CHARACTERISTICS OF NEW TOWN TRAVEL REVISITED: AN UPDATE OF
THE MORGAN-DICKEY STUDY OF RESTON, VIRGINIA

by

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In 1974, Kent R. Morgan and John W. Dickey published an in-depth study of the travel
characteristics of new town development ("The Characteristics of New Town Travel: A
Case Study of Reston, Virginia"). Using Reston as a case study (and Vienna, Virginia, as
a "control" post WWII suburb), the objective of the Morgan-Dickey research was "to
determine if the transportation element of this satellite new community has, in fact, altered
the travel patterns of its residents relative to the patterns exhibited in a more traditional
suburban development." The intent of the present analysis is to determine if Reston has
achieved the travel patterns anticipated by Morgan-Dickey, as well as by several
proponents of new town development. A review of the literature and analysis of recent
travel data suggests that while Reston has exhibited significantly lower automobile
availability rates than Vienna, other measures of travel behavior ---- e.g. "internal" trips
and trip generation rates --- are less conclusive, with Reston exhibiting only slightly more
favorable (in terms of reduced travel) patterns than Vienna. In fact, the data indicates that
Reston residents are less likely to carpool, take transit, bicycle, or walk to work than
Vienna workers. The research suggests that Reston may not be the most appropriate
model for evaluating new towns in general. The research further suggests that
development external to Reston likely has a significant impact on the travel behavior of its
residents.
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Introduction

At least as far back as ancient Egypt, Greece, and Rome, civilizations have looked to the development of "new towns" as a means of providing for strategic government and defense, supporting various religious objectives, and fostering economic competitiveness. Since the publication of Ebenezer Howard's seminal "Garden Cities of To-morrow" in 1902, new towns have promised residents the ideal marriage of town and country living. Mid-20th century urban planners further believed that the development of new towns might help reduce congestion and economic stagnation in central cities, while at the same time contribute to the management of the otherwise chaotic growth occurring in the suburbs. As Kent R. Morgan and John W. Dickey contend in the introduction to "The Characteristics of New Town Travel: A Case Study of Reston, Virginia", proponents of the new town concept propose that the construction of new, systematically planned communities will focus growth away from large urban centers by providing an attractive alternative to traditional suburban development, thus eliminating urban sprawl. Fundamentally, new towns will help address the question of how and where anticipated growth shall and should occur.

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Another important premise of the new town concept is that through the comprehensive planning of suburban communities, better relationships can be attained among several of the variables which influence the demand for travel. Indeed, Morgan and Dickey believed that new communities might become "prime testing areas for transportation planners to prove the effectiveness of techniques on altering travel behavior." Yet while several researchers studied the travel characteristics of residents of new towns in the late 60's and early to mid 1970s (Lansing et al in 1970, Morgan and Dickey in 1974, Zehner in 1977, etc.), very little evaluative work has been done since. This is unfortunate for at least three reasons:

- First, the seminal work done on new town travel behavior in the United States occurred long before most of these developments had fully matured. Indeed, Morgan and Dickey acknowledge that their conclusions should only be attributed to "this type of new community at a particular stage in its development," while Raymond J. Burby and Shirley F. Weiss, in their landmark 1977 publication on American new towns, claimed that such development was still in its infancy and that further research was necessary to see if new towns have lived up to their potential.

- Secondly, several unforeseen trends -- both specific to new towns (e.g., the financial hardships encountered by developer Robert Simon in Reston) and to American society in general (e.g., the dramatic increase of women in the work force

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5 Morgan and Dickey, ibid.
in the 1970s and '80s, the real estate boom of the 1980s and the rapid suburbanization associated with it, and the decreasing cost, in real dollars, of gasoline and the improving fuel efficiency of automobiles) --- have certainly had some impact on the travel behavior of residents of these planned communities. In fact, factors external to a given new town development may have the most significant impact on internal travel characteristics. The failure of Washington metropolitan area governments to contain growth within the "wedges and corridors" called for in the region's 1960 transportation plan, for example, has resulted in a dispersed and highly inefficient pattern of residential, commercial, and industrial development.

Absent of any regional commitment to coordinated growth, the community-oriented commercial establishments of new towns have found it difficult to compete with regional shopping malls; similarly, white collar employment opportunities have not been confined to high density urban districts or suburban activity centers but have been scattered throughout the region in low density office parks, almost always with free parking. The result, typically, is more and longer trips, primarily by automobile, both for the residents of the region and of the new town.

* Thirdly, given the emergence within the last ten years of "new urbanism" --- a development concept which shares many of the goals and objectives advanced by proponents of 1960's new towns --- the physical evolution of communities like Reston (and in particular Reston "villages" such as Lake Anne and Hunters Woods)
may provide some insight into the future of neo-traditional town development.

Once again, it is important that we understand and appreciate the dynamics between local subdivision development and its place in and impact upon regional goals for mobility, access, and community development.

These considerations justify a re-examination of the travel characteristics of new town residents. In the 22 years since Morgan and Dickey published "The Characteristics of New Town Travel", Reston, Virginia --- the model new town used for the analysis --- has "matured" into a mixed use community of over 52,000 residents, hundreds of community-oriented commercial sites, and an 85 acre regional shopping and office development which consists of nearly one million square feet of leasable retail and office space. But has this increase in retail and employment opportunities within Reston ultimately resulted in reduced travel for Reston residents? Does travel by public transportation and other non-automobile modes continue to be higher in Reston than in more traditional post World War II suburbs, as Morgan and Dickey found? In short, has Reston, in particular --- and new towns, in general --- succeeded in providing a compact, mixed use, and self-sufficient suburban environment which minimizes the demand for automobile travel?

The present research attempts to answer these very questions. Part I of the thesis provides a brief introduction to "new town" development, from Howard's 20th century concept for the development of "Garden Cities of To-morrow", to the early American efforts at Radburn and elsewhere in the '20s, '30s, and '40s, and, finally, the 1960's model
new community movement to which Reston belongs. In addition to providing an historical perspective, the purpose of Part I is to identify some basic criteria with which to distinguish new towns from more conventional types of suburban development.

Part II of the thesis focuses on new town objectives and strategies for meeting the mobility and accessibility needs of residents. Part II further summarizes the transportation planning considerations for new towns as noted by Morgan, Dickey, and others,\(^7\) and acknowledges where these planning inputs have failed to take hold at the implementation level.

Developer Robert Simon's original plan for Reston called for the creation of not only a new town, "but a new way of living."\(^8\) Part III of the research outlines the planning, development, and growth of Reston, discusses some of the original expectations for Reston, and summarizes the early difficulties encountered by Simon and subsequent developers in implementing the community's ambitious plan. Ultimately, Part III begins to establish a baseline on which to measure the "success" or "failure" of Reston (and by extension, the new town movement) in achieving desired travel patterns.

Part IV of the present research resummarizes the methodology and results of Morgan and Dickey's 1974 comparison between the travel behavior of residents of Reston and traditional post World War II suburb Vienna, Virginia, and presents the results of parallel and subsequent research on Reston and other new towns. Using US Census data and data generated from the Washington Council of Government's (COG) 1994 regional

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\(^7\) See, for example, Abend, Norman (1969) and Zehner, Robert B (1977).

\(^8\) Reston Prospectus. (1962).
origin and destination survey, and following Morgan and Dickey's general research methodology, Part IV also presents an updated analysis and evaluation of the travel behavior of residents of Reston and Vienna. The intent of this analysis is to determine if any significant changes in travel patterns have occurred in Reston (and Vienna) in the last quarter century, and, perhaps more to the point, if current travel behavior generally meets the goals and objectives of the original Reston plan.

Part V concludes the thesis with a summary of major findings and suggests other research opportunities on both new town travel characteristics in general, and the Reston development in particular.
Part I

The New Town Concept

The Ebenezer Howard New Town Ideal

While some authors have made the case that the concept of new towns is nearly as old as urban civilization itself, the modern notion of new town development in both the United States and Europe is generally traced to Ebenezer Howard's vision for self-sufficient satellite communities of residential, commercial, and industrial land uses, surrounded on all sides by a rural "greenbelt," and connected to larger urban areas by high speed, high capacity surface transportation corridors. Published in 1902, Howard's "Garden Cities of To-morrow" laid out the need for and principles of planning for new towns. According to Howard, neither the city (with its attendant overcrowding, crime, and environmental degradation) nor the country (which lacked economic and cultural opportunities) offered humans the quality of life they demanded. Instead, the development of new "garden cities" would provide residents with access to both nature and entrepreneurial opportunity --- an ideal living environment from which, Howard reasoned, "will spring a new hope, a new life, a new civilization."\(^{10}\)

Specifically, Howard envisioned 1,000 - 4,000 acre, 30,000 -50,000 person new towns "to be planned as a whole, and not left to grow up in a chaotic manner."\(^{11}\) Each

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\(^9\) See, for example, Golany, Gideon (1976), and Campbell, Carlos, (1976).

\(^{10}\) Howard, ibid. Page 48.

\(^{11}\) Howard, ibid. Page 23.
new town would be located in the center of an agricultural greenbelt at least five times the size of the town. As Alexander Garvin notes,

this was no dormitory suburb. Manufacturing firms located right in town would provide residents with employment. Farms located in the greenbelt would supply all of the agricultural products needed by residents.  

In addition to being "self-contained," Howard's garden cities were quite different than the type of up-scale, suburban development gaining popularity in Europe and the United States. New towns were to provide housing and work for a wide range of income groups, not just the middle and upper classes. Distances between home, work, and shopping were to be short, and most trips would be made by walking or public transportation. Perhaps most importantly (as well as most differently from subsequent American new town efforts), the development of new towns would be supported with public financing as part of a national policy of urban decentralization and rural preservation.

As opposed to most earlier attempts at new town development --- for example, industrial revolution-era "company towns," or the vacation refuge new towns of the early 20th century --- Howard was the first to conceive of new towns as a comprehensive, unified concept. Furthermore, Howard, perhaps more convincingly than anyone before him, attached the promise of true social reform to the planning and development of his

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New Town Developments

Howard first applied his garden city principles in 1903 to the development of Letchworth, 35 miles north of London. This mostly private undertaking proved extremely costly, and neither Letchworth nor Howard's second new town, Welwyn, is regarded as successfully demonstrating any superiority over conventionally-built suburban development. However, the new town concept found growing favor in Great Britain, and in 1946 Parliament passed a New Towns Act which provided the public support needed to maintain an ambitious and comprehensive program of new town construction.

The United States government has not embraced the new town ideal to anywhere near the level found in Britain and Europe; consequently, American new town developments have suffered from the realities of a real estate market that favors homebuilders over community builders. The development of the United States' first modern (Howard-inspired) new towns --- Radburn in the late 1920's, and Greenbelt, Maryland, Greendale, Wisconsin, and Greenhills, Ohio, in the late 1930s --- was interrupted by two extraordinary events: Radburn by the Great Depression, the others by the oncoming second World War. Consequently, while each achieved some tenets of new town idealism (Radburn, for example, was widely cited for its diverse mix of housing types and a grade-separated pedestrian path system), they were largely unable to attract or support the employment and retail sectors which Howard saw as necessary for economic self-sufficiency.

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13 Garvin, ibid. Page 320
Most suburban development following World War II focused on the rapid construction of moderately priced housing in small residential subdivisions. It wasn't until the early 1960s that the American new town movement began to once again reflect some of Howard's ambitious ideals. There are several reasons for this. First, new sources of capital provided developers with the backing they needed to sustain the development process over the several years necessary for the construction of new towns. Several large corporations --- mostly banks and insurance and oil companies --- sought to diversify their holdings with investments in large-scale real estate projects. Second, an emerging social consciousness of --- and subsequent national objectives for --- racial integration and the provision of low- and moderate-income housing, and the fostering of communal values, was slowly entering the real estate development field. For example, Federal housing programs provided developers with some incentive to build low-income housing in the suburbs. Moreover, a growing appreciation --- and, thus, marketability --- of the importance of the "community" unit encouraged homebuilders to provide neighborhood amenities and services to their developments.

