ 1 Yes ☐ 2 No

8. Estimate your combined annual household income before taxes (please check the appropriate box).

☐ 1	No Income		
☐ 2	$ 1 to $ 5,000	☐ 6	$ 35,001 to $ 50,000
☐ 3	$ 5,001 to $ 10,000	☐ 7	$ 50,001 to $ 75,000
☐ 4	$ 10,001 to $ 20,00	☐ 8	$ 75,001 to $ 150,0000
☐ 5	$ 20,001 to $ 35,000	☐ 9	More than $ 150,000

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UNIVERSITY OF CALIFORNIA, DAVIS, CA 95616

List the vehicles (cars, trucks, motorcycles, bicycles, etc.) that are usable and normally available to your household.

Vehicle	Make, Model and Year	Year Acquired	# of Miles Driven per year	Ownership				Fuel Type			
				Own	Lease	Com-pany	Other	Gaso-line	Diesel	Other	Describe Other
Example				☐	☐	☐	☐	☐	☐	☐	
Example				☐	☐	☐	☐	☐	☐	☐	
A				☐	☐	☐	☐	☐	☐	☐	
B				☐	☐	☐	☐	☐	☐	☐	
C				☐	☐	☐	☐	☐	☐	☐	
D				☐	☐	☐	☐	☐	☐	☐	
E				☐	☐	☐	☐	☐	☐	☐	
F				☐	☐	☐	☐	☐	☐	☐	

PLEASE CONTINUE ON THE NEXT PAGE.

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THANK YOU VERY MUCH.

PLEASE RETURN YOUR HOUSEHOLD QUESTIONNAIRE IN THE POSTAGE PAID ENVELOPE PROVIDED (INCLUDE ALL THE PERSONAL TRAVEL DIARIES FROM YOUR HOUSEHOLD).

If you are interested in the findings, preliminary results of this study will be available in the Insititute of Transportation Studies (ITS) office in September of 1993.
You may contact the ITS office by calling (916) 752-4194.

MOBILITY AND LIVABLE COMMUNITIES STUDY
INSTITUTE OF TRANSPORTATION STUDIES
UNIVERSITY OF CALIFORNIA, DAVIS, CA 95616

PERSONAL TRAVEL DIARY

of

_____

(Write your first name here.)

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Travel Survey Days: February 10, 11 and 12.

☐ Check here if you did not make any trips at all during this three-day period.

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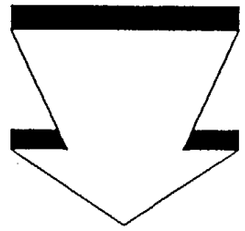
DE1 DE2

INSTRUCTIONS

Thank you for participating in this important study for the Bay Area!!

PERSONAL TRANSPORTATION	
List the vehicles **YOU** use (cars, trucks, motorcycles, bicycles, etc.) **DO NOT** include public transportation here.	
This column is the vehicle identification letter. This letter is used in the "TRIPS MADE..." pages in the "Means of Transportation" column. It will identify which vehicle you use for each trip.	Use this column to describe the vehicle. The description may include the type of vehicle. For example, a Peugeot can be a bicycle or a car.

Please use these instructions when completing the page below.



ABOUT YOU AND THE VEHICLES YOU USE

Please complete the information on this page before you to fill out the rest of your **PERSONAL TRAVEL DIARY.**

Year of Birth: 19 _____	Are you: ☐ Female ☐ Male

PERSONAL TRANSPORTATION	
List the vehicles **YOU** use (cars, trucks, motorcycles, bicycles, etc.) DO NOT include public transportation here.	
Vehicle	**Make, Model, Year**
Example A	
Example B	
A	
B	
C	
D	
E	
F	
G	

PLEASE CONTINUE ON THE NEXT PAGE.

INSTRUCTIONS

PLACES YOU GO MOST OFTEN

TRIP PURPOSES

1	TRANSFER TO DIFFERENT MEANS OF TRAVEL	Trips made to change your means of travel on your way to a final destination (for example, driving to a park-and-ride lot to join a vanpool).
2	RETURN HOME	Trips ending at home. Not necessarily the last trip of the day.
3	WORK	All trips made to your usual work place.
4	WORK-RELATED	Trips made to carry out work business at locations other than the main work place (for example, attending business meetings, calling on customers.)
5	SCHOOL	Trips made to attend class.
6	SHOPPING	Trips for shopping or browsing.
7	DROP OFF/ PICK UP PASSENGERS	Trips whose main purpose is to drop off or pick up someone.
8	PERSONAL BUSINESS	Trips made to carry out personal business such as going to the bank, post office, or the mechanic.
9	SOCIAL/ RECREATIONAL	Trips made to visit a friend or relative, to participate in or watch a ball game, go to the movies or theater, etc.
10	EAT MEAL	Trips made to a restaurant or fast food place to dine or carry-out.
11	MEDICAL/ DENTAL	Trips made to the doctor, dentist, optometrist, or medical/dental clinic.
12	OTHER	When you feel that the trip does not fall into any one of the above categories, specify the kind of trip.

LOCATION

Enter the name of the place you go and the cross streets. For example, you may go to the "Civic Auditorium" in Yourtown, or to the "Kennedy Elementary School" on Fifth St. and Elm Ave. in Anytown.

REASONS FOR CHOICE OF MODE

1 = No other way
2 = Convenience
3 = Cost
4 = Speed
5 = Personal Safety
6 = Health
7 = Environment
8 = Difficult to Find Parking
9 = Things to Carry
10 = Just Bought a New Car
11 = Other (describe)

TYPICAL MEANS OF TRANSPORTATION (MODE)

1 = Walk
2 = Bicycle
3 = Drive Alone
4 = Ride with Other
5 = Motorcycle
6 = Bus
7 = Caltrain
8 = BART
9 = Amtrak
10 = Other (Specify)

FREQUENCY

(How often do you typically make these trips?)

1 = Daily/more than weekly
2 = Weekly/more than monthly
3 = Monthly/less frequently

Please use these instructions when completing the page below.

PLACES YOU GO MOST OFTEN

Please indicate the trips you make most often in the table below. Some typical personal trip purposes are already entered.

Trip Purpose	Location	Distance (miles)	Typical Means of Transportation (Mode)	Reasons for Choice Of Mode	Frequency
See instructions above	Name, cross streets, and city	From home	See instructions above	See instructions above	See instructions above
Example					
1					
2					
3					
4					
5					
6					
7					
8					

PLEASE CONTINUE ON THE NEXT PAGE.

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DAY ONE

February 10, 1993

☐ Check here if you made no trips today.

INSTRUCTIONS

Use this page to help you fill out your Personal Travel Diary page below.

Find the heading matching the column heading on the page below. Place the number which describes the Trip Purpose, Means of Transportation, and Vehicle Used (if you used a personal vehicle), into the corresponding spaces.

FROM, TO PLACES YOU GO	MEANS OF TRANSPORTATION (MODE)
Use the number from the "Trip Purpose" column in your PLACES YOU GO MOST OFTEN table for location of trips you make most often. For trips you do not describe in PLACES YOU GO MOST OFTEN, please write in the names of the cross streets and city.	1 = Walk 2 = Bicycle 3 = Drive Alone 4 = Ride with Other 5 = Motorcycle 6 = Bus 7 = Caltrain 8 = BART 9 = Amtrak 10 = Other (Specify)
PEOPLE IN VEHICLE	**VEHICLE USED**
Enter the number of people in the vehicle (unless the vehicle is public transit such as a bus or train). Include yourself.	*If you use your private vehicle, please indicate which vehicle you are using by the letter from PERSONAL TRANSPORTATION on page 1.*

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TRIP PURPOSES		
1	TRANSFER TO DIFFERENT MEANS OF TRAVEL	Trips made to change your means of travel on your way to a final destination (for example, driving to a park-and-ride lot to join a vanpool).
2	RETURN HOME	Trips ending at home. Not necessarily the last trip of the day.
3	WORK	All trips made to your usual work place.
4	WORK-RELATED	Trips made to carry out work business at locations other than the main work place (for example, attending business meetings, calling on customers.)
5	SCHOOL	Trips made to attend class.
6	SHOPPING	Trips for shopping or browsing.
7	DROP OFF/ PICK UP PASSENGERS	Trips whose main purpose is to drop off or pick up someone.
8	PERSONAL BUSINESS	Trips made to carry out personal business such as going to the bank, post office, or the mechanic.
9	SOCIAL/ RECREATIONAL	Trips made to visit a friend or relative, to participate in or watch a ball game, go to the movies or theater, etc.
10	EAT MEAL	Trips made to a restaurant or fast food place to dine or carry-out.
11	MEDICAL/ DENTAL	Trips made to the doctor, dentist, optometrist, or medical/dental clinic.
12	OTHER	When you feel that the trip does not fall into any one of the above categories, specify the kind of trip.

TRIPS MADE ON _____ , 1993
(Date)

Trip	From / To — Places You Go	Start Time	Arrival Time	How Far?	Trip Purpose(s)	Means of Transportation	Vehicle Used	People in Vehicle
	For the trips you make often use the number corresponding to the location from the **Places You Go Most Often** table on page 2. For trips not described on the **Places You Go Most Often** page, please enter the name of the cross streets and the city.			Miles	See instructions above			
Example		___:___ ☐am ☐pm	___:___ ☐am ☐pm					
Example		___:___ ☐am ☐pm	___:___ ☐am ☐pm					
1		___:___ ☐am ☐pm	___:___ ☐am ☐pm					
2		___:___ ☐am ☐pm	___:___ ☐am ☐pm					
3		___:___ ☐am ☐pm	___:___ ☐am ☐pm					
4		___:___ ☐am ☐pm	___:___ ☐am ☐pm					

A49

PLEASE COMPLETE THE FOLLOWING QUESTIONS IF YOU PAY FOR PARKING OR TOLLS.

Please enter the total amount that you paid for tolls today. $_____.

Please enter the amount you paid for incidental parking fees (from parking meters & lots that are not routine). $_____.

Day One, Page 1

PLEASE CONTINUE DAY ONE ON THE NEXT PAGE.

IF YOU MADE NO MORE TRIPS TODAY, GO TO DAY TWO.

TRIPS MADE ON _____ (Date), 1993

Trip	From / Places You Go	To	Start Time	Arrival Time	How Far?	Trip Purpose(s)	Means of Transportation	Vehicle Used	People in Vehicle
	For the trips you make often use the number corresponding to the location from the **Places You Go Most Often** table on page 2. For trips not described on the **Places You Go Most Often** page, please enter the name of the cross streets and the city.				Miles	See instructions above			
5			☐ am ☐ pm	☐ am ☐ pm					
6			☐ am ☐ pm	☐ am ☐ pm					
7			☐ am ☐ pm	☐ am ☐ pm					
8			☐ am ☐ pm	☐ am ☐ pm					
9			☐ am ☐ pm	☐ am ☐ pm					
10			☐ am ☐ pm	☐ am ☐ pm					
11			☐ am ☐ pm	☐ am ☐ pm					
12			☐ am ☐ pm	☐ am ☐ pm					

Day One, Page 2

PLEASE CONTINUE DAY ONE ON THE NEXT PAGE.

IF YOU MADE NO MORE TRIPS TODAY, GO TO **DAY TWO.**

TRIPS MADE ON _____ , 1993
(Date)

Trip	From / Places You Go	To	Start Time	Arrival Time	How Far?	Trip Purpose(s)	Means of Transportation	Vehicle Used	People in Vehicle
	For the trips you make often use the number corresponding to the location from the **Places You Go Most Often** table on page 2. For trips not described on the **Places You Go Most Often** page, please enter the name of the cross streets and the city.				Miles	See instructions above			
13			☐ am ☐ pm	☐ am ☐ pm					
14			☐ am ☐ pm	☐ am ☐ pm					
15			☐ am ☐ pm	☐ am ☐ pm					
16			☐ am ☐ pm	☐ am ☐ pm					
17			☐ am ☐ pm	☐ am ☐ pm					
18			☐ am ☐ pm	☐ am ☐ pm					
19			☐ am ☐ pm	☐ am ☐ pm					
20			☐ am ☐ pm	☐ am ☐ pm					

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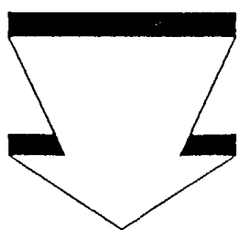
Day One, Page 3

END OF DAY ONE. TOMORROW, GO TO DAY TWO, PAGE 1.

DAY TWO FOLLOWS



DAY TWO

February 11, 1993

☐ Check here if you made no trips today.

TRIPS MADE ON _____ , 1993
(Date)

Trip	From / Places You Go	To	Start Time	Arrival Time	How Far?	Trip Purpose(s)	Means of Transportation	Vehicle Used	People In Vehicle
	For the trips you make often use the number corresponding to the location from the **Places You Go Most Often** table on page 2. For trips not described on the **Places You Go Most Often** page, please enter the name of the cross streets and the city.				Miles	See instructions above			
1			☐ am ☐ pm	☐ am ☐ pm					
2			☐ am ☐ pm	☐ am ☐ pm					
3			☐ am ☐ pm	☐ am ☐ pm					
			☐ am ☐ pm	☐ am ☐ pm					
5			☐ am ☐ pm	☐ am ☐ pm					
6			☐ am ☐ pm	☐ am ☐ pm					
7			☐ am ☐ pm	☐ am ☐ pm					

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PLEASE COMPLETE THE FOLLOWING QUESTIONS IF YOU PAID FOR PARKING OR TOLLS.

Please enter the total amount that you paid for tolls today. $_____.

Please enter the amount you paid for incidental parking fees (from parking meters & lots that are not routine). $_____.

Day Two, Page 1

PLEASE CONTINUE DAY TWO ON THE NEXT PAGE.

IF YOU MADE NO MORE TRIPS TODAY, GO TO DAY THREE.

TRIPS MADE ON _____ , 1993
(Date)

Trip	From / To — Places You Go		Start Time	Arrival Time	How Far?	Trip Purpose(s)	Means of Transportation	Vehicle Used	People in Vehicle
	For the trips you make often use the number corresponding to the location from the **Places You Go Most Often** table on page 2. For trips not described on the **Places You Go Most Often** page, please enter the name of the cross streets and the city.				Miles	See instructions above			
8			☐ am ☐ pm	☐ am ☐ pm					
9			☐ am ☐ pm	☐ am ☐ pm					
10			☐ am ☐ pm	☐ am ☐ pm					
			☐ am ☐ pm	☐ am ☐ pm					
12			☐ am ☐ pm	☐ am ☐ pm					
13			☐ am ☐ pm	☐ am ☐ pm					
14			☐ am ☐ pm	☐ am ☐ pm					
15			☐ am ☐ pm	☐ am ☐ pm					
16			☐ am ☐ pm	☐ am ☐ pm					

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Day Two, Page 2

PLEASE CONTINUE DAY TWO ON THE NEXT PAGE.

IF YOU MADE NO MORE TRIPS TODAY, GO TO DAY THREE.

TRIPS MADE ON _____ , 1993
(Date)

Trip	From / Places You Go	To	Start Time	Arrival Time	How Far?	Trip Purpose(s)	Means of Transportation	Vehicle Used	People in Vehicle
	For the trips you make often use the number corresponding to the location from the **Places You Go Most Often** table on page 2. For trips not described on the **Places You Go Most Often** page, please enter the name of the cross streets and the city.				Miles	See instructions above			
17			☐ am ☐ pm	☐ am ☐ pm					
18			☐ am ☐ pm	☐ am ☐ pm					
19			☐ am ☐ pm	☐ am ☐ pm					
			☐ am ☐ pm	☐ am ☐ pm					
21			☐ am ☐ pm	☐ am ☐ pm					
22			☐ am ☐ pm	☐ am ☐ pm					
23			☐ am ☐ pm	☐ am ☐ pm					
24			☐ am ☐ pm	☐ am ☐ pm					
25			☐ am ☐ pm	☐ am ☐ pm					

Day Two, Page 3

END OF DAY TWO. TOMORROW GO TO DAY THREE, PAGE 1.

