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16. Abstract <p>To what extent may highway investments shape population growth and land development? To answer this question, three decades of data were examined in the Virginia locations of Fairfax County, Spotsylvania County, and Newport News. In each location, a highway investment (or deliberate decision not to make such an investment) was proposed by some as an instrument for increasing, shaping, or decreasing population or development growth. The case study approach was used, considering Fairfax County's decision not to build Monticello and other freeways proposed in 1960s comprehensive plans, Spotsylvania's efforts to manage Route 3 traffic congestion, and Newport News' desire for the construction of I-664. By comparing what planners intended these transportation decisions to accomplish with what transpired, the adequacy of using highway investments to manage influence growth may be assessed.</p> <p>The results suggest that in many ways, transportation investments are a blunt policy instrument. They can and do affect short-term travel and longer term location choices, but it is difficult to use investments to manage growth precisely. In fact, in none of the three case studies were all planners' intentions realized: when planned roads were not built in order to stop growth, growth continued, and when roads were built to encourage development or redevelopment in a specific location, growth occurred elsewhere.</p> <p>Yet, the three case studies suggest several findings that, if applied to planning practice, can yield future plans that are more realistic: (1) view transportation improvements in a supply/demand context; (2) quantify expected impacts where possible; (3) give transportation plans a realistic implementation mechanism; and (4) present forecasts as ranges rather than point values. Although these practices may be "common sense," their explicit consideration may facilitate planning efforts in the short run. However, an unintended consequence of reviewing the case study histories is that they strongly suggest Virginia counties have limited options for managing growth. To some extent, counties can influence the specific location of growth and what type is attracted—but the case studies leave the impression that if the market is there to support growth, eventually it will come. Within Virginia's current legal environment, counties have limited options for how they can accommodate this growth.</p>			
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**FINAL REPORT**

**A TALE OF THREE REGIONS: INFLUENCE OF HIGHWAY INVESTMENTS  
ON POPULATION AND TRAFFIC GROWTH IN VIRGINIA**

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## ACRONYMS AND DEFINITIONS

ADT	Average daily traffic
BOS	Board of Supervisors
FHWA	Federal Highway Administration
Growth control	Implementation of policies designed to either stop growth or reduce the amount of growth that otherwise would have occurred.
Growth management	Implementation of policies designed to channel new growth into a specific location, attract a specific type of growth, and/or reduce the amount of growth that otherwise would have occurred.
Growth	An increase in population, employment, residential or commercial development, and the location of the increase.
PLUS	Fairfax County’s Planning and Land Use System
Removal of road	The decision not to construct a facility that has been proposed or planned but not yet built. The phrase “removal of road” does not mean to remove existing roads physically.
Success	The extent to which growth control policies or growth management polices influence population or employment as intended by planners, the public, or elected officials.
TPRAC	Transportation Planning Research Advisory Committee
Transportation investments	The amount of monetary investment in highway infrastructure; includes the decision not to make an investment.
Travel demand modeling	A mathematical process that uses four discrete steps (trip generation, trip distribution, mode choice, and traffic assignment) to determine future deficiencies in a transportation network by comparing expected future traffic volumes to the capacity of the network (a forecast ADT for a particular section of a roadway is one output from such a model)
TRB	Transportation Research Board
VDH	Virginia Department of Highways
VDH&T	Virginia Department of Highways and Transportation

VDOT

Virginia Department of Transportation

VTRC

Virginia Transportation Research Council

## EXECUTIVE SUMMARY

### **Intuitive Appeal of Using Transportation Investments to Manage Development**

Elected officials, citizens, stakeholder groups, and planners are interested in shaping how localities will accommodate increasing employment and population. Concerns include quantity of development, the patterns residences and jobs will follow, and how transportation and water infrastructure will accommodate resultant demand. Popular programs debating how localities should grow, such as the WAMU radio show concerning community design, sprawl, and “McMansions” as reported in *The Washington Post*, are common (Lewis, 2004).

Virginia counties and cities may potentially influence this growth through two broad categories of methods: regulatory land-based techniques and market-driven infrastructure techniques. The first category encompasses administrative mechanisms that affect how land may be developed. Examples are zoning ordinances, subdivision regulations, and site plan reviews. The common aspect of these techniques is that they manage land use by giving the locale some degree of control over when, where, and how private construction may proceed. The second category relies on infrastructure investment, such as transportation, water, and sewer lines, to shape demand for development. For example, in response to a new heavy rail station in a county’s capital improvements plan, high-density development of adjacent land may become appealing in the marketplace. A combination of the two categories may also be used. For example, counties may offer tax breaks and transportation improvements to draw businesses to a specific area. The two-category system is a useful lens through which to examine how Virginia counties and cities have tried to influence growth over the past 50 years.

Although zoning and other regulatory techniques potentially direct where development is permitted, market-driven infrastructure methods have intuitive appeal for several reasons. For new regulations in general and for local land-based regulations in particular, a fair amount of debate can be expected regarding what type of growth is desired in terms of density, mix of uses, and design. If, instead, growth can be induced in a particular pattern through non-regulatory means, such an approach is politically palatable—a critical advantage, given that land use decisions are made at the county or city level in Virginia. Further, land-based regulations, in some instances, are legally impractical. For example, if an undeveloped parcel can legally be developed for a given use under existing zoning, it is relatively difficult to hinder that process. For many localities, therefore, there is an interest in using infrastructure investments—specifically transportation improvements—to influence development.

### **Problem Statement: To What Extent Can Transport Investments Influence Growth?**

The question planners face is whether transportation investments *can* influence the quantity, location, and type of growth Virginia faces. Support can be found for either answer. A “no” answer would stem from the response that transportation is a derived demand and simply responds to population or employment growth already in place (Hartgen and Curley, 1999). A “yes” answer would be supported by the fact that transportation investments can improve developmental accessibility of new areas, thereby encouraging growth (Connally and Meiburg,

1968). Syntheses regarding both answers are also available (Transportation Research Board, 1995; Meyer and Miller, 2001), with the latter noting that it is not clear “given the high level of access currently provided by urban transportation systems (in particular road networks), whether incremental improvements in this access can significantly affect metropolitan patterns of development” (p. 130).

The question remains: How well have transportation investments been able to influence growth? If the answer is *substantially*, then planners and elected officials have a useful set of market-driven tools that may be employed in the future. If the answer is *very little*, then Virginians know that other methods are needed to manage development.

### **Purpose, Scope, Methods, and Definitions**

The purpose of this study was to determine the extent to which local governments have successfully used transportation investments to influence *growth*, defined as an increase in population, employment, residential or commercial development and the location of the increase. *Success* is the extent to which growth control policies or growth management policies influence population or employment as intended by planners, the public, or elected officials.

Eight Virginia-specific case studies were considered, and based on the availability of detailed longitudinal planning data, three were selected for detailed analysis: the Monticello and other freeways in Fairfax County, the Route 3 Corridor in Spotsylvania County, and I-664 in Newport News. For each case study, multiple decades of planning data were obtained, such as county or regional comprehensive plans, traffic counts, socioeconomic information, newspaper articles, and published literature. Questions posed to individuals familiar with aspects of the case study areas complemented this data set where archival materials left some questions unanswered. The investigators also took advantage of the detailed literature concerning portions of the case studies: Fairfax County (Dawson, 1977; Hale, 2001; Jantz, 2000; Peters, 1974) and Newport News (Kozel, 1997).

For each case study, it was possible to document how planners, elected officials, or members of the public probably intended their highway investment decisions to influence growth over at least a three-decade period. Then, it was feasible to compare the projections to events that transpired and to infer what, if any, actions could have been taken to eliminate any differences.

The scope of this work was limited to the three case studies. Appendix A discusses how the findings relate to growth in jurisdictions that others have documented, including Montgomery County and Arlington County.

## Overview of the Three Case Studies

### Monticello and Other Freeways in Fairfax County

Fairfax County, a suburb of the Washington, DC, metropolitan area, faced growth challenges earlier than did most of Virginia's jurisdictions. The county's population of 275,000 in 1960 more than doubled to 600,000 in 1980 and more than tripled to 975,000 by 2000 (Forstall, 1995b; U.S. Census Bureau, 2004). Although it will be seen that Fairfax County took roadways out of its comprehensive plan in an effort to stem this population growth (Yenckel, 1968), there is substantially more to the story of the county's larger growth management effort.

For almost a quarter century between 1952 and 1975, Fairfax County experimented with a wide range of growth management techniques involving sewer and water services, zoning, and transportation infrastructure, complementing these with public involvement initiatives and modeling of alternative scenarios. As early as 1962, the county's comprehensive plan noted:

The mass exodus of middle and upper income families from the metropolitan centers to "cheap, open, rural land, in the country" has resulted in hundreds of large-lot subdivisions which have skipped over previously serviced areas and are demanding equal services and schools farther and farther out (Fairfax County Planning Division, 1962, p. 10).

These large subdivisions were built in these new "farther out" areas rather than on vacant lands already served by public water, sewer, and schools, thereby requiring new capital investments.

Table ES-1 summarizes potential Fairfax County growth management efforts from 1955 to 1982, including proposed strategies and resulting effects. *Potential* indicates that action to remove roads from plans may have been taken for reasons other than to manage growth. Newspaper accounts document how the Fairfax County Board of Supervisors (BOS) removed major roadways from various plans between 1966 and 1975. However, prior to 1972, when a BOS that was more staunchly oriented to growth management was elected, it cannot be shown that the removal of roads was done explicitly to control growth. Although such a view is plausible, what is certain is only that for the period prior to 1972, planned roads were ultimately not built. It appears that several factors contributed to this decision. Some constituents did not want the localized disruptive effects of new roads; others viewed roads as competitive with transit; and still others probably wanted to redirect, limit, or stop growth. After the elections in the fall of 1971, the BOS' strong interest in managing growth suggests that any further or continued removal of roads from plans can be attributed to growth control. The BOS, however, also pursued other techniques for managing growth.

The BOS had removed the Pimmit Run Parkway (near McLean) in 1966 from the county's master plan (Sterago, 1966). Prior to September 1968, the BOS had "tossed out of adopted master plans" (Yenckel, 1968, p. D1) three major roads the Virginia Department of Highways (VDH) still had under consideration in 1969: the Potomac Freeway (a north/south route connecting the Capital Beltway near the Wilson Bridge to I-95 at the southern tip of Fairfax County), the Pimmit Run Parkway (near McLean), and the Monticello Freeway (an east/west route in southern Fairfax County connecting Prince William County to Arlington



**Table ES-1. Summary of Potential Fairfax County Growth Management Efforts<sup>a</sup>**

<b>Year</b>	<b>Strategy</b>	<b>Result</b>
1954	McHugh Plan of Residential Development presented to BOS. Plan calls for 3- and 5-acre lot sizes in western Fairfax County.	BOS rejects McHugh plan and in 1955 asks staff to develop revised residential plan.
1956	County staff develops comprehensive plan, zoning western Fairfax County with 1-acre-minimum lots.	BOS adopts staff-produced plan on May 2, 1956.
1956	Freehill Amendment proposed, which increases minimum to 2 acres. BOS adopts Freehill Amendment on August 1, 1956.	Freehill Amendment overturned by Virginia Supreme Court in 1959 because (1) too much land was under one type of zoning ordinance, and (2) emergency was not demonstrated.
1961	BOS responds to Freehill ruling by adding new types of zoning to ordinance that address legal challenges from Freehill Amendment, notably use of multiple zoning types.	Population almost doubles by 1970.
1966	BOS removes Pimmit Run Parkway from master plan.	Road not built.
Approx. 1968	BOS removes Potomac Freeway and Monticello Freeway from “adopted master plans.”	Roads not built.
1970-1975	BOS uses allocation of available sewer capacity to limit growth (and can legally do this if it can be proven that motivation is pollution control rather than growth control). [See Dawson, 1977, pp. 26-27, or Peters, 1974, pp. 51-52, for full discussion.]	<ul style="list-style-type: none"> <li>• Fairfax County Circuit Court rules in 1973 that restrictions on allocation of sewer taps to manage growth are illegal.</li> <li>• By 1976, four unintended consequences of restricted sewer capacity allocation occur: (1) growth accelerates as developers perceive time-limited resource; (2) developers use septic fields in lieu of sewer taps; (3) growth not reduced but dispersed over more land; (4) in instance where county shows water quality would suffer, county pressured to improve water quality by increasing sewer capacity.</li> </ul>
1973	BOS hires consultant to investigate legal feasibility of controlling development through zoning or other land use control mechanisms.	Based on case law and Virginia statutes, consultant concludes such growth management is likely not feasible without enabling legislation in Virginia.
1973	County’s Planning and Land Use System (PLUS) is initiated with goals of (1) increasing public involvement and (2) integrating transportation and land use.	Public involvement attained, with citizens providing concerns that originated in subcounty (area) plans.
1975	PLUS completed at cost of \$1.5 million. Comprehensive plan indicates that overall transportation service would improve only if (1) county attains much higher density than citizens desire and (2) dispersed employment centers are present.	No action taken except creation of comprehensive plan. Citizens do not generally desire substantially higher densities in their subareas.
1975	As part of PLUS, county recommends not building (or curtailing) Monticello Freeway, Outer Beltway, and Cross-County Expressway	Roads not built except Fairfax County Parkway (which resembles Cross-County Expressway).
1982	Chamber of Commerce notes that decision not to build roads included in previous plans was root cause of 1980s congestion.	Congestion continues to increase.

<sup>a</sup>The word *Potential* denotes the fact that action to remove roads may have been taken for reasons other than to manage growth.

County and the City of Alexandria) (Lockwood, R., personal communication, 2005; Hayes, Seay, Mattern & Mattern, 1969b). The Monticello Freeway and the Northern Virginia Freeway (which crisscrossed the Monticello Freeway and ran from the southeastern portion of the county to the northwestern portion of the county) were “scrapped by the [Fairfax] Board in the mid-1970s” (Hockstader and Jordan, 1987, p. C9). Newspaper articles as late as January 1975 indicated that Fairfax’s major planning initiative at the time—the Planning and Land Use System (PLUS)—would recommend dropping or scaling back three major highways: Monticello Freeway, the Outer Beltway, and the Cross-County Expressway (Touzalin, 1975).

The Fairfax County case study shows what may result when large, continual efforts to manage growth confront large, continual market pressures to grow. Table ES-1 also shows how actions may have unforeseen consequences, such as the impacts of the restriction on sewer capacity in the early 1970s.

### **Route 3 Corridor in Spotsylvania County**

This case study area is a 3-mile section of Route 3, bounded by I-95 to the east and the Five Mile Fork area to the west. In the last 30 years, Spotsylvania County has undergone an increase in the number of people seeking to live in an area with “lower costs for housing and other services, good public facilities, and a reasonable tax rate” (Payne, 1985, p. 23). At one point during the study period, 20% of the county’s work force was employed in the Washington, DC, metropolitan area (Payne, 1985). Spotsylvania’s growth challenges started later than Fairfax County’s, but as was the case with Fairfax, the comprehensive plans published in 1964 (Spotsylvania County Division of Industrial Development & Planning, 1964), 1980 (Spotsylvania County [Board of Supervisors], 1979), 1987 (Spotsylvania County Planning Commission, 1987), 1994 (Spotsylvania County Planning Department, 1994), and 2002 (Spotsylvania County Office of Planning, 2002) illustrate the steps planners took over the period of a few decades to address growth issues.

Table ES-2 summarizes major planning events for the Route 3 corridor and highlights selected recommendations of each year’s comprehensive plan. As shown in Figure ES-1, traffic volumes on Route 3 accelerated with the completion of the adjacent section of I-95 in 1964. Because the 1985 comprehensive plan review (Payne, 1985) appears to be a thorough document that influenced the succeeding 1987 comprehensive plan, it is included in Table ES-2.

The Route 3 case study shows the response by a smaller area to growth pressures. Spotsylvania County’s management efforts also had support from persons interested in the historical preservation of Civil War lands. Several themes are mentioned in more than one Spotsylvania comprehensive plan including (1) dispersed versus concentrated development, (2) streets laid out in a network or grid fashion instead of only a single large roadway to carry all traffic, and (3) the use of private sector funding for transportation improvements. The fact that the comprehensive plans discuss these goals in increasing specificity suggests that their implementation requires clear documentation of how to achieve them.

**Table ES-2. Summary of Major Planning Events for Route 3 Corridor in Spotsylvania County**

Year	Situation Envisioned in Document	Recommendations	Explanatory Notes
1964	Spotsylvania County had 1960 population of 14,000, projected to grow to 18,000 by 1980. Adjacent City of Fredericksburg considered dominant factor for growth. I-95 completed. <sup>a</sup>	One of county's 3 general business district areas should be located at intersection of I-95 and Route 3. Every effort should be made to avoid random scattering of unrelated retail and service outlets. <sup>a</sup>	Planners did not foresee impact of I-95 connecting Spotsylvania County to Washington, DC, on development of corridor. By 1980, population would be almost twice original estimate. (The 1994 plan indicates that the population was 32,000 in 1980). <sup>b</sup>
1980	Plan notes that strip development is problematic and scattered development should be avoided. <sup>c</sup> A VDH&T study (1981a) forecast 1995 average daily traffic of 57,000 for Route 3.	Plan suggests concentrating growth in primary settlement area, clustering commercial development, and using site planning requirements to eliminate problems associated with strip development. <sup>c</sup>	Growth concentrated in settlement area; by 1985, concerns noted about feasibility of high density. In 1995, Route 3 ADT very close to what VDH&T had forecast in 1981 (VDOT, 1995).
1985	Recognized that in 1970s, Spotsylvania was fastest growing Virginia county. Accepted growth would come, but did not want to grow in same way as Northern Virginia. I-95 widened from 4 to 6 lanes. <sup>d</sup>	Proper mix of development needed; look closely at impacts of higher density development, restrict development along secondary roads, and consider supporting legislation requiring developers to pay for roads. <sup>d</sup>	Interjurisdictional cooperation noted, but population continues to climb to 40,000. <sup>d</sup> Much of language from 1985 plan review appears to have been adopted in 1987 comprehensive plan. <sup>e</sup>
1987	Existing water and sewer facilities may be inadequate for future growth after 5 to 10 years. <sup>e</sup>	Reaffirms use of primary settlement area, timing land development with roadway improvements, and creating water and sewer master plan. <sup>e</sup>	Spotsylvania County Planning Department formed in 1992. Chesapeake Bay Watershed Act in 1990 led to the formation of this department <sup>e</sup> (Taylor, J., personal communication, 2005).
1994	Population is increasing, climbing to 57,000 in 1990 and 72,000 in 1995. <sup>b</sup>	Establish residential grid networks to reduce number of trips on Route 3 by connecting subdivisions and take full advantage of proffer system. <sup>b</sup>	
2002	Population exceeded 90,000 in 2000. Primary settlement area seems to be working as instrument for guiding growth.	Route 3 overlay plan instituted to control access. <sup>f</sup> Continue primary settlement area, implement transportation connections between developments, and make full use of developer contributions.	Power of this land use protection stems not only from plan but also from force of law. <sup>g</sup> Use of proffers supported by (1) documents offering additional details on how to use proffers and (2) creation of level of service standard that supports public facilities element.

<sup>a</sup>Spotsylvania County Division of Industrial Development & Planning, Report 9, 1964.

<sup>b</sup>Spotsylvania County Planning Department, 1994.

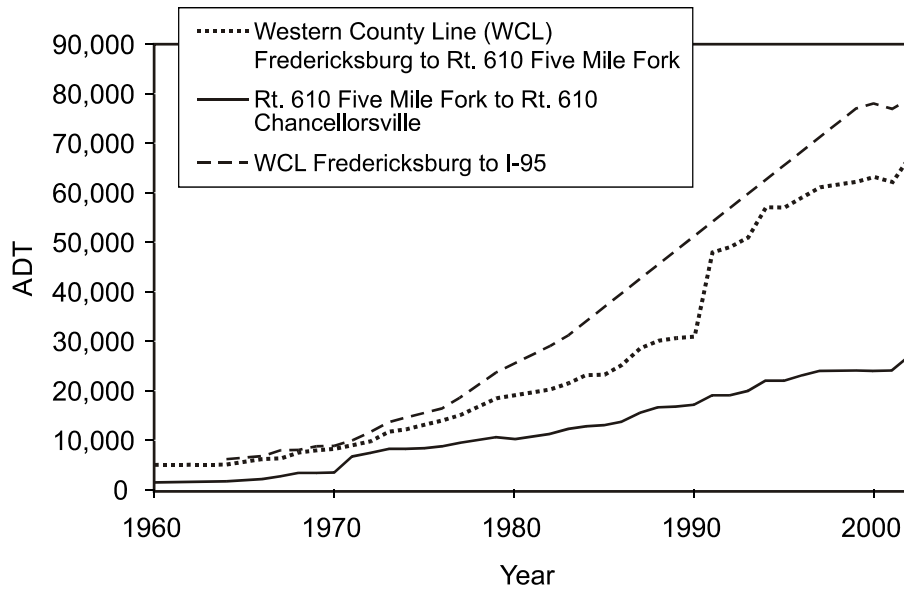
<sup>c</sup>Spotsylvania County [Board of Supervisors], 1979. (Subsequent documents refer to this document, which shows "12/79" as the "1980" plan; so it is thus called the 1980 plan elsewhere in this report.)

