

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

CITY OF FALLS CHURCH

MAY 1986

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FINAL REPORT

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MINIBUS FEEDER SYSTEM TO METRORAIL

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MAY 1986

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## 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.

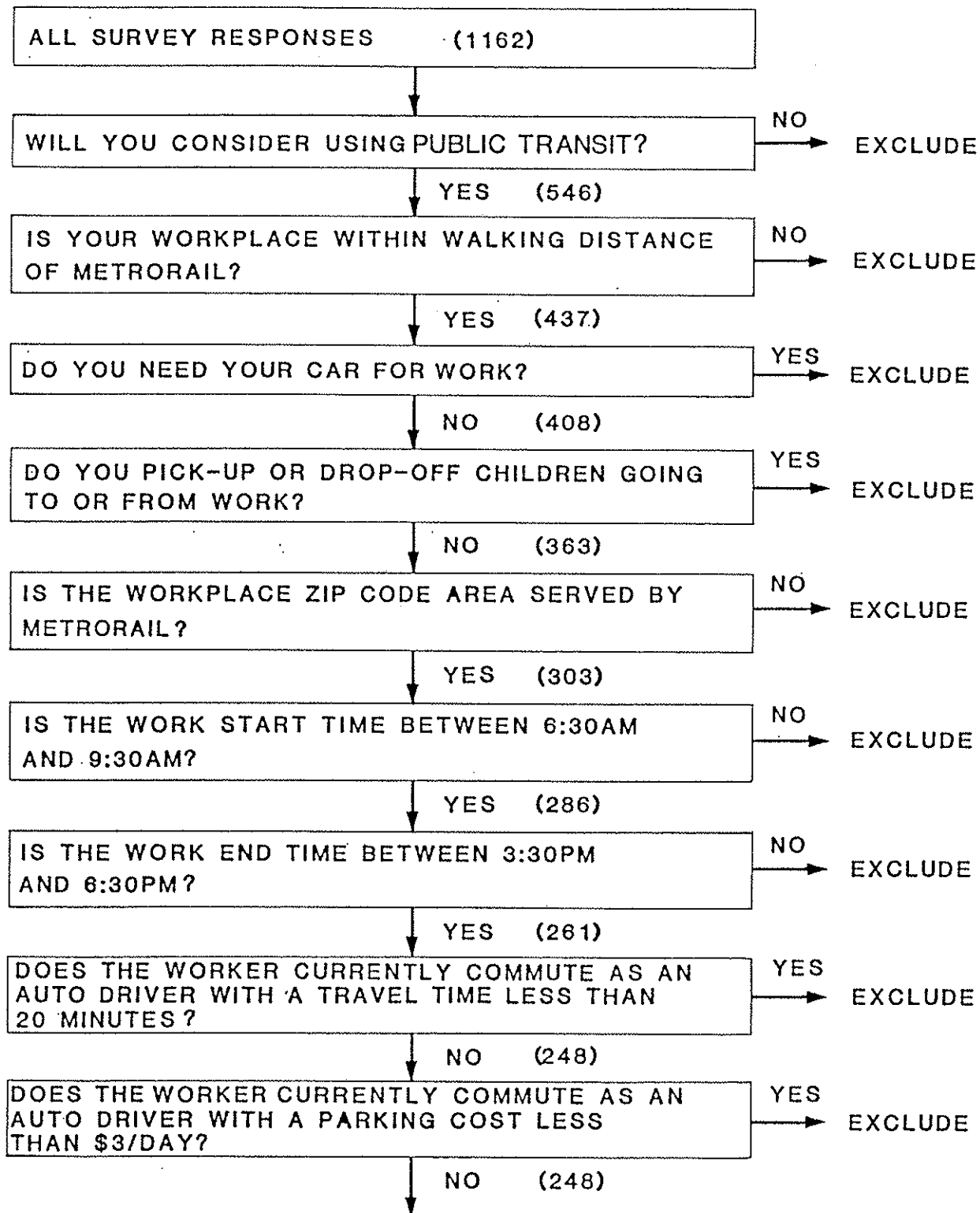
The telephone survey was conducted within 5 days of the completion of the self-administered survey. Respondents to the telephone survey were asked about their own commuting habits, and not about any other workers in the household. Two hundred valid telephone surveys were completed and the results were 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,

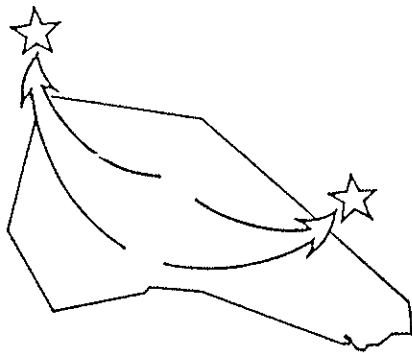
The City of Falls Church in cooperation with the Northern Virginia Transportation Commission is conducting a travel survey of households within the City. The main purpose of this survey is to determine residents' transportation needs. The information you provide will be used to shape future transportation 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, NVTTC



		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 <b>every 10 minutes</b> ? .....				
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 <b>every 20 minutes</b> ? .....				
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:

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