

MARKET RESEARCH ON THE FEASIBILITY
OF A NEIGHBORHOOD
MINIBUS FEEDER SYSTEM TO METRORAIL

CITY OF FALLS CHURCH

MAY 1986

ROBERT HITLIN RESEARCH ASSOCIATES, INC.
SG ASSOCIATES, INC.

FINAL REPORT

MARKET RESEARCH ON THE FEASIBILITY OF A NEIGHBORHOOD
MINIBUS FEEDER SYSTEM TO METRORAIL

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TABLE OF CONTENTS

	PAGE
EXECUTIVE SUMMARY.....	1
1. INTRODUCTION.....	4
2. DATA COLLECTION PROCEDURES.....	5
3. DATA ANALYSIS PROCEDURES.....	7
4. ESTIMATES OF PATRONAGE.....	11
5. ADDITIONAL CONSIDERATIONS.....	13
6. CONCLUSION.....	13
APPENDIX: QUESTIONNAIRE.....	15

EXECUTIVE SUMMARY

The Northern Virginia Transportation Commission, with the cooperation of the City of Falls Church Department of Planning and Development, sponsored a study in early 1986 conducted by Robert Hitlin Research Associates, Inc., and SG Associates, Inc., (RHRA/SG) to assess the potential market for a rush hour minibus feeder service for Falls Church. The proposed service would circulate through the neighborhoods of Falls Church and run to and from the two nearby Metrorail stations scheduled to open in June, 1986. The market assessment includes the entire City of Falls Church.

The study employed both traditional household surveying techniques and innovative procedures to arrive at the ridership estimates. The survey technique used a "dual frame" sampling approach that included a self-administered questionnaire delivered to every household in the City of Falls Church. The survey provided an opportunity for several workers in each household to respond to the questions. 1200 households (22% of the total) responded to the survey. A follow-up telephone survey of a sample of non-respondents to the self-administered survey also was conducted. The telephone survey was used to determine whether self-selection bias influenced the findings from the self-administered household survey. The telephone survey, a relatively small sample of non-respondents (200 households), showed that there was no significant self-selection bias in the responses to the self-administered household survey.

Transit market research has often produced patronage estimates that are higher than the actual ridership when proposed new services are implemented. This tendency to overestimate usage is probably a result of respondents who would like to have the service available as a back-up to their usual mode of travel, but rarely use the proposed service themselves. To compensate for this tendency to overstate usage, survey responses were run through a series of criteria or "screens" to insure that only the most likely riders of the proposed service would be included in the patronage estimates.

The selection screens were based on travel and household conditions, including: whether or not the respondent worked in an area served by a Metrorail station, dropped off children at school while commuting, current parking costs and length of commute, need for a car at work, expected use of a minibus at different fare and service frequency levels, and starting and ending work times. The screens proved most useful. 47.0% of the survey respondents indicated that they would use a feeder bus service to the station. However, through the use of the screens, only 21.3% remained as likely users of the service based on their responses to the questions which served as screens.

The survey results indicate that the minibus feeder service would be used by approximately 230 to 410 residents each day, or a range of 460 to 820 daily rides. The patronage estimates vary at different levels of fare and frequency of service. Over the course of a month about 510 residents of Falls Church - about 10% of all resident workers - would use the minibus service.

This report summarizes the findings of an in-depth analysis of the potential patronage for a minibus in Falls Church. Technical appendices that support this analysis may be obtained from the Falls Church Department of Planning and Development.

1. INTRODUCTION

The City of Falls Church is evaluating a potential minibus feeder service to the East Falls Church and West Falls Church Metrorail stations, which are scheduled to open in June, 1986. The service as currently envisioned would operate in peak periods only with routes structured to penetrate neighborhoods for maximum convenience to the City's residents.

The Northern Virginia Transportation Commission, in cooperation with the City of Falls Church Department of Planning and Development, sponsored a research project from January through May, 1986, to estimate the potential ridership of such a service under several fare and frequency levels.

The major challenge to overcome in transit market research is the well documented tendency of people to overestimate their usage of proposed transit services. Many people who indicate that they will use a service continue to commute by other means and use the new service as a back-up to their current mode of transportation. With this in mind, a new methodology was designed to overcome the limitations of standard research techniques. The sampling procedures were designed to reach the broadest possible cross-section of the target population. Subjective responses from the respondents were then compared with objective measures to test the validity of the responses.

The basic study approach uses information gathered by two types of surveys: a self-administered household survey and a telephone survey. The survey data were then put through a series of "screens" or filters to identify only those respondents who are truly likely to use the new service. This report describes the analysis techniques and presents the major research findings.

2. DATA COLLECTION PROCEDURES

The survey questionnaire was designed to permit several workers in a household to respond. A focus group session was held with residents of Falls Church to pre-test the wording of the questionnaire and the procedures for distribution and collection. The focus group was selected randomly and included several transit users. Most of the focus group members commuted by auto and a few were retired.

The self-administered questionnaire was placed in a clear plastic "hanger bag" and attached to the front doorknob of all households in Falls Church (4500 dwelling units). Respondents were asked to place the completed questionnaire in the same plastic bag on their door for collection two days later. Each questionnaire has space for up to three workers employed outside of the home to respond on the same questionnaire. Twenty-two percent of the households returned the form and this was judged to be a satisfactory return rate for the survey.

Addresses of households that did not return the form were recorded and used to draw a sample for the follow-up telephone survey. A household which responded to one survey was excluded from the universe of the other survey, and thus the two groups were completely independent of each other. It was particularly important that the two samples did not overlap because the results of the telephone survey were used to check for self-selection bias among respondents to the door-to-door survey.

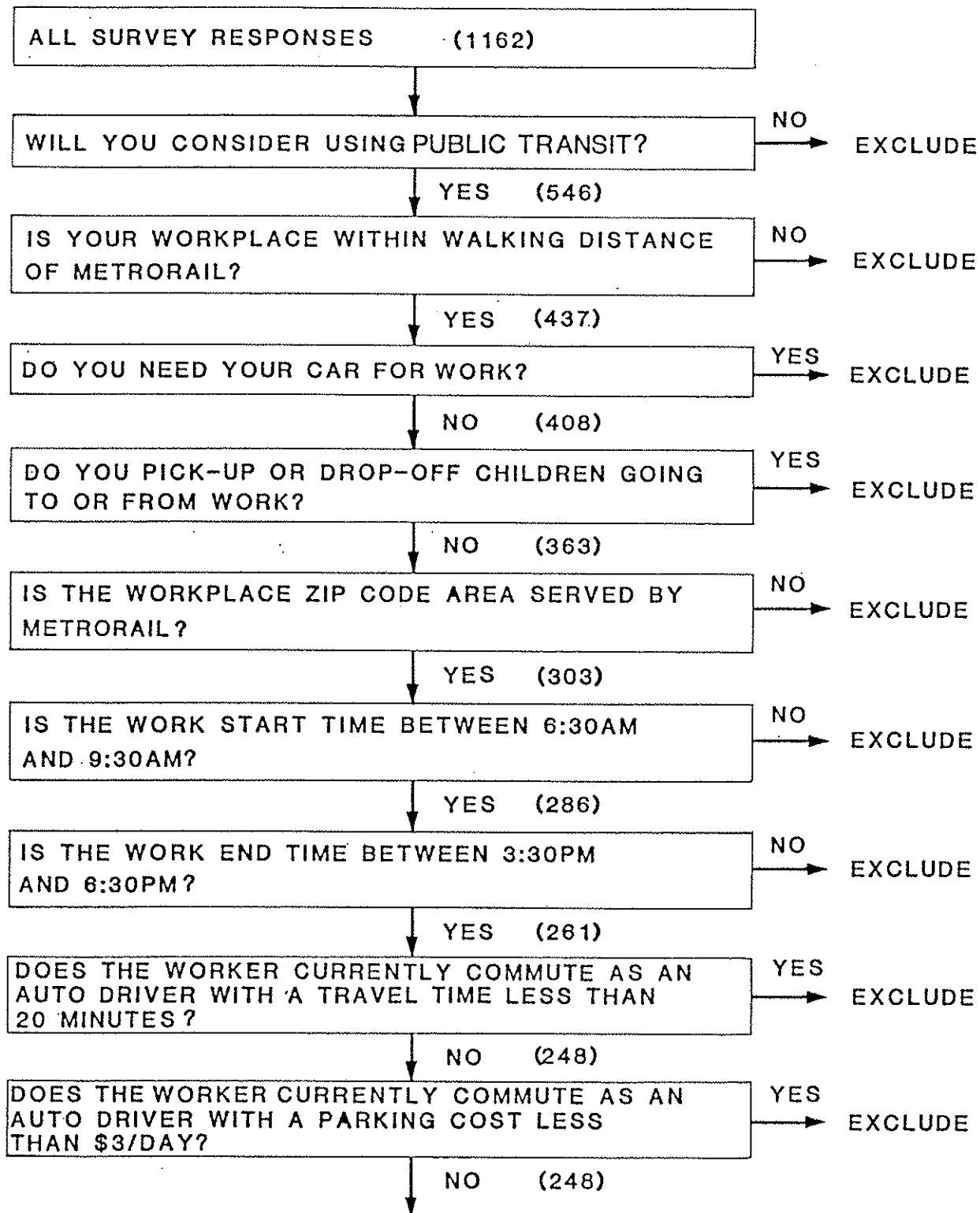
The telephone survey was conducted within 5 days of the completion of the self-administered survey. Respondents to the telephone survey were asked about their own commuting habits, and not about any other workers in the household. Two hundred valid telephone surveys were completed and the results were used to check for potential bias in the responses to the self-administered survey. If potential transit users had a greater propensity than non-transit users to return the self-administered questionnaire, this tendency would increase the likelihood of overestimating patronage when the household survey results were generalized to the entire City. However, the household characteristics and transit usage patterns of the respondents to the telephone survey were very similar to those of the self-administered survey. Therefore, for reasons of smaller potential sampling error, the final patronage estimates are based on the larger number of responses to the self-administered survey.

3. DATA ANALYSIS PROCEDURES

546 respondents to the self-administered household survey indicated an interest in using public transit to commute when Metrorail opens. These respondents constitute the upper limit of potential patrons for the proposed minibus. This set of survey responses was then run through a series of "screens" or filters to eliminate respondents who would be unlikely to actually use the new service. The survey included several questions that were used to distinguish people who would like to have the service available, but probably would not use it, from people who were judged to be likely users. The questions that were used as filters and the number of respondents surviving each screen, are illustrated in Figure 1.

The screening process was successful in combing out many people who probably would not use the service despite their expression of interest to do so. The impact of this approach on the survey responses is illustrated in Table 1. Only respondents who passed all of the screens are included in the final estimates of potential riders.

FIGURE 1
TECHNIQUE FOR SCREENING SURVEY RESPONSES



POTENTIAL USER OF MINIBUS SERVICE

NOTE: THE ORDER IN WHICH THE SCREENS WERE APPLIED AFFECTS THE NUMBER REMOVED AT EACH STAGE. THE ORDER DOES NOT AFFECT THE RESULT.

TABLE 1

IMPACT OF THE SCREENING PROCESS

TOTAL WORKERS RESPONDING	1162
POTENTIAL PUBLIC TRANSIT USERS	546
WORKERS PASSING ALL SCREENS	248

Table 1 illustrates the effect of this methodology compared to conventional ridership estimating techniques that rely solely on the respondent's expression of interest for patronage forecasting (i.e., 546 patrons versus 248 patrons). For this reason we are confident that the patronage forecasts are realistic estimates of the number of City residents who would use a feeder bus service operating in Falls Church.

Patronage estimates also were adjusted for expected frequency of use. Even regular transit users will not commute to work every day. Vacations, sick leave, out-of-town travel and other factors reduce time at work. Surveys of travel reveal that 15-20% of all workers do not report to their usual work place on an average day. From the Falls Church survey questions, we distinguished between regular riders (those who responded that they would ride 4-5 days per week) and occasional riders (those who responded that they would ride 1-3 days per week). Factors to account for probable frequency of use were applied to the survey estimates. The ridership factors are: 4 days a week for regular riders, one day a week for occasional riders, and zero for infrequent riders.

4. PATRONAGE ESTIMATES

The ridership estimates are based on the number of respondents who indicated a willingness to use public transit when Metrorail opens and who passed the screening process based on trip characteristics and work location. It should be noted that the survey posed the question on potential use of the minibus in the context of a ten minute trip to the Metrorail station. (See questions 21-24 in the Appendix.) It is highly unlikely, however, that a cost-effective service could be designed that would provide this level of service to all patrons. The patronage estimates should be viewed as upper limits as some of the respondents who indicated an interest in the service and passed all of the screens would not experience a ten minute trip to Metrorail. Further refinements were made to the 248 responses that passed the selection screens to consider the effects of different fare and service levels on potential usage. Elasticity factors were developed to determine how many riders would be lost due to lower service levels and higher fares.

Elasticity is a measure of the rate at which ridership declines as fares increase or the level-of-service declines. The survey included questions on potential use of the minibus under different fares and frequencies. The elasticity factors were applied to the base patronage estimate - which was based on free fare and a ten minute service frequency - and the results are presented in Table 2. The estimates of persons using the system on a typical day have been multiplied by two to reflect both the trip to the station in the morning and the trip from the station in the evening.