Lastly, as Burby and Weiss contend, the mass suburbanization which followed World War II had by 1960 triggered a "suburban critique."\(^\text{14}\) This criticism was directed at several attendant results of 1950s suburban development, including a) the marginalization of design, architecture, and site planning in the development process; b) the disregard for the environmental consequences of rapid, unplanned growth; c) the inefficiencies created

by incremental suburban development and the tremendous costs involved in providing necessary public services; and d) the difficulty in achieving a sense of community where shared space and neighborhood amenities are limited, land uses are segregated, and more time is spent in private automobiles than in the public sphere.

Howard's new town principles were thus viewed as a potential rebuttal to the criticism levied at American suburbs. New town developments like Reston, Virginia, and Columbia, Maryland, were consequently viewed by many as social experiments which might provide a new model of suburban living. As Campbell suggests,

For many of its residents, new town living represents an escape from what some may call the 'rat race' --- the back-and-forth pattern that millions of people find themselves being subjected to who live in the suburbs and work in the central city. For others, it represents a bold and seemingly pioneering step toward a new way of life . . . . for others still, a new town can be a chance to get away from the rigid pressures of small town living without being subjected to the anonymity and stress that can be part of central city living . . . . in addition . . . . new towns through community associations provide citizens with an opportunity to affect decisionmaking related to the development process.15

A major objective of such new town developments was to reverse the increasing inefficiencies of suburban transportation systems. Rather than contribute to the segregation of land uses and automobile-orientation of most post-World War II suburbs, developers of 1960's new towns sought to reduce both trip length and the need to travel by private automobile. As Zehner notes,

the provision of a broad array of facilities and services clustered at convenient sites within the community is expected to reduce the number and the distance of

automobile trips made by residents on a day-to-day basis. The presence of a sizable employment base is expected to encourage an above average proportion of those in the labor force to live and work in their own community, leading to a significant savings in commutation travel and time. In addition, the availability of a viable public transportation network and an extensive pathways system within these communities would be expected to further limit the need for automobile travel.\textsuperscript{15}

The transportation objectives of new towns, and the strategies associated with these objectives, are discussed in the following section.

Part II

Transportation in New Towns

It has been widely argued that the development of "new towns" (with the attendant characteristics summarized earlier) provides the transportation planner with the ideal environment for significantly altering travel behavior. That this behavior needs modification is a central premise of the suburban critique described in the previous section. As Burby and Weiss note

One of the most pervasive criticisms of less planned suburban development since World War II has been that it fosters major inefficiencies in travel. Frequently used community facilities are often inconvenient to residents and to each other, and suburban residents living toward the urban fringe face longer automobile commutation trips over congested roads, usually without public transportation alternatives. The appeal of a balanced new community lies in part in its approach to these problems of metropolitan travel.\(^{17}\)

This approach encompasses several complementary and interdependent strategies --- both internal and external to the new town --- aimed at reducing residents' dependence on the automobile for many basic trips. Specific to the development, the establishment of --- and adherence to --- a comprehensive master plan provides the transportation planner with an ideal context for planning an efficient transportation system because future residential populations and land uses are relatively well defined. Furthermore, the provision of a rational mix of land uses within this plan --- including employment, shopping, and community facilities --- is intended to minimize distances between

household origins and activity destinations. Distances can be reduced even further when
development is planned for and occurs at built densities which are higher than those found
in typical post-World War II suburbs. Additionally, the provision of convenient,
high-quality alternative modes of transportation --- for example, public transit, bicycle
trails, and pedestrian paths --- is expected to divert a significant portion of trips from the
automobile on to these other facilities.

Presumably, the demographic makeup of the Howard-inspired new town minimizes
aggregate community automobile usage (in comparison, at least, with traditional suburban
development) by default, as lower income residents --- many without access to an
automobile --- will tend to make fewer vehicle trips than middle and upper income
populations.

Finally, the development of new towns approximate to regional high-speed,
high-capacity transportation corridors, and the adoption by jurisdictions in the surrounding
region of growth strategies which target development into moderate density, mixed use
(and, ideally, mixed income) activity centers along these corridors --- while at the same
time limiting low density sprawl development patterns --- will also reduce aggregate
vehicle miles traveled (both for the residents of the new town and the region at large).

**Community Master Plan**

In sharp contrast with traditional suburban development, where planning often
follows initial settlement patterns and where there is little consideration of the functional
relationship between adjacent and approximate uses of land, the new town development is intended to follow a long-term blueprint of orderly and efficient growth. According to Burby and Weiss, "many of the benefits attributed to new communities are viewed as products of planning and the orderly staged development of the new community site. Therefore a master plan is an essential component of the new community concept." This plan will reflect several considerations, including land use, density, and the provision of alternative modes of transportation and low income housing and employment. These specific elements are discussed beginning on page 18. More holistically, the master plan provides a framework within which the planning and provision of community facilities and services (including, for example, public roadways, mass transit, and bicycle and pedestrian paths) can be integrated with --- and related to --- associated development.

New towns provide the opportunity to achieve great efficiencies in the delivery of public and social services. Robinson suggests that an advantage of the new town is that it provides a tabula rasa for the building of a community that from the outset may be made attractive in appearance, equitable in its distribution of the community's benefits, and efficient in operation. The new town can be viewed as an alternative urban environment in which intractable problems do not build up because they are anticipated by efficient planning on a manageable scale.

Similarly, Dames and Grecco contend that "physical features of a new town are planned so as to serve the population, without hindering it. A well designed traffic system

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18 Burby and Weiss, ibid. Page 42.
might be an example of this. Land uses are balanced to provide orderly expression. Buildings are sited to mix maximum harmony with the surroundings."  

Such planning also implies confidence in the long term stability of the community, in terms of both quality of life and investment potential.  

In terms of transportation, Abend argues that

one major advantage in transportation planning for new communities is that the pattern of future land use --- which is the basis for projecting travel demand --- is relatively [certain] . . . . [as is] the relevant characteristics of the community population. Thus, internally generated traffic can be forecast with some precision.  

Consequently, the appropriate type, size (e.g. capacity), and amount of transportation infrastructure and/or services can be planned and provided. Congestion should not occur within the ideal new town, because the community is provided with the (ideal) capacity to accommodate the travel required by new town residents.  

Moreover, because the transportation planner (ideally) has an accurate understanding of the future demographics of the community (including income, automobile ownership rates, etc.), mobility for all can be ensured with the provision of appropriate alternative modes of transportation. Bus routes can be planned simultaneous to development, rather than

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23 Of course, this ignores the phenomenon of induced demand for travel.
afterwards. In sum, great efficiencies --- both economic and social --- may be achieved through integration of transportation and land use planning.

Finally, a multimodal master plan can actively influence the travel behavior of the community's residents. As will be described shortly, high density, mixed use development encourages more walking trips, because destinations are more accessible by foot than in other types of urban environments. Fewer automobile trips may be also be realized through the provision of complimentary disincentives to driving --- for example, by limiting parking in the community. Consequently, a master plan is better able to guide and/or control more of the variables associated with the demand for travel, and is thus once again more likely to result in a more efficient transportation system.

Of course, while the master plan is intended to withstand any changes in control or ownership of the development, the reality is that new town plans have seldom (if ever) been adequately followed; the upfront costs and other financial pressures associated with such large developments have very nearly always resulted in at least some compromises (as is the case of Reston; an arguable exception is Columbia, MD). Furthermore, even assuming a scenario of development which is 100% consistent with a community master plan, the inability to control development on a regional level may impact the efficiency of the internal transportation system, not to mention the economic vitality of the new town. For example, competing commercial and office growth in areas surrounding the new town might induce new town residents to take more and/or longer trips outside of their communities, straining regional access points and underutilizing transportation systems.
and facilities (bicycle and pedestrian paths, internal bus systems) intended to serve localized travel. Conversely, too little retail and employment opportunity in the surrounding region might require non-residents to increase their travel to the community, thus putting stress on existing transportation facilities.

**Mixed Land Use**

As described in the previous chapter, the diversity of land uses provided for in the "ideal" new town environment is generally seen as a defining characteristic of such communities. By providing jobs and discretionary trip-destinations (shopping, recreation, etc.) within the community, developers of the ideal new town concept hope to minimize for their residents the long commutes --- and high commuting costs --- associated with post-World War II suburban developments.

Arguably, the rational balancing of jobs, retail, and residential units is primarily intended to meet economic development objectives, a consequence of which is reduced travel. According to Abend, "factors relating to new town designation include the presence of a substantial, planned, local economic base as compared to the traditional suburban dormitory where residents commute to industry or commerce in other communities." Golany concurs that "a new town with a high degree of self containment and a sound economic base will have many job opportunities, which make commuting outside minimal." 

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New town "self-containment" is not only desirable but in some cases may be necessary. Because the very nature of new town development requires often thousands of acres, the only available open land for such an undertaking may be well beyond tolerable commuting distances to the central business district of a metropolitan area. For example, Dames and Grecco noted that in 1968, 22% of American new towns were at least 20 miles from urban centers. In fact, without the full range of employment, shopping, and recreational opportunities envisioned by Howard et al, Alonso has predicted that new town developments are likely to increase, rather than reduce, commuting distances.

But achieving a balance between residential development, employment opportunities, and community facilities pays other dividends as well. According to Robinson, "the major benefit of the integrated [i.e. "balanced"] new town development is that it can offer benefits in other features of the town. One of the main functions of the industrial park is to earn income that can be used to subsidize residences." Indeed, Zehner concludes that "the main consequence of having a significant employment base with a numeric balance of jobs and employable residents is often that the commercial and industrial development will provide a large enough tax base to finance facilities and services in the community as it develops." Finally, improved access to community facilities and shopping areas is expected to result in higher rates of use and enjoyment.

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29 Robinson, ibid. Page 75.
and, through the interaction of residents at such facilities, may strengthen community cohesiveness and identification.

While self-containment and control over land uses provide several benefits, in reality they have been very difficult to achieve, especially in the United States. Once again, the magnitude of financing required to build a new town has forced most developers to abandon long term goals and succumb to market pressures, which has generally meant the construction of traditional residential subdivisions. The front end costs in providing public facilities and services before property values have generated any significant revenues or economic activity has also dissuaded local governments from supporting large planned developments. Similarly, competition among jurisdictions for attracting tax-generating businesses has generally undercut regionwide efforts to direct growth into mixed use suburban activity centers (see page 26 for more on regional planning).

Burby and Weiss have summed up the developer's and local planner's problem of providing for mixed land uses most succinctly when they comment that new communities have been caught between the financial risk involved in premature shopping center development and the risk of losing opportunities to competing centers outside of the community if shopping centers are delayed too long. As a whole, new communities were doing little better than conventional communities in providing shopping and commercial services.31

Density

Along with mixed land uses, moderate to high density development can have a significant impact on travel behavior. In addition to reducing distances between residential and other areas, compact development also typically requires less investment in costly transportation infrastructure. The Real Estate Research Corporation's seminal research on the "Cost of Sprawl" (as cited by Golany, 1976) found that a high density "planned" development of apartments and townhouses required 55% less investment in roads and utilities than a low density "sprawl" development of single-family residences. The study further indicated that air pollution emissions from home energy consumption and transportation were reduced by 45% in the high density development, and that residents living in higher density environments may consume up to 44% less in electricity and gasoline than residents living in lower density developments.\(^\text{32}\)

Higher built densities also provide a better market for public transportation and other modes of non-automobile transportation than does low density, sprawl development. Compact residential development further conserves open space for public use, or for future development of community facilities and amenities. Golany and Morgan and Dickey have argued that cluster development, in particular, delivers several benefits to both the developer and resident. First, higher densities can be achieved at lower costs per unit. Secondly, the costs of constructing and maintaining infrastructure, utilities, and streets are lower than in the conventional curvilinear subdivision. For example, studies

\(^{32}\) Golany, ibid. Page 66.
have demonstrated that at least in small developments, clustering permits a savings in local access streets of up to 70 percent. Finally, the clustering of single, detached, and attached housing around cul-de-sacs restricts traffic to residents, their friends, and service vehicles, and, by reclaiming the street from automobiles, may lead to greater social interaction among residents.  

