FINAL REPORT

METHODOLOGY FOR NONWORK TRAVEL ANALYSIS IN SUBURBAN COMMUNITIES

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(The opinions, findings, and conclusions expressed in this report are those of the authors and not necessarily those of the sponsoring agencies.)

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ABSTRACT

The increase in the number of nonwork trips during the past decade has contributed substantially to congestion and to environmental problems. Data collection methodologies, descriptive information, and reliable models of nonwork travel behavior are needed to accurately forecast traffic volumes and to develop and assess policies aimed at alleviating congestion. This study investigated characteristics of the nonwork trip through the development and implementation of a household daily travel survey and through the analysis of the data collected. The accuracy of using self reporting as a method for collecting daily household travel behavior was part of the evaluation and shown to be very effective within the limits of the survey. Results of the survey indicate that the most important factors in predicting household nonwork trip rates are geographic location, household size, household structure and the distribution of household members by gender. Individual nonwork trip rates were most influenced by gender, marital status and employment status. Trip chaining was shown to be a significant travel pattern with the majority of trip chains made on the work to home trip during the evening peak hour. Longer travel times appear to provide incentives to chain trips together, which suggests that increases in other travel costs might have a similar impact and motivate more efficient arrangement of trips. The findings are used to derive cross classification models for nonwork trip generation and are summarized as guidelines for designing travel demand management strategies that reduce nonwork travel.

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INTRODUCTION

The two main categories of trip purposes—work and nonwork—differ greatly in the ease with which they can be modelled for transportation planning purposes. The work trip is less complex to analyze due to its well defined origin and destination, temporal clustering, fixed route, frequency, and length.[1] It is also easier to obtain data on repetitive work trips, so the related forecasting methods are considered to be more reliable than corresponding nonwork modelling techniques. However, the percentage of daily household trips that are nonwork-related is growing, nonwork trips are more frequently being linked with work trips, and greater congestion than can be attributed to work trips is occurring on the weekends and during both weekday peak and non-peak hours. These changes, which have occurred over the last several decades, have forced a re-evaluation of basic modelling assumptions and have generated a need to focus on the contributions of nonwork trips to traffic problems.[2]

The nonwork trip is estimated to account for three-fourths of the total number of household trips taken, and this proportion is projected to increase as suburbanization and lifestyle changes further affect our daily travel behavior.[1] According to the National Personal Transportation Studies, the greatest rate of trip growth between 1977 and 1983 was in the number of nonwork trips, and this growth was strongest during the morning peak.[1] A greater understanding of this trip type is critical to improving forecasting techniques and to developing congestion-reducing strategies. As the need to accurately model and forecast the nonwork trip becomes more critical, the challenges of collecting data on this trip type are becoming evident. Whereas work trips can be estimated based on the population demographics and employment characteristics of an area, the properties of the nonwork trip are a function of many factors including such complex socioeconomic variables as the role of the individual in the household, the family's stage in the lifecycle, and the lifestyle of the household.[3, 4, 5]

Trip chaining, the linking of consecutive trips to visit more than one destination, is an important consideration in nonwork travel analysis that has been represented in an oversimplified

manner in most travel behavior models.[2, 3, 4, 6] That is, it is assumed in the analysis of destination choice that each trip can be examined independently without concern for the interrelationship that may exist among choices for a series of trips.[7] The complexity of this travel pattern makes it difficult to model because of the wide variety of trip types that can be combined and the many variables that influence an individual's likelihood to chain trips together, such as travel cost, travel time, availability of alternatives, and higher densities. A greater understanding of the trip chain will not only improve nonwork trip forecasting, as nonwork trips are generally components of trip chains, but will facilitate the evaluation of various policy changes, such as increased user costs and land use changes, on travel behavior.

As transportation agencies become more concerned with moving people rather than vehicles, the study of average vehicle occupancies gains importance. By broadening knowledge of the relationships between occupancies, household variables and trip purposes decision makers may be better equipped to design policies programs that will facilitate the movement of people, rather than vehicles.

PURPOSE AND SCOPE

The purpose of this project was to analyze nonwork travel. The study encompasses the development of a survey method, analysis of nonwork trip characteristics and development of a forecasting technique based on the data that was collected. The study is limited to a controlled data base from two neighborhoods in Northern Virginia. The study results will provide a methodology for transportation planners to use for considering nonwork trips in the development of multimodal transportation plans.

In order to achieve the purpose, the following objectives were established:

1. Develop an appropriate survey method, field test/administer and evaluate it.

2. Recommend a survey instrument for statewide studies of nonwork travel.

3. Determine the accuracy of self-reporting as a means of collecting daily household trip data.

4. Describe nonwork trips and related travel behavior such as travel times, trip chaining and vehicle occupancy in terms of household and individual socioeconomic characteristics, and geographic location.

5. Show how the study results can be interpreted for forecasting nonwork trips.

METHODS

The study methodology consisted of the development and implementation of a daily household travel survey, and the analysis of the results and recommendations for a procedure to forecast nonwork trips.

Survey Development

The development of an effective survey methodology required determination of the type of data needed, and the format of the instruments used to collect this data. It is known that travel behavior is influenced by the number of household members, and their gender and ages,[8-10] but it has also been suggested that the role of the individual in the household, the stage in the lifecycle, and the lifestyle of the household play a significant part in predicting travel characteristics.[3, 11] Several measures are needed to classify these complex socioeconomic descriptors. Gender, age, and occupation are used to describe the individual's role in the household. The household's stage in the lifecycle is categorized in this study according to the marital status of adult members of the household in conjunction with the age of children at home. Lifestyle attributes are said to influence the time allotment to various activities and were reflected in this study by income and auto ownership. A summary of the type of data needed to be collected is shown in Table 1. Income was divided into the following categories: below 19,999; 20,000-39,999; 40,000-59,999; 60,000-79,999; 80,000-99,999; and over 100,000. Survey participants were asked to describe their family structure as one of the following categories: single adult with child(ren); dual adult with child(ren); couple (no children); single occupant; roommates; or other.

Table 1
TYPES OF DATA COLLECTED

Household	Individual	Trip
income	age	origin, destination
# of licensed drivers	gender	time of departure and arrival
family structure	occupation	purpose
number of members by age	marital status	mode of travel
auto availability		vehicle occupancy

The survey instruments consisted of three components: the cover letter, the household questionnaire and the travel booklet. The cover letter was designed to convey to the respondents that information they furnished would help in reducing congestion in the northern Virginia area. The household questionnaire requests demographic and socioeconomic information. A 16-page booklet format, allowing for 12 trips to be reported, was used to collect the daily travel behavior of household members. It was 8 in. by 4 1/4 in. in size so it could easily be carried in a jacket pocket or purse to facilitate the recording of trips as they were taken, increasing the chance that

the information be recorded accurately. Each booklet included instructions so that household members would have a copy to reference as they completed their forms. The front cover requested traveler characteristics and the next two pages provided brief instructions on completing the daily diary. A separate page was included for recording the information on each trip. The back cover reminded people to send in the forms and provided a space for comments. Copies of the cover letter, the household questionnaire, and the travel log are included in the Appendix to this report.

The most important considerations in developing these instruments of the survey were that: (1) they encourage a high response rate and (2) they be easily understood so as to ensure that the information received was accurate. To achieve these objectives, similar previous surveys were first reviewed. Input was solicited from both professional and clerical staff at the Virginia Transportation Research Council (VTRC)—some with expertise in developing surveys and others with no familiarity. Based on this input, initial survey instruments were developed and a pre-test was conducted by asking 11 VTRC staff members to complete the survey and comment on the exercise. As a result of the input obtained from the pre-test, significant changes were made and the formats of the instruments were finalized.

Administering the Survey

The five steps of administering the household survey consisted of selecting the sample, distributing the survey instrument, calling the potential survey participants, sending reminder postcards, and manually recording on it vehicle movements for sample households.

Two subdivisions in the northern Virginia suburbs of the Washington, D.C. Metropolitan area were chosen for the case study and are indicated in Figure 1. One case study (Herndon) was located outside of the I-495 Capital Beltway, the major circumferential in the area, and another case study (Falls Church) was located inside the Beltway. So that geographic differences could be evaluated, These two areas differ in their proximity to the Washington central business district, and the Falls Church site has better access to mass transit and is in a more fully and densely developed area than the Herndon site. In order to neutralize the influence of income on travel behavior, the subdivisions had homes of similar value. The selected residential areas had only one access point, to facilitate the recording of inward and outward-bound vehicle movement. Survey material was distributed by mail to each household in both subdivisions. These packets contained a questionnaire on household characteristics, six daily travel logs, a postage-paid return envelope, and a cover letter.

Phone calls were made to all potential survey participants on the evening prior to the date they were requested to fill out their travel logs, to determine if the packets had arrived, to answer any questions, and to encourage participation. Follow-up reminder postcards were delivered about 3 days after the survey date.

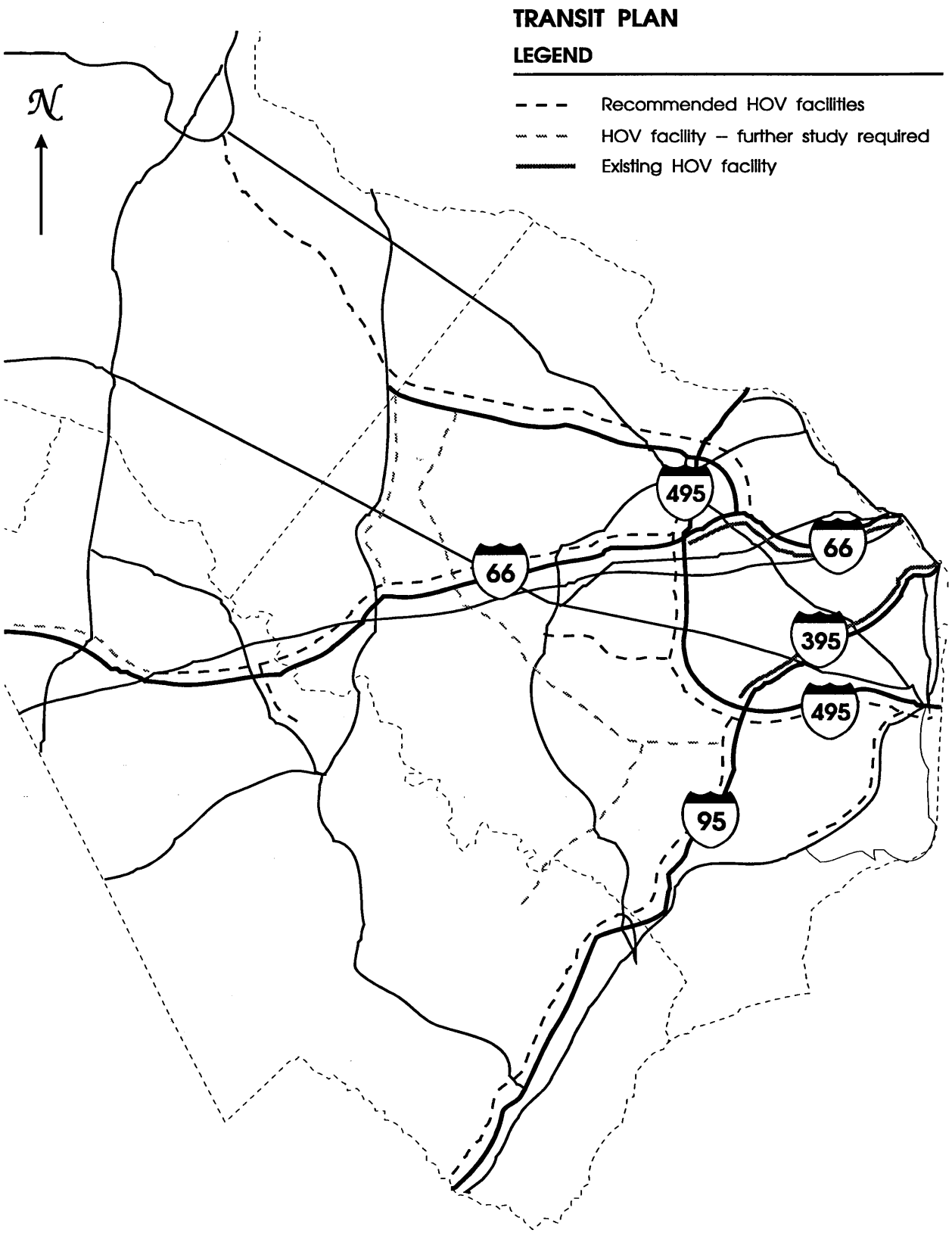

Figure 1. Survey sites located on a map of the Washington metropolitan area.

