REPORT OF THE DEPARTMENT OF HIGHWAYS AND TRANSPORTATION ON THE

VIRGINIA COMMUTER STUDY

TO THE GOVERNOR AND THE GENERAL ASSEMBLY OF VIRGINIA

- Martinsville Case Study

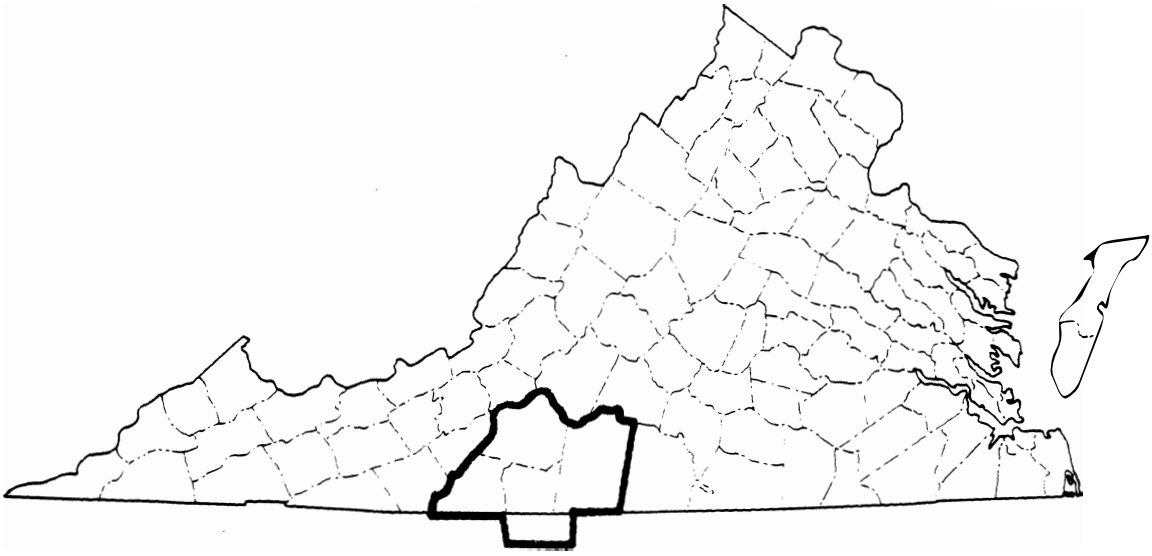
(See Also House Document 7)

HOUSE DOCUMENT NO. 7A

COMMONWEALTH OF VIRGINIA
RICHMOND
1983

VIRGINIA COMMUTER STUDY

An Analysis of Commuting Conditions in Three Case Study Areas



MARTINSVILLE CASE STUDY

PREPARED FOR
THE VIRGINIA
DEPARTMENT OF HIGHWAYS
AND TRANSPORTATION
BY
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VIRGINIA COMMUTER STUDY

Phase 3 Report
An Analysis of Commuting Conditions in Three Case Study Areas

Martinsville

June 1982

Prepared for
The Virginia Department of
Highways and Transportation

Prepared by
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INTRODUCTION

The purpose of the Virginia Commuting Study is to assess the feasibility of alternative transportation modes for commuters working in metropolitan centers, while residing in outlying communities. The study was prompted by the General Assembly's concern over the problems facing such commuters in a state and national climate of declining transportation revenues, high costs of building and operating transportation facilities, and an uncertain energy future. Of particular concern is the desire to identify more cost- and energy-efficient modal alternatives to the single-occupant auto, which characterizes much of today's commuting in Virginia.

Study Approach

The approach to this study has followed three broad phases:

1. The identification of problems and issues associated with commuting in Virginia (with an emphasis upon longer-distance commuting from outlying suburbs and exurban areas) and the development of policy, program, and legislative options to address these issues.

2. The identification of available modal options for such commuting (as drawn from national experience) and the development of a planning methodology through which the applicability of these options can be determined for urban areas in Virginia.

3. A detailed analysis of three case study areas--Northern Virginia, Roanoke, and Martinsville--in which the methodology developed in the second phase will be applied to determine the viability of various commuter options in these areas. The case study areas were chosen by the Virginia Department of Highways and Transportation (VDH&T) to provide a cross-section of urban area size and commuting problems that is somewhat representative of commuting conditions across the state.

An important feature of the study is the definition in Phase I of three future scenarios for commuter transportation in the 1980s and beyond, which reflect the uncertainties that exist with regard to energy availability and costs and financial resources for transportation improvements. The viability of alter-

native transportation actions in the case study areas (Phase 3) and alternative policy and program actions (Phase 1) is considered within the context of the scenarios to define actions which appear appropriate under any of the scenarios (and thus, represent high-priority actions for implementation).

Organization of this Report

This report documents one of the three case studies in Phase 3. Other reports describe the analyses and results of Phase 1 (Commuting Problems, Issues, and Policy/Program Response) and Phase 2 (A Methodology for Evaluating Commuter Travel Options in Virginia Cities). An Executive Summary provides an overview of the entire study and highlights principal conclusions and recommendations.

The presentation of case study analyses and conclusions basically follows the principal steps of the planning methodology that is detailed in the Phase 2 report. The case studies have the dual objectives of identifying actions that can be taken to improve commuting in each area and demonstrating the use of the planning methodology in a variety of commuting environments. The second objective requires that each step of the analysis be documented in detail so that subsequent users of the methodology can achieve maximum benefit from application in the case studies. Thus, the report contains more extensive tables, sample calculations, and description of assumptions than would ordinarily be found in a typical project feasibility study.

While each case study report follows the general outline of the major steps in the planning methodology, there are important differences in the way in which material is presented and in the level and type of analysis for each case study. This results primarily from the vast differences in commuting conditions between a large urban region such as Northern Virginia, that is part of an even larger metropolitan area, and a smaller, free-standing urban area, such as Martinsville. The types and level of problems in two such contrasting areas obviously demand different planning and analytical techniques, and the resulting transportation solutions are likely to be quite different in form, cost, and impact.

Finally, some of the variation in the case study discussions is the result of different analysts working on each area. While there was extensive communication between the three principal analysts during the study, each was given considerable flexibility in adapting and applying the basic methodology to conditions in his respective study areas. This had the benefit of producing three fairly independent tests of the planning methodology, reflecting not only differences among study areas, but differences in interpretation of the methodology, as well.

Definitions

In order to ensure that the application of the methodology is fully understood, some important terms and concepts will be defined in this section. Although explained in the Methodology Report, compilation of some of the more frequently used terms and concepts will enable ready reference for the analyst.

- Travel Market - A travel market is simply any group of travellers sharing a chosen set of common characteristics. The most important travel market in the Virginia Commuter Study is comprised of long-distance commuters, living in a specific corridor and commuting to the central area of a city. Thus, to the degree possible, information and analysis concerning commuter travel patterns is most helpful if it is on a corridor specific basis. Figure 3.1 illustrates different types of travel markets.

- Modal Options - Modal options are the different ways by which commuters can travel to work. Mode split is calculated for four modal options:

    1. Single Occupant Auto
    2. Carpool (two through six persons)
    3. Vanpool/Buspool (seven or more persons)
    4. Transit (where available or planned)

  Transit includes all submodes of transit except local bus service, which is not applicable to long distance commute trips. These submodes are Express Bus, HOV Facility/Light Rail, Rapid Rail, and Commuter Rail. Although it is rare, there may be occasions where more than one transit submode is available or planned in a corridor. In these instances, the submode which is estimated by the methodology to generate the highest mode share should be chosen to represent the entire transit mode share. Transit submodes should not be added together as the methodology was developed with the assumption of no competition among transit submodes. The hierarchy of modal options is shown in Figure 3.2.

- Modal Summary Tables - The modal summary tables (contained in the methodology report) are tables used to calculate mode shares for each of the four modes. Each table contains a basic mode share plus factors to be applied to the basic mode share, dependent upon characteristics of the corridor under examination. The basic mode share is the proportion of commuters expected to use a mode with the assumption that the travel market under consideration is typical in regards to trip length, income, and other socioeconomic variables. The basic mode share is different for different-sized urban areas and has a low, normal, and high value. In the vast majority of instances, the normal value should be used. The low or high value should be used only when the area

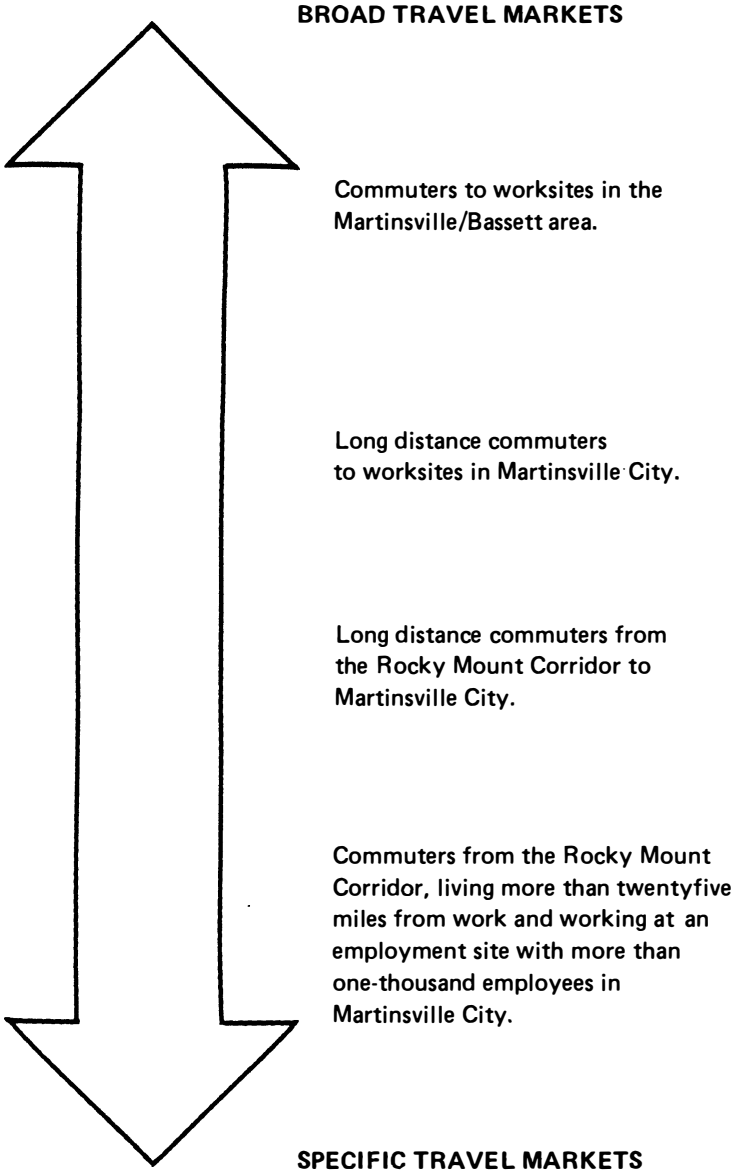


Figure 3.1
EXAMPLES OF TRAVEL MARKETS IN MARTINSVILLE, VIRGINIA

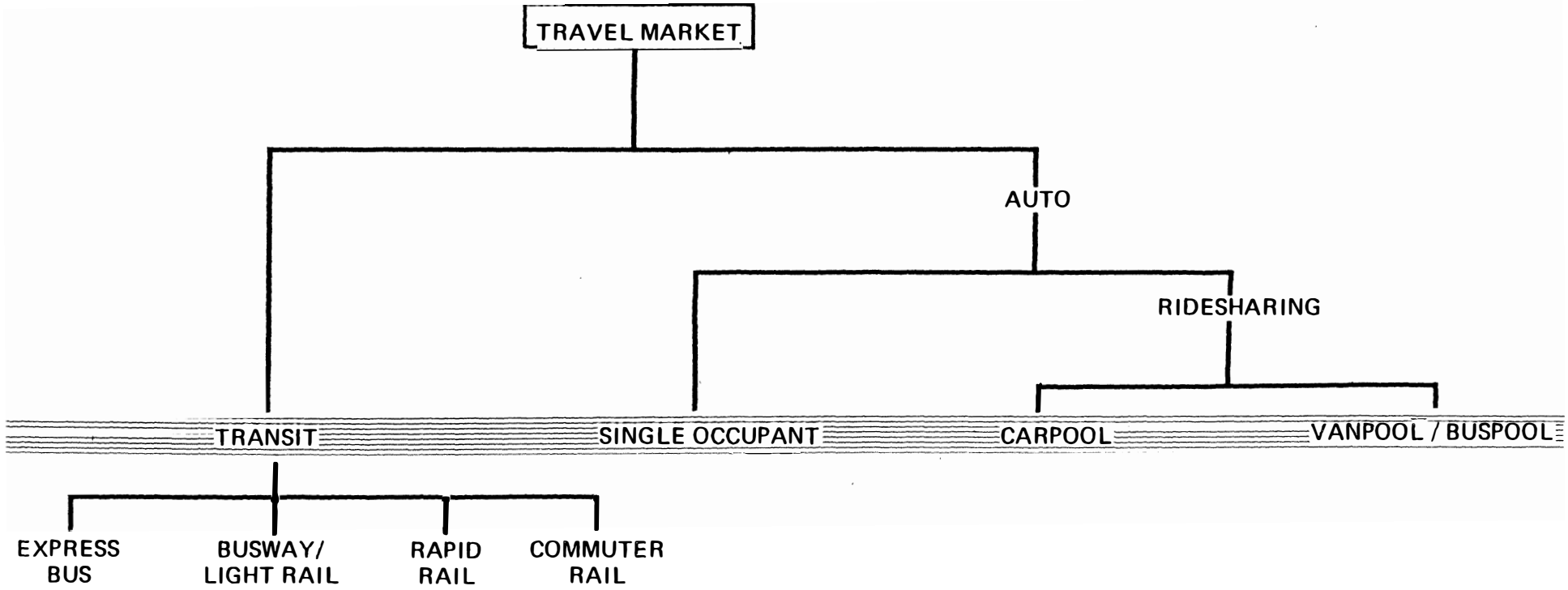


Figure 3.2
CLASSIFICATION OF MODAL OPTIONS

MODAL OPTIONS FOR WHICH MODE SPLIT IS CALCULATED

has characteristics that affect commuter travel which are radically different from similar-sized urban areas. The modal summary tables used in the Martinsville case study, "Carpool-Small Urban Area" and "Vanpool/Buspool-Small Urban Area" are reproduced as Tables 3.1 and 3.2. The analyst should refer to Part 2 of the Methodology Report for further detail.

- Socioeconomic Adjustment Factors - These factors (contained on the modal summary tables) reflect the propensity of certain commuter attributes to influence the use of a particular mode. A factor of greater than 1.000 indicates that commuters who exhibit the characteristic are more likely to use the mode than the norm. A factor of less than 1.000 indicates that commuters who exhibit the characteristic are less likely to use the mode than the norm.

- Ridesharing Assistance Factors - These factors (at the bottom of the modal summary tables) serve a similar function as the socioeconomic adjustment factors. They indicate the expected effects on mode share by the type of ridesharing assistance which is provided.

Sketch Planning Precision

A final consideration of paramount importance is the precision and use of the various quantitative estimates developed during the application of the methodology. The case study is designed to both test the reasonableness of the conclusions which arise from the methodology and to provide a step-by-step analysis for future users of the methodology. This latter purpose results in the inclusion of very detailed numerical values in the analysis. Owing to the broad-based nature of sketch planning, in many instances these values are not precise, but represent interim steps necessary to reach more accurate conclusions in later steps. The value of sketch planning is at the aggregate level and in allowing relatively quick analysis and comparison of alternative actions. Disaggregated values and absolute quantities should be viewed as reasonable approximations only.

To assist the analyst, a Conclusions section has been included, where appropriate, to bring together estimates and judgements which are valid within the sketch planning context. Any numerical values not included in these sections should be regarded as interim steps of unknown precision.

Table 3.1

MODAL SUMMARY TABLE: CARPOOL - Small Urban Area

Characteristic of Area or Travel Market	Typical Market Share Low	Normal	High
Employment Location			
Central Area/Suburbs	.171	.244	.267
Socioeconomic Section	**Proportional Adjustment Factors**		
Residential Density			
Low (less than 3 d.u./acre)			
Medium (3-6 d.u./acre)			
High (over 6 d.u./acre)			
Household Income			
Low		1.223	
Medium		.815	
High		.977	
Employment Concentration			
1-100 employees		.596	
101-500 employees		.888	
500-1,000 employees		.888	
1,000 + employees		1.776	
Type of Employment			
Office		1.106	
Retail		1.106	
Production		.841	
Work Trip Length			
0-5 miles		.635	
5-10 miles		1.059	
10-15 miles		1.106	
15-20 miles		1.735	
20-25 miles		1.800	
25+ miles		1.912	
Ridesharing Assistance Section			
Carpool Encouragement[1/]	Low	Normal	High
No action	1.00	1.00	1.00
Promotion/Information	1.00	1.00	1.00
Areawide matching	1.00	1.01	1.04
Employer matching[2/]	1.01	1.05	1.18

1/ These factors represent total areawide carpooling mode share and are not site specific as the vanpooling encouragement factors are.

2/ Assumes participation by all employers of 100+ persons.