TABLE 2

FALLS CHURCH PATRONAGE ESTIMATESDAILY TRIPS

(Value in parentheses is expected error at 90% confidence level)

SERVICE FREQUENCY	FARE LEVEL		
	Free	\$.25	\$.50
10 minutes	1324 (\pm 202)	1308 (\pm 200)	844 (\pm 164)
15 minutes	1116 (\pm 186)	1106 (\pm 186)	718 (\pm 152)
20 minutes	900 (\pm 168)	812 (\pm 162)	580 (\pm 138)

5. ADDITIONAL CONSIDERATIONS

Metrobus routes will be adjusted in June, 1986 to serve the new Metrorail stations. Some potential minibus riders may not use the new service, however, because they will continue to have convenient access to Metrorail through Metrobus. The survey did not attempt to measure the number of potential minibus patrons who are also well-served by Metrobus routes. Based on previous experiences with new transit services - where the potential market includes current transit users - it is likely that the number of persons who continue to use Metrobus will be significant.

Only residents of Falls Church were included in the survey. It is likely that people who live in nearby areas of Fairfax County outside City boundaries will also want to use the service. No trips of this type are included in these estimates. Without a conscious effort to route the minibuses to serve these contiguous areas, however, the number of non-resident riders is not likely to be high.

6. CONCLUSIONS

The potential daily patronage for a Metrorail feeder minibus system ranges from a high of 1324 trips for a 10 minute frequency, free fare service to a low of 580 trips for a 20 minute frequency, 50 cent fare service. The trip numbers reflect use of the service by between 5.5% and

12.6% of all workers living in Falls Church. These percentages are consistent with current observations of the proportion of workers using public transit.

A standard transit performance measure -- trips per vehicle mile -- was computed to further test the reasonableness of the patronage estimates. The estimate of vehicle-miles is based on a hypothetical system that would operate within a 5 minute walk of all Falls Church residents and a 10 minute ride to Metro.

For the service and fare alternatives shown in Table 2, trips per vehicle-mile are in the range of 2.02 to 4.19. Larger urban bus systems typically experience 2.0 to 3.0 trips per vehicle-mile. Small city systems offering all-day service have values of about 1.0. The somewhat higher than average values projected for the proposed Falls Church system are reasonable for a "peak-period only" service. The values exceeding 3.0 are projected only for the very low fare options - free or 25 cents. Fares this low are no longer found in most transit operations.

By way of comparison, the Montgomery County Ride-on service on Bus Route 27 (30 minute frequency, 60 cent fare) has 0.5 - 0.7 trips per vehicle mile in the peak period. Bus Route 31/32 (15 minute frequency, 60 cent fare) averages 1.5 trips per vehicle mile in the peak period. Both of these routes operate in suburban environments that are similar to Falls Church.

APPENDIX

QUESTIONNAIRE

CITY OF FALLS CHURCH TRANSPORTATION SURVEY



CITY OF FALLS CHURCH

Harry E. Wells Building • 300 Park Avenue • Falls Church, Virginia 22046

Mayor Carol W. DeLong
Vice Mayor Robert L. Hubbell

Elizabeth A. Blystone
W. John Cameron

Gary D. Knight
Edward B. Strait

J. Roger Wollenberg
(703) 241-5014

February, 1988

Dear Resident,

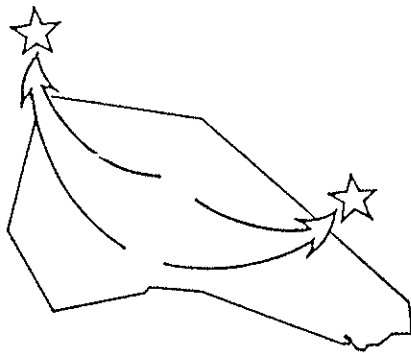
The City of Falls Church in cooperation with the Northern Virginia Transportation Commission is conducting a travel survey of households within the City. The main purpose of this survey is to determine residents' transportation needs. The information you provide will be used to shape future transportation policies within Falls Church. For example, the City is considering a mini-bus system that would link neighborhoods to the soon to be opened Metrorail stations.

Please take a few minutes to complete this survey and leave it on your doorknob in the plastic bag provided. The information you provide will be kept completely confidential and will not be used for any other purpose.

With kindest regards,

Carol W. DeLong

Carol W. DeLong, Mayor
Falls Church



John G. Milliken

John G. Milliken
Chairman, NVTCT

INSTRUCTIONS:

- a. All persons in the household who are employed outside of the home should respond on this one questionnaire.
- b. Please leave the completed survey in the plastic bag and attach to your front door by 10 a.m., Saturday, February 22.

QUESTIONS ABOUT YOUR HOUSEHOLD

- 1. How many people live in your household? _____ (1)
- 2. How many are 18 years old or older? _____ (2)
- 3. How many are employed outside the home, either full-time or part-time? _____ (3)
- 4. How many vehicles are available for commuting to work (autos, pickups, vans, motorcycles, etc.)? . _____ (4)
- 5. Housing Type? Single Family Detached 1. (5)
Town House 2.
Apartment or Apartment/Condominium 3.

IF NO ONE IS EMPLOYED OUTSIDE THE HOUSEHOLD, GO TO THE "ADDITIONAL COMMENTS" QUESTION ON THE BACK PAGE.

QUESTIONS ABOUT INDIVIDUAL WORKERS EMPLOYED OUTSIDE OF THE HOME

(NOTE: Three workers can use this same questionnaire. If there are more than three in the household, additional workers can respond in the margins.)

WORKER #1

- 6. Where do you work (address or nearest street intersection)?
street address _____ (6-10)
city/town _____ state _____ zip code _____
Do you report to this location most of the time? Yes 1. (11)
No 2.

ANSWER QUESTIONS IN COLUMN 1, NEXT PAGE.

WORKER #2

- 6. Where do you work (address or nearest street intersection)?
street address _____ (6-10)
city/town _____ state _____ zip code _____
Do you report to this location most of the time? Yes 1. (11)
No 2.

ANSWER QUESTIONS IN COLUMN 2, NEXT PAGE.

WORKER #3

- 6. Where do you work (address or nearest street intersection)?
street address _____ (6-10)
city/town _____ state _____ zip code _____
Do you report to this location most of the time? Yes 1. (11)
No 2.

ANSWER QUESTIONS IN COLUMN 3, NEXT PAGE.

		Worker #1	Worker #2	Worker #3	
7. Sex	Male	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(12)
	Female	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
8. Whether you use it or not, do you have a vehicle available to drive to work?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(13)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
9. How do you generally travel to work? (Check all that apply.)	Drive Alone	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(14)
	Carpool/Vanpool	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	(15)
	Bus	3. <input type="checkbox"/>	3. <input type="checkbox"/>	3. <input type="checkbox"/>	(16)
	Metrorail	4. <input type="checkbox"/>	4. <input type="checkbox"/>	4. <input type="checkbox"/>	(17)
	Other	5. <input type="checkbox"/>	5. <input type="checkbox"/>	5. <input type="checkbox"/>	(18)
10. What time do you start work?	A.M.	_____	_____	_____	(19-22)
	P.M.	_____	_____	_____	
11. What time do you leave work?	A.M.	_____	_____	_____	(23-26)
	P.M.	_____	_____	_____	
12. How long does it take you to get to work?	Minutes	_____	_____	_____	(27-29)
13. Is your workplace served by Metrorail (within walking distance of a station)?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(30)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
14. Have you ever used public transit on a regular basis to commute to work (in this area or elsewhere)?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(31)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
15. Will you consider using public transit to commute to work when Metrorail is opened to Falls Church and Vienna?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(32)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
16. Do you usually need your car at work?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(33)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
17. Do you drop off or pick up children at school or day care on your way to or from work?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(34)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
18. What does it cost you to park?	Per Day	\$ _____	\$ _____	\$ _____	(35-38)
19. If you currently commute in a carpool or vanpool, what is the charge per person?	Per Month	\$ _____	\$ _____	\$ _____	(39-42)

	Worker #1	Worker #2	Worker #3	
20. When the Falls Church Metrorail stations are opened, which station do you expect to use most?				
East Falls Church	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(43)
West Falls Church	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
Another Station	3. <input type="checkbox"/>	3. <input type="checkbox"/>	3. <input type="checkbox"/>	
Do not plan to use Metrorail	4. <input type="checkbox"/>	4. <input type="checkbox"/>	4. <input type="checkbox"/>	

The City of Falls Church is considering a neighborhood connector bus service operating on residential streets and serving nearby Metrorail stations using minibuses. This service would run *only* in morning and evening peak commuting hours. The anticipated average travel time to the station will be about 10 minutes. The one way Metrorail fare from West Falls Church to downtown Washington, D.C., will be \$1.70.

	Worker #1	Worker #2	Worker #3	
21. Would you use this service if the minibus came every 10 minutes ?				
Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(44)
No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
22. Would you use this service if the minibus came every 20 minutes ?				
Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(45)
No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
23. Would you use it if the minibus fare were: (Please answer all questions.)				
a. free?				
Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(46)
No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
b. 25 cents?				
Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(47)
No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
c. 50 cents?				
Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(48)
No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
d. 75 cents?				
Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(49)
No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
24. If you are interested in the minibus service, how often would you use it?				
4-5 Days/Week	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(50)
1-3 Days/Week	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
Less Often	3. <input type="checkbox"/>	3. <input type="checkbox"/>	3. <input type="checkbox"/>	

25. **Additional comments** on local transportation issues:

PLEASE PLACE THE COMPLETED SURVEY IN THE PLASTIC BAG AND ATTACH IT TO YOUR FRONT DOOR
BY 10:00 A.M., SATURDAY, FEBRUARY 22.

MARKET RESEARCH FOR METRORAIL FEEDER BUS SERVICE IN
CENTREVILLE, FAIRFAX COUNTY, VIRGINIA

JUNE 1986

ROBERT HITLIN RESEARCH ASSOCIATES, INC.

SG ASSOCIATES, INC.

FINAL REPORT

MARKET RESEARCH FOR METRORAIL FEEDER BUS SERVICE IN
CENTREVILLE, FAIRFAX COUNTY, VIRGINIA

PREPARED FOR
NORTHERN VIRGINIA TRANSPORTATION COMMISSION

ROBERT HITLIN RESEARCH ASSOCIATES, INC.

SG ASSOCIATES, INC.

JUNE 1986

	PAGE
1. INTRODUCTION.....	3
2. DATA COLLECTION PROCEDURES.....	3
3. DATA ANALYSIS PROCEDURES.....	4
4. RIDERSHIP ESTIMATES.....	6
5. DEMAND FOR EARLIER AND LATER BUSES.....	8

1. INTRODUCTION

A new Metrobus route from Centreville to the Vienna Metro Station is scheduled to open in June, 1986. The Northern Virginia Transportation Commission, in cooperation with the Fairfax County Department of Transportation, sponsored a study in early 1986 conducted by Robert Hitlin Research Associates, Inc., and SG Associates, Inc. ("RHRA/SG") to estimate the potential patronage on this new route.

The study employed both traditional household survey techniques and several innovative procedures to arrive at the ridership estimates. The survey technique used a "dual frame" sampling approach. The first part of the approach used a self-administered questionnaire delivered to almost every household in Centreville that provided an opportunity for several workers in each household to respond. The second part of the methodology included a follow-up telephone survey of 200 non-respondents to the initial household survey to check for potential response bias.

Transit market research often produces patronage estimates that turn out to be higher than actual ridership on proposed new services. This tendency to overestimate usage is probably a result of respondents who would like to have the service available as a backup to their usual mode of travel, but who rarely use the proposed service themselves. To compensate for this tendency to overstate usage, survey responses were run through a series of criteria or "screens" to insure that only the most likely riders of the proposed service were actually included in the estimates.

DATA COLLECTION PROCEDURES

Household Survey

A focus group session was held with residents of Centreville to pre-test the wording of the questionnaire and procedures for distribution and collection. The focus group participants were randomly selected from the community and included some transit users.

The self-administered questionnaire was placed in a clear plastic "hanger bag" and attached to the front doors of 3950 households in the Centreville area (out of approximately 4200 dwelling units). Respondents were asked to place the completed questionnaire in the same plastic bag on their door for collection two days later. Each questionnaire had space for up to three workers employed outside the home to respond on the same questionnaire. Completed forms were collected from 1024 households (25.9%), representing 1733 workers employed outside the home.

Telephone Survey

Addresses of households that did not return the household survey became the universe used to draw the sample for the follow-up telephone survey. A person who responded to one survey was excluded from the universe of the other survey and thus the two groups were entirely independent of each other. Since the telephone survey was used to check for potential response bias in the door-to-door survey it was particularly important that the two samples not overlap.

The telephone survey was conducted within 5 days of the completion of the self-administered survey. Respondents to the telephone survey were asked about their own commuting habits and not about any other workers in their household. Two-hundred and fifteen (215) telephone interviews were completed and used as the sample of non-responding households.