DAY THREE

February 12, 1993

☐ Check here if you made no trips today.

TRIPS MADE ON _____ (Date), 1993

Trip	From (Places You Go)	To (Places You Go)	Start Time	Arrival Time	How Far?	Purpose(s)	Means of Transportation	Vehicle Used	People in Vehicle
	For the trips you make often use the number corresponding to the location from the **Places You Go Most Often** table on page 2. For trips not described on the **Places You Go Most Often** page, please enter the name of the cross streets and the city.				Miles	See instructions above			
1			☐ am ☐ pm	☐ am ☐ pm					
2			☐ am ☐ pm	☐ am ☐ pm					
3			☐ am ☐ pm	☐ am ☐ pm					
4			☐ am ☐ pm	☐ am ☐ pm					
5			☐ am ☐ pm	☐ am ☐ pm					
6			☐ am ☐ pm	☐ am ☐ pm					
7			☐ am ☐ pm	☐ am ☐ pm					

PLEASE COMPLETE THE FOLLOWING QUESTIONS IF YOU PAID FOR PARKING OR TOLLS.

Please enter the total amount that you paid for tolls today. $_____.

Please enter the amount you paid for incidental parking fees (from parking meters & lots that are not routine). $_____.

Day Three, Page 1

PLEASE CONTINUE DAY THREE ON THE NEXT PAGE.

IF YOU MADE NO MORE TRIPS TODAY, RETURN YOUR PERSONAL TRAVEL DIARY.

TRIPS MADE ON _____ , 1993
(Date)

Trip	From / To — Places You Go		Start Time	Arrival Time	How Far?	Purpose(s)	Means of Transportation	Vehicle Used	People in Vehicle
	For the trips you make often use the number corresponding to the location from the **Places You Go Most Often** table on page 2. For trips not described on the **Places You Go Most Often** page, please enter the name of the cross streets and the city.				Miles	See instructions above			
8			☐ am ☐ pm	☐ am ☐ pm					
9			☐ am ☐ pm	☐ am ☐ pm					
10			☐ am ☐ pm	☐ am ☐ pm					
A-59			☐ am ☐ pm	☐ am ☐ pm					
12			☐ am ☐ pm	☐ am ☐ pm					
13			☐ am ☐ pm	☐ am ☐ pm					
14			☐ am ☐ pm	☐ am ☐ pm					
15			☐ am ☐ pm	☐ am ☐ pm					
16			☐ am ☐ pm	☐ am ☐ pm					

THE END. THANK YOU VERY MUCH FOR COMPLETING YOUR PERSONAL TRIP DIARY. PLEASE RETURN IT IN THE ENVELOPE PROVIDED.

You may use the space below for any comments you wish to make about the survey.

QUESTIONS? Call us at:

1-(800)-303-1103

(Hours: 10:00 am to 4:00 pm)
After hours you will reach a recording.
However, we will return your call to the number you specify.

THANK YOU VERY MUCH.

PLEASE RETURN YOUR PERSONAL TRAVEL DIARY IN THE POSTAGE PAID ENVELOPE PROVIDED (INCLUDE THE HOUSEHOLD QUESTIONNAIRE).

If you are interested in the findings, preliminary results of this study will be available in the Insititute of Transportation Studies (ITS) office in September, 1993.
You may contact the ITS office by calling (916) 752-4194.

MOBILITY AND LIVABLE COMMUNITIES STUDY
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UCD use

				DE1	DE2

Individual Questionnaire

PART A
About Your Frequent Trips

In Part A are questions about how you get to work or school. There are no right or wrong answers to any of these questions. All your answers are confidential. You are assured of complete anonymity when answering any part of this survey.

1. Your first name: _____

2. Are you employed?

   ☐₁ No → *Skip to Question 18 on page 4.*
   ☐₂ Yes
   ↓

3. Is your employment ☐₁ Full time? ☐₂ Part time?

4. Work location _____ (Nearest intersection or street address), _____ (City)

5. One-way home to work distance: _____(miles) (enter "0" if you work at home).

6. How many days a week do you commute to work? _____ days a week.

   If you do not commute to work, please skip to Question 18 on page 4.

7. What is your primary means of travel to work?

   ☐₁ Drive alone
   ☐₂ Car/vanpool
   ☐₃ Public transportation
   ☐₄ Bicycle
   ☐₅ Walk
   ☐₆ Other _____*(specify)*

8. How frequently do you share a ride (rideshare) to work (include informal ride-sharing with other employed family members or friends as well as formal car/van pools, but not bus, rail or other public transportation)?

☐ 1 Never
☐ 2 Less than once a month
☐ 3 1 - 3 times a month
☐ 4 Once a week
☐ 5 More than once a week

If you checked 'Never', skip to Question 10.

9. I rideshare **to work** because *(please check all that apply):*

☐ 1 I don't have a vehicle
☐ 2 It saves money
☐ 3 There's not enough parking
☐ 4 It saves wear and tear on my vehicle
☐ 5 Parking is expensive
☐ 6 I have time to read and relax
☐ 7 It's as fast as or faster than driving & parking
☐ 8 Other _____ *(specify)*

If you answered Question 9, skip to Question 11.

10. I do not rideshare to work because *(please specify):*

_____

11. How frequently do you ride public transportation (bus, train, etc.) to work?

☐ 1 Never
☐ 2 Less than once a month
☐ 3 1 - 3 times a month
☐ 4 Once a week
☐ 5 More than once a week

If you checked 'Never', skip to Question 14.

12. I use public transportation to get **to work** because *(please check all that apply):*

☐ 1 I don't have a vehicle
☐ 2 It saves money
☐ 3 There's not enough parking
☐ 4 It saves wear and tear on my vehicle
☐ 5 Parking is expensive
☐ 6 I have time to read and relax
☐ 7 It's as fast as or faster than driving & parking
☐ 8 Other _____ *(specify)*

13. How do you get to the stop or station?

☐ 1 Walk ☐ 2 Bicycle ☐ 3 Drive alone ☐ 4 Drive or ride with others
☐ 5 Other _____ *(specify)*

If you answered Question 13, skip to Question 15.

14. I do not use public transportation to get **to work** because *(please specify):*

- ☐ 1 None available
- ☐ 2 It doesn't stop near my home
- ☐ 3 There is no stop near work
- ☐ 4 I have to transfer to get to my work
- ☐ 5 There is no comfortable place to wait
- ☐ 6 The stop or station is unsafe
- ☐ 7 None available at the right time
- ☐ 8 It's too expensive
- ☐ 9 Physical impairment
- ☐ 10 I work after dark
- ☐ 11 Transit is too crowded
- ☐ 12 The vehicle is uncomfortable
- ☐ 13 It's too slow
- ☐ 14 I use my car for work
- ☐ 15 I use my car for errands
- ☐ 16 I take child(ren) to child care
- ☐ 17 I have too much to carry
- ☐ 18 It doesn't run on time
- ☐ 19 Other _____ *(specify)*

15. How frequently do you walk or bicycle **to work**?

- ☐ 1 Never
- ☐ 2 Less than once a month
- ☐ 3 1 - 3 times a month
- ☐ 4 Once a week
- ☐ 5 More than once a week

If you checked 'Never', skip to Question 17.

16. I walk or bicycle **to work** because *(please check all that apply):*

- ☐ 1 I don't have a vehicle
- ☐ 2 For exercise
- ☐ 3 It saves money
- ☐ 4 I live close to work
- ☐ 5 There's not enough parking
- ☐ 6 Parking is expensive
- ☐ 7 Other _____ *(specify)*

If you answered Question 16, please skip to Question 18.

17. I never walk or bicycle **to work** because *(please check all that apply)*:

- ☐ 1 I don't have a bicycle
- ☐ 2 Physical impairment
- ☐ 3 It's too far
- ☐ 4 I have too much to carry
- ☐ 5 I don't dress for it
- ☐ 6 I take child(ren) to child care
- ☐ 7 I do personal errands
- ☐ 8 I use my car for work
- ☐ 9 Wind, weather, hilly, heat or cold
- ☐ 10 I don't like to be sweaty when I arrive
- ☐ 11 There are no showers
- ☐ 12 There are no bike lockers or racks
- ☐ 13 My route is through an unsafe area
- ☐ 14 Some drivers are not careful
- ☐ 15 I work after dark
- ☐ 16 There are no sidewalks or bike paths
- ☐ 17 I don't like to walk or bicycle
- ☐ 18 Other _____ *(specify)*

18. Do you attend school?

☐ 1 No → ***Skip to Question 26 below.***
☐ 2 Yes

↓

19. Do you attend ☐ 1 Full time? ☐ 2 Part time?

20. School location _____, _____
(Nearest intersection or street address) (City)

21. One-way home to school distance: _____

22. How many days a week do you attend school? _____

23. What is your primary means of travel to school?

☐ 1 Drive alone
☐ 2 Car/vanpool
☐ 3 Public transportation
☐ 4 Bicycle
☐ 5 Walk
☐ 6 Other _____ *(specify)*

24. How frequently do you share a ride (rideshare) to school (include informal ride-sharing with other family members or friends as well as formal car/vanpools, but not the school bus)?

☐ 1 Never
☐ 2 Less than once a month
☐ 3 1 - 3 times a month
☐ 4 Once a week
☐ 5 More than once a week

25. How frequently do you ride public transportation (for example bus, or train) to school?

☐ 1 Never
☐ 2 Less than once a month
☐ 3 1 - 3 times a month
☐ 4 Once a week
☐ 5 More than once a week

26. Do you ever use public transit other than for commuting to work or school? ☐ 1 Yes ☐ 2 No

27. How would you *(do you usually)* get to the public transit stop/station *(check up to two)?*

☐ 1 Walk ☐ 2 Bicycle ☐ 3 Drive alone ☐ 4 Drive or ride with others
☐ 5 Other _____ *(specify)*

28. How many times during the past **two weeks** did you go to a grocery store?

☐$_1$ None ☐$_2$ 1 - 2 ☐$_3$ 3 - 5 ☐$_4$ 6 - 10 ☐$_5$ More often

29. List up to five grocery stores where you shop *(please list the most frequently visited one first).*

	Name of store	**Street and city**	**How you usually get there** *(walk, drive, bus, etc.)*
a.			
b.			
c.			
d.			
e.			

30. List up to five stores where you go clothes shopping *(please list the most frequently visited one first).*

	Name of store	**Street and city**	**How you usually get there** *(walk, drive, bus, etc.)*
a.			
b.			
c.			
d.			
e.			

31. How often during the past **two weeks** did you go to a shopping mall?

☐$_1$ None ☐$_2$ 1 - 2 ☐$_3$ 3 - 5 ☐$_4$ 6 - 10 ☐$_5$ More often

32. List up to three major shopping malls you often visit.

	Name of mall	**Street and city**	**How you usually get there** *(walk, drive, bus, etc.)*
a.			
b.			
c.			

33. How often during the past **month** did you shop at a discount store, membership store, or factory outlet store *(such as Home Base, Office Club, Home Depot, Price Club, etc.)?*

☐$_1$ None ☐$_2$ 1 - 2 ☐$_3$ 3 - 5 ☐$_4$ 6 - 10 ☐$_5$ More often

34. List up to three discount, membership or factory outlet stores where you often shop.

	Name of store	**Street and city**	**How you usually get there** *(walk, drive, bus, etc.)*
a.			
b.			
c.			

35. How often during the past **two weeks** did you buy vehicle fuel *(gasoline, diesel, liquid propane gas, or other fuel)?*

☐$_1$ None ☐$_2$ 1 - 2 ☐$_3$ 3 - 5 ☐$_4$ 6 - 10 ☐$_5$ More often

36. During the last year, have you changed your most frequently used means of transportation? ☐$_1$ Yes ☐$_2$ No

37. Why or why not? _____

_____

PLEASE CONTINUE ON THE NEXT PAGE.

MOBILITY AND LIVABLE COMMUNITIES STUDY
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UNIVERSITY OF CALIFORNIA, DAVIS, 95616

PART B
TRANSPORTATION AND URBAN LIFE

Part B questions ask what you think about a variety of subjects. There are no right or wrong answers to the following questions.

Please indicate how much you **agree** or **disagree** with the following statements by checking your response to each. Your opinions are important even if you feel you're not very familiar with the topics.

1. PRIVATE AUTOMOBILE	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
a. Driving allows me freedom.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b. Too many people drive alone.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c. I would rather drive an electric or other clean-fuel vehicle than give up driving.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
d. Driving allows me to get more done.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
e. Getting stuck in traffic doesn't bother me too much.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

2. RIDESHARING (CARPOOL OR VANPOOL)	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
a. I like someone else to do the driving.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b. Ridesharing saves money.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c. I am not comfortable riding with strangers.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
d. The rideshare car or van is often late.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

3. PUBLIC TRANSPORTATION	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
a. I can read and do other things when I use public transportation.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b. It costs more to use public transportation than it does to drive a car.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c. Public transportation is unreliable.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
d. I use public transportation when I cannot afford to drive.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
e. Buses and trains are pleasant to travel in.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

PLEASE CONTINUE ON THE NEXT PAGE.

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4. TRANSPORTATION	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
a. Traffic congestion will take care of itself because people will make adjustments.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b. Stricter vehicle smog control laws should be introduced and enforced.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c. We need to build more roads to help decrease congestion.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
d. More lanes should be set aside for carpools and buses.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
e. We should provide incentives to people who use electric or other clean-fuel vehicles.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

5. TIME	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
a. I feel that I am wasting time when I have to wait.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b. I would like to have more time for leisure.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c. I like to spend most of my time working.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
d. When things are busy at work, I get more done by cutting back on personal time.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
e. Occasionally, I would be willing to give up a day's pay to get a day off work.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

6. ENVIRONMENT	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
a. Environmental protection is good for California's economy.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b. People and jobs are more important than the environment.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c. Whoever causes environmental damage should repair the damage.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
d. High density residential development should be encouraged.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
e. Environmentalism hurts minority and small businesses.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

7. HOUSING	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
a. I need to have space between me and my neighbors.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b. Having shops and services within walking distance of my home would be important to me.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c. It's important for children to have a large backyard for playing.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
d. I would only live in a multiple family unit, (apartment, condo, etc.) as a last resort.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
e. Too much valuable agricultural land is consumed to supply housing.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

8. ECONOMY	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
a. I would be willing to pay a toll to drive on an uncongested road.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b. Vehicle emissions increase the need for health care.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c. Using tax dollars to pay for public transportation is a good investment.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
d. Environmental protection costs too much.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
e. We should raise the price of gasoline to reduce congestion and air pollution.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

PLEASE CONTINUE NEXT PAGE.

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PART C
LIFESTYLE

Part C asks about the types of things you like to do and how you spend your leisure time. This information is useful to indicate the demand for transportation and other urban facilities. We once again assure you that all responses will be kept strictly anonymous.