<sup>d</sup>Payne, 1985.

<sup>e</sup>Spotsylvania County Planning Commission, 1987.

<sup>f</sup>Spotsylvania County Office of Planning, 2002.

<sup>g</sup>For privately owned lands outside park boundaries for which development does not require involvement of U.S. Army Corps of Engineers, there is voluntary process whereby Spotsylvania County Planning Department may work with cooperating landowners to preserve historically significant lands (Taylor, J., personal communication, 2004).



**Figure ES-1. Average Daily Traffic (ADT) Count for Route 3 Corridor Based on Historical Data from Virginia Department of Transportation**

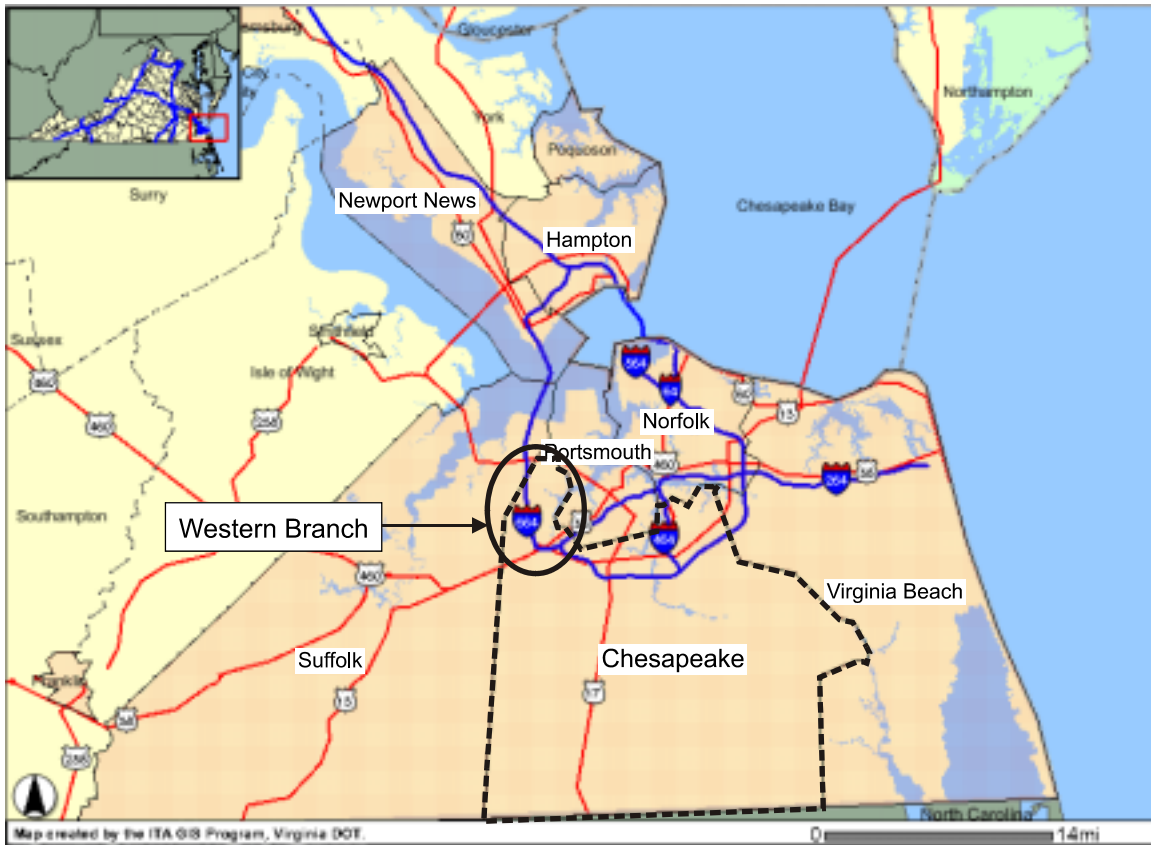
### Interstate 664 in Newport News

The accessibility of the Hampton Roads region can be measured simply in terms of the number of bridges crossing the James River. The I-664 case study examined how the recent completion of a four-lane interstate highway affected growth rates for the cities in the region. Figure ES-2 shows that I-664 brought a desired third link, enhancing this accessibility.

Before 1992, only two James River crossings existed in the region: the two-lane James River Bridge (completed in 1928 and upgraded to four lanes in 1982) and the Hampton Roads Bridge-Tunnel (completed in 1957 with a tube added in 1978). Proposed in 1966, federally funded in 1971, and approved by the Virginia State Highway Commission in 1973, construction of the 20.7-mile-long I-664 freeway began in 1979, with the final connection completed in 1992 (Kozel, 1997).

As noted by a newspaper article (Carroll and Halladay, 2002) and by Kozel (1997), prior to its completion, Newport News officials had welcomed the inclusion of I-664. Viewed as a “giant cul-de-sac” because it was bordered by water on three sides (Kozel, 1997), Newport News was at a competitive disadvantage to capture non-maritime industries. In fact, in 1981, Newport News had indicated to the Virginia Department of Highways and Transportation (VDH&T) that its single largest concern was inadequate funding for the completion of I-664; the city stated the road was essential to its “long-range economic and transportation objectives” (VDH&T, 1981b, p. 21-7).

Since 1992, I-664 has alleviated traffic congestion in the Hampton Road Bridge-Tunnel and improved transportation connections to the western edge of the region. Further, I-664 volumes have been close to those predicted: approximately 30,000 each day (Kozel, 1997). In its first year of operation, the average daily traffic (ADT) was 26,180 (Virginia Department of



**Figure ES-2. Influence of I-664 on Hampton Roads Region**

Transportation [VDOT], 2002). However, I-664 did not produce the hoped-for advantage of revitalizing and promoting growth in the Newport News area. Instead, the Monitor Merrimac Bridge-Tunnel link of I-664 made the City of Suffolk much more accessible, thus facilitating commuters' ability to take advantage of the lower land prices there (Galuszka, 2003). Although Suffolk and Chesapeake experienced population increases of 20% and 29%, respectively, following the completion of I-664, the population of Newport News increased by less than 2%. Employment also grew dramatically in Chesapeake and Suffolk based on a comparison of 1993 and 2001 employment figures (53% and 34%, respectively), whereas Newport News experienced growth of only 8% (Weldon Cooper Center for Public Service, 2004).

I-664 seems to have contributed to changes in the area's commuting patterns. In the 1980s, 60% of Suffolk residents worked in the city (Suffolk Department of Planning, 1998) compared to the 1990 U.S. census figure of 53% (Weldon Cooper Center, n.d.a). The opening of I-664 enabled easy access to the downtown area of Newport News and provided a more direct route to the Newport News shipyards adjacent to I-664. The number of workers commuting to a county or city outside their county or city of residence increased from 1990 (Weldon Cooper Center, n.d.a) to 2000 (Weldon Cooper Center, n.d.b) on average by 6% for the seven jurisdictions listed in Table ES-3. For the tidewater area, the largest decreases in percentage of population working in the city of residence occurred in Suffolk, Norfolk, and Newport News.

**Table ES-3. Percentage of Population Working in City of Residence**

<b>Jurisdiction</b>	<b>1990</b>	<b>2000</b>	<b>Decrease (%)</b>
Chesapeake	37	40	(3% increase)
Hampton	56	52	4
Newport News	66	56	10
Norfolk	77	67	10
Portsmouth	54	45	9
Suffolk	53	40	13
Virginia Beach	55	57	(2% increase)

### **Seven Key Findings From Case Studies**

The three case studies show why effective planning is difficult under even the best of circumstances and almost impossible under uncertain circumstances. Notably, the more difficult-to-implement planning techniques involve those influenced by changes in human behavior. The case studies also pose a challenge because they illustrate that fundamental to the art of forecasting and planning practice are decisions by individuals who make location and travel choices.

By comparing intended and actual impacts, it is possible to derive seven findings from these case studies:

1. The ultimate decision makers—voters—view growth issues differently depending on their context and viewpoint. (“Voters” in this instance were participants in the public participation process who provided input into planning efforts.)
2. Attempts to control growth can be thwarted by unforeseen market forces.
3. Growth management efforts must comply with existing laws or face judicial rejection.
4. Enhancements to a transportation system will alter the patterns of travel and land use.
5. Modern travel demand forecasting can produce realistic future scenarios of growth.
6. Identifying the solution to congestion is a necessary but not sufficient condition to relieve congestion.
7. Transportation capacity impact analysis is a useful decision-making tool for guiding future growth but only to the extent it improves the quality of the discussion.

### **Voters View Growth Issues Differently Depending on Their Context and Viewpoint**

In 1973, Fairfax County spent \$1.5 million and 18 months on PLUS, which sought to combine in a single document—and in a single process—all county growth management and planning activities (Dawson, 1977). At a countywide scale, PLUS was a direct response to citizen concerns about growth and congestion; thus, PLUS objectives such as an evaluation of

land use controls, a comprehensive rezoning of the county, and an adequate public facilities ordinance appeared reasonable. PLUS, however, had a public involvement component where the county was divided into small areas and citizens participated in review meetings of these small area plans that were to be aggregated into a larger document. In these meetings, citizens' goals were to preserve housing prices and low-density single-family use. As noted by Dawson (1977), citizens wanted a continuation of lower density residential development where they lived, despite the possibility that higher concentrations of development might have eased traffic congestion countywide. Generally, the solutions citizens were willing to consider in a county context were different than those they were willing to consider at the more localized small areas context. These participants were also voters, who had elected a BOS favoring growth management in 1971 (Peters, 1974).

### **Attempts to Control Growth Can Be Thwarted by Unforeseen Market Forces**

Tremendous growth pressure—and resultant concerns about growth—faced Fairfax County as early as the 1950s. The county actively tried to manage this growth through a regulatory means (limiting sewer availability) and either actively or unintentionally through a disincentive mechanism (ceasing most major freeway improvements). Setting aside the legal challenges, both attempts failed because they were overtaken by market forces that favored growth in Fairfax County.

- Fairfax initiated a policy that limited “distribution of available capacity” at one of its treatment plants (Peters, 1974, p. 51). This had two unintended consequences (Dawson, 1977). One was that developers, who feared that if they did not act quickly they would not have access to remaining sewer capacity, accelerated their activities. The second was that more large-lot developments began to rely on septic tanks because developers could thereby bypass delays associated with acquiring county sewer taps. The private sector participates in the “market” not just as a direct participant but also through political influence. Thus, even when Fairfax seemed able to restrict sewer capacity technically, individual jurisdictions within the county (such as the town of Herndon) or other entities (such as the State Water Control Board) could exert pressure such that Fairfax needed to allow new plant construction as a matter of practicality (Nunes, 1974).
- The Fairfax County BOS voted to delete every road from the 1969 thoroughfare plan; the only road that was ever built was the Northern Virginia Expressway, which ultimately became the Fairfax County Parkway (Lockwood, R., personal communication, 2005). In 1982, the Fairfax County Chamber of Commerce noted: “For the previous decade, successive Boards of Supervisors bowed to the complaints of some vocal residents and removed roads from the region’s transportation plan” (Fairfax County Chamber of Commerce, n.d.). This removal did not stop growth; by 1990, the county’s population slightly exceeded 800,000—the 1990 amount predicted in 1976 (Gordon, G., personal communication, 2005; Weldon Cooper Center, 2003).

## **Growth Management Efforts Must Comply with Existing Laws or Face Judicial Rejection**

For the period studied, Fairfax County's efforts to restrict growth were consistently overturned by the courts or were not initiated because of fears that they would be overturned. For example, the BOS had zoned western Fairfax County in 1956 with 2-acre minimum lot sizes (a decision known as the Freehill Amendment), which was overturned in 1959 by the Virginia Supreme Court in *Board of County Supervisors of Fairfax County v. Carper* (Fairfax County Planning Division, 1962; Jantz, 2000; Dawson, 1977). The ruling stated that zoning ordinances could be used only to improve public health, safety, or the conservation of natural resources—and in a strict interpretation of those powers, growth management did not meet the test. The narrow powers given to the county by the courts contrasted with the broad powers (presumably) given to the county under the General Zoning Enabling Act.

A review of the county's response to the court's decision leaves the impression that there was a contrast between the broad wording of the act and the court's more narrow interpretation (Fairfax County Planning Division, 1962). This strict interpretation was reinforced in the 1973 case *Alexander Feldman v. Board of Supervisors* in the Circuit Court of Fairfax County, which held that by withholding sewer taps, "the county was practicing growth control rather than protecting the general welfare" (Dawson, 1977, p. 26). Efforts by the county to manage growth through zoning moratoria and sewer restrictions ultimately failed, partly because of judgments by the courts (Peters, 1974). An investigation into the feasibility of using land ordinances to control growth suggested that such ordinances had been "invalidated" (Cox and Burt, 1973). The Fairfax County case study shows that at least for the period 1959 through 1975, court restrictions on county growth management efforts, or the threat thereof, limited to some extent the initiatives localities could take to manage growth.

## **Enhancements to a Transportation System Will Alter the Patterns of Travel and Land Use**

The truism that better transportation improves the exchange of people and goods is obvious. Yet, because transportation affects human behavior, predicting how people will respond to better transportation is not necessarily straightforward (although retrospective analyses seem easier to explain). Transportation was improved by the construction of I-95 near Route 3 in Spotsylvania County. At the time I-95 was completed in Spotsylvania in 1964, its impact on the surrounding area was not addressed in Spotsylvania's comprehensive plan except for a statement that it should be determined (Spotsylvania County Division of Industrial Development and Planning, 1964). This view is not surprising: in 1964, few long-distance commuters traveled from the Fredericksburg area to the Washington, DC, metropolitan area; the transportation infrastructure of the 1950s and early 1960s could not support high volumes of commuter traffic from Washington, DC, to Spotsylvania; and Spotsylvania had not seen the high growth rates of Fairfax County that followed World War II. Yet by 1980, the population had increased by more than 100% (not the 40% forecast in 1964) and residential and commercial areas were brought to the county because the interstate system was being used as a local road. In hindsight, although the interstate uses technology similar to that of the previous U.S. highway system, its impact was strikingly large. The completion of I-95 led to a new and better transportation system that facilitated different travel patterns not previously feasible.



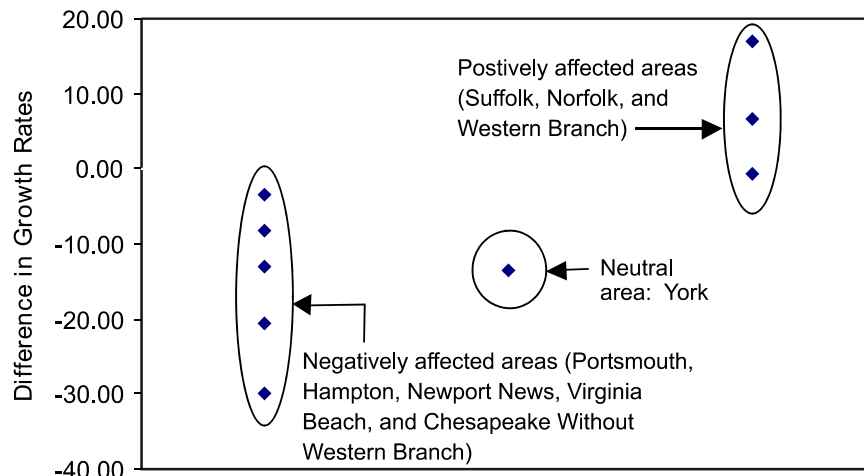
## Modern Travel Demand Forecasting Can Produce Realistic Future Scenarios of Growth

In the 1970s, VDH stated that an additional bridge would shift a city’s growth to rural areas that previously had not been as accessible (Kozel, 1997). Not surprisingly, the forecast came true in the 1990s when the bridge was built. The particular instance entailed the construction of I-664 in Newport News. In 1973, a VDH location public hearings brochure stated that the crossing “will only slightly reduce the proportional share of growth and fiscal return projected to occur in Hampton, Newport News, and Portsmouth, while increasing the shares in Nansemond [City of Suffolk], Norfolk and Chesapeake” (Kozel, 1997).

Based on this statement, I-664 would be expected to have a negative impact on population growth in five jurisdictions: Hampton, Newport News, Virginia Beach, Portsmouth, and the City of Chesapeake (not including the Western Branch area) because the population would be redistributed and attracted to areas with a lower land cost and increased accessibility. Similarly, positive impacts would be expected in the Western Branch area of Chesapeake, Suffolk, and Norfolk because of increased accessibility to open lands in Suffolk and Chesapeake (making them attractive) and the initial traffic relief from the Hampton Roads Bridge-Tunnel (making Norfolk attractive). In the authors’ judgment, no substantial impact on York County population would be expected because the area is sufficiently far from I-664.

With the benefit of hindsight, the forecasts from 1973 can be compared to the actual population change. Figure ES-3 makes such a comparison and suggests that the 1973 forecasts were on target: the population growth rates increased for Suffolk, Norfolk, and Western Branch and decreased for Portsmouth, Hampton, and Newport News.

The reason the impacts of transportation can be only partially forecast is that a variety of factors affects the population and employment under study. For example, in Figure ES-3, the visually apparent difference in growth rates coincides with the results of statistical testing ( $p = 0.02$ ). However, had Chesapeake been included as a single jurisdiction, the difference would not have been significant ( $p = 0.26$ ).



**Figure ES-3. Comparison of Growth Rate Differences for I-664 Areas.** Values shown are the difference between the 1993-2002 growth rate and the 1984-1993 growth rate.

The simple message is that the 1973 forecasts appear to have been accurate. Population growth did occur in the manner predicted at the 1973 location and design public hearing. Other specific instances of forecasting also have shown promise. The 1990 Fairfax County population of 818,623 was close to the 800,000 forecast in 1976 (Weldon Cooper Center, 2003; Gordon, G., personal communication, 2005). VDH&T's 1981 forecast for Route 3 of 52,000 and 56,000 for adjacent sections (VDH&T, 1981a) was close to the 57,000 reported for the forecast year (VDOT, 1995).

### **Identifying the Solution to Congestion Is a Necessary But Not Sufficient Condition to Relieve Congestion**

Concepts such as grid networks or extraction of proffers from developers have benefits for the regional population but disadvantages for specific stakeholders. Grid networks can reduce traffic on a primary road such as Route 3 by connecting subdivisions, but they may be a disadvantage for residents who do not want cut-through traffic. Proffers may create new infrastructure that otherwise would be paid for by all taxpayers or not built, but the proffers themselves are an additional cost for the developer and/or new residents.

The 1987 plan encouraged developers to provide assistance for building transportation infrastructure (Spotsylvania County Planning Commission, 1987), as did the 1994 and 2002 plans. Yet it appears that statements in the plan were not sufficient to implement this developer assistance. The 1994 plan noted that proffers had not been used by Spotsylvania to their "full advantage" (Spotsylvania County Planning Department, 1994, p. 115). Accordingly, the level of detail provided in the plans with respect to proffers increased, and the county published a separate *Zoning Proffer and Evaluation Guide* in 1998 and subsequently revised the guide (Spotsylvania County Planning Commission, 2003) to provide the necessary guidance (Taylor, J., personal communication, 2005). It was also necessary for the county to develop level of service (LOS) standards (shown in the 1998 public facilities element that is part of the 1994 comprehensive plan (Spotsylvania County Planning Department, 1994) to underpin the fees shown in the guide.

The 1994 plan proposed an interconnecting network of streets connecting subdivisions (Spotsylvania County Planning Department, 1994). The desire to interconnect streets is also expressed in the 2002 comprehensive plan (Spotsylvania County Office of Planning, 2002). Gridded streets do not appear to have been implemented in the case of by-right development; however, this could happen in the case of rezonings, as in the case of the Village of Spotsylvania Courthouse (Taylor, J., personal communication, 2005).

In summary, the Route 3 study suggests that although proposed initiatives might have produced a common public benefit, each placed a cost on a particular party. Interconnecting streets may challenge property rights, and proffers place a financial burden on developers and buyers. The Route 3 results suggest such ideas will tend not to be implemented unless specific guidance and specific steps are taken to facilitate implementation. For proffers, the specific steps are computation of LOS standards and the corresponding proffer guide. For gridded networks, it appears that although they can happen in the case of rezonings, it is difficult to find a way to implement them in the case of by-right development.

## **Transportation Capacity Impact Analysis Is a Useful Decision-Making Tool for Guiding Future Growth, But Only to the Extent It Improves the Quality of the Discussion**

Two of the three case studies suggest that a quantitative analysis of transportation demand and capacity might have improved the debate—but not eliminated the controversy.

