

**1996 Dallas-Fort Worth
Household Travel Survey**

REPORT ON SURVEY METHODS

**Prepared for the
North Central Texas Council of Governments
Arlington, Texas**

September 1996

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

The contents of this report reflect the views of the authors who are responsible for the opinions, findings, and conclusions presented herein. The contents do not necessarily reflect the views or policies of the Federal Highway Administration, the Federal Transit Administration, or the Texas Department of Transportation.

September 30, 1996

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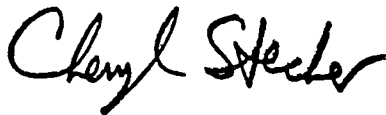
Dear Mr. Cervenka:

The Applied Management & Planning Group (AMPG) is pleased to submit this final report on the 1996 Dallas-Fort Worth Household Travel Survey. This survey was conducted in accordance with our agreement with the North Central Texas Council of Governments (NCTCOG).

This report documents our survey design, procedures, and methodological analyses. Copies of the survey instruments and other supporting materials are included. CD-ROMs containing the survey data have been provided to NCTCOG.

This survey reflects the hard work and thoughtful contributions of a variety of individuals and organizations. The Peer Review panelists assembled by NCTCOG provided many challenging ideas and suggestions. NCTCOG's survey development consultant, PlanTrans, offered ongoing constructive input during the design phase. Finally, we would like to thank NCTCOG staff for their support and contributions to this rich and exciting study.

Respectfully submitted,



Cheryl Stecher, Ph.D.
President, AMPG



Leslie Goldenberg
Principal, AMPG

TABLE OF CONTENTS

TABLE OF CONTENTS	i
LIST OF TABLES.....	iii
LIST OF FIGURES.....	v
EXECUTIVE SUMMARY	vi
I. INTRODUCTION.....	1
STUDY REGION.....	2
ORGANIZATION OF THE REPORT	3
II. OVERVIEW OF SURVEY METHODS	4
HOUSEHOLD SURVEY PRETEST	4
<i>24-Hour vs. 48-Hour Recording Period</i>	4
<i>Shorter vs. Longer Series of Questions About Each Activity Recorded</i>	5
<i>Incentives</i>	8
<i>Booklet vs. Log Format for the Diaries</i>	8
<i>Telephone vs. Mailback Retrieval of Information</i>	9
CONCEPTUAL DESIGN OF THE FULL SURVEY.....	9
GENERAL PROCEDURES.....	13
<i>Survey Length</i>	16
SPECIAL FEATURES OF THE SURVEY METHOD	17
<i>Method of Transit Activity Collection</i>	17
<i>Number of Recruitment Attempts to Each Number</i>	18
<i>Treatment of "Soft Refusals"</i>	18
<i>Proxy Rules</i>	19
<i>Inclusion of a Postage-Paid Return Envelope</i>	19
III. SURVEY INSTRUMENTS	22
PRENOTIFICATION LETTERS.....	22
TELEPHONE SCRIPTS	23
<i>Built-in Checks and Verifications</i>	23
INTERCEPT INSTRUMENTS.....	24
SURVEY MATERIALS	25
<i>Cover Letter</i>	25
<i>Brochure</i>	25
<i>Household/Vehicle Form</i>	25
<i>Diaries</i>	26
<i>Example Diary</i>	26
<i>Incentives</i>	27
IV. SAMPLING	28
RANDOM DIGIT DIAL SAMPLE	28
<i>Sample Generation</i>	36
<i>Other Sampling Issues</i>	37
INTERCEPT SAMPLE.....	38