1. What types of subjects did you read **last month** *(check all that apply)*?

☐ 1	Art/architecture	☐ 12	Home improvement	☐ 22	Religion
☐ 2	Business/finance	☐ 13	Horror stories	☐ 23	Romance
☐ 3	Children's (stories)	☐ 14	Humor	☐ 24	Sailing
☐ 4	Cooking/recipes	☐ 15	Men's	☐ 25	Science fiction
☐ 5	Computer	☐ 16	Military	☐ 26	Science/nature
☐ 6	Decorating	☐ 17	Mystery	☐ 27	Sports/exercise/health
☐ 7	Entertainment	☐ 18	News/politics	☐ 28	Trade/professional
☐ 8	Environmental	☐ 19	Outdoors	☐ 29	Westerns/adventure
☐ 9	Fashion	☐ 20	Pets and pet care	☐ 30	Women's
☐ 10	Gardening	☐ 21	Photography	☐ 31	Other _____ *(specify)*
☐ 11	History				

2. What best describes the way you spent **last weekend**? *(check as many as apply)*.

☐ 1	Yard work	☐ 8	Entertain people	☐ 15	Short vacation trips
☐ 2	Visit friends	☐ 9	Exercise	☐ 16	Movies
☐ 3	Go shopping	☐ 10	Volunteer work	☐ 17	Do chores
☐ 4	Religious activities	☐ 11	Dining out	☐ 18	Hobbies
☐ 5	Cultural activities	☐ 12	Stay home & relax	☐ 19	Outdoor/sports
☐ 6	Cook	☐ 13	Read	☐ 20	Other _____ *(specify)*
☐ 7	Concerts	☐ 14	Work		

3. In the last 12 months how many holiday trips did you take? _____

4. How many of your holiday trips were one week or longer? _____

PLEASE CONTINUE TO THE NEXT PAGE.

5. From the following lists, check all that you have done within the **last 12 months.**

A. Outdoors/Sports

- ☐ 1 Attended a professional sports event
- ☐ 2 Went rafting/canoeing
- ☐ 3 Went fishing
- ☐ 4 Participated in a sports event
- ☐ 5 Went scuba diving
- ☐ 6 Went on a picnic
- ☐ 7 Used an off-road vehicle
- ☐ 8 Went to a shooting range
- ☐ 9 Went skiing
- ☐ 10 Went horseback riding
- ☐ 11 Went hiking/backpacking/camping
- ☐ 12 Went hunting
- ☐ 13 Went mountain climbing
- ☐ 14 Went sailing
- ☐ 15 Participated in motorcross
- ☐ 16 Played tennis/golf
- ☐ 17 Went bird watching
- ☐ 18 Went swimming
- ☐ 19 Other_____ *(specify)*

B. Entertainment/Events

- ☐ 1 Went wine/beer tasting
- ☐ 2 Went to a horse race
- ☐ 3 Attended the ballet
- ☐ 4 Attended the theater
- ☐ 5 Went to a bar/night club
- ☐ 6 Went to a casino
- ☐ 7 Attended an auto show
- ☐ 8 Attended an auto race
- ☐ 9 Attended a concert/symphony
- ☐ 10 Attended a parade
- ☐ 11 Went to a state or county fair
- ☐ 12 Went to a trade show/exhibit
- ☐ 13 Went to the movies
- ☐ 14 Other _____ *(specify)*

C. Travel

- ☐ 1 Visited a national park or historic site
- ☐ 2 Visited a state park or historic site
- ☐ 3 Visited a local or regional park
- ☐ 4 Visited a wild animal park
- ☐ 5 Visited a beach
- ☐ 6 Visited a theme park/amusement park
- ☐ 7 Visited another state
- ☐ 8 Traveled to another country
- ☐ 9 Visited a wildlife refuge
- ☐ 10 Visited an aquarium
- ☐ 11 Took a cruise
- ☐ 12 Went to a zoo
- ☐ 13 Other _____ *(specify)*

D. Do It Yourself/Education/Hobbies

- ☐ 1 Took a class or short course
- ☐ 2 Made house improvements myself
- ☐ 3 Did automobile service/repair myself
- ☐ 4 Sewed (made clothes, quilts, etc.)
- ☐ 5 Painted/wrote
- ☐ 6 Volunteered to help the community
- ☐ 7 Put in flower/vegetable garden
- ☐ 8 Built/refinished furniture myself
- ☐ 9 Made household repairs myself
- ☐ 10 Taught a class
- ☐ 11 Did needlework/embroidery
- ☐ 12 Took/developed photographs
- ☐ 13 Entertained friends/family at home
- ☐ 14 Participated in community event(s)
- ☐ 15 Other _____ *(specify)*

MOBILITY AND LIVABLE COMMUNITIES STUDY
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PART D
DEMOGRAPHIC INFORMATION

In Part D we request some information about you to make sure we have a balanced mixture of people in our survey.

1. Do you have a driver's license? ☐$_1$ Yes ☐$_2$ No

2. What is your educational background?

☐$_1$ Some grade school or high school
☐$_2$ High school diploma
☐$_3$ Some college or technical school
☐$_4$ Four-year college/technical school degree
☐$_5$ Some graduate school
☐$_6$ Completed graduate degree(s)

Please answer Question 3 even if you are temporarily unemployed or retired.

3. What best describes your occupation?

☐$_1$ Not applicable
☐$_2$ Service/repair
☐$_3$ Sales
☐$_4$ Homemaker
☐$_5$ Student
☐$_6$ Manager/administrator
☐$_7$ Clerical/administrative support
☐$_8$ Professional/technical
☐$_9$ Production/construction/crafts
☐$_{10}$ Military

4. Please indicate your 1992 before-tax personal income using the following categories.

☐$_1$ No income
☐$_2$ 0 to $ 7,500
☐$_3$ $ 7,501 to $ 15,000
☐$_6$ $15,001 to $30,000
☐$_7$ $30,001 to $50,000
☐$_8$ Over $50,000

We would value any comments you may have regarding the subject of this study.

THANK YO Y MUCH!

March 5, 1993

Dear Survey Participant:

Thank you for participating in the Mobility and Livable Communities Study. We sincerely appreciate your cooperation. Your responses have provided us with invaluable information on travel and transportation. Your views and responses will be reflected in our final report.

As promised, we have enclosed $5 as a token of our appreciation and our recognition for your contribution and participation in the Mobility and Livable Communities Study.

If you are interested in the findings, preliminary results of the study will be available in the Institution of Transportation office sometime in December, 1993. You may contact the office by calling (916) 752-4194.

Please give us a call at the Institute of Transportation Studies if you have any questions. Again, thank you for your participation in the study.

With regards,

R. Kitamura
Professor

P. L. Mokhtarian
Assistant Professor

Land Use and Travel Behavior

Appendix B: Site Survey Results

Contents:

Summary of Concord Site Description

APARTMENTS

The site contains nine (9) apartment complexes with a total of 236 units. Two apartment complexes are located on Chestnut Avenue in the northeast center of the survey site. Six apartment complexes are located along Chestnut Avenue which runs through the center of the site in a south easterly direction. The apartments are located towards the east side of the survey site. The last apartment complex is located on Grove Avenue which runs north/south through the site slightly to the east.

BART

The BART station is at the opposite side of the survey site from the apartments. BART runs at approximately 2 hour intervals during the early a.m., increasing frequency to approximately one-half hour intervals during the peak commute hours from 5:00 a.m. through 7:30 a.m. and 4:00 p.m. through 6:00 p.m. Departure times are approximately one hour apart during the remainder of the day.

BUS SERVICE

There are thirteen (13) bus routes in the Concord survey area. All begin or end at the BART station. During the week the buses run from 5:52 a.m. to 7:34 a.m. and 4:38 p.m. to 6:45 p.m. at approximately one-half hour intervals. During the remainder of the bus service time buses run at approximately one hour intervals (from 41 minute to 74 minute intervals). Weekend service is provided at approximately one hour intervals.

BUSINESSES

The Concord survey site has one-hundred and forty-nine (149) businesses, including 5 churches in its approximately one-square mile area. One-hundred and one (101) are along Clayton Road. The next greatest concentration of business are along Galindo Street, which has eighteen (18) businesses. The remainder of the businesses are along Chestnut Avenue, Colfax Street, Concord Boulevard, Cowell Road, East Street, Farm Bureau Road, Grant Street, Grove Street, Lagunda Street, Main Avenue, and The Alameda.

The greatest concentration of business is around the BART station and is bordered by Mesa Street, Oakland Avenue, Clayton Road, Concord Boulevard, Galindo Street, and Monument Boulevard. Other businesses are located along Clayton Road and side streets near Clayton.

PARKS

There is one park, the Concord Community Park, located at the southeast of the Concord study site. It contains a picnic area, playground, swimming pool, tennis courts, a clubhouse, a refreshment stand, and parking.

SCHOOLS

There are three schools in the Concord study area. Two are along San Carlos Avenue at the southwest portion of the study area. The third school is located on Pancho Via Way to the north-east of the Concord Community Park.

SINGLE FAMILY RESIDENTIAL

The remainder of the site is dedicated to single family residential dwellings.

CONCORD SURVEY SITE

Con Legend
NC
Neighborhood Commercial
DB
Downtown Business
SF
Single Family
MF
Multiple Family
P
Public

Concord: Site Description

Street Name	Length (feet)	Width (feet)	Twoway Yes/no	Number of Lanes	Divided Yes/no	Condition	Speed Limit	Stop Signs	Stop Lights	Park Att	Sidewalk Yes/no	Sidewalk Width	Sidewalk Set Back	Light	Road Appear
Babel Ln.	3000	25	Y	2	Y	F	35	0	2	none	Y-d	3	0	Y	G
Clayton Rd.	9000	50	Y	3	Y	G	30	0	7	2 hr	Y	3	0	Y	G
Concord Blvd.	6900	40	Y	2	Y	G	35	0	6	2 hr	Y	2	0	Y	G
Cowell Rd.	3000	50	Y	2	Y	VG	35	0	2	none	Y-n	3	0	Y	G
Farm Bureau Rd.	3700	25	Y	2	Y	G	35	2	2	off street	N	0	0	Y	G
Galindo St.	2600	80	Y	4	Y	G	30	0	4	2 hr	Y	3	0	Y	G
1st St.	250	30	Y	2	N	G	25	1	0	off street	N	0	0	Y	G
2nd St.	250	30	Y	2	N	G	25	1	0	off street	N	0	0	Y	G
3rd St.	700	30	Y	2	N	G	25	2	0	on street	N	0	0	Y	G
5th Ave.	2700	20	Y	2	N	F	25	2	0	on street	N	0	0	Y	G
5th St.	1450	30	Y	2	N	F	25	3	0	off street	Y-w	3	3	Y	G
6th St.	1800	30	Y	2	Y	G	25	1	2	off street	N	0	0	Y	G
Almar St.	800	30	Y	2	N	G	25	2	0	4 hr	Y	3	2	Y	F
Ardra Ln.	400	20	Y	2	N	P	25	1	0	off street	N	0	0	N	F
Atlantic St.	950	20	Y	2	N	G	25	1	0	4 hr	Y-s	3	2	Y	F
Bonari Ct.	600	30	Y	2	N	G	25	1	0	on street	Y	4	0	Y	G
Barbis Way	1400	25	Y	2	N	G	25	1	0	on street	N	0	0	Y	G
Barrington Dr.	1100	30	Y	2	N	G	25	0	0	on street	Y	3	2	Y	VG
Billings Rd.	750	15	Y	1	N	P	25	1	0	none	N	0	0	N	F
Cambridge Pl.	450	20	Y	2	N	G	25	1	0	on street	N	0	0	Y	G
Carlton Dr.	1350	30	Y	2	N	G	25	1	0	on street	Y	3	0	Y	G
Chestnut Ave.	2350	35	Y	2	Y	F	25	2	0	on street	Y-s	3	4	Y	G
Colfax St.	300	40	N	3	N	G	30	0	2	none	Y	6	0	Y	G
Cordova Way	300	25	Y	2	N	F	25	1	0	off street	N	0	0	Y	F
Coventry Rd.	2650	30	Y	2	N	G	25	3	0	on street	Y	3	2	Y	G
Craig Dr.	1150	30	Y	2	N	G	25	1	0	on street	N	0	0	Y	G
Crawford St.	1200	30	Y	2	N	G	25	1	0	4 hr	Y	3	2	Y	G
Dakota Ln.	500	25	Y	2	N	F	25	1	0	off street	N	0	0	N	F
Davis Ave.	3300	30	Y	2	N	G	25	2	0	on street	N	0	0	Y	G
Deardoff Ln.	450	25	Y	2	N	G	25	1	0	off street	N	0	0	Y	F
Del Chiaro Way	550	30	Y	2	N	G	25	0	0	on street	Y	3	0	Y	G
Dennis Ct.	150	30	Y	2	N	G	25	0	0	on street	N	0	0	Y	G
Dina Dr.	150	25	Y	2	N	G	25	0	0	on street	N	0	0	Y	G
Dover Way	900	30	Y	2	N	G	25	2	0	on street	Y	4	0	Y	G
Drozda Ct.	100	15	Y	1	N	P	25	0	0	off street	N	0	0	N	G
Ducker Ct.	450	30	Y	2	N	G	25	1	0	on street	Y	4	0	Y	G
East St.	700	60	N	2	Y	G	25	0	1	none	Y	6	0	Y	F
Elm Rd.	1000	25	Y	2	N	G	25	2	0	off street	N	0	0	Y	G
El Monte Dr.	1200	25	Y	2	N	G	25	2	0	off street	N	0	0	Y	G
El Dorado Dr.	950	30	Y	2	N	G	25	1	0	off street	Y	3	0	Y	G
El Monte Way	250	25	Y	2	N	G	25	1	0	off street	N	0	0	Y	G
Emma Ct.	400	25	Y	2	N	G	25	1	0	off street	N	0	0	Y	G
Estates Ct.	100	25	Y	2	N	G	25	0	0	off street	N	0	0	Y	G
Fabian Way	500	30	Y	2	N	G	25	1	0	off street	Y	3	0	Y	G