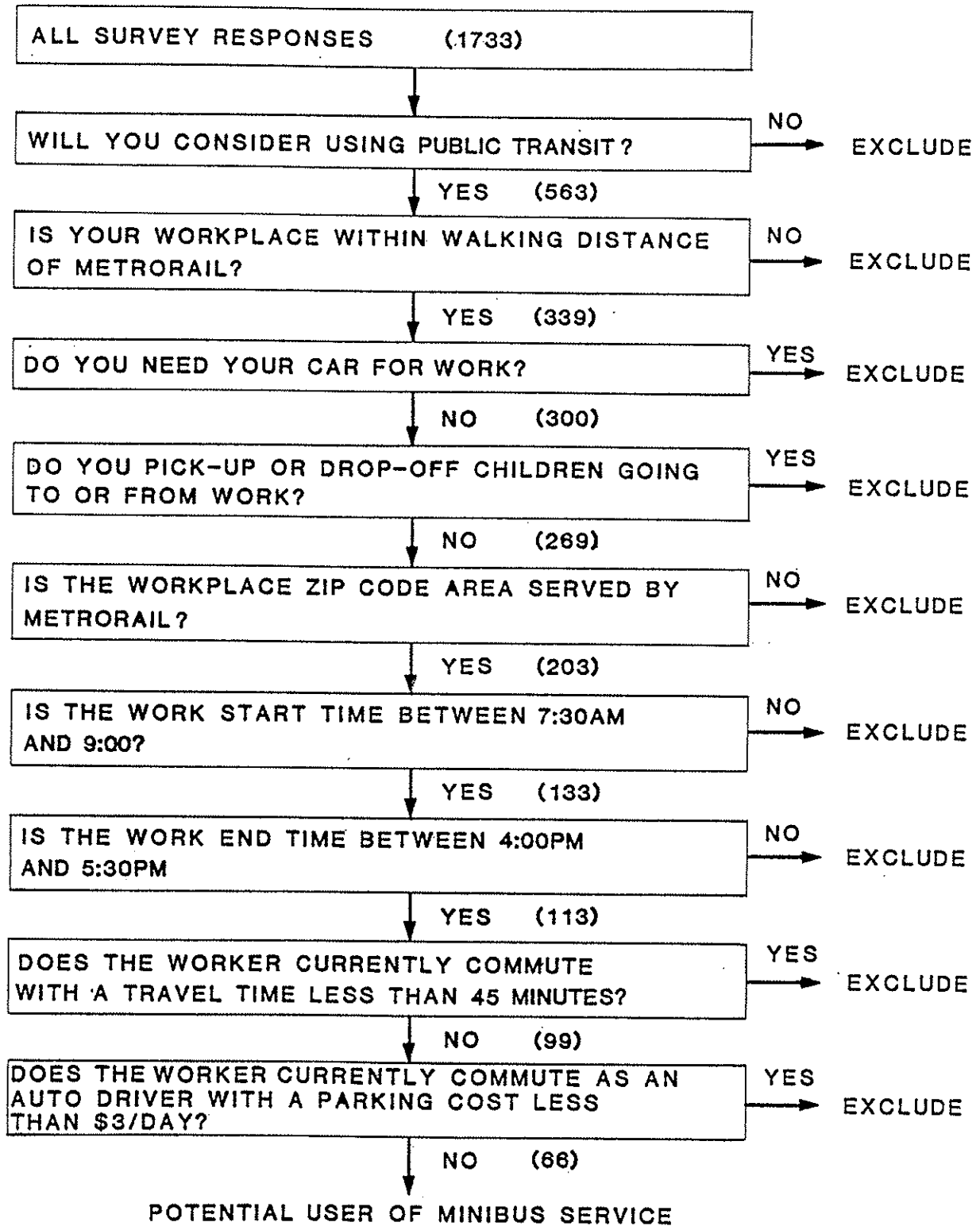
The small scale telephone survey was conducted as a check on potential bias in the responses to the self-administered survey. If potential transit users had a much greater propensity than non-transit users to return the questionnaire, the possibility of over-estimating patronage when generalizing to the entire Centreville area existed. However, the characteristics and transit usage patterns of the respondents to the telephone survey were very similar to those of the self-administered survey. Therefore, for reasons of smaller potential sampling error, the final patronage estimates were derived solely from the larger sample in the self-administered survey.

3. DATA ANALYSIS PROCEDURES

A total of 1733 workers responded to the household survey. Of these, 563 indicated an interest in using public transit when the new Orange line Metrorail stations open. These survey responses were run through a series of "screens" or filters that were designed to eliminate respondents who would be unlikely to actually use the new service. Several questions were included to distinguish between people who would like to have the service available but would probably not use it from those who would most likely use it. The questions that were used as filters are illustrated in Figure 1.

The screening process was successful in combing out many people who probably would not use the service despite their expression of interest to do so. The impact of this approach on the survey responses is illustrated in Table 1. Only respondents who passed all of the screens were included in the final estimates of potential riders.

FIGURE 1
TECHNIQUE FOR SCREENING SURVEY RESPONSES



NOTE: THE ORDER IN WHICH THE SCREENS WERE APPLIED AFFECTS THE NUMBER REMOVED AT EACH STAGE. THE ORDER DOES NOT AFFECT THE RESULT.

TABLE 1
 IMPACT OF THE SCREENING PROCESS

HOUSEHOLD SURVEY	
TOTAL WORKERS RESPONDING	1733
WORKERS EXPRESSING INTEREST IN PUBLIC TRANSIT	563
WORKERS PASSING ALL SCREENS	66

The table illustrates the effect of this methodology compared to conventional ridership estimating techniques that rely on an expression of interest for patronage forecasting (i.e., 563 versus 66). For this reason we are confident that the final estimates are a realistic estimate of the number of Centreville residents who will use the new bus route.

Estimates were also adjusted for expected frequency of use. Even regular transit users will not commute to work every day. Vacations, sick leave, out-of-town travel and other factors reduce time at work. Surveys of travel reveal that 15-20% of workers do not report to their usual work place on an average day.

4. RIDERSHIP ESTIMATES

The estimates of potential ridership include all respondents who indicated a willingness to use public transit and who passed the screening process. Despite the fact that not all of these respondents indicated that they would use Metrobus to get to Metrorail, any respondent who passed all of the screens was included as a potential Metrobus user. It may be possible, for example, that some respondents intending to park/ride may discover that parking is not available when and where they want it. For this reason the patronage estimates should be viewed as upper limits.

Extrapolation of the likely ridership is based upon the return rates in each of the 7 areas of Centreville. Table 2 indicates the return rate of each area, the expansion factor associated with it, the potential ridership, and the potential sampling error associated with each estimate.

TABLE 2

RIDERSHIP ESTIMATES BY AREA (1)

<u>Area</u>	<u>Return Rate</u> (<u>Household</u>)	<u>Expansion Factor</u>	<u>Number Passing Screen and Expecting to Use Bus Service</u>	<u>Expanded Estimate</u>	<u>Potential Sampling Error</u> (2)
London Towne	17.2%	5.8	5	29	+/- 1.30% (25 people)
Newgate	19.6%	5.1	4	20	+/- 1.70% (20 people)
Country Club	32.7%	3.1	19	59	+/- 1.77% (26 people)
Kimanna	22.6%	4.4	1	4	+/- 1.58% (9 people)
Xanadu Estates	25.0%	4.0	3	12	+/- 2.69% (13 people)
Ratcliffes	29.7%	3.4	2	7	+/- 3.46% (11 people)
Patent	27.8%	3.6	6	22	+/- 1.96% (17 people)

Based on the current routing plan that will offer service to the London Towne and Newgate communities, we estimate a market of about 49 persons who may use the new service as walk-on riders.

1 The current routing plan offers service to the the London Towne and Newgate areas only. The other 5 areas were included in the survey as candidates for possible future service.

2 In some cases the potential sampling error is larger than the estimate of ridership. However, this is not an error. It results from the fact that potential ridership is so rare in the community. For example, in London Towne with a potential ridership of only 1.5% of the respondents, a potential sampling error (at the 95% confidence level) of 1.3% is extremely large. However, if ridership were much higher the confidence interval would be a smaller proportion of the estimate.

Instead of using these results to estimate ridership, another way of looking at them is to estimate non-ridership. In that case the estimate for London Towne would be 98.5% +/- 1.3%. In this case the confidence interval is only a small fraction of the estimate.

We also estimate that 5% of the potential riders from other neighborhoods included in the market research will also use the service (park/ride, or by being dropped off), for a total of 54 potential riders.

On a typical workday about 80% of workers report to their principal place of work. Typical daily ridership is therefore, estimated to be 54 persons times 80%= 43 persons, yielding 86 daily rides (assuming equal morning and evening use).

5. DEMAND FOR EARLIER AND LATER BUSES

The ridership estimate is based on a one and one half hour range of work starting and ending times (7:30 - 9:00 A.M., 4:00 - 5:30 P.M.). A 3 hour range of starting and ending times (6:30 - 9:30 A.M., 3:30 - 6:30 P.M.) was also analyzed to gauge the impact of running earlier or later buses on the route.

Using the narrower time frame as a screen does have a major impact on the potential ridership. We estimate that offering service for a 3 hour morning and evening period would increase ridership by about 50% over the above estimates. However, this involves only 22 additional people.

A HANDBOOK FOR A DUAL FRAME METHODOLOGY
TO CONDUCT
TRANSIT MARKET RESEARCH

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TABLE OF CONTENTS

	PAGE
I. INTRODUCTION	3
II. RESEARCH PROCEDURES	7
Step 1. Profile The Service Area	7
Step 2. Develop Transit Service Concept	9
Step 3. Survey Design	10
a. Questionnaire	10
b. Focus Group	13
c. Sampling Procedures	14
i. Household Survey	14
ii. Telephone Survey	16
Step 4. Data Collection	17
a. Household Survey	17
b. Telephone Survey	22
Step 5. Code, Enter, and Tabulate Data	23
Step 6. Develop Ridership Estimates	25
a. Screen Out Non-Riders	25
b. Calculate Expansion Factors	29
c. Adjust for Frequency of Usage	30
d. Calculate Sampling Error	30
III. CONCLUSION	32
IV. APPENDICES	
1. Description of Falls Church Project	34
2. Falls Church Questionnaire	35
3. Flow Chart of Screening Process in Falls Church	39
4. Comparison of Household Survey and Telephone Survey Results in Falls Church	40
5. Description of Centreville Project	41
6. Centreville Questionnaire	42
7. Flow Chart of Screening Process in Centreville	46
8. Comparison of Household Survey and Telephone Survey Results in Centreville	47

I. INTRODUCTION

This handbook is a summary of a transit market research and analysis technique developed and conducted under contract with the Northern Virginia Transportation Commission in cooperation with the Falls Church Department of Planning and Development and the Fairfax County Office of Transportation.

This approach uses survey data to develop ridership estimates for public transit services. A "dual frame" methodology is used for collection of the survey data. The ridership is estimated by a screening process. The technique includes both self-administered surveys delivered to every housing unit in the target area and a followup telephone survey of non-respondents in each area. The resulting data is analyzed using a discriminant model-building approach that screens out unlikely transit users.

The estimates that result from this process are likely to be much more realistic than those derived from standard survey approaches. Transit research has clearly demonstrated the likelihood of overestimation of potential patronage if expressions of interest are accepted without further scrutiny. In one of the two instances where the technique has been applied the resulting estimate has been closely confirmed by the actual ridership of the new service. In the other location (where

service has not yet begun) the results have been accepted by local transit officials for planning purposes and are in line with the experience of similar systems in other cities.

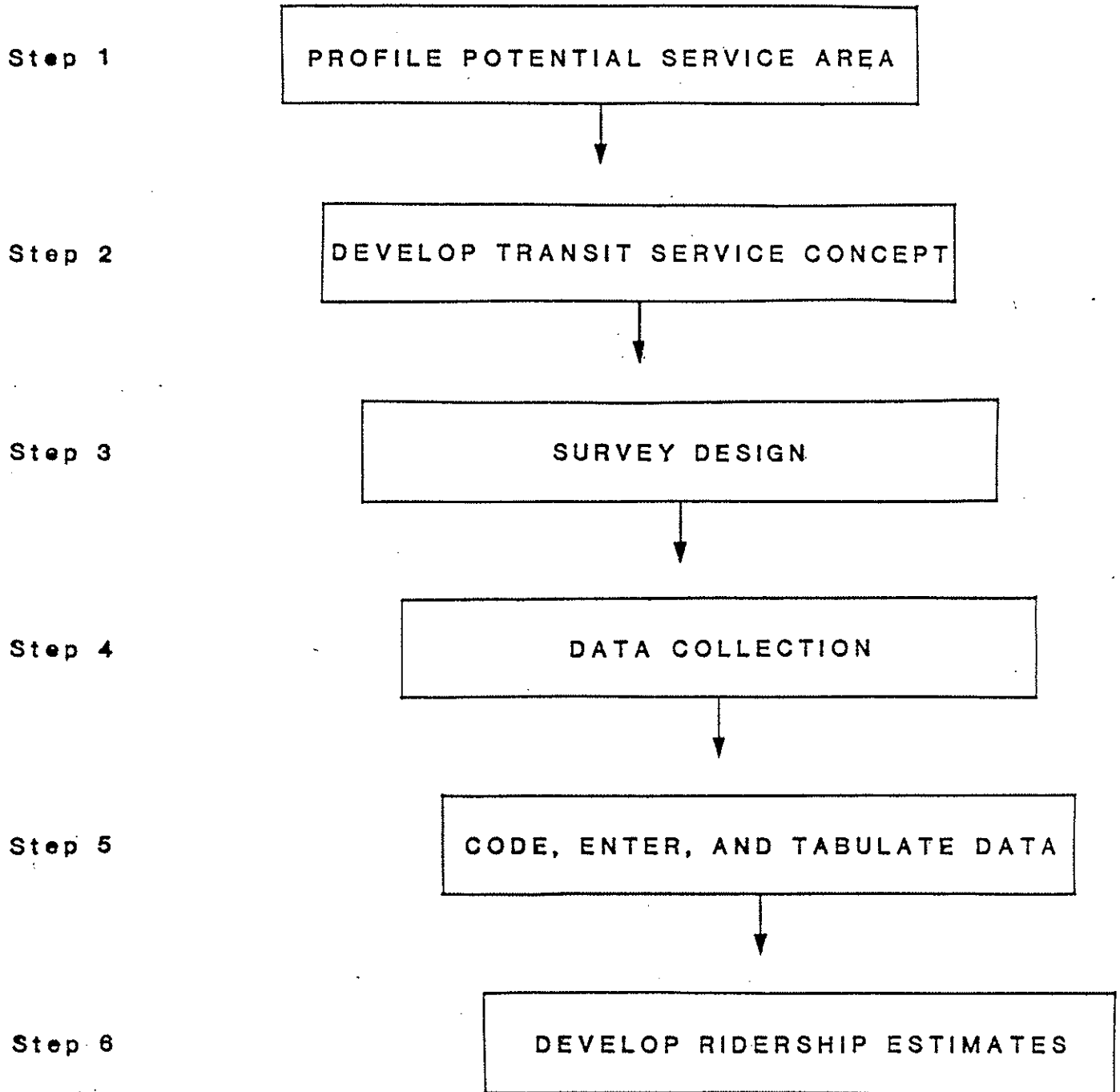
This technique for assessing demand for public transportation is adaptable for use in other areas. It is a cost-effective method for collecting data from potential transit users who are, statistically speaking, a "rare population," and for deriving reliable estimates of potential transit users. It also provides the ability to gather additional information to draw a profile of residents and their travel patterns that can be of use in general transportation planning unrelated to the immediate project.