Table 3.2

MODAL SUMMARY TABLE: VANPOOL/BUSPOOL - Small Urban Area

Characteristic of Area or Travel Market	Typical Market Share Low	Normal	High
Employment Location			
Central Area	.004	.019	.052
Suburbs	.004	.020	.054

Socioeconomic Section	Proportional Adjustment Factors
Residential Density	
Low (less than 3 d.u./acre)	
Medium (3-6 d.u./acre)	
High (over 6 d.u./acre)	
Household Income	
Low	
Medium	
High	
Employment Concentration	
1-100 employees	.398
101-500 employees	2.126
500-1,000 employees	2.049
1,000 + employees	.797
Type of Employment	
Office	1.216
Retail	1.216
Production	.676
Work Trip Length	
0-5 miles	.178
5-10 miles	.700
10-15 miles	1.215
15-20 miles	1.262
20-25 miles	2.009
25+ miles	5.140

Ridesharing Assistance Section

Vanpool/Buspool Encouragement[1/]	Low	Normal	High
Owner operated	1.00	1.00	1.00
Promotion/information	1.00	2.10	3.55
Match/lease administration	1.00	3.16	5.33
Financial Assistance	1.58	5.61	5.72

1/ Factors represent effects at specific employment sites, not areawide effects. Note difference compared to Carpool Encouragement factors.

CASE STUDY AREA DEFINITION

Geography

The case study area is centered on the independent city of Martinsville and is also comprised of Henry, Patrick, Franklin, and Pittsylvania Counties in Virginia, the city of Danville, Virginia and Rockingham County, North Carolina. Figure 3.3 defines the study area. The area lies on the western edge of the Virginia Piedmont, adjacent to the mountainous Blue Ridge region of southwestern Virginia.

Population and Land Use

The study area is predominantly rural with a total 1980 population of 324,300[1/]. Ninety-five percent of the land in the Virginia section of the study area is forested (64.3%) or agricultural (30.7%). Other land uses in the region are: 0.2% industrial, 0.13% commercial and an estimated 1.6% residential.[2/] The five-county region encompasses 3,160 square miles and 123,500 housing units, producing an overall density of 0.06 housing units per acre. Even in the towns and cities, average densities are on the order of one to two dwelling units per total acre. The most recently available census results indicate that there are only eight concentrations of 2,500 or more persons in the study area. Table 3.3 lists population, housing units, and land area for the counties, cities, and towns of the Martinsville case study area.

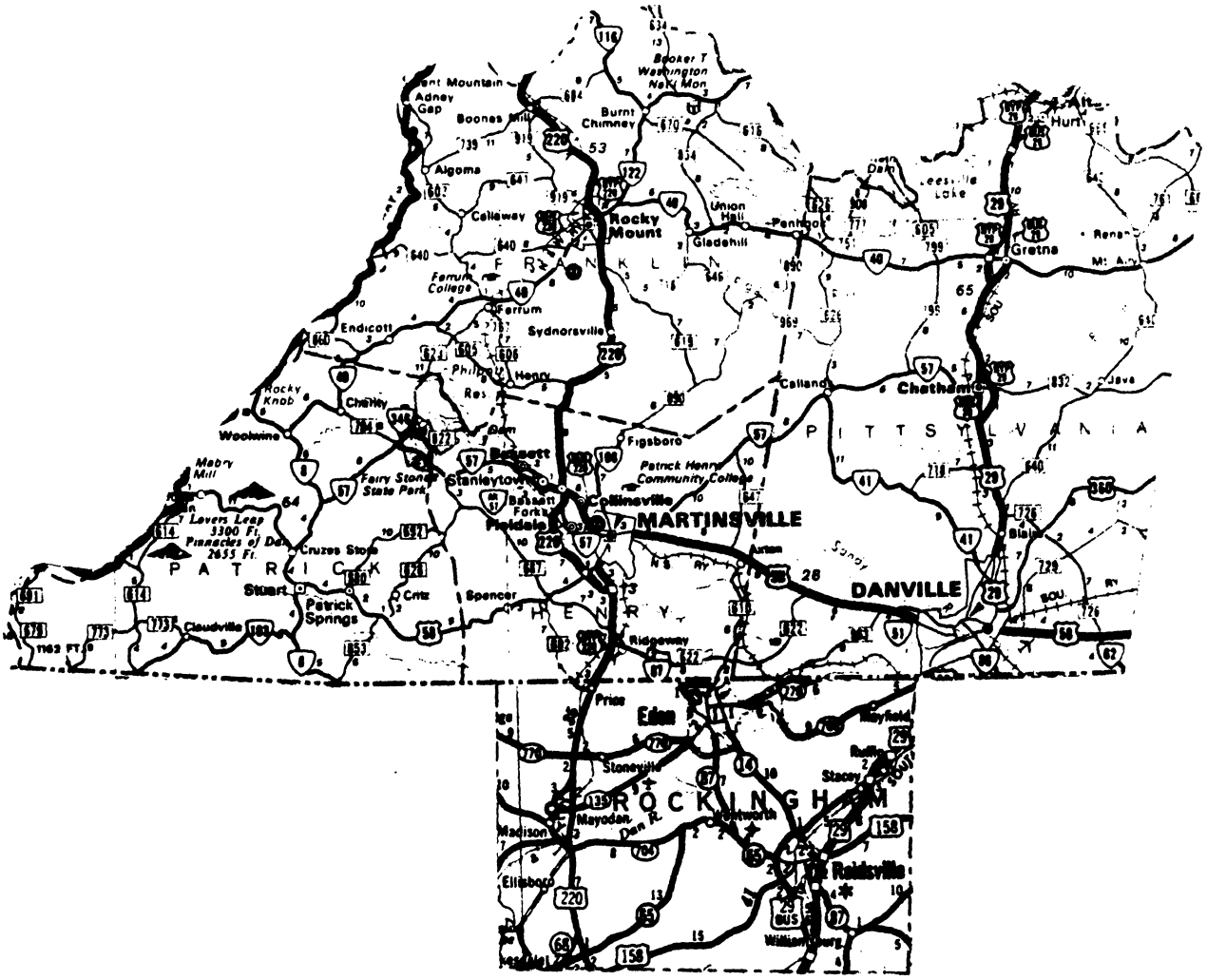
Employment

Employment in Martinsville and surrounding Henry County totals approximately 40,000 persons.[3/] Employment is concentrated in a thin, fifteen-mile crescent stretching from Ridgeway, south of Martinsville, to Bassett, northwest of Martinsville. Conservative estimates based on the Martinsville Area Transportation Study, the Martinsville Thoroughfare Plan, and the Industrial Guide to Martinsville and Henry County place current employment in this crescent at 34,000 workers. Further division of employment locations into four areas along the crescent reveals relative employment concentrations. These four divisions; Ridgeway/US 220 S, Martinsville/Fontaine, Collinsville/Fieldale, and Bassett/Stanleytown are shown in Figure 3.4. Employment in each of these areas is:

1/ 1980 Census.

2/ 1969 Martinsville Thoroughfare Plan, Fiscal Year 1980 West Piedmont Planning District Urban Area Economic Development Study.

3/ 1979 Virginia County Business Patterns, 1977 County and City Data Book.



NORTH

Figure 3.3
MARTINSVILLE CASE STUDY AREA

MARTINSVILLE CASE STUDY
Virginia Commuting Study

Table 3.3

POPULATION, HOUSING UNITS AND LAND AREA[1/]
MARTINSVILLE CASE STUDY

	1980 Population	1980 Housing Units	Land Area (square miles)
Counties and Independent Cities			
Martinsville City	18,149	7,079	11
Danville City	45,642	18,405	17
Henry County	57,654	20,968	381
Pittsylvania County	66,147	24,255	1,001
Franklin County	35,740	13,512	716
Patrick County	17,585	7,020	464
Rockingham County, NC	83,426	32,258	569
Total	324,343	123,497	3,159
Places of 2,500 or More Inhabitants			
Henry County			
Collinsville	7,452	2,900 [2/]	3.8
Franklin County			
Rocky Mount	4,198	1,740	4.5 [3/]
Rockingham County, NC			
Eden	15,672	6,569	11.8 [3/]
Madison	2,806	1,064	.2 [3/]
Mayodan	2,627	1,160	1.0 [3/]
Reidsville	12,492	4,982	7.7 [3/]

1/ Data sources: 1980 Census, 1977 County and City Data Book.

2/ Estimated.

3/ Data from 1975.

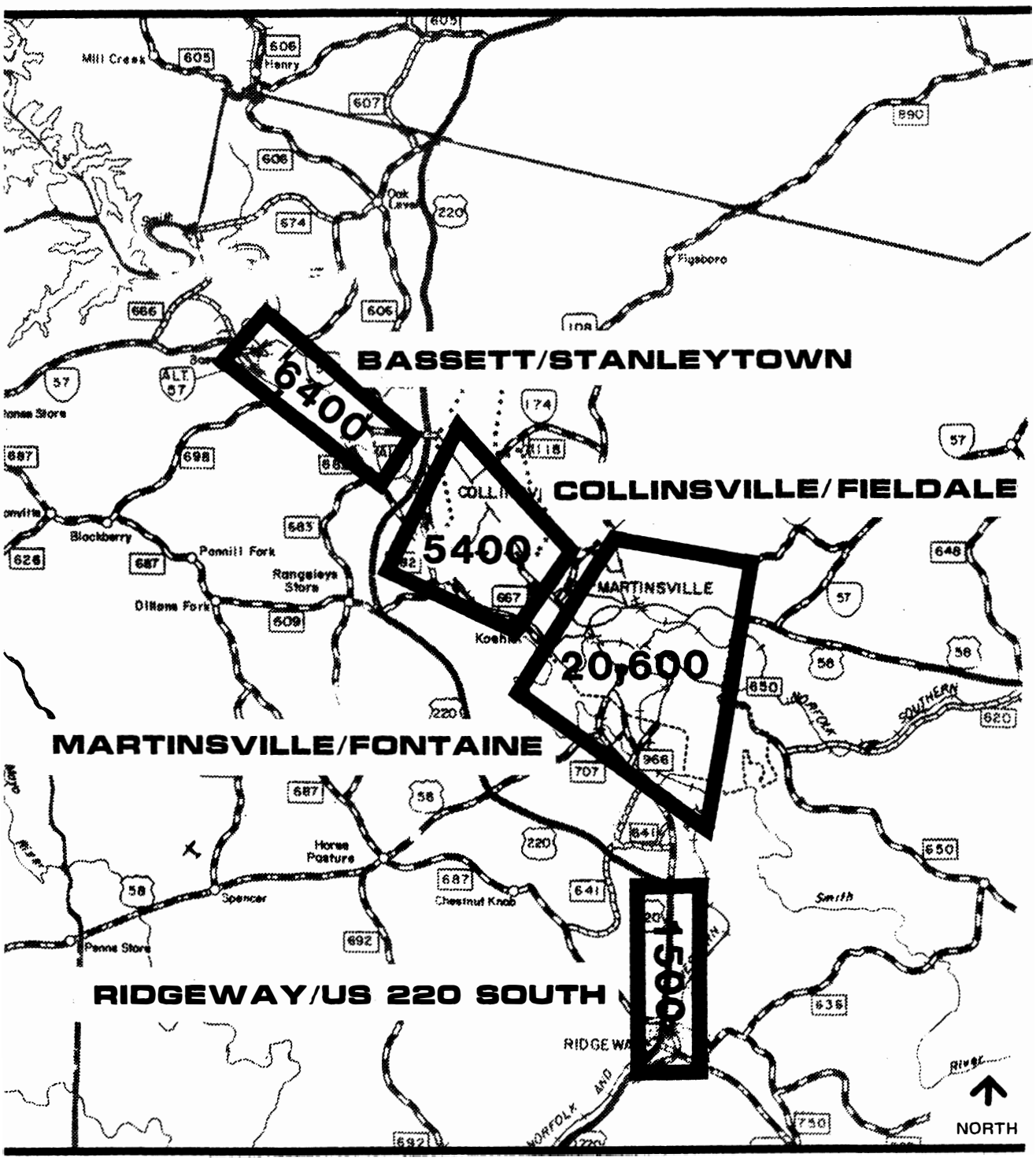


Figure 3.4
EMPLOYMENT CONCENTRATION

MARTINSVILLE CASE STUDY
Virginia Commuting Study

Ridgeway/US 220 S	1,500
Martinsville/Fontaine	20,600
Collinsville/Fieldale	5,400
Bassett/Stanleytown	6,400

A large component of the study area workforce is employed at a few major employment sites. Table 3.4 provides information on employment by worksite size for Martinsville and Henry County. Using information gleaned from several souces, rough estimates of employment by worksite size were prepared for each of the four major employment centers. These distributions are shown in Table 3.5.

The textile, furniture, and tobacco industries have long been the economic foundation of the region and textile and furniture manufacturing still account for large proportions of employment in the area. As a result, an unusually large percentage of the workforce is engaged in production work. Table 3.6 shows the estimated distribution of the area workforce by employment type.

Table 3.6

EMPLOYMENT TYPE DISTRIBUTION IN THE MARTINSVILLE AREA

Production	.67
Office	.23
Retail	.10

Source: (1) Virginia Department of Highways and Transportation.

Conclusions

Martinsville and the surrounding area are rural in character, with a population of 325,000 persons scattered over 3,200 square miles. Ninety-five percent of the land is forested or in agricultural use. Only four cities and towns in the region have populations of over 10,000: Danville (46,000), Martinsville (18,000), Eden, NC (16,000), and Reidsville, NC (12,000). Even in the towns and cities, residential densities rarely exceed two dwelling units per total acre. Employment is centered on the textile and furniture

Table 3.4

EMPLOYMENT DISTRIBUTION BY WORKSITE SIZE[1/]
MARTINSVILLE CASE STUDY

Worksite Size (number of employees)	Martinsville and Henry County	
	Number of Worksites	Percentage of Employees[2/]
1-100	1,196	25%
100-500	41	25%
500-1000	6	11%
1000+	7	39%

[1/] 1979 Virginia County Business Patterns.

[2/] See Methodology for Evaluating Commuter Options in Virginia Cities, Appendix C.

Table 3.5

DISTRIBUTION OF EMPLOYMENT BY WORKSITE SIZE
MARTINSVILLE CASE STUDY EMPLOYMENT AREAS

	Total Employees	Worksite Size 0-100	100-500	500-1000	1000+
Martinsville/Fontaine	20,600	.10	.26	.13	.51
Bassett/Stanleytown	6,400	.12	.23	.17	.48
Collinsville/Fieldale	5,400	.52	.20	.00	.28
Ridgeway/US 220 S	1,500	.14	.53	.33	.00
Rest of Henry County	4,000-6,000	.80	.20	.00	.00
Martinsville/Henry County	38,000-40,000	.25	.25	.11	.39

Sources: (1) County Business Patterns - Virginia, U.S. Census Bureau.
(2) Martinsville Area Transportation Study.
(3) Industrial Guide to Martinsville and Henry County.
(4) Data from Major Employers.

manuafacturing industries, with half of the workforce employed at sites of 500 or more workers and two-thirds of the workforce engaged in production work. Although total Martinsville and Henry County employment approaches 40,000 persons, 34,000 workers are concentrated in four general areas: Martinsville/Fontaine (20,600), Bassett/Stanleytown (6,400), Collinsville/ Fieldale (5,400), and Ridgeway/US 220 S (1,500).

PROBLEMS AND ISSUES

Problems confronting commuters can be assigned to one of five classifications:

- o congestion
- o travel cost (including parking)
- o parking availability and convenience
- o emergency or special situations (e.g., fuel shortage)
- o availability of travel options

Congestion is a concern of Martinsville area commuters. While employment shifts are staggered throughout the area, congestion still exists near plant site entrances and exists causing delays. The Martinsville Transportation Study identified five intersections operating at a level of service lower than Level C. These intersections are:

- o Memorial Blvd., Church St., and Fayette St. (LOS D) - Five-legged intersection of major approach roads.
- o Church St., Booker St., and Fairy St. (LOS D) - End of divided highway portion of Route 57/58, near entrances to both Pulaski and Hooker furniture plants.
- o Memorial Blvd. and Du Pont Rd. (LOS D) - Entrance to Du Pont plant.
- o Starling Ave. and Memorial Blvd. (LOS E) - Intersection of major approach routes.
- o Starling Ave. and Mulberry Rd. (LOS E) - Access point to Rives Road employers for commuters from the east, north and west.

Additionally, sections of Route 58 west and Route 57 west are operating at levels of service lower than Level C.

These sections are:

Route 58 west between Route 220 Business and the MATS Cordon line.

Route 57 - portions located in the Bassett-Stanleytown area.

Travel cost may be the single most important concern to area commuters, especially to those travelling long distances. Even with fuel prices at their current stable level and the increasing use of more fuel-efficient vehicles, annual fuel costs alone can easily amount to $500 per year for a commuter living 25 miles from work. When insurance differences and accelerated vehicle wear-and-tear are included, the cost to the commuter rises. Perhaps more importantly, the cost of new cars has made a vehicle dedicated to commuting during the day an expensive proposition, a problem magnified in two wage earner families.

Parking availability and convenience are not major problems in Martinsville. Free parking is provided on site by most employers, although some commuters are relegated to inconvenient parking sites.

Similarly, there are currently no emergency or special conditions in the area which result in major transportation problems. The scenario assessment contained in a latter part of this study will address potential problems that may arise.

The availability of travel options, an issue directly related to all other travel problems, is a concern in Martinsville. As mentioned above, commuter travel is heavily dependent upon the private automobile and ad hoc ridesharing formation.

In summary, travel cost is the primary commuter issue in Martinsville particularly for long-distance commuters. It affect commuters who would dispose of an existing vehicle (or delay purchase of a new vehicle) or significantly reduce out-of-pocket costs, if commuting alternatives were readily available. The lack of travel options prevents commuters from switching to higher-occupancy modes that they may prefer.

PLANS AND PROPOSALS

Existing plans and proposals to assist commuter transportation in Martinsville focus on improvement to the highway system and private sector encouragement of ridesharing. Minimal public sector involvement in the provision of alternative transportation modes is currently envisioned.