Concord: Site Description

Street Name	Length (feet)	Width (feet)	Twoway	Number of Lanes	Divided	Condition	Speed Limit	Stop Signs	Stop Lights	Park Att	Sidewalk Yes/no	Sidewalk Width	Sidewalk Set Back	Light	Road Appear
Felicia Ln.	350	20	Y	2	N	G	25	1	0	off street	N	0	0	N	F
Gainsborough Dr.	600	30	Y	2	N	G	25	1	0	on street	Y	3	0	Y	VG
Garnet Ln.	1100	25	Y	2	N	G	25	2	0	off street	N	0	0	Y	G
Gary Dr.	650	30	Y	2	N	G	25	2	0	on street	Y	3	0	Y	G
Gerald Dr.	250	25	Y	2	N	G	25	0	0	off street	N	0	0	Y	G
Glenwood Dr.	1150	30	Y	2	N	F	25	0	0	off street	N	0	0	Y	G
Grant St.	900	50	Y	4	Y	G	25	1	2	none	Y	5	5	Y	G
Grove Way	3700	25	Y	2	N	G	25	2	0	on street	N	0	0	Y	G
Hale Dr.	1150	30	Y	2	N	G	25	1	0	off street	N	0	0	Y	G
Heartland Ct.	350	30	Y	2	N	G	25	1	0	on street	Y	4	0	Y	G
Helene Ct.	150	30	Y	2	N	F	25	0	0	on street	Y	3	0	Y	G
Humphrey Dr.	1000	30	Y	2	N	F	25	2	0	off street	N	0	0	N	G
Jen Ct.	150	30	Y	2	N	G	25	0	0	on street	Y	3	0	Y	G
Karman Dr.	400	30	Y	2	N	G	25	0	0	on street	Y	4	0	Y	G
Kimball Ct.	150	30	Y	2	N	G	25	0	0	on street	Y	4	0	Y	G
Kimball Way	700	30	Y	2	N	G	25	1	0	on street	Y	4	0	Y	G
Laguna St.	1300	30	Y	2	N	G	25	3	0	on street	Y	3	2	Y	G
Laguna St.	500	25	Y	2	N	P	25	1	0	none	N	0	0	Y	F
Lancashire Dr.	650	30	Y	2	N	G	25	0	0	on street	Y	3	0	Y	VG
Leonard Dr.	950	25	Y	2	N	G	25	0	0	on street	Y-n	3	0	Y	G
Liana Ln.	1050	25	Y	2	N	G	25	2	0	off street	N	0	0	Y	G
Lonee Ct.	150	30	Y	2	N	G	25	0	0	on street	Y	3	0	Y	G
Lucky Dr.	450	15	Y	1	N	F	25	1	0	off street	N	0	0	Y	G
Main Ave.	300	30	Y	2	N	G	25	1	0	on street	Y	3	0	Y	G
Maria Ave.	1400	25	Y	2	N	G	25	0	1	off street	N	0	0	Y	G
Maria Ct.	150	30	Y	2	N	G	25	0	0	on street	Y	3	0	Y	G
Marvelle Ln.	350	30	Y	2	N	G	25	0	0	on street	Y	3	0	Y	G
Maynard St.	650	15	Y	1	N	F	25	2	0	off street	N	0	0	Y	G
Meridian Dr.	800	30	Y	2	N	G	25	1	0	on street	Y	3	0	Y	VG
Mesa St.	1000	30	Y	2	N	G	25	2	0	on street	Y	3	0	Y	G
Montebello Ct.	450	30	Y	2	N	G	25	1	0	on street	Y	3	0	Y	G
Mt Diablo St.	3100	30	Y	2	N	G	25	3	0	on street	Y	3	0	Y	G
Oak St.	550	40	Y	2	N	G	25	0	1	none	Y	4	0	Y	G
Oakland Ave.	1550	50	Y	4	Y	F	30	1	1	none	Y-e	3	0	Y	G
Orchard Ave.	500	30	Y	2	N	G	25	0	0	off street	N	0	0	Y	G
Oxford Pl.	450	20	Y	2	N	G	25	1	0	off street	N	0	0	Y	N
Pancho Villa Way	500	25	Y	2	N	P	25	0	0	none	N	0	0	Y	F
Park St.	700	40	Y	2	Y	G	25	1	0	none	N	0	0	Y	G
Parkside Dr.	300	30	Y	2	N	G	25	2	0	off street	N	0	0	Y	G
Port Chicago Hwy.	600	40	Y	2	N	F	25	1	0	on street	Y	4	0	Y	G
Prospect St.	950	25	Y	2	N	G	25	1	0	on street	Y	3	2	Y	G
Pacific St.	950	25	Y	2	N	G	25	1	0	on street	Y	3	2	Y	G
Reed Way	900	30	Y	2	N	F	25	0	0	off street	N	0	0	Y	G
Richardson Rd.	450	15	Y	1	N	F	25	0	0	off street	N	0	0	Y	F

Concord: Site Description

Name	Length (feet)	Width (feet)	Twoway	Number of Lanes	Divided	Condition	Speed Limit	Stop Signs	Stop Lights	Park Att	Sidewalk Yn	Sidewalk Width	Sidewalk Set Back	Light	Road Appear
Rose Ct.	100	25	Y	2	N	G	25	0	0	off street	N	0	0	Y	G
Rosland Dr.	700	25	Y	2	N	G	25	1	0	off street	N	0	0	Y	G
Roslyn Dr.	1000	30	Y	2	N	G	25	1	0	on street	Y	3	0	Y	G
San Carlos Ave.	2050	20	Y	2	N	F	25	2	0	4 hr	Y-e	3	2	Y	G
San Jose Ave.	1800	30	Y	2	N	G	25	3	0	4 hr	Y	3	2	Y	G
Santa Clara Ave.	1250	25	N	2	N	F	25	2	0	4hr	Y	3	0	Y	F
Shadeland Ct.	100	25	Y	2	N	G	25	0	0	off street	N	0	0	Y	G
Sheffield Ct.	0	0	0	0	0	0				off street	N	0	0	Y	G
Sheffield Pl.	800	30	Y	2	N	G	25	1	0	off street	N	0	0	Y	G
Sheridan Ct.	200	30	Y	2	N	G	25	0	0	on street	Y	3	0	Y	G
Sheridan Rd.	550	30	Y	2	N	G	25	1	0	on street	Y	3	0	Y	VG
Sinclair Ave.	1450	30	Y	2	N	G	25	2	0	on street	Y	3	3	Y	G
Stanford St.	1200	30	Y	2	N	F	25	1	0	off street	N	0	0	Y	G
St. Elizabeth Ct.	350	30	Y	2	N	G	25	1	0	on street	Y	3	0	Y	G
St. Peter Ct.	600	30	Y	2	N	G	25	1	0	on street	Y	3	0	Y	G
Sunset Ave.	300	50	N	4	N	G	25	0	1	none	Y	6	0	Y	F
The Alameda	2750	20	Y	2	N	F	25	2	0	off street	N	0	0	Y	G
Verna Ct.	150	30	Y	2	N	G	25	0	0	off street	N	0	0	Y	G
Verona Ct.	150	25	Y	2	N	F	25	0	0	on street	N	0	0	Y	G
Vicente Rd.	300	25	Y	2	N	F	25	1	0	off street	N	0	0	N	F
Walnut Ave.	2500	20	Y	2	N	F	25	2	0	off street	N	0	0	N	F
Walnut Heights	500	25	Y	2	N	F	25	0	0	off street	N	0	0	N	G
Wildwood Dr.	1050	30	Y	2	N	G	25	0	0	on street	Y	3	0	Y	G
Windsor Pl.	1150	25	Y	2	N	G	25	1	0	off street	N	0	0	Y	G

Summary of Pleasant Hill Site Description

Pleasant Hill has designated the area surrounding the BART station as a planned unit development (PUD) district. It's intent is to encourage development of high density, multi-family housing, business complexes, and business parks near the BART transit station.

APARTMENTS

There are forty-four apartment complexes in the Pleasant Hill survey area with a total of approximately 3,390 units. The majority of the units are located around the BART station along Jones Road, Las Juntas Way, and Elena Court. Four areas are designated as high density apartment complexes. They are located along Jones Road parallelling Highway 680, and south of Treat Boulevard; to the east of the BART PUD and north of Treat Boulevard, to the north of the BART PUD along Coggins Drive; and to the west of Highway 680 and separating the commercial district from the single family residential area.

On the south and east portion of the survey site is an area designated as low density multiple family. No apartments are located in this area and this area is not included in the above count. Duplexes or townhouses rather than apartments may be allowed in this area.

BART

The BART station is located near the center of the Pleasant Hill study site, north of Treat Boulevard and east of Highway 680.

BUS SERVICE

There are six (6) bus routes in the Pleasant Hill study area. Weekday service leaves at approximately fifteen (15) minute intervals during the peak commute hours of 6:22 a.m. to 8:57 a.m. and 4:34 p.m. to 7:35 p.m. (with intervals of 11 minutes to 20 minutes). Weekend service is at fifty (50) minute intervals.

BUSINESSES

Pleasant Hill has one-hundred and four (104) businesses located within the survey area. This includes four churches, two pre-schools, California State University Hayward, a private school, a convalescent hospital, day care center and a retirement home. Businesses are located along Treat Boulevard which runs east/west through the south central survey area; along Park Boulevard to the east of Highway 680 and at the northern boundary of the survey site; along Buskirk Avenue at the north of the BART PUD area and adjacent to Highway 680. There is a large "General Commercial" area located to the west of Highway 680 at the southern border of the study site.

PARKS

There are no parks located in this study area.

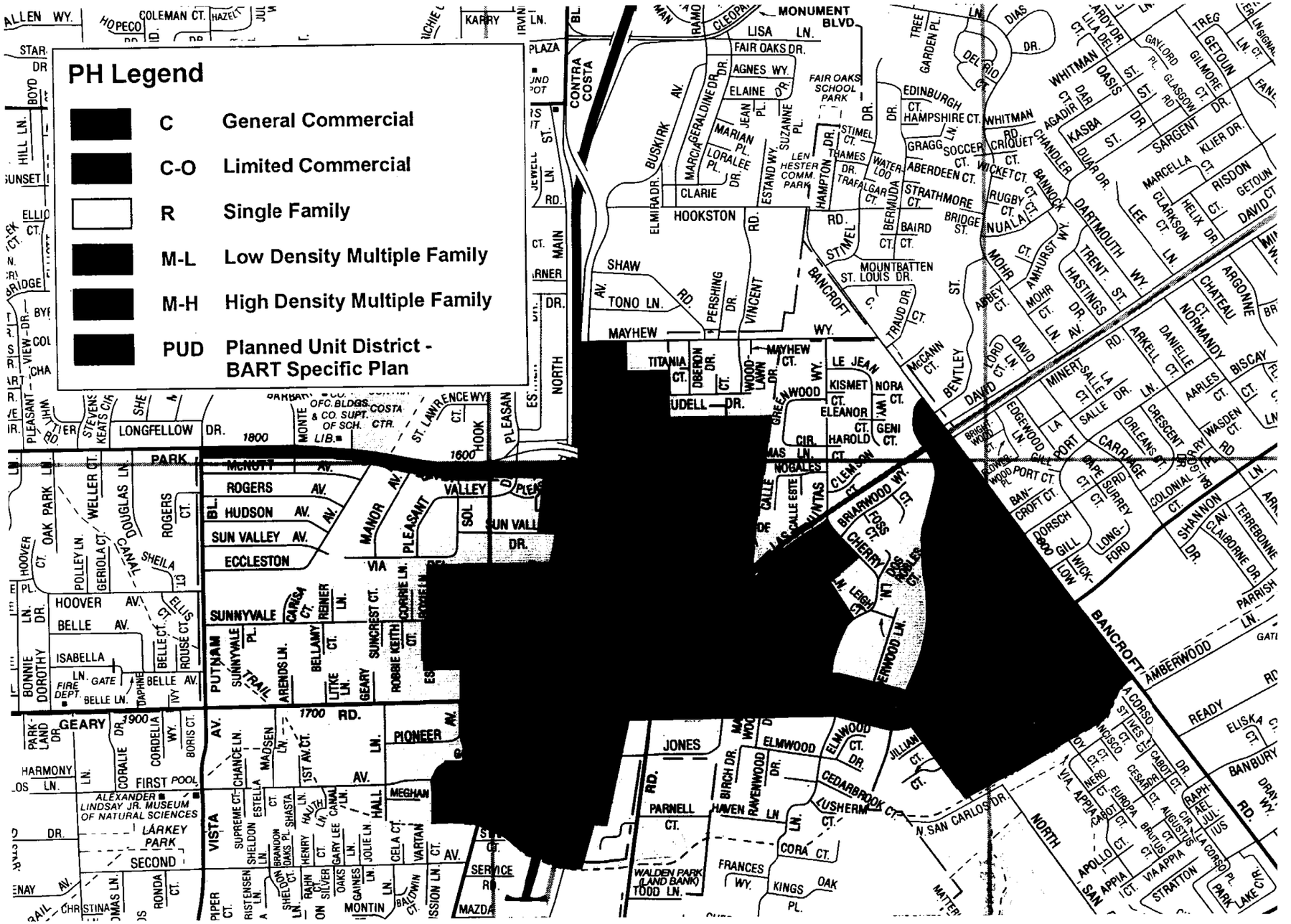
SCHOOLS

There are no public schools in the study area.

SINGLE FAMILY RESIDENTIAL

Single family residential areas are at the far west side of the study area, and at the north and south of the eastern portion of the study area.

PLEASANT HILL SURVEY SITE


PH Legend
C General Commercial
C-O Limited Commercial
R Single Family
M-L Low Density Multiple Family
M-H High Density Multiple Family
PUD Planned Unit District - BART Specific Plan

Pleasant Hill: Site Description

Name	Length (feet)	Width (feet)	Twoway	Number of Lanes	Divided	Condition	Speed Limit	Stop Signs	Stop Lights	Park Att	Sidewalk Yes/No	Sidewalk Width	Sidewalk Set Back	Light	Road Appear
McNutt Ave.	2050	25	2	2	N	F	25	1	0	on	N	0		Y	G
Monte Cresta	200	25	2	2	N	F	25	1	0	on	N	0		Y	G
Rogers Ave.	1400	25	2	2	N	F	25	1	0	on	N	0		Y	G
Hudson Ave.	1250	25	2	2	N	F	25	1	0	on	N	0		Y	G
Sun Valley Ave.	1200	25	2	2	N	F	25	1	0	on	N	0		Y	G
Eccleston Ave.	2400	25	2	2	N	F	25	2	0	on	N	0		Y	G
Manor Ave.	1050	25	2	2	N	F	25	1	0	on	N	0		Y	G
Via Del Sol	2300	25	2	2	N	F	25	2	0	off	N	0		Y	G
Pleasant Valley Dr.	1550	25	2	2	N	F	25	1	1	on	N	0		Y	G
Sun Valley Dr.	950	25	2	2	N	F	25	2	0	on	N	0		Y	G
Pleasant Ct.	300	25	2	2	N	F	25	0	0	on	N	0		Y	G
Sunnyvale Ave.	3400	25	2	2	N	G	25	1	1	off	N	0		Y	G
Wesley Ct.	450	25	2	2	N	G	25	0	0	off	Y	3		Y	G
Roxie Ln.	350	35	2	2	N	G	25	0	0	off	Y	3		Y	G
Corrie Ln.	350	35	2	2	N	G	25	0	0	off	Y	3		Y	G
Reiner Ln.	350	20	2	2	N	F	25	1	0	off	Y	3		Y	G
Carisa Ct.	350	35	2	2	N	G	25	0	0	off	N	3		Y	G
Bellamy Ct.	300	35	2	2	N	P	25	0	0	off	Y	3		Y	G
Sunnyvale Pl.	250	20	2	2	N	F	25	0	0	off	N	0		Y	G
Suncrest Ct.	250	20	2	2	N	P	25	0	0	off	N	0		Y	G
Robbie Keith Ct.	250	20	2	1	N	F	25	0	0	off	N	0		Y	G
Esplanade Pl.	400	40	2	2	N	G	25	0	0	off	Y	0		Y	G
Roxanne Ct.	400	20	2	1	N	G	25	0	0	off	N	0		Y	G
Geary Ct.	300	20	2	2	N	F	25	1	0	none	N	0		Y	G
Litke Ct.	250	15	2	1	N	F	25	0	0	none	N	0		Y	G
Arends Ln.	300	25	2	2	N	F	25	0	0	none	N	0		Y	G
Geary Rd.	2950	50	2	2	Y	G	35	0	1	none	N	0		Y	G
Alderwood Ln.	1000	15	2	1	N	P	25	1	0	none	N	0		Y	G
Cherry Ln.	2100	30	2	2	N	F	30	2	1	none	Y	0		Y	G
Dos Robles Ct.	250	25	2	2	N	G	25	0	0	none	N	0		Y	G
Briarwood Way	850	35	2	2	N	G	25	1	0	none	N	0		Y	G
Foss Ct.	100	35	2	2	N	G	25	0	0	none (9-11am)	N	0		Y	G
Briarwood Ct.	350	35	2	2	N	G	25	0	0	on	N	0		Y	G
Leigh Ct.	150	30	2	2	N	G	25	0	0	on	N	0		Y	G
Santos Ln.	900	35	2	2	N	F	25	2	0	on	Y	3		Y	G
Las Juntas Way	4500	35	2	2	Y	F	25	2	1	on	N	0		Y	G
Del Hombre Ln.	1200	25	2	2	Y	P	25	0	0	on	N	0		Y	G
Honey Trail Ct.	200	15	1	1	N	VP	25	0	0	off	N	0		Y	G
Wayside Ln.	400	15	2	2	N	P	25	0	0	off	N	0		Y	G
Coggins Dr.	4600	35	2	2	Y	G	25	1	1	on	Y	0		Y	G
Elena Dr.	900	30	2	2	Y w trees	F	25	0	0	on	Y	0		Y	G
Juana Ct.	450	30	2	2	N	F	25	0	0	on	Y	0		Y	G
Elena Ct.	500	30	2	2	N	F	25	0	0	on	Y	0		Y	G
Clemson Ct.	400	25	2	2	N	F	25	1	0	on	Y	3		Y	G