This handbook describes the techniques involved. The appendices provide some details about their application in two Northern Virginia locations. The communities where the approach has been utilized have approximately 4000-4500 housing units each. These techniques could easily be applied to smaller areas. Larger areas can be studied if the resources, supervisory personnel, and labor are available. Readers interested in more details should refer to the final reports for the projects in Falls Church and Centreville, available from the Northern Virginia Transportation Commission (2009 N. 14th St., Suite 300, Arlington, Virginia 22201, (703) 524-3322).

The steps in this handbook are keyed to the steps in the flowchart presented in Figure 1. The techniques will need to be adapted to specific projects in specific locations, but the information presented in this handbook should be adequate to serve as an overall blueprint for the research design and planning process.

FIGURE 1

DUAL FRAME
FLOWCHART OF STEPS



II. RESEARCH PROCEDURES

Each section of this handbook is keyed to the steps in the flowchart presented in Figure 1 (page 6). Sample questionnaires are included in the Appendices.

Step 1. Profile the Service Area

The first step in designing the research project is to become familiar with the characteristics of the area under investigation. The service area profile serves at least three purposes:

1. To define the geographic limits of the household and telephone surveys;
2. To provide basic demographic data that are used to check the validity of survey results and to develop survey expansion factors; and
3. To help in designing the survey questionnaire, developing specific "screens" to be used in the transit patronage analysis, and in understanding the needs of the community in developing alternative transit service concepts to test in the research.

Data to be included in the area profile are:

1. Base maps showing all streets with a scale of about 1"=200'
2. The definition of the potential service area

3. Number of households by type (e.g., single family, apartment, etc.)
4. Current estimate of transit use
5. Labor force information
6. Housing density in each part of the area
7. Parts of the area that are commercial (and therefore not surveyed).

For some of these items current accurate data may not be available. The most recent U.S. Census is the best starting point, but in rapidly growing areas these data may be out of date. Estimates of current transit use can be developed using records of the transit operator currently serving the area. Census data may also provide an estimate of transit work trips. However, these data may not agree with other sources due to quirks in the Census phrasing of the question on "mode of travel to work."

From the profile several measures should be developed to check against the characteristics of the survey samples. There may in fact be some differences between the two sets of numbers due to rapid growth in an area, so it cannot be assumed that any differences from Census data indicate errors in data collection. As the 1980 Census data becomes more and more obsolete its utility as a benchmark obviously lessens. Some of the characteristics of the sample to check are:

1. Number of households
2. Persons per household
3. Workers per household
4. Current transit use (number of trips).

Step 2. Develop Transit Service Concept

Before developing a questionnaire or a sampling design it is essential to clearly specify the type of transit service that the project is designed to test. After frequency, hours of service, potential routes, and fare alternatives have been determined, the questionnaire can be designed to test public reaction to a clearly defined concept.

One of the questions in the screening process is "Would you use (or consider using) the transit service described?" In order to obtain valid responses to this question the proposed service must be described in sufficient detail to permit the respondent to make a considered evaluation. The elements of the system that affect rider choice - distance from residence, service frequency, travel time, fare - must be presented either as specifications or as options.

To avoid raising expectations the description should avoid detail unless a commitment to a specific service plan has already been made. Stated service parameters, such as travel

time, should be reasonable in order to elicit the most accurate responses possible.

Hours of service may or may not be presented. For a planning study it is best to avoid specifying the hours of service so that the widest potential market is identified. The screening process can be used to determine the effect of various hours of operation on expected patronage.

Some desired levels of service may simply be too costly to operate. Before settling on the concepts to be tested in the surveys it is advisable to investigate the general cost of purchasing, maintaining, and operating the vehicles for the desired level of service. Such measures as revenue vehicle-miles, total vehicle-hours, revenue vehicle-hours, etc., should be estimated to determine the realistic costs of such service before raising public expectations by including unrealistic options in the questionnaire.

Step 3. Survey Design

a. Questionnaire

The questionnaires should be printed on two sides of high quality paper (about 40 pound stock) in four page booklet form. The questionnaires should be designed by graphic artists to give

them the appearance of official public documents and to make them interesting looking and attractive as well.

The questionnaires utilized in the two Northern Virginia locations are included in the Appendices. They can be utilized in other locations after suitable modifications are made to adapt them to specific localities. The first page is a cover letter signed by local officials. The questions on pages 2 and 3 are designed to collect the screening information that will be used to screen out respondents, who, although they might respond that they would consider using the new transit service, would be unlikely to do so. These screening questions may need little or no modification before use in other locations. The questions on page 4 of each questionnaire are designed to test the alternative service concepts and must be completely customized in each instance.

Printing in this manner permits use of standard materials for pages 2 and 3 while pages 1 and 4 can be customized to a particular area. Each page of the questionnaire is 8 1/2 x 11" so that standard paper sizes can be used. Use of a smaller form is not recommended. The larger form is easy to fill out and can be "spotted" by crews picking up forms.

The questionnaire is designed to be closed-ended (self-coding) in order to make it as easy to fill out as possible and

to make certain that all responses are usable. The final question asks for additional comments. The comments will likely provide some interesting ideas for transportation planners to consider. Comments may also help the researchers understand some of the thinking behind the responses, and provides a deeper understanding of the results which otherwise would be based solely on percentages.

The variables included in the final questionnaire that are used to profile the transit service areas, to compare the results to Census data, and to build the discriminant patronage estimation models are the following:

Household Demographics

- o number in household
- o number of adults in household
- o number employed outside household
- o number of vehicles available for commuting
- o housing type

Individual Worker and Trip Characteristics

- o work location (zip code)
- o sex
- o is a vehicle available for commuting
- o current mode of travel
- o work start time
- o work end time
- o total commuting time
- o is workplace served by public transit
- o ever commuted by transit before
- o willingness to use mass transit in the future
- o is personal car needed at work
- o are children dropped off/picked up by car when going to/from work
- o parking cost, if applicable
- o if carpool or vanpool member, monthly charge and number in vehicle

Transit Service Concept

- o use of service at various times
- o use of service at several fare levels
- o interest in earlier or later service
- o which public transit station/stop will be used

Some modification of the questionnaire will be required in most instances to conform to the nature of the area being surveyed. In other instances, identical questions may be asked but it will only become clear after the fact that certain questions will not prove to be effective screens. For example, the question on auto availability was designed to identify transit captives. In both areas studied in Northern Virginia there was almost universal auto availability and so this question did not prove to be a useful screen. In other areas having lower auto ownership rates it might be more useful as a screening measure.

b. Focus Group

Prior to finalizing the questionnaires and research procedures a focus group session should be held involving residents from the research site. Participants can be invited by letter and then by telephone, and paid \$25 to attend the two-hour session. Citizens can be recruited from a variety of sources, including people who have contacted the local governments about

related issues and names drawn at random from the telephone book.

The purpose of the focus group session is to solicit comments from average citizens on the length, clarity, and format of the proposed questionnaires. Sponsoring agency officials should attend and participate in the discussion of the questions, instructions, and distribution and collection procedures.

c. Sampling Procedures

The dual frame methodology calls for two independent surveys to be conducted in each research site. The first survey is a self-administered questionnaire delivered to each housing unit, and the second is a random sample telephone survey of non-respondents to the door-to-door survey.

i. Household Survey

A questionnaire is placed on the door of every housing unit in the research area. Questionnaires can be attached to each¹ doorknob or screen door in clear plastic "hanger bags." Respondents should be instructed to complete the questionnaire (with

¹ Mail boxes cannot be used since it is illegal to use them for anything besides U.S. mail.

space provided for several workers per household) and leave it on the doorknob in the plastic bags to be picked up after 10:00 A.M. two days later.

Problems can arise in deriving estimates from surveys in which respondents are a self-selected sample. If propensity to respond is related to the major question under study (i.e., transit usage), and the respondents are therefore not typical or representative of the universe from which they come, a very inaccurate estimate will be made. As a check on this potential problem a telephone survey must be conducted of non-respondents to confirm that the self-selected respondents to this door-to-door survey gave responses that were similar on almost all questions to the telephone respondents.

The door-to-door survey gathers information at low cost from a large number of households and results in a comparatively small confidence interval around the final results. The "dual frame methodology", therefore, controls costs as well as sampling error

2

While it is possible to pre-code the questionnaires to the housing unit level this approach is not recommended. To do so raises confidentiality and privacy questions. Such problems can be avoided while useful information is collected if questionnaires are coded at the block level while being picked up, and if addresses are crossed off on maps or master lists.

in the final estimate, while at the same time confirming the
3
validity of the door-to-door survey results.

ii. Telephone Survey

A random sample of 200 households from each research site should be selected from among the housing units that do not respond to the door-to-door survey. Telephone numbers for the selected addresses can be obtained from a reverse ("criss-cross") directory. A sample size of 200 households yields an overall confidence interval of between +/- 4.2% and +/- 7.1% for each research site (see pages 30-31 for further explanation).

In the design of complex surveys when low response rates lead to suspicion of self-selection bias the most effective strategy is to conduct a supplementary random survey of the non-respondents. The purpose of such a supplementary survey is to determine whether non-respondents are similar to respondents. The resulting information either establishes that the respondents are indeed representative of the universe from which they were drawn,

3

If the telephone survey results indicate that the door-to-door respondents are "untypical" on some major characteristic or on transit usage, weights derived from the telephone survey can be applied. This was not necessary in the two instances where the technique has been used so far. The Appendix contains tables comparing the survey results in Northern Virginia. The results of the door-to-door and telephone surveys in each location were clearly within each other's overlapping confidence intervals. In other words, self-selection bias was not a problem.

or provides some correction factors. For reasons of time and cost, however, supplementary surveys of initial non-respondents are rarely conducted in contemporary survey research.

This "dual frame" methodology uses an adapted version of this procedure. Non-respondents to the household survey are treated as a totally separate population in each location. A follow-up telephone survey of these non-respondents is conducted to derive independent estimates from these segments of the population. If the results of the two surveys are similar it is not necessary to apply any correction factors.

Step 4. Data Collection

a. Household Survey

A survey booklet must be delivered to each housing unit in each survey area. Labor can be provided by workers hired through

4
There is another potential use for the telephone survey. It can provide a patronage estimate for non-respondents to the household survey which can be added to the actual results of the household survey to arrive at a total estimate. The advantage of such an approach is that if the household results are considered as a universe (and not a sample) no sampling error need be included in interpreting that part of the totals. However, this means that the telephone survey sample needs to be very large in order to keep the confidence intervals associated with it small enough to be considered useful (since only a small proportion of people contacted will actually be transit users). This additional cost may negate the savings that are an important advantage of this dual frame approach.

a temporary employment agency. Other potential sources of labor are the Boy Scouts and Girl Scouts, and high school or college students. Questionnaires in clear plastic bags should be attached to each doorknob or screen door. The instructions on the questionnaire are that the booklets will be picked up two days later on a specified day after 10:00 A.M.

Distribution in each Northern Virginia location took place over a four day period. From 15 to 40 people can be involved in the distribution/collection process, depending on the size of the area and number of days allowed for the process. The density of an area (and the presence of high rise apartment buildings which are faster to distribute to than single family homes) will affect the time needed. For planning purposes it is safe to assume that each member of the survey crew can distribute about 30 forms per hour, and pick up about 40 per hour. Distributors were given maps and clipboards and instructed to note the address of each house when leaving a questionnaire. The distribution process will go smoothly if routes are worked out in advance and each member of the crew is given a map showing his or her route.

When the questionnaires are picked up the collectors should be instructed to cross off the number of each house or dwelling

5

With a likely response rate of about 25% the workers will have many fewer questionnaires to pick up than to distribute. Only surveys which have been placed outside the residence are to be picked up. They still have to cover the entire route, however.

unit from which a response is obtained. If possible, the crew members should pick up forms along the same route to which they distributed forms. In some areas with high density housing, lists of addresses can be made rather than using the maps themselves. Census block numbers can also be recorded on each questionnaire for use in subsequent analysis.

Other specific guidelines for this type of survey are as follows;

1. This type of door-to-door activity should not be conducted during the winter. The danger of cold weather, snow and ice make the work difficult, and potentially dangerous.

2. This activity can be conducted by high school or college students, but there is always difficulty in recruiting and relying on adequate numbers of them.

3. Even when dealing with adults hired through a temporary agency, many (20%) of the people who promise to show up will not. Hire more people than are needed to do the job.

4. The most efficient approach is to have a supervisor work directly with three or four people. The supervisor needs copies of maps on which to outline specific walking routes, and can do some of the work himself. A supervisor who has to work with more than 4 people may not be able to move people to new areas as soon as they complete their sections, resulting in some loss of time. Whatever the supervisory patterns that are employed, constant supervision is a must.

5. The temporary distribution/collection employees have little incentive to record address and block data thoroughly and carefully. Supervisors must pay careful attention to insure the accuracy of the records kept by collection/ distribution personnel. Close supervision, especially at the beginning, is essential.

6. If they are not readily available, maps of the areas to be surveyed must be developed prior to field work. They should be as clear as possible, at an appropriate scale and must include legible street names. If geographic analysis of the results is desired the block numbers must be clearly marked on maps given to survey workers. Prior to the survey the field supervisor should visit the area to check the housing density and accuracy of the maps in order to estimate the amount of time and labor needed to complete the task.