The final task was to record the license plate numbers and times of all vehicles entering and leaving the subdivision on the date of the survey, between 6:00 am and 8:00 pm. Although trips were taken outside of the data collection period, visibility and available resources limited the verification to this period.

Data Analysis

The survey data was organized into two files for use in the SPSS Statistical Package. The first file contained all information collected on the household questionnaire. The second contained the individual characteristics and daily travel behavior reported in the travel logs. The study sought to analyze the accuracy of self-reporting as a means of collecting home-based travel behavior, and various aspects related to nonwork travel such as the influence of household and individual characteristics, nonwork trip types, travel times, trip chaining and vehicle occupancy.

Survey Response

The rate of response was calculated for the total sample and for both subdivisions. Some discussion and possible explanations for the observed response rates are given.

Accuracy of Self Reporting

This aspect of the analysis required comparison of the data recorded manually in the field throughout the day of the survey with the travel behavior reported by the participants. Personal characteristics of the participants who reported trip behavior inaccurately were compared to those of the whole sample to determine if a common link existed. Characteristics of inaccurately reported trips, such as the time taken, whether they were in or out of the subdivision, and the duration of round trips were also compared to overall trip characteristics to determine if commonalities existed that could be explained or adjusted for in future surveys.

Household and Individual Profile of Sample

The mean value, range and standard deviation of various household characteristics were calculated. The frequencies of other household and individual characteristics were also determined and are displayed.

Nonwork Travel and Household Characteristics

Nonwork trips were defined as those to pursue dropping off and picking up of passengers, shopping, socializing, eating meals out, personal business and returning from these excursions. Work trips included all trips to work or to school and trips back home from both of these locations including stops en route. Household variables that influenced the travel behavior, and a household nonwork trip rate forecasting model were identified by: (1) generating linear regressions between the number of nonwork trips per household and independent variables, (2) generating a correlation matrix to identify possible combinations of variables to use in linear regression, (3) calculating the mean of nonwork trips by non-ratio variables, such as the family structure, income

range and geographic location, to determine which variables had the most influence, and (4) dividing the cases into values of variables where an influence was determined, and conducting additional regressions using ratio variables within these subsets.

A list and description of the household variables considered in the analysis is shown in Table 2. Household travel behavior could only be analyzed for those households where all of the licensed drivers submitted a travel log. This reduced the sample from 170 households to 118.

Table 2
DESCRIPTION OF HOUSEHOLD VARIABLES

Variable	Description
City	Indicates which site - Falls Church or Herndon.
Housenum	Unique sequential number.
Members	Total number of people residing at the household.
NLIC	Number of licensed drivers residing at the household.
Adults	Number of household members age 18 or over.
Children	Number of household members age 17 and under.
Income	Household income bracket. [six categories]
Structure	Relationship between members of the household.
Extended	Presence of extended family members residing in household.
Numextnd	Number of extended family members residing in household.
Vehicles	Total number of vehicles available to members of the household (includes number of cars, trucks, vans, motorcycles and others as indicated).

Nonwork Travel and Individual Characteristics

Characteristics of individual survey participants were collected on the travel log and consisted of the following four variables: Age, Marital Status, Occupation, and Gender. Occupations were classified into the following categories:

Professional
Business Managers/Officials/Proprietors
Clerical and Sales Workers
Technicians
Craftsmen/Foremen
Operatives
Unskilled, service, and domestic workers
Students
Unemployed
Homemaker
Retired
Inconclusive

Examination of the individual or person trip rate did not require that the household survey be complete, and therefore all 360 travel logs received were included in the analysis. The effect of the variables was determined by comparing the mean trip rates. The time distribution of trip making behavior was also compared among the categories of individual characteristics.

Household Nonwork Trips

This analysis involved examining relationships between the types of nonwork trips made and household characteristics. Nonwork trips were classified according to the following trip purposes:

Personal Business
Drop Off/Pick Up Passenger
Social
Meal
Shop
Other

The analysis involved first examining the average trip rates for each trip type based on various descriptive variables. A correlation matrix was developed of the various trip type rates by household socioeconomic characteristics, the data were plotted and single variable regression analysis performed. The whole sample was separated by household structure and linear regression conducted within each category. The whole sample was then again separated by stage in lifecycle categories and linear regression performed within each category.

Travel Times

Travel times were obtained in this study by subtracting the start time from the end time for each trip. Trip durations were then compared by trip purposes and characteristics of the individuals taking the trips.

Trip Chaining

A single stop made on a home based work trip was considered to be chained to the work trip. Two or more stops constituted a trip chain when leaving and returning to the same location. The types of trips that were most commonly included in trip chains and those most commonly linked together were specified. The characteristics of individuals who chain trips and the characteristics of their travel behavior were compared to those of the entire sample to identify those most likely to chain trips and the factors that influence trip chaining.

Vehicle Occupancy

Relationships between vehicle occupancies, work and nonwork trip purposes and individual characteristics were identified.

Utilization of Results

The results of this study are interpreted to show transportation planners ways to utilize them for estimating nonwork travel in their ongoing planning efforts. A survey instrument is provided for obtaining relevant data on nonwork trips for selected sample areas. This is supplemented by indicating different quantitative dimensions of nonwork travel such as relationships with household and individual characteristics, trip chaining, and vehicle occupancy. Example regression and cross classification models are shown as ways to represent the data for planning purposes.

RESULTS AND DISCUSSION

Survey Response

The majority of responses were received within a week of the survey date, with 99 percent arriving within three weeks of the survey. The overall response rate was 50%. A summary of the response rates is shown in Table 3.

Table 3
SUMMARY OF RESPONSES

	Falls Church	Herndon	Total
No. Surveys Sent Out	77	272	349
No. Households Responding	39	135	174
Household Response Rate	51%	50%	50%
No. of Complete Surveys*	27	93	120
Percent of Total Received	(69%)	(69%)	(69%)
Percent of Total Sent Out	(35%)	(34%)	(34%)

*Households from which all licensed drivers responded

All responses were used for individual travel analysis. However, for household travel behavior, only 69% of those received were from households where all licensed drivers responded, thus resulting in a 34% response rate for household travel behavior. An attempt to collect similar travel information in the Boston region achieved a 29.3% response from mailback surveys and a 42% response from telephone surveys.[12] In both of these cases, the sample was recruited, and the percentages cited are those where some type of response was received and not where all members responded. In addition to the effective survey method implemented in the northern Virginia survey, it is likely that the socioeconomic characteristics of the sample contributed to this high

response rate. A high percentage of the individuals surveyed were professionals and business officials, as shown in the disaggregation of the sample by occupation classifications (Table 4).

Table 4
OCCUPATIONAL CLASSIFICATION OF RESPONDENTS

Classifications	Number	% of Total
Professionals	148	41.3
Business Managers, Officials, and Proprietors	69	19.3
Students	39	10.9
Homemakers	32	8.9
Clerical and Sales Workers	23	6.4
Unskilled, Service and Domestic Workers	14	3.9
Retired	8	2.2
Technicians	7	2.0
Craftsmen and Foremen	5	1.4
Unemployed	4	1.1
Inconclusive	9	2.5
Total	358	

Accuracy of Self Reporting

The comparison of researcher-monitored travel behavior with that reported by individuals in their travel logs allowed for three possible outcomes: the number of trips matched, more trips were reported by the motorist than recorded by the research team, or more trips were recorded than actually reported in the travel log. The frequency of occurrence of these outcomes is listed in Table 5.

Table 5
RESULTS OF EVALUATION OF SELF-REPORTING

	Falls Church	Herndon	Total
Number of Vehicles Verified	53	196	249
All Trips Match	38	155	193
(percent of total)	(71.7)	(79.1)	(77.5)
Trips Do Not Match	15	41	56
(percent of total)	(28.3)	(20.9)	(22.5)
Reported fewer trips	9	27	36
Reported more trips	6	140	20

Of the 249 instances in which the vehicle behavior could be verified, all trips matched in over 77% of the cases. This indicates that self-reporting is a relatively accurate method of collecting home-based household travel behavior. It should be noted that only the accuracy of reporting home-based trips is reflected in these results. Steps were not taken to validate the accuracy of all trips reported. Also, trips that originated and ended within the subdivision were assumed to be reported accurately since the vehicle would not have passed the count station and therefore could not be verified. There are several reasons why a trip might be reported inaccurately. Technician error is possible but very unlikely since the traffic flow was moderate throughout the data collection period, and no technician reported any difficulty in recording license plates. Errors may have been introduced if respondents recorded the travel behavior on the wrong day or completed logs several days after the survey and were not able to recount their activities accurately.

Characteristics of Individuals Who Reported Inaccurately

Fifty-six individuals did not report their home-based trips correctly, and this segment of the sample was examined to identify common characteristics that might be used to adjust the results of future surveys to increase their reliability.

The age, sex and occupation of the 36 individuals who recorded fewer trips were compared to the sample. Although age had no effect on an individual's likelihood to report accurately, gender did have an influence. Although the sample had equal representation by gender, twenty-eight females and eight males were included in the group of inaccurately reporting participants. The overrepresentation of females may be attributed to the fact that females in the survey made an average of 0.67 more trips per day than males and an average of 1.65 more nonwork trips. One could surmise that as the number of trips and the variation in trip types increase, there is a greater chance that some will not be reported.

An examination of the occupations of participants who underreported trips revealed that homemakers and retirees were more likely to be inaccurate and professionals were more likely to be accurate. However, homemakers made an average of 0.2 more total trips per day than professionals and an average of 1.64 more nonwork trips, which might create a tendency for trips to go unreported.

Twenty individuals reported taking more trips than were actually recorded. Male representation was significantly higher in this subset, and the age representation was similar to the overall sample. With regard to classifications of occupations, homemakers, clerical workers and retirees were represented slightly more highly in this group, and professionals were slightly underrepresented.

Characteristics of Inaccurately Reported Trips

Fifty three trips were not reported. About 70% of these were return trips, which may be attributed to a misunderstanding of the definition of a trip and an assumption by the participant that it was not necessary to record return trips. Of the seven round trips that were not reported by the participants, six of these lasted 30 minutes or less in duration. These short trips may have been overlooked if participants did not feel the trip was sufficiently significant to warrant recording or

simply forgot the excursion if they completed the travel log much later than when they took the trips.

The time of day in which the non-reported trips were made was also explored. A greater percentage of non-reported trips occurred in the late afternoon, between 2 and 6 pm, than did total trips during this same period. This disproportionate distribution may indicate a tendency for trips not to be reported during this time frame. Three additional explanations for non-reporting during this period were hypothesized:

1. Nonwork trips are less likely to be accurately reported than work trips, and more non-work trips than work trips occurred during this time frame.

2. Individuals are less likely to report return trips and a greater percentage of return trips occurred during this time of day.

3. The individuals who are less likely to report trips accurately - females, homemakers and retirees - take more trips during the 2 - 6 pm period.

Further examination of the data indicated that the combined effect of the above three items was not sufficient to account for the high occurrence of non-reported trips during the late afternoon time frame, and therefore there may be more non-reporting of trips simply due to the time of the day they are taken.

Twenty-three trips were reported by participants and not recorded by technicians. Five round trips account for 10 of these trips, 9 are trips leaving the subdivision, and 4 are trips returning to the subdivision. These additional trips may have been fabricated to emphasize the need for certain transportation improvement projects. But it is also possible that individuals recorded a trip that they usually make so as to provide a "more accurate" representation of their daily behavior, or that they simply did not accurately recall their trips when completing the travel log.

Household and Individual Profile of Sample

Table 6 indicates the mean value, range, and standard deviation of the ratio variables considered in the analysis. Other household and individual variables where a mean could not be computed are described by the frequency in Table 7 and Table 8. As one of the objectives of the research involved detecting travel behavior differences based on geographic locations, neighborhoods were selected that were as similar as possible in order to isolate the distinction in travel behavior caused by the geographic differences. This resulted in household and individual descriptive variables that did not differ much.