Pleasant Hill: Site Description

Name	Length (feet)	Width (feet)	Twoway	Number of Lanes	Divided	Condition	Speed Limit	Stop Signs	Stop Lights	Park Att	Sidewalk Yes/no	Sidewalk Width	Sidewalk Set Back	Light	Road Appear
Harold Ct.	150	25	2	2	N	G	25	1	0	on	N	0		Y	G
Kismet Ct.	150	20	2	2	N	G	25	1	0	on	N	0		Y	G
Le Jean Way	1150	35	2	2	N	G	25	1	0	on	N	0		Y	G
Nora Ct.	150	35	2	2	N	G	25	0	0	on	N	0		Y	G
Geri Ct.	150	35	2	2	N	G	25	0	0	on	N	0		Y	G
Eleanor Ct.	150	35	2	2	N	G	25	0	0	on	N	0		Y	G
Greenwood Cr.	1250	30	2	2	N	G	25	2	0	on	N	0		Y	G
Calle Nogales Way	900	30	2	2	N	G	25	1	0	none	N	0		Y	G
Calle Este.	200	30	2	2	N	G	25	0	0	on	N	0		Y	G
Mayhew Ct.	150	25	2	2	N	F	25	0	0	on	N	0		Y	G
Woodlawn Dr.	550	30	2	2	N	F	25	1	0	on	N	0		Y	G
Ludell Dr.	850	30	2	2	N	G	25	0	0	on	N	0		Y	G
Ludell Ct.	250	30	2	2	N	G	25	0	0	on	N	0		Y	G
Oberon Dr.	500	35	2	2	N	G	25	1	0	on	Y	0		Y	G
Titania Ct.	100	35	2	2	N	G	25	0	0	on	Y	0		Y	G
Mayhew Way	2950	40	2	2	Y	G	30	2	0	on	Y	0		Y	G
Lesnick Ln.	550	25	2	2	N	G	25	1	0	on	N	0		Y	G
Pioneer Ave.	1050	25	2	2	N	F	25	2	0	on	N	0		Y	G
Hall Ln.	1000	25	2	2	N	G	25	1	0	off	N	0		Y	G
First Ave.	1100	25	2	2	N	G	25	1	0	off	N	0		Y	G
Gobel Way	450	25	2	2	N	F	25	0	0	off	N	0		Y	G
N. Main St.	3800	70	2	4	Y	G	25	0	3	2hr	Y	4		Y	G
Oak Park Blvd.	4000	30	2	2	Y	G	25	0	2	none	N	0		Y	G
Putnam Blvd.	2000	40	2	2	Y	G	25	0	1	on	Y	4		Y	G
Treat Blvd.	5500	90	2	6	Y	G	40	0	7	none	Y	4		Y	G
Bancroft Rd.	4350	60	2	4	Y	G	35	0	4	none	Y	4		Y	G
Jones Rd.	3000	60	2	4	Y	G	35	0	2	none	N	0		Y	G
Buskirk Ave.	3200	40	2	4	Y	G	35	0	3	none	Y	4		Y	G
Oak Rd.	4300	60	2	4	Y	G	30	0	6	none	Y	4		Y	G
Wayne Dr.	700	45	2	4	Y	G	25	0	2	none	N	0		Y	G
Haven Ln.	650	15	2	1	N	F	25	0	0	none	N	0		Y	G
Lusherm Ct.	300	20	2	1	N	F	25	0	0	none	N	0		Y	G
Cedarbrook Ct.	400	40	2	2	N	F	25	0	0	off	N	0		Y	G
Elmwood Dr.	1300	35	2	2	N	G	25	1	0	off	N	0		Y	G
Ravenwood Dr.	350	30	2	2	N	G	25	0	0	off	N	0		Y	G
Maywood Dr.	0	0	2	2	N		25	0	0	off		0		Y	G
Birch Dr.	350	30	2	2	N	G	25	0	0	off	N	0		Y	G
Elmwood Ct.	500	35	2	2	N	G	25	0	0	off	N	0		Y	G
Sheppard Rd.	900	30	2	2	N	G	25	1	0	off	Y	0		Y	G
Jillian Ct.	400	25	2	2	N	G	25	0	0	off	Y	0		Y	G
Sheppard Ct.	500	35	2	2	N	G	25	1	0	on	Y	0		Y	G
Candelero Dr.	2600	40	2	2	N	G	25	4	1	none	Y	4		Y	G
N. Oak Dr.	700	45	2	2	N	G	25	0	0	on	Y	4		Y	G
Seemas Ln.	0	0	2	2	N	G	25	0	0	off	Y	0		Y	G

Pleasant Hill: Site Description

Name	Length (feet)	Width (feet)	Twoway	Number of Lanes	Divided	Condition	Speed Limit	Stop Signs	Stop Lights	Park Att	Sidewalk Yes/no	Sidewalk Width	Sidewalk Set Back	Light	Road Appear
N. Creek Cr.	2000	45	2	2	N	G	25	0	0	off	Y	0		Y	G
N. Creek Pl.	200	45	2	2	N	G	25	0	0	off	Y	0		Y	G
Olmo Way	950	35	2	2	N	G	25	2	0	off	Y	0		Y	G
Pomar Way	1200	35	2	2	N	G	25	1	1	off	Y	0		Y	G
Candelero Ct.	950	40	2	2	N	G	25	0	0	on	Y	3	2	Y	G
Candelero Pl.	400	40	2	2	N	G	25	0	0	on	Y	3	2	Y	G
Countrywood Ct.	1300	40	2	2	N	G	25	1	0	on	Y	3	2	Y	G
Jones Rd.	3000	40	2	2	Y	G	35	0	2	none	N	0		Y	G
Parnell Ct.	700	15	2	2	N	F	25	0	0	off	N	0		Y	G
Roble Rd.	600	40	2	2	N	F	25	0	0	none	N	0		Y	G

Summary of North San Francisco Site Description

APARTMENTS

There are one-hundred and ninety-seven (197) apartment complexes in the North San Francisco survey area with approximately 3,330 units. Apartment complexes are scattered throughout the survey area with the greatest concentration of apartments along Broderick (29 apartment complexes and 852 units). Baker, the next block to the west of Broderick has 8 complexes and 227 units. McAllister, Golden Gate, Fulton, and Grove run east/west past Broderick and Baker which run north/south. There are 9 apartment complexes and 233 units on McAllister, 11 apartments and 171 units along Golden Gate, 10 apartments and 145 units on Fulton, and 6 apartments and 65 units on Grove. This area is bordered by Fell on the south with seven complexes and 90 units; Masonic to the east having 6 apartments and 70 units; and on the north, Turk with 9 apartments and 116 units.

BART

There is no BART service in this study area.

BUS SERVICE

North San Francisco has 20 bus routes serving the survey area. There are peak express buses leaving at seven (7) minute intervals from 6:52 a.m. to 8:37 a.m and from 4:30 p.m. to 6:20 p.m. An express to Richmond leaves beginning at 5:05 p.m. continuing at approximately 10 minute intervals through 6:22 p.m.
In the Financial District buses leave and arrive at 6 minute intervals throughout the day and at 4 minute intervals during the peak commute. Other lines travel at approximately 30 minute intervals during the off peak.

BUSINESS

There are approximately 470 businesses located within the North San Francisco survey area. Included in this is the University of San Francisco, two hospitals, two medical centers, two hospital annexes and a convalescent hospital as well as a cooking school, two mortuary schools, two pre-schools, a nursery school, and an elementary school. Also included are 27 churches and two child care centers along with a wide assortment of retail outlets and services (thirty-seven (37) liquor stores and bars, eight gas stations, and seventeen drycleaners).

Main business locations are along Geary Boulevard, running east and west, and along Divisadero Street, running north and south. Other businesses are located along California between Spruce and Laurel, at the corner of Presidio Avenue and California Street, and near the University of San Francisco along Masonic Avenue near Fulton and McAllister Streets. There are also two small business locations at the western border of the survey area along Arguello Boulevard.

PARKS

This site is north of and adjacent to Golden Gate Park. There are several public areas scattered throughout the survey site. However, none are designated as parks.

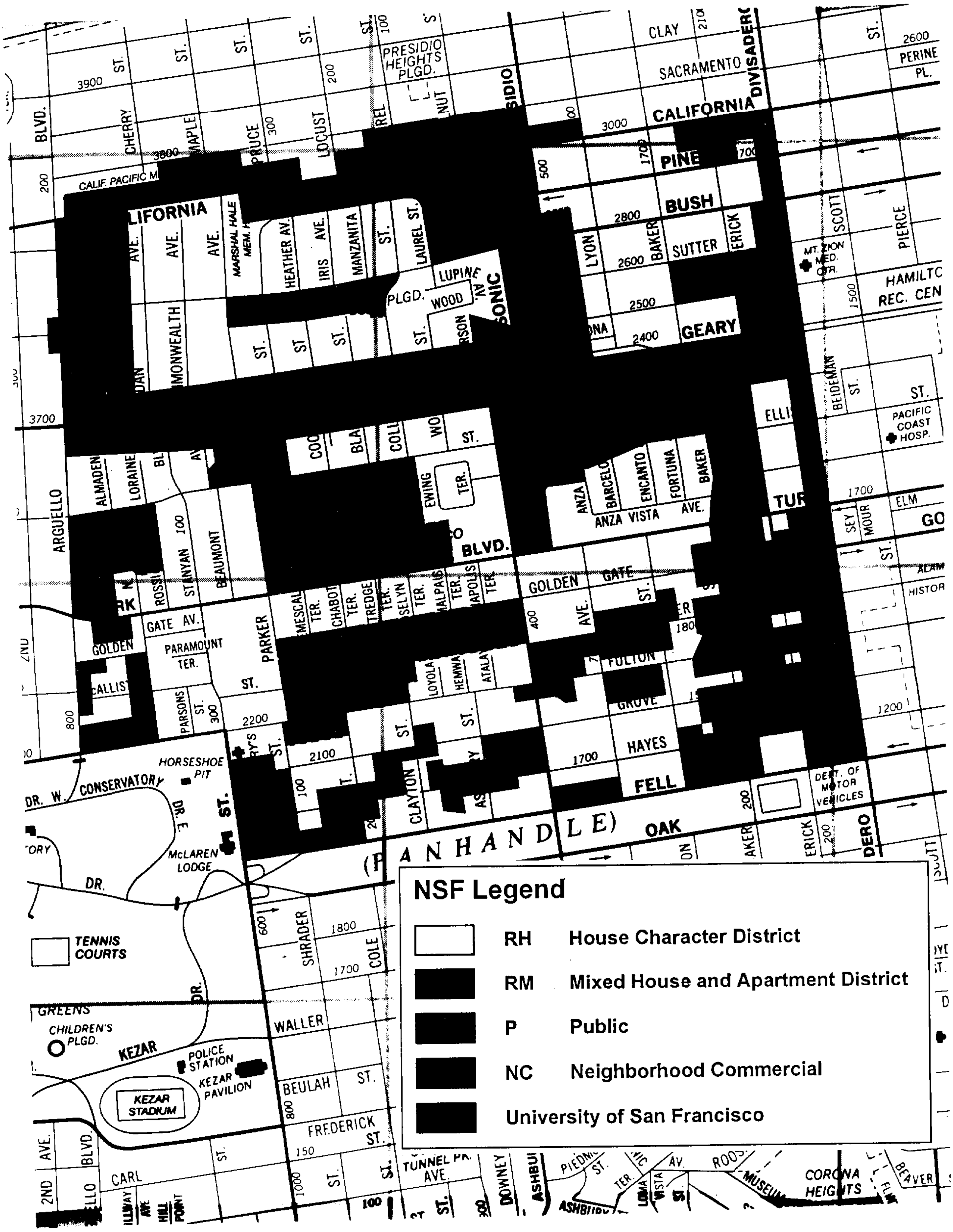
SCHOOLS

There are no public schools located in the survey area.

SINGLE FAMILY RESIDENTIAL

Single family residential neighborhoods are interspersed with multi family, commercial and public areas. There is less area designated as single family residential in the North San Francisco Survey area than in any of the other Bay Area survey sites.

NORTH SAN FRANCISCO SURVEY SITE



NSF Legend
RH House Character District
RM Mixed House and Apartment District
P Public
NC Neighborhood Commercial
University of San Francisco
CLAY
SACRAMENTO
CALIFORNIA
PINE
BUSH
SUTTER
GEARY
PRESIDIO HEIGHTS PLGD.
LUPINE
WOOD
LYON
BAKER
SCOTT
PIERCE
MT. ZION MED. CTR.
HAMILTON REC. CEN
PACIFIC COAST HOSP.
ARGUELLO
ALMADEN
LORAINE
STANYAN
BEAUMONT
PARKER
EWING TER.
ANZA VISTA AVE.
ANZA
BARCELO
ENCANTO
FORTUNA
ELM
GOLDEN GATE
GOLDEN GATE AV.
PARAMOUNT TER.
PARSONS
FULTON
GROVE
HAYES
FELL
OAK
(PANHANDLE)
CLAYTON
DEPT. OF MOTOR VEHICLES
HORSESHOE PIT
CONSERVATORY
McLAREN LODGE
TENNIS COURTS
CHILDREN'S PLGD.
KEZAR
POLICE STATION
KEZAR PAVILION
KEZAR STADIUM
SHRADER
COLE
WALLER
BEULAH ST.
FREDERICK ST.
CARL
TUNNEL PK. AVE.
DOWNEY
CORONA HEIGHTS