V. SURVEY EXECUTION.....	41
SCHEDULE	41
INTERVIEWER TRAINING.....	41
OPERATION OF THE SURVEY HOTLINE.....	43
INTERCEPT RECRUITMENT	43
TELEPHONE RECRUITMENT.....	44
MAILING OF SURVEY MATERIALS	50
REMINDER TELEPHONE CONTACT.....	51
RETRIEVAL TELEPHONE CONTACT	53
<i>Proxy Status</i>	55
<i>Reasons for Refusal</i>	59
DATA REVIEW AND CLEANING.....	59
<i>Case Counts</i>	60
VI. RESPONDENT PROFILE AND COMPARISON TO THE DALLAS/ FORT WORTH POPULATION.....	63
VII. STATED PREFERENCE SURVEY METHODS.....	67
PRINCIPLES OF THE SP METHODOLOGY.....	67
SP ANALYSIS METHOD AND OPTIONS.....	68
<i>Logit Model Estimation</i>	68
<i>Measures of Model Fit</i>	70
<i>Coefficient Values and T-Statistics</i>	70
<i>Options for Market Segmentation</i>	71
<i>Options for Model Application</i>	71
<i>Confidence Intervals and Model Sensitivity</i>	72
OBJECTIVES OF THE DALLAS-FORT WORTH SP SURVEY EFFORT	73
<i>Development of the Survey Instrument</i>	73
<i>Sample Selection</i>	75
<i>Mailing of SP Survey Materials</i>	75
<i>Analysis of the SP Pretest</i>	76
<i>Qualitative Analyses</i>	79
SP PRETEST CONCLUSIONS	80
VII. CONCLUSIONS ABOUT THE SURVEY METHODOLOGY.....	81
CONCEPTUAL APPROACH: TRAVEL AS AN ACTIVITY	81
METHOD OF TRANSIT ACTIVITY COLLECTION.....	82
NUMBER OF RECRUITMENT ATTEMPTS TO EACH NUMBER	83
INCLUSION OF A POSTAGE-PAID REPLY ENVELOPE	83
TREATMENT OF "SOFT REFUSALS"	84
PROXY RULES.....	84
PRENOTIFICATION LETTER.....	84
SUMMARY	84

LIST OF TABLES

TABLE A SUMMARY OF HOUSEHOLD DISPOSITIONS	vii
TABLE 1 ACTUAL INTERVIEW LENGTH IN MINUTES.....	17
TABLE 2 PROXY PROCEDURES MATRIX.....	20
TABLE 3 SAMPLING MATRIX	29
TABLE 4 STRATIFIED MINIMUM SAMPLE FOR COLLIN COUNTY.....	30
TABLE 5 STRATIFIED MINIMUM SAMPLE FOR DALLAS COUNTY.....	31
TABLE 6 STRATIFIED MINIMUM SAMPLE FOR DENTON COUNTY.....	32
TABLE 7 STRATIFIED MINIMUM SAMPLE FOR TARRANT COUNTY.....	33
TABLE 8 STRATIFIED MINIMUM SAMPLE FOR THE OTHER COUNTIES.....	34
TABLE 9 MINIMUM ADJUSTED SAMPLE SIZE, BY COUNTY.....	35
TABLE 10 ACHIEVED LEVEL OF ERROR AND CONFIDENCE	36
TABLE 11 SAMPLE ALLOCATION BY DAY OF WEEK	38
TABLE 12 BUS STOP LOCATIONS AND SCHEDULE FOR THE INTERCEPT SURVEY IN DALLAS (DART)	39
TABLE 13 TARGET NUMBER OF INTERCEPT RECRUITMENTS FOR DART INTERCEPT EFFORT	40
TABLE 14 DATA COLLECTION SCHEDULE	41
TABLE 15 SUMMARY OF HOTLINE ACTIVITY	43
TABLE 16 TELEPHONE RECRUITMENT RESULTS - INTERCEPTS ONLY	44
TABLE 17 DATA ELEMENTS COLLECTED AT RECRUITMENT.....	45
TABLE 18 TELEPHONE RECRUITMENT RESULTS.....	46
TABLE 19 INTERIM DISPOSITIONS.....	48
TABLE 20 DISTRIBUTION OF RECRUITMENT ATTEMPTS TO EACH NUMBER	49
TABLE 21 SUMMARY OF RECRUITMENT TYPES AND COMPLETION RATES.....	50
TABLE 22 POSTAGE MATRIX	50
TABLE 23 DISTRIBUTION OF REMINDER ATTEMPTS TO EACH RECRUITED HOUSEHOLD.....	51
TABLE 24 TELEPHONE REMINDER CALL OUTCOMES.....	52
TABLE 25 REASONS FOR REFUSAL AT REMINDER.....	53
TABLE 26 NUMBER OF ELAPSED DAYS BETWEEN THE ASSIGNED TRAVEL DAY AND RETRIEVAL OF THE LAST DIARY IN THE HOUSEHOLD.....	55
TABLE 27 EFFECT OF RELAXING THE PROXY RULES ON THE TIME REQUIRED TO OBTAIN A COMPLETE HOUSEHOLD	56
TABLE 28 SUMMARY OF HOUSEHOLD DISPOSITIONS	56
TABLE 29 COMPLETION RATES BY CELL - RDD HOUSEHOLDS.....	57
TABLE 30 COMPLETION RATES BY COUNTY - INT HOUSEHOLDS.....	59
TABLE 31 HOUSEHOLD AND INDIVIDUAL PERSON'S REASONS FOR REFUSAL AT RETRIEVAL.....	60