Highway improvements currently recommended that will benefit long-distance commuters include completion of the Martinsville bypass from its current terminus at US 220 south of the city to US 58 east of the city, reconstruction of US 58 west of Martinsville, VA 108 north of Martinsville, and Rives Road. New or upgraded roadways are recommended in the VA 57 corridor between Bassett and Martinsville along with improvement to some downtown streets to alleviate congestion from commuters destined for major employers in the southern part of Martinsville. Table 3.7 lists recommended highway improvements for the Martinsville area.[1/]

The 1979 VDH&T Transportation Development Plan for the West Piedmont Planning District recommended a four-step program to improve public transportation in the district. The program focused on trips by the elderly and low income populations and was centered on improved coordination among existing services.

Both the 1977 Commuter Transportation Study and 1980 Urban Area Economic Development Study prepared by the West Piedmont Planning District Commission stressed the need for employers to assume an active role in assisting employee carpooling and vanpooling. Some level of local government assistance to commuter buspooling was forseen as a temporary emergency measure in the event of serious fuel supply disruptions or significant increases in price. This latter step was recommended as a "dire-straits contingency."

DATA BASE

Little observed data regarding commuting patterns and characteristics exist for the Martinsville area. As a result, most of the corridor-specific information which follows was estimated by factoring known areawide totals or distributions according to reasonable assumptions or information from various local studies in the 1960's and 1970s. Sources heavily relied upon, and the information obtained from them, include:

1. 1980 Census - Population and household totals at the city and county level.

2. 1977 County and City Data Book - Land area and approximate employment type totals at the county and city level.

1/ VDH&T, Status Report: Statewide Transportation Facilities Inventory and Local Transportation Issues. West Piedmont Planning District 12. January, 1981.

Table 3.7

HIGHWAY IMPROVEMENT RECOMMENDATIONS
MARTINSVILLE TRANSPORTATION STUDY AREA[1/]

Route Classification	Total Thoroughfare System Mileage	Recommended Improvement (Exsiting Location) Mileage	Recommended Improvement (New Location) Mileage
Interstate	0	0	0
Primary	69.15	16.57	6.44
Secondary	22.87	9.75	3.64
Henry County Total	92.02	26.32	10.08
Interstate	0	0	0
Other	31.96	5.58	6.22
City of Martinsville Total	31.96	5.58	6.22
Study Area Total	123.98	31.90	16.30

[1/] Reproduced from Status Report: Statewide Transportation Facilities Inventory and Local Transportation Issues.

3. 1970 Census - Income ranges at the county and city level.

4. 1969 Martinsville Thoroughfare Plan - Trip purposes and destinations at external stations which formed the basis for distributing corridor trips to employment sites. Traffic operations data for Martinsville area roadways. Also used to supplement employment figures from other sources.

5. 1981 Martinsville 24-hour Traffic Counts and 1980 Interstate and Arterial ADT Volumes in Virginia - All current traffic volumes.

6. Commuter Transportation in the West Piedmont Planning District (1977) and information from Du Pont - Employee residence by zip-code which formed basis for distributions of employees by corridor and trip length by corridor. Overall trip length distribution. Approximate existing ridesharing levels.

7. Urban Area Economic Development Study for the West Piedmont Planning District 1980. Land use, density information.

8. 1979 Virginia County Business Patterns - Number of worksites by employment size.

9. Martinsville Area Transportation Study information - auto occupancy, ridesharing levels at major employers, locations of major employers, general employment figures, workforce composition.

CORRIDOR DEFINITION

Eight specific corridors radiating from the Martinsville area have been selected for analysis of potential long-distance commuter options. These eight corridors, designated by town and major highway route are:

1. Rocky Mount - US 220 N

2. Snow Creek - VA 108 N

3. Chatham - VA 57 E

4. Danville - US 58 E

5. Eden - VA 87 S

6. Madison/Mayodan - US 220 S

7. Stuart - US 58 W

8. Bassett - VA 57 W

The location of these corridors in the Martinsville vicinity is shown in Figure 3.5 while their position relative to the five county area is shown in Figure 3.6.

Corridor selection was based simply on the ability of study area highways to serve long distance commute trips destined for the Martinsville vicinity. Each of the eight roadways listed above extends more than ten miles from Martinsville and uniquely serves a portion of the travel market.

Corridor Origins and Destinations

Due to the lack of specific long-distance origin/destination data, person trip volumes for each of the designated corridors were estimated by determining employee residence location patterns for persons working at each of the four main employment concentrations. These patterns were developed according to Martinsville worker residence zip codes contained in the 1977 Commuter Study, supplemented with information from Du Pont and by internal study area destinations for trips passing through external stations from the 1969 Thoroughfare Plan. The process involved:

(1) Assignment of a 8,647-worker sample in the Martinsville area (26% of the study area employment) to surveyed zip code residences, by zip code route. Of the sample, 5,679 are from several area firms surveyed for the 1977 Commuter Transportation Study and 2,968 are from Du Pont's records.

(2) The 1977 study did not include North Carolina residents, although it stated that 5% of regional employment is comprised of North Carolina residents. An additional 55 workers were assigned to North Carolina zip codes (12% of Du Pont's workforce is from North Carolina) to bring the overall North Carolina share to 5%).

(3) Each zip code route total was factored by 3.9 to equate the sum of the workers in each zip code route with targeted Martinsville area employment.

(4) Zip code routes were assigned to one of the designated eight corridors based on probable commute patterns to the Martinsville area.

(5) Workers from each corridor were assigned to one of the four employment areas based on the distribution of internally destined trips at corridor external stations in the Martinsville Thoroughfare Plan. Totals were then balanced to match actual employment in each of the four areas.

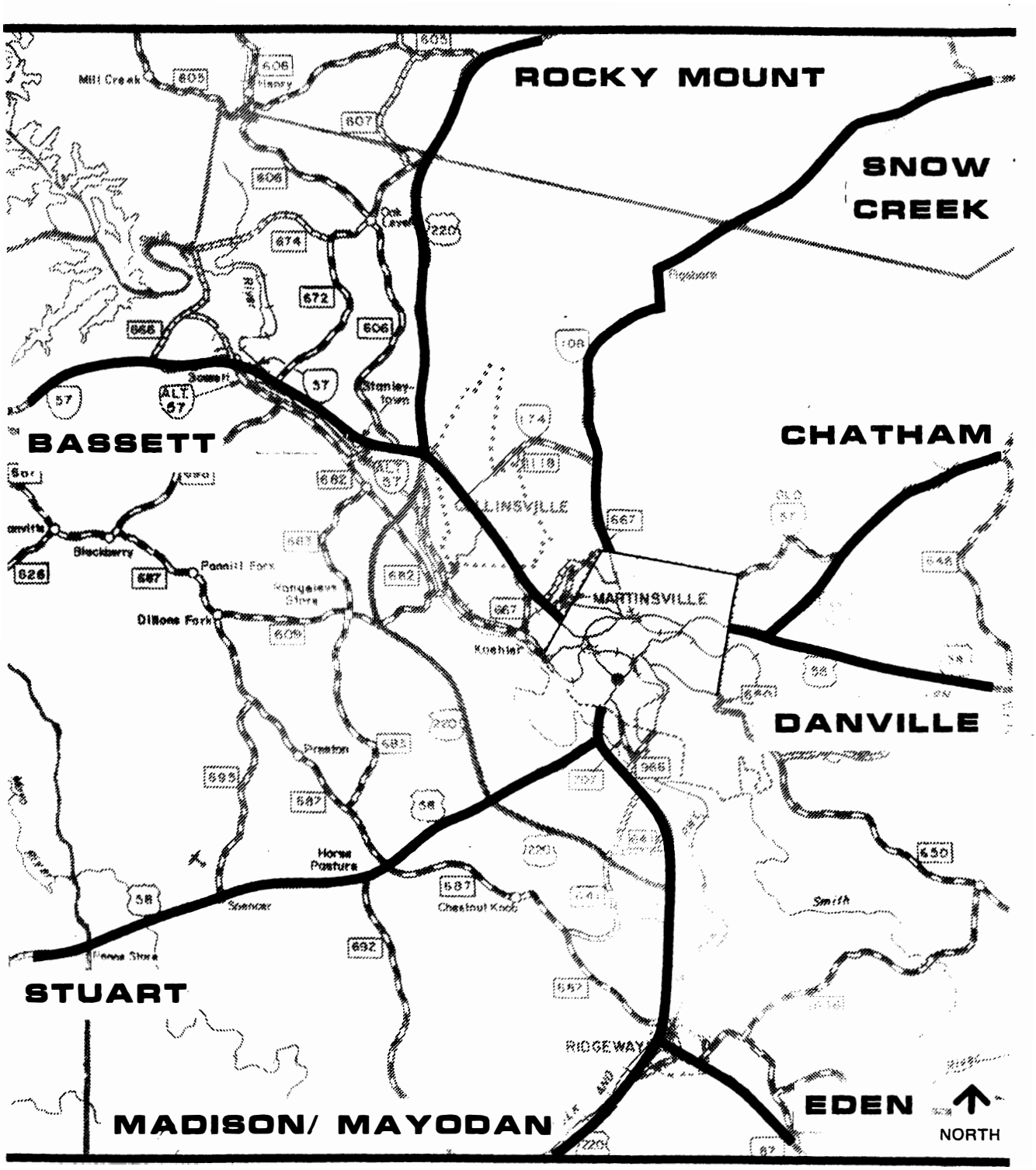


Figure 3.5
MAJOR CORRIDOR ROADWAYS

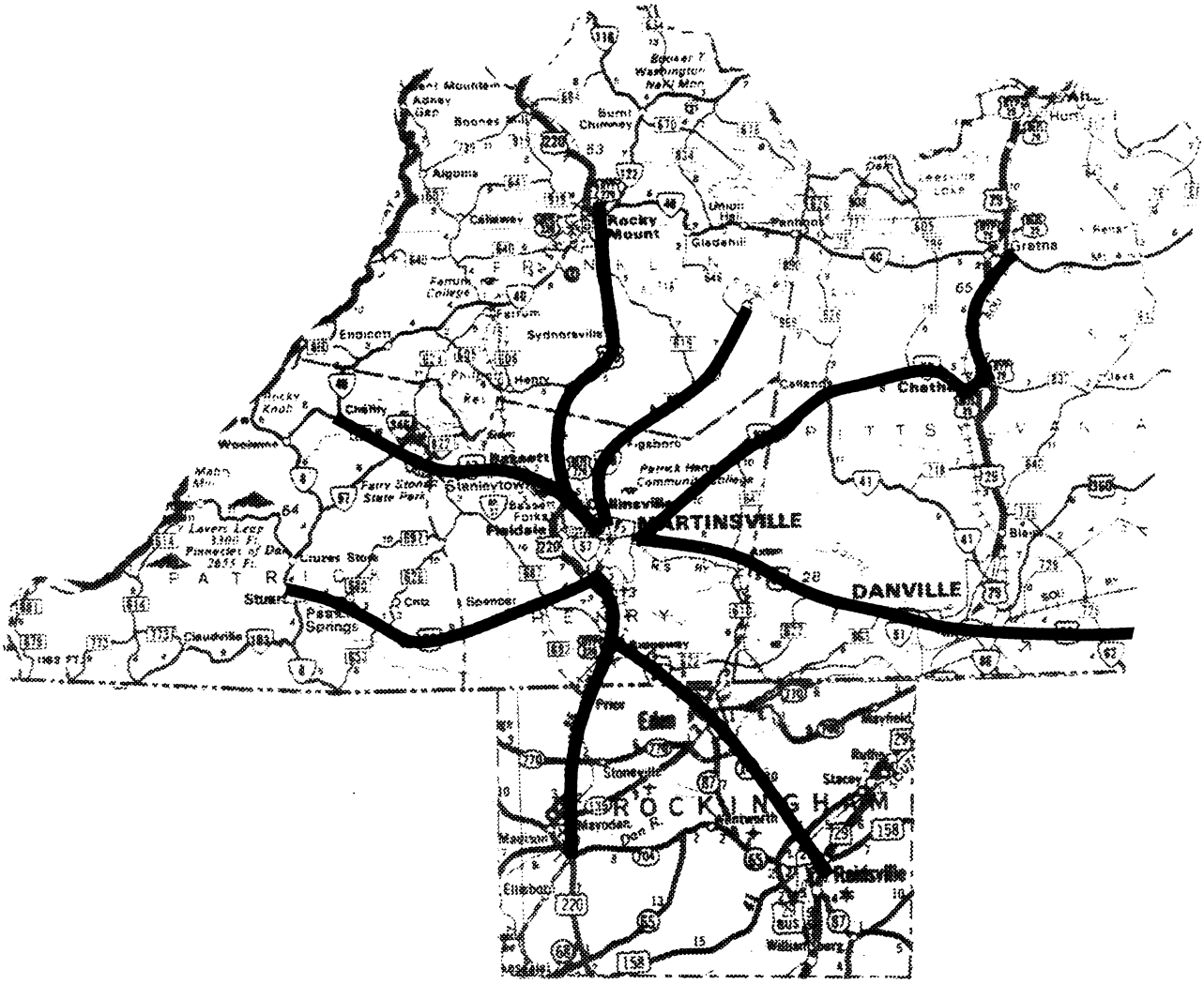


Figure 3.6
MARTINSVILLE STUDY AREA CORRIDORS

MARTINSVILLE CASE STUDY
Virginia Commuting Study

These results are shown in Table 3.8. The Rocky Mount corridor, with nearly 4,000 daily commuters is the most heavily travelled, while the Bassett and Eden corridors, with under 2,000 daily commuters, are the least heavily travelled.[1/] Approximately 13,400 commuters, 40% of the targeted employment, live in a central area comprised of Martinsville, Collinsville, Fieldale, and the Fontaine area. They represent work trips of a short, local nature, rather than linear corridor travel, and will not be addressed in the analysis in as much detail as corridor trips.

Commute Distance

The distribution of commute trip length, shown in the bottom row of Table 3.9, was obtained from the 1977 Commuter Study. Rough approximations of trip length by corridor and by employment location were generated from measurement of origin/destination patterns developed in the previous step.

Perhaps the most important statistic in Table 3.9 is the distribution by corridor of work trips longer than 25 miles one-way. The Rocky Mount corridor shows a large number of very long trips with the Stuart, Danville, and Eden corridors also registering significant long distance commuting.

Corridor Income

City and county income stratifications from the 1970 Census were adjusted by the change in the Consumer Price Index from 1970 to 1978 (1.707) to obtain 1978 income stratifications, the year for which much of the modal summary table data were available. The following equivalency table was used to develop the high, medium and low ranges needed for the modal share analysis:

Modal Summary Sheet Income Ranges	1970 Census Income Ranges
under $10,000 (Low)	under $6,000
$10,000 - $25,000 (Medium)	$6,000 - $15,000
over $25,000 (High)	over $15,000

Income level by corridor, shown in Table 3.10, was estimated by apportioning income from the cities and counties according to the percentage of total corridor workers residing in each jurisdiction. Income level was relatively stable throughout with central area residents having slightly higher incomes and Rocky Mount and Stuart corridor residents having slightly lower incomes.

1/ The Eden corridor branches off the Madison/Mayodan corridor at Ridgeway. The 1,800 commuters in the Eden corridor live south of that point.

Table 3.8

COMMUTER ORIGINS AND DESTINATIONS

	Employment Centers				
Corridors	Martinsville/ Fontaine	Bassett/ Stanleytown	Collinsville/ Fieldale	Ridgeway/ US 220 S	Total
Rocky Mount	1,250	1,180	1,430	40	3,900
Snow Creek	1,130	280	670	20	2,100
Chatham	1,810	90	180	20	2,100
Danville	2,200	120	210	70	2,600
Eden	1,260	140	180	220	1,800
Madison/Mayodan	2,120	240	310	330	3,000
Stuart	2,140	330	540	90	3,100
Bassett	390	1,190	320	0	1,900
Corridor Total	12,300	3,570	3,840	790	20,500
Central Area	8,300	2,830	1,560	710	13,400
Total	20,600	6,400	5,400	1,500	33,900

Sources: (1) Commuter Transportation in the West Piedmont Planning District, West Piedmont Planning District Commission, 1977

(2) Employee zip code information from major employers.

(3) Martinsville Thoroughfare Plan, Virginia Department of Highways, 1969.

Assumptions: O/D information from external stations balanced to equal employment center distribution.

Table 3.9

COMMUTE DISTANCE DISTRIBUTION BY CORRIDOR AND BY EMPLOYMENT LOCATION

	One-way commute distance (miles)							
	0-5	5-10	10-15	15-20	20-25	25+	Trips more than 10 miles	Trips more than 25 miles
Corridor								
Rocky Mount	.19	.25	.13	.04	.07	.32	2,180	1,240
Snow Creek	.10	.46	.21	.03	.05	.15	910	310
Chatham	.00	.63	.25	.03	.02	.07	780	150
Danville	.27	.33	.17	.03	.04	.16	1,040	420
Eden	.04	.23	.16	.19	.13	.25	1,310	450
Madison/Mayodan	.09	.40	.31	.04	.06	.10	1,520	300
Stuart	.03	.40	.25	.06	.11	.15	1,770	460
Bassett	.59	.24	.10	.01	.03	.03	320	60
Central Area	.62	.38	.00	.00	.00	.00	0	0
Employment Location								
Martinsville/Fontaine	.32	.39	.13	.03	.04	.09	5,960	1,860
Bassett/Stanleytown	.44	.31	.09	.02	.03	.11	1,600	710
Collinsville/Fieldale	.28	.39	.13	.02	.05	.13	1,780	710
Ridgeway/US 220 S	.46	.35	.08	.02	.02	.07	290	110
Total	.34	.37	.12	.03	.04	.10	9,830	3,390

Note: Commute distance distributions from each corridor to each employment location were developed in order to apply the methodology. This table is a summary of those calculations.