North San Francisco: Site Description

Name	Length (feet)	Width (feet)	Twoway	Number of Lanes	Divided	Condition	Speed Limit	Stop Signs	Stop Lights	Park Att	Sidewalk Yes/no	Sidewalk Width	Sidewalk Set Back	Light	Road Appear
Broderick St.	3100	40	2	2	N	G	25	7	2	Y	Y	10			
St. Joseph Ave.	1550	60	2	2	Y	G	25	3	1	Y	Y	6			
Beaumont Ave.	900	35	2	2	N	G	25	2	0	Y	Y	10			
Parker Ave.	4200	40	2	2	Y	G	25	4	3	Y 2-hr	Y	6			
Stanyan St.	2550	50	2	2	Y	G	25	0	4	Y 2-hr	Y	10			
Hayes St.	5000	40	2	2	Y	G	25	7	4	Y 2-hr	Y	10			
Clayton St.	1000	45	2	2	N	G	25	3	1	Y 2-hr	Y	10			
Baker St.	2900	70	2	2	Y	G	25	5	2	Y 2-hr	Y	12			
Anza Vista Ave.	1650	50	2	2	Y	G	25	2	0	Y 2-hr	Y	6			
Vega St.	300	40	2	2	Y	F	25	0	0	Y 2-hr	Y	6			
Nido St.	500	40	2	2	Y	F	25	1	0	Y 2-hr	Y	6			
Terra Vista Ave.	1350	50	2	2	N	G	25	1	0	Y 2-hr	Y	4			
Eddy St.	700	40	2	2	Y	G	25	0	0	Y 2-hr	Y	6			
Ellis St.	700	40	2	2	N	G	25	1	0	Y 2-hr	Y	8			
Fortuna Ave.	650	40	2	2	N	F	25	0	0	Y 2-hr	Y	3			
Encanto Ave.	650	40	2	2	N	F	25	0	0	Y 2-hr	Y	3			
Barcelona Ave.	600	40	2	2	N	F	25	0	0	Y 2-hr	Y	3			
O'Farrell St.	2600	50	2	2	Y	G	25	2	4	Y 2-hr	Y	6			
Central Ave.	2000	40	2	2	N	F	25	4	2	Y 2-hr	Y	8			
Annapolis Ter.	350	50	2	2	N	F	25	1	0	Y 2-hr	Y	3			
Tamalpais Ter.	350	50	2	2	N	F	25	1	0	Y 2-hr	Y	3			
Roselyn Ter.	350	50	2	2	N	F	25	1	0	Y 2-hr	Y	3			
Kittredge Ter.	350	50	2	2	N	F	25	1	0	Y 2-hr	Y	3			
Chabot Ter.	350	50	2	2	N	F	25	1	0	Y 2-hr	Y	3			
Temescal Ter.	350	50	2	2	N	F	25	1	0	Y 2-hr	Y	3			
Golden Gate Ave.	1000	60	2	2	Y	G	25	5	2	Y 2-hr	Y	3			
Mc Allister St.	4100	45	2	2	N	F	25	7	1	Y 2-hr	Y	3			
Atalaya Ter.	250	30	2	2	N	F	25	1	0	Y 2-hr	Y	3			
Hemway Ter.	250	30	2	2	N	F	25	1	0	Y 2-hr	Y	3			
Loyola Ter.	250	30	2	2	N	F	25	1	0	Y 2-hr	Y	3			
Cole St.	1000	50	2	2	N	G	25	3	1	Y 2-hr	Y	10			
Ashbury St.	1000	60	2	2	N	F	25	3	1	Y 2-hr	Y	6			
Fell St.	5050	80	1	4	N	G	30	1	8	Y 2-hr	Y	10			
Schrader St.	1000	50	2	2	N	G	25	2	1	Y 2-hr	Y	12			
Grove St.	4600	50	2	2	N	F	25	7	0	Y 2-hr	Y	8			
Lorraine Ct.	350	30	2	2	N	G	25	0	0	Y 2-hr	Y	4			
Almaden Ct.	400	30	2	2	N	G	25	0	0	Y 2-hr	Y	4			
Rossi Ave.	850	30	2	2	N	G	25	0	0	Y 2-hr	Y	4			
Edward St.	850	30	2	2	N	F	25	1	0	Y 2-hr	Y	4	3		
Anza St.	3500	60	2	4	Y	G	25	1	3	Y 2-hr	Y	5			
Willard St.	1000	40	2	2	N	F	25	3	0	Y 2-hr	Y	6			
Golden Gate Ave.	4500	40	2	2	N	F	25	1	0	Y 2-hr	Y	6			
Paramount Ter.	250	40	2	2	N	F	25	0	0	Y 2-hr	Y	6			
Parsons St.	400	40	2	2	N	G	25	1	0	Y 2-hr	Y	8			

North San Francisco: Site Description

Name	Length (feet)	Width (feet)	Twoway	Number of Lanes	Divided	Condition	Speed Limit	Stop Signs	Stop Lights	Park Att	Sidewalk Yes/no	Sidewalk Width	Sidewalk Set Back	Light	Road Appear
Arguello Blvd.	4300	80	2	4	Y	G	25	7	0	Y 2-hr	Y	12			
Palm Ave.	1700	60	2	2	N	F	25	3	0	Y 2-hr	Y	6			
Commonwealth Ave.	1750	60	2	2	N	G	25	3	0	Y 2-hr	Y	6			
Jordan Ave.	1750	60	2	2	N	F	25	2	1	Y 2-hr	Y	6			
Spruce St.	1800	30	2	2	N	G	25	2	1	Y 2-hr	Y	5	3		
Cook St.	1250	30	1	1	N	G	25	1	0	Y 2-hr	Y	10			
Heather Ave.	600	35	2	2	N	G	25	0	0	Y 2-hr	Y	10			
Mayfair Dr.	1050	30	2	2	N	G	25	0	0	Y 2-hr	Y	4			
Iris Ave.	600	40	2	2	N	G	25	0	0	Y 2-hr	Y	4			
Manzanita Ave.	600	40	2	2	N	G	25	0	0	Y	Y	4			
Laurel St.	7510	45	2	2	N	G	25	1	1	Y	Y	4			
Lupine Ave.	550	35	2	2	N	G	25	1	0	Y	Y	4			
Wood St.	950	35	2	2	N	F	25	1	0	Y	Y	4			
Collins St.	2100	35	2	2	N	F	25	1	1	Y 2-hr	Y	6			
Blake St.	1150	35	2	2	N	F	25	1	0	Y 2-hr	Y	6			
Masonic Ave.	5050	90	2	6	Y	G	30	0	9	Y 2-hr	Y	10			
Lyon St.	4150	40	2	2	N	F	25	8	2	Y 2-hr	Y	10			
Presidio Ave.	1750	50	2	2	Y	F	25	3	3	Y 2-hr	Y	6			
Bush St.	2000	50	1	3	Y	G	25	0	5	Y 2-hr	Y	6			
Sutter St.	2000	35	2	2	Y	F	25	4	1	Y 2-hr	Y	10			
Pine St.	2000	60	1	3	Y	F	25	0	5	Y 2-hr	Y	6			
Post St.	2000	60	2	3	Y	F	25	2	3	Y 2-hr	Y	10			
Leona Ter.	0	0	2	2			25	0	0	Y 2-hr	Y	0			
Garden St.	500	20	1	1	N	G	25	0	0	none	Y	3			
Broderick St.	4750	35	2	2	N	F	25	9	5	Y 2-hr	Y	8			
Baker St.	1800	45	2	2	F		25	1	5	Y 2-hr	Y	8	10		
Ertson Ct.	0	0	2	2	N		25	0	0	Y 2-hr	Y	0			
Fulton St.	6150	65	2	4	Y	G	30	1	8	Y 2-hr	Y	8	10		
Turk Blvd.	6100	65	2	4	Y	G	25	0	5	Y 2-hr	Y	10			
Geary Blvd.	4900	100	2	6	Y	G	25	1	8	Y metered	Y	10			
Euclid Ave.	3900	50	2	2	Y	G	25	5	3	Y 2-hr	Y	10			
California St.	5750	80	2	4	Y	G	25	0	10	Y 2-hr	Y	10			
Divisadero St.	5300	100	2	4	Y	G	25	0	13	Y metered	Y	6	8		
Emerson St.	500	30	2	2	N	G	25	1	0	Y 2-hr	Y	10			
Ewing Ter.	1400	35	2	2	N	G	25	0	0	Y 2-hr	Y	3			

Summary of South San Francisco Site Description

APARTMENTS

This site contains 20 apartment complexes with a total of 403 units. Most apartments are located along Monterey Boulevard at the southeast border of the survey area. The largest apartment complex, with 144 units is on Woodside Avenue at the northwest border of the survey area.

BART

BART is located at the far southeast of the survey area just north of Highway 280, and is surrounded by commercial development.

BUS SERVICE

This survey area has one bus line serving it at approximately one-half hour intervals throughout the day during the week, and at approximately one hour intervals during the week-end.

BUSINESS

There area eighty-seven (87) businesses located in this survey area, including five churches. Most businesses are located along Monterey Boulevard at the southern boundary of the site, along Portola at the northeast, and surrounding the BART station at Glen Park and Circular Avenue. There is a higher proportion of dry cleaners (8) and gas stations (5) in this survey area than in other survey area.

PARKS

With seven (7) parks, this survey area has more parks than the other survey areas. Mt. Davidson Park is located in the center of the survey site, several smaller parks are scatter throughout the area and one larger park stretches along O'Shaughnessy Boulevard.

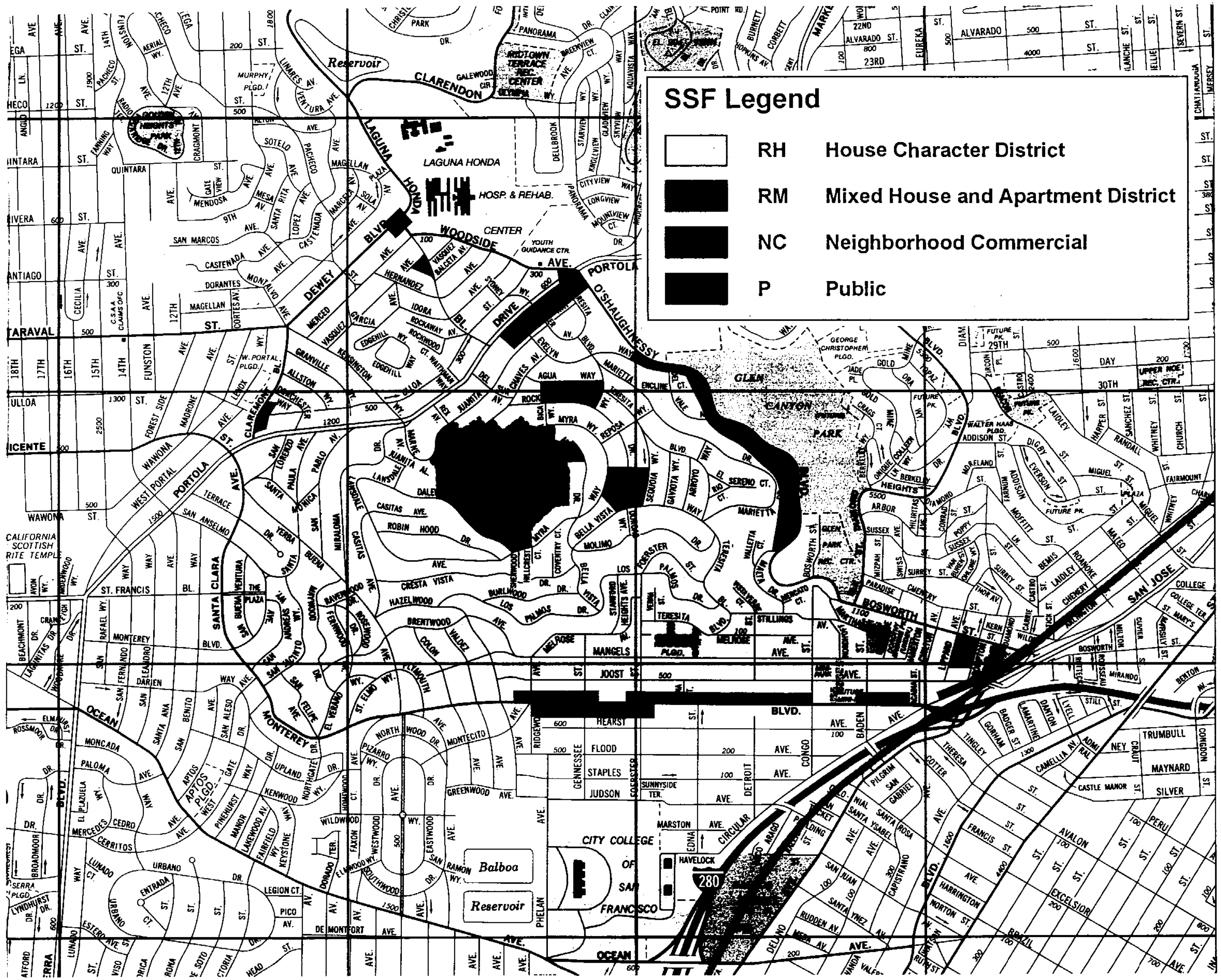
SCHOOLS

This survey site has five schools within its borders, also the greatest number of schools of any other survey site.

SINGLE FAMILY RESIDENTIAL

This site is predominantly single family residences with few multi-family areas and commercial districts.

SOUTH SAN FRANCISCO SURVEY SITE


SSF Legend
RH House Character District
RM Mixed House and Apartment District
NC Neighborhood Commercial
P Public
LAGUNA HONDA
HOSP. & REHAB.
CITY COLLEGE OF SAN FRANCISCO
Balboa Reservoir
GLEN CANYON PARK
Reservoir

South San Fransicso: Site Description

Name	Length (feet)	Width (feet)	Twoway	Number of Lanes	Divided	Condition	Speed Limit	Stop Signs	Stop Lights	Park Att	Sidewalk yes/no	Sidewalk Width	Sidewalk Set Back	Light	Road Appear
Acadia St.	400	25	2	0	N	F	25	1	0	Y 2hr	Y	12			
Agua Way	1000	30	2	2	N	G	25	1	0	Y	Y	4			
Allston Way	700	30	2	2	N	F	25	1	0	Y 2hr	Y	3			
Arroyo Way	900	35	2	1	N	G	25	0	0	Y	Y	4			
Baden St.	900	45	2	2	N	F	25	2	0	Y	Y	6			
Balceta Ave.	950	35	2	2	N	G	25	2	0	Y	Y	3	3		
Bella Vista Way	2950	35	2	2	N	F	25	1	0	Y	Y	4			
Borworth St.	2050	60	2	4	Y	F	25/35	3	1		Y	6			
Brentwood Ave.	2900	35	2	2	N	G	25	1	0	Y	Y	4			
Brompton Ave.	500	25	1	2	N	F	25	2	0	Y 4hr	Y	12			
Burlwood Dr.	1200	35	2	2	N	F	25	0	0	Y	Y	4			
Burnside Ave.	350	45	2	2	N	P	25	0	0	Y	Y	6			
Casitas Ave.	2150	45	2	2	N	F	25	1	0	Y	Y	4			
Chaves Ave.	1150	30	2	2	N	G	25	0	0	Y	Y	4			
Chilton Ave.	500	40	2	2	N	G	25	1	0	Y 2hr	Y	5			
Circular Ave.	1250	30	2	2	Y	F	25	0	0	Y off Street	Y	3			
Claremont Blvd.	1500	45	2	2	Y	G	25	3	0		Y	3			
Colon Ave.	1200	35	2	2	N	F	25	1	0	Y	Y	4			
Congo St.	1800	40	2	2	N	F	25	3	0	Y	Y	6			
Coventry Ct.	300	45	2	2	N	F	25	0	0	Y	Y	4			
Cresta Vista Dr.	2700	45	2	2	N	F	25	0	0	Y	Y	4			
Dalewood Way	1750	50	2	2	N	G	25	0	0	Y	Y	4			
Del Sur Ave.	600	30	2	2	N	G	25	2	0	Y	Y	4			
Del Vale Ave.	1000	35	2	2	N	G	25	1	0	Y	Y	4			
Detroit St.	1600	45	2	2	N	F	25	0	0	Y	Y	6			
Dewey Blvd.	1900	60	2	4	Y	G	25	2	1	Y 2hr	Y	3	4		
Diamond St.	400	30	2	2	Y	G	25	0	1	Y metered	Y	6			
Dorcas Way	300	0	2	2	N	G	25	0	0	Y	Y	4			
Dorchester Way	600	35	2	2	N Y(GR)	G	25	3	0	Y 2hr	Y	4			
Edgehill Way	2050	20	2	2	N	G	25	0	0	N	Y	3			
Edna St.	250	35	2	2	N	F	25	1	0	Y	Y	6			
El Sereno Ct.	600	35	2	2	N	G	25	0	0	Y	Y	4			
El Verano Way	1250	40	2	2	N	G	25	2	0	Y	Y	4			
Encline Ct.	600	35	2	2	N	G	25	0	0	Y	Y	4			
Evelyn Way	2250	30	2	2	Y (1)	G	25	1	2	Y	Y	3			
Fernwood Dr.	1000	40	2	2	N	G	25	2	0	Y	Y	4			
Foerster St.	2650	45	2	2	N	F	25	2	1	Y	Y	4			
Fowler Ave.	850	30	2	2	N	G	25	1	0	Y	Y	4			
Garcia Ave.	600	35	2	2	N	G	25	2	0	Y	Y	3	3		
Gaviota Way	650	35	2	2	N	G	25	0	0	Y	Y	4			
Genesee St.	850	45	2	2	N	F	25	0	1	Y	Y	4			
Granville Way	1150	30	2	2	N	G	25	2	0	Y	Y	3			
Hamerton Ave.	250	45	2	2	N	F	25	0	0	Y	Y	6			
Hazelwood Ave.	1250	35	2	2	N	F	25	4	0	Y	Y	4			