Howard and other proponents of the garden city concept for new town development suggested an ideal gross density of 13 persons per acre, significantly higher than the 3-4 persons per acre density found in traditional post-World War II suburbs. However, while English new towns have achieved gross densities near 15 persons per acre and Tapiola, Finland, registered 25 persons per acre in 1976, Abend predicted that the density of American new towns would not exceed 4.5 persons per acre.

**Alternative Transportation Modes and Facilities**

The provision of an internal network of public transportation and bicycle/pedestrian facilities is another major element of the new town ideal. Such alternatives to travel by automobile offer the potential for improved community safety, reduced air and noise pollution, lower parking requirements, and enhanced mobility for residents without access to private vehicles.

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33 Golany, ibid. Page 228; Morgan and Dickey, ibid. Page 11
34 Campbell, ibid. Page 80.
35 Abend, ibid. Page 252.
Exactly what degree --- and type(s) --- of alternative transportation is provided is based to a large extent on the factors described above (and below). For example, the success of non-automobile modes of travel --- in new towns, as elsewhere --- is dependent largely upon the density and development of the built environment. In general, public transportation requires higher development densities than those found in typical World War II suburbs; Abend suggests a rule of thumb of 12 persons per acre.\(^{36}\) Higher public transportation use might also be achieved where transit is given preferential treatment over automobiles. Examples of this might be limiting parking at --- or private vehicle access to --- certain community amenities, or providing high-occupancy vehicle (HOV) systems and facilities.

Of course, another strategy for increasing the use of public transportation is the provision of high quality, convenient service. This could mean frequent fixed route systems, but for smaller service areas should include paratransit, jitney, and other non-traditional services. In any form, public transportation is costly and typically requires heavy operating subsidies, either from local government or the community's developer; residents ultimately pay for these services through taxes (when provided by government) or higher housing costs or community association fees (if provided by the developer). Perhaps not surprisingly, internal transit services in new towns, to date, have not provided a high level of service. Zehner found in 1977 virtually no use of public transportation for shopping trips in the 13 American new towns he studied.\(^{37}\)

\(^{36}\) Abend, ibid. Page 252.
\(^{37}\) Zehner, ibid. Page 92.
Morgan and Dickey note that another "typical requirement for most new town transportation systems is the provision of pedestrian and bicycle pathways." In new towns which favor cluster development, where residential streets lacking through-put are laid out like branches extending from local streets, pedestrian paths between and behind residential areas are especially critical in that they provide convenient non-motorized linkages with the rest of the community.

In fact, pedestrian path systems achieve multiple goals for the new town. Golany suggests that

in a new town, planning pedestrian circulation has social implications. An overall systematically and efficiently designed pattern may offer social advantages that are not possible in vehicle systems. Since people will be walking they may meet casually, and such meetings may support interaction among different social, ethnic, racial, and age groups. The safety of pedestrian systems encourage people to come outside . . . . moreover, a pedestrian system may enable residents to be familiar with various geographic sections of their urban centers and its environs. This situation will support the development of individual identification with the community, of relaxation and of physical health.  

**Income Diversity**

As noted previously, accommodating a wide range of income groups is a major social objective of the new town ideal. Interestingly, providing for a range of housing types may also contribute to the self-sufficiency of new town developments. In addition to luring the professional office buildings and industrial parks coveted by most suburban jurisdictions, the new town also requires workers to fill lower paying service and blue

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30 Morgan and Dickey, ibid.
39 Golany, ibid. Page 158
collar jobs. Golany suggests that "it is essential to establish careful coordination in a self-contained community between the types of local job opportunities and the types of housing, to prevent residents from commuting because of a lack of suitable housing that workers can afford or because of a lack of appropriate jobs." Zehner warns that if housing and employment opportunities are not inter-related, travel may actually increase because residents cannot find appropriate jobs within the community and must go elsewhere, and non-residents will commute to the new town to fill the jobs that it residents cannot. This ultimately puts a stress on the community's transportation facilities if the goal of the new town (per its master plan) is to strive for self-containment.

As a matter of course, lower income households tend to own fewer automobiles and drive less than middle and high income populations. The 1990 National Personal Transportation Survey (NPTS) indicates that households earning $10,000 per year own an average of 1.0 automobiles, while households earning over $40,000 annually own 2.3 vehicles. Similarly, the estimated annual miles driven per licensed driver by household income for households earning less than $10,000 is 9,053 miles, while the comparable figure for households earning at least $40,000 is 14,666 miles.

While these data do not indicate an effect of any characteristics of new town developments, they do point to the special requirements of low income residents who might live in new towns; that is, a truly income-integrated community may require a higher

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40 Golany, ibid. Page 172.
41 Zehner, ibid.
level of public transportation service to meet basic mobility needs than those found in more traditional, homogeneous suburbs. As Salley notes

Are private automobiles alone adequate to meet the social, environmental, access, and economic requirements of new towns? The answer is no. The new city will be composed of a diverse population in terms of age, occupation, race and income. The middle-income, middle-aged group will find the automobile an excellent form of transportation to satisfy its access needs, but those too young, too old, or too poor to operate or own a car will need to rely upon public transit if they are to participate fully in the life of the community. 31

**Regional Access and Planning**

While the considerations above generally have the most significant impact on a new town's *internal* travel characteristics, several factors (e.g., the extent to which employment and retail is provided within the community, or the degree of balance between housing and job *type*) will require linkages to the regional transportation system. Morgan and Dickey acknowledge that the achievement of transportation objectives in new towns is dependent on the extent and nature of development occurring external to the community.

The planner must be aware of access needs to potential future development surrounding the new town and provide for it in such a fashion (that) it does not become disruptive or obsolete. In short, the new town plan and its transportation element must represent a successful adjustment to existing and future development in its environs. 44

Regional access is critical, particularly in a development's infancy, where there is not yet enough employment or other economic activity to support the residential

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44 Morgan and Dickey, ibid, Page 9.
population. In fact, Burby and Weiss note that "the development of a number of new communities became financially feasible undertakings [only] when the extension of limited access highways made the development site accessible to large metropolitan areas."45

More generally, Howard refused to divorce his garden city concept from its regional requirements; that is, economies of scale dictate that new towns will always be dependent on larger metropolitan areas for certain services, and that the best defense against encroachment upon rural areas is the development of a regional network of "town clusters."46

Theoretically, then, external access for new towns has been related primarily to a region's urban core, or, in the case of the garden city model, between high density, mixed use new towns. The reality of growth patterns in the United States since 1950, however, is that the suburbs are gaining a larger and larger share of employment opportunities, while central cities continue to experience a relative decline in jobs. Of the 19 million jobs created in the 1980s, for example, 70 percent were located in the suburbs; from 1980 to 1990, suburb-to-suburb commuting absorbed more than 58 percent of all commuting growth, whereas the traditional suburb-to-central city commute's share of growth for the decade decreased to only 20 percent.47

In addition to the proliferation of employment, the expansion of new commercial outlets --- characterized by high-volume, "big box" discount retailers --- in the suburbs

45 Burby and Weiss, ibid. Page 322.
46 Howard, ibid. Page 36.
(and beyond) has had a great effect on American's travel patterns. The attraction of such development to the exurban fringe is obvious: the availability of large tracts of inexpensive land provides not only ample parking for customers but allows retailers to keep large product inventories on site, thus permitting bulk purchasing of goods which can be passed on to the consumer in the form of deeply discounted prices. The downside of this type of economic activity is that smaller commercial establishments which cater to more localized markets cannot compete with the low prices offered by the regional retailers.

Consequently, several of the benefits prevalent in the ideal new town --- greenbelt preservation, self-sufficiency through the provision of employment, shopping, and amenities, and community identification --- are reduced when development pressures encourage the utilization of adjacent open land for low density commercial uses which typically require the use of private automobiles for access. Only local government can manage this type of pressure. And, absent of any regional authority to mitigate the self interest of individual jurisdictions, these governments have largely been unwilling to significantly restrict such tax revenue-generating enterprises.
Part III

Transportation in Reston

Considered by many to be among the best applications of Ebenezer Howard's garden city principles to suburban development practice in the United States, Reston, Virginia, is also an excellent example of the difficulty of achieving the new town ideal. The following provides a brief history of and background on the Reston development and summarizes its level of attainment of the six automobile mitigation "strategies" described in the previous section.

The Reston Master Plan

Reston was conceived of and developed by Robert E. Simon, a New York builder who envisioned by 1980 a diverse new town for 70,000 - 80,000 residents, complete with a wide range of employment opportunities and recreational and social amenities. Like Ebenezer Howard, Simon wanted to develop a carefully planned suburban environment which combined the benefits of both town and county living. The Reston plan called for the development of seven residential villages of 10,000 - 12,000 residents, each with accessory shopping, schools, and recreation facilities. Simon also planned for 1,300 acres of light industrial and research uses and a regional "town center" with retail, office, and some residential units.
The original concept for Reston was certainly a product of its times. First, a generally strong economy generated the new sources of capital financing needed for such a large scale venture, and Simon was able to secure backing from several corporate lenders, including Gulf Oil and the John Hancock Mutual Life Insurance Company. These investors recognized the potential of realizing cost savings through the coordinated planning and provision of residential subdivisions with public facilities and amenities. Second, the burgeoning American civil rights movement influenced the thinking of developers like Simon and Columbia, Maryland, developer James Rouse, who saw new towns as a means of integrating different ethnic and income groups into a singular community. Third, the emerging suburban critique was generating new ideas for residential development, and several local governments began to embrace and adopt more flexible and innovative suburban zoning ordinances to accommodate these concepts. Finally, the National Capital Year 2900 Plan, completed in 1961, suggested the development of new towns throughout the metropolitan area as a means of managing anticipated suburban growth.

The development of a master plan for Reston began in 1961, shortly after Simon purchased approximately 6800 acres of farmland in northwest Fairfax County, Virginia, 18 miles to the north and west of downtown Washington DC. Simon, whose father was involved in the development of Radburn nearly 30 years earlier, modeled his plan on the

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48 Burby and Weiss. ibid. Page 52.
British garden cities of Letchworth and Harlow, as well as the Finnish new town of Tapiola. The plan was further driven by seven goals that Simon had established for the Reston new town:

1. That the widest choice of opportunities be made available for the full use of leisure time. This means that the New Town should provide a wide range of recreational and cultural facilities, as well as an environment for privacy.

2. That it be possible for anyone to remain in a single neighborhood throughout his life, uprooting being neither inevitable nor always desirable. By providing the fullest range of housing styles and prices --- from high rise efficiencies to six-bedroom townhouses and detached houses --- housing needs can be met at a variety of income levels and at different stages of family life. This kind of mixture permits residents to remain rooted in the community --- if they so choose --- as their particular housing needs change. As a by-product, this also results in the heterogeneity that spells a lively and varied community.

3. That the importance and dignity of each individual be the focal point for all planning, taking precedence over large-scale concepts.

4. That people be able to live and work in the same community.

5. That commercial, cultural, and recreational facilities be made available to the residents from the outset of the development --- not years later.