Table 3.10

1978 INCOME LEVELS IN THE MARTINSVILLE STUDY AREA

Cities and Counties	Low	Medium	High
Martinsville	.27	.56	.17
Danville	.32	.56	.12
Henry County	.27	.63	.10
Pittsylvania County	.44	.50	.06
Patrick County	.40	.55	.05
Franklin County	.39	.53	.08
Rockingham County, NC	.33	.57	.10

Corridors	Low	Medium	High
Central Area	.27	.59	.14
Rocky Mount	.34	.57	.09
Snow Creek	.30	.60	.10
Chatham	.29	.62	.09
Danville	.32	.59	.09
Eden	.31	.59	.10
Madison/Mayodan	.28	.62	.10
Stuart	.33	.59	.08
Bassett	.29	.62	.09

Sources: (1) Money Income in 1978 of Households in the United States, U.S. Census Bureau.
(2) General Social and Economic Characteristics of the Population, Virginia and North Carolina, 1970. U.S. Census Bureau.

Assumptions:
(1) Income levels adjusted relative to the CPI.
(2) Income distribution unchanged from 1970 to 1978.
(3) Corridor income determined by proportion of commuters residing in applicable jurisdictions.

It is interesting to note that the Rocky Mount and Stuart corridors also contained the two largest volumes of long-distance commuters, those for whom commuting costs would be highest.

Employment Type

No attempt was made to differentiate the employment classifications of Table 3.6 by corridor. Each corridor was assumed to contain identical distributions of employment type.

Conclusions

There is a significant number of long-distance commuters in the Martinsville area, with approximately 30% (9,800 persons) of the study area employment commuting over 10 miles one-way to work and an estimated 10% (3,400 persons) commuting over 25 miles. The Rocky Mount corridor has substantially more long distance commuters than any other corridor. The Danville, Eden, and Stuart corridors also have significant long-distance commuting. Paradoxically, the Rocky Mount, Danville, Eden, and Stuart corridors have the lowest income levels in the area. Thus, those faced with the greatest commuting costs are the least able to afford them.

THE TRANSPORTATION SYSTEM

Transportation in the Martinsville area is heavily dependent upon both the private automobile and individual initiative in the formation of ridesharing arrangements. There is currently neither a local bus system nor any organization actively promoting ridesharing. Inter-city bus service links Martinsville with Danville, Rocky Mount, Roanoke, and the industrial crescent of North Carolina, although it is estimated that virtually no Martinsville area workers use the service for commuting purposes.[1/] In addition, a few entrepreneurs have initiated buspool service to major employment sites in the area, primarily the Du Pont plant just south of Martinsville. However, less than one percent of area employees commute via buspool.[2/]

1/ Intercity Bus Service in Virginia (1981), Virginia Highway and Transportation Research Council, and Commuter Transportation in the West Piedmont Planning District.

2/ Martinsville Area Transportation Study.

INITIAL SCREENING OF MODAL OPTIONS

The initial modal screening criteria, as described in the methodology and reproduced here as Table 3.11, relate the viability of different modes to central area employment, corridor volume, residential density, and corridor length. The central area employment (20,600) and residential density (approximately 1 to 2 DUs/total acre in cities and towns) for the Martinsville area indicate insufficient demand to justify any of the public transit modes, although they approach the levels necessary to support express bus service. Thus, unless any corridors exhibit unusually high peak hour, peak direction person volumes, only the ridesharing modes should be considered for further analysis. From 1980 daily volumes provided by VDH&T the peak hour, peak direction person volumes shown in Figure 3.7 were calculated using the following assumptions:

- 10% of daily traffic in the peak hour (conservative assessment used in general traffic engineering applications. 1969 Martinsville Thoroughfare Plan external station count indicated an overall 8.3% peak hour factor).
- 60% of peak hour traffic in the peak direction (from general traffic engineering applications).
- A 1.38 work trip auto occupancy (based on gate counts at eleven major Martinsville employers).

Even on the outskirts of Martinsville, where trips from several corridors converge, person trip volumes are lower than those necessary to support any of the public transit modes. Therefore, only the ridesharing modes, carpool and vanpool/buspool, will be considered in the modal share analysis.

APPLICATION OF MODAL SUMMARY TABLES

Using the distributions developed in Tables 3.5, 3.6, 3.9, and 3.10 and the Carpool and Vanpool/Buspool Modal Summary Sheets described in the methodology report and reproduced as Tables 3.1 and 3.2 of this case study report, estimates of ridesharing in each of the corridors and to each of the employment centers were calculated. No special ridesharing assistance by employers was assumed. The results, shown in Table 3.12, indicate combined ridesharing modal shares of 30% for the region, a figure higher than the default value for small urban areas. Individual corridor ridesharing estimates, shown in the last column of Table 3.12, range from a low of 24% in the Bassett corridor to highs of 41% in the Eden corridor and 39% in the Rocky Mount and Stuart corridors. The central area had an estimated 22% ridesharing percentage.

Table 3.11

INITIAL SCREENING CRITERIA FOR MODAL OPTIONS

Mode	Corridor Volume (one-way, peak hour, peak direction person trips)[1/]	Employment	Residential Density (dwelling units/ residential acre)	Corridor Length (miles)
Express Bus	3,000	25,000[2/]	3	5[4/]
Light Rail/Busway	8,000	50,000[2/]	9	5[4/]
Rapid Rail	17,000	70,000[2/]	12	7[4/]
Commuter Rail	17,000	100,000[2/]	1	10[4/]
Carpool	—	100[3/]	1	3[5/]
Vanpool	—	300[3/]	1	7[5/]
Buspool	—	300[3/]	2	7[5/]

1/ At maximum load point in corridor for design year.

2/ Central area total employment for design year.

3/ Individual employers or continguous employers with similar shift and employee characteristics.

4/ Facility length

5/ Trip length

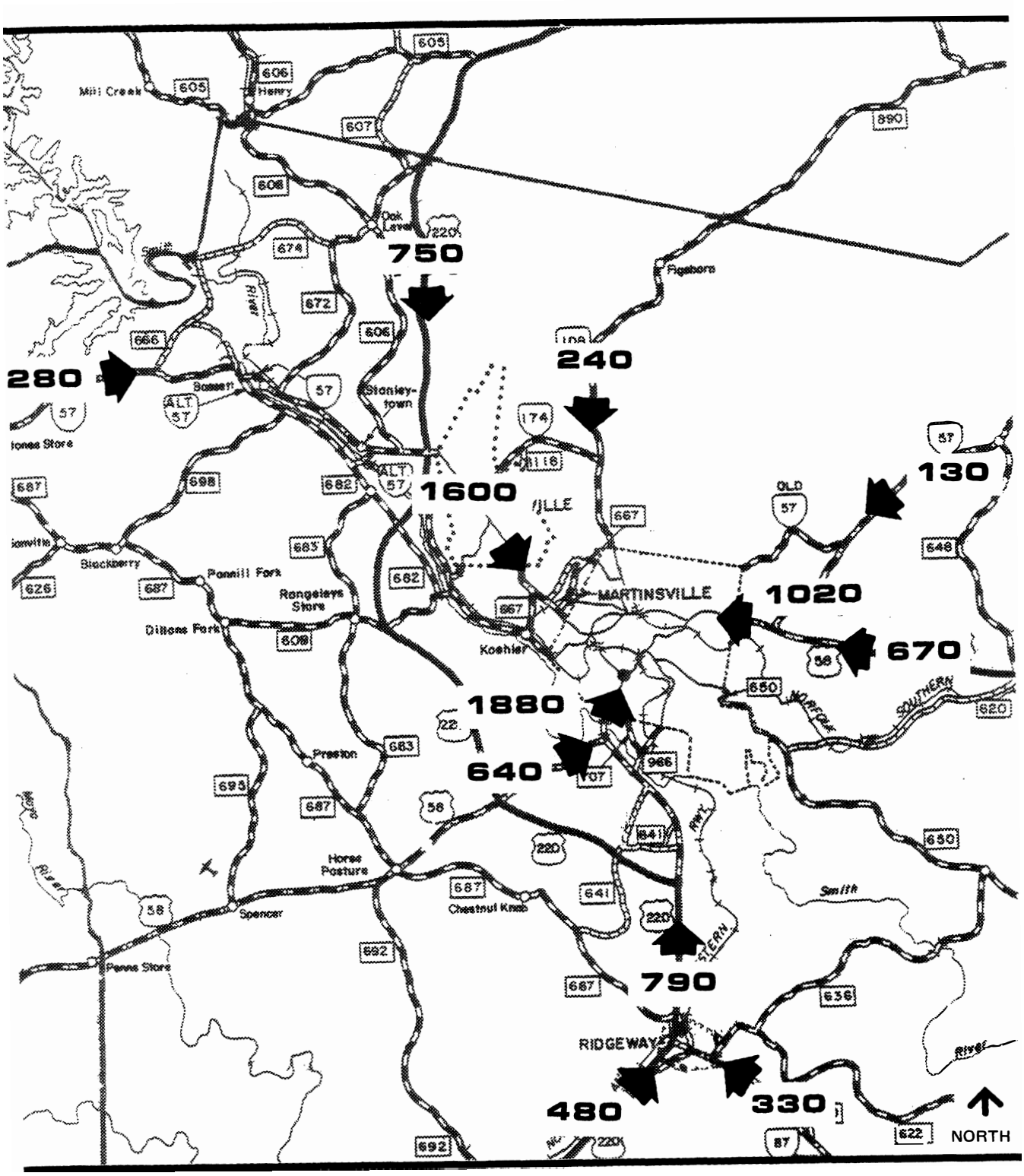


Figure 3.7
PEAK HOUR PERSON VOLUMES

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Table 3.13 illustrates the calculations for one cell of Table 3.12; the carpool mode share for residents of the Danville corridor who work in the Martinsville/Fontaine area.

Validation

It is difficult to validate the ridesharing estimates in the Martinsville area because no areawide ridesharing data exists. The 1977 Commuter Transportation Study stated that "approximately 80% of the West Piedmont Planning District's labor force drives individually to work in privately-owned automobiles." This conclusion was based on telephone surveys of both large and small industries. In comparison, the modal share estimates indicate higher ridesharing levels. In many respects, a higher ridesharing percentage is expected because of the almost doubling of fuel price between 1977 and 1980.

More recent information would indicate that the estimating technique provides reasonable estimates of ridesharing, at least at very large industrial employers in rural and small urban areas. Observed vehicle occupancy counts, taken by VDH&T at gates of major Martinsville employers in 1981 indicated ridesharing levels of 40% to 50% in most instances. Application of the modal summary tables to the Du Pont site, for which the requisite base data were available, resulted in estimated ridesharing of 43% versus 46% observed. Table 3.14 shows these results. Although the modal summary tables represent average conditions, and therefore can be expected to deviate substantially from conditions at any individual site, very rough estimates indicate that the tables would estimate ridesharing at similar levels at the other ten sites for which gate counts of vehicle occupancy were made.

Commuter Travel in the Martinsville Area

The modal shares of Table 3.12 can be translated into person and vehicle trip totals, using the commuter origins and destinations of Table 3.8 and the following factors contained in the Methodology Report:

(1) (one-way work person trips) = (number of employees) x (1.7)[1/]
(2) (peak hour, peak direction work person trips)
= (one-way work person trips) x (0.18)
(3) average carpool occupancy = 2.5
(4) average vanpool occupancy = 12

1/ An example of a one-way work person trip is a trip from home to work. Every commuter makes two work person trips on days that (s)he works. The 1.7 figure accounts for absenteeism.

Table 3.12

ESTIMATED MODE SHARES IN THE MARTINSVILLE AREA
1980 EXISTING CONDITIONS

CORRIDOR	EMPLOYMENT AREA														
	Martinsville/ Fontaine			Bassett/ Stanleytown			Collinsville/ Fieldale			Ridgeway/ US 220 S			Total		
	Carpool	Vanpool Buspool	Drive Alone 1/	Carpool	Vanpool Buspool	Drive Alone 1/	Carpool	Vanpool Buspool	Drive Alone 1/	Carpool	Vanpool Buspool	Drive Alone 1/	Carpool	Vanpool Buspool	Drive Alone 1/
Rocky Mount	.42	.05	.53	.35	.04	.61	.28	.03	.69	.34	.14	.52	.35	.04	.61
Snow Creek	.34	.03	.63	.41	.06	.53	.24	.02	.74	.28	.10	.62	.32	.03	.65
Chatham	.33	.02	.65	.35	.03	.62	.24	.02	.74	.26	.04	.70	.32	.02	.66
Danville	.32	.03	.65	.41	.06	.53	.25	.03	.72	.28	.09	.62	.32	.03	.65
Eden	.38	.04	.58	.51	.08	.41	.35	.05	.60	.18	.03	.79	.37	.04	.59
Madison/Mayodan	.34	.03	.63	.41	.05	.54	.27	.02	.71	.13	.01	.86	.31	.03	.66
Stuart	.39	.03	.58	.33	.03	.64	.26	.02	.72	.26	.07	.67	.36	.03	.61
Bassett	.33	.03	.64	.20	.01	.79	.20	.01	.79	--	--	--	.23	.01	.76
Central Area	.21	.01	.78	.24	.01	.75	.18	.01	.81	.16	.01	.83	.21	.01	.78
Total	.30	.02	.68	.28	.02	.70	.24	.02	.74	.17	.03	.80	.28	.02	.70

1/ Includes walk and other

Table 3.13

CALCULATION OF CARPOOL MODE SHARE FROM THE DANVILLE CORRIDOR TO THE MARTINSVILLE/FONTAINE EMPLOYMENT AREA

Variable	Input	Value
Base Mode Share (Table 3.1)	Normal Conditions	.244
Household Income (Table 3.11)	.32 low .59 medium .09 high	(.32) (1.223) + (.59) (.815) + (.09) (.977) = .960
Employment Concentration (Table 3.5)	.10 0-100 .26 100-500 .13 500-1,000 .51 1,000+	(.10) (.596) + (.26) (.888) + (.13) (.888) + (.51) (1.776) = 1.312
Type of Employment (Table 3.6)	.23 Office .10 Retail .67 Production	(.23) (1.106) + (.10) (1.106) + (.67) (.841) = .928
Work Trip Length (Table 3.10 note)	.29 0-5 miles .36 5-10 miles .14 10-15 miles .03 15-20 miles .04 20-25 miles .14 25+ miles	(.29) (.635) + (.36) (1.059) + (.14) (1.106)+ (.03) (1.735) + (.04) (1.800) + (.14) (1.912) = 1.112
Ridesharing Assistance (Table 3.1)	No Areawide Encouragement	1.000

CARPOOL MODE SHARE = (.244) (.960) (1.312) (.928) (1.112) (1.000)

= .32 (i.e., 32% of the commuters in the Danville corridor destined to the Martinsville/Fontaine employment area are carpooling.)

Table 3.14

APPLICATION OF THE MODAL SUMMARY TABLES TO THE DU PONT PLANT IN MARTINSVILLE

Variable	Input	Value[1/]
Base Mode Share:	Normal Conditions	.244 carpool .020 vanpool/buspool
Household Income:	.10 low (assumed) .60 medium (assumed) .30 high (assumed)	CP = (.10) (1.223) + (.60) (.815) + (.30) (.977) = .904 V/B = 1.000
Employment Concentration:	1,000+	CP = 1.776 V/B = .797
Type of Employment:	.776 production .224 office	CP = (.776) (.841) + (.224) (1.106) = .900 V/B = (.776) (.676) + (.224) (1.216) = .797
Work Trip Length:	.34 0-5miles .18 5-10 .16 10-15 .12 15-20 .08 20-25 .12 25+	CP = (.34) (.635) + (.18) (1.059) + (.16) (1.106) + (.12) (1.735) + (.08) (1.800) + (.12) (1.912) = 1.165 V/B = (.34) (.178) + (.18) (.700) + (.16) (1.215) + (.12) (1.262) + (.08) (2,009) + (.12) (5.140) = 1.310
Ridesharing Assistance	Carpooling-promotion/ information (low level)	1.000
	Vanpooling - promotion/ information (low level)	1.000

Modal Shares

Mode	Estimated Mode Share	Observed Mode Share
Carpool	.41	.46
Vanpool/Buspool	.02	
Drive Alone	.57	.54

Carpool = (.244) (.904) (1.776) (.900) (1.165) (1.000) = .41
Vanpool/Buspool = (.020) (1.000) (.797) (.797) (1.310) (1.000) = .02
Drive Alone = 1.00 - .41 - .02 = .57

1/ CP = Carpool
V/B = Vanpool/Buspool

Person and vehicle trip totals were prepared for daily one-way work trips and peak hour, peak direction work trips. The former will permit analysis of overall travel impacts, particularly as they relate to fuel consumption and pollution emissions, while the latter indicates congestion effects and the applicability of ridesharing efforts.

Tables 3.15 through 3.18 summarize these results for each of the corridors as follows:

Table 3.15 - Daily, one-way, work person trips
Table 3.16 - Daily, one-way, work vehicle trips
Table 3.17 - Peak hour, peak direction, work person trips
Table 3.18 - Peak hour, peak direction, work vehicle trips

Tables 3.17 and 3.18, which are the peak hour, peak direction corridor summaries, are of particular importance. They indicate the ability to group trips within a relatively small time period (crucial for vanpool/buspool success) and they relate to general congestion effects and other rush hour concerns.

Examination of the columns of Table 3.17 shows that in several instances vanpool/buspool demand is insufficient to support the use of even one peak hour van. As a result, an estimated 16 peak hour vanpools serve Martinsville area employment sites, with only the Rocky Mount Corridor eliciting demand for more than a couple vanpools under existing conditions.

In the next section, which examines modal alternatives, only ridesharing assistance alternatives will be considered, as only they have shown justification for further analysis.

Conclusions

Approximately 30% of the Martinsville area workforce commutes via carpool or vanpool/buspool while 70% drive alone, walk, or take other modes to work. Ridesharing modes are most heavily used in the Eden, Rocky Mount, and Stuart corridors, where about 40% of commuters travel by alternative modes, and are least heavily used in the Bassett corridor and the Martinsville/Collinsville/Fieldale central area where 20% to 25% of workers commute in carpools and vanpools.