TABLE 32 SELECTED HOUSEHOLD DEMOGRAPHICS	64
TABLE 33 OWN/RENT STATUS.....	65
TABLE 34 HOUSEHOLD AND PERSONAL INCOME.....	65
TABLE 35 PERSON'S SPANISH ORIGIN.....	66
TABLE 36 PERSON'S ETHNICITY.....	66
TABLE 37 SUMMARY OF SP CHOICE SET ATTRIBUTES AND LEVELS	74
TABLE 38 SP PRETEST RESPONSE RATES.....	76
TABLE 39 SP CHOICE DISTRIBUTION.....	76
TABLE 40 SP PRETEST MODEL RESULTS.....	78
TABLE 41 SP PRETEST: MODEL ESTIMATED FOR EACH VERSION OF THE QUESTIONNAIRE.....	79

LIST OF FIGURES

FIGURE 1 STUDY AREA.....	2
FIGURE 2 SHORTER ACTIVITY DIARY	8
FIGURE 3 LONGER ACTIVITY DIARY.....	7
FIGURE 4 LOG-STYLE DIARY.....	10
FIGURE 5 COMPARISON OF SURVEY METHODS	11
FIGURE 6 FINAL DIARY USED IN THE REVEALED PREFERENCE SURVEY	13
FIGURE 7 SURVEY PROCEDURES FLOW CHART.....	15
FIGURE 8 TEXT OF THE PRENOTIFICATION LETTER	22
FIGURE 9 SURVEY SCHEDULE.....	41
FIGURE 10 FLOW OF CASE COUNTS	61

TABLE 32 SELECTED HOUSEHOLD DEMOGRAPHICS	64
TABLE 33 OWN/RENT STATUS.....	65
TABLE 34 HOUSEHOLD AND PERSONAL INCOME.....	65
TABLE 35 PERSON'S SPANISH ORIGIN.....	66
TABLE 36 PERSON'S ETHNICITY.....	66
TABLE 37 SUMMARY OF SP CHOICE SET ATTRIBUTES AND LEVELS	74
TABLE 38 SP PRETEST RESPONSE RATES.....	76
TABLE 39 SP CHOICE DISTRIBUTION.....	76
TABLE 40 SP PRETEST MODEL RESULTS.....	78
TABLE 41 SP PRETEST: MODEL ESTIMATED FOR EACH VERSION OF THE QUESTIONNAIRE.....	79

EXECUTIVE SUMMARY

The North Central Texas Council of Governments (NCTCOG) contracted with the Applied Management & Planning Group (AMPG) to conduct a revealed preference household travel behavior survey. There were two primary objectives for the revealed preference household survey:

1. Update the existing data for NCTCOG's regional travel demand models; and,
2. Provide new data elements to permit the models to be upgraded.

In addition, NCTCOG was interested in advancing the state of the practice in travel survey methodology. NCTCOG, in cooperation with the Federal Highway Administration (FHWA), sponsored a pretest of the revealed preference household travel survey in 1994-95. The pretest compared several methodological options and served to inform the design of the final survey effort. This report addresses the methods used for the final survey.

The Dallas-Fort Worth Household Travel Survey involved the collection of information about household characteristics and travel using a unique "travel as an activity" approach. The instrument used to support this conceptual approach differed from conventional trip or activity diaries. While trip diaries focus on respondent's changes of location, and activity diaries center on events at fixed locations with accompanying questions about how shifts in location were made, the "travel as an activity" approach asked respondents to account for all of their time, including both trips and activities.

Travel and activity information was requested from all persons in sampled households. An incentive of \$2 per person was attached to outgoing survey materials, which included one household/vehicle information form and a diary for each member of the household.

All information to be collected was printed on diary forms to avoid "probing" for unanticipated information. Twenty-seven activity categories were suggested on the forms, including three in-home activity categories (sleep, work, and everything else).