6. That beauty --- structural and natural --- is a necessity of the good life and should be fostered.

7. That Reston be a financial success.

Despite strong financial backing, the massive front end costs associated with a development of its size outpaced its revenues, and Simon was forced to give up control of Reston in 1967 to Gulf Oil. Reston was later divided among several conventional home...
builders, and the commitment to Simon's moderate density, mixed use village concept was abandoned.

The construction in the early 1990s of Reston Town Center was in keeping with Simon's original plan for an 85 acre urban core of major retail and high density office buildings within a 460 acre "town center district." But the development includes neither housing nor adequate pedestrian access to the adjacent Reston villages. At the same time, low density, automobile-oriented retail development has been built to the north of the town center, contributing to traffic congestion on surrounding roads and denying the full range of activities and buildings Simon had envisioned for the area.52

By 1990, Reston's population of 49,000 was only 65 percent of the population planned for in 1980. Aside from a) the urban core of the town center. b) the first (and most conceptually realized) village center at Lake Anne; c) the Reston pedestrian trail network; and d) a series of extremely restrictive community covenants, there appears to be very little which sets Reston apart physically from surrounding suburban development in Fairfax County. Furthermore, the Reston new town model has not been imitated anywhere since. As Grubsich sums up

Reston was last generally seen in the news in the late 1960s when Simon, having exhausted his credit before his audacious and expensive experiment could turn the financial corner, was ousted, and Reston receded from the headlines with a reputation as a well-intentioned failure.53

Land Use and Accessibility in Reston

While Reston may not have succeeded financially, to what degree did it succeed in meeting land use and transportation objectives? There is a diversity of opinion in the literature regarding Simon's land use goals for Reston. William Whyte claimed in 1964 that the relocation of government offices in Reston would one day turn the development into its own self-contained city. Others have argued that Reston, like all American new towns, will always be dependent on the central business district to provide employment opportunities.

In fact, while one of Simon's seven goals for the development was to make it possible that people be able to live and work in the same community, he never intended for Reston to be "self-sufficient." Simon's original plans for Reston assumed access to the Federal Aviation Administration-owned Dulles Airport Access Highway which cut through the development and which Simon believed would provide residents with an easy commute into employment sites in the region's urban core. Simon also sought to preserve the right-of-way of the abandoned Washington and Old Dominion Railroad corridor for rapid rail transit to Washington DC. Simon's inability to secure either access to the highway or the rail right-of-way contributed to the slower than projected sale of property, and was a major factor in his departure from the development (Reston later gained bus-only access to the Dulles facility in 1973, and a general purpose toll road was

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completed in the Dulles corridor in 1983; see page 38 for a profile of Reston's access to the rest of the region).

While the development's chief project engineer estimated that 60% of Reston residents would eventually work in the community, Simon himself predicted that only 30% of the population would work in Reston. Simon's residential village concept, on the other hand, was intended to provide an optimal market for community-oriented shops, services, and amenities. By locating a 15,000 - 25,000 square foot grocery store with up to 75,000 square feet of other commercial uses (along with public facilities such as community centers, day-care facilities, and places of recreation) in the center of each of seven moderate density villages, Simon believed that the everyday consumption and social needs of residents could be met within a short walking, bicycling, or, in the case of Lake Anne Village, boating trip. Such development would ultimately reduce the overall number of discretionary automobile trips per household, decrease automobile emissions and noise pollution, increase public safety, and help foster a strong community spirit.

In 1997, only three of the seven villages is served by its own grocery store. At Lake Anne --- the most fully realized of the seven villages --- commercial occupancy rates are low. Instead of several small (less than 100,000 square foot) retail centers, Reston is home to three strip mall shopping areas of over 200,000 square feet (not counting the Town Center). Moreover, at least 18 other 200,000 square foot plus shopping centers are

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located within an eight mile ring of Reston Town Center. Additional data on the character and distribution of land uses in Reston is presented in the following chapter.

**Density**

Like Howard, Simon saw higher density residential development as a means of preserving open space and of facilitating the development of "something of the busy life and character of a fine city street, with all of its visual and social interest, [and] without its problems of automobile traffic."57 While he was unable to incorporate Reston, Simon did win some significant zoning concessions from Fairfax County. Fairfax County's Residential Planned Community (RPC) zoning, established in 1962, permitted densities in Reston as high as 60 persons per acre as long as the overall density of the community did not exceed 13 persons per acre. County planners estimated that operating costs for roads and other public facilities and services (including schools, water, police and fire protection, and garbage collection) in Reston would be only 40% of the costs for providing services in less planned areas.58

As mentioned earlier, subsequent Reston homebuilders abandoned Simon's plans for moderate density housing. Today, the population density of Reston is only 6.8 persons per acre, far short of original projections but significantly higher than the average density for Fairfax County.

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Alternative Modes of Transportation

Simon claims as his greatest success in Reston the establishment of an extensive network of grade-separated bicycle and walking trails.⁵⁹ Today, over 50 miles of walking paths traverse the community. Additionally, the abandoned Washington and Old Dominion rail corridor has been converted into a multipurpose recreation trail linking Reston with other communities in the region.

Reston's public transportation system has had a storied history. Although the metropolitan Washington Year 2000 long range plan called for rail access between Reston and the region's urban core, such a system was never built; moreover, Simon did not adequately pursue any alternative forms of HOV transportation for improving either regional access or internal circulation.⁶⁰ ⁶¹ Subsequent development interests also shied away from providing public transportation. Merlin argues that "despite the stated object of public transportation, it is admitted to be of secondary consideration [by] the new firm [Gulf Oil] at Reston."⁶² ⁶³

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⁶¹ That is not to say that his planning and development team did not consider any alternatives. A 1963 memo from chief architect William Conklin to Robert Simon described a proposal by Westinghouse to build a "world's fair" internal rapid transit system. The proposal predicted peak hour ridership of 6,000 persons. The system was not seriously considered.
⁶³ Nowhere in the literature on Reston did the author find any speculation that Gulf Oil was purposely undermining public transportation efforts in Reston. However, it must be questioned whether it is in an oil company's best interest to promote modes of transportation which might lead to decreased consumption of its product. Indeed, according to Burby and Weiss, the Gulf Oil Corporation's initial participation in financing
Instead, residents established their own express commuter service, Reston Commuter Bus (RCB), in March, 1968. Just over 1,000 passengers used the service in its first month of operation; ten years later, however, RCB --- which leased its services from the Washington Area Metropolitan Transit Authority (WMATA) --- was averaging 52,000 riders a month.\textsuperscript{64} Ridership remained high until the 1986 opening of WMATA's Metrorail station at West Falls Church. The extension of heavy rail service to eastern Fairfax County induced WMATA to terminate its commuter bus service at West Falls Church, but the forced transfer resulted in the loss of several riders.

The Reston Internal Bus System (RIBS) provides an average of 16,000 trips monthly on four routes which begin and end at Reston Town Center.\textsuperscript{65} RIBS serves all of the community's senior citizen facilities, public housing developments, schools, and amenities. Operating expenses are subsidized by Fairfax County.

\textbf{Income Diversity}

Another of Simon's goals for Reston was to accommodate a variety of income and ethnic groups. Today, nearly 11 percent of the population is black, compared to a countywide figure of 7.8\%. In addition, 13.2 percent of the population earns less than $25,000 a year, as compared to 11.6 percent for all of Fairfax County. While the existence of a significant low-income population in Reston has nothing to do with Simon's

\textsuperscript{64} Reston Commuter Bus, Inc. \textit{Annual Report, 1977} Page 23.
\textsuperscript{65} 1996 Ridership figures provided by Transportation Management Services, Inc.
goal of reducing vehicular traffic, it does suggest that the mobility needs of the community may be different than the needs found in more traditional, homogeneous suburban neighborhoods.

**Regional Access and Planning**

Not only was Reston itself an experiment, the regional context within which it was to be developed was also a departure from past suburban planning practice. Galanty suggests that in the absence of regional planning, the location of [American new town] developments was determined by market forces or the whim of the developer. The dawn of a new era was signaled, however, in 1961 by the year 2000 regional plan for Washington, DC, which not only proposed a pattern for orderly growth but actually pinpointed favorable sites for the location of new towns.\(^{66}\)

The *National Capital Year 2000 Plan*, approved by President Kennedy in May 1961, rejected "uncontrolled urban sprawl as a pattern of new development" in favor of

- the creation of relatively compact, well-planned suburban communities;
- the concentration of the new communities in corridors radiating from the central city;
- greater reliance on mass transportation; [and]
- the reservation of major portions of the countryside as permanent open space.\(^{67}\)

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\(^{67}\) NCPC, ibid. Page ix.
The Year 2000 Plan was in response to the highly dispersed pattern of growth occurring in the region, particularly in private industry jobs where 60% of all private employment opportunities were located outside of downtown Washington, and, of these jobs, less than one quarter were located in centers of over 1,000 workers. The development of a regional network of new towns, connected by high speed highway and rail transit corridors, was specifically identified in the plan as a desirable metropolitan growth strategy.

While the approach to growth identified in the Year 2000 Plan was widely copied by other metropolitan planning agencies in the mid to late 1960s, this "wedges and corridors" pattern of development --- with "wedges" of open countryside separating "corridors" of development --- was never achieved in the Washington area. Development pressures in Northern Virginia have resulted in even more dispersed growth since 1960 than prior to it. The population of Fairfax County has nearly doubled since 1970; furthermore, this population is becoming increasingly dispersed throughout the region. For example, three County planning districts had population densities in 1970 of under 0.5 persons per acre (ppa): Pohick at 0.33 ppa, Upper Potomac at 0.46 ppa, and Bull Run at 0.48 ppa. By

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68 NCPC, ibid. Page 23.
69 In the early 1950s, the United States government proposed the decentralization of Federal facilities as a defense against a possible nuclear attack. The subsequent "strategic dispersal" of Federal office buildings in the 50s and 60s underscored the lack of a regional consensus for meeting this objective, as most relocated government facilities suffered from poor access to the regional highway network, to residential communities, and to other supporting amenities.
1996, Pohick's population density had increased almost 900% to 2.9 ppa, and Upper Potomac's and Bull Run's densities had increased over 700% to 3.3 ppa each. 70

Summary

The preceding overview of Reston's transportation and land use systems suggests that, despite developer Simon's goal of limiting automobile travel within the community, the community itself does not demonstrate a particularly strong commitment to the transportation planning considerations ascribed to the ideal new town environment. Specifically, the inability of Simon and subsequent developers to stage development in accordance with the original master plan for the community has limited the intended integration of land use and transportation systems planning. Although well served by a comprehensive pedestrian trail network, gross densities in Reston have not met original expectations; this in turn, has contributed to scattered development patterns, resulting in increased distances between home origins and activity destinations.

In addition, it was never intended by Simon that Reston would achieve the economic self-sufficiency of the Howard-inspired new town. The evidence further suggests that while Reston is well served by public transportation, internal and commuter services were not a part of the original Reston plan.

Of particular note is the failure of the Reston village center concept to provide the mixed-use, multi-purpose activity core necessary to support the needs of its surrounding community. While the more recently-built villages have lacked a commitment by development interests to building such community-oriented centers, the low economic performance of the older centers may be attributed to their uncompetitiveness with larger shopping centers. The imbalance which results from such uncoordinated development underscores the importance of a regional policy for targeting growth in "corridors" and higher density centers, an explicit condition of Howard's plan for new town development.
Part IV
Analysis of Reston Travel Behavior: 1968 - 1994

Prior Research

In 1974, Kent R. Morgan and John W. Dickey published an in-depth study of the travel characteristics of new town development ("The Characteristics of New Town Travel: A Case Study of Reston, Virginia"). Using Reston as a case study, the Morgan-Dickey report set out to 1) summarize the transportation planning process for 1960s new town development; 2) examine the outcomes of this process in terms of the provision of local roads, public transportation, pedestrian and bicycle facilities, and parking; and 3) to address the impact "of these various components and the general character of new towns upon patterns of travel."\(^{71}\) According to Morgan and Dickey, the ultimate objective of the study was "to determine if the transportation element of this satellite new community has, in fact, altered the travel patterns of its residents relative to the patterns exhibited in a more traditional suburban development."\(^{72}\) Nearby Vienna, Virginia, was utilized as the "control" suburban environment with which to make comparisons of travel behavior.