7. Distribution routes should be predetermined along with personnel drop off/pick up points.

8. Schedule distribution routes to provide for supervisor contact at least every 30 minutes. At each contact the supervisor should review the records being kept.

10. Forms should be prepared if the scale of the maps is not large enough to permit direct recording of addresses (see Figure 2).

11. To the extent feasible, use the same worker for pick up and drop off in a given area. Familiarity with the area speeds the process.

FIGURE 2
HOUSEHOLD SURVEY DISTRIBUTION ADDRESS RECORDING FORM

Surveyor Name _____ Date _____ Starting Time _____

Street	Area or Block #	Address	Street	Area or Block #	Address

12. Specific block numbers should be assigned to each block in the survey area. Crew members should note the block number on the returned forms at the time of pick up.

b. Telephone Survey

A telephone survey of workers from a sample of non-responding housing units must be conducted for each research site. The samples can be drawn from a reverse ("criss-cross") directory that lists all streets and addresses alphabetically. The records kept during the door-to-door survey are the basis for determining the eligibility of a household for inclusion in the telephone survey.

A problem that may arise during the sample selection is that the directory may not list apartment numbers within garden apartment or high rise developments. Instead there may be only alphabetical listings of residents. In such cases, random samples should be drawn from these buildings. Consequently, some people called on the phone will indicate that they have already returned the questionnaires. This may result in some inefficiency in the survey, but should not be a major problem. These people can be replaced in the sample by other names from the same developments.

The per completion price of the telephone survey is likely to be three to four times the per completion price for the

household survey. It is not possible to give precise dollar figures because so many variables are involved in a given area. Telephone surveys will vary because of the length of the questionnaire and the type of sampling done within each household. The cost of the household surveys will vary according to housing density, weather, the existence of high rise and low rise buildings, local labor rates, etc. What is certain, however, is that the household approach will yield many more completions and more data than the telephone approach will for the same amount of money. It does, however, require a much greater organizational effort.

Step 5. Code, Enter and Tabulate Data

All questionnaires must be thoroughly edited before data entry takes place. The largest problems are likely to involve the workplace zip codes supplied by the respondents if the area being studied is a complicated metropolitan area. Approximately 40% of the respondents in Northern Virginia could not supply their

6
The comparative costs on the two Northern Virginia projects were approximately \$7 per respondent for the household survey and \$25 per respondent for the telephone surveys. These figures include all project costs - questionnaire development, sampling, editing, data entry, extensive computer analysis, and written reports. These per unit prices can be slightly reduced by adapting the questionnaires in the Appendices and by building on the experience contained in this Handbook. As a comparison, the Federal Highway Administration Office of Planning estimates total project costs for random door-to-door (in person) interviews at \$100 per completion, and \$50 if the housing units are highly clustered. Telephone costs can also run up to \$50 per completion.

workplace zip code. In these cases they were asked to supply either workplace addresses or the nearest intersection. Maps and zip code books can be consulted using this information to derive the zip codes. This is a very time consuming process at the editing stage.

Each questionnaire should receive a unique identification number (using an automatic numbering machine) that will allow it to be retrieved when machine processing identifies errors either in the coding or in the punching. All questionnaires should be subjected to range and logic checks to identify errors before the screening and estimation process begins.

The data processing can be done on a personal computer with sizable hard disk capability and commercially available statistical packages that have the ability to remove records from the data set in steps according to specified criteria. These are sometimes one variable criteria, and in other cases multiple variable criteria. While the basic logic of the screening process is not difficult to explain, it is complicated to translate it into computer language. The processing will require some sophisticated programming, data cleaning, and problem

7
All of the statistical analysis in the Northern Virginia projects was done on an IBM XT with 10 megabyte hard disk using the SPSSPC+ statistical package. An 8087 Coprocessor is recommended to reduce processing time considerably.

solving abilities. It is advisable that only an experienced programmer/analyst undertake it.

Data can be entered directly onto floppy disks. Once keyed the data can be transferred directly to hard disk for editing and cleaning processes. Be certain to keep backup copies of the data at every stage to guard against machine or operator failure. The data sets will become sizable and may exceed the capacity of some editing programs. It is advisable to test all editing and screening programs with dummy data whose errors and results are designed in advance to be certain that all programs are in fact operating correctly.

Step 6. Develop Ridership Estimates

a. Screen Out Non-Riders

There is a well documented understanding among transit researchers that more people will generally indicate that they intend to use a proposed service than will in fact use it when it opens. The philosophy underlining the screening process is that by asking questions regarding current activity patterns, attitudes, and capabilities of the respondents it is possible to separate those who have a high probability of using the transit

service from those who "have an interest" or would "like the service" but are unlikely to use the service on a regular basis.

The ideal analytical situation in estimating potential patronage for proposed services would be to survey both users and non-users of similar services in other locations and to apply a formal "discriminant analysis" in order to classify the population into "transit user" and "non-user" segments. Since this is an expensive and unrealistic possibility in most research situations the questionnaire and discrimination questions were developed subjectively based on experience with other transit services and the screening was "all-or-nothing," i.e., a respondent was rated as either a probable transit user or as a probable non-user. Probabilities were either zero or one with no intermediate probabilities used.

The estimate that emerges from the screening and analysis stage is designed to be a "mature estimate" of patronage. It is really an estimate of the potential market for transit in a given area, excluding persons who are very unlikely to use transit. The estimate is actually the largest number of people that the transit service can hope to attract through effective marketing and reliable service. Patronage on new transit routes generally grows in the early stages until a plateau is reached. The methodology described in this handbook is designed to forecast

the approximate level of that plateau, excluding any population
8
growth in the service area.

The screening questions are of 5 types:

Type 1. Propensity to use transit

- a. Will you consider using public transit on a regular basis to commute to work?
- b. Have you ever used public transit on a regular basis to commute to work?
- c. How do you generally travel to work?

Those who responded "no" to question 1a are excluded from the potential rider group. Question 1b has not yet been used in the screening process but could prove to be useful in the future.

Type 2. Work Place Location

- a. Is workplace served by public transit (within walking distance of a station/stop)?
- b. Workplace zip code
- c. Report to primary work location most of the time?

8
One problem with this geographically based estimation technique is that some people from nearby areas not included in either survey may park/ride.

Type 3. Factors Related to Auto Use

- a. Vehicle available to drive to work
- b. Do you usually need your car at work?
- c. Do you need your car to drop off or pick up children at day care on your way to or from work?

Type 4. Time and Cost of Current Trip to Work

- a. How long does it take to get to work?
- b. Parking cost
- c. Carpool or vanpool charge per person (per month)

Type 5. Ability to Use Transit Service Offered

- a. Work start time from 6:30 A.M. to 9:30 A.M.
- b. Work end time from 3:30 P.M. to 6:30 P.M.

These are a stringent set of screens. Many people who indicate that they will use the transit option in fact fail these screens. Table 1 illustrates the effectiveness of the screening process in the two Northern Virginia locations.

As Table 1 indicates, the screening process reduced the number of respondents who contributed to the final estimates significantly. Through this discriminant-type filter procedure many of the kinds of respondents who traditionally account for

the overestimates in surveys of potential riders of new services
 9
 have been removed from the estimate.

TABLE 1
 IMPACT OF THE SCREENING PROCESS

	FALLS CHURCH	CENTREVILLE
Total Workers Responding	1162	1733
Workers Expressing Interest in Public Transit	546	563
Workers Passing All Screens	248	10 66

b. Calculation of Expansion Factors

The number of workers who pass all of the screens are a known fraction of the workers in a given area. The trips that will be made by these workers must be extrapolated to the universe from which they were drawn using the following formula to calculate expansion factors:

9

See Appendices 3 and 4 for flow charts illustrating the detailed results of the screening process in Falls Church and in Centreville. Note that the number of respondents screened out at each stage is affected by the order in which the screens are applied.

10

These numbers will not match the figures found in the Centreville final report. Final estimates for Centreville were based on only those respondents who live in pre-selected areas scheduled to be served by new bus routes.

all_workers = (expansion factor)
workers responding to survey

c. Adjustments for "Frequency of Usage"

The questionnaire can contain a question asking potential riders how often they would use the new service. In one of the Northern Virginia projects the categories provided were 4-5 days/week, 1-3 days/week, and "less often," but other formulations of this question are possible. It is important to ask this question because research has demonstrated that as many as 15-20% of workers do not report to their regular place of work each day because of vacations, illness, or travel. These results can be applied as a correction factor to the patronage estimates.

11

12

d. Calculation of Sampling Error

The calculation of all potential sampling errors and confidence intervals was done at the 95% level of confidence (+/- 1.96 standard errors) using the formula:

11

The factor applied in Falls Church, for example, was .59. Additional adjustments may be made to remove potential commuters from the estimate who live in areas deemed impractical to serve when the final routes for the new service are established.

12

See Earl Babbie, Survey Research Methods (Belmont, CA: Wadsworth), Chapter 5.

$$\text{Standard Error} = \frac{\sqrt{PQ}}{\sqrt{N}}$$

where:

P= proportion of riders estimated out of the total workers in the universe

Q= (1-P) 13

N= sample size

Since transit ridership is a statistical "rare event" the large sample sizes provided by the household survey are needed to avoid having very large confidence intervals that seriously reduce the utility of the eventual estimates.

For the 200 household sample size used in the telephone survey the confidence interval ranges from approximately +/- 4.2% when 10% are transit riders (P=.10, Q=.90) to approximately +/- 7.1% when 50% are transit riders (P=.50, Q=.50).¹⁴

13

The potential sampling error calculations for Falls Church (free fare, 10 minute frequency) were as follows:

percent of workers estimated to use the service = 12.6%
sample size= 1162

$$\sqrt{\frac{(.126)(.874)}{1162}} (1.96) = .0097313 (1.96) = +/- 1.91\%$$

14

Using the formula above a confidence interval can be calculated for results under 10% or over 90%.

III. CONCLUSION

This manual is designed as a step by step guide to a research procedure that can provide significant amounts of information for a modest investment of resources. It is a cost effective technique that gathers large amounts of data efficiently, including data that can be of use for planning purposes beyond the scope of the immediate project.

Estimates derived for locations where the techniques described in this manual have been applied have been found to be very reasonable by professional transportation planners. In addition, if the data is stored in the appropriate manner (i.e., if block numbers are coded for each survey form) they can also be used to plan routes for the service being studied.

IV. APPENDICES

DESCRIPTION OF PROJECT IN FALLS CHURCH

The Falls Church project was designed to estimate potential ridership for a proposed neighborhood minibus service serving the two new nearby Metrorail stations scheduled to open several months after the completion of the survey. Since Falls Church is an incorporated city the delineation of the service area posed no difficulty. The only complication was whether or not to include housing units on property that is partly in Falls Church and partly outside of it. The decision was made to include these properties since they do pay some taxes to the City.

Information about population and housing characteristics was available through the Falls Church Department of Planning and Development, as were detailed maps showing Census Block numbers and groupings. Falls Church is a city of approximately 4500 households and over 9000 people. Other sources of demographic information were the U.S. Census, and travel pattern analyses based on Census data compiled by Falls Church staff and by NRTC staff using data supplied by the Washington Metropolitan Council of Governments. Since Falls Church is an older suburban area with a comparatively stable population the demographic information and maps available were reliable and accurate.

Several proposed routes and frequencies were analyzed for overall cost, revenue vehicle-miles, total vehicle-hours, revenue vehicle-hours, etc., in order to estimate the realistic costs of such service. After studying the results of this analysis Falls Church staff decided to test the free, \$.25, .50 and .75 fare levels, and 10 and 20 minute frequencies in the survey.

CITY OF FALLS CHURCH TRANSPORTATION SURVEY



CITY OF FALLS CHURCH

Harry E. Wells Building • 300 Park Avenue • Falls Church, Virginia 22046

Mayor Carol W. DeLong
Vice Mayor Robert L. Hubbell

Elizabeth A. Blystone
W. John Cameron

Gary D. Knight
Edward B. Strat

J. Roger Wollenberg
(703) 241-6014

February, 1986

Dear Resident,

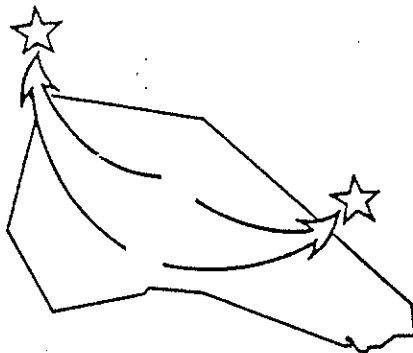
The City of Falls Church in cooperation with the Northern Virginia Transportation Commission is conducting a travel survey of households within the City. The main purpose of this survey is to determine residents' transportation needs. The information you provide will be used to shape future transportation policies within Falls Church. For example, the City is considering a mini-bus system that would link neighborhoods to the soon to be opened Metrorail stations.

Please take a few minutes to complete this survey and leave it on your doorknob in the plastic bag provided. The information you provide will be kept completely confidential and will not be used for any other purpose.

With kindest regards,

Carol W. DeLong

Carol W. DeLong, Mayor
Falls Church



John G. Milliken

John G. Milliken
Chairman, NVTC

INSTRUCTIONS:

- a. All persons in the household who are employed outside of the home should respond on this one questionnaire.
- b. Please leave the completed survey in the plastic bag and attach to your front door by 10 a.m., Saturday, February 22.