A total of 9,398 households was recruited for the study. Of these, 790 (8.4 percent) ultimately provided at least partial information and 3,996 (42.5 percent) provided materially complete information. **Table A** below summarizes the dispositions of all recruited households.

Recruitment was conducted through both random digit dialing and transit intercept. Of the 9,398 households recruited, 992 originated through the transit intercept effort; 372 of these (37.5 percent) completed the study. The other 8,406 households recruited were derived from randomly generated telephone numbers; 3,624 (43.1 percent) of this group completed the survey.

Table A			
Summary of Household Dispositions			
Disposition		N	Percent
Complete		3,996	42.5%
Partial		789	8.4%
Refused at retrieval:			
Refused at retrieval (promised to mail in materials)	689		
Refused at retrieval (all other)	1,843		
Total refused at retrieval		2,532	26.9%
Retrieval efforts made, but household not resolved		1,161	12.4%
Refused at reminder		445	4.7%
Dropped at reminder:			
No package received - do not send another	51		
Disconnected number	64		
No such person	60		
Terminated by respondent	16		
Business/Non-Spanish language barrier/Other	24		
Total dropped at reminder		215	2.3%
Dropped at retrieval:			
Disconnected number	75		
No such person	24		
Business/Non-Spanish language barrier/Other	24		
Total dropped at retrieval		123	1.3%
Recruited, but not advanced to subsequent stages		154	1.6%
Counted as refused at retrieval (phonefile), but actually converted to complete or partial		(17)	(>0.1%)
Total		9,398	100.0%

The survey was conducted using computer assisted telephone interviewing (CATI) for recruitment, reminder and retrieval of all information.

Special features of the study included:

- **Prenotification letters** introducing the survey were sent to those households where an address could be matched to the randomly generated telephone number in order to promote higher recruitment rates;
- **The method of transit activity collection** called for each segment of a transit trip - getting to the transit stop, waiting/boarding, riding the transit vehicle, alighting, and getting to the final destination - to be reported as a separate activity in order to permit the collection of full temporal and geographic information related to transit usage;

- **The number of recruitment attempts to each number** was increased (from the industry-standard six) to nine in order to minimize the potential non-response bias associated with people who travel more being at home less often to answer the telephone;
- **The attempt to convert initial “soft refusals”** during the recruitment phase was another strategy designed to minimize non-response bias;
- **Stringent proxy rules**, which emphasized adults’ direct reporting of their travel and activities, were established in order to promote more complete and accurate reporting; and,
- **Inclusion of a postage-paid reply envelope in the survey package** allowed survey respondents to send in their completed materials, thus providing a separate, verifiable source of information about the travel behaviors collected through the telephone interviewing process.

In addition to the revealed preference household survey, the project involved the development of a stated preference survey to measure commuters’ responses to various travel time and pricing scenarios.

KEY CONCLUSIONS

The Dallas-Fort Worth Household Survey succeeded in accomplishing its two primary objectives of updating the existing data for NCTCOG’s regional travel demand models and providing new data to permit the models to be upgraded.

NCTCOG’s additional interest in advancing the state of the practice in travel survey methodology was also accomplished. The Dallas-Fort Worth Household Survey was the most in-depth and exhaustive travel survey ever conducted in the United States, with the possible exception of surveys collecting in-home activities in addition to travel. NCTCOG’s goal in gathering data of this richness was to support not only existing four-step travel demand models, but also to enable the development of new models, such as those based on activities or out-of-home time use.

Conclusions regarding the special features of this study include:

- **Conceptual Approach: Travel as an Activity.** The survey demonstrated that the “travel as an activity” approach does work. It appears, however, to contribute to lower completion rates than more conventional trip or activity diary methods. Additional analysis is needed to determine if the new approach results in the collection of higher-quality data from those households that do provide information.
- **Prenotification Letter.** The prenotification letter improved the survey’s recruitment and completion rates, and proved to be a worthwhile component.