Utilizing several different measures --- including automobile ownership rates, overall vehicle miles traveled (VMT), journey to work distances, total number of person trips by mode, and weekend travel characteristics --- the study concluded that Reston

\(^{71}\) Morgan and Dickey, ibid. Page 3
\(^{72}\) Morgan and Dickey, ibid. Page 3.
households tended to own fewer vehicles and make more trips by walking and public
transportation than households in Vienna. Furthermore, while the two communities
exhibited little difference in work travel distances and trip frequencies, the authors argued
that "there is reason to suggest that the maturing of the new town may eventually aid in
reducing the average work trip length." 73

Morgan and Dickey used as support for their research a prior study completed in
1970 by John Lansing, Robert Marans, and Robert Zehner of the University of Michigan. 74
Studying a range of community types --- from "least planned" suburban developments to
highly planned new towns (including Reston and Columbia, MD) --- Lansing et al. found
lower automobile ownership rates in new towns than in other communities, but vehicle
miles traveled was slightly higher and the journey to work distance slightly lower than in
less planned suburbs. On the other hand, public transportation use and walking trips were
also significantly higher in Reston and Columbia than in less planned communities.

In 1977, Zehner published a follow up to his work with Lansing and Marans. 75
Pairing fifteen "new communities" with twenty one "conventionally developed" suburban
communities, Zehner sought to measure the success of planned new towns in achieving
desired transportation objectives. Zehner's study is considered to be the seminal research
on new town travel behavior. Zehner found that, in general:

73 Morgan and Dickey, ibid.
75 Zehner, ibid.
while new towns provided for more community amenities, "the number of available facilities inventoried explained little of the variance in either automobile ownership or total household driving." Rather, the data indicated that the provision of shopping facilities has the greatest non-commute impact on the amount that residents drive, and that the median distance to shopping centers in new towns was about 3.8 miles, compared to a median distance of 5.2 miles for conventional developments;

- a very low proportion of new community employed heads of household actually worked where they lived, and that, overall, there was very little difference between the median duration of the journey to work for new town residents (24.8 minutes) and residents of conventional communities (25.3 minutes);

- public transportation use was higher in new than in conventional communities, though still low relative to travel by automobile.

- although the new towns studied exhibited a wide range of travel behaviors, in the aggregate new town residents averaged 7.5 percent fewer annual vehicle miles traveled (VMT) and owned 4 percent fewer automobiles than residents of conventional communities.

For Reston, specifically, Zehner found that only 12 percent of employed heads of household lived and worked in Reston in 1973, and that the median journey to work was 40 minutes --- the longest of the fifteen new communities studied. Reston also exhibited a

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*Zehner, ibid. Page 12.*
17 percent increase in annual VMT between 1969 and 1973, although conventional communities studied had a much higher rate of increase. Reston also demonstrated the highest use of public transportation for both external and internal trips of all communities studied.

Like the Morgan and Dickey research, Zehner cautioned that the new towns he studied were on average only one-fifth completed and that, therefore, his conclusions were related to "developing new communities, rather than completed communities. Particular circumstances in individual new and conventional communities will change over time as their populations grow and mature."77

**Introduction to the Present Data Analysis**

The present research re-examines the now "mature" new town of Reston, specifically the travel characteristics of its residents. Several data sources will be used, including:

- the 1990 US Census; specific products of the Census used include the *Census Summary Tape File 1A* on population, race, age, sex and type of household; *Census Summary Tape File 3A* on population, housing, income, employment, and economic indicators; and the *Census Transportation Planning Package* for journey to work and other transportation data.

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the Metropolitan Washington COG's 1994 regional origin-destination household survey. The (regional) sample size for this survey is 5800 households; see below for a disclosure of the limitations associated with the 1994 COG data. In addition, summary data from the COGs 1987 and 1968 household surveys will also be utilized.

- summary data provided by several other sources: the 1990 National Personal Transportation Survey (NPTS), the Fairfax County Office of Management and Budget; the Fairfax County Economic Development Authority; the Reston Land Corporation; and the results of the Zehner and Morgan-Dickey studies.

Where the availability of data makes it possible, the same measures used by Morgan and Dickey will be duplicated here. Similarly, Morgan and Dickey's control community of Vienna will again be paired with Reston.

**Data Limitations**

The small sample size of the COG's regional household survey must be re-acknowledged. The 5800 households region wide translate into 30 Reston households; meanwhile 48 Vienna households are included *only when the Vienna study area is extended to the Planning District boundary* (see the next page for a definition of study area boundaries). In addition, not all work trips are being picked up in the available survey data. Specifically, work commutes that involve one or more shopping or "other" trips before reaching an employment destination are *not* counted as work trips but as
home based shopping or other trips; the work segment of these trips are subsequently
counted as non-home based trips. These limitations compel the author of this research to
use the COG data for illustrative purposes only. Furthermore, the 1994 COG data will
only be presented to compare and contrast the 1968 COG data used in the Morgan/Dickey
study.

Problems with identifying consistent study area boundaries represent another
limitation; this issue is discussed below.

**Community Profiles**

Defining the geographic boundaries of the two study communities proved
somewhat difficult. Because Reston is not incorporated, Fairfax County does not collect
data specific to the community. Prior to 1990, the County did disaggregate some
transportation data beneath the Planning District level; for example, in its 1987
Transportation Survey Results, the Upper Potomac District was divided into "north",
"mid", and "south" subareas. Reston corresponded somewhat with the Mid Upper
Potomac boundaries. However, no more recent data from the County is available at that
geographic level.

To the extent possible, the Reston Census Defined Place (CDP) will be used as
the community "unit" for Reston. The CDP provides the most --- and most consistent ---
data needed for the present analysis. It must be acknowledged here that the COG's travel

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*Morgan and Dickey never identified the community units of Reston or Vienna in their 1974 study.*
analysis zones used for their travel demand forecasting and long range planning activities do not conform exactly with the Census tracts to define the Reston CDP. However, every effort has been made to match the COG's data with the CDP as closely as possible.

For Vienna, the community unit will be the incorporated Town of Vienna. In two cases, the Vienna Planning District --- which includes the Town and some outlying areas --- will be used. In the first case, the County's 1987 travel data is not disaggregated below the Planning District level. In the second case, the limited sample size of the COG's 1994 regional travel survey data makes it necessary to use the larger geographic area of the Planning District. All deviations from the Vienna Town unit will be noted in the forthcoming analysis.

For their research, Morgan and Dickey chose to contrast Reston with Vienna, because "the communities selected . . . . needed to be similar in every respect except for the degree of planning attributable to each." Although Reston is a larger community than Vienna, the areas share several attributes. Some of the more relevant characteristics are summarized below:

- The communities share a relatively high median household and per capita income.

The 1990 median annual household income in Vienna was slightly higher than in Reston: $61,271 vs $56,884. However, Reston had a per capita income of $26,252.

79 Morgan and Dickey, ibid. Page 22.
compared with $23,729 for Vienna. Vienna has a larger share both of households earning under $25,000 and over $100,000 than does Reston.

- In 1990, 2.1% of all Reston households received public assistance income, while 1.6% of Vienna households received such assistance.

- The 1996 population density of Reston is slightly higher than that of Vienna (6.8 persons per acre vs 6.3 persons per acre). The countywide density is 3.9 persons per acre.

- The average household size in Reston is slightly smaller than in Vienna (2.56 to 2.72).

- The 1990 median value of owner occupied housing in Reston was $201,700, while the median housing value in Vienna was $212,000. The 1990 median value for Fairfax County was $213,800.

- Reston is 11.0 percent black and 5.5 percent Hispanic. Vienna is 4.1 percent black and 5.2 percent Hispanic.

In addition, there are at least two striking land use differences between Reston and Vienna:

- A housing unit inventory of the two communities is presented in Table 1 (page 51). While Reston offers a variety of housing types, with townhouses occupying the largest single share of the market at 37.7%, Vienna is over 80% single family homes.
Table 2 provides a summary of nonresidential gross floor area by general activity. Surprisingly, Vienna supports a more diverse nonresidential market than does Reston. Even more striking is the diversity of activities found at the subcensus tract level. Specifically, 30% of all Reston subcensus tracts lack any retail or office uses, while 60% lack any industrial uses. Every subcensus tract in Vienna, however, possesses both retail and office activities, and only one lacked any industrial uses. This data suggests that, contrary to expectations, Vienna has achieved a far greater mix of land uses than has Reston.

In terms of location within the region, Reston is approximately 18 miles for downtown Washington, DC. Vienna, is located southeast of Reston and is about 14 miles to the urban core.

The following provides a comparison and analysis of four basic characteristics of suburban mobility: 1) automobile ownership; 2) the journey to work; 3) trip frequencies; and 4) walking trips. In addition, a brief discussion of internal and non-work based trips for the two communities will conclude Part IV.

Automobile Availability

Table 3 provides automobile and vehicle availability rates in 1970 and 1990 for Reston, Vienna, and all US households. The table indicates that in 1990, as in

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Morgan and Dickey also used the Lansing study to describe weekend travel behavior and annual miles driven. However, no such recent data exists for either community, and so these characteristics cannot be analyzed.

Includes all vehicles owned by or available on a regular basis to the household.
Table 1

Housing Unit Inventory

Percentage Inventory by Type

<table>
<thead>
<tr>
<th></th>
<th>Reston</th>
<th>Vienna</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Family</td>
<td>24.2</td>
<td>82.3</td>
</tr>
<tr>
<td>Duplex</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Townhouse</td>
<td>37.7</td>
<td>7.6</td>
</tr>
<tr>
<td>Multiplex</td>
<td>5.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Garden Apts</td>
<td>30.5</td>
<td>9.5</td>
</tr>
<tr>
<td>Mid/Hi-Rise Apts</td>
<td>2.3</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Fairfax County Demographics Report, 1996
### Table 2