Table 6
HOUSEHOLD DESCRIPTIVE VARIABLES

Variable (per Household)	Mean	Standard Deviation	Range
Total Trips	8.74	4.26	0 to 24
Work Trips	3.70	2.32	0 to 12
Nonwork Trips	5.03	3.84	0 to 19
Vehicles	2.12	.59	1 to 4
Members	3.16	1.21	1 to 7
Number of Licensed Drivers	2.01	.46	1 to 4
Number of Females Reporting	1.05	.37	0 to 3
Number of Males Reporting	.97	.39	0 to 2
Number of Children	1.20	1.04	0 to 5
Number of Adults	1.95	.62	0 to 5

Table 7
CHARACTERISTICS OF HOUSEHOLD RESPONDENTS

Variable	Categories				
Household Structure	Dual Adult w/ Children	Couple With No Children	Single Adult w/ Children	Single Occupant	Roommates
Number	68	29	9	5	3
Percent	60.2	25.7	7.96	4.42	1.8
Income	20,000-39,999	40,000-59,999	60,000-79,999	80,000-99,999	Over 100,000
Number	4	15	29	28	23
Percent	3.3	12.5	24.2	23.3	19.2
Geographic Area	Falls Church	Herndon			
Number	27	91			
Percent	22.9	77.1			

Table 8
CHARACTERISTICS OF INDIVIDUAL RESPONDENTS

Variable	Categories						
Occupation	Home-maker	Prof	Mgrs/Off	Student	Service	Clerical	Retired
Number	32	146	70	34	14	22	11
Percent	8.9	40.6	19.4	9.4	3.9	6.1	3.1
Age	≤ 20	21-30	31-40	41-50	51-60	61-70	≥ 70
Number	41	26	123	108	40	12	6
Percent	11.4	7.2	34.1	29.9	11.1	3.3	1.7
Licensed Driver	Yes	No					
Number	327	30					
Percent	90.8	8.3					
Married	Yes	No					
Number	292	64					
Percent	81.1	17.8					
Gender	Female	Male					
Number	180	177					
Percent	50.4	49.6					

Nonwork Travel and Household Characteristics

Linear regressions between the number of nonwork trips per household and several independent variables were first conducted in order to define a model of nonwork travel based on household characteristics. The variables used, the correlation coefficient, and the resulting R squares are listed in Table 9. Considering that an R square of 1.00 represents an ideal fit, it is apparent that these models are not reliable predictors of the nonwork trip rate. The variable with the greatest correlation was the number of members in the household. The best fit was achieved using the number of females in the household. This resulted in an R square of 0.18452, which is considerably lower than that desired and does not demonstrate a reliable model.

Linear regression with multiple variables was conducted to determine if nonwork travel could be more reliably described by using several household characteristics. Table 10 shows the correlation matrix of related variables. Regressions and step-wise regressions were also conducted with those variables having the most influence. No combination of independent variables was found that had an R square greater than that 0.18, which was achieved using the number of females in a single variable linear regression.

Table 9
LINEAR REGRESSIONS WITH ONE VARIABLE

Variable	Correlation	R Squared
Number of Females	.328	.18452
Members in the Household	.385	.14812
Number of Adults	.340	.11568
Number of Licensed Drivers	.275	.07553
Number of Children (under 18)	.255	.06506
Number of Unemployed	.197	.03877
Number of Males	.184	.03368
Number of Vehicles	.145	.02094
Number of Employed	.061	.00377

Table 10
CORRELATION MATRIX OF HOUSEHOLD VARIABLES

	1	2	3	4	5	6	7	8	9
1 NWTS	1.00								
2 LIC	.275	1.00							
3 EMP	.061	.582	1.00						
4 MALES	.184	.742	.455	1.00					
5 FEMS	.328	.594	.287	.012	1.00				
6 CHILD	.255	.105	-.031	.016	.155	1.00			
7 MEMBS	.385	.753	.194	.310	.399	.864	1.00		
8 VEHS	.145	.686	.525	.543	.294	-.020	.228	1.00	
9 ADULTS	.340	.725	.437	.588	.534	.054	.550	.486	1.00

Since the number of females had a high correlation with the number of members, the percentage of females in the household was computed and used in a regression with the number of members. The percentage of females only had meaning when the gender of all members in the household was known, so was only computed for those 52 households in which all members submitted travel logs. The correlation coefficient between the percentage of females and number of members was -.1592. Use of both of these variables did not improve the model from that found through single variable regression. Using this smaller sample, a regression was also conducted using the number of males and number of females in the household, which had a correlation coefficient of 0.1440. The resulting R square of .33563 indicates that the breakdown of males and

females in the household is a better predictor of the number of nonwork trips within the limited sample than simply using the number of members.

The final step in the analysis was to divide the entire sample into subsets based on those variables with the most influence and perform additional regressions within those subsets in order to find a reliable model. The mean of nonwork trips was determined for each category of variables in order to determine likely subsets. Table 11 shows these results. Those variables with the most influence include the location, family structure, presence of a homemaker and presence of children in the household. Within these subsets, additional regressions were conducted using the number of children, number of members and number of vehicles. The only breakdown which did prove somewhat fruitful was the division by geographic location. Within the sample from Herndon, a regression conducted with the number of members in the household resulted in an R square of 0.208, which is greater than that achieved with the whole sample. Unfortunately, this same variable did not have as good a predictive ability within the Falls Church sample.

Table 11
NONWORK TRIPS / HOUSEHOLD FOR SOCIOECONOMIC CHARACTERISTICS

Variable	Value	Daily Nonwork Trips/HH	Cases	Std. Dev.
All Households		5.03	117	3.84
City: Falls Church		6.00	27	3.92
Herndon		4.73	90	3.79
Income	20,000-39,999	5.50	4	3.79
	40,000-59,999	5.33	15	4.35
	60,000-79,999	4.96	27	3.22
	80,000-99,999	5.04	28	3.34
	Over 100,000	4.70	23	4.56
	Didn't Report	5.20	20	4.42
Structure	Single Adult w/kids	4.67	8	4.42
	Dual Adult w/kids	5.75	67	2.07
	Single Occupant	2.80	7	3.90
	Couple No Kids	3.79	29	1.98
Presence of Homemaker	Yes	5.81	26	2.83
	No	4.80	91	4.08
Presence of Children	Yes	5.75	75	4.06
	No	3.74	42	3.06

Although a reliable model for the household nonwork trip rate was not produced, the results do provide valuable information on the influence of household characteristics on nonwork travel behavior. The variables that have the most influence on the number of nonwork trips taken in a household are the geographic location, household structure, household size, and the distribution of household members by gender. The presence of a homemaker and the presence of children in a household also increased the number of nonwork trips taken.

Nonwork Travel and Individual Characteristics

The characteristics unique to the individual survey respondent included gender, marital status, occupation, and age.

Females in this survey made an average of 2.97 nonwork trips per day, 81% more than the males, who averaged 1.64 nonwork trips. The distribution of these trip types by the time of day is shown in Figure 2. Both males and females make the greatest percent of their nonwork trips during the evening peak hours, from 5 pm to 7 pm. For males, the second most frequent occurrence of nonwork trips is around 11 am. Females' nonwork trips are somewhat more evenly distributed throughout the day than those made by males. This more even distribution may be partially due to the greater number of female than male homemakers in the survey who make nonwork trips throughout the day.

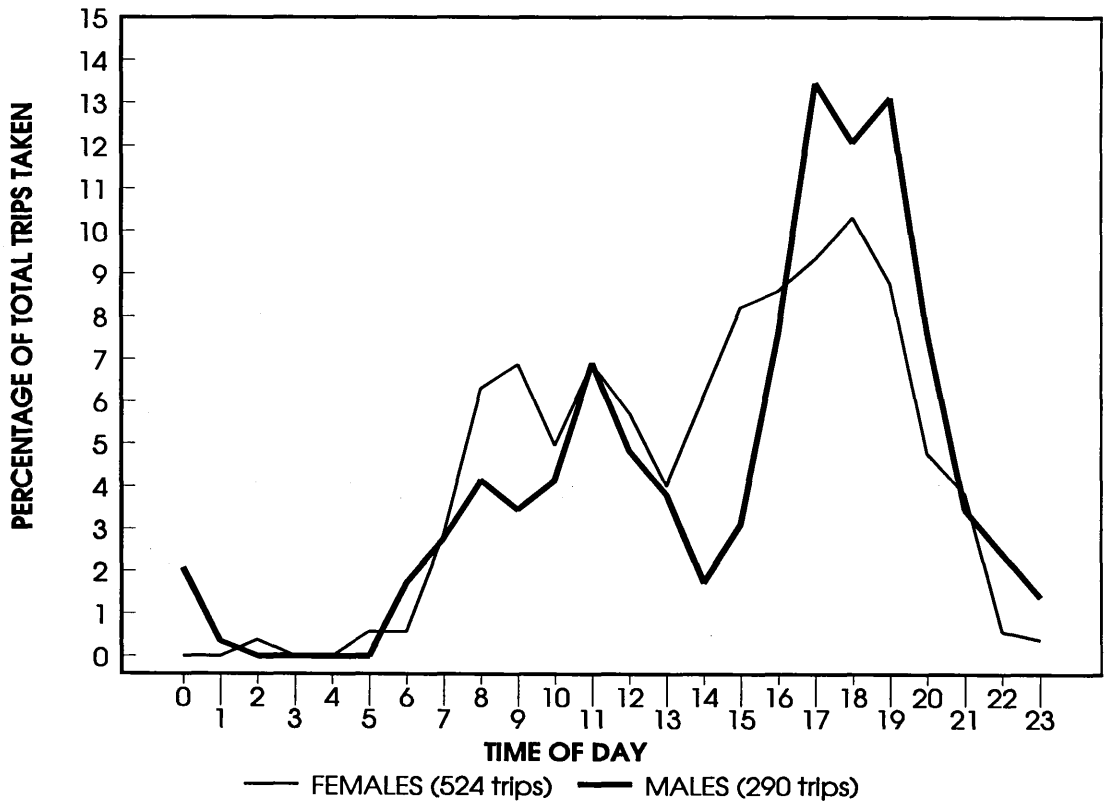

Figure 2. Percentage of nonwork trips by time of day by gender.

Married individuals make an average of 0.22 more nonwork trips than those who are not married. But the distinction of being married affects the trip rate of genders differently. Whereas the rate for females is about the same for both marital statuses, unmarried males make about 27% fewer trips than those who are married.

The time distribution of nonwork trips also differs by marital status. Figures 3 and 4 show the temporal distribution for males and females by marital status. Married and unmarried males have similarly-shaped distributions, with the three peak trip periods in the morning, mid-day and evening. The distribution of unmarried males is shifted about 2 hours later in the day. The peaks in the distribution of nonwork trips by married and unmarried females were similar, but unmarried females had much more distinct peaks than did married females. Since 94% of the unmarried females are employed outside of the home, their nonwork trips are probably more constrained by a work schedule to morning, mid-day and evening periods. Also, few unmarried individuals participating in the survey had children and therefore would not have trip-making demands due to children throughout the day.

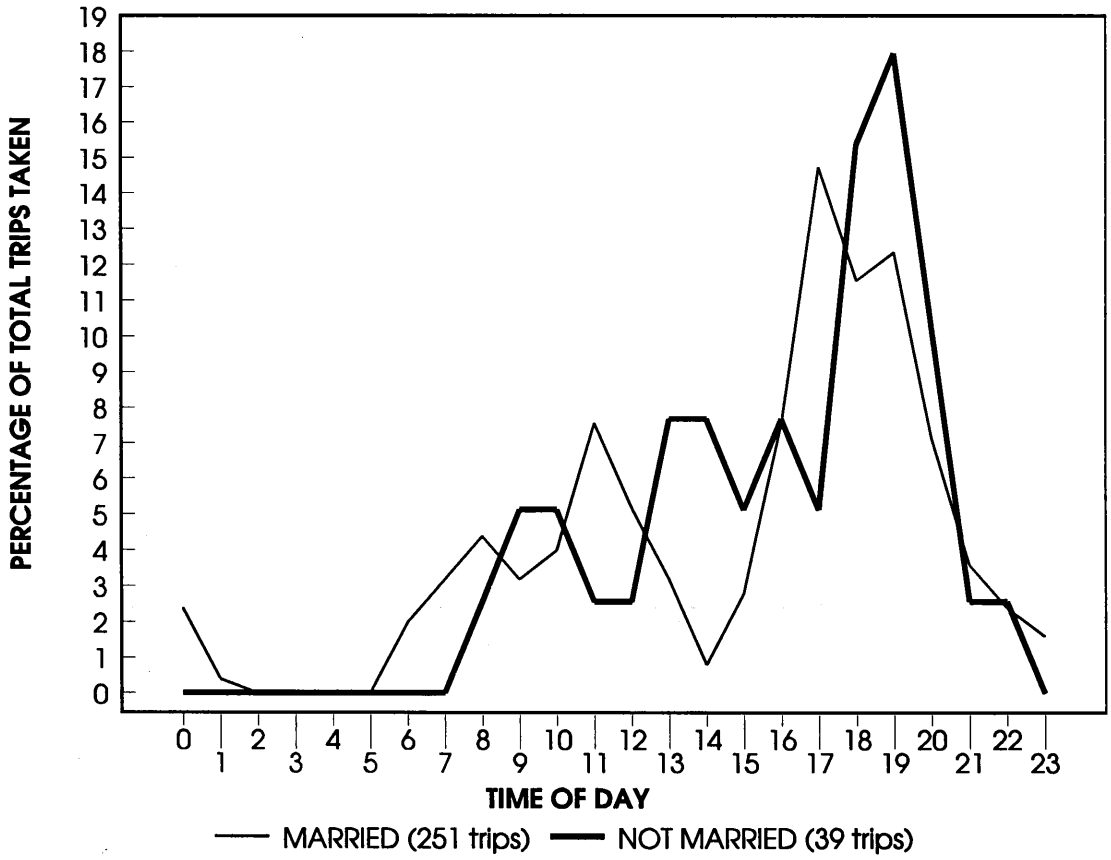

Figure 3. Percentage of nonwork trips by time of day for males.