- **Method of Transit Activity Collection.** The method of transit activity collection was a mixed success. In certain cases it did produce the full range of information desired by NCTCOG, but it appears to have been misunderstood by about half of the target respondents.
- **Number of Recruitment Attempts to Each Number.** Among successfully recruited households, more than 98 percent of the households were recruited in six calls or less. Only 154 households (less than two percent) were recruited on the seventh or subsequent call. This suggests that the additional recruitment attempts beyond the industry-standard six calls were only marginally useful.
- **Treatment of "Soft Refusals."** With minimal negative effects on the survey completion rate, the effort to include initial "soft refusals" appears to have reduced a source of potential non-response bias and thereby enhanced the overall quality of the dataset.
- **Proxy Rules.** Over 80 percent of adults reported their own activities directly. The mean activity rates for these persons was higher than those of persons whose activities were reported by a proxy. Taking special steps to minimize proxy reporting was a positive feature of the survey which resulted in better data quality.
- **Inclusion of a Postage-Paid Reply Envelope.** About 7 percent of respondents opted to mail back their materials using the reply envelope *instead* of consenting to telephone retrieval of their information. NCTCOG handled the surveys that were mailed in. From among all households that were not wholly or partially retrieved by telephone, 6 percent returned at least some information by mail. This figure indicates that most households who promised to mail in materials did so. NCTCOG plans to perform additional analysis to determine how data from these households will be incorporated into the retrieval files.

SUMMARY

The Dallas-Fort Worth Household Survey succeeded in gathering a rich set of data from a large sample of households, and the resulting dataset offers NCTCOG many opportunities both to update its existing travel demand models and to experiment with new ones. The survey effort leaves NCTCOG with many options for the future use of these data, and it should meet the organization's travel data needs into the 21st Century.

- **The number of recruitment attempts to each number** was increased (from the industry-standard six) to nine in order to minimize the potential non-response bias associated with people who travel more being at home less often to answer the telephone;
- **The attempt to convert initial “soft refusals”** during the recruitment phase was another strategy designed to minimize non-response bias;
- **Stringent proxy rules**, which emphasized adults’ direct reporting of their travel and activities, were established in order to promote more complete and accurate reporting; and,
- **Inclusion of a postage-paid reply envelope in the survey package** allowed survey respondents to send in their completed materials, thus providing a separate, verifiable source of information about the travel behaviors collected through the telephone interviewing process.

In addition to the revealed preference household survey, the project involved the development of a stated preference survey to measure commuters’ responses to various travel time and pricing scenarios.

KEY CONCLUSIONS

The Dallas-Fort Worth Household Survey succeeded in accomplishing its two primary objectives of updating the existing data for NCTCOG’s regional travel demand models and providing new data to permit the models to be upgraded.

NCTCOG’s additional interest in advancing the state of the practice in travel survey methodology was also accomplished. The Dallas-Fort Worth Household Survey was the most in-depth and exhaustive travel survey ever conducted in the United States, with the possible exception of surveys collecting in-home activities in addition to travel. NCTCOG’s goal in gathering data of this richness was to support not only existing four-step travel demand models, but also to enable the development of new models, such as those based on activities or out-of-home time use.

Conclusions regarding the special features of this study include:

- **Conceptual Approach: Travel as an Activity.** The survey demonstrated that the “travel as an activity” approach does work. It appears, however, to contribute to lower completion rates than more conventional trip or activity diary methods. Additional analysis is needed to determine if the new approach results in the collection of higher-quality data from those households that do provide information.
- **Prenotification Letter.** The prenotification letter improved the survey’s recruitment and completion rates, and proved to be a worthwhile component.

Table of Contents

	INTRODUCTION
2	OVERVIEW OF SURVEY METHODS
3	SURVEY INSTRUMENTS
4	SAMPLING
5	SURVEY EXECUTION
6	RESPONDENT PROFILE AND COMPARISON TO THE DALLAS/FT. WORTH POPULATION
7	STATED PREFERENCE SURVEY METHODS
8	CONCLUSIONS ABOUT THE SURVEY METHODOLOGY

I. INTRODUCTION

The North Central Texas Council of Governments (NCTCOG) contracted with the Applied Management & Planning Group (AMPG) to conduct a revealed preference household travel behavior survey. There were two primary objectives for the revealed preference household survey:

1. Update the existing data for NCTCOG's regional travel demand models; and,
2. Provide new data elements to permit the models to be upgraded.

In addition, NCTCOG was interested in advancing the state of the practice in travel survey methodology. NCTCOG, in cooperation with the Federal Highway Administration (FHWA), sponsored a pretest of the revealed preference household travel survey in 1994-95. As discussed in more detail in Chapter II, the pretest compared several methodological options and served to inform the design of the final survey effort.