**Total Non-Residential Development, by General Activity and Sub-Census Tract**

**Square Feet and Percentage of Total Leasable Area**

<table>
<thead>
<tr>
<th></th>
<th>Industrial</th>
<th>Office</th>
<th>Retail</th>
<th>Institutional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reston</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>805.3</td>
<td></td>
<td>10,987</td>
<td>266,131</td>
<td>71,248</td>
<td>348,366</td>
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<tr>
<td>812.1</td>
<td>38,201</td>
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<td>3,908,426</td>
<td>85,064</td>
<td>4,373,691</td>
</tr>
<tr>
<td></td>
<td>0.1</td>
<td>0.6</td>
<td></td>
<td></td>
<td>2.9</td>
</tr>
<tr>
<td>814.1</td>
<td>0.3</td>
<td>155,257</td>
<td>161,345</td>
<td>316,602</td>
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</tr>
<tr>
<td></td>
<td>32.3</td>
<td>1.3</td>
<td>1.3</td>
<td></td>
<td>32.3</td>
</tr>
<tr>
<td>820.1</td>
<td>3,814</td>
<td>114,911</td>
<td></td>
<td>118,725</td>
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<tr>
<td></td>
<td>0.9</td>
<td></td>
<td></td>
<td>0.9</td>
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</tr>
<tr>
<td>820.2</td>
<td></td>
<td></td>
<td>102,818</td>
<td>102,818</td>
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<tr>
<td></td>
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<td></td>
<td>0.8</td>
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<tr>
<td>821.1</td>
<td>80,101</td>
<td>48,207</td>
<td>9,979</td>
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<td>0.4</td>
<td>0.1</td>
<td>1.2</td>
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<tr>
<td>822.1</td>
<td>14,450</td>
<td>1,833,116</td>
<td>667,305</td>
<td>249,676</td>
<td>2,764,547</td>
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<td>0.1</td>
<td>15.1</td>
<td>5.5</td>
<td>2.1</td>
<td>22.8</td>
</tr>
<tr>
<td>822.2</td>
<td>424,649</td>
<td>910,267</td>
<td>163,801</td>
<td>22,150</td>
<td>1,520,857</td>
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<td>7.5</td>
<td>1.4</td>
<td>0.2</td>
<td>12.6</td>
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<tr>
<td>822.3</td>
<td></td>
<td>73,766</td>
<td></td>
<td>112,979</td>
<td>186,745</td>
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<td>0.6</td>
<td></td>
<td></td>
<td>0.9</td>
<td>1.5</td>
</tr>
<tr>
<td>823.1</td>
<td>1,469,873</td>
<td>370,111</td>
<td>407,966</td>
<td>2,247,950</td>
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<tr>
<td></td>
<td>12.1</td>
<td>3.1</td>
<td>3.4</td>
<td>18.8</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>477,300</td>
<td>8,286,537</td>
<td>1,674,826</td>
<td>1,338,136</td>
<td>12,118,676</td>
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<tr>
<td></td>
<td>3.9</td>
<td>68.4</td>
<td>13.8</td>
<td>10.9</td>
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<table>
<thead>
<tr>
<th></th>
<th>Industrial</th>
<th>Office</th>
<th>Retail</th>
<th>Institutional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vienna</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>607.1</td>
<td>6,520</td>
<td>162,656</td>
<td>332,948</td>
<td>339,328</td>
<td>841,452</td>
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<td></td>
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<td>4.4</td>
<td>9.0</td>
<td>9.1</td>
<td>22.7</td>
</tr>
<tr>
<td>608.1</td>
<td>1,243,644</td>
<td>279,172</td>
<td>17,147</td>
<td>1,539,963</td>
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</tr>
<tr>
<td></td>
<td>33.4</td>
<td>7.5</td>
<td>0.5</td>
<td>41.4</td>
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</tr>
<tr>
<td>609.1</td>
<td>238,450</td>
<td>199,781</td>
<td>115,896</td>
<td>98,544</td>
<td>652,671</td>
</tr>
<tr>
<td></td>
<td>6.4</td>
<td>5.4</td>
<td>3.1</td>
<td>17.5</td>
<td></td>
</tr>
<tr>
<td>610.1</td>
<td>66,519</td>
<td>310,405</td>
<td>209,578</td>
<td>99,213</td>
<td>685,715</td>
</tr>
<tr>
<td></td>
<td>1.8</td>
<td>8.3</td>
<td>5.6</td>
<td>18.4</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>311,496</td>
<td>1,916,529</td>
<td>937,614</td>
<td>554,244</td>
<td>3,719,883</td>
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<tr>
<td></td>
<td>8.4</td>
<td>51.5</td>
<td>25.2</td>
<td>14.9</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Fairfax County 1996 Demographics Report*
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>2.9</td>
<td>5.1</td>
<td>2.7</td>
<td>3.8</td>
<td>20.6</td>
<td>9.2</td>
</tr>
<tr>
<td>1</td>
<td>44.8</td>
<td>33.3</td>
<td>48.3</td>
<td>45.4</td>
<td>48.4</td>
<td>32.8</td>
</tr>
<tr>
<td>2</td>
<td>48.3</td>
<td>16.2</td>
<td>48.3</td>
<td>10.1</td>
<td>26.4</td>
<td>38.4</td>
</tr>
<tr>
<td>3 or more</td>
<td>4.0</td>
<td>100.0</td>
<td>4.0</td>
<td>100.0</td>
<td>4.6</td>
<td>19.5</td>
</tr>
</tbody>
</table>

Source: 1970 and 1990 Census; 1990 NPTS
1970, multiple vehicle ownership rates in Reston and Vienna exceeded national rates, although the gap between Reston (61.6%) and the United States at large (57.9%) has decreased. It must be noted here that the 1970 Census tabulated separate rates for automobiles and trucks, while the 1990 Census combined the two into a single category ("vehicles"); this translates (for each of the three populations) into a significantly higher share of households with 3 or more vehicles.

That said, the overall availability of private vehicles remains lower in Reston than in Vienna, which is consistent with Morgan and Dickey's finding that "the proportion of families owning two or more cars appears to be inversely related to the level of planning (of a community)." But vehicle ownership is also a function of household income, and Reston households are less wealthy than Vienna households; therefore we would expect Reston to have a lower vehicle availability rate, regardless of its level of planning. Table 4 provides a summary of automobile availability by income for both communities. The table provides evidence that while the availability of multiple vehicles increases as household income increases, multiple vehicle availability in Reston has not increased to the same degree as in Vienna. For example, 88.5% of Vienna households earning between $75,000 and $100,000 annually have access to two or more vehicles; only 71.9% of similar households in Reston have multiple vehicle availability. This suggests that, controlling for income, Reston households have lower automobile ownership rates than Vienna households.

\[\text{Morgan and Dickey, ibid. Page 26.}\]
### Table 4

**Vehicle Availability per Household, by Income Group**

#### VIENNA

<table>
<thead>
<tr>
<th>Household Income (In Dollars)</th>
<th>Percent Vehicle Availability per Household</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
</tr>
<tr>
<td>0 - 24,999</td>
<td>21.5</td>
</tr>
<tr>
<td>25,000 - 49,999</td>
<td>2.5</td>
</tr>
<tr>
<td>50,000 - 74,999</td>
<td>2.0</td>
</tr>
<tr>
<td>75,000 - 99,999</td>
<td>1.4</td>
</tr>
<tr>
<td>100,000 - 149,999</td>
<td>0.0</td>
</tr>
<tr>
<td>150,000 +</td>
<td>0.0</td>
</tr>
</tbody>
</table>

#### RESTON

<table>
<thead>
<tr>
<th>Household Income (In Dollars)</th>
<th>Percent Vehicle Availability per Household</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
</tr>
<tr>
<td>0 - 24,999</td>
<td>24.1</td>
</tr>
<tr>
<td>25,000 - 49,999</td>
<td>3.1</td>
</tr>
<tr>
<td>50,000 - 74,999</td>
<td>1.1</td>
</tr>
<tr>
<td>75,000 - 99,999</td>
<td>0.0</td>
</tr>
<tr>
<td>100,000 - 149,999</td>
<td>0.2</td>
</tr>
<tr>
<td>150,000 +</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Source: 1990 US Census
How does one explain the different rates? It was noted previously that Reston has a slightly higher population density --- and a far larger percentage of townhouse, garden apartments, and apartment buildings --- than Vienna. In their 1970 *Reston Transportation Study*, Voorhees and Associates noted that automobile ownership rates for residents of townhouses and apartment buildings were far lower than for single family residences. In fact, transportation planners and travel demand forecasters generally accept housing type as one determinant of automobile ownership. Morgan and Dickey found in 1972 that the added factor of dwelling unit type, above and beyond mere income, appears to be an important factor in comparing new towns to traditional suburban communities. Additionally, such a pattern would suggest that the ability of new towns to reduce at least multiple car ownership is related more to the mixture of housing types rather than to characteristics peculiar to new communities.

The 1990 data indicates that the diversity of housing types still has a large influence on automobile ownership rates in Reston.

**The Journey to Work**

As noted previously, the presumed self-sufficiency and mixture of land uses found in the ideal new town environment is intended to result in shorter commuting distances for community residents. On the other hand, the location of new towns at the urban fringe

---

84 Morgan and Dickey, ibid. Page 29.
could ultimately lead to longer commutes if residents do not work in the community they live in.

While average work trip distances cannot be calculated with the present data, it is instructive to note that the mean travel time for the journey to work for residents of Reston in 1990 was 27.0 minutes; for Vienna, the commute travel time was 26.2 minutes. Travel time is both a function of distance traveled and mode of travel. The following summarizes first the distance of the work trip, as measured by location of employment, followed by the work commute mode.

**Employment Location** --- Table 5 presents the percentage of study area workers in 1990 who were employed in a) their place of residence, b) other areas of Fairfax County, c) the central business district (defined for our purposes as the District of Columbia and Arlington County), d) other areas of the metropolitan region; and e) outside of the region. The table indicates that a higher percentage of Reston residents worked in Reston than Vienna residents who worked in Vienna. This is a significant reversal from the 1968 data collected by the Metropolitan Washington COG, which indicated that over 9.3% of Vienna residents commuted to work locations within the community whereas only 4.1% of Reston residents worked in Reston.

While certainly an improvement over 1968 levels, the 1990 data indicates that 77.5% of work destinations are still outside of the community, significantly higher than the 70% figure anticipated by Reston developer Robert Simon. However, there is reason to believe that more Reston residents now work in the community. Specifically, the
Table 5

Place of Work

Percentage of Employed Residents

<table>
<thead>
<tr>
<th></th>
<th>Reston</th>
<th>Vienna</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment in Place of Residence</td>
<td>22.5</td>
<td>17.7</td>
</tr>
<tr>
<td>Employment in Remaining Areas of County</td>
<td>43.3</td>
<td>40.1</td>
</tr>
<tr>
<td>Employment in Wash. DC/Arlington</td>
<td>19.2</td>
<td>26.8</td>
</tr>
<tr>
<td>Employment in Remaining Areas of MSA</td>
<td>13.3</td>
<td>13.9</td>
</tr>
<tr>
<td>Employment Outside of MSA</td>
<td>1.7</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: 1990 US Census
construction of the regional Reston Town Center --- which currently totals over 500,000
square feet of leasable office space --- did not begin until 1990, long after the Census data
was collected. In fact, the Reston Chamber of Commerce claim that over 40% of the
working population is now employed in Reston. 85 86

Interestingly, a higher percentage of Reston residents work in other parts of
Fairfax County than do Vienna residents, moreover a lower percentage of Reston
residents work in the regional core than do residents of Vienna. This is not surprising,
inasmuch as Reston is approximately 5 miles further from the CBD than is Vienna.

Of further interest is an historical summary of employment locations and work trip
destinations, as presented in Table 6. Note that from 1968 to 1990, the percentage of
employment locations in Fairfax County --- the region's fastest growing jurisdiction ---
increased, while the percentage of downtown job locations decreased (although a slightly
higher percentage of Vienna residents worked in the CBD in 1990 than in 198787). The
data reflects a national trend of increasing suburban employment opportunities, and an
associated decline in the regional share of jobs in the central city.