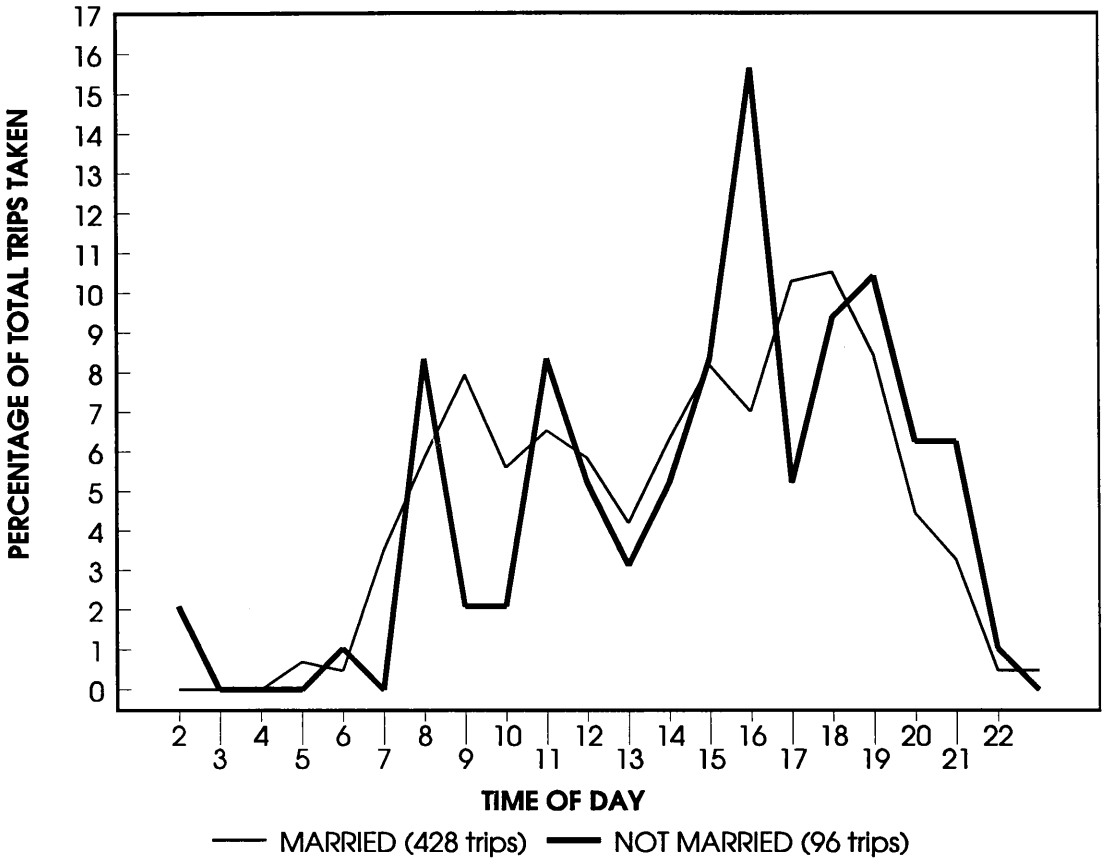

Figure 4. Percentage of nonwork trips by time of day for females.

The average number of nonwork person trips is displayed for each occupation classification in Figure 5. Of all occupations included in the survey, homemakers have the highest average nonwork trip rate. The time distribution of nonwork trips by employed and unemployed individuals are displayed in Figures 6 and 7. As can be expected, those who are employed make most of their nonwork trips at three distinct times of the day: early in the morning, at lunch time and in the evening. Trip making behavior by unemployed individuals is more erratic, with more trips taken earlier in the day than by those who are employed.

Nonwork trip rates divided by gender and marital status are displayed in Table 12 for employed and unemployed individuals. In all cases, the unemployed individuals make more nonwork trips than the employed. The average number of nonwork trips increased with age and is highest for the 31-40 age group. The number of trips then dropped for the 41-50 age bracket and remained approximately constant for the remainder of the age groups represented. These trends can be seen in Figure 8. The peak of nonwork trips at the 31-40 age group may be partially attributed to the fact that this age bracket also has the highest average number of children, at 1.65 per household.

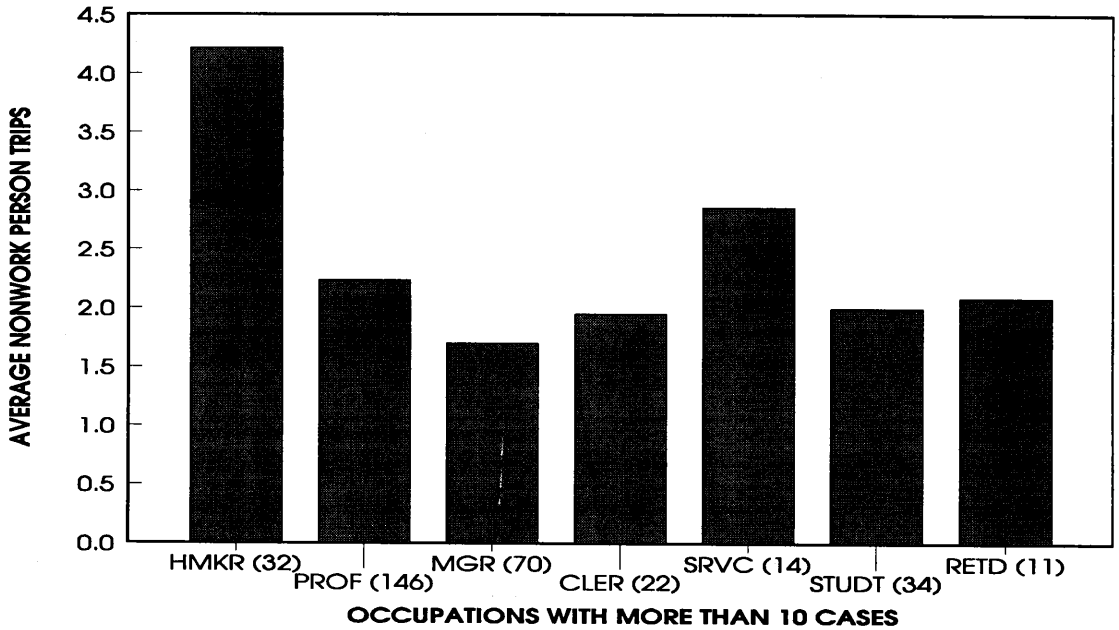

Figure 5. Average nonwork trips by occupation (number of cases is annotated).

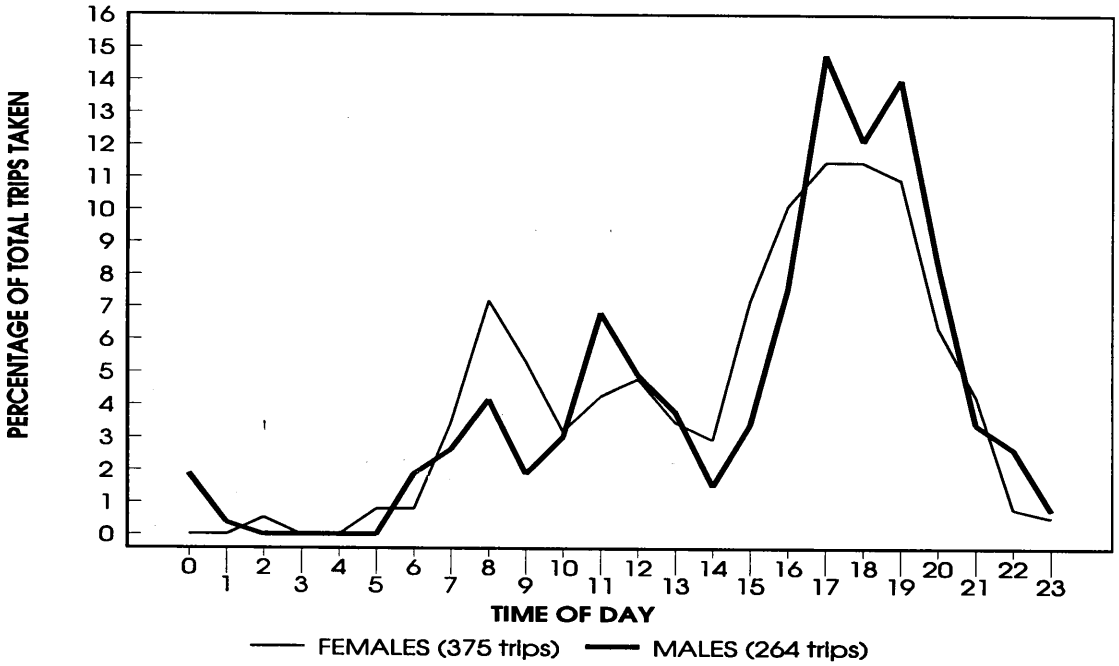

Figure 6. Percentage of nonwork trips by time of day for employed by gender.

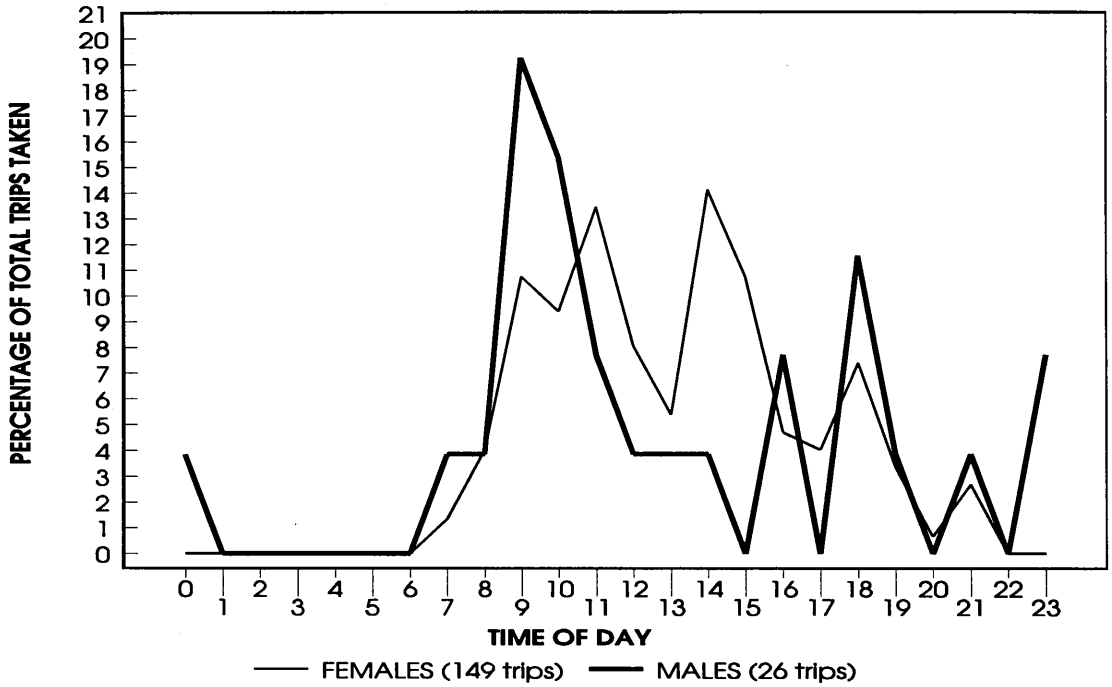

Figure 7. Percentage of nonwork trips by time of day for unemployed by gender.