In Fairfax County, some believed that congestion might divert some motorists to transit. Sufficient congestion can cause persons to change to another mode if it can provide faster service. A quantitative study might have enabled VDH and Fairfax County to agree on what those congestion levels (and associated transit service levels) were. Although disagreement could still have existed about how the county and specific neighborhoods should develop, a study might have at least crystallized the discussion into a specific argument about how neighborhoods (if redesigned for transit) and roads would appear (low-density development remained).

In Spotsylvania County, a primary settlement area was designated in the 1980 comprehensive plan (Spotsylvania County [Board of Supervisors], 1979). Had a thorough capacity analysis been undertaken, decision makers might have traded off various Route 3 congestion levels by using techniques that, although able to reduce Route 3 congestion, had drawbacks for specific stakeholders (such as interconnections between neighborhoods).

### **Conclusions**

- *Transportation investments do facilitate growth to some degree. Yet, although better transportation facilitates the exchange of people and goods, better transportation is not necessary for such exchange to occur.*
- *Transportation investments, by themselves, are unwieldy and imprecise tools for shaping the direction of future growth.* In some cases, as with I-95 in the 1970s and I-664 in the 1990s, they likely served to redistribute growth, although this impact was not foreseen with I-95 and in both cases did not shape growth exactly as all stakeholders had intended. Newport News had hoped that I-664 would improve the city's economy (VDH&T, 1981b). In Fairfax County, the impact of these investments was not as large as that of external growth pressures, and decisions not to invest in particular highways did not stop growth. This experience is consistent with that described in the literature, which questions whether incremental improvements in capacity can induce significant changes in land use (Meyer and Miller, 2001). Thus, transportation investments are blunt instruments—they promote all types of exchange, not just those that are socially desired.
- *Attempts to control growth can be mitigated by unforeseen market forces.* Even without the transportation changes, market forces were already in place to encourage growth to some degree. Fairfax County was poised to grow in the 1960s because of its proximity to Washington, DC; Spotsylvania County was ready to grow in the 1970s and 1980s because of higher land prices in Northern Virginia; and Suffolk was ready to grow in the 1990s because of its cheaper land. In Fairfax's case, the growth occurred, even though all freeways except

one were removed from VDOT's *Northern Virginia Major Thoroughfare Plan to Meet 1985 Needs* (Lockwood, R., personal communication, 2005; Northern Virginia Transportation Coordinating Council, 1999). In the case of Spotsylvania and Suffolk, I-95 and I-664, respectively, served to accentuate market forces already in place. As is evident from Fairfax County, when there are strong market pressures for an area to grow and the land, sewer, and water are available, that growth will come, with or without significant addition to the transportation infrastructure.

- *Localities, for better or worse, are quite limited in what they can do to respond to growth.* To some extent, counties can change where growth will occur and can sometimes change the type of growth (such as commercial or high density), provided public support (through citizen pressure and/or elected officials) exists. Yet, even when counties want to accommodate growth through transportation infrastructure, they are limited in what they can accomplish in terms of being able to raise revenue for transportation improvements (from either developers or taxpayers). The history of planning efforts in Fairfax, Spotsylvania, and Newport News demonstrates that localities in general are unable to influence fully how growth will occur—even in the presence of a supportive market. Whether such a limitation is good or bad is for others to judge. That this limitation exists is a key finding of the three case studies.

### **Recommended Planning Practices for Localities**

The purpose of this study was to determine how transportation investments have influenced growth in Virginia. It was not intended as a critique of previous planning efforts. In fact, recommendations that seem obvious today (such as the efficacy of using a single roadway link to serve local and through traffic) would have been made by earlier planners had they been given the luxury of hindsight.

With this in mind, the following recommendations are offered:

1. *To make projected transportation impacts more realistic in transportation plans, view transportation improvements in a supply/demand context: they facilitate the exchange of people and commerce in the presence of market demand.* As shown with I-664 and I-95, better transportation leads to a change in human behavior—if the demand is present. For I-95, the supply of residential land for Washington, DC, area workers was expanded; for I-664, cheaper Suffolk land became accessible. Impacts may be more accurately predicted by viewing transportation improvements as reductions in travel cost rather than real-world infrastructure changes. It was difficult in 1964 to realize that the limited access highway, although using similar technology, was a fundamentally different mode of transportation than the existing highway network. However, had planners been able to ignore the fact that the limited access highway used similar technology and instead viewed I-95 as a lower cost transportation link, there might have been additional questions raised regarding how this cost reduction would affect behavior.

2. *To make socioeconomic projections more realistic in transportation plans, consider using a forecast range with low and high population estimates.* This is not a panacea—probably few in 1960 who projected Spotsylvania’s 1.25% annual population increase would have believed that a 4.25% annual increase would have occurred by 1980—but likely a range of forecasts could have made planners consider the potential for a larger than expected increase. Although it is possible to have accurate forecasts, as with the 1976 prediction of the 1990 Fairfax population, the 1981 prediction of the 1995 Route 3 ADT, and the traffic on I-664, consideration of a range of forecasts might help identify previously unconsidered scenarios.
3. *Quantify expected impacts where possible.* Transportation and land use planning necessarily address finite quantities of developable land, population, transportation capacity, and financial resources. Had the transportation demand that would be generated in Spotsylvania been compared to the supply of Route 3—even at an order of magnitude—the access problems might have been identified in advance. A disagreement between VDH and Fairfax County might have been averted had both parties agreed on a common way to quantify roadway needs.
4. *Give transportation plans a realistic implementation mechanism.* Specific behavioral changes that are socially desired will not take place in the absence of either direct incentives for individuals to make the change or a law mandating the change. Although Fairfax County residents had an interest in public transportation in the 1960s and 1970s, they did not choose higher densities in their neighborhoods such that transit could be supported.
5. *Since comprehensive plans may be better served by having only a few strategies that are well considered and implemented, choose strategies well.* Table ES-4 shows how to apply Recommendations 1 through 4 to a single planning concept, using gridded streets as in the Route 3 case study as an example. Although the comprehensive plans may help pinpoint the benefits and disadvantages of various countermeasures, this study showed that implementation can be quite difficult.

**Table ES-4. Example of How to Apply Recommendations to Single Planning Concept (Using Gridded Streets)**

<b>Recommendation</b>	<b>Related Question</b>
1. Recognize that transportation improvements facilitate exchange.	<p>Although gridded streets will undoubtedly be conducive to subdivision-to-subdivision trips (as intended), they will also draw trips from Route 3.</p> <ul style="list-style-type: none"> <li>• Based on computed trip generation rates from residential subdivisions and commercial centers, what proportion of the trips is likely to be drawn to connections between subdivisions?</li> <li>• Will gridded streets create particular nexuses or intersections conducive to commercial development?</li> </ul>
2. Use high and low forecasts.	Produce 2 new estimates: trip generation figure that is twice the value of that obtained in Recommendation 1 (to simulate extra development) and figure that is half the value. To what extent do these two trip generation rates affect traffic congestion?

*continues*

<b>Recommendation</b>	<b>Related Question</b>
3. Quantify expected impacts.	Compare traffic volumes on residential streets using low trip generation estimate and high trip generation estimate. If resources permit, conduct capacity analysis or even pedestrian LOS analysis (to determine how high and low volumes affect quality of walking experience for pedestrians).
4. Identify an implementation mechanism.	Gridded streets may improve circulation, but just as was observed with Fairfax PLUS, residents may be against local changes even though such changes improve the overall system. Is there a county-driven land use process or requirement, such as linking gridded streets to proffers, to make such grids more realistic? How can county planners propose the concept of gridded streets early in the planning process? Are there other administrative procedures not yet mentioned that the county and VDOT should jointly consider to make gridded streets more widely practiced?

## **FINAL REPORT**

### **A TALE OF THREE REGIONS: INFLUENCE OF HIGHWAY INVESTMENTS ON POPULATION AND TRAFFIC GROWTH IN VIRGINIA**

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## **INTRODUCTION**

It is well known that following World War II, residential and commercial development in the United States expanded outward from central business districts, an era that saw an increase in automobile use. Metropolitan areas extended three to four times further than had been the case before automobile use became common (Muller, 1995). From 1945 to 2001, the total number of automobile registrations in the United States more than quintupled (Bureau of Transportation Statistics, 2004; Federal Highway Administration [FHWA], 1997). Just as land consumption grew during this 60-year period, so did the body of academic and popular literature describing the interrelationship between transportation and land use. Such research has focused on at least three broad areas: the true cost of transportation investments to society (Louis Berger Group, Inc., 2002; Forkenbrock and Weisbrod, 2001); how economic growth has been generated or redistributed as a function of transportation investments (Weisbrod et al., 2001; Weiss, 2002), and how transportation investments and land use patterns have interacted (Connally and Meiburg, 1968; Hartgen and Curley, 1999; Meyer and Miller, 2001; Moore and Sanchez, 2001; Pollard, 2001; Transportation Research Board [TRB], 1995).

Although few studies have flatly stated that transportation and land use are independent, the degree to which they interact is debated. In a 1995 TRB study, the Committee for Study of Impacts of Highway Capacity Improvements on Air Quality and Energy Consumption could not reach a consensus regarding transportation's influence on development. Although most members felt there was a moderate impact, a minority statement argued a much stronger influence of transportation on growth (TRB, 1995). If transportation experts cannot agree on the extent to which transportation and development interrelate, it is not surprising that local officials cannot either.

Yet, the same local officials who are charged with managing growth must look forward, not backward, when making transportation and land use decisions. In Virginia, these officials influence but do not completely control two distinct areas: (1) land development, through the

comprehensive plan, zoning ordinances, subdivision ordinances, and site plan reviews, and (2) transportation, notably their direct influence on the projects to be included in the “Secondary Six-Year plans” (Virginia Department of Transportation [VDOT], 2005) and, to a lesser extent, their influence on aspects of VDOT’s primary and interstate construction programs.

The challenge of looking forward is compounded by the fact that states do not have the same administrative and legislative tools for addressing growth. In Virginia, proffers and impact fees can be used by localities for transportation infrastructure provided by land developers. *Proffers* are improvements funded by and suggested by developers in order to have a parcel of land rezoned; examples of proffers are new roads, playgrounds, and additional landscaping. The limitation is that the *Code of Virginia* allows such fees only when a rezoning is requested. Unbuilt land already zoned for development is not subject to those fees (Virginia Chapter of the American Planning Association, 2002; *Code of Virginia*, § 15.2-2297).

Fortunately, Virginia now has a rich history of instances where localities have attempted to influence growth through transportation investments. Given that growth management efforts started in at least one Virginia county in the 1950s, it should be possible to examine previous attempts to manage growth and to compare the results with what transpired.

## PURPOSE AND SCOPE

The Virginia Transportation Research Council’s (VTRC) Transportation Planning Research Advisory Committee (TPRAC) provides suggestions for planning-related research needed by VDOT’s field units and central office and Virginia’s planning district commissions. This project was undertaken in response to one such suggestion, finalized in 2001 (Miller, 2002).

### **Investigation of the Consequences of Limiting Transportation Capacity to Control Growth:**

What are the consequences of limiting transportation capacity in an effort to diminish population growth? This is a “smart growth” related issue. It is often said, “If you build it, they will come.” What happens when you don’t build it? The hypothesis is that growth comes anyway and the effort to provide capacity to meet transportation demand is exacerbated. The local jurisdiction is then required to take on a greater role and funding responsibility to create the transportation capacity necessary to meet demand. The research project would focus on a national literature search and the documentation of a few case histories around Virginia. The emphasis would be on localities and regions that have removed planned transportation improvements, including transit projects, from their adopted plans. A good starting point would be Fairfax County, which removed many roads planned in the 1960s from their plan in the 1970s. Growth was not deterred and the county subsequently had to fund over \$100 million for transportation improvements through local bond issues. This study could serve to strengthen the connection between transportation and land use planning, particularly when fiscal implications are documented. The study could evaluate effects on quality of life, funding, air quality conformity, population growth, commercial growth, and politics and produce documentation that can be used to address some of the issues raised that are continually raised in “smart growth” discussions. The documentation could also emphasize the importance of coordinating land use and transportation planning as VDOT strives to provide greater assistance to local governments in the development of their comprehensive plans.



This statement focused on the effectiveness of limiting highway capacity as a mechanism to control growth, where, according to the original problem statement, Fairfax County removed several key roadways from transportation plans created in the 1960s in an effort to stem rapid development in the county. For this study, investigators were asked to expand the scope to include the opposite situation: where transportation projects *were* built.

The purpose of this study was to determine the extent to which local governments have successfully used transportation investments to influence growth, defined as the quantity and shape of development. Three definitions affected this research:

1. *Transportation investments* are defined as the amount of monetary investment in highway infrastructure and include the decision not to make an investment.
2. *Growth* is defined as an increase in population, employment, and residential or commercial development and the location of the increase.
3. *Success* is defined as the extent to which growth control policies or growth management polices influence population or employment as intended by planners, the public, or elected officials.

The theme of “smart growth” mentioned in the TPRAC problem statement is beyond the scope of this research but is discussed in other publications (Miller and Hoel, 1997; TRB, 2005).

## **METHODS**

The case study approach was used to achieve the objectives of this study. These case studies were selected and analyzed through four tasks that comprised this research.

1. Identify possible case studies.
2. Select a few case studies for detailed analysis.
3. Collect data for selected cases.
4. Compare goals and results.

### **Identify Possible Case Studies**

As discussed previously, VTRC’s TPRAC mentioned only one area for consideration: Fairfax County. The Fairfax County case is important because it is an example of an attempt to delete many of the roads in the transportation plan in an effort to inhibit growth. Further discussions with TPRAC and VDOT management produced additional suggestions of case studies to be investigated. Some participants in these discussions wanted a broader perspective on using transportation to influence growth, i.e., not just how *not* building roads could decrease growth but also how building particular facilities could redirect growth. Accordingly, the scope of the study was expanded to include eight possible case studies.

1. Route 288 (Goochland County)
2. Route 58 Corridor (Southern Virginia)
3. Virginia Railway Express (Fredericksburg)
4. Route 3 Corridor (Spotsylvania County)
5. Metro Station Areas (Arlington County)
6. Monticello Freeway et al. (Fairfax County)
7. I-664 (Newport News)
8. Powhite Parkway Extension (City of Richmond and Chesterfield County).

### **Select Case Studies for Detailed Analysis**

The eight proposed cases were investigated to determine which would provide the most useful information for the research. Screening was based on eight criteria: hypothesized economic growth, hypothesized population change, hypothesized mobility changes, hypothesized property value changes, information regarding water and sewer services, explicit or implicit planning goals, availability of data, and length of time period. These criteria were chosen because they represent the information needed to determine whether a given transportation decision was intended to influence growth, and if so, what the influence actually was. Table 1 summarizes these criteria. A survey emailed to Virginia state and local officials, shown in Appendix B provided insights regarding the case studies.

**Table 1. Summary of Criteria Used to Screen Potential Case Studies**

<b>Criterion</b>	<b>Definition</b>
Economic growth	Positive increase in residential and commercial development coupled with increase in jobs and businesses
Population change	Change in jurisdictional or regional population as defined by U.S. Census
Mobility change	Changes in travel time, vehicles per lane, or other mobility measures
Property values	Increase or decrease in price per acre of land or price per dwelling unit
Water and sewer services	Change in land served by public water and sewer systems
Planning goals	Documented intentions, whether plans, memoranda, or interviews, that show specific objectives of transportation investments
Availability of data	Firm documentation in form of county comprehensive plans, memoranda, newspaper articles, meeting archives, or interviews with affected personnel
Time period	Duration in years for which socioeconomic, planning, and infrastructure data are available and relevant to infrastructure decision being analyzed

### **Collect Data for Selected Cases: Monticello Freeway (Fairfax County), Route 3 (Spotsylvania County), and I-664 (Newport News)**

As a result of applying the criteria in Table 1, three case studies spanning the areas of Fairfax County, Spotsylvania County, and the City of Newport News were selected. Although each case had a different growth goal, there were commonalities in the types of data sought. Such data included planning documents (comprehensive plans, land use plans, public facility plans, and other written material), socioeconomic data, maps, published literature, and interviews with experts:

- *Comprehensive plans* illustrate the problems local officials and planners thought transportation investments could solve. Such plans also include forecasts for population, jobs, housing, and sewer and water infrastructure.
- *Land use plans* show how affected land is zoned or permitted to develop. In cases where growth is to be controlled, such zoning can show how transportation does or does not concentrate growth in a specific location.
- *Public facility plans* illustrate where water and sewer services are provided and are often, but not always, needed to have residential and commercial development.
- *Insights from experts* entailed discussions with planners, elected officials, consultants, and other persons. These interviews were used to complement the printed material.
- *Published literature.* For two of the three case studies, literature had been published that offered insights (Dawson, 1977; Hale, 2001; Jantz, 2000; and Peters, 1974, for Fairfax County; Kozel, 1997, for Newport News).

### **Compare Goals and Results**

Each case study area had a specific goal for making a transportation investment, such as limiting population growth, relieving congestion, or redeveloping a specific jurisdiction. These goals were compared to what happened in practice. By comparing predicted results with actual data, it was feasible to understand (1) the extent to which growth could be influenced by the transportation investment, and (2) the factors that enhanced or hindered success. In short, this step allowed the determination of “what went wrong” and “what worked” with the prediction methods. The synthesis of the process and failures for all three case studies was used to suggest techniques that offer promise and caveats planners and policy makers should consider.

## **RESULTS AND DISCUSSION**

The results of the initial screening of the eight potential case studies are provided in Appendix C. Because the five case studies that were not selected may be worthy of further investigation, the strengths and weaknesses of each may be of value. The three case studies chosen for further study met most of the criteria in Table 1. Each case study could show how population, employment, and mobility had changed over time; each offered a robust longitudinal set of land use and transportation data; and each showed how a transportation decision was made with the specific intention of influencing growth.

Each case study has a separate focus:

1. *Fairfax County's Monticello Freeway* illustrates a county's efforts to control population growth through zoning, water and sewer limitations, and eventually not constructing transportation infrastructure.
2. *Spotsylvania County's Route 3 Corridor* illustrates efforts to reduce congestion in a situation in which rapid population growth and development occurred before the changes were evident.
3. *Newport News' I-664 construction* illustrates how a new transportation link facilitated development and the extent to which forecasts reflected reality.

### **Monticello and Other Freeways (Fairfax County)**

Fairfax County's efforts to manage growth started in the 1950s and have included several strategies: zoning ordinances and moratoria, water and sewer allocations, an integrated land use and transportation system, and to some extent the decision not to construct freeways. Because its growth challenges started much earlier than did those in most other parts of Virginia, Fairfax now has a long historical record of actions taken to shape development trends deliberately.

### **Attempts to Manage Growth Through Zoning: 1956–1973**

Although created and authorized in 1938 to produce comprehensive zoning regulations, the Fairfax County Planning Commission did not develop a comprehensive plan until the 1950s, when the county already had water shortages and septic tank failures (Jantz, 2000). County officials initially responded to these growth pressures by using existing zoning regulatory powers.

The first Fairfax County comprehensive plan was produced by a consultant, Francis Dodd McHugh, and presented to the BOS in either 1953 (Jantz, 2000) or 1954 (Fairfax County Planning Division, 1958; Dawson, 1977). Multiple drafts may have been presented, so it is possible both years are correct. Described by county staff as the *McHugh Plan of Residential Development–1980*, the plan included minimum lot sizes of 5 acres (in “Conservation Areas”), 3 acres (in “Agricultural Areas”), and from 1/4 to 1 acre (in “Single-Family Areas”) (Fairfax County Planning Division, 1958). The plan specifically stated that one of the criteria for developing these recommendations was consideration of where water and sewer facilities already existed or were “assumed to be economically available” (Fairfax County Planning Division, 1958, p. 3). Dawson (1977) notes that the planning commission, however, objected to “the large-lot (three to five acres minimum) zoning suggested for most of the undeveloped western two thirds of the County” (p. 16). Dawson's statement is corroborated by the *1958 Plan of Residential Development*:

The McHugh Plan was not adopted by either the Fairfax Planning Commission or the Board of Supervisors. In 1955, the Planning Staff was instructed to prepare a plan of residential development. This was done by following the same basic criteria as were used in the McHugh Plan with one notable exception. The Planning Commission Plan indicated a one-acre lot size in the rural areas, based on an ultimate population of 352,000 persons, whereas the McHugh Plan

had proposed a three to five-acre lot size in the rural areas. The Planning Commission Plan was subsequently adopted on 2 May 1956 (Fairfax County Planning Division, 1958, p. 7).

The same document notes that on August 1, 1956, the plan was amended again and was a compromise between McHugh's 1954 3-to-5-acre minimum lot sizes and the planning commission's May 1956 1-acre minimum lot sizes. This amendment is the Freehill Amendment (so named because it was proposed by supervisor Joseph Freehill), and it entailed 2-acre minimum lot sizes for the rural areas of the county (Fairfax County Planning Division, 1958; Dawson, 1977). A landowner, G. Wallace Carper, whose property was restricted by this amendment brought suit. In 1959, the Virginia Supreme Court of Appeals overturned the Freehill Amendment, and the western part of the county was rezoned to 1-acre lot sizes (Dawson, 1977; Jantz, 2000).