The survey involved the collection of information about household characteristics and travel using a household/vehicle information form and an activity-focused diary. Travel information was requested from all persons in sampled households. A total of 9,398 households was recruited for the study. Of these, 790 (8.4 percent) ultimately provided at least partial information and 3,996 (42.5 percent) provided materially complete information.

In addition to the revealed preference household survey, the project involved the development of a stated preference survey to measure commuters' responses to various travel time and pricing scenarios. This report also includes a discussion of the stated preference survey component.

The team that conducted this project consisted of the following firms:

- **Applied Management & Planning Group (AMPG)**, Los Angeles, California, with responsibility for overall project management; designing the survey instruments; managing the telephone data collection; packaging and mailing travel diaries to participating households; and data file creation, cleaning, and analyses;
- **Interviewing Service of America (ISA)**, Van Nuys, California, with responsibility for drawing the sample of telephone numbers, and conducting the telephone recruitment and computer-aided telephone interviewing (CATI) retrieval of travel information;
- **Dikita Engineering**, Dallas, Texas, which performed intercept recruitment; and,
- **Mark Bradley Research and Consulting**, Mill Valley, California, which developed the stated preference survey plan and instruments.

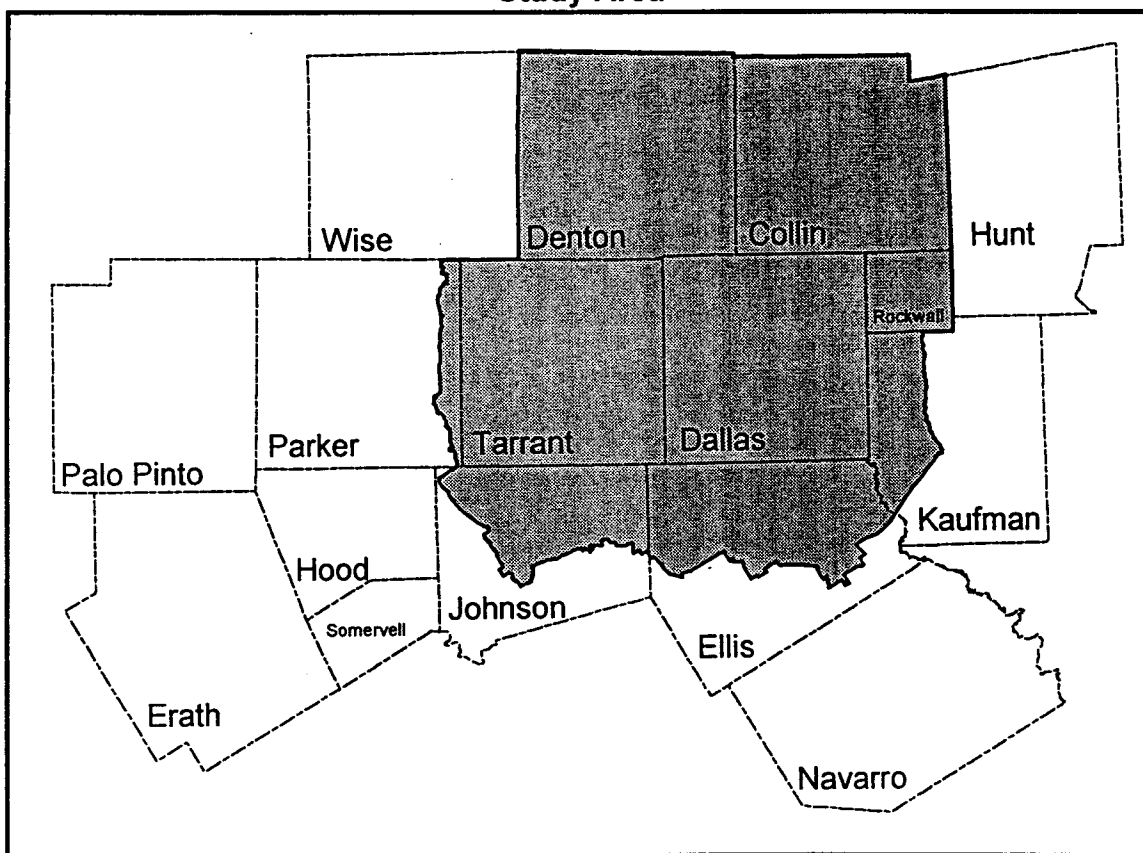
NCTCOG also engaged Peter Stopher of PlanTrans (Baton Rouge, Louisiana) to advise on the design of survey instruments.