In terms of all day commuting, approximately 20,200 single occupant autos, 3,200 carpools and 40 to 50 vanpools carry commuters to and from work in the study area. During the peak hour, in the peak direction, an estimated 7,300 single occupant autos, 1,200 carpools and 10 to 20 vanpools are used for employee travel in the Martinsville area.

Table 3.15
DAILY, ONE-WAY WORK PERSON TRIPS BY MODE[1/]
1980 EXISTING CONDITIONS

	EMPLOYMENT AREA														
	Martinsville/ Fontaine			Bassett/ Stanleytown			Collinsville/ Fieldale			Ridgeway/ US 220 S			Total		
CORRIDOR	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone
Rocky Mount	900	110	1,120	690	90	1,230	680	70	1,670	20	10	40	2,290	280	4,060
Snow Creek	660	50	1,210	190	30	250	270	20	850	10	0	20	1,130	100	2,330
Chatham	1,000	70	2,000	50	10	100	70	0	230	10	0	20	1,130	80	2,350
Danville	1,190	100	2,450	80	10	110	90	10	260	30	10	70	1,390	130	2,890
Eden	820	90	1,230	120	20	100	110	10	180	70	10	300	1,120	130	1,810
Madison/Mayodan	1,230	100	2,270	170	20	220	140	10	380	70	10	480	1,610	140	3,350
Stuart	1,410	130	2,100	190	20	360	240	20	660	40	10	100	1,880	180	3,220
Bassett	220	20	430	410	10	1,600	110	10	430	0	0	0	740	40	2,460
Corridor Total	7,430	670	12,810	1,900	210	3,970	1,710	150	4,660	250	50	1,030	11,290	1,080	22,470
Central Area	3,010	100	11,110	1,140	40	3,630	480	20	2,150	190	10	1,000	4,820	170	17,890
Total	10,440	770	23,920	3,040	250	7,600	2,190	170	6,810	440	60	2,030	16,110	1,250	40,360

1/ Estimates rounded to the nearest 10 persons; estimates not adjusted for insufficient demand to form vanpools.

Table 3.16

DAILY, ONE-WAY, WORK VEHICLE TRIPS BY MODE[1/]
1980 EXISTING CONDITIONS

CORRIDOR	EMPLOYMENT AREA														
	Martinsville/ Fontaine			Bassett/ Stanleytown			Collinsville/ Fieldale			Ridgeway/ US 220 S			Total		
	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone
Rocky Mount	360	9	1,120	276	7	1,230	272	6	1,670	12	2/	40	920	22	4,060
Snow Creek	264	4	1,210	76	2	250	108	2	850	4	0	20	452	8	2,330
Chatham	400	6	2,000	24	2/	100	28	0	230	4	0	20	456	6	2,350
Danville	476	8	2,450	36	2/	110	40	2/	260	16	2/	70	568	8	2,890
Eden	328	7	1,230	48	2	100	48	2/	180	32	2/	300	456	9	1,810
Madison/Mayodan	492	8	2,270	68	2	220	60	2/	380	32	2/	480	652	10	3,350
Stuart	564	11	2,100	76	2	360	96	2	660	20	2/	100	756	15	3,220
Bassett	88	2	430	168	2/	1,600	48	2/	430	0	0	0	304	2	2,460
Corridor Total	2,972	55	12,810	772	15	3,970	700	10	4,660	120	0	1,030	4,564	80	22,470
Central Area	1,204	8 3/	11,110	456	3 3/	3,630	192	2 3/	2,150	80	0 3/	1,000	1,928	13 3/	17,890
Total	4,176	63	23,920	1,228	18	7,600	892	12	6,810	200	0	2,030	6,492	93	40,360

1/ Estimates do not account for time of day of travel.

2/ Insufficient demand to justify a vanpool round trip. Trips included in carpool estimate.

3/ Represents additional corridor vanpool trips due to addition of central area riders.

Table 3.17
PEAK HOUR, PEAK DIRECTION, WORK PERSON TRIPS BY MODE[1/]
1980 EXISTING CONDITIONS

	EMPLOYMENT AREA														
	Martinsville/ Fontaine			Bassett/ Stanleytown			Collinsville/ Fieldale			Ridgeway/ US 220 S			Total		
CORRIDOR	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone
Rocky Mount	162	20	202	124	16	221	122	13	301	4	2	7	412	51	731
Snow Creek	119	9	218	34	5	45	49	4	153	2	0	4	204	18	420
Chatham	180	13	360	9	2	18	13	0	41	2	0	4	204	15	423
Danville	214	18	441	14	2	20	16	2	47	6	2	13	250	24	521
Eden	148	16	221	22	4	18	20	2	32	13	2	54	203	24	325
Madison/Mayodan	221	18	409	31	4	40	25	2	68	13	2	86	290	26	603
Stuart	254	23	378	34	4	65	43	4	119	8	2	18	339	33	580
Bassett	40	4	77	74	2	288	20	2	77	0	0	0	134	8	442
Corridor Total	1,338	121	2,306	342	39	715	308	29	838	48	10	186	2,036	199	4,045
Central Area	542	18	2,000	205	7	653	86	4	387	24	2	180	867	31	3,220
Total	1,880	139	4,036	547	46	1,368	394	33	1,255	82	12	366	2,903	230	7,265

1/ Estimates not adjusted for insufficient vanpool/buspool demand.

Table 3.18

PEAK HOUR, PEAK DIRECTION, WORK VEHICLE TRIPS BY MODE
1980 EXISTING CONDITIONS

	EMPLOYMENT AREA														
	Martinsville/ Fontaine			Bassett/ Stanleytown			Collinsville/ Fieldale			Ridgeway/ US 220 S			Corridor Total		
CORRIDOR	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone
Rocky Mount	65	2	202	50	1	221	49	1	301	2	1/	7	166	4	731
Snow Creek	48	1	218	16	1/	45	21	1/	153	1	0	4	86	1	420
Chatham	72	1	360	4	1/	18	5	0	41	1	0	4	82	1	423
Danville	86	2	441	6	1/	120	7	1/	47	2	1/	13	101	2	521
Eden	59	1	221	10	1/	18	9	1/	32	5	1/	54	83	1	325
Madison/Mayodan	88	2	409	14	1/	40	11	1/	68	5	1/	86	118	2	603
Stuart	102	2	378	15	1/	65	19	1/	119	3	1/	18	139	2	580
Bassett	18	1/	77	30	1/	288	9	1/	77	0	0	0	57	0	442
Total	538	11	2,306	145	1	715	130	1	838	19	0	186	832	13	4,045
Central Area	217	2 2/	2,000	82	1 2/	653	36	0 2/	387	15	0 2/	180	350	3 2/	3,220
Total	755	13	4,036	227	2	1,368	166	1	1,225	34	0	366	1,182	16	7,265

1/ Insufficient demand. Trips included in carpool estimate.

2/ Represents additional vanpools formed due to addition of central area riders.

MODAL ALTERNATIVES ANALYSIS

A full range of ridesharing assistance programs was described in the Methodology Report. Table 3.19, reproduced from the Methodology Report, summarizes these program levels and Table 3.20 gives typical costs and staffing requirements associated with each program. Table 3.21 relates these program levels to the ridesharing assistance factors in the modal summary sheets (Tables 3.1 and 3.2).

The Level One program is designed to enhance the ridesharing status quo at minimal cost, and hence, will not be analyzed in terms of program effects. Its focus is to keep ridesharing in the public awareness and to provide the private sector with information to be used at its own initiative. No direct program benefits in terms of increased ridesharing have been recorded for Level One programs. Indirect benefits, which logically accrue, arise from employer-sponsored programs, which use the information they receive to set up successful ridesharing efforts, and from individuals who become more receptive to ridesharing through the promotional activities.

The Level Two program is projected to cause an approximate one percent increase in areawide carpooling and a doubling in vanpooling at those employment sites with greater than 100 employees which actively pursue a ridesharing program. Because no data exist specifying an expected level of employer participation, an assumed 25% of area employees working in firms with over 100 employees would be exposed to a Level Two program.

The Level Three program is estimated to cause an approximate five percent increase in areawide carpooling. In addition, vanpooling is expected to triple at firms participating in the program. An estimated 80% of area employees of firms with 100 or more workers would be exposed to a Level Three program.

The Level Four program is anticipated to result in an 18% increase in carpooling. Inclusion of lease guarantees from the public sector, close-in free parking, and assumed employer-subsidized vanpool operation is expected to increase vanpooling more than five-fold for the estimated 80% of employees in firms with over 100 workers exposed to the Level Four program.

The ridesharing encouragement factors shown in Tables 3.1 and 3.2 and discussed in the preceding paragraphs were applied to the modal shares of Table 3.12 and the trip volumes of Tables 3.15 through 3.18. Table 3.22 shows modal shares expected from the implementation of Level Two, Three and Four ridesharing assistance programs. The footnotes of Table 3.22 translate site specific vanpooling effects to areawide estimates. Tables 3.23 through 3.26 relate these mode shares to corridor commuting as follows:

Table 3.23 - Daily, one-way, work person trips
Table 3.24 - Daily, one-way, work vehicle trips

Table 3.19

FOUR TYPICAL RIDESHARING PROGRAMS

Level One:	Program emphasis is on information dissemination to employers and individual commuters. Program aspects include media and roadside advertisements encouraging ridesharing and urging employer involvement in ridesharing efforts. Information requests are handled by existing staff on a part-time basis, who send ridesharing kits describing the steps necessary to form ridesharing arrangements or employer ridesharing programs to interested persons and employers. No direct staff involvement or matching services are provided.
Level Two:	In addition to Level One activities, manual or computer matching is provided to those individuals and employers so requesting. Survey forms are provided to employers to ensure necessary data are collected. Level two activities may be handled by existing personnel or additional staff may be required, according to area size and program response.
Level Three:	Program emphasis shifts from response to incoming requests to active promotion of ridesharing, especially in regard to major employers. Full time professional staff contact individual employers and business groups to set up ridesharing presentations to both management and employee groups. All steps in ridesharing formation are monitored by program staff, working closely with major employers. Services include technical assistance in vanpool and buspool formation, including identifying costs and steps involved in leasing, organization, insurance. Program staff assist in licensing and other regulatory requirements.
Level Four:	In addition to Level Three activities, Level Four includes ridesharing incentives such as lease guarantees to minimize vanpool risk, close-in carpool/vanpool parking, establishment of park/ride lots and financial assistance such as free or reduced cost parking, subsidized vanpool operation, etc.

Source: A Methodology for Evaluating Commuter Travel Options in Virginia Cities, January 1982, Barton-Aschman Associates, Inc.

Table 3.20

TYPICAL COSTS AND STAFFING ASSOCIATED WITH RIDESHARING PROGRAMS

	Total Cost	Personnel	Promotion	Computer	Other	Full Time Staff	Part Time Staff
LEVEL ONE							
Small Urban Area	$ 10,000	$ 6,000	$ 2,000		$ 2,000	0	1
Medium Urban Area	12,000	8,000	2,000		2,000	0	1
Large Urban Area	15,000	10,000	3,000		2,000	0	1
LEVEL TWO							
Small Urban Area	$ 25,000	$ 16,000	$ 4,000	$	$ 5,000	1	0
Medium Urban Area	35,000	20,000	6,000	3,000	6,000	1	0
Large Urban Area	50,000	32,000	7,000	4,000	7,000	1	1
LEVEL THREE							
Small Urban Area	$ 50,000	$ 27,000	$ 8,000	$ 8,000	$ 7,000	1	1
Medium Urban Area	60,000	33,000	10,000	9,000	8,000	1	1
Large Urban Area	90,000	60,000	11,000	10,000	9,000	2	1
LEVEL FOUR							
Small Urban Area	$ 80,000	$ 50,000	$ 10,000	$ 10,000	$ 10,000	2	1
Medium Urban Area	100,000	65,000	13,000	12,000	10,000	3	0
Large Urban Area	150,000	95,000	20,000	20,000	15,000	3	2

Table 3.21

RELATION OF RIDESHARING PROGRAM COST LEVELS TO DEGREE OF ASSISTANCE PROVIDED

Degree of Ridesharing Assistance Provided	Ridesharing Market Share and Corresponding Program Level		
	CARPOOL -- all areas		
	Low	Normal	High
Promotion/Information	Level 1	Level 1	Level 1
Areawide Matching	Level 2	Level 2	Level 2
Employer Matching	Level 3	Level 3	Levels 3&4
	VANPOOL/BUSPOOL -- all areas		
	Low	Normal	High
Promotion/Information	Level 1	Level 2	Level 2
Match/Lease Administration	Level 3	Level 3	Level 3
Financial Assistance	Level 4	Level 4	Level 4

Table 3.22

ESTIMATED 1980 MODE SHARES WITH THE IMPLEMENTATION OF RIDESHARING ASSISTANCE PROGRAMS

	Level Two Program[1]			Level Three Program[2]			Level Four Program[3]		
	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone
CORRIDOR									
Rocky Mount	.35	.05	.60	.36	.10	.54	.41	.16	.43
Snow Creek	.32	.03	.65	.33	.07	.60	.37	.11	.52
Chatham	.32	.03	.65	.33	.06	.61	.38	.09	.53
Danville	.32	.04	.64	.33	.07	.60	.37	.12	.51
Eden	.37	.05	.58	.38	.10	.52	.43	.17	.40
Madison/Mayodan	.32	.03	.65	.33	.06	.61	.37	.11	.52
Stuart	.36	.04	.60	.37	.08	.55	.42	.12	.46
Basset	.23	.01	.76	.24	.03	.73	.27	.05	.68
Central Area	.21	.01	.78	.22	.02	.76	.25	.03	.72
EMPLOYMENT AREA									
Martinsville/Fontaine	.30	.03	.67	.31	.05	.64	.35	.08	.57
Basset/Stanleytown	.28	.03	.69	.29	.05	.66	.33	.08	.59
Collinsville/Fieldale	.24	.02	.74	.25	.04	.71	.28	.07	.65
Ridgeway/US 220 S	.18	.03	.79	.18	.06	.76	.21	.10	.69
TOTAL	.28	.63	.69	.29	.05	.66	.33	.08	.59

1/ 75% of employees in 100+ worker firms. 25% of these workers assumed exposed to program.
Vanpool factor = (.75)(.25)(2.10)+1-(.75)(.25)=1.21

2/ 75% of employees in 100+ worker firms. 80% of these workers estimated exposed to program.
Vanpool factor = (.75)(.80)(3.16)+1-(.75)(.80)=2.30

3/ 75% of employees in 100+ worker firms. 80% of these workers estimated exposed to program.
Vanpool factor = (.75)(.80)(5.61)+1-(.75)(.80)=3.76

Table 3.23

DAILY, ONE-WAY, WORK PERSON TRIPS BY MODE[1/]
1980 CONDITIONS WITH RIDESHARING ASSISTANCE

Corridor	Level Two Program			Level Three Program			Level Four Program		
	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone
Rocky Mount	2,320	340	3,970	2,410	640	3,580	2,710	1,050	2,870
Snow Creek	1,140	120	2,310	1,190	240	2,140	1,340	390	1,840
Chatham	1,150	100	2,320	1,190	200	2,180	1,340	320	1,910
Danville	1,410	170	2,840	1,470	310	2,640	1,660	520	2,240
Eden	1,130	160	1,770	1,170	310	1,580	1,320	500	1,240
Madison/Mayodan	1,620	170	3,310	1,690	330	3,080	1,900	540	2,660
Stuart	1,890	210	3,170	1,970	400	2,900	2,210	650	2,410
Bassett	740	50	2,440	770	90	2,370	870	150	2,210
Corridor Total	11,400	1,320	22,130	11,860	2,520	20,470	13,350	4,120	17,380
Central Area	4,850	180	17,750	5,060	360	17,360	5,670	590	16,520
Total	16,250	1,500	39,880	16,920	2,880	37,830	19,020	4,710	33,900

1/ Estimates rounded to nearest 10 persons; estimates not adjusted for insufficient demand to form vanpools.

Table 3.24

DAILY, ONE-WAY WORK VEHICLE WORK TRIPS BY MODE[1/]
1980 CONDITIONS WITH RIDESHARING ASSISTANCE

Corridor	Level Two Program			Level Three Program			Level Four Program		
	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone
Rocky Mount	932	27	3,970	964	54	3,580	1,084	87	2,870
Snow Creek	459	10	2,310	479	19	2,140	536	32	1,840
Chatham	465	7	2,320	487	14	2,180	536	27	1,910
Danville	579	10	2,840	588	25	2,640	664	43	2,240
Eden	457	12	1,770	468	26	1,580	528	42	1,240
Madison/Mayodan	655	12	3,310	681	26	3,080	760	45	2,660
Stuart	761	17	3,170	788	34	2,900	884	54	2,410
Bassett	299	3	2,440	313	6	2,370	348	12	2,210
Corridor Total	4,607	98	22,130	4,768	204	20,470	5,340	342	17,380
Central Area	1,940	17[2/]	17,750	2,024	34[2/]	17,360	2,268	49[2/]	16,520
Total	6,547	115	39,880	6,792	238	37,830	7,608	391	33,900

1/ Estimates do not account for time of day of travel; estimates adjusted for insufficient demand to justify a vanpool round trip by origin and destination.

2/ Represents additional corridor vanpool trips due to addition of central area riders.

Table 3.25 - Peak hour, peak direction, work person trips
Table 3.26 - Peak hour, peak direction, work vehicle trips

The intermediate steps in the development of the above tables--the calculation of person and vehicle trips by origin/destination pair--are omitted for the sake of brevity, but were identical to the process described earlier for Tables 3.15 through 3.18.