South San Fransicso: Site Description

Name	Length (feet)	Width (feet)	Twoway	Number of Lanes	Divided	Condition	Speed Limit	Stop Signs	Stop Lights	Park Att	Sidewalk Yes/no	Sidewalk Width	Sidewalk Set Back	Light	Road Appear
Hernandez Ave.	1800	35	2	2	N	G	25	2	1	Y 4hr	Y	3			
Hillcrest Ct.	200	35	2	2	N	F	25	0	0	Y	Y	4			
Idora Ave.	2000	35	2	2	N	G	25	4	0	Y 4hr	Y	4			
Isola Way	250	30	2	2	N	G	25	1	0	Y	Y	4			
Joost Ave.	6050	45	2	2	N	F	25	1	0	Y 2hr	Y	6			
Juanita Way	2250	35	2	2	N	G	25	0	0	Y	Y	4			
Kensington Way	1800	20	2	1	N	F	25	3	0	Y 2hr	Y	4			
La Bica Way	250	30	2	2	N	G	25	0	0	Y	Y	4			
Laguna Honda Blvd.	2000	60	2	2	Y (L)	G	25	2	1	Y 4hr	Y	4			
Lanadale Ave.	1300	0	2	2	N	G	25	0	0	Y	Y	4			
Lippard Ave.	600	25	1	2	N	F	25	1	0	Y 4hr	Y	12			
Los Palmos Dr.	4600	45	2	2	N	F	25	0	0	Y	Y	4			
Malta Dr.	1150	0	2	2	Y	G	25	2	0	Y	Y	4			
Mangels Ave.	6150	45	2	2	N	F	25	0	0	Y	Y	6			
Marietta Dr.	3900	35	2	2	N	G	25	2	0	Y	Y	4			
Marne Ave.	1200	50	2	2	N	G	25	1	0	Y	Y	4			
Martha Ave.	800	40	2	2	N	P	25	0	0	Y	Y	6			
Maywood Dr.	1700	30	2	2	N	G	25	2	0	Y	Y	4			
Melrose Ave.	2250	40	2	2	N	F	25	1	0	Y	Y	6			
Mercato Ct.	100	35	2	2	N	G	25	0	0	Y	Y	4			
Merced Ave.	1800	35	2	2	N	G	25	1	0	Y	Y	3	3		
Mira Loma Dr.	2700	40	2	2	Y (1)	G	25	1	1	Y	Y	3			
Molimo Dr.	3150	35	2	2	N	F	25	1	0	Y	Y	4			
Monterey Blvd.	9500	60	2	4	Y	F	30	6	2	Y 2hr	Y	6			
Myra Way	2950	35	2	2	N	F	25	0	0	Y	Y	4			
Nordoff St.	500	45	2	2	N	F	25	0	0	Y	Y	6			
O'Shaughnessy Blvd.	6600	40	2	4	Y	G	25/35	1	1	Y 4hr	Y	4			
Omar Way	500	35	1	1	N	G	25	1	0	Y	Y	4			
Pacheco St.	350	35	2	2	Y (GR)	G	25	1	0	Y	Y	3	3		
Plymouth Way	700	40	2	2	Y	G	25	2	0	Y	Y	4			
Portola Dr.	5200	60	2	4	Y	G	25	1	4	Y 2hr	Y	3	4		
Ravenwood Dr.	550	30	2	2	N	F	25	1	0	Y	Y	4			
Reposa Way	800	30	2	2	N	G	25	1	0	Y	Y	4			
Rex Ave.	300	50	2	2	N	G	25	1	0	Y	Y	4			
Ridgewood Ave.	600	40	2	2	N	F	25	1	0	Y	Y	4			
Rio Ct.	250	35	2	2	N	G	25	0	0	Y	Y	4			
Robin Hood Dr.	1600	0	2	2	N	G	25	0	0	Y	Y	4			
Rockaway Ave.	750	30	2	2	N	G	25	1	0	Y	Y	3			
Rockdale Dr.	1500	30	2	2	N	G	25	0	0	Y	Y	4			
Rockwood Ct.	500	30	2	2	N	G	25	0	0	Y	Y	3			
Rosewood Dr.	800	30	2	2	N	G	25	2	0	Y	Y	4			
San Andreas Way	1150	25	2	2	Y 40	G	25	1	0	Y	Y	3	5		
San Anselmo Ave.	1700	45	2	2	N	G	25	2	0	Y	Y	3	5		
San Buena Ventura	1050	25	2	2	N	G	25	0	0	Y	Y	3	6		GR

South San Fransicso: Site Description

Name	Length (feet)	Width (feet)	Twoway	Number of Lanes	Divided	Condition	Speed Limit	Stop Signs	Stop Lights	Park Att	Sidewalk Yes/no	Sidewalk Width	Sidewalk Set Back	Light	Road Appear
San Felipe Ave.	950	30	2	2	N	G	25	1	0	Y	Y	4			
San Jacinto Way	1700	30	2	2	N	G	25	2	0	Y	Y	4			
San Lorenzo Ave.	850	40	2	2	Y (1)	G	25	2	0	Y	Y	3			
San Pablo Ave.	1750	30	2	2	N	G	25	2	0	Y	Y	3	6		GR
Santa Clara Ave.	2600	40	2	2	Y	G	25	4	1	Y 2hr	Y	4	10		
Santa Monica Ave.	1200	25	2	2	Y	G	25	0	0	Y	Y	3	6		GR
Santa Paula Ave.	1400	45	2	2	N	G	25	2	0	Y	Y	3	5		GR
Sequoia Way	1150	35	2	1	N	G	25	2	0	Y	Y	4			
Sherwood Ct.	200	35	2	2	N	F	25	0	0	Y	Y	4			
St. Elmo Way	1000	40	2	2	N	G	25	2	0	Y	Y	4			
St. Frances Blvd.	550	80	2	2	N	G	25	1	0	Y	Y	3	6		GR
Stanford Heights	800	45	2	2	N	F	25	1	0	Y	Y	4			
Stillings Ave.	1450	40	2	2	N	P	25	0	0	Y	Y	6			
Sydney Way	600	35	2	2	N	G	25	1	0	Y 4hr	Y	4			
Teresita Blvd.	6550	50	2	2	Y (1)	G	25	3	0	Y	Y	6			
Terrace Dr.	700	25	2	2	N	G	25	1	0	Y	Y	3	10		GR
Ulloa St.	4100	35	2	2	N	G	25	5	0	Y 2hr	Y	3			
Valdez Ave.	1000	35	2	2	N	F	25	1	0	Y	Y	4			
Valetta Ct.	300	0	2	2	Y	G	25	0	0	Y	Y	4			
Vasquez Ave.	2050	35	2	2	N	G	25	2	0	Y	Y	3	3		
Verna St.	400	25	2	2	N	G	25	0	0	Y	Y	4			
Vista Verde Ct.	400	35	2	2	N	F	25	0	0	Y	Y	6			
Waithman Way	200	35	2	2	N	P	25	1	0	Y	Y	3			
Woodside Ave.	2200	60	2	4	Y	G	35	0	3	Y 2hr	Y	4			
Yerba Buena Ave.	3550	40	2	2	N	G	25	4	0	Y	Y	4			

Summary of San Jose Site Description

APARTMENTS

There are three (3) apartment complexes in the San Jose study area, with 390 units. All three complexes have more than 100 units each. In each of the other survey sites there is a mix of large and small apartment complexes with small complexes prevailing. All complexes are located together on Branham Drive and the Almaden Expressway along the eastern border of the survey site.

BART

San Jose has no BART service.

BUS SERVICE

This site is served by four (4) bus routes. Buses arrive at approximately 30 minute (ranging from 26 to 39 minutes) intervals from 6:26 a.m. to 10:14 a.m. and 3:53 p.m. to 7:16 p.m. Service intervals during the middle of the day are approximately 60 minutes. Week-end service is provided at sixty (60) minute intervals on some lines and at thirty (30) minute intervals on others.

BUSINESS

This survey area has 96 businesses, including 7 churches. Commercial areas are designated at the northeast and southwest and southeast corners of the survey area and along Branham Boulevard at the southern border of the survey area. Business are concentrated in three (3) of the four (4) corners of the survey area and along a major east/west street.

PARKS

The San Jose survey area has one park, Moore Park, located on Hillsdale and Cherry Boulevards, near the center of the northern site border.

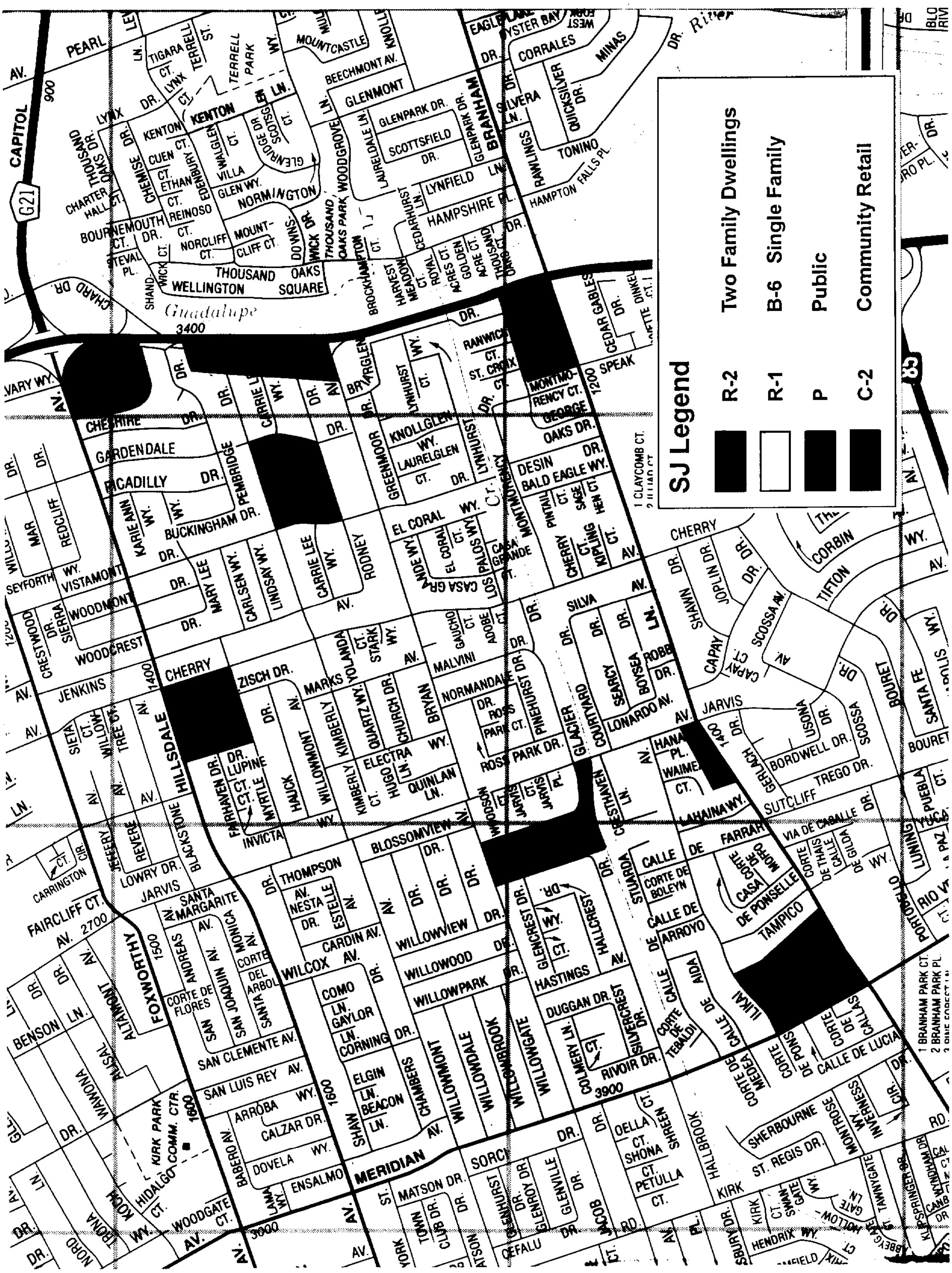
SCHOOLS

There are two elementary schools in the survey area. They are Reed Elementary School on Jacob Avenue which runs through the center western portion of the survey area, and Valley View Elementary School on Kimberly Drive in the northeast quadrant of the survey area. Valley View Elementary school also has a pre-school and daycare center.

SINGLE FAMILY RESIDENCES

This site is predominantly single family residences with a low residential density. The only apartments are concentrated along four (4) blocks near the expressway.

SAN JOSE SURVEY SITE



SJ Legend
R-2 Two Family Dwellings
R-1 B-6 Single Family
P Public
C-2 Community Retail
CAPITOL AV.
PEARL AV.
BRANHAM LN.
THOUSAND OAKS DR.
WELLINGTON SQUARE
Guadalupe
CHERRY AV.
HILLSDALE AV.
FOXWORTHY AV.
MERIDIAN AV.
JARVIS AV.
BLOSSOMVIEW DR.
CHESHIRE DR.
GARDENDALE
PICADILLY DR.
BUCKINGHAM DR.
PEMBRIDGE DR.
ZISCH DR.
MARKS AV.
ROSS PARK DR.
SILVA AV.
SPEAK LN.
LONARDO AV.
WILLOWVIEW DR.
WILLOWOOD DR.
WILLOWPARK DR.
SAN CLEMENTE AV.
SAN LUIS REY AV.
KIRK PARK
HIDALGO COMM. CTR.
RIVOIR DR.
CALLE DE LUCIA
ST. REGIS DR.
SHERBOURNE DR.
TAMPICO
CORBIN
TIFTON
SCOSSA AV.