Documentation found in the 1962 *Preserving Open Space in Fairfax County* suggests that this rejection of the Freehill Amendment may have been quite surprising to the county at the time. This 1962 report refers to a 19-page legal review published as Appendix C to the report. In that review, it is noted that although Virginia's General Zoning Enabling Act calls for a "liberal" interpretation, the case law showed a narrow judicial interpretation. The relevant passage from that review states

Virginia's general zoning enabling act<sup>19</sup> is as broad and comprehensive as those found in the great majority of jurisdictions. This act appears even more impressive because of the code provision<sup>20</sup> calling for a liberal construction of all the zoning sections. However, since the court, in Board of County Supervisors v. Carper, 200 Va. 653, 107 S.E.2d 390 (1959), has given notice that it will not construe this statute liberally, apparently no zoning plan which does not fall within Virginia's narrow definition of the "general welfare" will be upheld. Any ordinance attempting to prevent areas of the county from being developed must give the residents of those areas and of the whole county a proportionate advantage as an alternative. This requirement in turn leads to a question of relative benefits, an area almost as nebulous as the scope of the "general welfare" (Fairfax County Planning Division, 1962, p. 60). [Note that "19" and "20" are endnotes that state "Virginia Code Ann. Sec. 15-844 (repl. Vol. 1956)" and "Virginia Code Ann. Sec. 15-854 (repl. Vol. 1956)" respectively.]

This court case illustrated to planners and local governments that despite the wording of the law, zoning had to meet specific tests in order to be upheld when contested in court. If the investigators' interpretation is correct, it appears that a reading of the Act itself (presumably relatively broad zoning powers accruing to the county) was substantially different from the interpretation in court (presumably relatively narrow zoning powers for the county). In response to the aforementioned passage, the county's 1962 report stated

The University of Virginia's research memorandum reminds us that the otherwise liberally constructed zoning enabling act of Virginia\*\* has not been so liberally construed in Board of Supervisors of Fairfax County v. Carper, 200 Va. 653, 107 S.E. 2d 390 (1959). As a result of this case, the Freehill Amendment (which attempted to preserve two-thirds of Fairfax County in a 2-acre minimum lot size zone) was defeated (Fairfax County Planning Division, 1962, p. 34). [Note that the \*\* in this passage is a footnote that states "Virginia Code Ann. Par. 15-844." Note also that the "research memorandum" to which the passage refers is the 19-page legal review that is Appendix C of the 1962 report.]

Specifically, the Freehill Amendment did not meet this definition for two reasons: (1) too much land was zoned for one category, and (2) there was a lack of "emergency need" for the

planning effort proposed in the amendment. In short, the defeat of the Freehill Amendment eliminated the possibility of restricting growth through large lot zoning as had been suggested for the western portion of Fairfax (Fairfax County Planning Division, 1962).

In 1959, the Fairfax County BOS responded to the defeat of the Freehill Amendment with a new comprehensive plan (the date of the new plan is listed as 1958, but the plan contains a zoning map dated 1959; the plan was adopted September 1, 1958 [before the defeat of the Freehill Amendment]). The plan states

The adopted Plan of Residential Development dated 1 September 1958 reflects the Freehill Amendment, but after the defeat in Court of this Amendment, the Board of Supervisors adopted a zoning map dated 1 September 1959 which eliminated the indiscriminate rural two-acre zoning areas and provided for specific two-acre zoning areas which were determined through staff study and owner petitions that certain areas be zoned for two-acre residential use (Fairfax County Planning Division, 1958, p. 7).

Although the aforementioned passage refers to some 2-acre minimum lots, Dawson (1977) and Jantz (2000) note the prevalence of 1-acre lots, which contributed to significant development in the 1960s. In 1962, Fairfax County staff recommended the adoption of several different zoning categories, such as agricultural, conservation, flood plains, airport and flight hazard, large-lot, and clustered development (Fairfax County Planning Division, 1962). Yet, between 1960 and 1970, population, school enrollment, and the county's budget increased by 83%, 133%, and 300%, respectively (Dawson, 1977), and Dawson notes that the 1960s BOSs "took little interest in channeling growth" except for the case of the planned community of Reston (p. 23). Peters (1974) confirms Dawson's evaluation of the BOSs in the 1960s, noting that

Although the three boards that served from 1960 to 1972 became progressively more aware of the need to regulate growth and adopted more sophisticated controls, they left the initiative for development in private hands. They acquiesced to most housing industry requests for both diversified residential uses and rezonings to higher densities. . . . Their primary response to the mushrooming growth pressures was decisionmaking in a case-by-case review of rezoning applications (p. 27).

Still, interest in controlling, managing, or shaping future growth had not dissipated. Planners appeared to have this interest, based on this passage from the 1965 Land Use Survey, which emphasized a desire to have a different kind of growth in the western portion of Fairfax:

Approximately 90 per cent of vacant land, however, lies in the western portion of the county. It is here that the future of the county lies. Proper use of this land according to a comprehensive plan is mandatory for sound development, development that is in sharp contrast to the urban sprawl to the east (Fairfax County Planning Office, 1965, p. 8).

As noted later in this report, newspaper articles showed the public's interest in the topic of growth management, although not everyone agreed as to how growth should be managed. The sea change in the BOS policies, however, occurred with the 1971 election. Peters (1974) notes that the BOS elected in 1971 "rejected their predecessors' relatively passive approach to land use regulation" (p. 49), and Dawson (1977) notes that such BOS members were "determined to make some changes" with respect to development and growth control (p. 26).

A 1973 study commissioned by Fairfax County documents the county's interest in growth management and its realization that zoning was not likely to be an effective tool for growth management (Cox and Burt, 1973). The study examined legal and administrative techniques that could be used to implement a "development control/contribution system" (p. 3). At the time, based on a review of case law and Virginia statutes, the authors concluded that using zoning to control growth was not likely to be a successful strategy without further enabling legislation. The authors did not refute entirely the possibility of managing growth but summarized their findings with respect to zoning as

Land use control ordinances enacted with the justification of conserving municipal resources or avoiding large expenditures for public facilities have generally been invalidated upon findings that either the intent or the result of such ordinances was to unconstitutionally exclude "thrifty and respectable citizens" from the community (Cox and Burt, 1973, p. 34).

Their work shows the county's continued interest in controlling growth through zoning mechanisms and that the legal feasibility of success had been shown to the county to be highly questionable. The study lends credence to the concept that the county would be interested in other techniques that could manage growth. These techniques included bans on new construction permits in a portion of the county in 1972 (Willmann, 1972) and 1974 "emergency ordinance . . . [that] . . . stopped county consideration of site plans, subdivision plans, rezonings, special permits, and development plans which had not already received county approval" (Nicol, 1974a, p. B10). Growth management techniques also included sewer allocations.

### **Attempts to Manage Growth Through Sewer Allocations: 1970–1975**

In 1970, the Federal Water Pollution Control Act was passed to protect water quality throughout the nation. As a result of this legislation, the Virginia State Water Control Board started to require local governments to construct only large-capacity sewer systems (Jantz, 2000). In general, the construction of sewer systems relieves developers of having to construct their own sewer and septic systems, making it more attractive for landowners to develop land because of the lower cost (Popper, 1981). Once a large-capacity sewer system was constructed, more lands were potentially available for development because of the availability of water and sewer services (Jantz, 2000; Popper, 1981).

Accordingly, the county attempted to use the allocation of sewer capacity to slow development in particular locations. The county "instituted a time-phasing procedure that curtailed distribution of available capacity at the Blue Plains treatment plant" (Peters, 1974, p. 51). The denial of available sewer capacity was challenged in court, with the local courts ruling in the 1973 *Alexander Feldman v. Board of Supervisors* (Circuit Court of Fairfax County) that by withholding sewer taps, "the county was practicing growth control rather than protecting the general welfare" (Dawson, 1977, p. 26). The county's interest in growth management at the time was apparent; for example, in 1972 the county had voted to "use most future sewer grants to reduce the sewer fees charged county residents rather than to expand sewer capacity to accommodate more population" (Bredemeier, 1972b, p. B3).

In addition to challenges from the courts, individual jurisdictions and the state could also pressure Fairfax to increase sewer capacity. Notably, the State Water Control Board had the

option of building a regional plant. Had Fairfax chosen not to cooperate, then as reported in the *Washington Post*, the chairman of the state board had noted, “the county could be shut off from state and federal funding for alternative methods of sewage treatment” (Nunes, 1974). Similarly, the town of Herndon at the time was also interested in building a plant; had Fairfax ultimately been uncooperative, the county would have lost any control over sewer hookups once they were built (Nunes, 1974).

With respect to a different treatment plant—the Lower Potomac treatment plant—Peters (1974) explains that the courts did allow sewer hookups to be denied because the county could prove that pollution, rather than growth control, was the reason for denying new sewer connections. Still, restrictions on sewer allocation did not serve their intended purpose of stopping or slowing growth but instead had four unintended consequences:

1. *Sewer restrictions increased the speed of development.* Developers feared that development in the entire county might soon be stopped, thus they accelerated new construction (Dawson, 1977).
2. *Developers increased the use of septic tanks* instead of being delayed by waiting for sewer taps (Dawson, 1977).
3. *The county was pressured to increase sewage capacity.* In response to the county successfully showing that water quality was the reason for restrictions on the Lower Potomac treatment plant, the Virginia water control board required that Fairfax improve its water quality at the plant. Yet doing so would then enable the plant to permit more sewer connections (Peters, 1974)!
4. *New growth was dispersed but not reduced.* In response to the increased use of septic tanks, the BOS increased the minimum lot size from half an acre to a full acre (Peters, 1974). Development continued at the same rate but consumed more land (Dawson, 1977).

Popper stated: “The construction of sewer systems has contributed to the feverish and speculative growth of communities as diverse as Fairfax County, Virginia, Tulsa, Oklahoma; and Lake Tahoe, Nevada” (Popper, 1981, p. 35).

### **Attempts to Manage Growth through the Planning and Land Use System: 1973–1975**

The strong interest in managing growth by the BOS elected in 1971 was also noted by Peters (1974), who described the BOS’ strategy as four separate initiatives: instituting a moratorium on rezoning, restricting sewer capacity, increasing the minimum lot size for using septic tanks from 1/2 to 1 acre, and slowing the pace with which rezoning requests were processed. It was the failure of these four approaches to manage growth that led the BOS to look at integrating transportation and land use as a possible technique (Peters, 1974). In 1973, the newly elected BOS passed a resolution to start the countywide Planning and Land Use System, which was commonly referred to as PLUS (Dawson, 1977). PLUS set out to combine in a single document nearly all the recent planning and growth management techniques



at the time and to “integrate all municipal activities into a broad coordinated process” (Dawson, 1977, p. 2). The process for creating PLUS lasted 18 months and cost \$1.5 million to complete (Dawson, 1977). More than 100 “planners, architects, economists, demographers, statisticians, lawyers, engineers, and administrators” were hired to develop PLUS, and the explicit intent cited in the news at the time was to manage growth, given that only about half the county’s acreage had been developed (Nicol, 1974b, p. D1).

To its credit, PLUS did improve citizen participation in major planning decisions (Peters, 1974; Dawson, 1977). However, it did not significantly stop growth or significantly rechannel growth for at least two reasons that Dawson described:

1. *Citizen involvement was a strong part of the process, and the citizens who participated did not want substantially different land use patterns than what were already present.* Dawson (1977) wrote:

Despite the alleged desires of the citizens to control growth and preserve the environment, an effect of their input was to perpetuate the low-density sprawl pattern of development that currently exists in the county, a pattern planners assert will eventually worsen rather than improve the environment (p. 111).

The fact that PLUS was culminating in 1975—an election year—may also have contributed to individual supervisors ensuring that the plans represented interests of their districts as opposed to those of the county at large (Dawson, 1977). A logical inference is that a particular supervisor might push for low-density development in his or her district even if higher density might enable the county to accommodate the growth overall.

2. *Planners did not know whether they should design a transportation system to support a given land use or whether they should design land development that could be supported by a given transportation system.* The conflict was described in the context of daily work between transportation and land use planners:

Throughout the PLUS program, this “Chicken and Egg” problem recurred. The transportation planners in the planning office contended that they could do a transportation plan and impact analysis only when they were told what the planned land use would be in undeveloped areas of the county. The land use planners insisted that they couldn’t plan land use without knowing what kind of transportation system would be available to support additional growth (Dawson, 1977, p. 87).

In sum, PLUS did entail an analysis that showed that a major land development, notably “nodes of high-density development and outlying concentrated employment centers” would improve travel (Dawson, 1977, p. 88). Yet citizens did not want to see a *drastic* land use change. An inference is that although congestion was a problem, the cure of high-density development was worse in the eyes of the citizens who participated in PLUS.

## Attempts to Manage Growth through Fewer Roads: 1965–1975

Another growth management tool was the removal of planned transportation facilities altogether from transportation plans. Certainly traffic congestion was viewed as a product of growth by some; referring to a more than doubling of county vehicle miles traveled over a 10-year period, Peters (1974) wrote: “Both affluence and lack of planning administration are to blame for the crowded conditions” (p. 7). What is less clear is the extent to which the county leadership, as opposed to the general public, viewed transportation as a root of growth.

### *Northern Virginia’s Major Thoroughfare Plan*

In the early 1960s, each locality surrounding the Washington, D.C., metropolitan area produced separate transportation plans that illustrated proposed freeways and roadways that were needed to facilitate future growth (Lockwood, R., personal communication, 2005).

Ultimately, three freeways were removed from a 1965 plan adopted by the Fairfax County BOS (Fairfax staff described the 1965 document as the “Major Streets and Highways Plan”): the Monticello Freeway, the Potomac Freeway, and a cross-county highway stretching from the George Washington Parkway into Maryland (Owolabi, R.O., personal communication, 2003).

In 1969, the firm of Hayes, Seay, Mattern and Mattern combined the transportation plans of the surrounding counties and developed and produced a comprehensive highway network plan for the entire Northern Virginia area (personal communication, R. Lockwood, 2005). The firm performed traffic assignments for the region and determined that the plan they presented would provide transportation needs through the mid-1980s. Later documents describe the title of this plan as the *Northern Virginia Major Thoroughfare Plan to Meet 1985 Needs* (Northern Virginia Transportation Coordinating Council, 1999). The plan was designed for transportation needs through the mid-1980s and illustrated major expressways that crisscrossed Fairfax County, including the Monticello Freeway (Hale, 2001). Plate 1 in the plan, entitled “Recommended Major Thoroughfare Plan—1985,” shows many freeways that were never built (Hayes, Seay, Mattern & Mattern, 1969b; Lockwood, R., personal communication, 2005). The 1969 plan included more than \$600 million of highway improvements for Fairfax County alone, with almost four-fifths of these being construction improvements as opposed to right-of-way costs (Hayes, Seay, Mattern, and Mattern, 1969a).

Although VDH was responsible for the study, the study does not appear to have been formally published. No mention was made in newspaper articles at the time, and the plan cannot be found in the State Library of Virginia or the WorldCat database maintained by the Online Computer Library Center (OCLC). Moreover, a reading of the plan does not clarify if it was published (Hayes, Seay, Mattern, and Mattern, 1969). The title page notes it was published for VDH in cooperation with the various Northern Virginia jurisdictions (cities of Alexandria, Fairfax, and Falls Church; counties of Arlington, Fairfax, Loudoun, and Prince William; and towns of Leesburg, Manassas, Manassas Park, and Vienna). The plan notes that it was reviewed by representatives of VDH and “local governmental jurisdictions at various stages of

development” and finally suggests it may simply represent a summary of work to date rather than an interjurisdictional resolution:

Work on this study had to be terminated at a point, however, in order that the report could be produced and distributed. It may be anticipated that current and continuing activity in the study area will result in some discrepancies and conflicts with the plan, but this should not impair its usefulness as a tool in the continuing transportation planning process (Hayes, Seay, Mattern, and Mattern, 1969a, p. 4).

It appears there was some disagreement between the decisions of the localities and the VDH plan. The Pimmit Parkway, which had been removed from the county master plan by the BOS in 1965 or 1966 (Sterago, 1966), is found on the 1969 plan under a different name: Pimmit Run Expressway. The Potomac Freeway had been taken off the county’s highway and freeway plan by the BOS in 1965 but was again found on the 1969 thoroughfare plan with the same name (Buehrer, 1965).

In total, the plan showed seven freeways: Bluemont Expressway, Four Mile Run Expressway, Monticello Freeway, Northern Virginia Expressway, Outer Beltway, Pimmit Run Expressway, and Potomac Freeway (Hayes, 1969b). It appears that pieces of only two of these were built. (Today’s Jack Herrity Parkway resembles half of the 1969 proposed Outer Beltway. That portion is from Route 7 to a point south of Fairfax City. Today’s Jack Herrity Parkway also resembles part of the 1969 Northern Virginia Expressway. That portion is from a point south of Fairfax City to I-95.) An excellent comparison of suggestions from the 1969 plan and actual construction, along with detailed maps, is available on the Internet (Hale, 2001).

#### *Controversy Surrounding Proposed Freeways*

Although the Northern Virginia major thoroughfare plan was a technically sound study, significant controversy arose (R. Lockwood, personal communication, 2005). There appear to be several reasons for this controversy, as discussed here. Although the literature does not refer directly to the 1969 comprehensive plan, it does note some opposition to new freeways in general.

*First, the roads were unpopular with a segment of the population that wanted to reduce growth and viewed roads as a catalyst of growth.* Referring to a proposed outer beltway, a 1974 article noted that its main effect “would be to open for growth” the area between that new facility and the existing Capital Beltway (Eisen, 1974, p. G1). *The Washington Post* had editorialized ten years earlier upon completion of Interstate 495 (the Capital Beltway that was in effect an inner beltway) that “Every new road brings with it a burst of new development” (Closing the Ring, 1964). The tone of these two sources is not identical: in the investigators’ opinion, Eisen appears to view a proposed new road in a moderately negative light whereas the *Washington Post* appears to celebrate a newly constructed road’s completion but warn of the need for land planning adjacent to the interchanges. Both sources, however, acknowledge a link between new road construction and growth. In fact, in reference to the “1960’s and early 70’s” [a time that would have encompassed the 1969 comprehensive plan] Jantz writes that development was “primarily controlled by the proximity of land to the established transportation routes” (Jantz, 2000, p. 35).

*Second, the negative localized impacts of road construction contributed to the controversy.* Newspaper accounts described the controversy that arose because of neighborhoods being disrupted or businesses being relocated; such arguments could arise even with smaller scale improvements to existing roads. Writing for *The Washington Post*, Ringle described citizen opposition to the widening of an 1.8-mile stretch of Sherwood Hall Lane from two to four lanes, where the removal of trees and the increased traffic were fiercely denounced by some citizens.

The Sherwood Hall project is no North Central Freeway or Three Sisters Bridge dispute. But it is one more example of the clash between private interests and public policy that with increasing frequency seem to have marked many local road projects (Ringle, 1971, p. B2).

*Third, some planners were not opposed to growth overall but instead wanted to use roadway investments to influence the direction of growth.* Dawson (1977) wrote that

Fairfax County planners see transportation improvements as a tool for growth management. They would prefer to improve roads selectively and to locate new facilities in accordance with the preferred location for growth, allowing road congestion to increase in areas where they wish to encourage use of mass transit (p. 8).

In short, based on Dawson's (1977) observation, at least some planners viewed roadway investments as a way of shaping where growth could occur. An article at the time suggesting that Fairfax planners viewed transit as a viable option in lieu of substantial additional roadbuilding lends credence to Dawson's observation (Grubisich, 1975). Other articles from the early 1970s also suggested a preference for transit as at least a partial substitute for roadbuilding (Mathews, 1972; Bredemeier, 1972a).

*Fourth, freeways were viewed as competitors of transit.* Although the Monticello Freeway, the Potomac Freeway, and the Cross-County Freeway were proposed in the early 1960s Fairfax County transportation plans, the BOS had voted to postpone action indefinitely in 1962. One reason was the National Capital Transportation Agency's plan to incorporate mass transit in the Washington, D.C., metropolitan area to help with transportation issues (Munsey, 1962b). During the mid-1960s, some Fairfax supervisors thought of the planned Metro as another option to road construction. A statement by BOS Chairman Joseph Parrish in reference to the Potomac Freeway was:

From a viewpoint of pure planning and engineering it may be fine, but from a viewpoint of practical planning and politics, it's something else again. From a political viewpoint, and as a transportation facility, it approaches the ridiculous (Love, 1965, p. 3).

The article also quoted the chairman as saying: "It is time for the staff and governing body to take steps to promote rapid transit" (Love, 1965, p. 3). In 1975, the comprehensive plan developed by county staff that was presented to the BOS called for "no new roads or additional lanes on present roads for Washington-bound automobiles over the next decade" and instead envisioned within 12 years the use of "buses that would travel on special lanes of existing major highways leading toward the capital" (Grubisich, 1975, p. C4).