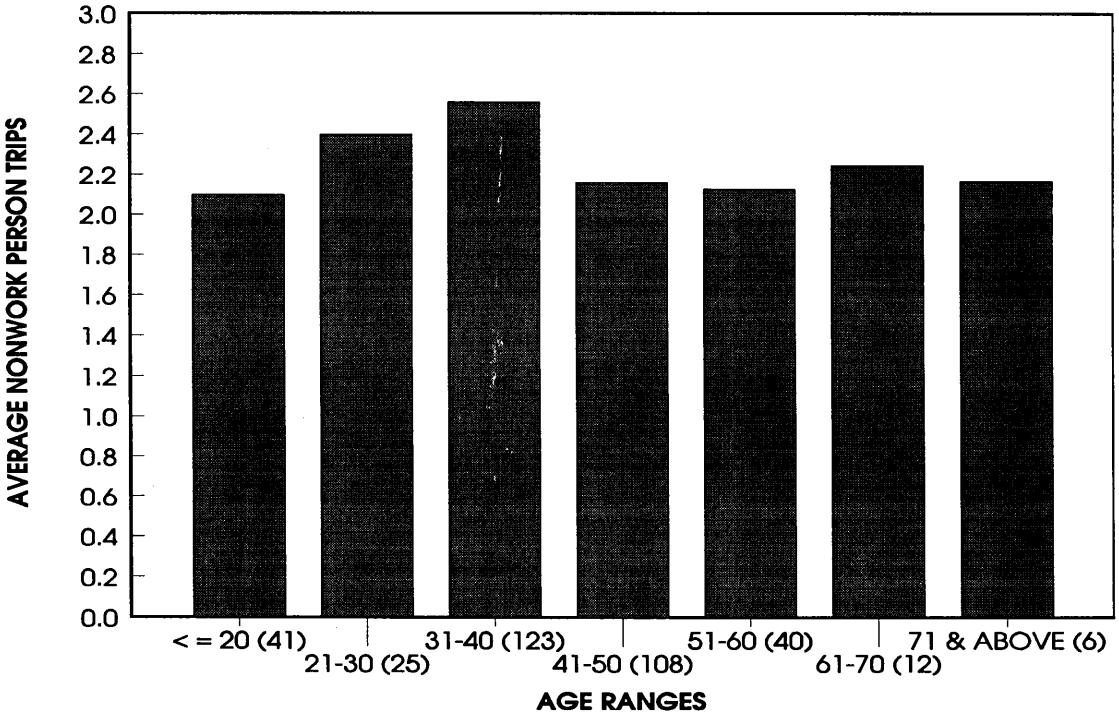

Figure 8. Average nonwork trips by age.

Table 12
AVERAGE NONWORK TRIPS PER DAY FOR EMPLOYED AND UNEMPLOYED

		Male	Female
Employed	Married	1.71	2.96
	Single	0.96	2.55
Unemployed	Married	2.00	3.83
	Single	2.29	4.00

Household Nonwork Trips

Nonwork trips were divided into specific types in hopes of defining ways to predict trip rates for the various trip types and to describe nonwork trip types in terms of household characteristics. Single variable regression with the whole sample and with subsets by household variables did not result in a reliable method to predict any trip rates of nonwork trip purposes. Factors contributing to this include the small sample and relatively few trips of each type. The data indicate some definite trends in trip behavior that can be described by household variables. The following paragraphs discuss the results of the analysis and Table 13 displays the trends by showing the average trip rate for each trip type by household variable.

Table 13
AVERAGE DAILY HOUSEHOLD NONWORK TRIP RATES

Variable	Value	NW	Daily Household Nonwork Trip Rate by Trip Purpose				
			Drop	Social	Meal	Shop	P Bus
Total Trips		411	102	28	43	92	143
Mean for all HHs		5.03	.834	.214	.364	.745	1.16
Location	Fall Church	6.00	1.190	.407	.185	.889	.963
	Herndon	4.73	.733	.156	.400	.700	1.220
Members	1	1.60	0	0	0	.600	0.400
	2	3.75	0.330	.139	.194	.583	1.190
	3	5.40	1.050	.300	.400	.600	.800
	4	5.73	1.110	.250	.364	.841	1.320
	5	5.25	.750	.375	.750	.625	1.130
Number of Females	0	3.00	0	0	.250	.250	1.00
	1	4.80	.837	.221	.308	.712	1.10
	2	7.25	.875	.250	1.000	.750	2.00
	3	19.00	4.000	0	0	6.000	2.00

Table 13
AVERAGE DAILY HOUSEHOLD NONWORK TRIP RATES

Variable	Value	NW	Daily Household Nonwork Trip Rate by Trip Purpose				
			Drop	Social	Meal	Shop	P Bus
Number of Males	0	3.64	1.000	.273	.182	.455	.636
	1	5.01	.798	.222	.394	.727	1.170
	2	7.43	1.140	0	0	1.430	1.860
Children	0	3.74	.262	.119	.262	.667	1.170
	1	5.75	1.100	.200	.400	.550	1.100
	2	5.75	1.170	.278	.375	.875	1.230
	3	4.17	.667	.500	.333	.667	.500
Adults	1	3.00	.900	.200	.100	.300	.500
	2	4.11	.840	.225	.309	.766	1.190
	3	6.29	.714	0	1.290	.571	1.570
	4	6.00	1.000	0	0	1.000	3.000
	5	19.00	4.000	0	0	6.000	2.000
Homemaker	Yes	5.80	.731	.462	.346	.714	1.62
	No	4.80	.868	.143	.352	.846	1.03
Drivers	1	3.27	.818	.182	.182	.364	.636
	2	4.85	.811	.263	3.260	.737	1.120
	3	9.11	1.220	0	.889	1.330	2.110
	4	4.50	.500	.500	0	.500	2.000
Structure	C	3.79	.276	.172	.276	.690	1.170
	D	5.75	1.070	.250	.456	.779	1.250
	SA	4.67	1.110	.333	.111	.222	1.000
	SO	2.80	.200	0	.200	.800	.800
Income	2	5.50	.250	.250	.250	.750	2.00
	4	5.33	1.270	.133	.133	.800	1.27
	6	4.93	.704	.407	.259	.593	1.15
	8	5.04	.750	.071	.464	.786	1.04
	10	4.70	1.000	.130	.435	.900	1.04
Vehicles	1	3.42	.917	.167	.167	.417	.583
	2	5.02	.927	.232	.281	.768	1.150
	3	6.00	.476	.191	.714	.810	1.520
	4	4.50	.500	0	.500	1.000	1.500
Lifecycle Couples	18-29	1.00	0	0	0	0	1.000
	30-49	2.82	.182	.091	0	.636	.910
	50-65	5.86	.500	.286	.429	1.000	1.790
	65+	1.50	0	0	.250	.500	0
Parents w/ Kids' Ages:	≤ 6	5.46	1.270	.231	.269	1.000	.731
	7-11	5.73	1.000	.367	.467	.700	1.370
	12-17	5.00	1.210	.143	.286	.571	.929
Singles:	18+	8.13	1.000	.125	.875	.625	2.500
	30-49	0	0	0	0	0	0
	50-65	2.00	0	0	0	1.000	0
	65+	3.00	0	0	0	1.000	1.000

Drop-Off or Pick-Up Trips

More of these trip types occurred in Falls Church than at the more suburban Herndon site. This may largely be attributed to the Falls Church metro station, which was the destination of several drop-off trips. An examination of the household structure reveals that the number of drop-off trips generally increased as the number of members, females, and adults increased. Also, households with fewer than 3 vehicles tended to make more trips of this nature. As the vehicles available per person increased, a general decrease in the number of drop-off trips was observed.

Social Trips

Social trips represented only 4.5% of all nonwork trips taken on this weekday. The average number of social trips is much greater in Falls Church than in Herndon, and households with homemakers make more of these trips than those without. The structure has a definite influence on the number of trips, with single occupant households taking no social trips and single parents taking the highest average number of trips at 0.333.

Meal Trips

Meal trip rates are higher in Herndon than in Falls Church, which is likely attributable to a greater percentage of working parents and longer travel times, affording less time to prepare meals. This trip type generally increased with the number of household members, which might be expected if households went out for meals together and all members submitted travel logs. However, meal trips per person also showed a general increase as the size of the household increased. Households with adult children had a high number of meal trips. Couples in the 50-65 age bracket make up the next largest category of this trip type.

This is the only category of trips where a relationship with household income is seen. Households with income in the highest two brackets (80,000 to 100,000+) make more meal trips than those reporting lower incomes.

Shopping Trips

More shopping trips were taken in Falls Church than in Herndon, but the division was more equal than for other trip types. The number of shopping trips did not vary considerably with the number of members. Shopping trips increased with the number of vehicles in the household and with the number of females and of males. The 50-65 age group had the greatest share of the shopping trips in both the couples and single occupant categories.

Personal Business Trips

The average number of personal business trips increased with the number of males, females, and generally with the number of adults in the household. The presence of a homemaker also results in a higher trip rate. Parents with adult children represent the greatest trip takers in this category with parents who have children under 11 also making more trips than average. Couples in the 50-65 age bracket also reported a lot of personal business trips.

Travel Time Spent Pursuing Activities

The average amount of time spent pursuing a range of nonwork trip types is shown in Table 14. Two sets of data are shown. The first set includes all cases, and the second set, labeled "MISSING CASES EXCLUDED," includes only those cases for which some time was spent pursuing the activity listed.

In this sample, the average time spent pursuing work trips is greater than that spent pursuing nonwork trips. Although the number of nonwork trips has been reported to exceed the number of work trips at a ratio of 3:1,[1] longer work travel times are probably a result of people living further from their places of employment, or of congestion during peak hours when most work trips occur. The standard deviations are all large, indicating little conformity. Although there is relatively little difference in the time spent pursuing the categories of nonwork trips, more time is spent on personal business and drop off/pick up trips than on the others. This might indicate the role of location in making a shopping or meal trip in contrast to personal business trips where the choice of a doctor, bank or child care center is less dependent on its proximity to the residence.

Table 15 lists the average time spent pursuing various trip types based on socioeconomic descriptors. Only cases that included the trip type listed were used in the computation of averages.

For all trips, the time spent pursuing activities is greater for those living in Herndon than in Falls Church. This may be a result of the closer proximity of amenities to the Falls Church residents than to the Herndon residents. Despite the lower time spent pursuing nonwork activities, the nonwork trip rate in Falls Church is greater. If the reason that trip rates are greater in Falls Church is due to the proximity of conveniences, this may be an important factor in evaluating the impact of multi-purpose activity centers. The proximity of facilities may reduce the vehicle miles travelled, but will not have a directly proportionate impact on congestion if the number of trips taken grows.

Table 14
AVERAGE TOTAL TRAVEL TIME SPENT PURSUING TRIPS
(Time in Minutes)

Trip Types	Total Sample Population		Missing Cases Excluded	
	Mean	Std Dev	Mean	Std Dev
Travel time to and from:				
Work/work Related	51.59	54.73	64.35	54.00
All Nonwork Trips	36.32	40.75	59.09	82.93
Travel time to pursue:				
Personal Business	8.72	18.00	24.92	22.89
Drop Off/pick Up	5.74	15.11	23.49	22.81
Social Activities	1.61	8.64	19.30	23.92
Shopping	4.83	9.98	16.50	12.21
Meals	2.24	10.04	17.50	23.06

Table 15
AVERAGE TRAVEL TIME BY TRIP TYPES BY VARIOUS DESCRIPTORS

Variable	Value	Average Travel Time (in Minutes) by Trip Type Categorized by Socioeconomic and Location Characteristics						
		Work	Non Work	Pers Busn	DO /PU	Socl	Shop	Meal
Number of Cases		283	238	126	88	30	105	46
Total Sample Population		64.4	53.3	25.5	23.5	19.3	16.5	17.5
City	Falls Church	53.5	49.2	22.1	18.2	12.1	16.0	10.0
	Herndon	66.9	54.4	25.7	25.3	25.6	16.7	18.6
Gender	Female	50.3	56.2	25.0	21.3	20.5	16.4	16.0
	Male	76.0	49.4	24.8	29.6	13.2	16.9	15.5
Married	No	56.8	46.0	17.5	15.2	19.5	18.5	12.6
	Yes	66.4	54.7	26.4	25.1	19.2	16.2	16.8
Age Bracket	0 -16	33.3	37.2	19.0	7.75	10.0	15.0	15.0
	17-25	73.6	50.2	11.6	26.0	18.7	21.0	13.0
	26-30	69.7	45.0	19.5	35.3		22.2	15.0
	31-35	56.2	55.2	18.5	21.2	30.3	16.5	8.57
	36-40	70.2	50.0	32.0	20.3	10.0	11.1	26.0
	41-45	76.4	64.5	34.5	31.9	16.5	16.1	14.3
	46-50	62.1	49.7	33.1	25.1	5.0	20.6	7.5
	51-55	79.5	54.3	27.0	11.7	25.5	20.2	8.3
	56-60	44.5	40.2	13.2			25.6	13.3
	61-65	63.8	61.0	18.4	8.0		8.0	6.0
	65 & over	50.0	28.7	18.7	25.0		13.8	
Occupation	Homemaker	14.5	63.2	26.2	20.6	26.6	18.7	13.3
	Employed	68.7	51.6	26.9	23.7	18.9	15.5	16.4
	Students	46.0	43.2	16.2	20.1	9.2	13.7	12.3
	Retired	20.0	41.0	13.2			12.0	
	Unemployed		85.0	45.0			48.3	

Gender strongly influences the time spent pursuing both work and nonwork trips, with males spending much more time on work, and females more time on nonwork trips. Males also spend more time dropping off and picking up passengers and females spend more time pursuing social activities. Overall, married people spend more time travelling. Shopping is the only trip type where single individuals have greater travel times than married individuals. Survey participants under the age of 17 had shorter work and nonwork travel times. Since school selection is based on proximity of residential location, this is a likely result. With regard to occupation, it is

not surprising that those who were employed spent more time pursuing work trips and nonwork travel times were greater for homemakers and unemployed.