Table 7 paints a similar picture. This comparison of work trips based on the
COG's 1968 and 1994 travel survey data suggests that Fairfax County accounts for

86 The limited 1994 COG data, however, suggests that only 20 percent of total work
trips were internal to the community. Table 11 summarizes the percentage of total trips by
purpose which begin and end in Reston and Vienna, based on the 1968 and 1994 COG
data. Internal trips will be discussed later in Part IV.
87 Note that the 1987 data on Vienna reflects the entire Fairfax County Vienna
Planning District.
<table>
<thead>
<tr>
<th></th>
<th>Reston</th>
<th>Vienna</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment in Resident County</td>
<td>12.3</td>
<td>62.6</td>
</tr>
<tr>
<td>Employment in Wash. DC/Arlington</td>
<td>55.7</td>
<td>20.7</td>
</tr>
<tr>
<td>Other</td>
<td>32.0</td>
<td>17.3</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 7
Trips by Destination and Purpose for Reston and Vienna

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Home Based Work Trips</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fairfax Co.</td>
<td>12.25</td>
<td>57.67</td>
<td>44.76</td>
<td>38.97</td>
</tr>
<tr>
<td>Arlington Co.</td>
<td>20.41</td>
<td>9.1</td>
<td>18.58</td>
<td>11.77</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>35.26</td>
<td>24.44</td>
<td>25.03</td>
<td>31.84</td>
</tr>
<tr>
<td>Loudon Co.</td>
<td>15.04</td>
<td>6.49</td>
<td>2.12</td>
<td>1.5</td>
</tr>
<tr>
<td>Montgomery Co.</td>
<td>12.96</td>
<td>2.3</td>
<td>5.14</td>
<td>12.85</td>
</tr>
<tr>
<td>Alexandria/Prince William Co.</td>
<td>0</td>
<td>0</td>
<td>1.33</td>
<td>3.07</td>
</tr>
<tr>
<td>Other</td>
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<td>0</td>
<td>2.53</td>
<td>0</td>
</tr>
<tr>
<td><strong>Home Based Shopping Trips</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Fairfax Co.</td>
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<td>100</td>
<td>86.65</td>
<td>93.51</td>
</tr>
<tr>
<td>Arlington Co.</td>
<td>0</td>
<td>0</td>
<td>5.66</td>
<td>0</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>0</td>
<td>0</td>
<td>0.27</td>
<td>0</td>
</tr>
<tr>
<td>Loudon Co.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2.1</td>
</tr>
<tr>
<td>Montgomery Co.</td>
<td>0</td>
<td>0</td>
<td>4.14</td>
<td>0</td>
</tr>
<tr>
<td>Alexandria/Prince William Co.</td>
<td>0</td>
<td>0</td>
<td>3.27</td>
<td>4.39</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Home Based Other Trips</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Fairfax Co.</td>
<td>60.41</td>
<td>86.99</td>
<td>79.07</td>
<td>86.26</td>
</tr>
<tr>
<td>Arlington Co.</td>
<td>8.16</td>
<td>3.31</td>
<td>6.96</td>
<td>2.66</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>0</td>
<td>1.35</td>
<td>3.98</td>
<td>6.97</td>
</tr>
<tr>
<td>Loudon Co.</td>
<td>31.42</td>
<td>6.25</td>
<td>2.51</td>
<td>2.65</td>
</tr>
<tr>
<td>Montgomery Co.</td>
<td>0</td>
<td>0.66</td>
<td>4.32</td>
<td>0</td>
</tr>
<tr>
<td>Alexandria/Prince William Co.</td>
<td>0</td>
<td>0</td>
<td>1.94</td>
<td>1.47</td>
</tr>
<tr>
<td>Other</td>
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<td>1.43</td>
<td>1.22</td>
<td>0</td>
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<tr>
<td><strong>Non-Home Based Trips</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fairfax Co.</td>
<td>90.66</td>
<td>91.02</td>
<td>73.21</td>
<td>84.37</td>
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<td>Arlington Co.</td>
<td>0</td>
<td>1.05</td>
<td>1.48</td>
<td>1</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>4.67</td>
<td>1.62</td>
<td>0</td>
<td>5.66</td>
</tr>
<tr>
<td>Loudon Co.</td>
<td>0</td>
<td>2.66</td>
<td>4.73</td>
<td>2.19</td>
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<tr>
<td>Montgomery Co.</td>
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<td>10.82</td>
<td>2.77</td>
</tr>
<tr>
<td>Alexandria/Prince William Co.</td>
<td>0</td>
<td>0</td>
<td>4.97</td>
<td>1.41</td>
</tr>
<tr>
<td>Other</td>
<td>4.67</td>
<td>3.66</td>
<td>4.79</td>
<td>2.61</td>
</tr>
</tbody>
</table>

Source: 1968 and 1994 Metropolitan Washington COG Origin-Destination Surveys
nearly three-fifths of all work trip destinations for the residents of Reston; meanwhile more Vienna residents commute to the Washington DC-Arlington core than to other Fairfax county employment sites.

*Mode of Transportation* --- Table 8 provides 1990 US Census *journey to work* data by mode. Note that Reston has both a higher drive alone rate and a lower collective rate of use of alternative modes of transportation than does Vienna. Most surprising is the lower percentage of commute trips by walking and by public transportation in Reston than in Vienna (walking trips will be discussed below). The data suggests that despite the existence of both commuter express services to downtown and an internal community bus system, transit is not the preferred mode choice for work trips.

There are at least two potential reasons for this. First, the dispersal of jobs throughout the region in general --- and Fairfax County in particular, as discussed above --- has created an employment market which cannot be adequately served by traditional CBD-oriented public transportation services. As more and more Reston residents commute to Fairfax County locations, as indicated by the data, they are increasingly likely to travel by automobile. Second, Reston is not served by the regional rapid rail transit system, as is Vienna. The lack of direct rail access to other points in the region may partially explain Reston's low transit usage rates, while at the same time help explain Vienna's higher use.

Table 9 provides an historical summary of commuting trends. It is noteworthy that the drive alone rate for Reston residents has increased in each of the three
### Table 8

**Journey to Work (By Mode)**

Percentage of Work Trips

<table>
<thead>
<tr>
<th></th>
<th>Drive Alone</th>
<th>HOV</th>
<th>Transit</th>
<th>Bicycle</th>
<th>Walk</th>
<th>Work @ Home</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reston</td>
<td>76.9</td>
<td>11.4</td>
<td>5.9</td>
<td>0.4</td>
<td>1.9</td>
<td>3.0</td>
<td>0.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Vienna</td>
<td>70.3</td>
<td>13.5</td>
<td>8.6</td>
<td>0.3</td>
<td>3.1</td>
<td>3.9</td>
<td>0.3</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: 1990 US Census
Table 9
Journey to Work 1970-1990 (By Mode)
Percentage of Work Trips by Mode

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive Alone</td>
<td>74.8</td>
<td>76.7</td>
<td>66.1</td>
<td>74.5</td>
<td>76.7</td>
<td></td>
<td>76.9</td>
<td>70.3</td>
<td>63.0</td>
</tr>
<tr>
<td>HOV</td>
<td>10.2</td>
<td>14.1</td>
<td>10.9</td>
<td>14.0</td>
<td>8.4</td>
<td></td>
<td>11.4</td>
<td>13.5</td>
<td>15.9</td>
</tr>
<tr>
<td>Transit</td>
<td>8.8</td>
<td>3.6</td>
<td>10.6</td>
<td>7.5</td>
<td>9.5</td>
<td></td>
<td>5.9</td>
<td>8.6</td>
<td>13.7</td>
</tr>
<tr>
<td>Bicycle</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td>0.4</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Walk</td>
<td>2.3</td>
<td>2.6</td>
<td>6.4</td>
<td>---</td>
<td>---</td>
<td></td>
<td>1.9</td>
<td>3.1</td>
<td>---</td>
</tr>
<tr>
<td>Work @ Home</td>
<td>2.6</td>
<td>0.9</td>
<td>2.2</td>
<td>2.4</td>
<td>2.7</td>
<td></td>
<td>3.0</td>
<td>3.9</td>
<td>2.8</td>
</tr>
<tr>
<td>Other</td>
<td>1.3</td>
<td>2.1</td>
<td>2.9</td>
<td>1.6</td>
<td>2.7</td>
<td></td>
<td>0.5</td>
<td>0.3</td>
<td>0.5</td>
</tr>
</tbody>
</table>

study years, while transit usage has declined. Of tangential interest is the increasing percentage of residents of Reston, Vienna, and the metropolitan area who work at home --- a trend that is likely to continue as telecommunication technologies improve and peak hour traffic congestion worsens.

**Frequency of Trip Making**

In their 1974 study, Morgan and Dickey claim that an important ingredient in the planning of any transportation system is the number of trips generated within the study area. Only through a basic recognition of the magnitude of tripmaking can the planner adequately provide for mobility. However, it may be equally possible to temper the necessity for transportation facilities if the proper design arrangements are provided. Essentially, then, the present concern is with the systematic differences in tripmaking which can be associated with differences between the nature of the communities under study.88

One would assume that the mixed use environment associated with the ideal new town would provide the proper design arrangements necessary to manage the demand for travel. Additionally, as Voorhees and Associates found in their 1970 study, townhouse residences in the community averaged 20% fewer person trips per unit than single family homes did;89 consequently, higher density new town developments would be expected to generate fewer trips than lower density suburbs. Indeed, as Table 10 suggests, nearly one-half as many trips per person are generated in Reston than in Vienna.

That said, tripmaking in Reston has increased significantly --- in fact, at a slightly faster rate than in Vienna. Moreover, Reston residents still average 0.9 more trips than

88 Morgan and Dickey, ibid. Page 37.
Table 10

Trips per Person
by Trip Purpose for Reston and Vienna

<table>
<thead>
<tr>
<th>Trip Purpose</th>
<th>1968</th>
<th>1994</th>
<th>1968</th>
<th>1994</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Trips/Pop</td>
<td>0.44</td>
<td>0.79</td>
<td>0.5</td>
<td>0.82</td>
</tr>
<tr>
<td>Shopping Trips/Pop</td>
<td>0.39</td>
<td>0.59</td>
<td>0.49</td>
<td>0.59</td>
</tr>
<tr>
<td>Other Trips/Pop</td>
<td>0.52</td>
<td>1.28</td>
<td>0.52</td>
<td>1.4</td>
</tr>
<tr>
<td>Non-Home Based Trips/Pop</td>
<td>0.17</td>
<td>1.31</td>
<td>0.35</td>
<td>1.6</td>
</tr>
<tr>
<td>Home Based Trips/Pop</td>
<td>1.35</td>
<td>2.67</td>
<td>1.51</td>
<td>2.81</td>
</tr>
<tr>
<td>Total Trips/Pop</td>
<td>1.52</td>
<td>3.98</td>
<td>1.86</td>
<td>4.41</td>
</tr>
</tbody>
</table>

Source: 1968 and 1994 Metropolitan Washington COG Origin-Destination Surveys
the national average for daily trips per person (3.08 trips per day, according to the 1990 NPTS).

**Walking Trips**

As noted previously, the 1990 US Census indicates that fewer people walk to work in Reston than in Vienna. This is surprising for three reasons. First, Vienna lacks the internal network of pedestrian paths enjoyed by residents in Reston. It would be expected that the existence of such a path system would encourage more walking trips; however, the journey to work data suggests that the walking trails have had very little impact on work trips. It could be, as Voorhees suggests, that the generation of walking trips is independent of vehicular trips; that is, the provision of an attractive path network does not divert trips from other modes of travel but instead produces recreational trips that would otherwise not be made.  

Second, Reston's higher population density and internal employment rates would suggest at least a comparable rate of walking work trips with Vienna. However, the Fairfax County data on nonresidential development in the two communities indicates that, while Reston does have more leasable office and retail space than Vienna, these facilities are more likely to be concentrated in specific areas of the community. In Vienna, on the other hand, such development may be more evenly spread throughout the area, ultimately shortening the distance traveled for some residents who work in the community. In other

---

words, Vienna seems to demonstrate a key characteristic of new towns: a diverse mix of land uses, located within walking distance of residential areas.

Table 11 provides some additional data on walking trips in Reston and Vienna. Based on the results of the COG survey, Reston demonstrated no walking work trips. However, 31.6 percent of shopping trips which began and ended in Reston were made by foot, compared to under 4.4 percent of similar trips in Vienna. Reston also demonstrated higher rates of walking (and bicycling) for other internal trips than did Vienna.