Conclusions

Implementation of a Level One ridesharing program would maintain current ridesharing levels and ensure that private sector programs have access to useful information and ideas to promote employee pooling. A Level Two program would have a barely perceptible impact, perhaps increasing ridesharing from the current 30% of commuters in the Martinsville area to 31%. A Level Three program would further increase ridesharing to approximately 35% of the workforce, while a Level Four program, combined with a high degree of active employer involvement, could result in 40% of Martinsville area workers commuting to work via carpools and vanpools.

Comparison of program effects with existing conditions yields the following results:

	Number of Vehicles Used for Commuting					
	Inbound Daily			Inbound Peak Hour		
	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone
Existing Condition	3,200	40-50	20,200	1,200	10-20	7,300
Level Two Ridesharing Program	3,300	50-60	19,900	1,200	10-20	7,200
Level Three Ridesharing Program	3,400	110-120	18,900	1,300	40-50	6,800
Level Four Ridesharing Program	3,800	190-200	16,900	1,400	60-70	6,100

The effect of the ridesharing programs on total vehicle usage in comparison to existing conditions is summarized below.

	Number of Inbound Daily Vehicles Removed From Roadways	Number of Inbound Peak Hour Vehicles Removed From Roadways
Level Two Ridesharing Program	200	100
Level Three Ridesharing Program	1,000	400
Level Four Ridesharing Program	2,500	900

The next sections of the Martinsville Case Study Report examine expected changes in commuting characteristics between 1980 and the year 2000 and the effects these changes induce on modal shares and trip volumes.

Table 3.25

PEAK HOUR, PEAK DIRECTION, WORK PERSON TRIPS BY MODE[1/]
1980 CONDITIONS WITH RIDESHARING ASSISTANCE

Corridor	Level Two Program			Level Three Program			Level Four Program		
	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone
Rocky Mount	418	61	715	434	115	644	488	189	517
Snow Creek	205	22	416	214	43	385	241	70	331
Chatham	207	18	418	214	36	392	241	58	344
Danville	254	31	511	265	56	475	299	94	403
Eden	203	29	319	211	56	284	238	90	223
Madison/Mayodan	292	31	596	304	59	554	342	97	479
Stuart	340	38	571	355	72	522	398	117	434
Bassett	133	9	439	139	16	427	157	27	399
Corridor Total	2,052	239	3,985	2,136	453	3,683	2,404	742	3,130
Central Area	873	32	3,195	911	65	3,125	1,021	106	2,974
Total	2,925	271	7,180	3,047	518	6,808	3,425	848	6,104

1/ Estimates not adjusted for insufficient vanpool/buspool demand.

Table 3.26

PEAK HOUR, PEAK DIRECTION, WORK VEHICLE TRIPS BY MODE[1/]
1980 CONDITIONS WITH RIDESHARING ASSISTANCE

Corridor	Level Two Program			Level Three Program			Level Four Program		
	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone
Rocky Mount	176	5	715	175	10	644	197	15	517
Snow Creek	86	1	416	88	4	385	97	6	331
Chatham	83	1	418	88	3	392	98	4	344
Danville	105	2	511	111	3	475	122	8	403
Eden	85	2	319	87	4	284	95	8	223
Madison/Mayodan	120	2	596	125	5	554	138	8	479
Stuart	140	2	571	145	6	522	159	10	434
Bassett	55	0	439	62	0	427	64	2	399
Corridor Total	841	15	3,985	882	35	3,683	970	61	3,130
Central Area	351	3 2/	3,195	369	5 2/	3,125	410	9 2/	2,974
Total	1,192	18	7,180	1,251	40	6,808	1,380	70	6,104

1/ Estimates adjusted for insufficient vanpool/buspool demand by origin and destination.

2/ Represents additional corridor vanpools formed due to addition of central area riders.

FUTURE TRAVEL CHARACTERISTICS

Changes in travel conditions between 1980 and 2000 are based on changes in population in the cities and counties of the region and in changes in employment in Martinsville and surrounding Henry County. No existing plans or proposals which address the existing highway and public transportation network should have significant effects on long-distance commuter travel. Between 1980 and 2000, population in the region is estimated to grow 6.7%.[1/] Table 3.28 lists projected growth in each of the cites and counties of the region. Growth is expected to be concentrated in the region's counties, with both Martinsville and Danville forcast to experience population declines. This trend toward further scatter of residence locations will most likely result in a larger proportion of long-distance commuters in the year 2000 in comparison to 1980.

Employment in Martinsville and the surrounding area is projected to increase 21.3% between 1980 and 2000.[2/] Table 3.27 shows projected employment for each of the four Martinsville area employment centers. The anticipated employment growth rate is over three times the population growth rate. In all likelihood, employers will need to attract employees from even greater distances in the year 2000 in order to satisfy workforce demands. The trend for Martinsville is clear. Through rapidly rising employment, moderate population growth in the counties, and population decline in Martinsville, not only will the total number of long-distance commuters increase, but they will also represent a larger proportion of all commuters. Table 3.28, which relates population change in each jurisdiction to average commute distance to Martinsville area work sites, indicates a 3% increase in average trip length between 1980 and 2000; from 10.0 to 10.3 miles. This potential rise in commute distance, although slight, would be lessened should alternative employment scenarios develop, such as decreased out-commuting from Martinsville to other employment areas.

The population changes by jurisdiction and employment growth described in Table 3.27 were translated into year 2000 commuter origins and destinations, based on the proportion of corridor commuters living in each jurisdiction and working in each employment area. Minor balancing was performed to match control totals. Table 3.29 depicts year 2000 origin and destination.

1/ Department of Planning and Budget Commonwealth of Virginia. Population Projections: Virginia Counties and Cities 1980-2000. January, 1980.

2/ Martinsville Area Transportation Study. Based on straight-line annual growth rate.

Table 3.27

YEAR 2000 POPULATION AND EMPLOYMENT

	Population		
	1980	Change 1980-2000 1/	2000
Martinsville	18,149	-7.8%	16,700
Danville	45,642	-8.0	42,000
Henry County	57,642	+12.4	64,800
Franklin County	35,740	+22.3	43,700
Patrick County	17,585	+6.7	18,800
Pittsylvania County	66,147	+7.4	71,000
Rockingham County, NC	83,426	+6.7 2/	89,000
Total	324,343	+6.7	346,000

	Employment		
	1980	Change 1980-2000 3/	2000
Martinsville/Fontaine	20,600	+21.1%	24,900
Bassett/Stanleytown	6,400	+21.6	7,800
Collinsville/Fieldale	5,400	+21.6	6,600
Ridgeway/US 220 S	1,500	+21.6	1,800
Total	33,900	+21.3	41,100

1/ Commonwealth of Virginia, Population Projections: Virginia Counties and Cities 1980-2000.

2/ Estimated, based on regional average.

3/ Martinsville Area Transportation Study. Based on Martinsville and Henry County average annual employment growth.

Table 3.28
YEAR 2000 COMMUTE DISTANCES

City or County	Proportion of 1980 Commuters[1/]	Proportion of 2000 Commuters[2/]	Average Commute Distance to Martinsville Sites[3/]
Martinsville	.233	.199	4 miles
Danville	.006	.005	30
Henry	.555	.579	6
Pittsylvania	.024	.022	25
Franklin	.088	.100	30
Partick	.047	.046	25
Rockingham	.047	.049	25
1980 Average			10.0[4/]
2000 Average			10.3

1/ From zip code residences.

2/ From zip code residences factored by 1980-2000 population change.

3/ Estimated from residence distribution with 10.0 average control.

4/ 1977 WPPD Commuter Transportation Study.

Table 3.29
YEAR 2000 COMMUTER ORIGINS AND DESTINATIONS

	Employment Centers				
Corridors	Martinsville/ Fontaine	Bassett/ Stanleytown	Collinsville/ Fieldale	Ridgeway/ US 220 S	Total
Rocky Mount	1,730	1,600	1,820	50	5,200
Snow Creek	1,450	380	850	20	2,700
Chatham	2,250	110	220	20	2,600
Danville	2,710	150	250	90	3,200
Eden	1,600	180	230	290	2,300
Madison/Mayodan	2,680	310	390	420	3,800
Stuart	2,620	400	660	120	3,800
Bassett	470	1,440	390	0	2,300
Corridor Total	15,510	4,570	4,810	1,010	25,900
Central Area	9,390	3,230	1,790	790	15,200
Total	24,900	7,800	6,600	1,800	41,100

Because commute distance is a signficant determinant of mode choice, an estimate of future trip length distribution was calculated. No change in corridor trip length distribution was assumed between 1980 and 2000 (refer to Table 3.9). It was expected that the overall distribution would change and the average trip length increase due solely to residence migration from the central area to the corridors. Table 3.30 shows that this is indeed the case.

No changes are foreseen in any of the other socioeconomic characteristics which influence mode choice: residential density, household income (in constant dollars), employment concentration, or type of employment. Any change to the areawide mode share will result from the longer commute distances associated with population decline in Martinsville and growth in the surrounding counties.

Conclusions

Population decline in Martinsville and growth in the surrounding counties, coupled with a substantial employment level increase, will result in both a higher absolute number and proportion of long-distance commuters by the year 2000. Between 1980 and 2000, the percentage of workers living less than five miles from work is expected to decline from 34% to 33% of the workforce, while the percentage living more than 25 miles from work will increase from 10% to 11% from the workforce. A resultant 3% increase in average trip length is anticipated.

The area workforce will increase 21% between 1980 and 2000, to 41,000 persons. During the same span, the number of commuters living more than ten miles from work will increase 27% to 12,500 and the number of commuters living more than twenty-five miles from work will rise to 4,400, a 28% increase.

YEAR 2000 INITIAL SCREENING

The initial screening criteria of Table 3.11 were re-examined in light of projected population and employment growth. Even the most heavily travelled approach roads to Martinsville, which carry traffic from more than one corridor, would require peak hour traffic increases on the order of 60% to meet the express bus service warrant. Because areawide employment is expected to grow by 20%, and even the fastest growing corridor will register no more than a 33% gain in commuter travel, ridesharing will remain the only viable commuter option in the year 2000.

Table 3.30

COMMUTE DISTANCE DISTRIBUTION BY CORRIDOR

	One way commute distance (miles)										
	0-5	5-10	10-15	15-20	20-25	25+	Average Commute Distance	1980 Trips more than 10 miles	2000 Trips more than 10 miles	1980 Trips more than 25 miles	2000 Trips more than 25 miles
Corridor											
Rocky Mount	.19	.25	.13	.04	.07	.32	20.8	2,180	2,900	1,240	1,670
Snow Creek	.10	.46	.21	.03	.05	.15	11.7	910	1,190	310	410
Chatham	.00	.63	.25	.03	.02	.07	7.8	780	960	150	180
Danville	.27	.33	.17	.03	.04	.16	12.2	1,040	1,280	420	530
Eden	.04	.23	.16	.19	.13	.25	18.7	1,310	1,670	450	570
Madison/Mayodan	.09	.40	.31	.04	.06	.10	8.5	1,520	1,930	300	390
Stuart	.03	.40	.25	.06	.11	.15	14.6	1,770	2,160	460	540
Bassett	.59	.24	.10	.01	.03	.03	9.3	320	390	60	60
Central Area	.62	.38	.00	.00	.00	.00	4.8	0	0	0	0
1980 Total	.34	.37	.12	.03	.04	.10	10.0	9,830		3,390	
2000 Total	.33	.37	.12	.03	.04	.11	10.3		12,480		4,350

Note: Commute distance distributions from each corridor to each employment location were developed in order to apply the methodology. This table is a summary of those calculations.

YEAR 2000 MODAL SUMMARY ANALYSIS

In the same manner that Table 3.12 was developed for 1980, year 2000 modal share estimates were calculated for each corridor/employment area origin/ destination pair. The results, summarized in Table 3.31, reveal that the increased trip distances associated with population changes have only a slight effect on mode share. The detailed calculations -- not shown --indicate a rise in the areawide ridesharing mode share from 30.0% to 30.5% between 1980 and 2000.

Tables 3.32 through 3.35 give daily one-way and peak hour, peak direction person and vehicle trip totals for the year 2000, based on mode shares and corridor commute volumes. Trips by individual employment area were developed, but only corridor totals are shown for purposes of comparison.

During the year 2000, 28,300 vehicles will be used each day to carry 34,900 commuters to and from work in the Martinsville area, compared to 1980 levels of 23,500 vehicles carrying 28,900 commuters. During the peak hour, an additional 17,000 vehicles will enter Martinsville area employment centers, when compared to 1980. This 20% increase in commuter activity will be most pronounced in the Rocky Mount, Snow Creek, Eden, and Madison/ Mayodan corridors, where increases in commuting of 33%, 29%, 28%, and 27%, respectively, are anticipated. More moderate growth is forecast for the Chatham (24%), Danville (23%), Stuart (23%), and Bassett (21%) corridors. Yet, only the central area, with a 13% increase in commuting, is expected to lag behind the employment growth rate of 21%.

Conclusions

Between 1980 and the year 2000, a very slight increase in the proportion of persons who rideshare to work is anticipated, although this proportion will remain at approximately 30% of the workforce. An additional 4,800 vehicles will be used for commuting in the year 2000 when compared to present conditions, 1,700 of these during the peak hour. The four corridors radiating from the city in the north and south directions will witness the largest growth in vehicle volumes, although all corridor volumes will increase in excess of 20%.

YEAR 2000 MODAL ALTERNATIVES ANALYSIS

The various ridesharing assistance programs were analyzed for their effects on carpool and vanpool use in the year 2000, using the same process described for the 1980 analysis. Table 3.36 gives estimated year 2000 mode shares for Level Two, Three, and Four ridesharing assistance programs, by corridor.

Table 3.31

ESTIMATED MODE SHARES IN THE MARTINSVILLE AREA
YEAR 2000 CONDITIONS

CORRIDOR	EMPLOYMENT AREA														
	Martinsville/ Fontaine			Bassett/ Stanleytown			Collinsville/ Fieldale			Ridgeway/ US 220 S			Total		
	Carpool	Vanpool Buspool	Drive Alone 1/	Carpool	Vanpool Buspool	Drive Alone 1/	Carpool	Vanpool Buspool	Drive Alone 1/	Carpool	Vanpool Buspool	Drive Alone 1/	Carpool	Vanpool Buspool	Drive Alone 1/
Rocky Mount	.42	.05	.53	.35	.04	.61	.28	.03	.69	.34	.14	.52	.35	.04	.61
Snow Creek	.34	.03	.63	.41	.06	.53	.24	.02	.74	.28	.10	.62	.32	.03	.65
Chatham	.33	.02	.65	.35	.03	.62	.24	.02	.74	.26	.04	.70	.32	.02	.66
Danville	.32	.03	.65	.41	.06	.53	.25	.03	.72	.28	.09	.62	.32	.03	.65
Eden	.38	.04	.58	.51	.08	.41	.35	.05	.60	.18	.03	.79	.37	.04	.59
Madison/Mayodan	.34	.03	.63	.41	.05	.54	.27	.02	.71	.13	.01	.86	.31	.03	.66
Stuart	.39	.03	.58	.33	.03	.64	.26	.02	.72	.26	.07	.67	.36	.03	.61
Bassett	.33	.03	.64	.20	.01	.79	.20	.01	.79	--	--	--	.23	.01	.76
Central Area	.21	.01	.78	.24	.01	.75	.18	.01	.81	.16	.01	.83	.21	.01	.78
Total	.30	.02	.68	.28	.02	.70	.24	.02	.74	.17	.03	.80	.28	.02	.70

1/ Includes walk and other

Table 3.32

DAILY ONE-WAY WORK PERSON TRIPS BY MODE[1/]
1980 AND YEAR2000

Corridor	1980 Carpool	1980 Vanpool Buspool	1980 Drive Alone	2000 Carpool	2000 Vanpool Buspool	2000 Drive Alone
Rocky Mount	2,290	280	4,060	3,070	370	5,400
Snow Creek	1,130	100	2,330	1,460	130	3,000
Chatham	1,130	80	2,350	1,410	110	2,910
Danville	1,390	130	2,890	1,720	170	3,550
Eden	1,120	130	1,810	1,430	170	2,310
Madison/Mayodan	1,610	140	3,350	2,030	180	4,240
Stuart	1,880	180	3,220	2,290	210	3,950
Bassett	740	40	2,460	890	50	2,980
Corridor Total	11,290	1,080	22,470	14,300	1,390	28,340
Central Area	4,820	170	17,890	5,450	180	20,210
Total	16,110	1,250	40,360	19,750	1,570	48,550

1/ Estimates rounded to the nearest 10 persons estimates not adjusted for insufficient demand to form vanpools.

Table 3.33

DAILY ONE-WAY WORK VEHICLE TRIPS BY MODE[1/]

Corridor	1980 Carpool	1980 Vanpool Buspool	1980 Drive Alone	2000 Carpool	2000 Vanpool Buspool	2000 Drive Alone
Rocky Mount	920	22	4,060	1,233	29	5,400
Snow Creek	452	8	2,330	585	11	3,000
Chatham	456	6	2,350	569	8	2,910
Danville	568	8	2,890	704	10	3,550
Eden	456	9	1,810	584	12	2,310
Madison/Mayodan	562	10	3,350	821	13	4,240
Stuart	756	15	3,220	921	17	3,950
Bassett	304	2	2,460	366	2	2,980
Corridor Total	4,564	80	22,470	5,783	102	28,340
Central Area	1,928	13[2/]	17,890	2,180	17[2/]	20,210
Total	6,492	93	40,360	7,963	119	48,550

1/ Estimates do not account for time of day of travel estimates adjusted for insufficient vanpool demand by O/D pair.

2/ Represents additional corridor vanpools due to addition of central area riders.