Yet, it is important not to oversimplify the four reasons for this controversy. For example, with regard to the fourth reason, that freeways were competitors to transit, although some persons may truly have wanted no more freeways in an effort to promote transit, the picture that emerges from some of the details reported in the press is more nuanced. In 1974, a Fairfax County official did note the importance of reducing transit time through improvements such as fringe parking lots and express bus lanes. Yet the article also reports that the same official noted that “some highway improvements must be made to provide minimum access by car to such areas as Pohick and to allow local bus circulation” (County Highway Needs Sizable, 1974).

The desire to link transportation and land development is also evident from the manner in which transportation projects programmed by VDH are discussed in the county’s 5-year capital improvements program (CIP). The 1974 CIP states that the “lack of an adopted Countywide transportation plan and a staged land use plan has limited the programming of highway improvements in accordance with growth policies or in relationship to land use” (Fairfax County Office of Comprehensive Planning, p. 295). This statement appears to be in reference to the fact that PLUS, in May 1974, was still underway and thus no revised land use plan had been adopted. Accordingly, county staff provided no commentary on the VDH Six-Year Improvement Program (which is unusual for a CIP, which tends to show the rationale for performing or not performing various projects). Instead, the CIP states that in the future, PLUS would result in land use plans that should influence the VDH program:

It is expected that the plans being prepared under the PLUS program would provide the basis for influencing the State’s programming process and the programs towards reflecting road improvements based on growth and land use policies (Fairfax County Office of Comprehensive Planning, p. 297).

### *Rationale for Removing Roads from Transportation Plans*

The removal of proposed transportation facilities from Fairfax County transportation plans during the 1960s and 1970s is documented extensively in the regional newspapers and documentation of the time. As early as 1962, an article stated: “The highway master plan has been the subject of controversy since it was recommended by County planners almost two years ago” (Munsey, 1962a). The article specifically noted three contentious routes: “the Pimmit, Monticello, and Potomac freeways” (Munsey, 1962a). The controversy was not a one-time occurrence but rather was sustained. For example, *The Washington Post* reported in 1966 that Fairfax County was “against a proposes [sic] Pimmit Run Freeway” that was in a “master plan for Northern Virginia” prepared by the “Northern Virginia Regional Planning and Economic Development Commission” (Opposition Expected, 1966). The literature also noted the growth position of some elected officials or candidates at the time; for example, Jean Packard, who lost the election for BOS chair to Jack Herrity, was quoted as saying: “Fairfax must maintain our quality of life by stopping wildfire growth” (29 Candidates, 1975).

However, there is no documentation explicitly stating that Fairfax County officials removed proposed transportation facilities from long-range plans and funding programs in an effort to control growth. To ascertain whether such a link was possible, several persons familiar

with decisions at the time were contacted by telephone. Shiva K. Pant, the county's chief transportation planner in the early 1970s, recalled:

Prior to the initiation of the PLUS program in 1973, the Board voted to remove several major planned roadways from the County's adopted Comprehensive Plan, including capacity-enhancing facilities such as the Monticello Freeway, the Pimmit Parkway, the Northern Virginia Expressway and the Potomac Freeway.

The Board's motivation for removing these roads from transportation plans was to manage growth. However, this removal was not the only method through which the Board had sought to manage growth.

Instead, the Board had previously tried to manage growth through other methods, notably [zoning moratoriums and] sewer restrictions. These methods had been overturned by the Courts. Thus, prior to the initiation of the PLUS program, the removal of roads from the transportation plans was viewed by the Board as another avenue for managing growth (Pant, S., personal communication, 2005).

Similarly, J. Hamilton Lambert, who in 1976 served as Fairfax County's acting county administrator, concurred:

During the early 1970s, the County generally tried to manage growth through (1) zoning restrictions and the planning process and (2) sewer and water control. Transportation needs were generally a lesser issue. During the early 1970s, there was a viewpoint held by some parts of the citizenry and some parts of the governing body that "if you don't build the roads, then people will not come." There was a view held by some Board members at that time that by not building certain major roads, growth could be reduced (Lambert, J.H., personal communication, 2005).

Other documents show that a limited transportation infrastructure program was deliberate. For example, the 1975 county plan states as a preface to its "Transportation" section that the level of service (LOS) for highways and transit would be poor and that this decision results from practical considerations. Yet the plan does not state that growth control through reduced transportation improvements was the specific goal. Rather, the plan identifies various transportation and transit improvements and introduces these improvements with a passage stating

... it is neither economically nor environmentally possible to meet the travel demand generated by the proposed land uses. The plan has attempted to accommodate the demand generated at a level of service lower than that conventionally recommended for design purposes. This was done primarily to reduce facility requirements and incorporate citizen and task force positions toward minimizing major highway improvements (Fairfax County [Board of Supervisors], 1975, pp. II-T-1).

### *Changes in the Fairfax Board After 1975*

The elections of November 1975 changed the composition of the BOS and the county's attitude toward growth. As noted by Lambert, and as suggested by a reading of newspaper articles from that period, the election of three new supervisors (John F. Herrity, Marie Travesky, and John Shacochis), combined with the reelection of Martha Penino and Joseph Alexander, gave a five-person majority on the BOS that had a different attitude toward growth than the previous BOS (Lambert, J.H., personal communication, 2005; Rosenfeld and Scaberry, 1975). Herrity, who in the previous term

was supervisor of the Springfield District and was elected BOS chair in 1975 and took office in January 1976, noted:

In January 1976, Fairfax County's "growth policies changed." Three distinct events occurred in a single meeting: the sewer moratoriums were lifted, economic development was promoted, and Interstate 66 was put back on the map. Further, in 1977, the Springfield Bypass (which eventually became the Fairfax County Parkway) was also proposed (Herrity, J.F., personal communication, 2005).

In 1982, the Fairfax County Chamber of Commerce concluded that the 1970s BOS had "bowed to the complaints of some vocal residents and removed roads from the region's transportation plan" and that this action was the root cause for Fairfax County's transportation problems in the 1980s (Fairfax County Chamber of Commerce, n.d.). Newspaper articles from the 1980s also refer to the failure to construct various roads as a contributing factor to traffic congestion (Berry, 1986; Specter, 1986).

The promotion of economic development that started in 1976 was significant. In fact, Gerald L. Gordon, current president and CEO of the Fairfax County Economic Development Authority, noted that Herrity formed a blue ribbon panel composed of elected officials and the business community to address a very clear charge: How will Fairfax develop over the next 14 years? (Gordon, G.L., personal communication, 2003). The motivation for this group was (1) a high residential tax burden in 1976 and (2) an expected influx of an additional 345,000 residents by 1990, which could push the property tax higher. The specific target of this group was to increase the business share of the real estate tax burden to 25% above its 1976 percentage of 11.76%.

In retrospect, the county raised the rate to 26.8%—a significant improvement. Accordingly, the property tax rate has dropped from \$1.74 per \$100 of valuation in 1976 to \$1.13 as of March 2005 (Gordon, G.L., personal communication, 2005). These results suggest that although the county did not deter residential growth prior to 1976, it has successfully attracted business growth since 1976.

Transportation implications are also evident. It is suggested that the location of employment in Fairfax has resulted in reverse commuting patterns, which may relieve some congestion that would have otherwise resulted had the majority of commuters still evidenced the traditional [radial] commuting pattern (Gordon, G.L., personal communication, 2005). After 1975, Fairfax viewed the location of employment centers in the western part of the county as one way of relieving traffic. The 1977 Fairfax County comprehensive plan noted that

It should be recognized that location of employment centers in western Fairfax County, as opposed to the core, would tend to disperse employment to some degree, and add to the expense and difficulty of serving as many trips by transit. However, it is a very effective method of reducing requirements for radial highways, which cannot be met under present housing and employment locational trends (Fairfax County Comprehensive Plan, 1977, p. 433).

## Lessons Learned from the Fairfax County Case Study

The problem statement posed by TPRAC suggested that Fairfax County officials removed roads directly from transportation plans as a sole means of controlling growth. That is not the case. Instead, between 1956 through 1975, Fairfax County experimented with a variety of growth management efforts, including minimum lot sizes (in the late 1950s) and zoning moratoria, sewer allocations, and an increase in the lot sizes for septic tanks (all in the early 1970s).

Instead, it *appears* that the removal of roads from transportation plans may have been one component of a growth management strategy, although other reasons are possible. As documented by the newspaper articles cited in this report, although there is evidence that the county wanted to manage growth and although there is evidence that planned roads were not built, there is not explicit documentation that links the *county's decision not to build roads* to the *county's desire to manage growth* except for interviews with primary sources, as described earlier. Those sources strongly suggest that removal of roads from plans was a deliberate growth mechanism *after 1971*. The interviews, however, do not cover in detail the period prior to 1971, and the literature suggests that a variety of reasons existed for removing roads from plans *prior to 1971*.

Certainly it is *possible* that before 1971, growth management was *the* reason for removing roads from plans. The aforementioned 1964 editorial, for example, showed a sentiment that new road construction could spur growth (Closing the Ring, 1964). Other articles at the time reported the view that roads influence the location of new development (Eisen, 1964; Willmann, 1964). However, prior to 1971, there does not appear to be *proof* that the county's decision not to construct roads was definitely due to the county's explicit desire to manage growth, as opposed to other reasons for removing roads from plans, such as encouragement of mass transit (Grubisich, 1975; Munsey, 1962b) or a desire for roads not to disrupt specific and existing neighborhoods (McLean's Road Issue is Shelved, 1965).

It is difficult to pinpoint a single decision made by the Fairfax BOS between 1955 and 1975 that could have led to successfully controlled growth given the market demand in Fairfax County and the legal precedents established during the period. The BOS could have attempted to channel growth differently, but legal constraints at the time did not seem to allow a locale to eliminate growth.

Yet the ease of hindsight cannot be overstated. As aptly described by *The Washington Post* in 1986: "If it is easy now to notice inadequacies in Virginia's road system, it was not that simple 20 years ago" (Specter, 1986). In fact, a prescient editorial in the same newspaper 22 years earlier, in reference to the completion of Interstate 495, had concluded that "The long-term consequences of this new beltway can only be dimly seen as the ritual ribbon is cut today" (Closing the Ring, 1964). Yet what insights could have been helpful in the 20 years between 1955 and 1975? That is, without the benefits of looking backward, are there any lessons that could have improved the Fairfax experience?



The investigators suggest at least four inferences that apply to growth management practices that may be gleaned from the Fairfax experience. These are termed *inferences* because they appear plausible based on observations by the investigators but they are not incontrovertible.

1. *Voters' decisions are contextual.* As was shown with PLUS, citizens who might have wanted to improve transportation services countywide had still considered first how such decisions affected their own neighborhood. Generally, citizens wanted a continuation of lower density residential development where they lived, despite the possibility that higher concentrations of development might have eased traffic congestion countywide.
2. *When the market exists for growth in a location, growth will come.* Notably, restricting sewer taps in the early 1970s had unintended consequences because market forces caused them to be used in a different manner than what was intended. Whether the removal of roads from plans prior to 1972 was done to manage growth or not, it is evident that the failure to construct roads has not impeded residential growth in Fairfax. (It appears that the strategy followed after 1976 of choosing a type of growth to attract is more feasible than preventing it entirely, although this report does not look at developments after 1976 in detail.)
3. *Legal restrictions or the threat thereof affect what counties can implement.* Fairfax County could not restrict sewer taps, for example, unless there was a clear environmental reason to do so (Dawson, 1977; Peters, 1974), and there were clear restrictions on how zoning could be used to manage growth (Cox and Burt, 1973; Fairfax County Planning Division, 1962). In fact, PLUS arose in part because other growth management techniques had failed—partly because of restrictions on behalf of the courts (Peters, 1974).

More recent literature cautions against drawing the blanket assumption that Virginia's "Dillon Rule" status, a status in which any power enjoyed by a locality must spring from an express grant by the legislature, is the source of all legal troubles (Richardson, Gough, and Puentes, 2003). However, a reading of Fairfax's history suggests that the courts strongly influenced what the county could do to manage growth. As noted by the press at the time, the threat of action by another entity (such as the town of Herndon or the State Water Control Board) also limits what a single locale can accomplish (Nunes, 1974).

4. *Quantitative studies may be able to clarify opposing positions, but only up to the point where this information can be translated into action.* For example, the concept that congestion might divert some motorists to use transit is reasonable. Eventually, as has been observed in some urban locations, sufficient congestion will cause persons to change to another mode if the mode can provide faster service. A quantitative study might have enabled VDH and Fairfax County to agree on what those congestion levels (and associated transit service levels) were. However, had even such a rigorous study been available (and somehow the assumptions and

projections had been uncontested), there could still have disagreement about how the county and specific neighborhoods should develop—even if each side could clearly see the consequences of high versus low density zoning in specific locations. A quantitative study appears to have been helpful with regard to the forecast of population in 1976 combined with an assessment of the tax rate, where the extra population would logically have increased the tax rate had business development not been encouraged.

### **Route 3 Corridor (Spotsylvania County)**

The Route 3 corridor is approximately 3 miles long and is located in Spotsylvania County. The highway is bounded by I-95 to the east and Route 610 East (Five Mile Fork) to the west. The section is approximately 50 miles from Washington, D.C., and Richmond, Virginia. Land along this section of road has been developed in two layers since the completion of I-95 in 1964. The first consists of residential areas with access to Route 3. The second consists of large retail centers such as the Spotsylvania Mall, directly adjacent to Route 3, as commercial strip development.

#### **History of Growth in the Route 3 Corridor**

Figure 1 suggests the five periods of growth in Spotsylvania County. They are described in time periods as follows:

1. *Before the construction of the interstate system: 1950-1964.* Spotsylvania did not have high growth as did Northern Virginia immediately following World War II. The transportation infrastructure of the 1950s and early 1960s could not support high volumes of commuter traffic from Washington, D.C., to Spotsylvania. Figure 2 shows the 3-mile study area as it existed in 1953.
2. *Immediately after I-95 was completed but before development occurred: 1964-1970.* As was the case for the preceding decades, growth was primarily influenced by the City of Fredericksburg.
3. *First period of rapid growth: 1971-1979.* Spotsylvania's population doubled during this decade, reaching 34,000 by 1980. Growth was influenced by the Washington, D.C., metropolitan area (Spotsylvania County [Board of Supervisors], 1979). Visually and operationally, Route 3 was transformed. Subdivisions and commercial strip centers replaced farmland; some entrances were given their own traffic signal without interconnectedness between the parcels such that travel between them required using Route 3. As a consequence, the throughput of Route 3 decreased since volumes increased (every local trip was on Route 3) and capacity declined (because of the increase in signalized access points).
4. *Short decline in development: 1980-1983.* During the economic recession, two major events occurred that shaped the future developmental path of the county. An

annexation agreement with the City of Fredericksburg guaranteed the county the large commercial tax base located along the Route 3 corridor for at least 30 more years, since the city would not annex additional land. Further, the 1978 closure of the FMC cellophane manufacturing facility—one of the largest in the world—left the county with a 7-million-gallon-per-day industrial wastewater treatment plant that was converted into a cleanser for municipal wastewater (Payne, 1985). With water and sewer services provided by this facility, development could continue unabated.

5. *Accelerated growth: 1984 to present.* The area became one of the fastest growing counties in Virginia; population increased from 34,000 in 1980 to more than 90,000 in 2000. Although historical employment figures for Spotsylvania alone are not available prior to 1991, from 1984 to 2000, employment for the combined area of Spotsylvania County and the City of Fredericksburg more than doubled (NPA Data Services, Inc., 2003). There was a slight dip in employment in 1991 likely attributable to the recession, but the combined employment for the two areas climbed thereafter. Employment data are available for the jurisdictions separately for the period 1991 through 2000; these data show Spotsylvania’s employment increased substantially relative to that of Fredericksburg’s (Weldon Cooper Center, 2004; Virginia Employment Commission, 2005).

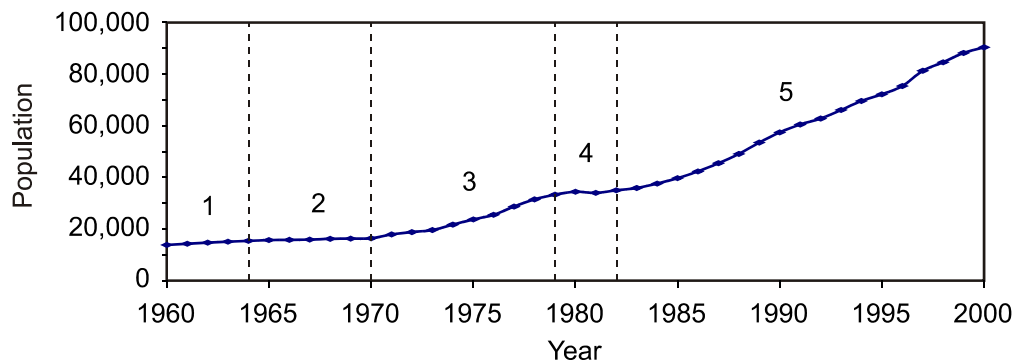
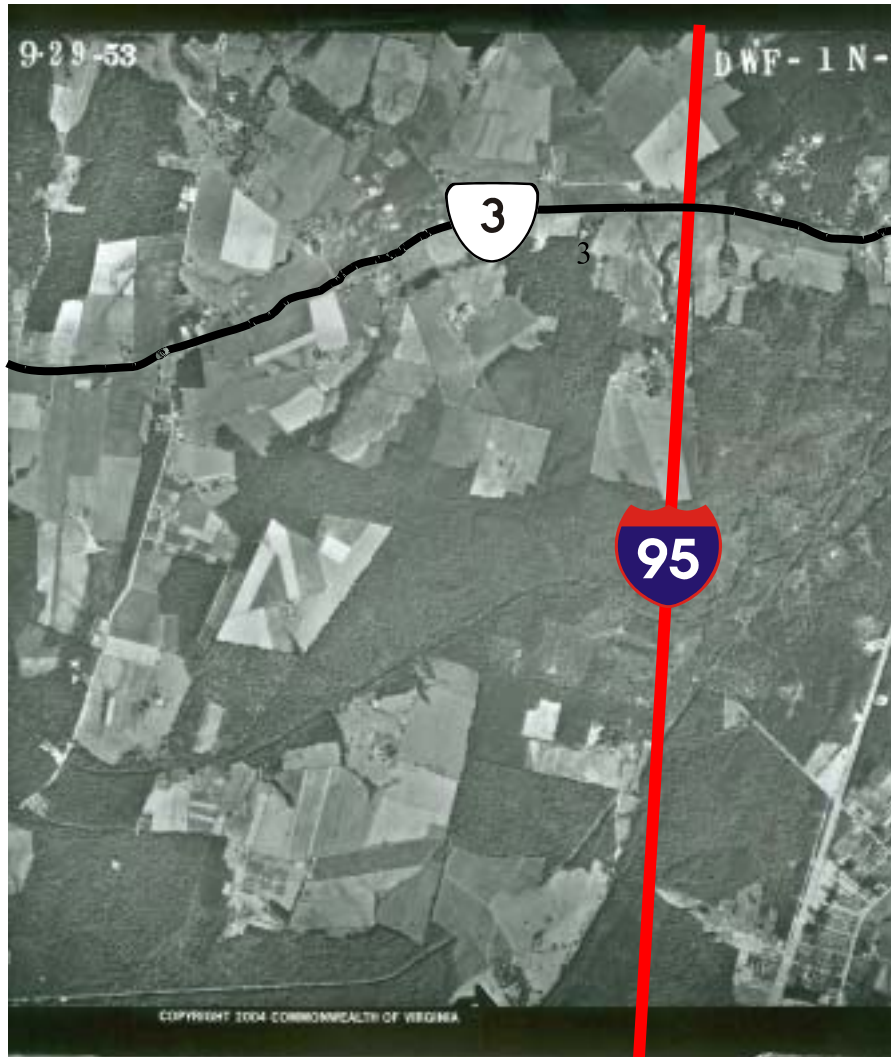


Figure 1. Population of Spotsylvania County (Weldon Cooper Center, 2003a; Weldon Cooper Center, n.d.c).

### Planners’ Response to Route 3 Growth

A review of the comprehensive plans prepared for the Route 3 corridor in 1964, 1980, 1987, 1994, and 2002 provides a wealth of data regarding the planners’ intentions for managing growth (Spotsylvania County Division of Industrial Development and Planning, 1964; Spotsylvania County [Board of Supervisors], 1979; Spotsylvania County Planning Commission, 1987; Spotsylvania County Planning Department, 1994; Spotsylvania County Office of Planning, 2002). Related documents such as a 1977 student project (Payne, 1977), a 1985 comprehensive plan review (Payne, 1985) and a 2001 Environmental Impact Statement (VDOT, 2001) illustrate some of the issues that members of the public or planners may have considered at the time of the comprehensive plans, although such documents do not necessarily represent the views of Spotsylvania at the time.