STUDY REGION

The geographical region of study for the household survey consisted of the 5,000 square-mile Dallas-Fort Worth Metropolitan Area, referred to by residents as the "Metroplex." As shown in **Figure 1**, this area includes all or part of the nine counties that make up the Consolidated Metropolitan Statistical Area (CMSA):

- Collin;
- Dallas;
- Denton;
- Ellis;
- Johnson;
- Kaufman;
- Parker;
- Rockwall; and,
- Tarrant.

Figure 1
Study Area



ORGANIZATION OF THE REPORT

The remainder of this report is organized as follows.

Chapter II: Overview of survey methods, including the influence of pretest results on the conceptual design of the survey, a discussion of the unique features of this survey, and a review of the survey procedures for recruitment, mailing of materials, reminder contacts, and data cleaning.

Chapter III: Discussion of the survey instruments.

Chapter IV: Presentation of the sampling plan, and discussion of how and why the actual survey deviated from the sampling plan.

Chapter V: Execution of the survey, including the overall schedule, interviewer training, monitoring and reporting, the survey hotline, the time spent in telephone retrieval, and survey response rates.

Chapter VI: Respondent demographic profile and comparisons to 1990 Census data for the Dallas-Fort Worth CMSA.

Chapter VII: Discussion of the stated preference survey.

Chapter VIII: Conclusions and recommendations for subsequent surveys.

The Appendices include survey instruments, training materials, and other supporting documentation.

It should be noted that the survey dataset is very rich, and includes far more information than presented in this report. This report is not intended as a summary of the survey findings, but rather aims to document the survey methods that were employed. The complete dataset has been provided to NCTCOG, who will be responsible for geocoding, final data cleaning, survey expansion, and travel/activity summaries.

II. OVERVIEW OF SURVEY METHODS

This section of the report provides an overview of survey methods, including:

- A review of the findings from the survey pretest;
- A discussion of the conceptual design of the survey and its unique features; and,
- A review of the survey procedures for recruitment, mailing of materials, reminder contacts, and data cleaning.

HOUSEHOLD SURVEY PRETEST

In late 1994 and early 1995, NCTCOG undertook an extensive pretest in preparation for the household travel survey. NCTCOG was interested in pretesting three survey methodological options, and the interactions between them:

- A 24-hour vs. 48-hour recording period;
- A shorter vs. longer series of questions about each activity recorded; and,
- Three types of incentives -- a pen per person, \$2 per person, or both a pen and \$2 per person.

Shortly following initial work on the pretest, the Federal Highway Administration (FHWA) offered to sponsor additional research on household survey methods, using the NCTCOG pretest as a cost-effective opportunity to leverage research dollars by adding methodological options to the mix. FHWA was specifically interested in:

- A booklet vs. log format for the diaries; and,
- Telephone vs. mailback retrieval of information.

The combined resources of NCTCOG and FHWA enabled the pretest to examine all five of the options noted above. The key findings associated with each of these methodological options are reviewed below.

24-Hour vs. 48-Hour Recording Period

The use of 24- or 48-hour diaries to collect household activity and/or travel information has been the subject of considerable debate. A 48-hour recording period has been advocated as providing additional information about the variability of household travel behavior. The countering viewpoint has held that 48-hour data collection places too great a burden on respondents, and is likely to result in lower response rates and/or less complete reporting of travel behavior. The possible tendency for respondents to report less trip-making on the

second day of a 48-hour interval has been the subject of particular debate and conflicting research findings.

In terms of response rate, the pretest demonstrated that a recording period of 24 hours was 1.6 times more likely to result in a complete interview than a 48-hour recording period (p-value <0.01). The survey response rates for households assigned to a 48-hour recording period ranged from 35 percent to 47 percent, while those assigned to complete comparable 24-hour diaries were considerably higher, ranging from 42 percent to 50 percent.