QUESTIONS ABOUT YOUR HOUSEHOLD

- 1. How many people live in your household? _____ (1)
- 2. How many are 18 years old or older? _____ (2)
- 3. How many are employed outside the home, either full-time or part-time? _____ (3)
- 4. How many vehicles are available for commuting to work (autos, pickups, vans, motorcycles, etc.)? _____ (4)
- 5. Housing Type? Single Family Detached 1. (5)
- Town House 2.
- Apartment or Apartment/Condominium 3.

IF NO ONE IS EMPLOYED OUTSIDE THE HOUSEHOLD, GO TO THE "ADDITIONAL COMMENTS" QUESTION ON THE BACK PAGE.

QUESTIONS ABOUT INDIVIDUAL WORKERS EMPLOYED OUTSIDE OF THE HOME

(NOTE: Three workers can use this same questionnaire. If there are more than three in the household, additional workers can respond in the margins.)

WORKER #1

- 6. Where do you work (address or nearest street intersection)?
- street address _____ (6-10)
- city/town _____ state _____ zip code _____
- Do you report to this location most of the time? Yes 1. (11)
- No 2.

ANSWER QUESTIONS IN COLUMN 1, NEXT PAGE.

WORKER #2

- 6. Where do you work (address or nearest street intersection)?
- street address _____ (6-10)
- city/town _____ state _____ zip code _____
- Do you report to this location most of the time? Yes 1. (11)
- No 2.

ANSWER QUESTIONS IN COLUMN 2, NEXT PAGE.

WORKER #3

- 6. Where do you work (address or nearest street intersection)?
- street address _____ (6-10)
- city/town _____ state _____ zip code _____
- Do you report to this location most of the time? Yes 1. (11)
- No 2.

ANSWER QUESTIONS IN COLUMN 3, NEXT PAGE.

	Worker #1	Worker #2	Worker #3		
20. When the Falls Church Metrorail stations are opened, which station do you expect to use most?	East Falls Church	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(43)
	West Falls Church	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
	Another Station	3. <input type="checkbox"/>	3. <input type="checkbox"/>	3. <input type="checkbox"/>	
	Do not plan to use Metrorail	4. <input type="checkbox"/>	4. <input type="checkbox"/>	4. <input type="checkbox"/>	

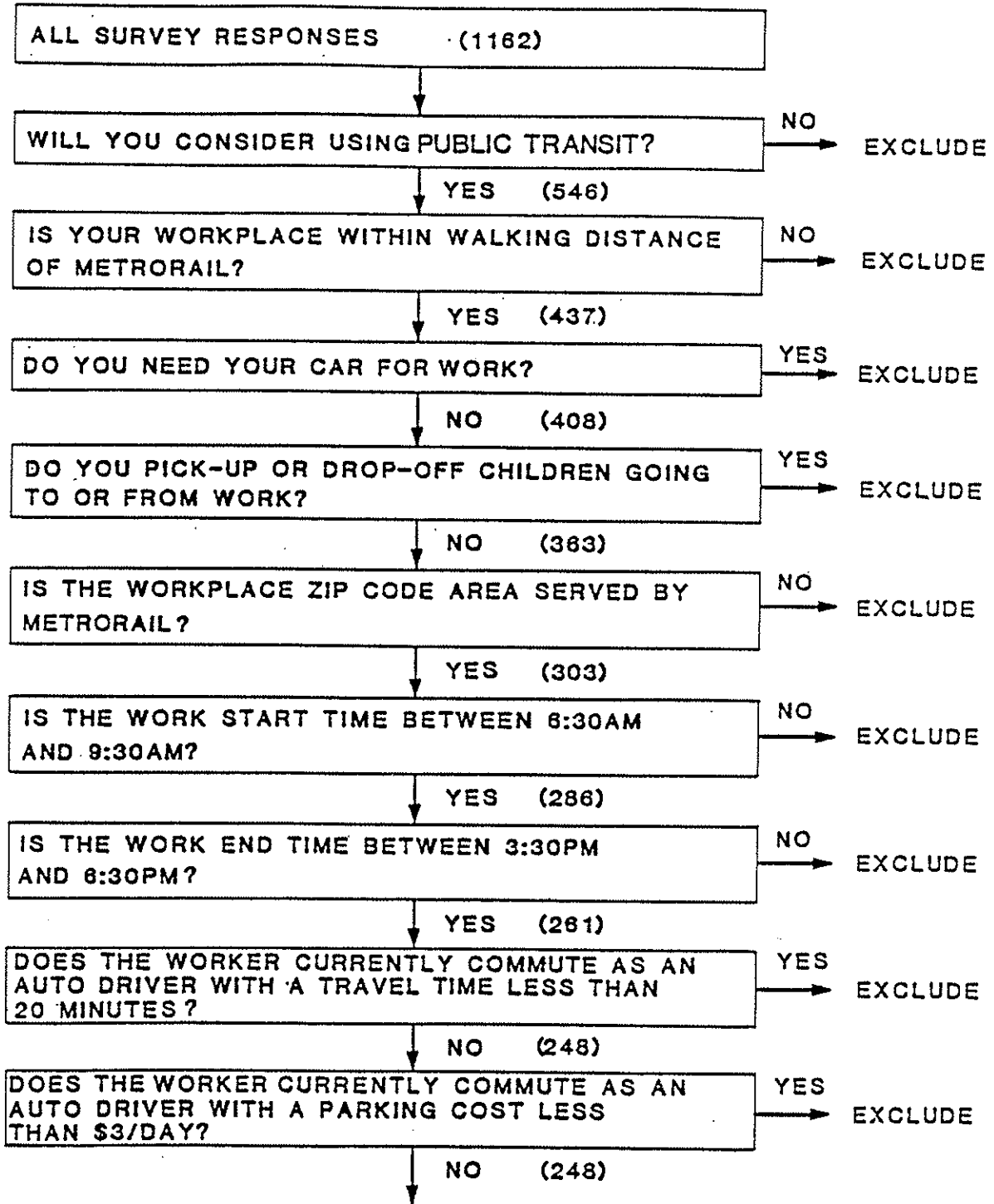
The City of Falls Church is considering a neighborhood connector bus service operating on residential streets and serving nearby Metrorail stations using minibuses. This service would run *only* in morning and evening peak commuting hours. The anticipated average travel time to the station will be about 10 minutes. The one way Metrorail fare from West Falls Church to downtown Washington, D.C., will be \$1.70.

	Worker #1	Worker #2	Worker #3		
21. Would you use this service if the minibus came every 10 minutes ?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(44)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
22. Would you use this service if the minibus came every 20 minutes ?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(45)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
23. Would you use it if the minibus fare were: (Please answer all questions.)					
a. free?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(46)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
b. 25 cents?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(47)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
c. 50 cents?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(48)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
d. 75 cents?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(49)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
24. If you are interested in the minibus service, how often would you use it?	4-5 Days/Week	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(50)
	1-3 Days/Week	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
	Less Often	3. <input type="checkbox"/>	3. <input type="checkbox"/>	3. <input type="checkbox"/>	

25. **Additional comments** on local transportation issues:

PLEASE PLACE THE COMPLETED SURVEY IN THE PLASTIC BAG AND ATTACH IT TO YOUR FRONT DOOR
BY 10:00 A.M., SATURDAY, FEBRUARY 22.

TECHNIQUE FOR SCREENING SURVEY RESPONSES



POTENTIAL USER OF MINIBUS SERVICE

NOTE: THE ORDER IN WHICH THE SCREENS WERE APPLIED AFFECTS THE NUMBER REMOVED AT EACH STAGE. THE ORDER DOES NOT AFFECT THE RESULT.

COMPARISON OF HOUSEHOLD AND TELEPHONE SURVEYS
FALLS CHURCH

NUMBERS ARE MEANS OR YES=1 AND NO=2	HOUSEHOLD OR TELEPHONE SURVEY?	
	HOUSEHOLD	TELEPHONE
PEOPLE IN HOUSEHOLD.....	2.7	2.8
ADULTS IN HOUSEHOLD.....	2.1	2.1
EMPLOYED OUTSIDE THE HOME.....	1.9	1.8
VEHICLES AVAILABLE FOR COMMUTING.....	1.9	2.0
REPORT TO WORKPLACE MOST OF THE TIME?.....	1.0	1.0
SEX.....	1.5	1.5
WORK WITHIN WALKING DISTANCE OF SUBWAY?..	1.5	1.5
EVER REGULAR TRANSIT USER?.....	1.5	1.5
WILL YOU USE NEW METRORAIL TO COMMUTE?	1.5	1.5
NEED CAR AT WORK?.....	1.8	1.7
DO YOU DROP OFF KIDS WHEN COMMUTING?.....	1.9	1.9
USE MINIBUS WITH 10 MINUTE FREQUENCY?.....	1.4	1.4
USE MINIBUS WITH 20 MINUTE FREQUENCY?.....	1.6	1.5
USE MINIBUS IF FREE?.....	1.4	1.4
USE MINIBUS IF 25 CENT FARE?.....	1.4	1.4
USE MINIBUS IF 50 CENT FARE?.....	1.7	1.6
USE MINIBUS IF 75 CENT FARE?.....	1.9	1.8

DESCRIPTION OF PROJECT IN CENTREVILLE

The Centreville area is a rapidly growing suburban area of approximately 4000 households for which up-to-date maps and population data do not exist. The purpose of the study in this area was to estimate potential ridership and optimal departure times for a planned feeder bus service to a soon to be opened Metrorail station.

Fairfax County property maps supplied by Fairfax County Office of Transportation staff were utilized along with commercially available maps, but these were incomplete due to the recent rapid growth of the area. Population data from the 1980 U.S. Census proved to be very outdated. The lack of adequate demographic data led to difficulties in estimating the number of households in the area, and therefore the amount of time, number of data collectors, and number of forms required.

The new Metrobus route from Centreville to the Metrorail station was approved before this survey was begun. Since Metrobus fares are fixed areawide the major questions to be answered by the survey were the expected level of demand for the proposed route, whether an extension of the route to other nearby areas would be justified, and the optimum departure times for the trips.

These questions were addressed by providing the currently proposed schedule to respondents and asking about interest in the service. Respondents were also asked if they would use the service if there were an earlier or later morning, or earlier or later evening trip in the schedule. Residents from areas not currently included in the proposed route were also included in the sample to obtain information on reaction to extending the proposed route.

CENTREVILLE TRANSPORTATION SURVEY



Northern Virginia Transportation Commission

Arlington Executive Building • 2009 North 14th Street • Suite 300 • Arlington, Virginia 22201 • (703) 524-3322

February, 1986

Chairman
John G. Milliken

Vice Chairman
George T. Snyder, Jr.

Secretary/Treasurer
Bernard S. Cohen

Commissioners:
City of Alexandria
James P. Moran, Jr.
Robert L. Calhoun

Arlington County
Ellen M. Bozman
Michael E. Brunner
John G. Milliken

Fairfax County
Joseph Alexander
Elaine McConnell
T. Farrell Egge
Nancy K. Falck
James M. Scott

City of Fairfax
George T. Snyder, Jr.

City of Falls Church
Carol W. DeLong

Virginia Department
of Highways & Transportation
Sally H. Cooper

Virginia General Assembly
Senator Joseph V. Gartlan, Jr.
Senator Edward M. Holland
Delegate Bernard S. Cohen
Delegate Robert E. Harris
Delegate Warren G. Stambaugh

Staff:
Executive Director
Richard K. Tauba

Dear Resident,

Fairfax County in cooperation with the Northern Virginia Transportation Commission is conducting a travel survey of households in the Centreville area. The main purpose of this survey is to determine residents' commuting needs. The information you provide will be used to shape future transportation policies in your community. For example, the survey results will help shape plans for bus service that will connect Centreville with the soon to be opened Vienna Metrorail station.

Please take a few minutes to complete this survey and leave it on your doorknob in the plastic bag provided. The information you provide will be kept completely confidential and will not be used for any other purpose.

With kindest regards,

Elaine McConnell
Fairfax County Supervisor,
Springfield District

John G. Milliken
Chairman, NVT

INSTRUCTIONS:

- a. All persons in the household who are employed outside of the home should respond on this one questionnaire.
- b. Please leave the completed survey in the plastic bag and attach to your front door by 10 a.m., Saturday, February 22.

QUESTIONS ABOUT YOUR HOUSEHOLD

- 1. How many people live in your household? _____ (1)
- 2. How many are 18 years old or older? _____ (2)
- 3. How many are employed outside the home, either full-time or part-time? _____ (3)
- 4. How many vehicles are available for commuting to work (autos, pickups, vans, motorcycles, etc.)? _____ (4)
- 5. Housing Type? _____ (5)
 - Single-Family Detached 1.
 - Town House 2.
 - Apartment or Apartment/Condominium 3.

IF NO ONE IS EMPLOYED OUTSIDE THE HOUSEHOLD, GO TO THE "ADDITIONAL COMMENTS" QUESTION ON THE BACK PAGE.

QUESTIONS ABOUT INDIVIDUAL WORKERS EMPLOYED OUTSIDE OF THE HOME

(NOTE: Three workers can use this same questionnaire. If there are more than three in the household, additional workers can respond in the margins.)

WORKER #1

- 6. Where do you work (address or nearest street intersection)? (6-10)
 - street address _____
 - city/town _____ state _____ zip code _____
 - Do you report to this location most of the time? Yes 1. (11)
 - No 2.

ANSWER QUESTIONS IN COLUMN 1, NEXT PAGE.

WORKER #2

- 6. Where do you work (address or nearest street intersection)? (6-10)
 - street address _____
 - city/town _____ state _____ zip code _____
 - Do you report to this location most of the time? Yes 1. (11)
 - No 2.

ANSWER QUESTIONS IN COLUMN 2, NEXT PAGE.

WORKER #3

- 6. Where do you work (address or nearest street intersection)? (6-10)
 - street address _____
 - city/town _____ state _____ zip code _____
 - Do you report to this location most of the time? Yes 1. (11)
 - No 2.