**Figure 2. Proposed I-95 Corridor and Existing Route 3 Corridor in 1953**

*1964 Comprehensive Plan*

The 1964 comprehensive plan (Spotsylvania County Division of Industrial Development and Planning, 1964) is a series of 10 reports. The plan declares in its future land use summary that its objective is to “present proposals for location of existing and future land use development correlated with existing and future streets and highways to achieve a more integrated, closely related pattern of land usage” (Spotsylvania County Division of Industrial Development and Planning, 1964, Report 9, p. 1). Thus, Spotsylvania County’s early connection between land use and transportation was clearly outlined in the plan. Yet the impact of I-95, completed the same year, was given minimal attention. In fact, the expected dominant growth factor was not Washington, D.C., or I-95 but rather the adjacent city of Fredericksburg. Given that Fredericksburg in 1960 had a population of 13,639—almost identical with that of Spotsylvania’s at the time (13,819) (Weldon Cooper Center, n.d.c.)—it was reasonable for planners to write: “In considering the development of a future planning program for Spotsylvania County, the one

dominating factor that must be taken into consideration is the county's close proximity to the City of Fredericksburg" (Report 9, p. 1).

With the perspective of hindsight, it is evident that population dispersion from Washington, D.C., and the use of I-95 as a local road were not evident at the time. Yet planners also admitted this uncertainty regarding I-95. The 1962 Major Streets and Highways Plan (another report within the 1964 comprehensive plan), states simply: "Existing Route 1, south of the Interstate 95 interchange, is shown with a future 110-foot right of way until Interstate 95 is constructed and its effect on the area determined" (p. 6).

### *1980 Comprehensive Plan*

A 1977 student project suggests issues that may have been discussed by some members of the public prior to the 1980 comprehensive plan. The impact of the interstate system was evident, with the 1977 document noting that the forecast widening of I-95 would increase commuter traffic to Washington and Richmond (Payne, 1977). It was also evident that Route 3 has a finite capacity, which could be exceeded by intense commercial strip development. The document further noted that a failure to control future access points would threaten the road's ability to serve as a major transportation corridor in the future (Payne, 1977).

The 1980 comprehensive plan alluded to the goal of concentrating future residential development. The plan states as one of its objectives: "Encourage community development activity within areas that have evolved as residential and economic communities historically as opposed to rural undeveloped areas" (Spotsylvania County [Board of Supervisors], 1979, p. 3) as well as the need to avoid "scattered and isolated developments" (Spotsylvania County [Board of Supervisors], 1979, p. 5). By 2000, the county intended two-thirds of its population to be within a "primary community settlement area," which was an area well served by public utilities (Spotsylvania County [Board of Supervisors], 1979, p. 15).

The 1980 plan also noted the phenomenon of strip developments (Spotsylvania County [Board of Supervisors], 1979); in fact, the transportation element of the comprehensive plan noted that concentration of commercial areas would "reduce the frictional problems associated with strip development" (Spotsylvania County [Board of Supervisors], 1979, p. 62). Alluding to what may signify an access management concern, the plan notes with specific reference to Route 3 that

The difficulty associated with commercial strip development near intersections and along major highways (strip development) can be resolved/managed through the application of site planning requirements. Both the public interest in Route 3 as a major highway thoroughfare and the private interests in prime commercial development potential and residential investment can be realized through specific site planning requirements, thereby accruing a net positive return to all interests along the Route 3 corridor (Spotsylvania County [Board of Supervisors], 1979, p. 30).

It is not clear whether this passage also refers to an idea suggested in the 1977 student project: "The developer should be required to assist in the provision of the needed facilities since he is creating or contributing to the need" (Payne, 1977, p. 46).

In 1981, VDH&T published a transportation study that encompassed the three jurisdictions of Spotsylvania County, Stafford County, and the City of Fredericksburg (VDH&T, 1981a). The study included a recommendation that Route 3 be widened from four to six lanes. The study quotes Spotsylvania's Planning Director as stating: "The improvements as set out will provide a base thoroughfare system compatible with and serving the expected future community development in Spotsylvania County" (VDH&T, 1981a, p. 49).

Interestingly, the study's forecasts of traffic volumes were quite accurate. The study used travel demand modeling to forecast traffic volumes and predicted that Route 3 ADT would increase to 51,920 vehicles per day (between Route 610 East [Five Mile Fork] and Route 639 East) and to 55,680 vehicles per day (between Route 639 East and I-95) (VDH&T, 1981a). VDOT's Traffic Engineering Division reported in 1995 that the section of Route 3 encompassing most of the two sections (e.g., a section between Five Mile Fork and the City of Fredericksburg) had an ADT of 57,000 (VDOT, 1995).

### *1985 Comprehensive Plan Review and 1987 Comprehensive Plan*

As noted by former Spotsylvania County planner John Taylor, the 1985 comprehensive plan review (Payne, 1985) illustrated that the county's growth had changed since the recession of the early 1980s and that the existing planning practices and documents did not provide the

necessary guidance to manage this growth and direct it for all the good of all Spotsylvanians. The implementation was not followed through to revise the zoning and subdivision ordinances in accordance with the comprehensive Plan. Revisions to the Zoning and Subdivision Ordinances followed soon after the adoption of the 1994 and 2002 Comprehensive Plans (Taylor, T., personal communication, 2003, 2005).

A reading of 1985 and 1987 documents suggests five topics that future plans would need to resolve:

1. *Although the growth boundary had successfully encouraged development within a confined area, the roadway could not accommodate the demand therein.* As more concentrated developments occurred in the growth boundary zone, improvements and additions to the transportation system within this zone did not follow, resulting in increased traffic and congestion. In 1985, Payne wrote: "Dense residential development can, and in some parts of Spotsylvania already does, seriously overtax secondary roads that were never designed to handle the number of vehicles that are now using them" (p. 29). The high-density development refers to eight units per acre that Payne described as apartments and townhouses.
2. *Residential development was not coordinated with transportation improvements.* The 1987 comprehensive plan states that the timing of development along inadequate secondary roads should be controlled through zoning until the transportation infrastructure is improved (Spotsylvania County Planning Commission, 1987).
3. *Access points along Route 3 were growing.* The 1985 comprehensive plan review noted that

a number of actions are possible, within the regulations of an amended zoning ordinance, to guide development in the Route 3 and Route 208 corridors. One action would be to control unlimited strip development and the proliferation of highway entrances by promoting shopping center type commercial development (Payne, 1985, p. 46).

The review goes on to suggest service roads, setbacks, and aesthetic improvements such as landscaping. The same language was incorporated into the 1987 comprehensive plan (Spotsylvania County Planning Commission, 1987). Thus, to the county's credit, it recognized that the management of access points, while being a transportation function within the purview of the VDOT, is driven by land use changes at the county level.

However, although the 1987 plan contains a "Transportation" section, these suggestions are in the main section entitled "Environmental Protection and Resource Conservation." Thus it is possible that the county was more concerned about the visual impacts of strip development rather than the impacts on the transportation system.

4. *The 1987 plan suggested specific ways in which developers could assist in transportation infrastructure improvements for secondary roads.* The 1987 plan noted: "development can either wait until the roadways are improved with public funds or the cost of the necessary improvements can be included in the overall costs of the development" (Spotsylvania County Planning Commission, 1987, p. 48).

The plan suggests the use of proffers (through conditional zoning) to improve roadway frontage immediately affected by the project. The plan also suggests an extension of this concept—which the plan notes would require enabling legislation in Virginia—where developers would be required to pay for "improvements away from the development site on roads that are impacted by additional traffic from the project." Finally, the plan discusses another access management concept for secondary roads—notably reducing residential driveway density on high-speed secondary roads with speed limits of 55 mph (Spotsylvania County Planning Commission, 1987).

Although the concept of changing land development patterns and/or obtaining funds from development to improve the secondary system was also discussed in the 1985 review (Payne, 1985), additional wording, such as the explicit use of the phrase "conditional zoning" and the concept that development could wait or could provide funds for necessary improvements) appears to have been added to the 1987 comprehensive plan.

5. *The county did not have a local transportation planner.* The 1987 plan noted that the 1980 comprehensive plan had simply not addressed transportation planning, a fact also evident from a review of the 1979 document containing the plan (Spotsylvania County Planning Commission, 1987). In fact, the 1985 review had called for the planning district to provide funds for a transportation planner (Payne, 1985). Although planning services were acquired from VDOT, these were not the same as a

local planner focusing exclusively on the county's interests. The specific critique appears to be the slow pace of roadway improvements. The plan states

With rapid growth, however, the questionable ability of the state highway department to plan and construct needed improvements on a timely basis when faced with serious budget constraints has forced localities such as Spotsylvania to explore a more active participation in transportation planning. With greater local participation and follow through, documents such as the Stafford, Spotsylvania, and Fredericksburg Area Transportation Study—Year 1995 Transportation Plan, prepared by the highway department in 1981, could become vital tools for influencing community land use decisions (Spotsylvania County Planning Commission, 1987, p. 45).

### *1994 Comprehensive Plan*

The 1994 comprehensive plan (Spotsylvania County Planning Department, 1994) appears to be substantially more detailed than the 1987 plan, outlining several points that need to be addressed. Although the 1979 and 1987 plans had outlined policies for specific land areas, they had not outlined policies for specific transportation corridors. They did suggest various improvements to specific roadways and differentiate policy by secondary road and primary road. The 1994 plan contained substantial details for specific transportation corridors: Route 3, Route 208, and Brock Road. In fact, 8 years later, this 1994 effort was referred to as the “county’s first transportation plan” (Spotsylvania County Office of Planning, 2002, p. 60).

The 1994 plan notes that Virginia “adopted the Chesapeake Bay Preservation Act in September 1989 to partially fulfill provisions of an interstate regional agreement made in 1984 between the states of Virginia, Maryland, Pennsylvania, and Washington, D.C.” (Spotsylvania County Planning Department, 1994, p. 30). Further, the act initiated the formation of the Spotsylvania County Planning Department in 1992. The reason was that Spotsylvania had only one planning position: a director of planning. To comply with the 1989 act (which required substantial mapping in accordance with its environmental regulations), Spotsylvania created a geographic information systems (GIS) unit. As of 1992, the comprehensive plan was 5 years old and due for an update. This, and their GIS unit, led Spotsylvania to create a planning department with three positions: the planning director, a position focused on “current” planning (e.g., subdivision ordinances), and a person focused on “long range” planning (Taylor, T., personal communications, 2003, 2005).

Notable details in the 1994 plan (Spotsylvania County Planning Department, 1994) are:

- *The plan mentions the value of grid networks*, noting that Spotsylvania should

undertake as a priority the creation of an alternative street network between the existing highways which provides both alternative routes for through traffic and an internal travel pattern between adjacent subdivisions without promoting offensive cut through traffic in neighborhoods (Spotsylvania County Planning Department, 1994, p. 77).

As with the 1987 plan, the plan noted that new development should contribute to this cost. The plan refers to the concept of a network of streets as does the transportation element adopted on October 10, 1995, and bound with the plan.



- *The plan comments on the use of proffers and provides more detailed guidance on how developers may fund improvements.* “Spotsylvania has broad authority to negotiate for proffers related to a rezoning. It has not taken full advantage of that opportunity” (p. 115).

The plan provides details on how proffers may be used, such as through rezoning proposals. The county also clarifies limitations on its powers to obtain private funding under Virginia law, such as by-right development or the statutory requirements of impact fees. Information regarding how proffers may and may not be used is fairly extensive.

- *The plan explicitly recognizes that the document is only a plan and not a substitute for an implementation strategy.* The plan contains an “Implementation” section, which discusses growth management approaches through zoning and developer-funded transportation improvements at length. The plan concludes:

The Comprehensive Plan is a compelling guide for the long range development of the County; however, it is not self-enforcing and, therefore, it must be implemented through various measures including the Zoning Ordinance, Subdivision Ordinance, related land use controls, changes to the County organization or operations and the Capital Improvement Program (p. 141).

The change in organization appears to refer to the county’s consideration of creating its own transportation department within the county government or the creation of a transportation improvement district.

- *The plan describes the need for an explicit access management strategy.* In the corridor plan for Route 3, an explicit recommendation is to create an “access management plan” for the corridor, where such a plan would include grid networks and shared access points.

### *2002 Comprehensive Plan*

The 2002 comprehensive plan (Spotsylvania County Office of Planning, 2002) has several defining characteristics.

- *The plan is similar to the 1994 plan (and the 1998 Route 3 transportation element appended to the 1994 plan) in that it discusses the need for access management and the need for implementation.* For the Route 3 corridor, the 2002 plan also implies the value of gridded networks, such as

alternative routes for local traffic (p. 35)

improving access to and between commercial development while maintaining the capacity of this regional transportation corridor (p. 37)

an orderly transportation network along the Route 3 corridor that links neighborhoods, commercial areas, and community facilities and provides alternative routes for local traffic around the area (p. 38)

[in reference to the entire county and not just Route 3] ensuring connections within and between developments that offer alternative routing for traffic (p. 63).

- *Details on proffers were now being made available through the plan and other documents.* The 1998 *Zoning and Evaluation Proffer Policy Guide* had been adopted and was being revised in 2003 (Spotsylvania County, 2003; Taylor, T., personal communication, 2005). The significance of this guide is magnified when a statement in a 2001 corridor study prepared by VDOT (2001) is considered. The document suggests that proffers were difficult to implement.

Spotsylvania County's 1994 Comprehensive Plan states that "no rezoning should be approved unless the proposal is in conformance with the Comprehensive Plan and the net impacts on public facilities are positive, or if the net impacts can be adequately addressed through proffers" (Spotsylvania, 1994). Although Spotsylvania County has established proffer guidelines in its comprehensive plan, local planners recognize that proffers are currently underutilized and can be difficult to enforce (p. 192).

The 2002 plan states the importance of obtaining funds from developers to finance necessary transportation improvements (Spotsylvania County Office of Planning, 2002). Techniques included making full use of the proffer system, seeking enabling legislation to levy impact fees, encouraging property owners to dedicate right of way for transportation infrastructure, developing guidelines for a transportation impact analysis for new development, and requiring such analyses for new development along Route 3. In fact, one of the 29 implementation steps listed in the plan pertains to defining LOS standards for transportation infrastructure; in the context of the plan, it appears that such standards could help with obtaining private sector funding for transportation improvements.

- *The plan indicates that the goal of keeping most development in the primary settlement areas may be working, although definitive quantitative proof is not provided.* A retrospective from the 2002 comprehensive plan and the 2001 Outer Connector study (VDOT, 2001) suggest that the county was pleased with the development patterns to date. The 2001 study notes: "These effects associated with the Outer Connector–Northwest Quadrant, combined with the land use planning and regulations in place in the Study area jurisdictions, do not support the conclusion that the proposed facility would lead to sprawl development in Stafford and Spotsylvania Counties" (p. 255). Further, the 2002 plan states: "As envisioned in the 1980, 1987, and 1994 comprehensive plans, the Primary Settlement District will be the area of the county where most of the residential, commercial, office and industrial development will occur" (VDOT, 2002, p. 14). The plan also suggests that residential growth "shall continue within the settlement areas of the County in proportion to existing development patterns" (VDOT, 2002, p. 5). The plan also notes, like the 2001 study, the efficacy of growth management techniques in Spotsylvania:

The rapid growth in Spotsylvania has been primarily concentrated in the northern and central portions of the County in a concentric pattern around the City of Fredericksburg as well as in a more linear fashion along the Route 3, Route 17, and Route 208 corridors. There has been significant growth around Lake Anna, primarily recreational and retirement living. In the remainder of Spotsylvania County, although growth is also occurring, a rural settlement pattern predominates. These local growth patterns are the results of a number of factors including the availability of public water and sewer, the existing transportation network, the proximity to employment and shopping centers and established planning, zoning, and growth controls (Spotsylvania County Office of Planning, 2002, pp. 129-130).

### **Evaluation of Route 3 Growth Management Efforts**

Generally it can be said that growth came to Spotsylvania; by the time the interstate system was constructed and its impacts were evident, Spotsylvania was one of the fastest growing counties in Virginia. Thus Spotsylvania's challenge was to respond to growth. Accordingly, its growth management process can be placed into four categories:

1. The magnitude of the problem was not foreseen.
2. A countermeasure was suggested but no action was taken.
3. A countermeasure was implemented, difficulties were experienced, and the countermeasure was revised
4. A countermeasure has been implemented successfully.

#### *Category 1. Problem's Magnitude Not Foreseen*

To the credit of the 1964 planners, some forecast changes occurred as expected: Spotsylvania's business district grew at the Route 3/I-95 interchange and both roads served trade and future residential areas (Spotsylvania County Division of Industrial Development and Planning, 1964). Yet the magnitude of the interstate's impact was not forecast.

The failure to anticipate the magnitude of traffic growth does not imply that planners of that era were negligent in formulating their forecasts. The indirect impacts from the interstate system were unknown at the time and limited access highways were uncommon in the United States when I-95 was constructed.

Similarly, the lack of access control for the Route 3 corridor before the 1980 plan is understandable because the Route 3 volumes—and the impacts of additional signals—were not widely understood. Concepts of how access control affects capacity were in the national literature at the time (American Association of State Highway Officials, 1973), but access management had not gained the prominence it attained in the 1990s. Further, with no planning department or transportation planner available in the county at that time, it is not unusual that the impact of adding access points in 1964 was unrecognized.

### *Category 2. Countermeasures Proposed But Not Implemented*

One solution mentioned in Spotsylvania County's comprehensive plans but not fully implemented is the establishment of a grid system. The 1994 plan suggests establishing a grid system instead of concentrating trips from subdivisions onto Route 3 (Spotsylvania County Planning Department, 1994). The concept is covered again in the 2002 plan regarding "connections between developments" (Spotsylvania County Office of Planning, 2002, p. 63).

It appears that one reason for not establishing grid networks is that they illustrate a situation where benefits for a region conflict with disadvantages for a specific location. Alternatively stated, benefits for a large population are in conflict with disadvantages for a small population. For example, the creation of a grid network may be advantageous for circulation but also will increase traffic on some roads that formerly were disconnected dead end streets. A VDOT planner noted that in the late 1980s

VDOT prepared a drawing showing a linking of subdivision streets in the neighborhoods adjacent to Route 3 to create a parallel network. The drawing, on aerials, did not get circulated, as the County felt it could not support running additional traffic through the subdivisions on residential streets. In fact, in the mid 1990s the County requested changing traffic on a subdivision street from two-way to one-way in order to divert Mall traffic away from the subdivision (Vogel, E., personal communication, 2004.)

On a similar note, a former planner with Spotsylvania County noted: "the implementation of gridded streets does not appear to be happening in the case of by-right development. However, it could happen in the case of rezonings, as in the case of the Village of Spotsylvania Courthouse" (Taylor, T., personal communication, 2005).

Spotsylvania did not have a planning department until 1992 (Taylor, J., personal communication, 2003). It is reasonable to infer that this lack may have contributed to grid networks not being fully considered by the county; certainly Payne's comments in the 1985 comprehensive plan review refer to the need for a transportation planner. However, the context for a transportation planner is discussed in the 1985 review as the need for coordination of regional transportation issues. Thus it appears that no real impetus for how to create gridded streets was envisioned prior to the 1994 plan.

### *Category 3. Countermeasure Attempted, Revised, and Attempted Again*

Proffers were not considered in the 1964 plan, and although they may have been alluded to in the 1980 plan, they were not described in detail. Rather, the concept of obtaining developer assistance to fund transportation projects appears to have originated with the 1985 plan review (Payne, 1985) and the 1987 comprehensive plan (Spotsylvania County Planning Commission, 1987). The county appears to have had a strong interest in this concept starting with the 1987 plan, because the 1985 review had noted the issue and the 1987 plan added details to the suggestion. The 1994 plan also has language requiring public infrastructure investments to keep pace with development investments, as suggested in 1994.

The 1994 plan also noted that proffers were not being used to the full extent possible (Spotsylvania County Planning Department, 1994), as was also indicated in the 2001 Outer

Connector Study (VDOT, 2001). Since about 1998, however, the county has worked to improve the process such that proffers are now being used effectively (Taylor, J., personal communication, 2005). Taylor noted that before 1998, proffers tended to be land that was offered for schools, parks, or other infrastructure. In 1998, the county developed LOS standards that would support proffer guidelines, and these standards are shown in the public facilities element of the plan. For example, the 1998 Public Facilities Ordinance is appended to the 1994 plan and shows that the Library of Virginia Board Summary of Standards suggests the need for 0.6 square foot per capita to provide adequate library services (Spotsylvania County Planning Department, 1994). These types of LOS standards supported the resultant *Zoning Proffer and Evaluation Guide*, also created in 1998, and enabled the first cash contributions to be made (instead of just land). Accordingly, the guide, which was revised in 2003, now specifies an amount per dwelling unit type (i.e., single-family, townhouse, multi-family) for various types of services, such as fire and rescue, libraries, schools, etc. Taylor also confirmed that specific guidance, such as that found in the guide, has helped proffers to be used more effectively.