San Jose: Site Description

Name	Length (feet)	Width (feet)	Twoway	Number of Lanes	Divided	Condition	Speed Limit	Stop Signs	Stop Lights	Park Att	Sidewalk Yes/no	Sidewalk Width	Sidewalk Set Back	Light	Road Appear
Hilladale Ave.	7900	120	Y	6	Y	G	40	0	3	N. side	Y	3	4	Y	G
Newberry Dr.	1150	40	Y	2	N	G	25	1	0	on street	Y	6	4	Y	G
Meridian Ave.	4800	80	Y	4	Y	G	35	0	3	none	Y	3	5	Y	G
Branham Ln.	6850	80	Y	4	Y	G	35	0	5	none	Y	3	5	Y	G
Almaden Rd.	1700	25	Y	2	Y	G	45	0	1	none	Y	3	5	Y	G
Cheshire Dr.	1100	30	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Bryan Ave.	3950	30	Y	2	N	G	25	4	0	on street	Y	3	4	Y	G
Jacob Ave.	2850	30	Y	2	Y	G	30	1	1	on street	Y	3	4	Y	G
Willowpark Dr.	1000	30	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Willowood Dr.	1000	30	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Willowgate Dr.	2000	30	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Willowbrook Dr.	2000	30	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Willowdale Dr.	2000	30	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Willowview Dr.	1150	30	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Willowmont Ave.	4350	30	Y	2	Y	G	25	2	0	on street	Y	3	4	Y	G
Blossomview Dr.	1000	30	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Jarvis Ave.	4250	40	Y	2	Y	G	30	2	2	on street	Y	3	4	Y	G
Chambers Dr.	1550	30	Y	2	N	G	25	0	0	on street	Y	3	4	Y	G
Wilcox Ave.	700	30	Y	2	Y	G	25	2	0	on street	Y	3	4	Y	G
Corning Dr.	650	30	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Ensalmo Ave.	950	30	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Como Ln.	200	30	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Gaylor Ln.	200	30	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Elgin Ln.	200	30	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Beacon Ln.	200	30	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Cardin Ave.	700	30	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Bald Eagle Way	800	30	Y	2	N	G	25	1	0	on street	Y	3	4	Y	G
Pintail Ct.	150	30	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Sagchen Ct.	150	30	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Montmorency Dr.	1900	30	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Cherry Ave.	4400	60	Y	3	Y	G	30	1	2	on street	Y	3	4	Y	G
Kipling Ct.	400	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Cherry Ave.	400	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Los Palos Way	750	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Los Palos Ct.	150	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Casa Grande Ct.	150	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Casa Grande Way	950	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
El Coral Way	900	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
El Coral Ct.	250	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Stark Way	150	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Yolanda Ct.	200	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Gaucho Ct.	200	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Adobe Ct.	150	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Marks Ave.	1100	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G

San Jose: Site Description

Name	Length (feet)	Width (feet)	Twoway	Number of Lanes	Divided	Condition	Speed Limit	Stop Signs	Stop Lights	Park Att	Sidewalk Yes/no	Sidewalk Width	Sidewalk Set Back	Light	Road Appear
Hugo Ln.	300	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Quinlan Ln.	500	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Quartz Way	550	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Kimberly Ct.	300	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Kimberly Dr.	3850	60	Y	2	Y	G	25	2	0	on street	Y	3	4	Y	G
Church Dr.	500	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Fairhaven Dr.	800	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Fairhaven Ct.	150	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Inviota Way	350	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Myrtle Ave.	2000	60	Y	2	Y	G	25	2	0	on street	Y	3	4	Y	G
Lupine Ct.	150	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Overbrook Dr.	550	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Zisch Dr.	500	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Carlson Way	700	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Lindsay Way	700	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Carrie Lee Way	1400	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Rodney Dr.	2250	60	Y	2	Y	G	25	2	0	on street	Y	3	4	Y	G
Woodcrest Dr.	600	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Woodmont Dr.	600	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Vistamont Dr.	3350	60	Y	2	Y	G	25	2	0	on street	Y	3	4	Y	G
Gardendale Dr.	2400	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Picadilly Dr.	1150	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Karie Ann Way	500	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Mary Lee Way	1100	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Jenkins Ave.	1950	60	Y	2	Y	G	25	2	0	on street	Y	3	4	Y	G
Pembridge Dr.	1600	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Pembridge Ct.	650	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Buckingham Dr.	650	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Montmorency Ct.	350	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
George Oaks Dr.	900	60	Y	2	Y	G	25	1	0	on street	Y	4	4	Y	G
Electra Way	1100	60	Y	2	Y	G	25	1	0	on street	Y	4	4	Y	G
Hauck Dr.	1150	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Estelle Ave.	500	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Thompson Ave.	500	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Nesta Dr.	200	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Shaw Dr.	2700	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Woodson Ct.	200	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Jarvis Ct.	200	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Jarvis Pl.	200	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
La Haina Way	650	60	Y	2	Y	G	25	2	0	on street	Y	3	4	Y	G
Waimea Ct.	500	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Hanalei Pl.	150	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Calle de Stuarda	2250	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Corte de Boleyn	200	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G

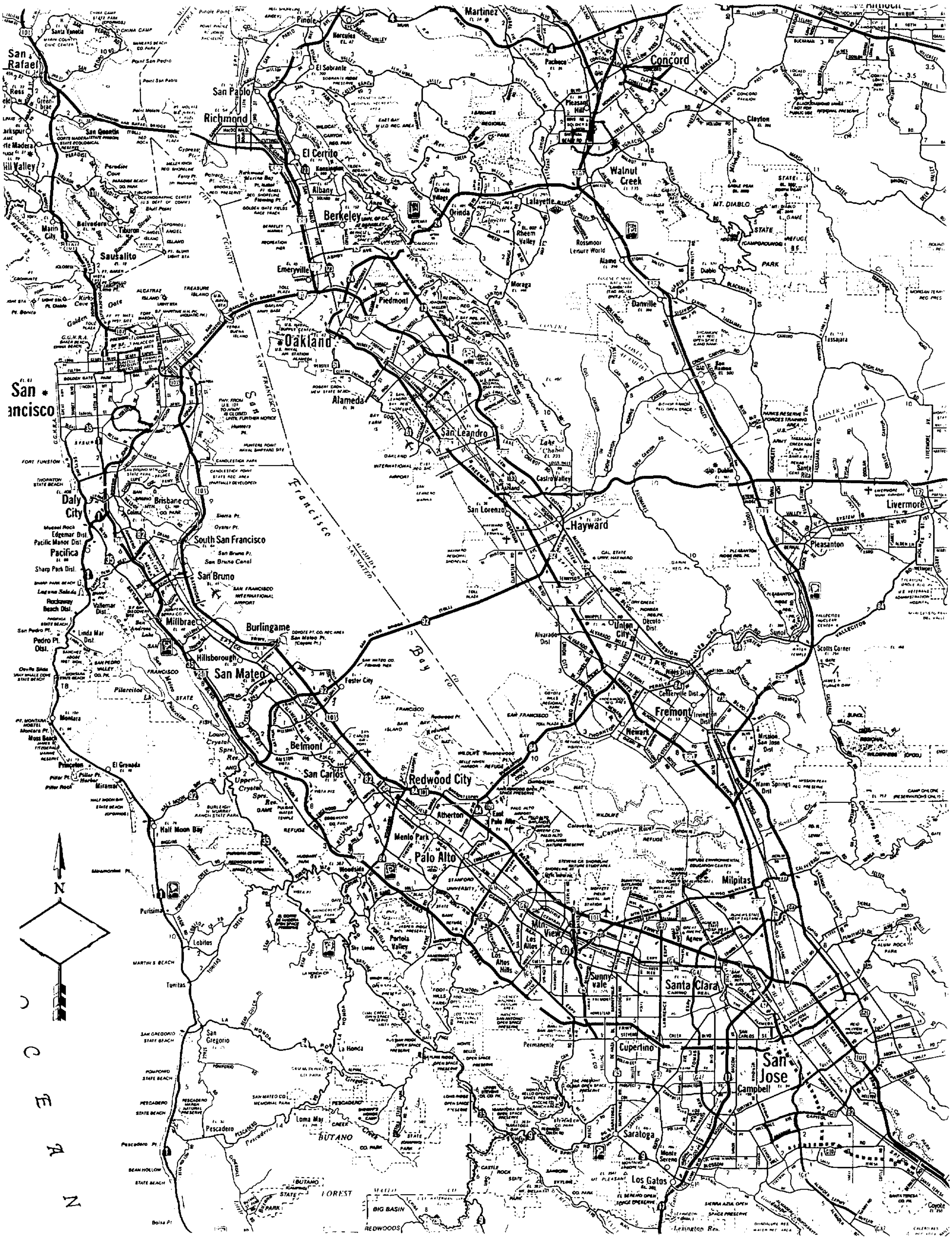
San Jose: Site Description

Name	Length (feet)	Width (feet)	Twoway	Number of Lanes	Divided	Condition	Speed Limit	Stop Signs	Stop Lights	Park Att	Sidewalk Yes/no	Sidewalk Width	Sidewalk Set Back	Light	Road Appear
Calle de Farrar	1150	60	Y	2	Y	G	25	2	0	on street	Y	3	4	Y	G
Calle de Arroyo	400	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Calle de Aida	1200	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Corte de Tebaldi	150	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Calle de Tosca	850	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Tampico	800	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Casa de Ponselle	850	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Corte de Moffo	150	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Hallbrook Dr.	1950	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Reedhurst Ave.	850	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Glencrest Dr.	950	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Glencrest Ct.	150	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Glencrest Way	150	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Hastings Ave.	850	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Hall Crest Dr.	750	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Glenacres Ct.	750	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Ilikai Ave.	2850	60	Y	2	Y	G	25	3	0	on street	Y	3	4	Y	G
Duggan Dr.	600	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Silvercrest Dr.	500	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Colmery Ln.	500	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Colmery Ct.	150	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Rivoir Dr.	600	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Glacier Dr.	2800	60	Y	2	Y	G	25	3	0	on street	Y	3	4	Y	G
Melvini Dr.	950	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Normandale Dr.	650	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Pinehurst Dr.	500	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Ross Park Dr.	1200	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Ross Park Ct.	150	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Courtyard Dr.	1250	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Searcy Dr.	900	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Lonardo Ave.	500	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Boysen Dr.	850	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Robb Ave.	200	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Silva Ave.	750	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Cresthaven Ln.	850	25	Y	2	Y	G	25	1	0	off street	Y	3	4	Y	G
Lizzie Ln.	450	60	Y	2	Y	G	25	1	0	on street	Y	4	4	Y	G
Prosper Ave.	850	60	Y	2	Y	G	25	1	0	on street	Y	4	4	Y	G
Briarglen Dr.	2000	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Greenmoor	950	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Knollglen Way	600	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Laurelglen Ct.	350	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Lynhurst Way	1350	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G
Lynhurst Ct.	350	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Renwick Ct	400	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G

San Jose: Site Description

Name	Length (feet)	Width (feet)	Twoway	Number of Lanes	Divided	Condition	Speed Limit	Stop Signs	Stop Lights	Park Att	Sidewalk Yes/no	Sidewalk Width	Sidewalk Set Back	Light	Road Appear
St. Croix Ct.	400	60	Y	2	Y	G	25	0	0	on street	Y	3	4	Y	G
Desin Dr.	800	60	Y	2	Y	G	25	1	0	on street	Y	3	4	Y	G

RELATIVE LOCATION OF ALL BAY AREA SURVEY SITES



San Rafael
Martinez
Antioch
Pinole
Hercules
Concord
Pacheco
Pleasant Hill
Clayton
San Pablo
Richmond
El Sobrante
El Cerrito
Kensington
Albany
Berkeley
Orinda
Lafayette
Walnut Creek
Rheem Valley
Moraga
MT. DIABLO
Rossmoor Leisure World
Alamo
Danville
Tassajara
Emeryville
Piedmont
Oakland
Alameda
San Leandro
Castro Valley
Lake Chabot
San Lorenzo
Hayward
Dublin
Pleasanton
Livermore
Sunol
Union City
Alvarado Dist.
Decoto Dist.
Fremont
Newark
Irvington Dist.
Centerville Dist.
Mission San Jose Dist.
Warm Springs Dist.
Milpitas
Sausalito
Tiburon
Belvedere
Mill Valley
Corte Madera
Larkspur
Greenbrae
Ross
San Quentin
Mill City
Treasure Island
Alcatraz Island
San Francisco
Daly City
Brisbane
South San Francisco
San Bruno
Pacifica
Millbrae
Burlingame
Hillsborough
San Mateo
Foster City
Belmont
San Carlos
Redwood City
Atherton
Menlo Park
East Palo Alto
Palo Alto
Woodside
Portola Valley
Los Altos
Los Altos Hills
Mtn. View
Sunnyvale
Santa Clara
Agnew
Cupertino
San Jose
Campbell
Saratoga
Monte Sereno
Los Gatos
Coyote
Montara
Moss Beach
Princeton
El Granada
Miramar
Half Moon Bay
Purisima
Lobitos
Tunitas
San Gregorio
La Honda
Pescadero
Loma Mar
Sky Londa
Permanente
San Francisco Bay
BUTANO STATE FOREST
BIG BASIN REDWOODS
N
OCEAN

Institute of Transportation Studies University of California at Davis

Land Use and Travel Behavior

Appendix C: Survey Data Files

Contents:

Davis Survey Data Files

The data files are developed for the phases of the survey or a particular question which requires a separate file. Each phase of the survey focused on one particular segment of the study. Phase-0 is the one-page recruitment questionnaire. Phase-1 is a background questionnaire. Phase-2 is the household questionnaire, and Phase-3 is a Transportation and Urban Life questionnaire. The travel Diary is the fourth survey for the Davis pilot survey. Copies of each survey can be found in Appendix A. In order to maintain confidentiality, address files are not made available. The names of the data files for each survey are listed below. The files are available with supporting documentation.

Davis Phase-0 (Will you participate) data files:	PH0DAVIS.DBF
Davis Phase-1 (Background) data files:	BACKEXT.DBF
Davis Phase-2 (Household) data files:	PH2EXT.DBF
Davis Phase-3 (Individual) data files:	PH3AEXT.DBF, PH3BEXT1.DBF, PH3BEXT2.DBF, PH3CEXT.DBF, PH3DEXT.DBF,
Davis Trip Diary data files:	DAVISTRI.DBF,

Bay Area Survey Data Files

The data files for the Bar Area surveys are developed for the phases of the survey or a particular question which requires a separate file a combined file. Each phase of the survey focused on one particular segment of the study. Phase-0 is the one page recruitment questionnaire. Phase-1 is the household questionnaire. Phase-2 is the individual questionnaire. The travel diary is the fourth survey for the Bay Area survey. Copies of each survey follow. As with the Davis survey, address files are not made available. The names of the data files for each survey are listed below. The files are available with supporting documentation.

Will You Participate	ARBPH0.TXT
Household Questionnaire	PH1EXT.TXT, VEH2.TXT
Personal Travel Diary	TRIP.TXT, FREQTRIP.TXT
Individual Questionnaire	PH2EXT1.TXT, PH2XT2.TXT
Combination file	HOUSE.TXT

Mailing Address Data Base Used for the Bay Area Household Survey and Data Files Summarizing Survey Results

Sample households were selected randomly from each study site based on mailing address. Mailing addresses were collected through a Florida company that provides addresses for marketing uses.

In order to develop a list of residential mailing addresses, carrier route numbers, a post office term for a specific delivery area, were needed because mail marketing firms requested carrier route numbers before furnishing a mailing list. For the Pleasant Hill and Concord sites Carrier Route Information System (CRIS) sheets were obtained by a site-visit to each post office. San Jose mailed the necessary sheets, and the CRIS information for San Francisco had to be obtained through a central Post Office facility in Memphis, Tenn.

Since the Post Office does not release individual addresses, a list of carrier route numbers for each site was developed by using detailed zoning and plot maps in conjunction with the CRIS sheets. Streets falling within each site's boundaries could be matched to a particular carrier route number and the total site-specific carrier route numbers for each of the five Bay Area sites provided the information necessary for a mail marketing firm to generate five residential mailing lists on diskettes.

Data Files

Data from the Personal Travel Diary, Household Questionnaire and Individual Questionnaires was entered using DBASE IV. DBASE was chosen for data entry for several reasons. First, data from DBASE can easily be translated into Word Perfect, ASCII files and various statistical packages. Second, the data entry screen can be customized for ease of data entry. Third, it is commonly available on most IBM and IBM compatible computers and is therefore the most compatible format available.