The pretest also demonstrated that daily trip rates were higher for individuals who kept 24-hour diaries, ranging from 3.80 to 5.27, as compared to daily (weekday) trip rates of 2.34 to 5.05 for persons with 48-hour recording period. Furthermore, the pretest found a statistically significant trend (p-value <0.01) towards the reporting of fewer trips on the second day of a 48-hour reporting interval.

Shorter vs. Longer Series of Questions About Each Activity Recorded

Travel behavior surveys have traditionally asked for relatively limited information regarding the time, location, and nature of each activity reported. With transportation planners' increased interest in issues such as mode use choices, household members' interdependent travel, trip chaining, and parking costs, there has been increased demand for a longer series of questions about each activity. One issue associated with this demand for new information is how best to ask such questions in the context of a travel diary, from the point of view of question wording, ordering, and graphic design. A separate issue is the extent to which lengthening the number of questions posed each time an activity is reported creates such a burden that response rates are impacted.

The pretest directly compared survey outcomes for longer and shorter series' of questions, with a focus on response rate differentials¹. **Figures 2 and 3** illustrate the layout of the shorter and longer set of questions. It should be noted that the approach in all versions of the pretest and the full survey was to print all questions on the survey forms, in order to avoid probing respondents for unanticipated information.

Activity Data Elements in Both Versions

- Type of activity
- Start and end time of activity
- Place name and address of activity location
- Mode used to get to the activity
- Use of household vehicle
- Transit/taxi fare payment method

Activity Data Elements in Longer Versions Only

- Activity repetition
- Size of traveling party
- Number of household members in traveling party
- Shopping mall-related questions
- Parking cost
- Walk time from vehicle to activity location
- Use of bicycle lanes
- Bicycle storage
- Distance of bicycle travel
- Distance of walk/wheelchair travel

¹ There were two slightly different formats for the longer set of questions. The first format was pretested in Fall, 1994 using a 24-hour diary, and the second was pretested in Spring, 1995 using a 48-hour diary.

Figure 2
Shorter Activity Diary

Activity 3

1 What was the next thing you did? (check ONE only)

At Home Activities

- Working at home (related to main or second job)
- All other at home (including sleep)

Pick up or drop off other people

- At their home
- At their workplace
- At their school/day care/childcare
- At another place (specify): _____

Bus/Trolley

- Wait for/get on bus/trolley
- Get off bus/trolley

Regular Carpool/Vanpool

- Wait for/join carpool/vanpool
- Leave carpool/vanpool

Work

- Work
- Work-related
- Volunteer work

Other activities away from home

- School/College/University
- Childcare/Day care/After school care
- Buy gas
- Shop
- Eat out
- Banking/Post Office/Other Personal Business
- Medical/Dental/Clinic
- Social/Visiting/Civic/Religious/Church
- Recreation/Gym/Athletic/Entertainment/Vacation
- Accompany another person to their activity
- Other (specify): _____

2 How long did it take to get from your 2nd activity to your 3rd activity?

minutes
 less than one minute

3 What time did you:

start activity 3 ?

stop activity 3 ?

circle one ↓
: : a m
: : p m

4 Where were you?

- Same place as 2nd activity (Go to next activity)
- At home At main job
- At school At second job
- At another location (complete shaded area) ↓

Business/store/place name

Address or cross streets

City

5 How did you get to this new location?

- | | |
|--|--|
| Walk/Wheelchair | <input type="checkbox"/> Next activity |
| Driver in a car, van, truck or motorcycle | <input type="checkbox"/> 6 |
| Passenger in a car, van, truck or motorcycle | <input type="checkbox"/> 6 |
| Express bus | <input type="checkbox"/> 7 |
| Local bus | <input type="checkbox"/> 7 |
| School bus | <input type="checkbox"/> Next activity |
| Trolley | <input type="checkbox"/> 7 |
| Taxi | <input type="checkbox"/> 7 |
| Bicycle | <input type="checkbox"/> Next activity |
| Other (specify) _____ | <input type="checkbox"/> Next activity |

6 Car/Van/Truck/Motorcycle

Did you use one of the vehicles listed on the form for this trip? **If yes, which one?**

- No Yes

Make

Model

7 Bus/Trolley/Taxi

How did you personally pay your fare?

- Cash → \$. I paid nothing, because the fare was: Free
- Transfer Reimbursed (e.g. by your employer)
- Pass Paid by someone else
- Other (specify): _____