ANSWER QUESTIONS IN COLUMN 3, NEXT PAGE.

		Worker #1	Worker #2	Worker #3	
7. Sex	Male	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(12)
	Female	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
8. Whether you use it or not, do you have a vehicle available to drive to work?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(13)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
9. How do you generally travel to work? (Check all that apply.)	Drive Alone	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(14)
	Carpool/Vanpool	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	(15)
	Bus	3. <input type="checkbox"/>	3. <input type="checkbox"/>	3. <input type="checkbox"/>	(16)
	Metrorail	4. <input type="checkbox"/>	4. <input type="checkbox"/>	4. <input type="checkbox"/>	(17)
	Other	5. <input type="checkbox"/>	5. <input type="checkbox"/>	5. <input type="checkbox"/>	(18)
10. What time do you start work?	A.M.	_____	_____	_____	(19-22)
	P.M.	_____	_____	_____	
11. What time do you leave work?	A.M.	_____	_____	_____	(23-26)
	P.M.	_____	_____	_____	
12. How long does it take you to get to work?	Minutes	_____	_____	_____	(27-29)
13. Is your workplace served by Metrorail (within walking distance of a station)?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(30)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
14. Have you ever used public transit on a regular basis to commute to work (in this area or elsewhere)?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(31)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
15. Will you consider using public transit to commute to work when Metrorail is opened to Falls Church and Vienna?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(32)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
16. Do you usually need your car at work?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(33)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
17. Do you drop off or pick up children at school or day care on your way to or from work?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(34)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
18. What does it cost you to park?	Per Day	\$ _____	\$ _____	\$ _____	(35-38)
19. If you currently commute in a carpool or vanpool, what is the charge per person?	Per Month	\$ _____	\$ _____	\$ _____	(39-42)

Metrobus will establish a bus service from the Centreville area (via I-66) to the new Vienna Metro station when it opens this summer. The round trip bus fare from Centreville to the Vienna Station will be \$1.25. The one way Metrorail fare to Metro Center in downtown Washington, D.C., will be \$2.30 and to The Pentagon will be \$2.15.

A possible schedule for the bus service is:

MORNING			EVENING		
Leave Centreville	Arrive Vienna Metrorail Station	Arrive Metro Center or Pentagon	Leave Metro Center or Pentagon	Leave Vienna Metrorail Station	Arrive Centreville
6:00 A.M.	6:20 A.M.	6:55 A.M.	4:55 P.M.	5:30 P.M.	5:50 P.M.
6:30 A.M.	6:50 A.M.	7:25 A.M.	5:25 P.M.	6:00 P.M.	6:20 P.M.
7:00 A.M.	7:20 A.M.	7:55 A.M.	5:55 P.M.	6:30 P.M.	6:50 P.M.

20. If the bus operates on the major streets in your subdivision, and is within a 5 minute walk from your home will you use this service?

Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(43)
No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	

IF YOU ANSWERED "NO" TO QUESTION 20:

21. Please indicate if the addition of any of the following trips would result in your use of this service. (Please answer all questions.)

a. An earlier morning bus?

Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(44)
No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	

b. A later morning bus?

Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(45)
No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	

c. An earlier evening bus?

Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(46)
No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	

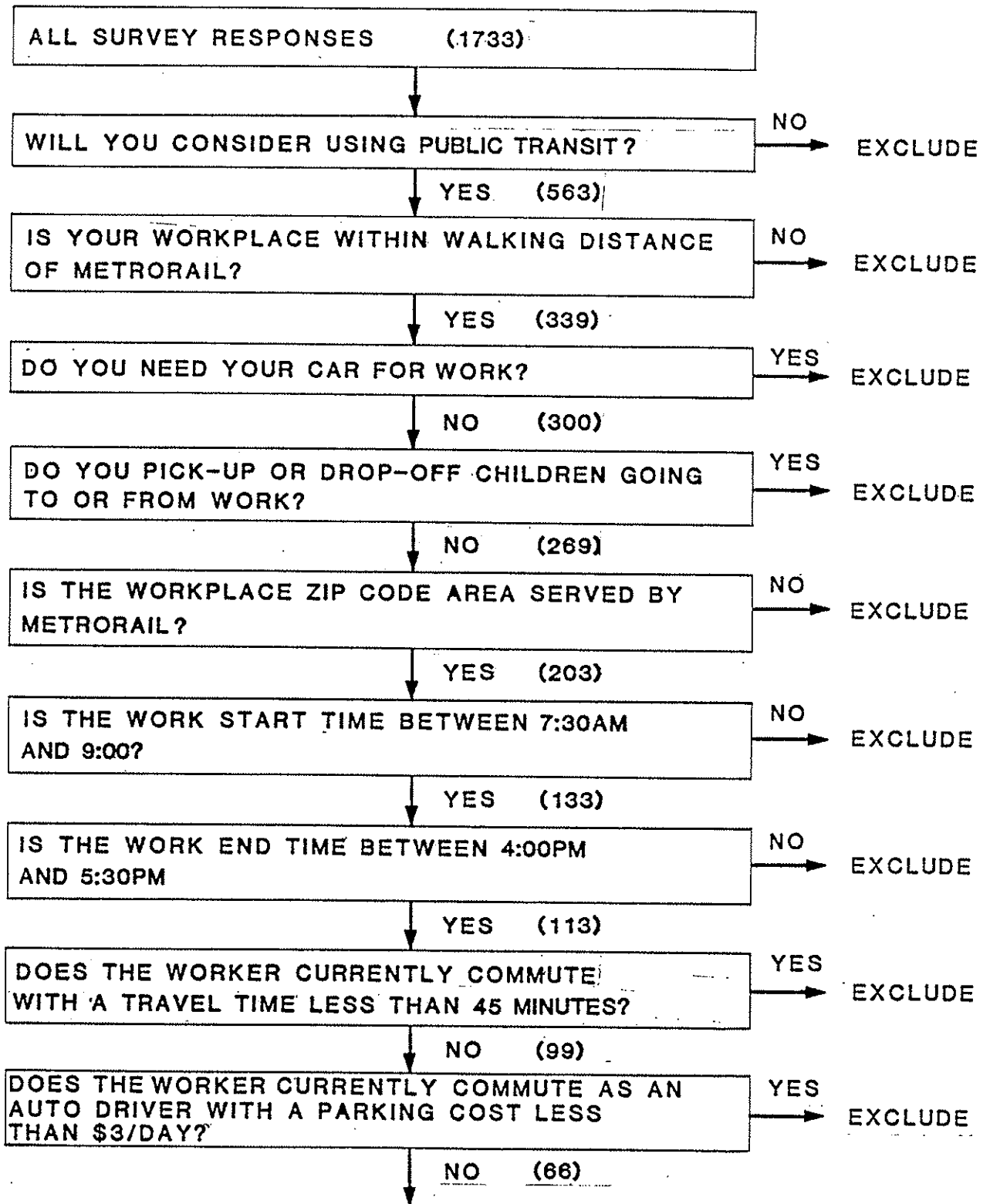
d. A later evening bus?

Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(47)
No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	

22. Additional comments on local transportation issues:

PLEASE PLACE THE COMPLETED SURVEY IN THE PLASTIC BAG AND ATTACH IT TO YOUR FRONT DOOR BY 10:00 A.M., SATURDAY, FEBRUARY 22.

TECHNIQUE FOR SCREENING SURVEY RESPONSES



POTENTIAL USER OF METROBUS SERVICE

NOTE: THE ORDER IN WHICH THE SCREENS WERE APPLIED AFFECTS THE NUMBER REMOVED AT EACH STAGE. THE ORDER DOES NOT AFFECT THE RESULT.

COMPARISON OF HOUSEHOLD AND TELEPHONE SURVEYS
CENTREVILLE

NUMBERS ARE MEANS OR YES=1 AND NO=2	HOUSEHOLD OR TELEPHONE SURVEY?	
	HOUSEHOLD	TELEPHONE
PEOPLE IN HOUSEHOLD.....	3.0	3.2
ADULTS IN HOUSEHOLD.....	2.1	2.1
EMPLOYED OUTSIDE THE HOME.....	2.0	1.9
VEHICLES AVAILABLE FOR COMMUTING.....	2.1	2.1
REPORT TO WORKPLACE MOST OF THE TIME?.....	1.0	1.0
SEX.....	1.5	1.5
WORK WITHIN WALKING DISTANCE OF SUBWAY?..	1.7	1.8
EVER REGULAR TRANSIT USER?.....	1.7	1.7
WILL YOU USE NEW METRORAIL TO COMMUTE?	1.7	1.7
NEED CAR AT WORK?.....	1.7	1.5
DO YOU DROP OFF KIDS WHEN COMMUTING?.....	1.9	1.8
WILL YOU USE THE NEW BUS SERVICE?.....	1.7	1.7
WANT AN EARLIER MORNING BUS?.....	1.9	2.0
WANT A LATER MORNING BUS?.....	1.8	1.9
WANT AN EARLIER EVENING BUS?.....	1.8	1.9
WANT A LATER EVENING BUS?.....	1.9	2.0

NORTHERN VIRGINIA TRANSPORTATION COMMISSION

REQUEST FOR PROPOSAL

TRANSIT MARKET RESEARCH

Issued: November 20, 1985

REQUEST FOR PROPOSAL
TRANSIT MARKET RESEARCH PROJECT

SECTION I: INTRODUCTION

Statement of Problem

The continuing growth of the Washington, D.C. metropolitan area and the expansion of Metrorail into suburban areas has created new opportunities for transit services. Recent transit service planning in Northern Virginia has focused on adjustments to existing bus routes as well as a re-orientation of these routes to feed Metrorail stations. In the coming years Virginia's transit service planning will emphasize feeder systems to Metrorail for both commuters and non-peak period travellers. Other transit planning activities will address non-traditional travel demands such as reverse commuting (i.e., away from the core area) and intra-suburban trips. The principal purpose of this project is to develop a technique for estimating the demand for transit services in areas that do not currently receive service, or where service does not operate all day. Study findings may also be used to analyze existing services to improve the fit between travel demand and supply.

Although much information about travel is already available, it is either too old or too aggregate to permit reliable analysis of small scale transit proposals. With the exception of special purpose surveys, the Metropolitan Washington Council of Government's 1968 Travel Survey is the only available information on household travel by origin to destination pairs. Information in the 1980 Census regarding the characteristics of travel groups with specific origins and destinations is suppressed by the Census Bureau to preserve confidentiality. Due to the limitations of existing data, NVTC has issued this RFP to design and implement a system for the collection of empirical and attitudinal travel data that will be used to evaluate the viability of potential transit initiatives in specific target areas.

Sponsoring Agency

The Northern Virginia Transportation Commission was created by the Virginia General Assembly in 1964. It consists of 18 commissioners of whom 17 are locally elected officials representing the counties of Arlington and Fairfax, the cities of Alexandria, Falls Church, and Fairfax City, and delegates and senators of the Virginia General Assembly, plus one representative of the Virginia Department of Highways and Transportation. Among other activities, the NVTC coordinates transportation services in Northern Virginia, conducts demonstrations of innovative transportation services, and undertakes technical research.

NVTC has received an Urban Mass Transportation Administration (UMTA) Section 8 grant for FY'86 to accomplish the project purposes described above. This Request for Proposals (RFP) has been issued prior to establishing a contract with a consulting firm to develop and apply a market research technique that will enable NVTC to assess potential patronage for proposed transit services. All tasks and services required under this contract are specifically described in SECTION II: SCOPE OF SERVICES.

NVTC will evaluate the proposals received from interested firms, select one firm (or project team), establish contract provisions acceptable to NVTC and the selected firm, and enter into an agreement for a period of at least six months.

NVTC reserves the right to reject any or all proposals received. In addition, any firm which submits a proposal agrees that such proposal shall become the permanent property of NVTC and that all costs incurred for proposal preparation are the responsibility of the proposer.

Proposal Evaluation

The transit industry has limited experience with market research techniques that can be used to estimate potential patronage. Therefore, NVTC encourages proposers to be creative in their submissions and NVTC will explicitly consider the ingenuity of the proposed methodology in the proposal evaluation. A selection committee appointed by NVTC will evaluate the proposals according to the criteria described below and will make a recommendation to NVTC's Contracting Officer. NVTC's Contracting Officer will make the final decision for contract award. Evaluation criteria and their relative shares of a possible 100 point score are:

1. An understanding of the problem. (10 points)
2. The creativity of the approach. (25 points)
3. The experience of the firm. (10 points)
4. The experience of key personnel assigned to this project. (25 points)
5. Performance of the firm in performing similar work. (20 points)
6. Participation of Minority Business Enterprise (MBE) . (7 points)
7. Participation of Woman-Owned Business Enterprise (WBE). (3 points)

In addition to the technical evaluation, contract price will be considered.

Following a review of the proposals, NVTC staff may undertake further discussions with those firms submitting the most highly rated proposals.

Due Date for Proposals

Responses to the RFP must be delivered to the Northern Virginia Transportation Commission no later than 5:00 p.m., December 20, 1985.

Ten copies of the response and all supporting materials must be delivered or mailed to:

Edward J. Barber
Northern Virginia Transportation Commission
2009 N. 14th Street, Suite 300
Arlington, Virginia 22201
(703) 524-3322

All communications regarding this Request for Proposal should be directed to Mr. Barber, listed above.

Contract Regulations

The successful firm must comply with all applicable Metropolitan Washington Council of Governments and Virginia Department of Highways & Transportation policies and regulations, as set forth by Attachment 1, Standard Agreement Articles.

Pre-Proposal Conference

NVTC will conduct a pre-proposal conference at 1 p.m. on December 3, 1985 to answer questions about the RFP and to provide further guidance on the project objectives.