Trip Chaining

This section addresses the various characteristics and types of trip chains. Included is a discussion about when they are most likely to occur, the types of trips likely to be chained together, and the characteristics of individuals who chain trips.

Trip Chain Characteristics

Table 16 shows the number of times various trip purposes are chained together regardless of origin and destination. The table is set up as a matrix with each combination listed once. As one stop made on the way to or from work constitutes a trip chain, these "single stops" are also represented in a separate row.

Table 16
FREQUENCY OF TRIP PURPOSES LINKED TOGETHER FOR ALL CHAINED TRIPS

	Total Trips by Purpose				
	Drop Off/ Pick Up	Shop	Social	Meal	Personal Business
Single Stop	36	23	6	4	22
Drop Off/Pick Up	13	16	3	2	27
Shopping		12	5	4	22
Social			6	0	5
Meal				2	10
Personal Business					33

Dropping off and picking up passengers is the most common trip purpose that is chained. Personal business and shopping trips are common purposes of trip chains. The most common combinations of trip purposes are personal business with shopping or with dropping off and picking up passengers, and two personal business trips.

All trip chains were categorized based on four possible origin-destination combinations: work to home, home to home, home to work and work to work. The number of trips in this sample linked for each classification is shown in Table 17.

Table 17
NUMBER OF TRIP CHAINS BY ORIGIN AND DESTINATION CLASSIFICATION

Number of Trips Chained	Work to Home	Home to Home	Home to Work	Work to Work	Total	Percent of Total
1	59	38	36	7	140	69.3
2	17	16	6	0	39	19.3
3	8	4	4	1	17	8.4
4	0	1	1	1	3	1.5
5	0	2	0	0	2	0.9
8	0	1	0	0	1	0.5
Total	84	62	47	9	202	
Percent of Total	41.6	30.7	23.3	4.5		

The greatest number of trip chains, representing almost 42 percent of the total, occurred on the work to home trip. An individual generally has fewer schedule constraints when returning from work than on the way to work, allowing the flexibility to make a stop. The demands that need to be met on the way home, such as picking up groceries for dinner, probably contribute to this large occurrence.

The types of trips linked together and the frequency of stops for each origin and destination category were examined. Trip chains made on the way home from work typically consist of one stop, and the three most common purposes fulfilled are shopping, personal business and dropping off or picking up passengers. These three purposes are those most frequently combined into multi-stop trip chains.

For chains that begin and end at the home, personal business trips are most frequently linked with dropping off or picking up passengers and with shopping trips.

The majority of trip chains made on the way to work or school consist of just one stop. Dropping off and picking up passengers is the most frequent trip purpose fulfilled. Car-pooling, and dropping children off at day-care and at school, are likely reasons for this high occurrence. These trips, which are more mandatory in nature since they are necessary to fulfill the travel needs of other household members, are more common than discretionary stops due to the time constraints that most individuals are under when travelling from home to work or school.

Very few trip chains are made by individuals who leave and return to work. Of those that are made, personal business trips are the most common linked with other personal business and dropping off and picking up passengers.

Characteristics of Trip Chainers

Factors that have been shown to influence travel behavior include the time and cost of travel, the transportation network, the location, availability and attributes of various attractions, and socioeconomic characteristics. This aspect of the analysis examines the influence of this last factor on the likelihood of chaining trips.

Socioeconomic characteristics of those who chain trips were compared to those in the entire sample. Less than half of the respondents linked trips, and the age, marital status and geographic location of an individual had a negligible influence on the likelihood of trip chaining. Gender and occupation classifications were the only two variables that had an impact on the likelihood of trip chaining. These results are shown in Table 18. More women than men chained trips, partially explained by the fact that women reported making a greater number of total and nonwork trips, frequently components of trip chains. Occupation does not show a significant influence, although employed individuals show a slight tendency to chain trips less frequently, and homemakers are more prone to trip chaining. Since homemakers have a significantly higher nonwork trip rate than all other occupation classifications, they have more opportunities to chain trips together.

Respondents who reported chaining trips together also made more trips than the total sample. Those results are summarized in Table 19. The greater the number of trips taken, the greater the likelihood of chaining trips, as the chance that needs will coincide in space and time increases. The average number of trips taken by those who chain trips is higher in Falls Church than in Herndon. The difference between the trip rates of those who trip chain and the total sample is higher in Falls Church. This suggests that in Falls Church the number of trips taken influences an individual's propensity to chain trips, more so than in Herndon. Even though in Herndon the average number of trips is lower, the time spent pursuing both work and nonwork trips is higher than in Falls Church. It is conceivable that in Herndon the low land use densities create greater travel times, which is sufficient to encourage trip chaining even though the individual might be taking fewer trips.

The difference between the number of trips taken by males who trip chain and the number of trips taken by the total sample is greater than that for women. This may indicate that the number of trips must reach a certain amount before trip chaining is invoked and many more females reached that point than did males.

Vehicle Occupancy

Vehicle occupancies were reported by travellers on the travel logs for each trip taken, and the analysis was divided into two segments: by trip purpose, and by socioeconomic characteristics.

Table 18
CHARACTERISTICS OF TRIP CHAINERS AND THE TOTAL SAMPLE

	Make Up of Trip Chainers		
	Number	% of Trip Chainers	% of Total Sample
Total	158	100.0	43.9
Gender			
Female	99	62.3	50.4
Male	59	37.1	49.6
Occupation Classification			
Homemaker	24	15.1	8.9
Employed	117	73.6	75.5
Children	1	0.6	1.4
Students	13	8.2	9.4
Retired	4	2.5	3.1

Table 19
AVERAGE PERSON TRIP RATE OF TRIP CHAINERS AND THE TOTAL SAMPLE

	Average Number of Daily Trips	
	Trip Chainers	Total Sample
Total Population	5.52	4.24
Falls Church	6.15	4.70
Herndon	5.34	4.11
Females	5.68	4.57
Males	5.29	3.90

A summary of vehicle occupancies for various trip purposes is shown in Table 20. The average vehicle occupancy for nonwork trips was 0.53 people higher than for work trips. The three nonwork trip purposes with the highest vehicle occupancies are droping off and picking up passengers, social and meal trips. These trips might benefit from a local network of high occupancy vehicle lanes, but it is not likely drivers taking trips with such short average durations would use a freeway HOV system. Work trips with the longest duration, that would likely occur on a freeway, also had the lowest vehicle occupancies. Vehicle occupancies on school trips are considerably higher than those to work, which raises the average occupancy of the general category of work trips.

Table 21 lists average vehicle occupancies for various groups. Female drivers on average have 0.32 more occupants in their vehicles than males. This is expected, since vehicle occupan-

cies are higher for nonwork trips, and females make more nonwork trips. Higher vehicle occupancies in Herndon were unexpected, as more nonwork trips were reported in Falls Church. However, many more work trips taken in Herndon with much lower occupancies reduced the overall average. It is unexpected that single individuals have higher average vehicle occupancies than married people. Since married people tend to have bigger households than single individuals and take an average of 0.13 more nonwork trips, this finding was not expected. However, married people also take an average of 0.13 more work trips, and these have substantially lower vehicle occupancies.

Vehicle occupancies increased with age until they peaked at the 31-40 age bracket and then began to decline. The same trend was observed in the nonwork trip rates. Probably the higher vehicle occupancies in nonwork trips contributes to the trend of decreased vehicle occupancies with age that is seen in Table 22.

As shown in Table 23, homemakers recorded the highest vehicle occupancies of all occupation classifications. It is not surprising as they also recorded the highest number of nonwork trips and belong to larger households with higher average numbers of children. The other two occupations that have high vehicle occupancies, unskilled/service and student, contain individuals who are both notably younger than those in other classifications.

Table 20
AVERAGE VEHICLE OCCUPANCY BY TRIP PURPOSE

	Average Vehicle Occupancy	Total Occupancy For All Trips	Number of Trips Represented
Work	1.21	456	376
School	2.49	117	47
Home From Work	1.30	253	195
Total Work	1.34	826	618
DO/PU	2.31	309	134
Shop	1.71	217	127
Social	2.43	85	35
Meal	2.36	111	46
Personal Bus	1.53	273	179
Home FROM NW	1.80	501	278
Total Nonwork	1.87	1496	799

Table 21
AVERAGE VEHICLE OCCUPANCIES BY SOCIOECONOMIC CHARACTERISTICS

	Average Vehicle Occupancies	
Gender of Driver	Male 1.28	Female 1.60
Site Location	Falls Church 1.39	Herndon 1.45
Marital Status	Married 1.42	Single 1.54

Table 22
AVERAGE VEHICLE OCCUPANCIES BY AGE RANGE

Vehicle Occupancies by Age	
≤ 20	1.72
21 - 30	1.41
31 - 40	1.54
41 - 50	1.32
51 - 60	1.28
61 - 70	.98
71 & above	1.46

Table 23
AVERAGE VEHICLE OCCUPANCIES BY OCCUPATIONS
REPRESENTED BY MORE THAN 10 CASES

Vehicle Occupancies by Occupations			
Occupation	Vehicle Occupancy	Avg NW trips	Average Age
Homemaker	1.87	4.22	41.22
Professional	1.40	2.24	41.31
Managers/Officials	1.20	1.70	42.86
Clerical	1.13	1.95	41.91
Unskilled/Srvc	1.59	2.86	30.57
Students	1.55	2.00	12.36
Retired	1.06	2.09	68.09

UTILIZATION OF RESULTS FOR TRANSPORTATION PLANNING

This study confirmed that the nonwork trip is complex to model. Model development requires a large sample with many descriptive variables. The information collected and the analysis conducted in this report provide valuable insight into model development, and the findings provide a basis for proposing nonwork trip generation forecasting models. As an example, a cross-classification model was generated based on those variables shown to have the most influence on the household nonwork trip rate. Tables 24 through 26 show these results. This modelling method, which is consistent with currently used forecasting techniques, can be applied in suburban communities with similar characteristics to those in the survey. The tables can also be used to validate or compare to other modelling techniques, such as those presented in NCHRP 187.

Table 24
NONWORK TRIP GENERATION BY HOUSEHOLD STRUCTURE

Variable	Value	Average Nonwork Trips Per Day Per Household			
		Single Adult w/ Kids	Dual Adult W/ Kids	Couple	Single
All Participants		4.63	5.78	3.79	3.29
City	Falls Church	5.75	6.92	6.57	2.67
	Herndon	3.80	5.50	2.91	3.00
Homemaker	Yes	—	6.21	5.50	4.50
	No	4.67	5.57	3.52	1.67
Income	20,000 - 39,999	8.00	—	4.00	6.00
	40,000 - 59,999	5.00	4.00	5.00	—
	60,000 - 79,999	4.00	5.63	3.00	0.00
	80,000 - 99,999	4.00	6.27	3.40	—
	Over 100,000	2.00	5.38	4.38	—
Vehicles	1	3.67	5.00	—	2.80
	2	7.00	5.42	3.87	—
	3	6.00	7.15	3.60	—
	4	—	6.00	3.00	—
No. of Children under 17	0			3.79	2.80
	1	4.75	6.00	—	—
	2	4.25	5.63	—	—
	3	—	4.17	—	—
	5	—	15.0	—	—
Ages:	No Children	—	—	3.74	2.80
	0-17 only	4.00	5.88	—	—
	17 & up only	—	6.67	—	—
	both categories	—	12.33	—	—

Table 25
NONWORK TRIP GENERATION BY NUMBER OF MALES
AND NUMBER OF FEMALES REPORTING

	Average Nonwork Trips Per Day Per Household					
Females	>	0	1	2	3	Total
Males	0	—	3.40	6.00	—	3.64
	1	2.50	4.89	7.67	—	5.01
	2	3.50	6.67	6.00	19.00	7.43
	Total	3.00	4.80	7.25	19.00	

Table 26
NONWORK TRIP GENERATION BY LOCATION, NUMBER OF VEHICLES,
AND NUMBER OF MEMBERS

	Average Nonwork Trips Per Day Per Household							
Members	1 Vehicle		2 Vehicles		3 Vehicles		4 Vehicles	
	FC	Herndon	FC	Herndon	FC	Herndon	FC	Herndon
1	2.67	0.00	—	4.49			—	
2	—	3.67	6.29	2.42	5.50	5.00	3.00	
3	4.50	2.00	8.00	5.30		5.00		
4	5.0 0		8.60	5.24	4.50	6.17		6.00
5	—			2.60	6.00	11.50		
7	—			17.00				
Total	3.6 7	3.17	7.40	4.70	5.2 0	6.25	3.00	6.00

CONCLUSIONS

Specific conclusions derived from the results of this study were divided into categories that correspond to those used in the results and discussion section of this report.