Table 3.34

PEAK HOUR, PEAK DIRECTION WORK PERSON TRIPS BY MODE[1/]
1980 AND YEAR 2000

Corridor	1980			2000		
	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone
Rocky Mount	412	51	731	553	67	972
Snow Creek	204	18	420	263	23	540
Chatham	204	15	423	254	20	524
Danville	250	24	521	310	31	639
Eden	203	24	325	257	31	416
Madison/Mayodan	290	26	603	365	32	763
Stuart	339	33	580	412	38	711
Bassett	134	8	442	160	9	536
Corridor Total	2,036	199	4,045	2,574	251	5,101
Central Area	867	31	3,220	981	32	3,638
Total	2,903	230	7,265	3,555	283	8,739

1/ Estimates not adjusted for insufficient vanpool/buspool demand.

Table 3.35

PEAK HOUR, PEAK DIRECTION WORK VEHICLE TRIPS BY MODE[1/]
1980 AND YEAR2000

Corridor	1980			2000		
	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone
Rocky Mount	166	4	731	222	5	972
Snow Creek	86	1	420	109	1	540
Chatham	82	1	423	102	1	524
Danville	101	2	521	127	2	639
Eden	83	1	325	107	2	416
Madison/Mayodan	118	2	603	149	2	763
Stuart	139	2	580	169	2	711
Bassett	57	0	442	66	0	536
Corridor Total	832	13	4,045	1,051	15	5,101
Central Area	350	3[2/]	3,220	394	3[2/]	3,638
Total	1,182	16	7,265	1,445	18	8,739

1/ Estimates adjusted due to insufficient vanpool/buspool demand on an origin/destination basis.

2/ Additional corridor vanpool trips due to addition of central area riders.

Table 3.36

ESTIMATED 2000 MODE SHARES WITH THE IMPLEMENTATION OF RIDESHARING ASSISTANCE PROGRAMS

	Level Two Program[1/]			Level Three Program[2/]			Level Four Program[3/]		
	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone
CORRIDOR									
Rocky Mount	.35	.05	.60	.36	.10	.54	.41	.16	.43
Snow Creek	.32	.03	.65	.33	.07	.60	.37	.11	.52
Chatham	.32	.03	.65	.33	.06	.61	.38	.09	.53
Danville	.32	.04	.64	.33	.07	.60	.37	.12	.51
Eden	.37	.05	.58	.38	.10	.52	.43	.17	.40
Madison/Mayodan	.32	.03	.65	.33	.06	.61	.37	.11	.52
Stuart	.36	.04	.60	.37	.08	.55	.42	.12	.46
Basset	.23	.01	.76	.24	.03	.73	.27	.05	.68
Central Area	.21	.01	.78	.22	.02	.76	.25	.03	.72
Total	.29	.03	.68	.30	.05	.65	.33	.09	.58

1/ 75% of employees in 100+ worker firms. 25% of these workers assumed exposed to program.
Vanpool factor = (.75)(.25)(2.10)+1-(.75)(.25)=1.21

2/ 75% of employees in 100+ worker firms. 80% of these workers estimated exposed to program.
Vanpool factor = (.75)(.80)(3.16)+1-(.75)(.80)=2.30

3/ 75% of employees in 100+ worker firms. 80% of these workers estimated exposed to program.
Vanpool factor = (.75)(.80)(5.61)+1-(.75)(.80)=3.76

Tables 3.37 through 3.40 relate these mode shares to toal and peak, person and vehicle volumes.

Conclusions

The ridesharing assistance programs would have a slightly greater impact in the future than in 1980, with forecast increases in ridesharing from the base 30% to 32% for Level Two, 35% for Level Three, and 42% for Level Four. Areawide, these increases would result in the following inbound daily and peak hour vehicle trip totals:

	Number of Vehicles Used for Commuting					
	Inbound Daily			Inbound Peak Hour		
	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone
Year 2000 Base Condition	4,000	50-60	24,000	1,400	10-20	8,700
Level Two Ridesharing Program	4,000	70-80	24,000	1,500	20-30	8,600
Level Three Ridesharing Program	4,200	140-150	22,700	1,500	50-60	8,200
Level Four Ridesharing Program	4,700	240-250	20,300	1,700	80-90	7,300

The effect of the ridesharing programs on total vehicle usage in the year 2000 is summarized below:

	Number of Inbound Daily Vehicles Removed From Roadways	Number of Inbound Peak Hour Vehicles Removed From Roadways
Level Two Ridesharing Program	200	100
Level Three Ridesharing Program	1,300	400
Level Four Ridesharing Program	3,100	1,100

The next section of the Martinsville Case Study Report relates the effects on vehicle usage of the ridesharing programs to areawide mileage cost, fuel and emissions impacts, both for 1980 and the year 2000.

IMPACT ASSESSMENT

Impacts associated with implementation of ridesharing options are calculated in this section for 1980 and the year 2000 with regard to:

- o miles of travel
- o costs

Table 3.37

DAILY, ONE-WAY WORK PERSON TRIPS BY MODE[1/]
2000 CONDITIONS WITH RIDESHARING ASSISTANCE

Corridor	Level Two Program			Level Three Program			Level Four Program		
	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone
Rocky Mount	3,100	450	5,290	3,220	860	4,760	3,620	1,400	3,820
Snow Creek	1,470	160	2,960	1,530	310	2,750	1,720	500	2,370
Chatham	1,420	130	2,870	1,480	240	2,700	1,660	400	2,360
Danville	1,740	210	3,490	1,810	390	3,240	2,030	630	2,780
Eden	1,440	210	2,260	1,500	390	2,020	1,680	650	1,580
Madison/Mayodan	2,050	220	4,190	2,140	410	3,910	2,400	680	3,380
Stuart	2,320	260	3,880	2,410	490	3,560	2,710	800	2,950
Bassett	900	60	2,950	930	110	2,870	1,050	180	2,680
Corridor Total	14,440	1,700	27,890	15,020	3,200	25,810	16,870	5,240	21,920
Central Area	5,500	210	20,130	5,740	410	19,690	6,430	680	18,730
Total	19,940	1,910	48,020	20,760	3,610	45,500	23,300	5,920	40,650

1/ Estimates rounded to the nearest 10 persons. Estimates not adjusted for insufficient demand to form vanpools.

Table 3.38

DAILY, ONE-WAY WORK VEHICLE TRIPS BY MODE[1/]
2000 CONDITIONS WITH RIDESHARING ASSISTANCE

Corridor	Level Two Program			Level Three Program			Level Four Program		
	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone
Rocky Mount	1,240	36	5,290	1,288	71	4,760	1,448	117	3,820
Snow Creek	560	14	2,690	615	25	2,750	693	42	2,370
Chatham	572	9	2,870	605	18	2,700	666	33	2,360
Danville	715	13	3,490	724	31	3,240	812	52	2,780
Eden	582	17	2,260	600	32	2,020	672	54	1,580
Madison/Mayodan	830	16	4,190	862	33	3,910	960	57	3,380
Stuart	934	20	3,880	964	43	3,560	1,084	67	2,950
Bassett	363	4	2,950	378	7	2,870	420	15	2,680
Corridor Total	5,796	129	27,890	6,036	260	25,810	6,755	437	21,920
Central Area	2,220	20[2/]	20,130	2,296	38[2/]	19,690	2,572	57[2/]	18,730
Total	7,996	149	48,020	8,332	298	45,500	9,327	494	40,650

1/ Estimates do not account for time of day of travel; estimates adjusted for insufficient demand to justify a vanpool round trip by origin and destination.

2/ Represents additional corridor vanpool trips due to addition of central area riders.

Table 3.39

PEAK HOUR, PEAK DIRECTION WORK PERSON TRIPS BY MODE[1/]
2000 CONDITIONS WITH RIDESHARING ASSISTANCE

Corridor	Level Two Program			Level Three Program			Level Four Program		
	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone
Rocky Mount	558	81	952	580	155	857	652	252	688
Snow Creek	265	29	533	275	56	495	310	90	427
Chatham	256	23	517	266	43	486	299	72	425
Danville	313	38	628	326	70	583	365	113	500
Eden	259	38	407	270	70	364	302	117	284
Madison/Mayodan	369	40	754	385	74	704	432	122	608
Stuart	418	47	698	434	88	641	488	144	531
Bassett	162	11	531	167	20	517	189	32	482
Corridor Total	2,600	307	5,020	2,703	576	4,647	3,037	942	3,945
Central Area	990	38	3,623	1,033	74	3,544	1,157	122	3,371
Total	3,590	345	8,643	3,736	650	8,191	4,194	1,064	7,316

1/ Estimates not adjusted for insufficient vanpool/buspool demand.

Table 3.40

PEAK HOUR, PEAK DIRECTION WORK VEHICLE TRIPS BY MODE[1/]
2000 CONDITIONS WITH RIDESHARING ASSISTANCE

Corridor	Level Two Program			Level Three Program			Level Four Program		
	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone	Carpool	Vanpool Buspool	Drive Alone
Rocky Mount	224	7	952	234	12	857	261	21	688
Snow Creek	108	2	533	110	4	495	125	8	427
Chatham	102	2	517	108	3	486	124	5	425
Danville	128	2	628	136	4	583	146	10	500
Eden	108	2	407	110	6	364	121	9	284
Madison/Mayodan	151	2	754	157	6	704	175	9	608
Stuart	172	3	698	176	8	641	195	12	531
Bassett	68	0	531	68	2	517	78	2	482
Corridor Total	1,061	20	5,020	1,099	45	4,647	1,225	76	3,945
Central Area	400	3 2/	3,623	413	8	3,544	463	11	3,371
Total	1,461	23	8,643	1,512	53	8,191	1,688	87	7,316

1/ Estimates adjusted for insufficient vanpool/buspool demand by origin and destination.

2/ Represents additional corridor vanpools formed due to addition of central area riders.

- o fuel usage
- o pollution emissions

1980 Impact Assessment

As an initial step, an estimate was prepared of modal usage by distance based on the commute distance adjustment factors contained in the modal summary tables (Tables 3.1 and 3.2) and the trip length distributions of Table 3.9. The factors reflect the propensity of commuters with different length trips to carpool and vanpool. Application of these factors, along with the mode shares for each option, yield the daily one-way vehicle trips by distance shown in Table 3.41. Although the distance distribution was based on person trips, it should represent both carpool and drive alone vehicle trips with reasonable accuracy. Vanpool vehicle trips were assumed a minimum of ten miles, although they serve persons living closer than ten miles from work.

As a second step, average trip distance within each five mile range was assumed to be the mid-point of that range. Based on the average areawide one-way commute distance of 10 miles, an average distance of 34.8 miles was calculated for the 25+ mile category.

Using an annualization factor of 250, the vehicle trips of Table 3.41 were translated into the VMT, fuel consumption and pollution emission totals shown in Table 3.42 with the application of the following values:

- o fleet fuel consumption = 16.4 mpg
- o HC emissions = 5 gm/mile
- o CO emissions = 44 gm/mile
- o NO_x emissions = 4 gm/mile

Table 3.43 compares the cost impacts of the three analyzed ridesharing programs on a per trip basis, assuming the ridesharing program costs of Table 3.20 and a 1980 average vehicle operating cost (excluding fixed costs) of 11.3¢ per mile.

Year 2000 Impact Assessment

In the same manner in which Table 3.27 was developed for 1980, year 2000 commute vehicle trips by distance are given in Table 3.44. Estimates of VMT, fuel consumption and pollutant emissions were then calculated using the following year 2000 values:

- o fleet fuel consumption = 22.5 mpg
- o HC emissions = 1.4 gm/mile
- o CO emissions = 15 gm/mile
- o NO_x emissions = 1.9 gm/mile

Table 3.41
1980 DAILY ONE-WAY VEHICLE TRIPS BY COMMUTE DISTANCE

	Commute Distance 0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25+	Total
Existing Conditions							
Carpool	1,328	2,406	818	320	444	1,176	6,492
Vanpool/Buspool	0	0	18	4	10	60	92
Drive Alone	16,488	15,116	4,718	866	1,076	2,096	40,360
Total	17,816	17,522	5,554	1,190	1,530	3,332	46,942
Level Two Program							
Carpool	1,340	2,248	824	324	448	1,184	6,548
Vanpool/Buspool	0	0	22	6	12	74	114
Drive Alone	16,426	14,986	4,654	848	1,042	1,924	39,880
Total	17,766	17,414	5,500	1,178	1,502	3,182	46,542
Level Three Program							
Carpool	1,390	2,520	854	336	462	1,230	6,792
Vanpool/Buspool	0	0	46	12	24	156	238
Drive Alone	16,284	14,442	4,384	764	886	1,070	37,830
Total	17,674	16,962	5,284	1,112	1,372	2,456	44,860
Level Four Program[1/]							
Carpool	1,600	2,900	986	384	530	1,208	7,608
Vanpool/Buspool	0	0	82	22	44	242	390
Drive Alone	15,480	12,936	3,752	572	574	586	33,900
Total	17,080	15,836	4,820	978	1,148	2,036	41,898

1/ Level Four program adjusted due to excessive ridesharing demand in the 25+ mile range.

Sample Calculation: Level Two carpool vehicles, 15-20 miles.

Total Employees = 33,900 (Table 9)
Total daily one-way person trips = 33,900 (1.7) = 57,630
15-20 mile daily one-way person trips = 57,630 (.03) = 1,728 (Table 10).
Base mode share = .28 (Table 13).
15-20 mile factor = 1.735 (Table 1).
Level Two program factor = 1.01 (Table 1)
Adjusted mode share = .28 (1.735)(1.01) = .49.
15-20 mile carpool vehicle trips = 1,728 (.49)/2.5 = 338

Summation of all carpool estimates resulted in a rounding factor of .96 to match the control total of 6,548, resulting in a calculated estimate of 338(.96) = 324.

Table 3.42

1980 VMT, FUEL CONSUMPTION AND POLLUTION EMISSIONS IMPACTS

	Existing Conditions	Level Two Program	Level Three Program	Level Four Program
Annual Person Trips	14,400,000	14,400,000	14,400,000	14,400,000
Annual Ridesharing Person Trips	4,340,000	4,450,000	4,960,000	5,940,000
Annual Vehicle Trips	11,700,000	11,600,000	11,200,000	10,500,000
Annual Ridesharing Vehicle Trips	1,650,000	1,670,000	1,760,000	2,000,000
Annual Vehicle Miles of Travel	104,000,000	102,000,000	93,000,000	84,000,000
Annual Fuel Consumption (gallons)	6,340,000	6,220,000	5,670,000	5,120,000
Annual Pollution Emissions (kilograms)				
HC	520,000	510,000	470,000	420,000
CO	4,580,000	4,490,000	4,090,000	3,700,000
NO_x	420,000	410,000	370,000	340,000

Table 3.43

RIDESHARING PROGRAM COST IMPACTS

	Level Two Program	Level Three Program	Level Four Program
Annual Ridesharing Program Costs	$ 25,000	$ 50,000	$ 80,000
Additional Ridesharing Trips Induced 1/	120,000	620,000	1,600,000
Cost Per Induced Trip	$ 0.21	$ 0.08	$ 0.05
Annual Vehicle Operating Cost Savings			
Total	$230,000	$1,240,000	$2,260,000
Average Carpooler 2/	$ 380	$ 380	$ 380
Long Distance Carpooler 3/	$ 940	$ 940	$ 940

1/ Annual one-way person trips.

2/ 10 mile one-way commute. Shift from drive alone to 3-person carpool.

3/ 25 mile one-way commute. Shift from drive alone to 3-person carpool.

Table 3.44
YEAR 2000 DAILY ONE-WAY VEHICLE TRIPS BY COMMUTE DISTANCE

	Commute Distance 0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25+	Total
Base Conditions							
Carpool	1,564	2,920	990	388	536	1,564	7,962
Vanpool/Buspool	0	0	22	6	12	78	118
Drive Alone	19,148	18,522	5,646	1,054	1,310	2,840	48,550
Total	20,712	21,472	6,658	1,448	1,858	4,482	56,630
Level Two Program							
Carpool	1,572	2,932	994	388	538	1,572	7,996
Vanpool/Buspool	0	0	26	8	14	100	148
Drive Alone	19,094	18,490	5,576	1,028	1,280	2,552	48,020
Total	20,666	21,422	6,596	1,424	1,832	4,224	56,164
Level Three Program							
Carpool	1,636	3,054	1,038	406	562	1,636	8,332
Vanpool/Buspool	0	0	52	14	30	202	298
Drive Alone	18,982	18,232	5,168	914	1,030	1,174	45,500
Total	20,618	21,286	6,258	1,334	1,622	3,012	54,130
Level Four Program 1/							
Carpool	1,888	3,526	1,196	468	648	1,600	9,326
Vanpool/Buspool	0	0	134	36	74	250	494
Drive Alone	18,122	16,836	3,742	636	628	686	40,650
Total	20,010	20,362	5,072	1,140	1,350	2,536	50,470

1/ Level Four program adjusted due to excessive ridesharing demand in the 25+ mile range.

These estimates are shown in Table 3.45. Table 3.46 compares the year 2000 cost impacts of the three ridesharing options that were analyzed. An 11.3¢ per mile operating cost was retained, assuming future fuel consumption improvements are offset by a rise in the constant-dollar price of fuel.

Conclusions

Implementation of ridesharing programs in the Martinsville area can result in the following 1980 and year 2000 annual ridesharing person trip increases compared to base conditions:

	1980	2000
Level Two Program	120,000	140,000
Level Three Program	620,000	760,000
Level Four Program	1,600,000	1,990,000

The increases result in the following VMT, fuel consumption and pollutant emission reductions:

	Vehicle Miles of Travel	
	1980	2000
Level Two Program	2,000,000	3,000,000
Level Three Program	11,000,000	16,000,000
Level Four Program	20,000,000	29,000,000

	Gallons of Fuel	
	1980	2000
Level Two Program	120,000	140,000
Level Three Program	670,000	710,000
Level Four Program	1,220,000	1,290,000

	Kilograms of Pollutants	
	1980	2000
Level Two Program	110,000	50,000
Level Three Program	590,000	290,000
Level Four Program	1,060,000	530,000

Cost impacts, summarized below, relate these benefits to the cost per new one-way ridesharing person trip, and the vehicle operating cost savings for each dollar of program funds expended.