SECTION II: SCOPE OF SERVICES

Analytic Approach

The following task descriptions convey one possible approach to predicting transit demand in well-defined target areas. NVTC will also consider proposals to accomplish the project goals through alternative approaches. A steering committee will be convened that represents jurisdictions where surveying may occur. The committee may also include possible transit service providers. The consultant will keep the steering committee advised of project activities and will incorporate the steering committee's comments into the study products and activities. NVTC will serve as the project manager and will provide final direction and approval of all contract activities.

Task 1. Delineate and Characterize Potential Service Area(s)

NVTC anticipates that the available funding for this project will permit in-depth analysis of two sites as potential markets for transit service expansions. The City of Falls Church will be one of the sites and the other location will be in Fairfax County. In Task 1, the consultant will assemble pertinent information (secondary sources only) about the travel and demographic characteristics of the target site. This information will be used in Task 3 to determine sample size and sample selection techniques.

Site 1. Falls Church, Virginia, is an incorporated City centrally located within the metropolitan area of Northern Virginia. There are approximately 4250 households within the City. The East and West Falls Church Metrorail Stations are located just outside the City and are scheduled to open in June 1986. Metrobus service is currently provided on the major arterials (Route 7 and Washington Street) during peak and non-peak periods.

Falls Church requested that NVTC include the City as a survey site in this project to assist City staff in determining the community's support and need for a locally sponsored transit service. The City staff's concept of a locally sponsored transit service includes the use of small vehicles, such as vans, to penetrate residential neighborhoods within the City and offer service to and from the East and West Falls Church Metrorail Stations. The service would probably operate only during peak commuting hours on a regularly scheduled basis.

Site 2. Site #2 covers a five square-mile area in Centreville, located in western Fairfax County. The objective of this analysis will be to determine the demand for fixed-route, fixed-schedule transit in an area that currently does not have transit service. A random survey of households will be conducted at a rate that will allow analysis at the subarea (i.e., subdivision) level. Data will be obtained on demographics, trip patterns, auto availability, as well as perceived use of transit service on different alignments and at different service levels.

The area to be sampled in Centreville extends from Little Rocky Run in the southeast to Foxhall Mount in the northwest. Major subdivisions in the area include Country Club Manor, Zanadu Estates, London Towne, Center Heights, The Meadows, the Knolls at Newgate, and Ratcliffes.

Current plans call for the introduction of fixed-route, fixed schedule transit service in June 1986. The route has been designed to serve two

major townhouse developments: London Towne off Stone Road and the Meadows off St. Germain Drive. The route will provide three trips in each rush hour period operating at a 30-minute frequency. Buses will run non-stop on I-66 between Route 28 and the Vienna Metrorail Station off Nutley Street.

The household survey will be used to estimate the demand for this service as proposed and under several alternatives. The alternatives may include increased frequency and extended service hours on the primary alignment as well as extensions of the route to (1) Country Club Manor via Stone Road, Braddock Road, and Carlbern Drive or (2) Lower Braddock Road north of I-66 via Braddock and Stone Roads or Patent and Awbrey Drives.

The consultant will work closely with NVTC and the steering committee to develop clear-cut definitions for the second target market area and the potential transit services to be evaluated. The consultant will document Task 1 findings in a technical memorandum.

Task 2. Develop and Refine Transit Service Concept(s)

Based upon the results from Task 1, the consultant will work with the steering committee to develop a transit service concept for the target area. The proposed service concept will incorporate the host community's judgement and the consultant will work closely with the jurisdiction's staff to develop the service concept.

Descriptors of the proposed transit service may include:

- a. location and frequency of service
- b. vehicle type and provider
- c. fare structure
- d. combined fixed route transit and para-transit services

The Consultant will prepare a technical memorandum at the conclusion of Task 2 that documents the transit service proposals that will be analyzed in the following tasks.

Task 3. Design Survey and Sampling Procedures

NVTC anticipates that the most effective means for assessing transit demand will be a household survey. However, the consultant may present an alternative approach in the technical proposal. Tasks 3, 4 and 5 are based on a survey approach but may be revised by the consultant if he or she so desires.

At the beginning of Task 3, the consultant will brief the steering committee on alternative survey techniques and the cost implications of these different approaches. The consultant will also be responsible for recommending a survey approach based upon the project characteristics described in Tasks 1 and 2. The project committee will select the preferred surveying and sampling techniques and the consultant will base the survey design on the committee's selection.

At a minimum, the consultant will be responsible for the following activities in Task 3:

- a. Calculate Sample Size. The consultant will estimate sample sizes for the levels of precision and confidence that the steering committee specifies for the survey findings. The project committee may seek particular information about certain strata within the sample and this should be reflected in sample size determinations.

- b. Design Survey Instrument - Traditional transportation surveys collect demographic and travel information that is used in turn to simulate travel behavior. This project will rely in part upon the traditional time and cost comparisons for assessing market demand. In addition, the survey will explore the respondent's perceived level-of-interest in the transit service. The tendency for survey respondents to overstate their interest in proposed transit services is well known. Therefore, the consultant will devise an approach that recognizes this non-commitment bias and will interpret the survey findings accordingly.
- c. Pre-Test and Revise Survey Instrument as Necessary.
- d. Develop a Coding Scheme for Survey Responses.
- e. Reproduce Survey and Response Forms.

Task 4. Execute Survey

The consultant will be responsible for all aspects of survey execution, including surveyor training, quality control, administrative procedures for call-backs and related activities. The consultant will describe in the technical proposal the means by which surveyors will be recruited and employed (e.g., part-time college students). A description of all pertinent survey administration practices that the consultant will employ should be included in the technical proposal. NVTC will not provide any facilities for survey execution.

Task 5. Code, Tabulate and Summarize Findings

The consultant will code the results in a format that can be read by statistical software packages designed for IBM-compatible microcomputers. Geographic coding will be performed at a level that permits analysis at the census block level.

The consultant will prepare a summary report of the principal survey findings regarding transit opportunities in the target area(s). The report will provide a concise description of the survey results, how they were interpreted and any assumptions used in the analysis. Supporting tables and graphs will be provided in the summary report. The technical proposal should specify how the analyst intends to use the information that will be collected in the household surveys. Trip tables, cross tabulations, user profiles, and trip frequencies and purposes are illustrative of the findings and analyses to be presented in the final report. A separate summary report will be prepared for each target area surveyed.

Task 6. Document Survey Responses and Procedures for Future Use

The consultant will prepare a fully edited machine-readable file of the survey responses that can be used on IBM-compatible microcomputers. The sample size and sample selection procedures will be documented and all supporting materials referenced. The consultant will also document the level-of-effort associated with survey execution, coding and editing to help NVTC estimate future requirements for surveys beyond the scope of this project.

SECTION III: PROPOSAL PREPARATION

NVTC requires that the following items be specifically addressed in the consultant's proposal:

A. Staffing

The names and resumes of project personnel shall be furnished as well as a description of each individual's responsibilities. Survey personnel need not be identified but the manner in which the consultant will staff the surveying activities should be clearly described.

B. Level-of-Effort for Task Completion

The proposal shall contain a description of the personnel requirements and direct costs associated with each element of the consultant's work program.

C. Schedule

The proposal shall contain a schedule of activities for project completion and should indicate the timing and duration of these activities. The final report for the Falls Church analysis of transit demand shall be available no later than March 15, 1986. The entire project shall be completed no later than June 1, 1986.

D. References

The proposal shall contain at least three references to clients for whom the consultant has performed similar work. The references should include names, addresses and telephone numbers.

E. Qualifications of the Firm(s)

The proposal shall contain brief descriptions of work performed elsewhere that is relevant to the proposed study. The description should include the date of such work, the scope of the effort (e.g., approximate contract value), and any significant results from the study findings (e.g., product or service introduction).

F. Cost Proposal

The proposal shall include a separate detailed description of all costs associated with the proposed study. At a minimum, the proposal should include wage rates, number of hours by individual, overhead and administrative costs, direct costs for purchased services and materials, profit, and any other items that will be required for the successful execution of the study. NVTC funding for this contract will not exceed \$35,000.00.

G. Other Information

The proposal should include all additional information that, in the consultant's judgement, the selection committee will need to complete its technical evaluation, including documentation of MBE/WBE status.

STANDARD AGREEMENT ARTICLES

SECTION 1

CHANGES

- a. The parties hereto agree that any modification or change in any aspect of this CONTRACT must be accomplished in writing by both parties before it is considered a contract requirement.
- b. The parties hereto may, from time to time, propose changes in Statement of Work to be performed by the CONTRACTOR. Such changes, including material scope of work changes, time schedule and report delivery changes, budget revisions that increase, decrease, or materially change the CONTRACT's total compensation must be mutually agreed upon in writing, approved by and between COG and the CONTRACTOR and concurred by UMTA, when required, before they are considered contract changes.
- c. Budget revisions supported by appropriate documentation submitted by the CONTRACTOR and involving no increase or decrease in the CONTRACT's total compensation must be concurred in by UMTA, when required, and may be granted by COG to the CONTRACTOR through unilateral written action which fully specifies the revised budget line item amounts. No-cost time schedule extension supported by appropriate documentation submitted by the CONTRACTOR may be granted by COG to the CONTRACTOR through unilateral written action which fully specifies the revised Period of Performance and the report delivery date.

SECTION 2

EQUAL EMPLOYMENT OPPORTUNITY

- a. In connection with the execution of this CONTRACT, the CONTRACTOR shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin. The CONTRACTOR shall take affirmative action to insure that applicants are employed, and that employees are treated during their employment, without regard to their race, religion, color, sex, or national origin. Such actions shall include but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff; or termination, rates of pay, or other forms of compensation; and selection of training, including apprenticeship.

b. No qualified handicapped applicant for employment, or employee, shall, on the basis of handicap, be subjected by the CONTRACTOR to discrimination in employment under any program or activity that receives or benefits from financial assistance under this CONTRACT. CONTRACTOR shall make reasonable accommodation to the known handicaps of an otherwise qualified applicant for employment, or current employee, unless the CONTRACTOR can demonstrate to COG that the accommodation would impose an undue hardship on the operation of the PROJECT. Reasonable accommodation shall be as defined in Title 49, Code of Federal Regulations, Part 27.33.

SECTION 3 INTEREST OF MEMBERS OF CONGRESS

No member of or delegate to the Congress of the United States shall be afforded to any share or part of this CONTRACT or to any benefit arising therefrom.

SECTION 4 INTEREST OF MEMBERS OF COG AND OTHERS

No officers, member or employee of COG and no member of its governing body, and no other public official of the governing body of the locality or localities in which the PROJECT is situated or being carried out, or of other local public agencies, who exercises any functions or responsibilities in review of approval of the undertaking or carrying out the PROJECT during his or her tenure or one year thereafter, shall have any personal interest, direct or indirect, apart from his official duties, in this CONTRACT or the proceeds thereof.

SECTION 5 INTEREST OF THE CONTRACTOR

The CONTRACTOR covenants that it has presently no interest, shall not acquire any interest, direct or indirect, which would conflict in any manner or degree with the performance of services required to be performed under this CONTRACT. The CONTRACTOR further covenants that in the performance of this CONTRACT, no person having any such interest shall be employed.

SECTION 6 AUDIT AND INSPECTION OF RECORDS

The CONTRACTOR shall permit the authorized representatives of COG, the U.S. Department of Transportation and the Comptroller General of the United States to inspect and audit all data and records of the CONTRACTOR relating to his performance under the CONTRACT until the expiration of three (3) years after final payment under the CONTRACT.

SECTION 7 RIGHTS IN WORK PRODUCT

The CONTRACTOR shall be responsible for all material and work items produced under this CONTRACT including, but not limited to, all materials, work products, reports, textual materials, maps, graphs, diagrams, charts or other illustrative material and textual material prepared by any consultant retained under this CONTRACT. All such materials and work items shall not be the subject of a copyright by the CONTRACTOR or its consultants and, upon satisfactory completion of this CONTRACT, or earlier termination thereof under provisions of Sections 10 and 23 of this CONTRACT, or otherwise, shall become the property of COG. The CONTRACTOR and COG shall have an unrestricted right to use, duplicate or disclose all such materials and work items in any manner and for any purpose whatsoever and to permit others to use duplicate or disclose said materials and work items.

SECTION 8 DISADVANTAGE BUSINESS ENTERPRISE/WOMEN
BUSINESS ENTERPRISE

In connection with the performance of this CONTRACT, the CONTRACTOR shall cooperate with the PROJECT Sponsor in meeting its commitments and goals with regard to the maximum utilization of Disadvantage Business Enterprises/Women Business Enterprises (DBE/WBE) and shall use its best efforts to insure that DBE/WBE shall have the maximum practicable opportunity to compete for subcontract work under this CONTRACT. Best efforts to meet the goals shall be documented.

SECTION 9 ALLOWABLE COSTS

Only those costs which are consistent with Federal Acquisition Regulations (FAR) shall be reimbursed under this CONTRACT.

SECTION 10 COVENANT AGAINST CONTINGENT FEES

The CONTRACTOR warrants that he has not employed any person to solicit or secure this CONTRACT upon any agreement for a commission, percentage, brokerage or contingent fee. Breach of warranty shall give the Contracts Officer the right to terminate this CONTRACT or, in his discretion, to deduct from the CONTRACT price or consideration the amount of such commission, percentage, brokerage or contingent fees. This warranty shall not apply to commissions payable by the CONTRACTOR upon contracts or sales secured or made through a bona fide established commercial or selling agency maintained by the CONTRACTOR for the purpose of securing business.

SECTION 11 The VDH&T reserves the right to review and comment upon all products developed during the course of this study.

SECTION 12 VDH&T reserves the right of final acceptance on technical reports prepared under this contract

SECTION 13 VDH&T reserves the right of final acceptance on the Final Report(s) prepared under this contract.