Survey Method:

1. A high response rate was achieved when this survey method was implemented. Development steps that proved most beneficial included the testing of instruments and input from those outside transportation and research fields. Personal telephone contact with the potential respondents was a positive reinforcement and an effective reminder as is evidenced by

the response rate and commentary received from participants. Based on participant response, improvement in survey instructions is warranted.

2. Self reporting was a 75% accurate method of collecting home-based daily household travel behavior in suburban communities similar to those surveyed in this research.

3. The time of day that a trip is taken influences a person's likelihood of underreporting trips, with trips taken between 2 and 6 pm less likely to be reported than those taken at other times of the day.

Nonwork Travel and Household Characteristics

4. The average daily household nonwork trip rate for this sample was 5.03. Nonwork travel was influenced by the geographic location, household structure, household size and distribution of household members by gender. The presence of a homemaker increased the household nonwork trip rate.

Nonwork Travel and Individual Characteristics

5. The individual nonwork trip rate was 2.32 trips per day, and was most influenced by gender, marital status and employment status. Females, married individuals and those who are not employed outside the home had the highest nonwork trip rates.

Household Nonwork Trips

6. Personal business and dropping off and picking up passengers were the most frequently reported types of nonwork trips.

7. The number of drop off and pick up trips increases as the number of vehicles available for each member of the household decreases and is higher in households with children. The average number of meal trips was higher in households that were in the higher income brackets.

Travel Time

8. A reduction in travel time may not result in a proportionate reduction in congestion, as with less time spent travelling, more trips are made. This finding highlights the importance of implementing disincentives to automobile usage, such as road pricing or additional gas taxes.

9. More travel time is spent on work trips than on nonwork trips. Of the specific nonwork types that were examined, more travel time is spent pursuing personal business, and drop off and pick up trips than any other purpose.

10. The factors that have the greatest influence on the travel times are the geographic location, gender and marital status.

Trip Chaining

11. Trip chaining is a significant travel pattern, particularly on one leg of a work trip. As the cost or time of travel increases, more trip chaining can be expected as incentives are created. Decreases will be seen in the home-based other trips and increases in the non-home based trips with additional trip chaining.

12. The majority of trip chains are taken on the work to home trip and the most frequently chained trip purposes are personal business, dropping off and picking up passengers and shopping.

13. Trip chainers are typically women, employed, and make a greater number of trips than the average survey participant.

14. These findings on trip chaining can be interpreted to formulate improved forecasting techniques.

Vehicle Occupancy

15. Vehicle occupancies are higher for nonwork trip purposes than for work purposes, and the three nonwork trip purposes that had the highest vehicle occupancies were dropping off and picking up passengers, social and meal trips.

16. Vehicle occupancies are highest for younger drivers, for female drivers, for homemakers, for unmarried individuals and for residents in Herndon.

17. The above conclusions can be used to help define appropriate demand management strategies for congested areas.

RECOMMENDATIONS

1. The final format of the household questionnaire and the travel log used in this survey is recommended for areas with similar characteristics to those surveyed, with the following minor modifications:

    a. A sample booklet completed for one day's trips should be included in each packet distributed to a household.

    b. Packets should include more detailed instructions for recording of trip chains, return trips, nonwork trips, multi-modal trips, and multi-purpose trips. This is particularly important for surveys that are conducted where the sample includes a significant portion of individuals with a low educational level.

2. Cross-classification Tables 24-26 can be used for predicting trip rates in neighborhoods with similar characteristics to the two surveyed in this study. Deviations in the neighborhood under study would require that adjustments be made to this trip rate. Similar tables for other neighborhoods should be developed.

3. Since the average number of nonwork trips exceeds the work trip for both households and individuals, engineers and planners who are looking for ways to reduce congestion, decrease energy consumption and improve air quality should give proper emphasis to the nonwork trip. Also, since nonwork trips are usually discretionary, they may be easier to control than work travel as they are more sensitive to changes in travel costs, such as time and out-of-pocket costs.

4. In order to reduce miles travelled and encourage trip chaining, mixed use development should be an important consideration in future planning and zoning controls. Important components of these mixed use developments are employment centers, day-care facilities, and shopping establishments.

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APPENDIX A. SURVEY INSTRUMENTS

COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION
3975 FAIR RIDGE DRIVE
FAIRFAX, VA 22033

RAY D. PETHTEL
COMMISSIONER

CLAUDE D. GARVER, JR.
DISTRICT ADMINISTRATOR

April 13, 1992

Frances and Medford Shealy
or Current Residents
13163 Ruby Lace Court
Herndon VA 22071

Dear Resident:

All of us who drive in the Northern Virginia area are aware that traffic congestion is a major problem. One way in which we at the Virginia Department of Transportation are trying to ease future congestion is to improve our planning techniques. I am writing to ask for your help.

Did you ever find yourself in the midst of a traffic jam and wonder where all the people were going? We are conducting a survey to help answer that question. If we can determine a relationship between household characteristics and the travel behavior of families in Fairfax, we can more accurately predict traffic volumes on our local highways. Prior studies have concentrated on the home to work trip and, although we are interested in this trip type, we hope that our study will provide insight into other types of trips as well.

I have enclosed a questionnaire and several travel logs that will help us categorize your household and the way you make trips. I am asking that on Wednesday, April 22, 1992, each member of your household record in the travel log each vehicle trip taken that day. We are sending this questionnaire out to many area households, and all responses will remain confidential. Your household will not be identifiable in our study, and the results will be used for planning and research purposes only.

I sincerely appreciate your participation in this survey. The effort you take to provide accurate information is invaluable to us, and you can be assured that it will be used to enhance transportation planning in Northern Virginia. I have included a postage-paid return envelope for the questionnaire and travel logs. Also included are instructions for completing the logs. However, if you have any questions, don't hesitate to call me at (703) 934-0604. Thank you again for your time and assistance.

Sincerely,

Farid Bigdeli

Farid Bigdeli
Northern Virginia
Transportation Planner

PBL:jk

Enclosures

VIRGINIA DEPARTMENT OF TRANSPORTATION
DAILY HOUSEHOLD TRAVEL PATTERN SURVEY

1. Circle the category that best characterizes your household:

single occupant

roommates, non-related

couple, no children

single-adult with children

dual-adult with children

other_____

2. Total Household Income: (please circle one) optional

Less than $20,000

$20,000 - $39,999

$40,000 - $59,999

$60,000 - $79,999

$80,000 - $99,999

$100,000 or above

3. Do extended family members over 18 currently live with you?

Y or N (please circle one)

4. If yes, how many?_____

5. Please list the number of household members in each of the following age categories:

_____ under 6 years _____ 6 - 11 years

_____ 12 - 17 years _____ 18 - 29 years

_____ 30 - 49 years _____ 50 - 65 years

_____ over 65 years

6. The number of licensed drivers in your household is:_____

7. Please list the number of vehicles in each category available to members of your household for daily use:

_____ Passenger Cars _____ Van or Mini-Vans

_____ Pick-up Trucks _____ Motorcycles

_____ Other, please specify _____

SAMPLE TRAVEL LOG

ONE-DAY TRAVEL LOG
WEDNESDAY, April 22, 1992

TRAVELER CHARACTERISTICS:

ARE YOU ☐ MALE ☐ FEMALE?	WHAT IS YOUR AGE? ____
ARE YOU A LICENSED DRIVER? ☐ Yes ☐ No	
ARE YOU MARRIED (OR LIVING WITH SOMEONE TO WHOM YOU HAVE A SIMILAR RELATIONSHIP)? ☐ Yes ☐ No	
WHAT IS YOUR OCCUPATION? _____ (Please be specific)	

TO COMPLETE YOUR LOG,
simply record *each* trip you make throughout the day and answer the specific questions regarding that trip. Whether you're off to work or stopping for coffee at your favorite convenience store, we're interested in *all* the trips you make.

YOU ARE ONE OF THE FEW PERSONS CHOSEN TO HELP US UNDERSTAND THE TRAVEL PATTERNS IN THE NORTHERN VIRGINIA REGION. PLEASE FILL IN THIS TRAVEL LOG AND RETURN!

HOW TO RECORD A TRIP IN YOUR TRAVEL LOG

First, write down where you're going and the address. If you don't know the address, write down the closest intersecting streets.

Then, record the time that you begin the trip and when you arrive.

Specify the purpose of your trip by circling one of those suggested or writing in one that is not listed.

Specify what method of travel was used to reach your destination. If a car or truck was used, tell us the number of occupants, including the driver. Let us know if you used one that was not mentioned or a combination of methods.

Finally, if you used a personal car or truck, please let us know the license plate number.

ANY QUESTIONS, FEEL FREE TO CALL THE VDOT NORTHERN VIRGINIA PLANNING DEPARTMENT AT 934–0604.

EXAMPLE TRIP

TRAVEL LOG FOR WEDNESDAY, April 22, 1992

MY FIRST TRIP BEGINS AT HOME. WORK. OTHER. (circle one)

ADDRESS 140 University Dr., Fairfax

MY FIRST DESTINATION:
7-11, Main + Oak Sts.
Fairfax
(Name and address or closest intersecting streets)

MY FIRST TRIP STARTS AT	I REACH MY DESTINATION AT
7:00 am / pm	7:10 am / pm

THE PURPOSE OF MY TRIP: (please circle one)

RETURN HOME	SCHOOL
WORK/WORK RELATED	SOCIAL
PERSONAL BUSINESS	MEAL
DROP OFF/PICK UP PASSENGER	SHOP
OTHER ____	

THE METHOD OF TRAVEL I USE TO REACH MY DESTINATION: (please circle one)

DRIVER OF A CAR OR TRUCK (# OF OCCUPANTS IS 2)	
PASSENGER IN A CAR OR TRUCK (# OF OCCUPANTS IS ___)	
SCHOOL BUS	BICYCLE
TRANSIT BUS	TAXI
OTHER (please specify) ____	WALK
COMBINATION OF THESE METHODS (please list) ____	

IF HOUSEHOLD VEHICLE WAS USED, PLEASE PROVIDE THE LICENSE PLATE NUMBER: NLF-123

BEGIN BY RECORDING YOU FIRST TRIP ON THE NEXT PAGE.

TRAVEL LOG FOR WEDNESDAY, April 22, 1992

HOME.
MY FIRST TRIP BEGINS AT WORK. (circle one)
OTHER.

ADDRESS _____

MY FIRST DESTINATION:

_____

_____

(Name and address or closest intersecting streets)

MY FIRST TRIP STARTS AT	I REACH MY DESTINATION AT
am ____:____ pm	am ____:____ pm

THE PURPOSE OF MY TRIP: (please circle one)

RETURN HOME
WORK/WORK RELATED
PERSONAL BUSINESS
DROP OFF/PICK UP PASSENGER
SCHOOL
SOCIAL
MEAL
SHOP
OTHER _____

THE METHOD OF TRAVEL I USE TO REACH MY DESTINATION:
(please circle one)

DRIVER OF A CAR OR TRUCK (# OF OCCUPANTS IS ____)
PASSENGER IN A CAR OR TRUCK (# OF OCCUPANTS IS ____)
SCHOOL BUS
TRANSIT BUS
OTHER (please specify) _____
BICYCLE
TAXI
WALK
COMBINATION OF THESE METHODS (please list) _____

_____

IF HOUSEHOLD VEHICLE WAS USED, PLEASE PROVIDE THE LICENSE PLATE NUMBER: _____

TRAVEL LOG FOR WEDNESDAY, April 22, 1992

MY SECOND TRIP DESTINATION:

_____

_____

(Name and address or closest intersecting streets)

MY FIRST TRIP STARTS AT	I REACH MY DESTINATION AT
am ____:____ pm	am ____:____ pm

THE PURPOSE OF MY TRIP: (please circle one)

RETURN HOME
WORK/WORK RELATED
PERSONAL BUSINESS
DROP OFF/PICK UP PASSENGER
SCHOOL
SOCIAL
MEAL
SHOP
OTHER _____

THE METHOD OF TRAVEL I USE TO REACH MY DESTINATION:
(please circle one)

DRIVER OF A CAR OR TRUCK (# OF OCCUPANTS IS ____)
PASSENGER IN A CAR OR TRUCK (# OF OCCUPANTS IS ____)
SCHOOL BUS
TRANSIT BUS
OTHER (please specify) _____
BICYCLE
TAXI
WALK
COMBINATION OF THESE METHODS (please list) _____

_____

IF HOUSEHOLD VEHICLE WAS USED, PLEASE PROVIDE THE LICENSE PLATE NUMBER: _____

Please turn the page to record your next trip. If you will not make any more trips today, turn to the back cover.