**Internal and Non-Work Trips**

Table 11 provides other interesting data on the travel characteristics of residents of Reston and Vienna. Specifically, Reston achieves significantly higher percentages of internal trips for all trip categories than does Vienna. The dramatic increase in internal work and shopping trips is consistent with Morgan and Dickey's prediction that, over time, Reston would become increasingly self-sufficient; that is, more trips would begin and end in Reston as more employment and shopping opportunities were located in the community. In total, 43.4% of all trips generated in Reston also end in the community, compared to a rate of just over 35% for Vienna trips.

While these Reston trip characteristics do demonstrate some level of self-containment, Table 11 also presents some sobering data. First, only 20 percent of work trips begin and end in Reston --- far below developer Simon's expectations and

---

Note that the 1994 data is based on a limited sample size, and, for Vienna, reflects the Fairfax County Vienna Planning District boundary.
Table 11
Internal Trips as Percent of Total Trips by Purpose for Reston and Vienna

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Trips</td>
<td>4.08</td>
<td>20.19</td>
<td>9.21</td>
<td>13.85</td>
</tr>
<tr>
<td>Vehicle-Driver</td>
<td>(100.00)</td>
<td>(100.00)</td>
<td>(88.62)</td>
<td>(100.00)</td>
</tr>
<tr>
<td>Vehicle-Passenger</td>
<td>---</td>
<td>---</td>
<td>(8.54)</td>
<td>---</td>
</tr>
<tr>
<td>Transit</td>
<td>---</td>
<td>---</td>
<td>(2.84)</td>
<td>---</td>
</tr>
<tr>
<td>Bike</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Walk</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Shopping Trips</td>
<td>20.58</td>
<td>68.57</td>
<td>31.73</td>
<td>48.16</td>
</tr>
<tr>
<td>Vehicle-Driver</td>
<td>(100.00)</td>
<td>(62.35)</td>
<td>(71.19)</td>
<td>(82.91)</td>
</tr>
<tr>
<td>Vehicle-Passenger</td>
<td>---</td>
<td>(2.00)</td>
<td>(28.81)</td>
<td>(12.70)</td>
</tr>
<tr>
<td>Transit</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Bike</td>
<td>---</td>
<td>(4.04)</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Walk</td>
<td>---</td>
<td>(31.61)</td>
<td>---</td>
<td>(4.39)</td>
</tr>
<tr>
<td>Other Trips</td>
<td>42.79</td>
<td>40.63</td>
<td>31.54</td>
<td>35.16</td>
</tr>
<tr>
<td>Vehicle-Driver</td>
<td>(64.55)</td>
<td>(49.65)</td>
<td>(57.84)</td>
<td>(79.38)</td>
</tr>
<tr>
<td>Vehicle-Passenger</td>
<td>(35.45)</td>
<td>(27.12)</td>
<td>(42.16)</td>
<td>(19.39)</td>
</tr>
<tr>
<td>Transit</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Bike</td>
<td>---</td>
<td>(7.04)</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Walk</td>
<td>---</td>
<td>(16.19)</td>
<td>---</td>
<td>(1.23)</td>
</tr>
<tr>
<td>Non-Home Based</td>
<td>23.37</td>
<td>48.5</td>
<td>27.66</td>
<td>41.35</td>
</tr>
<tr>
<td>Vehicle-Driver</td>
<td>(100.00)</td>
<td>(71.89)</td>
<td>(53.46)</td>
<td>(63.18)</td>
</tr>
<tr>
<td>Vehicle-Passenger</td>
<td>---</td>
<td>(17.15)</td>
<td>(46.54)</td>
<td>(23.64)</td>
</tr>
<tr>
<td>Transit</td>
<td>---</td>
<td>(2.57)</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Bike</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Walk</td>
<td>---</td>
<td>(8.39)</td>
<td>---</td>
<td>(13.18)</td>
</tr>
</tbody>
</table>

Total Home Based Trips

Source: 1968 and 1994 Metropolitan Washington COG Origin-Destination Surveys
current Chamber of Commerce projections. Secondly, note that zero percent of internal
work trips, less than 36% of internal shopping trips, and slightly over 23 percent of other
internal trips were made by non-automobile modes of transportation. This suggests that
even though Reston may have more employment, retail, and recreational opportunities
located within the community than do other suburban jurisdictions, access to these
facilities is still largely dependent on travel by private vehicle. In fact, the survey sample
reported no internal trips by public transportation, despite the existence of a community
transit system. Assuming for a moment the statistical validity of the 1994 COG data, this
suggests that either RIBS is not adequately meeting the mobility needs of the Reston
population, or that the convenience of travel by automobile --- characterized by faster
travel times than transit and free, available parking --- undermines the ability of public
transportation to increase its modal share of the travel market.
Part V

Summary of Findings (and Discussion)

The preceding thesis presents a re-examination of the travel characteristics of the new town of Reston, Virginia, based upon the research design set forth by Kent Morgan and John Dickey in their 1974 study on new town transportation systems. The research combines a review of past literature on new town development, in general, and Reston, in particular, with an analysis of current travel data for Reston and the control community of Vienna. The following summarizes some of the key findings of the research:

- Planners of the ideal new town must consider at least six interdependent and complimentary travel demand "strategies" to achieve desired reductions in travel by automobile. The establishment of --- and adherence to --- a comprehensive master plan provides the transportation planner with an ideal context for planning an efficient transportation system because future residential populations and land uses are relatively well defined. The provision of a rational mix of land uses within this plan --- including employment, shopping, and community facilities --- is intended to minimize distances between household origins and activity destinations. Distances can be reduced even further when development is planned for and occurs at built densities which are higher than those found in typical post-World War II suburbs. The availability of convenient, high-quality alternative modes of transportation --- for example, public transit, bicycle trails, and pedestrian paths --- is expected to
divert a significant portion of trips from the automobile on to these other facilities. Providing low income housing and blue collar and service employment minimizes aggregate community automobile usage (in comparison, at least, with traditional suburban development) by default, as lower income residents --- many without access to an automobile --- will tend to make fewer vehicle trips than middle and upper income populations. Finally, the adoption by jurisdictions in the surrounding region of growth strategies which target development into moderate density, mixed use activity centers will also reduce aggregate vehicle miles traveled (both for the residents of the new town and the region at large).

- Despite developer Robert Simon's goal of limiting automobile travel within the community, Reston itself --- and its local government, Fairfax County --- has not demonstrated a particularly strong commitment to several of these transportation planning considerations. The inability of Simon and subsequent developers to stage development in accordance with the original master plan for the community has limited the integration of land use and transportation necessary to achieve travel demand management goals. Although well served by a comprehensive pedestrian trail network, gross densities in Reston have not met original expectations; this in turn, has contributed to scattered development patterns, resulting in increased distances between home origins and activity destinations. The evidence further suggests that while Reston is served by public transportation, internal and commuter services were not a part of the original Reston plan. Finally, the Reston village
The center concept has proven unsuccessful in providing the mixed-use, multi-purpose activity core necessary to support the needs of its surrounding community— and thus significantly reduce discretionary automobile trips. This failure may be attributed in large part to the County’s inability to control growth and protect localized markets from larger shopping centers.

Consequently, the research suggests that Reston is perhaps not the most appropriate model for measuring new town travel behavior, that is, certain expectations have been ascribed to the community which it cannot possibly fulfill. An alternative view is that Reston is an appropriate model inasmuch as it typifies both the broad differences in approaches and objectives among the various new town experiments in the United States and the great difficulty in planning for—and ultimately realizing—a "new" town.

- Nevertheless, the analysis of transportation and travel data for Reston and Vienna revealed lower household vehicle availability rates for residents of the former, consistent with Morgan and Dickey's findings of twenty years earlier. The data further supports Morgan and Dickey's contention that a mixture of housing types may help explain the lower Reston rates. The general increase of multiple vehicle ownership rates since 1970 for both communities is consistent with national trends.

- 1990 US Census Journey to Work data indicates that the mean commute travel time for Reston residents was 27.0 minutes; for Vienna the travel time was 26.2 minutes.
This is consistent with both Morgan and Dickey's research and the findings presented in a subsequent study by Robert Zehner.

- The data indicated that Reston demonstrated a higher degree of internal employment opportunities --- measured by the percentage of the working age Reston population employed in the community --- than did Vienna. However, internal employment rates are lower than projected by developer Simon and others. There is reason to believe, however, that more Reston residents now work in the community. Specifically, the construction of the regional Reston Town Center --- which currently totals over 500,000 square feet of leasable office space --- did not begin until 1990, long after the Census data was collected.

- Fewer Reston residents worked in the urban core than their Vienna counterparts. This fact, coupled with the aforementioned work trip travel times and the internal employment rates (which would presumably contribute to a reduction in the mean travel time), suggests that while many Reston residents may have short local commutes, many more have long work trips in dispersed locations throughout the region. Indeed, the nature of the non-local work trips of the Reston workforce may help explain the community's high single occupancy vehicle commute rates.

- In addition to a higher tendency to drive alone, Reston residents are less likely to carpool, take transit, or walk to work than are working residents of Vienna. This is somewhat surprising given the new town transportation planning considerations described in Parts II and III of the research, including the provision of higher
density, mixed use development and public transportation and pedestrian facilities. In fact, land use data suggests that while Reston had denser concentrations of non-residential uses than did Vienna, Vienna exhibited a higher level of integration of office, retail, and residential development. In other words, the more dispersed nonresidential development found in Vienna may actually provide more opportunities for walking to work than in Reston.

- In addition to work trips, more shopping and other trips begin and end in Reston than in Vienna. This is consistent with Morgan and Dickey's prediction that, over time, Reston would become increasingly self-sufficient; that is, more trips would begin and end in Reston as more employment and shopping opportunities were located in the community. However, the vast majority of these internal trips were made by automobile. The data suggests that transit use in Reston is as low as in Vienna.

- Consistent with Morgan and Dickey's findings, Reston generated fewer trips per person than did Vienna. However, the difference between the two communities was small, moreover, daily trip frequency rates for Reston residents were significantly higher than the national average. The poor performance of community-oriented activity centers in Reston, as originally envisioned, and the subsequent need to make more dispersed trips to meet daily needs, may contribute to the higher trip generation rates.
In summary, the literature review suggests that Reston may not be an appropriate model for evaluating the travel characteristics of the ideal new town. The empirical data suggests that while Reston has exhibited significantly lower automobile ownership rates than Vienna, other measures of travel behavior --- e.g., "internal" trips and trip generation rates --- are less conclusive, with Reston exhibiting only slightly more favorable (in terms of reduced travel) patterns than Vienna. In fact, Reston residents are less likely to carpool, take transit, bicycle, or walk to work than Vienna workers. Although internal employment rates in Reston are higher than in Vienna, they are low relative to some expectations.

While the preceding analysis provides a summary evaluation of travel behavior of the residents of Reston, there remains a need for additional research. For example, this thesis' analysis of 1990 Census Journey to Work data does not capture the travel patterns generated by the development of the Reston Town Center, the first phase of which was not completed until 1993. The duplication of the present study design using Year 2000 Census data may reveal significantly different travel behavior, with an increase in internal work trips in Reston an expected research outcome. Furthermore, a more statistically rigorous analysis of available data might identify which of several independent variables --- for example, household income, employment sector, and the nature of development external to the study area --- have had the most significant impact on travel behavior in and around Reston.
Finally, research related to more recent trends in residential development could prove valuable. In the mid 1960s, Reston was envisioned as a promising alternative to the inefficiencies and poor design characteristic of post-World War II suburban growth. Thirty years later, neo-traditionalists are championing a similar planning solution to the problems associated with automobile-oriented development. With neo-traditional town developments just now beginning to mature, replicating the present research design on these communities would prove an interesting evaluation of new urban planning and design principles and their impact on the travel behavior of residents.
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Vitae

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April 21, 1997