Table 3.45

YEAR 2000 VMT, FUEL CONSUMPTION AND POLLUTION EMISSIONS IMPACTS

	Base Conditions	Level Two Program	Level Three Program	Level Four Program
Annual Person Trips	17,500,000	17,500,000	17,500,000	17,500,000
Annual Ridesharing Person Trips	5,350,000	5,490,000	6,110,000	7,340,000
Annual Vehicle Trips	14,200,000	14,000,000	13,500,000	12,600,000
Annual Ridesharing Vehicle Trips	2,020,000	2,040,000	2,160,000	2,460,000
Annual Vehicle Miles of Travel	130,000,000	127,000,000	114,000,000	101,000,000
Annual Fuel Consumption (gallons)	5,780,000	5,640,000	5,070,000	4,490,000
Annual Pollution Emissions (kilograms)				
HC	180,000	180,000	160,000	140,000
CO	1,950,000	1,910,000	1,710,000	1,520,000
NO_x	250,000	240,000	220,000	190,000

Table 3.46

YEAR 2000 RIDESHARING PROGRAM COST IMPACTS

	Level Two Program	Level Three Program	Level Four Program
Annual Ridesharing Program Costs[1/]	$ 25,000	$ 50,000	$ 80,000
Additional Ridesharing Trips Induced[2/]	140,000	760,000	1,990,000
Cost Per Induced Trip	$ 0.81	$ 0.07	$ 0.04
Annual Vehicle Operating Cost Savings			
Total	$340,000	$1,810,000	$3,280,000
Average Carpooler[3/]	$ 380	$ 380	$ 380
Long Distance Carpooler[4/]	$ 940	$ 940	$ 940

1/ Constant 1980 dollars.

2/ Annual one-way person trips.

3/ 10 mile one-way commute. Shift from drive alone to 3-person carpool.

4/ 25 mile one-way commute. Shift from drive alone to 3-person carpool.

	Program Cost Per Induced Ridesharing Trip	
	1980	2000
Level Two Program	$0.21	$0.18
Level Three Program	$0.08	$0.07
Level Four Program	$0.05	$0.04

	Vehicle Operating Cost Savings Per $1 of Program Funds	
	1980	2000
Level Two Program	$ 9	$14
Level Three Program	$25	$36
Level Four Program	$28	$41

The next section of the report examines year 2000 impacts in light of future conditions different from those assumed in the above analysis.

SCENARIO ANALYSIS

The preceding analysis of year 2000 modal usage and impacts assumed travel attributes identical to 1980. That is, a trip from a given origin to a given destination would involve the same amount of time and the same cost for the traveller. This "base condition" may not, and probably will not, reflect actual travel conditions faced by Martinsville commuters in the year 2000. This section of the report examines the likely impacts on commuter travel associated with three different future scenarios; the expected future, a constrained-travel future, and an unconstrained-travel future. The three scenarios are described elsewhere in this study and summarized below. The scenarios will be examined for their effects on representative trips, shown in Table 3.47, and their relation to the viability of the alternative ridesharing programs analyzed for Martinsville.

Future Scenarios

The three scenarios represent composite travel changes based on three descriptors: fuel cost, funding for highway construction and maintenance, and funding for transit operations. In Martinsville, where transit service is not envisioned, only the first two of these concerns will affect commuter behavior.

Under the expected future, travel conditions are expected to deteriorate slightly in comparison to the base condition. Real fuel costs (including the effects of increased fuel efficiency) will rise and highway and transit funding will not keep pace with current system demands, resulting in modest increases in travel time and cost for commuters. The constrained future portends more drastic increases in travel time and cost as fuel prices register sharp increases and scaled back maintenance leads to roadway disrepair. The unconstrained future presages stable fuel prices resulting in a real decrease in cost due to increased vehicle fuel efficiency. Under this scenario, highway financing is adequate for all maintenance and reconstruction needs, resulting in a corresponding slight decrease in travel time. Table 3.48 summarizes the time and cost implications of the three scenarios, while Table 3.49 relates these changes to the representative trips.

Scenario Modal Analysis

The technique used to estimate the modal shifts resulting from the hypothesized system changes is called "incremental logit analysis". Given a known original mode share, the absolute change in system variables, and coefficients describing the relative sensitivity of travellers to each variable, a new mode share can be estimated. The method is described in more detail in an appendix to the Methodology Report.

The results of the scenario analysis are shown in Table 3.50. Under the expected future, ridesharing will be a slightly more attractive mode than under the base condition, capturing 30% of the 10-mile trips versus the base 29% and 59% of the 25-mile trips versus the base 56%. The constrained-travel future would result in even higher ridesharing percentages, 34% of the 10-mile trips and 69% of the 25-mile trips. Conversely, the unconstrained future would decrease ridesharing to 28% of 10-mile commuters and 51% of 25-mile commuters.

Conclusions

Future levels of ridesharing in the Martinsville area will depend on the cost of auto commuting borne by commuters. If fuel costs--or any other auto costs such as purchase price or parking charges--rise, commuters will tend to form pool arrangements to offset these increases. If constant-dollar costs decrease, the incentive to pool will dissipate. In either case, future levels of highway and transit support will have virtually no impact on mode choice, as single-occupant auto commuters and ridesharers will be equally affected.

Without any ridesharing assistance programs, between 27% and 34% of the average Martinsville area commuters--those who live 10 miles from work--can be expected to carpool, vanpool or buspool to work in the year 2000. Similarly, between 50% and 70% of those living 25 miles from work--Stuart, Rocky Mount, and Danville residents, for example--will rideshare.

Table 3.47
REPRESENTATIVE TRIP CHARACTERISTICS[1/]

Characteristic	Length of Trip: Average	Length of Trip: Long
Typical Origin	Bassett	Stuart
Distance (miles)	10	25
Driving Time (minutes)[2/]	20	50
Fuel Cost[3/]	$1.65	$1.65

1/ One-way trip destined to Martinsville.

2/ Average 30 mph speed.

3/ Constant 1980 dollars.

Table 3.48
SCENARIO DESCRIPTORS FOR SENSITIVITY ANALYSES[1/]

Descriptor	Scenario: Constrained	Scenario: Expected	Scenario: Unconstrained
Fuel Cost	+50%	+10%	-20%[2/]
Highway Service Levels	o 30% increase in peak-hour travel time.	o 5% increase in peak-hour travel time.	o 5% decrease in peak-hour travel time.
Transit Service Levels	o 20% increase in peak-hour headways.	o 10% increase in peak-hour headways.	o 10% decrease in peak-hour headways.
	o 20% decrease in speed.	o 5% decrease in speed.	o 5% increase in speed.
	o 30% increase in fares.	o 25% increase in fares.	o 20% increase in fares.

1/ Impacts above and beyond recently enacted 3% tax on wholesale price of gas in Virginia.

2/ Net effect of an increase in gas tax partially offsetting a larger decrease in non-tax gas cost.

Table 3.49
EFFECTS OF SCENARIOS ON CHARACTERISTICS OF REPRESENTATIVE TRIPS

Characteristic	Scenario	Change in Characteristic for Representative Trip: Average	Long
Driving Time (minutes)			
	Constrained	+ 6.0	+ 15.0
	Expected	+ 1.0	+ 2.5
	Unconstrained	- 1.0	- 2.5
Fuel Cost			
	Constrained	+ $0.83	+ $0.83
	Expected	+ $0.17	+ $0.17
	Unconstrained	- $0.33	- $0.33

Table 3.50
IMPACTS OF SCENARIOS ON YEAR 2000 MODAL SHARES

Scenario	Mode	Mode Share for Representative Trip: Average	Long
Base Condition[1/]			
	Ridesharing	.293	.564
	Drive Alone	.707	.436
Constrained			
	Ridesharing	.340	.691
	Drive Alone	.660	.309
Expected			
	Ridesharing	.302	.591
	Drive Alone	.698	.409
Unconstrained			
	Ridesharing	.275	.509
	Drive Alone	.725	.491

1/ Based on typical mode shares and trip length factors in Tables 3.1 and 3.2. Other socioeconomic factors not considered.

Ridesharing assistance programs can serve useful, though different, purposes under either a constrained or unconstrained scenario. Their impacts would be greater under constrained conditions, as more commuters will desire alternative commute modes and need the information and matching services provided. Under unconstrained conditions, the focus of ridesharing assistance programs would shift from responding to commuter interest in ridesharing to stemming a trend away from ridesharing.

RECOMMENDATIONS AND IMPLEMENTATION CONCERNS

The preceding sections have concluded that any improvements in commuting conditions for long-distance commuters must come from assistance to ridesharing. Transit options would not be feasible, given the demand they would serve. An examination of the effects of various ridesharing assistance programs, under both current conditions and possible future conditions, has also been undertaken. This section of the Martinsville Case Study Report suggests levels of ridesharing support which may be most appropriate in the Martinsville area and addresses issues involved in their implementation.

Recommendations

The relatively high proportion of long-distance commuters among the Martinsville area workforce, combined with factors conducive to ridesharing--several large employers, the lack of alternative modes--indicates that a ridesharing assistance program is warranted. It is further evident that the best compromise between program cost and program impacts would be what has been designated a Level Three program--one which actively solicits employer involvement in the encouragement of ridesharing, rather than passively responds to employer-initiated contacts.

The Level One and Level Two programs, though less costly in absolute terms, result in slight benefits and more cost on a per-trip basis. The Level Four program, although less costly on a per-trip basis, involves substantially higher program costs and its success is contingent on strong employer committment to ridesharing, a factor that can not necessarily be induced by public committment of funds. Should conditions supportive of a Level Four effort develop, it would be relatively easy to upgrade a Level Three program to meet the demand.

Program Elements

Due to the significant Martinsville area employment, and the proven superiority of employer-based ridesharing strategies, program emphasis would be

centered on a public/private partnership. The program would rely on extensive contact with the Martinsville-Henry County Chamber of Commerce and with individual employers. Ridesharing assistance to the general public would be included in the program, but would be of secondary importance.

General employer-based program elements would include:

- Ridesharing presentation to the Chamber of Commerce and other business, service, and government groups describing program operations and benefits.
- Similar presentation to top management of individual employers of 100 or more workers (approximately 50 in Martinsville and Henry County).
- Designation by each participating employer of one middle management employee to act as the ridesharing contact person.
- Circulation of flyers to all employees in regular company mailings (paychecks, interoffice newsletters, etc.) describing ridesharing and a forthcoming commuter survey.
- Survey of employees through regular company mailings to solicit interest in ridesharing and commuting information (time of day, residence location, willingness to drive).
- Matching of interested employees.
- Company sponsored "coffee break" to offer matched individuals a chance to meet with the employer contact person and each other to overcome the reluctance to pool with strangers.
- Periodic employer promotion/information.
- Follow-up program monitoring through re-survey or gate counts.

In addition, promotion to the general public would be included to encourage people to telephone match requests into the public ridesharing office. Close liason with the state and with other ridesharing programs would be established for the purposes of information sharing.

Costs and Staffing

The type of program described above would require one full-time professional with good initiative and excellent business communications skills and a part-time administrative/clerical person with computer programming knowledge. It cannot be stressed too greatly that failure to attract a competent, experienced program director will doom the ridesharing assistance effort. Annual costs of the program, described in Table 3.20, would number in the $50,000 range.

Program Funding

Funding for the ridesharing program would most likely come from a combination of state and local sources. Three state programs have the potential as funding sources for ridesharing programs. They are summarized below along with their approximate funding level for the forthcoming biennium.

- Financial Assistance for Mass Transit ($70.4 million, $67.5 million dedicated to areas with transit systems, $2.9 million available to all areas of the State) - State funding of 50% for ridesharing administrative costs, 95% of non-Federal share for any capital acquisitions.

- Public Transportation Promotion, Operations Studies and Ridesharing Support ($350,000) - State funding of 80% of ridesharing program costs.

- Experimental Public Transportation Projects ($770,000) - State funding of 95% of experimental ridesharing program costs for up to twelve months.

On a long-term basis, between 20% and 50% of program costs will be borne locally and 50% to 80% will be provided by the state. The recommended ridesharing assistance program would require between $10,000 and $25,000 in local funds. Current funding for the 80% match program would be insufficient should several existing experimental programs continue, or new programs develop, therefore, the Martinsville area should be prepared to bear 50% of program costs, unless future funding increases.

Program Implementation

The recommended ridesharing assistance program would best be placed under the auspices of the West Piedmont Planning District Commission. The cross-jurisdictional nature of ridesharing and the distribution of benefits to both commuters of one jurisdiction and employers and residents of another, necessitate a funding mechanism which obtains contributions from all affected jurisdictions. Local funding for the WPPD is obtained through such a mechanism. Program implementation within the WPPD would logically include expansion of the program to cover Danville area employers. Although coordination would involve some economies, overall program costs would most likely rise.

MARTINSVILLE CASE STUDY CONCLUSIONS

Application of the Virginia Commuter Methodology to the Martinsville area was designed to both test the reasonableness of the methodology's estimates and findings, and to evaluate appropriate travel alternatives for area commuters. In both regards, the methodology appears to have performed admirably.

Methodology

The conclusions about the methodology and its techniques arising from this case study application include:

1. The information necessary to apply the methodology is readily available from state and federal sources, surmounting data problems at the local level. Improved local data would most likely increase the accuracy of the methodology and drastically reduce the amount of time required to apply it.

2. The screening criteria were successful at eliminating infeasible modal options such as express transit and other capital intensive transit modes.

3. The modal summary tables accurately forecast ridesharing usage at the one site for which the requisite validation data exist. The modal estimates for the area appeared reasonable and produced logically consistent differences between different travel markets.

Long-Distance Commuter Alternatives

The case study application revealed that ridesharing assistance programs offer the only promising alternative to single-occupant auto commuting. Among the findings from the analysis of various ridesharing alternatives are:

1. Relatively inexpensive ridesharing programs, with the active assistance of area employers, can bring about significant mode shifts to car-pooling, vanpooling and buspooling.

2. The recommended Level Three program would increase areawide ride-sharing from approximately 30% of the workforce to nearly 35%.

3. Program costs of under $0.10 per induced ridesharing trip can be realized by the recommended program, an amount much less than most deficit per passenger figures recorded by transit modes.

4. The primary benefits gained from ridesharing will be lowered costs for area commuters and the lessening of congestion impacts at site entrances/exits and parking lots.

5. Future changes in auto related costs will help determine the relative effectiveness of ridesharing programs.

SUMMARY

The principal conclusion derived from the case study analyses is that, regardless of urban area size or characteristics, ridesharing modes (carpooling, vanpooling, and buspooling) offer virtually the only feasible modal alternatives to the single-occupant (i.e., drive alone) auto for long-distance commuters. This conclusion applies generally to work trips of more than 5 miles in length for most medium-sized urban areas and all small urban areas, and to work trips of more than 10 miles for large urban areas. Exceptions to this conclusion are limited to major commuting corridors in Northern Virginia, where the extent of suburban development and the volume of commuter traffic generated by Washington area employment are sufficient to warrant transit service (primarily, bus) for trips longer than 10 miles.

The high costs of transit service (bus or rail), coupled with the modest volumes of long-distance commuters in most corridors, render transit infeasible or a poor public investment for serving this portion of the total commuting market. In corridors where long-distance commuting volumes approach transit service warrants, the most cost-effective approach to a financially marginal proposition is to seek private sector provision of the service, or to bolster private operators who may already be running bus service in the corridors. Public transportation plays an essential role in meeting the demands of shorter commuting trips, primarily within medium-sized and large urban areas. The Northern Virginia case study has underscored this fact through its assessment of Metrorail's positive impact on commuting conditions in that area.

Fortunately for the commuters and taxpayers of Virginia, the most feasible modal alternatives (ridesharing) for long-distance commuting are also the most cost-effective in terms of low user costs and very low public investments required. More efficient use is made of the vast existing fleet of private vehicles, while public costs for expensive new buses and trains is minimized.

However, a major question associated with ridesharing in the future is whether further substantial shifts to that mode can be attained, unless drastic increases in commuting costs and congestion force commuters in that direction. Under the expected future of fairly stable gasoline prices and a continuing federal role at least in capital funding for highways and transit,

there may be insufficient incentive for significant growth in ridesharing, even under an aggressive program of public encouragement. Estimated results of attractive ridesharing programs in the case study areas range from a maximum shift to ridesharing of 12% in Martinsville to a maximum shift of 6% in Northern Virginia.

Although small as a percentage of total commuting, these modal shifts are not insignificant in their impacts in reducing vehicle-miles of travel, pollution emissions, and gasoline consumption, because they are drawing strongly from the longer work trips. Moreover, they are additions to an already strong base of ridesharing. For example, about 30% of all workers in the Martinsville area are already ridesharing.

In Northern Virginia the projected growth of suburban employment at a rate several times faster than that of the Washington central area will bring about major changes in commuter travel patterns in that area. One immediate implication is that scattered suburban employment sites will be difficult to serve with conventional transit, and local congestion around these sites is likely to grow. Ridesharing programs focused upon major employers may be a critical element in future transportation planning for such areas.

In summary, while the absolute shift in modal share of commuter travel to ridesharing may be modest even under an active promotional program, the state should pursue a strong ridesharing program because (1) it is very cost-effective as a mode of travel in terms of public costs per ridesharer served or vehicle removed from the road, (2) the beneficial, incremental impacts are important, and on top of an already significant ridesharing base, replacement of major factor in holding down congestion, pollution emissions, and energy consumption, and (3) it is the only feasible modal alternative for most long-distance commuters.