TRAVEL LOG FOR WEDNESDAY, April 22, 1992

MY THIRD TRIP DESTINATION:

_____

_____

(Name and address or closest intersecting streets)

MY FIRST TRIP STARTS AT	I REACH MY DESTINATION AT
____:____ am pm	____:____ am pm

THE PURPOSE OF MY TRIP: (please circle one)

RETURN HOME
WORK/WORK RELATED
PERSONAL BUSINESS
DROP OFF/PICK UP PASSENGER
SCHOOL
SOCIAL
MEAL
SHOP
OTHER _____

THE METHOD OF TRAVEL I USE TO REACH MY DESTINATION: (please circle one)

DRIVER OF A CAR OR TRUCK (# OF OCCUPANTS IS ____)
PASSENGER IN A CAR OR TRUCK (# OF OCCUPANTS IS ____)
SCHOOL BUS
TRANSIT BUS
OTHER (please specify) _____
COMBINATION OF THESE METHODS (please list) _____
BICYCLE
TAXI
WALK

IF HOUSEHOLD VEHICLE WAS USED, PLEASE PROVIDE THE LICENSE PLATE NUMBER: _____

Please turn the page to record your next trip. If you will not make any more trips today, turn to the back cover.

TRAVEL LOG FOR WEDNESDAY, April 22, 1992

MY FOURTH TRIP DESTINATION:

_____

_____

(Name and address or closest intersecting streets)

MY FIRST TRIP STARTS AT	I REACH MY DESTINATION AT
____:____ am pm	____:____ am pm

THE PURPOSE OF MY TRIP: (please circle one)

RETURN HOME
WORK/WORK RELATED
PERSONAL BUSINESS
DROP OFF/PICK UP PASSENGER
SCHOOL
SOCIAL
MEAL
SHOP
OTHER _____

THE METHOD OF TRAVEL I USE TO REACH MY DESTINATION: (please circle one)

DRIVER OF A CAR OR TRUCK (# OF OCCUPANTS IS ____)
PASSENGER IN A CAR OR TRUCK (# OF OCCUPANTS IS ____)
SCHOOL BUS
TRANSIT BUS
OTHER (please specify) _____
COMBINATION OF THESE METHODS (please list) _____
BICYCLE
TAXI
WALK

IF HOUSEHOLD VEHICLE WAS USED, PLEASE PROVIDE THE LICENSE PLATE NUMBER: _____

Please turn the page to record your next trip. If you will not make any more trips today, turn to the back cover.

MY FIFTH TRIP DESTINATION:

_____

_____

(Name and address or closest intersecting streets)

MY FIRST TRIP STARTS AT	I REACH MY DESTINATION AT
____:____ am pm	____:____ am pm

THE PURPOSE OF MY TRIP: (please circle one)

RETURN HOME
WORK/WORK RELATED
PERSONAL BUSINESS
DROP OFF/PICK UP PASSENGER
OTHER _____
SCHOOL
SOCIAL
MEAL
SHOP

THE METHOD OF TRAVEL I USE TO REACH MY DESTINATION: (please circle one)

DRIVER OF A CAR OR TRUCK (# OF OCCUPANTS IS ____)
PASSENGER IN A CAR OR TRUCK (# OF OCCUPANTS IS ____)
SCHOOL BUS
TRANSIT BUS
OTHER (please specify) _____
COMBINATION OF THESE METHODS (please list) _____
BICYCLE
TAXI
WALK

IF HOUSEHOLD VEHICLE WAS USED, PLEASE PROVIDE THE LICENSE PLATE NUMBER: _____

Please turn the page to record your next trip. If you will not make any more trips today, turn to the back cover.

MY SIXTH TRIP DESTINATION:

_____

_____

(Name and address or closest intersecting streets)

MY FIRST TRIP STARTS AT	I REACH MY DESTINATION AT
____:____ am pm	____:____ am pm

THE PURPOSE OF MY TRIP: (please circle one)

RETURN HOME
WORK/WORK RELATED
PERSONAL BUSINESS
DROP OFF/PICK UP PASSENGER
OTHER _____
SCHOOL
SOCIAL
MEAL
SHOP

THE METHOD OF TRAVEL I USE TO REACH MY DESTINATION: (please circle one)

DRIVER OF A CAR OR TRUCK (# OF OCCUPANTS IS ____)
PASSENGER IN A CAR OR TRUCK (# OF OCCUPANTS IS ____)
SCHOOL BUS
TRANSIT BUS
OTHER (please specify) _____
COMBINATION OF THESE METHODS (please list) _____
BICYCLE
TAXI
WALK

IF HOUSEHOLD VEHICLE WAS USED, PLEASE PROVIDE THE LICENSE PLATE NUMBER: _____

Please turn the page to record your next trip. If you will not make any more trips today, turn to the back cover.

TRAVEL LOG FOR WEDNESDAY, April 22, 1992

MY SEVENTH TRIP DESTINATION:

_____

_____

(Name and address or closest intersecting streets)

MY FIRST TRIP STARTS AT	I REACH MY DESTINATION AT
____:____ am / pm	____:____ am / pm

THE PURPOSE OF MY TRIP: (please circle one)

RETURN HOME
WORK/WORK RELATED
PERSONAL BUSINESS
DROP OFF/PICK UP PASSENGER
SCHOOL
SOCIAL
MEAL
SHOP
OTHER _____

THE METHOD OF TRAVEL I USE TO REACH MY DESTINATION: (please circle one)

DRIVER OF A CAR OR TRUCK (# OF OCCUPANTS IS ____)
PASSENGER IN A CAR OR TRUCK (# OF OCCUPANTS IS ____)
SCHOOL BUS
TRANSIT BUS
OTHER (please specify) _____
COMBINATION OF THESE METHODS (please list) _____
BICYCLE
TAXI
WALK

IF HOUSEHOLD VEHICLE WAS USED, PLEASE PROVIDE THE LICENSE PLATE NUMBER: _____

Please turn the page to record your next trip. If you will not make any more trips today, turn to the back cover.

TRAVEL LOG FOR WEDNESDAY, April 22, 1992

MY EIGHTH TRIP DESTINATION:

_____

_____

(Name and address or closest intersecting streets)

MY FIRST TRIP STARTS AT	I REACH MY DESTINATION AT
____:____ am / pm	____:____ am / pm

THE PURPOSE OF MY TRIP: (please circle one)

RETURN HOME
WORK/WORK RELATED
PERSONAL BUSINESS
DROP OFF/PICK UP PASSENGER
SCHOOL
SOCIAL
MEAL
SHOP
OTHER _____

THE METHOD OF TRAVEL I USE TO REACH MY DESTINATION: (please circle one)

DRIVER OF A CAR OR TRUCK (# OF OCCUPANTS IS ____)
PASSENGER IN A CAR OR TRUCK (# OF OCCUPANTS IS ____)
SCHOOL BUS
TRANSIT BUS
OTHER (please specify) _____
COMBINATION OF THESE METHODS (please list) _____
BICYCLE
TAXI
WALK

IF HOUSEHOLD VEHICLE WAS USED, PLEASE PROVIDE THE LICENSE PLATE NUMBER: _____

Please turn the page to record your next trip. If you will not make any more trips today, turn to the back cover.

TRAVEL LOG FOR WEDNESDAY, April 22, 1992

MY NINTH TRIP DESTINATION:

_____

_____

(Name and address or closest intersecting streets)

MY FIRST TRIP STARTS AT	I REACH MY DESTINATION AT
____:____ am / pm	____:____ am / pm

THE PURPOSE OF MY TRIP: (please circle one)

RETURN HOME
WORK/WORK RELATED
PERSONAL BUSINESS
DROP OFF/PICK UP PASSENGER
SCHOOL
SOCIAL
MEAL
SHOP
OTHER _____

THE METHOD OF TRAVEL I USE TO REACH MY DESTINATION: (please circle one)

DRIVER OF A CAR OR TRUCK (# OF OCCUPANTS IS ____)
PASSENGER IN A CAR OR TRUCK (# OF OCCUPANTS IS ____)
SCHOOL BUS
TRANSIT BUS
OTHER (please specify) _____
BICYCLE
TAXI
WALK
COMBINATION OF THESE METHODS (please list) _____

_____

IF HOUSEHOLD VEHICLE WAS USED, PLEASE PROVIDE THE LICENSE PLATE NUMBER: _____

Please turn the page to record your next trip. If you will not make any more trips today, turn to the back cover.

TRAVEL LOG FOR WEDNESDAY, April 22, 1992

MY TENTH TRIP DESTINATION:

_____

_____

(Name and address or closest intersecting streets)

MY FIRST TRIP STARTS AT	I REACH MY DESTINATION AT
____:____ am / pm	____:____ am / pm

THE PURPOSE OF MY TRIP: (please circle one)

RETURN HOME
WORK/WORK RELATED
PERSONAL BUSINESS
DROP OFF/PICK UP PASSENGER
SCHOOL
SOCIAL
MEAL
SHOP
OTHER _____

THE METHOD OF TRAVEL I USE TO REACH MY DESTINATION: (please circle one)

DRIVER OF A CAR OR TRUCK (# OF OCCUPANTS IS ____)
PASSENGER IN A CAR OR TRUCK (# OF OCCUPANTS IS ____)
SCHOOL BUS
TRANSIT BUS
OTHER (please specify) _____
BICYCLE
TAXI
WALK
COMBINATION OF THESE METHODS (please list) _____

_____

IF HOUSEHOLD VEHICLE WAS USED, PLEASE PROVIDE THE LICENSE PLATE NUMBER: _____

Please turn the page to record your next trip. If you will not make any more trips today, turn to the back cover.

MY ELEVENTH TRIP DESTINATION:

_____

_____

(Name and address or closest intersecting streets)

MY FIRST TRIP STARTS AT	I REACH MY DESTINATION AT
____:____ am / pm	____:____ am / pm

THE PURPOSE OF MY TRIP: (please circle one)

RETURN HOME
WORK/WORK RELATED
PERSONAL BUSINESS
DROP OFF/PICK UP PASSENGER
SCHOOL
SOCIAL
MEAL
SHOP
OTHER _____

THE METHOD OF TRAVEL I USE TO REACH MY DESTINATION:
(please circle one)

DRIVER OF A CAR OR TRUCK (# OF OCCUPANTS IS ____)
PASSENGER IN A CAR OR TRUCK (# OF OCCUPANTS IS ____)
SCHOOL BUS
TRANSIT BUS
OTHER (please specify) _____
BICYCLE
TAXI
WALK
COMBINATION OF THESE METHODS (please list) _____

_____

IF HOUSEHOLD VEHICLE WAS USED, PLEASE PROVIDE THE LICENSE PLATE NUMBER: _____

Please turn the page to record your next trip. If you will not make any more trips today, turn to the back cover.

MY TWELFTH TRIP DESTINATION:

_____

_____

(Name and address or closest intersecting streets)

MY FIRST TRIP STARTS AT	I REACH MY DESTINATION AT
____:____ am / pm	____:____ am / pm

THE PURPOSE OF MY TRIP: (please circle one)

RETURN HOME
WORK/WORK RELATED
PERSONAL BUSINESS
DROP OFF/PICK UP PASSENGER
SCHOOL
SOCIAL
MEAL
SHOP
OTHER _____

THE METHOD OF TRAVEL I USE TO REACH MY DESTINATION:
(please circle one)

DRIVER OF A CAR OR TRUCK (# OF OCCUPANTS IS ____)
PASSENGER IN A CAR OR TRUCK (# OF OCCUPANTS IS ____)
SCHOOL BUS
TRANSIT BUS
OTHER (please specify) _____
BICYCLE
TAXI
WALK
COMBINATION OF THESE METHODS (please list) _____

_____

IF HOUSEHOLD VEHICLE WAS USED, PLEASE PROVIDE THE LICENSE PLATE NUMBER: _____

Please turn to the back cover

IF YOU WILL NOT MAKE ANY MORE TRIPS TODAY, YOU HAVE COMPLETED YOUR LOG!

THANK YOU FOR TAKING THE TIME TO PROVIDE US WITH INFORMATION THAT WILL IMPROVE OUR PLANNING TECHNIQUES.

Please gather all travel logs from other household members, and together with the completed household questionnaire, mail them back in the preaddressed, postage-paid envelope.

YOUR OPINION MATTERS . . .

Please use this space to give us any comments you have about transportation in the area or about this survey.