Another factor may have helped proffers move forward: publicizing the limitations of the existing situation. It is noteworthy that the 1994 plan stated that proffers had not been used by Spotsylvania to their “full advantage” and that, a few years later, changes were made such that these could be used. It is not possible to state definitively whether the 1994 plan’s criticism was an impetus for change or simply a reflection that change would occur. Thus it is plausible, but not proven, that such self-criticism was also a helpful step.

#### *Category 4. Countermeasure Implemented Successfully*

The establishment of a primary settlement area, which includes most of the county’s water, sewer, and road systems, was successfully implemented. This 100-square-mile area, the primary settlement area, has incorporated most of the county's growth since its inception. Further, zoning ordinances, water sewer master plans, and legal protections of adjacent historic Civil War battlefield sites have lent authority to the district such that development has been more concentrated since 1985 (Taylor, J., personal communication, 2003, 2005). The fact that the Outer Connector study mentions “land use planning and regulations in the Study area jurisdictions” as part of the reason why a proposed limited access facility would not lead to “sprawl development” in Spotsylvania supports the view that land planning in Spotsylvania has been relatively strong (VDOT, 2001, p. 255).

Generally, the county has successfully prevented dispersed development since the 1980s. Not only has a goal of concentrated development been stated in the plans, but also implementation mechanisms have been put in place to limit development to this area. These include:

- *Primary settlement districts* that have restricted water and sewer service to this growth boundary area. Most residential subdivisions that have public water and sewer are found in the primary settlement district, and future improvements to sewer facilities are considered in light of where growth is desired (Spotsylvania County Office of Planning, 2002).

- *Zoning* is being used to concentrate growth, allowing larger densities in the district and lower densities outside the district (Spotsylvania County Office of Planning, 2002).
- *The Fredericksburg and Spotsylvania National Military Park General Management Plan* (which governs the use of the Civil War sites within national park boundaries) established zones within the park territory that specify permitted uses (VDOT, 2001). In addition, partly because the National Trust for Historic Preservation designated the Chancellorsville Battlefield as one of the 11 most endangered historic areas in the nation, Congress allocated more than \$1.0 million toward the purchase of these areas to prevent future development of these historic sites. For privately owned lands located outside the park boundaries that do not require the involvement of the U.S. Army Corps of Engineers for development, there is a voluntary process whereby the Spotsylvania County Planning Department may work with cooperating landowners to preserve historically significant lands (Taylor, J., personal communication, 2004).

Finally, the fact that revisions to zoning and subdivision ordinances followed the 1994 and 2002 comprehensive plans (Taylor, J., personal communication, 2005) also suggests that in terms of land development, Spotsylvania has been able to implement ideas from the comprehensive plan.

Although the plan states the goal of concentrating development in the primary settlement area, it contains language that possibly places this goal in jeopardy. A maximum residential growth rate of 2% is desired, with an action item being to “downzone the County to limit by right subdivision development” (Spotsylvania County Office of Planning, 2002, p. 5). Elsewhere in the plan is the statement that the county should “downzone/rezone the Primary Settlement District to limit by-right subdivisions to 0.5-3.0 units per acre” (p. 14). The long-term impact of such a downzoning remains to be seen. It has been noted: “there has been increased pressure to develop rural areas at their by-right use, avoiding the need for a rezoning and being subject to the increased proffer guidelines” (Vogel, E., personal communication, 2004)

### **Lessons Learned From the Route 3 Case Study**

To the credit of the Spotsylvania’s planners, the plans’ evolution has been from the general to the specific. For example, the 1964 plan called for general transportation and land use coordination but did not give specific measures to implement such coordination. Succeeding plans in 1987 and 1994 outlined specific ideas, such as developer-supported infrastructure. The 2002 plan not only contained specific measures but also assigned responsibility for their implementation to specific parties. It is also noteworthy that there was self-criticism in the 1994 plan, which may have contributed to detailed guidance on proffers subsequently provided by the county.

Four general lessons appear evident from the history of the Route 3 corridor:

1. *Enhancements to a transportation system will alter the patterns of travel and land use.* It must have been difficult in 1964 to predict how the interstate system would

change the fundamental nature of transportation in cities. A technique for making such a prediction might have been to ignore existing knowledge about roads and normal commuting distances at the time and instead imagine the proposed interstate system as simply a theoretical and undefined transportation improvement. The next step would have been to ask how improved transportation systems have influenced human behavior in the past, regardless of how a given mode was used in the present. Planners might have then been able to see that distant areas would become closer and that human behavior would change accordingly. By reducing the interstate's construction to a hypothetical transport link, planners might also have been able to look at root causes of human behavior and at least be led to look closely at other areas that were beginning to develop as a function of better transport, such as Tysons Corner, Virginia.

2. *Identifying the solution to congestion is a necessary but not sufficient condition to relieve the problem.* Concepts such as grid networks and funding from the private sector, which have benefits for the regional population but disadvantages for specific stakeholders, will tend not to be implemented unless specific steps are taken to make implementation feasible. An example where this was done appears to have been the proffers where the county provided specific guidance outside of the comprehensive plans.
3. *Forecasting can work.* The 1995 ADT forecast for Route 3 in 1981 appears to have been accurate.
4. *Implementation of some ideas takes time.* The concept of developers helping pay for improvements is an example of an idea whose implementation appears to have gradually moved forward through persistent efforts by the county. The concept was initially noted in a 1977 student project, was definitely prevalent in the 1985 comprehensive plan review, and was an important part of the 1987 comprehensive plan. By 1994, the proffers were in use (but not to maximal effectiveness), and in 1998, a policy guide was adopted to clarify how they could be used. The 2001 Outer Connector Study reported some difficulties with them, and the policy guide was last updated in 2003. As of 2005, it is noted that the guide "is a growth management mechanism that has been very successful" (Taylor, J., personal communication, 2005). In short, this has been a concept that Spotsylvania has been interested in for two decades, and it appears to be one that, through persistence, is now being implemented successfully.

### **I-664 (Newport News)**

I-664 links Newport News with the other jurisdictions in Hampton Roads, most notably Suffolk and Chesapeake. The completion of I-664 added a third crossing of the James River. The two existing crossings were the two-lane James River Bridge completed in 1928 (upgraded to a four-lane bridge in 1982) and the one-tube Hampton Roads Bridge-Tunnel opened in 1957 (with a another tube added in 1978).

I-664 differs from the other two case studies because, as suggested in the sections that follow, it appears that Newport News viewed this improvement as a way to increase growth. It is therefore appropriate to examine the reasons behind its construction in the early 1970s and to compare these with changes in growth in the Hampton Roads region before and after 1992 when I-664 was completed.

### **Rationale for Constructing I-664: 1970-1975**

The rationale for constructing I-664 has been well documented by Kozel (1997), who noted several studies in the 1960s that proposed sections of I-664: the 1965 Southeastern [Virginia] Regional Transportation Study, the 1966 Peninsula Area Transportation Study, and the 1968 Proposed Thoroughfare Plan. In fact, although Newport News was located outside the focus area of the Southeastern Virginia Regional Transportation Study, the 1962 traveler survey referenced in the study showed a heavy demand between the focus area (Norfolk, Portsmouth, and portions of Chesapeake, Virginia Beach, and [what later became] the City of Suffolk) and Newport News (Wilbur, Smith, and Associates, 1965). In retrospect, it is plausible to see how this heavy demand between Newport News and the Suffolk/Portsmouth/Norfolk area could be an impetus for consideration of another crossing.

In the 1960s, the City of Suffolk had been a rural community located at the edge of the Hampton Roads region. In 1974, the City of Suffolk merged with Nansemond County, acquiring an extensive amount of land (Galuszka, 2003). When this land was acquired, I-664 was well into the planning phases and the possible developmental shifts in growth that might occur as a result of its construction were evident. Such developmental shifts would occur because the area would become more accessible to travelers and more attractive because of land values (Kozel, 1997). Even after I-664 had been completed, the “vast expanses of open, inexpensive land” in Suffolk was noted in the press (Comprehensive Suffolk Rezoning, 1999) as well as the fact that I-664 made Suffolk more accessible (Thomas A. O’Grady, Suffolk’s Incoming Development Director, 1996; Mooney, 1996).

When it was completed in 1992, the Newport News mayor expected more benefits from the interstate because it would make Newport News more accessible to the rest of the Hampton Roads region (Carroll and Halladay, 2002; Kozel, 1997). In an interview with the *Richmond Times-Dispatch*, Neil A. Morgan, the city’s assistant planning director, described the “on-ramps to Interstate 664” as part of the reason for Newport News being “an awesome transportation hub” (Petkofsky, 1997).

Other sources also suggest that Newport News expected to benefit from the construction of I-664. Planners, engineers, and decision makers also believed that the large investments in multiple ramps and fly-overs that were provided for the downtown area of Newport News would make the area more attractive, thus increasing downtown activity (Case, R.B., personal communication, 2003). Further, in a January 1981 summary of local transportation issues, VDH&T noted the following with respect to the City of Newport News in describing feedback received from members of the Peninsula Planning District (of which Newport News is a member):



The City of Newport News is the only jurisdiction that has submitted Issues pertaining to Highways and Public Transportation. The contents of their letter is as follows:

Of utmost concern to our City is the now apparent lack of adequate State funding to complete the I-664 crossing of Hampton Roads. This interstate project is of critical importance to the long-range economic and transportation objectives (VDH&T, 1981b, p. 21-7).

In fact, the 1966 Peninsula Area Transportation Study singled out Newport News as needing transportation improvements. The study noted the need for a variety of transportation improvements throughout Newport News—not just the crossing that would become I-664. The study noted that existing routes do not adequately serve Newport News:

The route [in reference to Interstate 64, not to be confused with Interstate 664] is ideally located for north-south through travel but affords little or no direct service to heavy commercial and industrial concentrations in and near the Newport News central business district....Recommended extensions of the freeway and expressway system are intended to complement existing and committed facilities and fill the void left by the absence of such thoroughfares in heavily traveled corridors of Newport News (DeLeuw, Cather, & Associates, 1967, p. 9).

The study also alludes to I-664. It discusses a North-South Freeway that in 1967 was proposed to start north of Boxley Boulevard/Oyster Point Road and run south past 34<sup>th</sup> Street, essentially following today's 2005 alignment of Jefferson Avenue (Route 143). The study alludes to the crossing that later became I-664, noting that

Provision has also been made for possible future extension of the North-South Freeway to a new crossing of Hampton Roads near Newport News Point. Additional studies of regional travel demands will determine whether such a crossing is warranted (DeLeuw, Cather, & Associates, 1967, p. 10).

Yet there is documentation that at the time it was thought that I-664 might encourage growth in jurisdictions besides Newport News. Kozel (1977) noted that the "Location Hearing Information brochure" given to the public by VDH during Location Public Hearings on March 13 and 14, 1973, stated:

A new third crossing of Hampton Roads will create a shift in the future regional development pattern which will not otherwise occur. This shift will only slightly reduce the proportional share of growth and fiscal return projected to occur in Hampton, Newport News, and Portsmouth, while increasing the shares in Nansemond, Norfolk, and Chesapeake. This shift could be considered a minor negative impact for the first three cities (cited in Kozel, 1997).

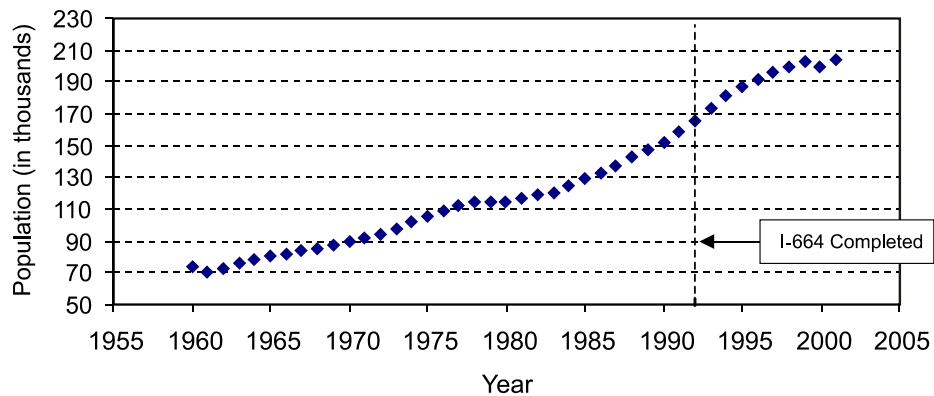
This philosophy that other jurisdictions could benefit from the construction of I-664 was also noted by Stutz (1993): "The opening of I-664 makes the Western Branch area [part of the City of Chesapeake] more accessible for businesses and individuals as the city grows" (p. 1). In retrospect—after the completion of I-664—this view is more pronounced. For example, Suffolk's Department of Economic Development (2004) stated: "with the opening in 1992 of I-664 and the Monitor-Merrimac Memorial Bridge-Tunnel, everything's changed." *The Virginian-Pilot* noted that the Monitor-Merrimac Bridge-Tunnel "fuels explosive growth in northern Suffolk" (McNatt, 1997).

## Overview of Growth Before and After Completion of I-664

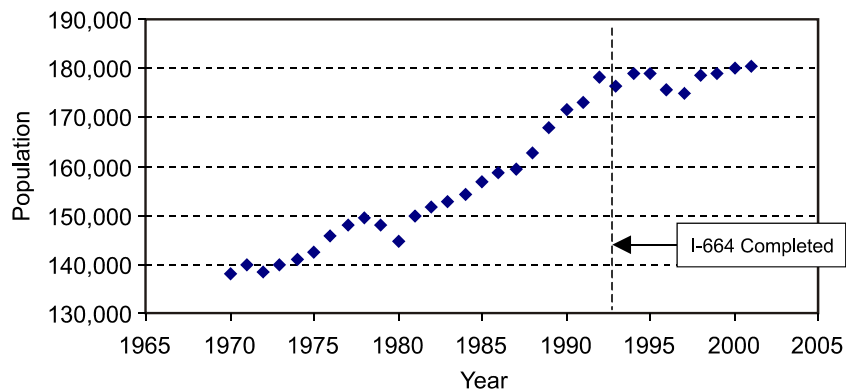
With the completion of the last I-664 link in 1992, more than a decade of development in the neighboring jurisdictions can be examined to ascertain how the third crossing stimulated the region's growth. To understand the developmental influences of I-664, trends were investigated for jurisdictions that publicly discussed the impacts of I-664: Chesapeake, Newport News, and Suffolk. In addition, because the Western Branch area of Chesapeake is particularly sensitive to the growth impacts of I-664, it was examined apart from the rest of the city. The area is in the northwest quadrant of Chesapeake, and its entire population is within 2 miles of I-664 (Stutz, 1993).

### *Overview of Population Growth*

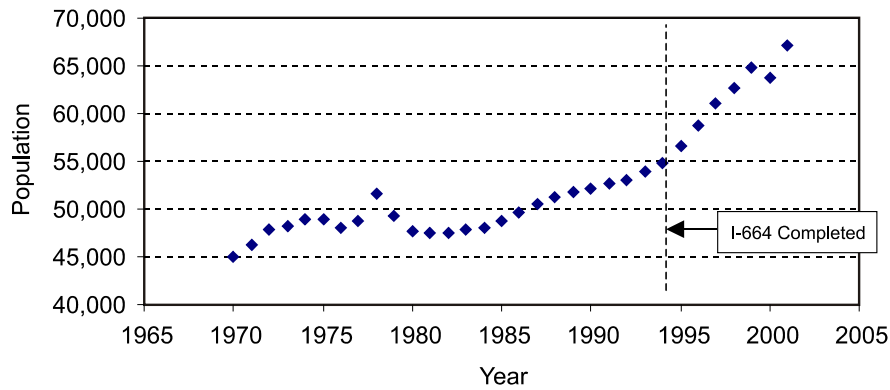
The data suggest that I-664 has had an impact on growth in the region, but at the expense of Newport News. Figures 3 through 5 show population growth trends for the cities of Chesapeake, Newport News, and Suffolk. As will be shown, the trends suggest that Suffolk may have gained the population growth that might have occurred in Newport News had I-664 not been built.



**Figure 3. Chesapeake, Virginia, Population Growth (Weldon Cooper Center, 2003a, n.d.c)**



**Figure 4. Newport News, Virginia, Population Growth (Weldon Cooper Center, 2003a, n.d.c)**



**Figure 5. Suffolk, Virginia, Population Growth (Weldon Cooper Center, 2003a, n.d.c)**

The role of I-664 in increasing Chesapeake’s growth may be examined in greater detail by comparing the Western Branch to the rest of the city. Between 1993 and 2002, the Western Branch area underwent a 22.9% increase in population; over the same period, the rest of the city underwent a 19.5% increase in population. For the previous 9-year period, however, the rest of Chesapeake had a growth rate exceeding that of Western Branch. (See Table 2.) The proximity of I-664 to the Western Branch area may have accounted for the difference.

Other demographic indicators such as the number of building permits shown in Figures 6 and 7 reinforce the assumption that I-664 may have transferred some growth to Suffolk that otherwise would have occurred in Newport News had I-664 not been completed. However, the decreasing trend in Newport News building permits and the increasing trend in Suffolk building permits after 1993 may also be attributable to chance.

**Table 2. Comparison of Western Branch Area and Chesapeake Populations**

Year	1984 <sup>1</sup>	1993	2002
Western Branch only	19,472 <sup>5</sup>	24,050 <sup>5</sup>	29,547 <sup>4</sup>
City of Chesapeake without Western Branch	104,728 <sup>3</sup>	146,850 <sup>2</sup>	175,553 <sup>6</sup>
9-year increase for Western Branch only	--	23.5%	22.9%
9-year increase for City of Chesapeake without Western Branch	--	40.2%	19.5%

<sup>1</sup>An exact count for Western Branch was not available for 1984. Accordingly, a 1984 Western Branch population was interpolated by assuming a constant percentage growth rate from 1980 to 1990, with the 1980 and 1990 figures themselves obtained from Stutz (1993), i.e., source 5. Note also that sources 2, 3, and 6 give populations only for the entire City of Chesapeake; it is the investigators’ responsibility to subtract the Western Branch populations from sources 4 and 5 [or interpolated by source 5 in the case of the 1984 Western Branch population] from the City of Chesapeake populations, which are available in sources 2, 3, and 6, to derive the second row population estimates for the “City of Chesapeake without Western Branch.”

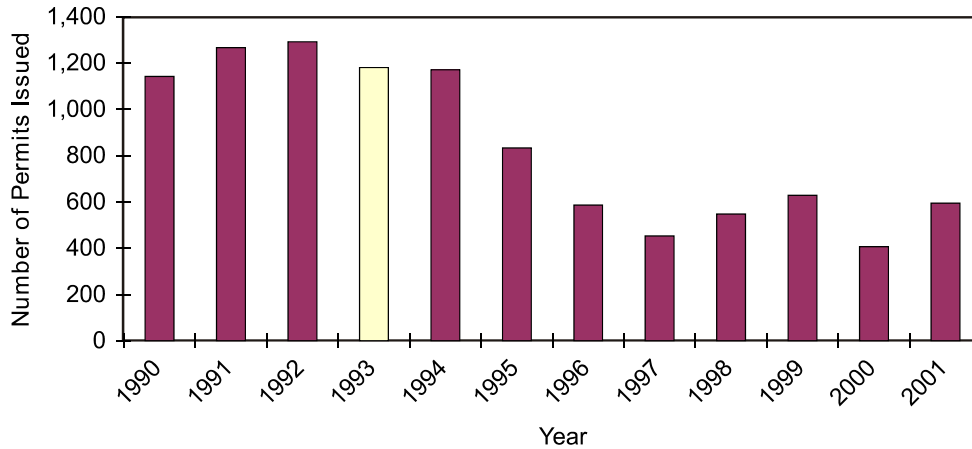
<sup>2</sup>Weldon Cooper Center, 2003a.

<sup>3</sup>Weldon Cooper Center, n.d.c.

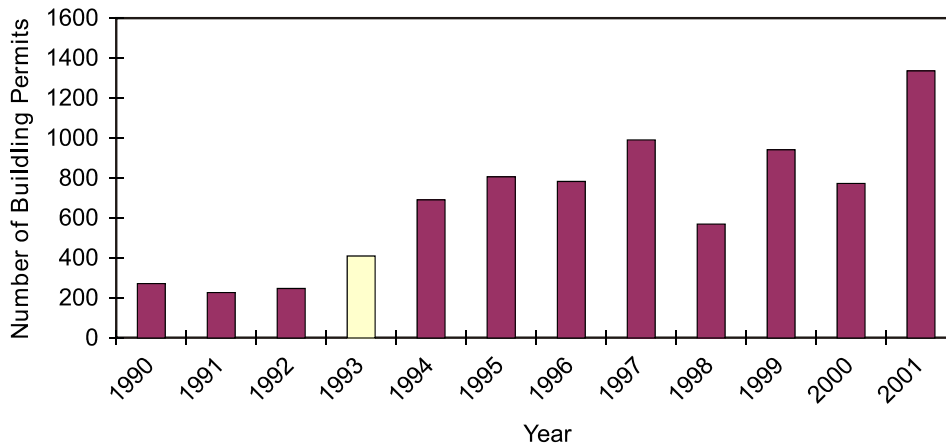
<sup>4</sup>Chesapeake Department of Planning and Department of Economic Development, 2001.

<sup>5</sup>Stutz, 1993.

<sup>6</sup>Weldon Cooper Center, 2003b.



**Figure 6. Newport News, Virginia, Building Permits Issued**



**Figure 7. Suffolk, Virginia, Building Permits Issued**

**Statistical Comparison of Growth Before and After Completion of I-664**

With the complete facility open to traffic in 1993, population growth for the before period 1984-1993 and the after period 1993-2002 can be compared. The percentage change for the before period is computed as

$$\frac{(1993 \text{ population} - 1984 \text{ population})}{1993 \text{ population}} \times 100 = \text{Percentage change}$$

Table 3 provides the before and after percentage change. I-664 was expected to have a negative impact on five jurisdictions: Hampton, Newport News, Virginia Beach, Portsmouth, and the area of Chesapeake without the Western Branch because growth would be redistributed to areas with lower land cost and increased accessibility. Positive impacts were expected in Western Branch and Suffolk (because of the increased accessibility to open land therein) and Norfolk (because of the initial traffic relief from the Hampton Roads Bridge-Tunnel). No substantial impact was expected in York County because of its distance from I-664.

**Table 3. Percentage of Population Change Before and After Construction of I-664**

Parameter	Negative Impact Expected					Positive Impact Expected			No Impact Expected
	Hampton City	Newport News City	Virginia Beach City	Portsmouth City	Chesapeake City Without Western Branch <sup>1</sup>	Suffolk City	Norfolk City	Western Branch <sup>1</sup>	York County
% Change Before 1984-1993	11.1	14.5	33.5	- 2.3	40.2	11.9	- 11.2	23.5	32.4
% Change After 1993-2002	3.0	1.4	3.5	- 5.7	19.5	28.9	- 4.7	22.9	18.8
Difference (After - Before)	- 8.1	- 13.1	- 30.0	- 3.4	- 20.7	17.0	6.5	- 0.7	- 13.6
Mean	- 15.1					7.6			
Standard deviation	10.5					8.9			

<sup>1</sup>An exact count for Western Branch was not available for 1984. Accordingly, a 1984 Western Branch population was interpolated by assuming a constant percentage growth rate from 1980 through 1990.

Table 3 compares these expectations with what transpired, suggesting an imperfect correlation between the location of the facility and the resultant impact on growth. Hampton, Newport News, Virginia Beach, Portsmouth, Chesapeake without Western Branch, Western Branch, and York County experienced negative impacts in population after the interstate was constructed. Suffolk and Norfolk experienced positive impacts. Table 3 also shows the limitations and imperfections of this analysis. Contrary to what was expected, the Western Branch and York County population rates dropped.

The large variation shown in Table 3 suggests a large variation in these growth rates. Accordingly, Eq. 1 was used to determine whether the difference between the negative and positive groups was statistically significant.

$$\text{Is } \left| \bar{u}_1 - \bar{u}_2 \right| \geq T_{\alpha/2, n_1+n_2-2} \sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}} \quad (\text{Eq. 1})$$

where

$n_1$  = sample size for postively affected group = 5

$n_2$  = sample size for negatively affected group = 3

$S_1$  = standard deviation for positively affected group = 10.5

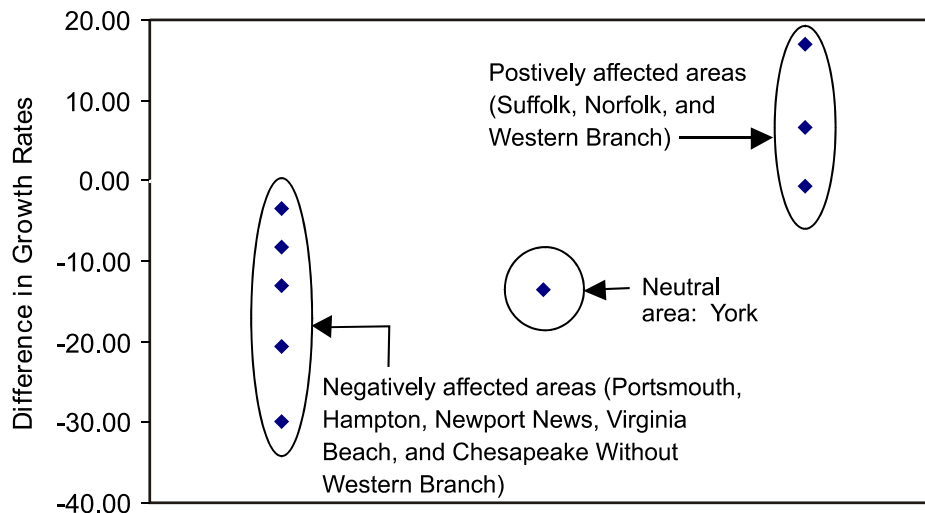
$S_2$  = standard deviation for negatively affected group = 8.9

$T$  =  $T$  statistic at the  $\alpha = 0.05$  confidence level with  $n_1 + n_2 - 2$  degrees of freedom

The T statistic is used instead of the conventional  $Z = 1.96$  because of the relatively small sample size.

Application of Eq. 1 shows that since the difference in means on the left side yields 22.7 and that on the right side equals 17.0, the difference in means is significant ( $p = 0.02$ ). Thus, the difference in growth rates between the jurisdictions whose growth should have been hampered by I-664 and those jurisdictions whose growth should have been stimulated by I-664 is statistically significant. The practical interpretation is that I-664 may have contributed to increased growth in the jurisdictions shown to the right of Figure 8 (Suffolk, Norfolk, and Western Branch) and it may have contributed to decreased growth in the jurisdictions shown to the left of Figure 8 (Portsmouth, Hampton, Newport News, Virginia Beach, and Chesapeake without Western Branch).

A limitation of this analysis is that it is very sensitive to assumptions regarding how to categorize these jurisdictions. For example, the City of Chesapeake was split into two jurisdictions for the purposes of this analysis: Western Branch and the non-Western Branch. However, had the City of Chesapeake not been split into two categories the difference would not have been statistically significant ( $p = 0.24$  if equal variances are assumed for  $p = 0.26$  if Eq. 1 is modified to address the case of unequal variances). Thus, one would have concluded that the differences in growth rates were not correlated with I-664's construction but instead was attributable to chance. Overall, these results suggest that I-664 did affect population growth, but they also show the sensitivity of this analysis to assumptions made regarding how to categorize the various jurisdictions.



**Figure 8. Comparison of Growth Rate Differences for I-664 Areas.** Values shown are the difference between the 1993 to 2004 growth rate and the 1984 to 1993 growth rate.

### The Anticipated Impact of I-664

The data suggest that I-664 increased accessibility for Newport News. As predicted from the VDH Location Public Hearings in 1973 (Kozel, 1997), growth in the 1990s has occurred in Suffolk and Norfolk at the probable expense of Newport News, Portsmouth, and Hampton.

Further, the average daily traffic on the Monitor-Merrimac Bridge-Tunnel was not far from its forecast. When I-664 opened in 1992, planners had predicted that around 30,000 motorists a day would use the bridge-tunnel (Kozel, 1997; Suo, 1992). In the first year of operation, the average daily traffic was 26,180 (VDOT, 2002; FHWA & VDOT, 2001). In this particular case, therefore, it appears that forecasts of growth can in fact prove accurate. Interestingly, however, the amount of traffic decreased on the Hampton Roads Bridge Tunnel for a short time but soon reached previous traffic levels a few months later (Messina, 2002). By 1997, traffic volumes had increased by 49% to 39,000 (FHWA & VDOT, 2001).

## CONCLUSIONS

- *Transportation investments do facilitate growth to some degree. Yet although better transportation facilitates the exchange of people and goods, better transportation is not necessary for such exchange to occur.*
- *Transportation investments, by themselves, are unwieldy and imprecise tools for shaping the direction of future growth.* In some cases, as with I-95 in the 1970s and I-664 in the 1990s, they likely served to redistribute growth, although this impact was not foreseen with I-95 and in both cases did not shape growth exactly as all stakeholders had intended. Newport News had hoped that I-664 would improve the city's economy (VDH&T, 1981b). In Fairfax County, the impact of these investments was not as large as that of external growth pressures, and decisions not to invest in particular highways did not stop growth. This experience is consistent with that described in the literature, which questions whether incremental improvements in capacity can induce significant changes in land use (Meyer and Miller, 2001). Thus, transportation investments are blunt instruments—they promote all types of exchange, not just those that are socially desired.
- *Attempts to control growth can be thwarted by unforeseen market forces.* Even without the transportation changes, market forces were already in place to encourage growth to some degree. Fairfax County was poised to grow in the 1960s because of its proximity to Washington, D.C.; Spotsylvania County was ready to grow in the 1970s and 1980s because of higher land prices in Northern Virginia; and Suffolk was ready to grow in the 1990s because of its cheaper land. In Fairfax's case, the growth occurred, even though all freeways except one were removed from VDOT's *Northern Virginia Major Thoroughfare Plan to Meet 1985 Needs* (Lockwood, R., personal communication, 2005; Northern Virginia Transportation Coordinating Council, 1999). In the case of Spotsylvania and Suffolk, I-95 and I-664, respectively, served to accentuate market forces already in place. As is evident from Fairfax County, when there are strong market pressures for an area to grow and the land, sewer, and water are available, that growth will come, with or without significant addition to the transportation infrastructure.
- *Localities, for better or worse, are quite limited in what they can do to respond to growth.* To some extent, counties can change where growth will occur and can sometimes change the type of growth (such as commercial or high density), provided public support (through

citizen pressure and/or elected officials) exists. Yet, even when counties want to accommodate growth through transportation infrastructure, they are limited in what they can accomplish in terms of being able to raise revenue for transportation improvements (from either developers or taxpayers). The history of planning efforts in Fairfax, Spotsylvania, and Newport News demonstrates that localities in general are unable to influence fully how growth will occur—even in the presence of a supportive market. Whether such a limitation is good or bad is for others to judge. That this limitation exists is a key finding of the three case studies.

## RECOMMENDATIONS FOR PLANNING PRACTICE

The conclusions of this study do not lend themselves to organizational changes or specific models or forecasting techniques that VDOT or localities should make or use when creating transportation plans. Instead, they lead to five short-term recommendations that can assist planners when hypothesizing the extent to which transportation investments may affect future land use and can be used as supporting evidence when addressing complex issues of transportation and growth.

1. *To make projected transportation impacts more realistic in transportation plans, view transportation improvements in a supply/demand context: they facilitate the exchange of people and commerce in the presence of market demand.* As shown with I-664 in Newport News and I-95 in Spotsylvania, better transportation leads to a change in human behavior—if the demand is present. For I-95, the supply of residential land for Washington, D.C., area workers was expanded; for I-664, cheaper Suffolk land became accessible. Impacts may be more accurately predicted by viewing transportation improvements as reductions in travel cost rather than real-world infrastructure changes. In 1964 it was difficult to predict that the limited access highway would be used, to the extent it was, for intra-urban travel as opposed to long distance travel. It may also have been difficult to realize that the limited access highway, although using similar technology, was a fundamentally different mode of transportation than the existing highway network. However, had planners been able to ignore prevailing assumptions about the usage and technology of a limited access highway and instead view I-95 simply as a lower cost transportation link, there might have been additional questions raised regarding how this cost reduction would affect behavior.
2. *To make socioeconomic projections more realistic in transportation plans, consider using a forecast range with low and high population estimates.* This is not a panacea—probably few in 1960 who projected Spotsylvania’s 1.25% annual population increase would have believed that a 4.25% annual increase would have occurred by 1980—but likely a range of forecasts could have made planners consider the potential for a larger than expected increase. Although it is possible to have accurate quantitative forecasts, as with the 1976 prediction of the 1990 Fairfax population, the 1981 prediction of the 1995 Route 3 ADT, and the traffic on I-664,



consideration of a range of forecasts might help identify previously unconsidered scenarios.

3. *Quantify expected impacts where possible.* Transportation and land use planning necessarily address finite quantities of developable land, population, transportation capacity, and financial resources. Had the transportation demand that would be generated in Spotsylvania been compared to the supply of Route 3—even at an order of magnitude—the access problems might have been identified in advance. A disagreement between VDH and Fairfax County might have been averted had both parties agreed on a common way to quantify roadway needs.
  4. *Give transportation plans a realistic implementation mechanism.* Specific behavioral changes that are socially desired will not take place in the absence of either direct incentives for individuals to make the change or a law mandating the change. Although Fairfax County residents had an interest in public transportation in the 1960s and 1970s, they did not choose higher densities in their neighborhoods such that transit could be supported.
- 6.5. *Since comprehensive plans may be better served by having only a few strategies that are well considered and implemented, choose strategies well.* Table 4 shows how to apply Recommendations 1 through 4 to a single planning concept, using gridded streets as in the Route 3 case study as an example. Although the comprehensive plans may help pinpoint the benefits and disadvantages of various countermeasures, this study showed that implementation can be quite difficult.

**Table 4. Example of How to Apply Recommendations to Single Planning Concept (Using Gridded Streets)**

Recommendation	Related Question
1. Recognize that transportation improvements facilitate exchange.	Although gridded streets will undoubtedly be conducive to subdivision-to-subdivision trips (as intended), they will also draw trips from Route 3. <ul style="list-style-type: none"> <li>• Based on computed trip generation rates from residential subdivisions and commercial centers, what proportion of the trips is likely to be drawn to connections between subdivisions?</li> <li>• Will gridded streets create particular nexuses or intersections conducive to commercial development?</li> </ul>
2. Use high and low forecasts.	Produce 2 new estimates: trip generation figure that is twice the value of that obtained in Recommendation 1 (to simulate extra development) and figure that is half the value. To what extent do these two trip generation rates affect traffic congestion?
3. Quantify expected impacts.	Compare traffic volumes on residential streets using low trip generation estimate and high trip generation estimate. If resources permit, conduct capacity analysis or even pedestrian LOS analysis (to determine how high and low volumes affect quality of walking experience for pedestrians).
4. Identify an implementation mechanism.	Gridded streets may improve circulation, but just as was observed with Fairfax PLUS, residents may be against local changes even though such changes improve the overall system. Is there a county-driven land use process or requirement, such as linking gridded streets to proffers, to make such grids more realistic? How can county planners propose the concept of gridded streets early in the planning process? Are there other administrative procedures not yet mentioned that the county and VDOT should jointly consider to make gridded streets more widely practiced?

## COSTS AND BENEFITS ASSESSMENT

Implementation of the five short-term recommendations offers costs and benefits for transportation planning practice, as shown in Table 5.

**Table 5. Benefits and Costs of Implementing the Five Short-Term Recommendations**

Recommendation	Potential Benefits	Potential Costs
1. View transportation improvements in a supply/demand context.	Otherwise unforeseen changes in behavior anticipated, and transportation system developed to respond to these changes.	Greater opportunity for planner to make a mistake. (A forecast that deviates from assuming the future is similar to the past may be received with skepticism.)
2. Use a forecast range with high and low estimates.	Magnitude of uncertainty associated with future projections conveyed.	Plan more cumbersome to read. (A population estimate of 800,000 is easier to understand than a range between 500,000 and 1.1 million.)
3. Quantify expected impacts where possible.	Difficult tradeoffs may be better understood. (For example, just how much must existing residential density increase to make transit viable?)	Requires effort and data. These will likely translate into monetary costs in the form of staff time or consultant assistance.
4. Give transportation plans a realistic implementation mechanism.	Good ideas publicized in plan implemented.	<ul style="list-style-type: none"> <li>• Political risk for locally elected officials who must endorse plan.</li> <li>• Plan may not be most appropriate mechanism to develop implementation steps; such steps may detract from visionary aspects of plan.</li> </ul>
5. Choose strategies well.	Potential for easier implementation if decision makers have a smaller number of items on which to direct their energies.	Because a plan is a consensus document, having only a few key strategies may conflict with a plan that has “a little something for everyone”; thus, there may be a political or consensus-building cost.

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## APPENDIX A

### A SITUATION WHERE LAND USE DID CHANGE SIGNIFICANTLY

The Fairfax County case study noted that citizens who participated in the public involvement process in the early 1970s did not want different land uses than they had at present. However, two other jurisdictions appear to have made drastic changes in how they will grow in order to respond to market pressures. These jurisdictions were not examined by the investigators in detail, and thus they are not included as a case study in the report. However, anecdotal information about their land use policies is included in the interest of completeness. Their experience serves as a corollary to the Fairfax County case study—that *drastic action may be required to effect a substantial change in land use*. These two jurisdictions are Montgomery County and Arlington County.

#### Approaches Used by Montgomery and Arlington to Influence Land Use

Montgomery County used drastic *regulatory* action. Although Fairfax County attempted this by restricting water availability, in Montgomery's case, the action was much more powerful: legislation gave authority to the county to use zoning, sewer, and the availability of public facilities to dictate where growth was permitted (Dawson, 1977). As a result, Montgomery County's land consumption (3.5 km of development per year) was substantially smaller than that of Fairfax (5.7 km per year) for the period 1973-1985 (Jantz, 2000). It is also noteworthy that for the period 1970 to 1980, Montgomery saw only an 11% change in population, much less than the almost one-third increase in Fairfax County (Forstall, 1995a, 1995b). However, given that a variety of factors may influence population growth, this study states only that it appears plausible that differences in planning seemed to contribute to the different growth rates in Montgomery and Fairfax. In addition to these sources (Dawson, 1977; Jantz, 2000), others have noted that the different planning philosophies in Montgomery and Fairfax have affected development therein (Fehr, 1997) or the lack of an adequate public facilities test (Melton, 1998). Hamblen (1991) described a growth control instrument in use in Montgomery that in the early 1970s had been unsuccessfully attempted in Fairfax almost two decades earlier: construction moratoriums. However, in Montgomery's case, the moratoria are tied to the "capacity of the transportation system, schools, and other public facilities" (Hamblen, 1991, p. 11).

Arlington County used drastic *land development* action. The Ballston-Rosslyn and Jefferson Davis corridors, home of the Washington Metropolitan Area Transit Authority heavy rail system, went from having 9% of Arlington County's population in 1960 to 34% in 2000, based on authors' analysis of data that others have obtained (Arlington County Department of Community Planning, Housing, and Development, 2002, 2004; NPA Data Services, Inc., 2003). The drastic change in density, facilitated by the location of the heavy rail line, helped Arlington County aim for a ratio of 95/5: 95% of the county was planned as "low-density residential, garden apartment, or retail" and 5% was planned to "encourage mixed-use, high-density development" (Fisette, n.d., p. 9). Arlington's community profile summary states: Arlington has focused high-density commercial and residential development around Metrorail stations in the Rosslyn-Ballston and Jefferson Davis Metro Corridors, while maintaining lower density

residential neighborhoods in the rest of the county (Arlington County Department of Community Planning, Housing, and Development, 2005).

This may be contrasted with the minor changes resulting from Fairfax County's PLUS. Neither drastic action was undertaken by Fairfax County: the Montgomery option was not legally possible, and the Arlington option was not politically possible. Because neither Montgomery County nor Arlington County was studied in depth, it would be speculative to conclude that drastic action is a prerequisite for substantial land use change, but such an inference is indeed plausible.

### **Source of Supporting Statistics for the Portion of Arlington's Population Within the Metro Corridors**

The preceding section notes that the two Metro corridors in Arlington increased their share of Arlington's population from 9% in 1960 to 34% in 2000. The sources of data for this statement are as follows:

- In 1960, the average household size for Arlington County was 2.90 persons/household (Arlington County Department of Community Planning, Housing, and Development, 2002). Prior to 1960, there were 4,837 units in these corridors (Arlington County Department of Community Planning, Housing, and Development, 2004). These two figures suggest that approximately 14,000 people were living in the corridor in 1960. At that time, the total population of Arlington County was roughly 160,000 (Arlington County Department of Community Planning, Housing, and Development, 2002). Thus, approximately 9% of Arlington's population lived in these two corridors in 1960.
- During the period 1960-1999, an additional 24,822 residential units were constructed in the corridors (Arlington County Department of Community Planning, Housing, and Development, 2004). Based on these units built since 1960 and the 4,837 units built prior to 1960, there were a total of 29,659 residential units in Arlington in 2000. Further, in 2000, Arlington had on average 2.15 persons/household (Arlington County Department of Community Planning, Housing, and Development, 2002). These two figures suggest a total of 63,800 persons living in the corridor in 2000. The 2000 total population for Arlington was 189,453 (Arlington County Department of Community Planning, Housing, and Development, 2002). Thus, approximately 34% of Arlington's population lived in these two corridors in 2000.
- The methods described are approximate. However, the number of persons per household shown is consistent with one other data set (NPA Data Services, Inc., 2003).

## APPENDIX B

### SURVEY INSTRUMENT USED TO SCREEN CANDIDATE CASE STUDIES

*In the investigators' experience, surveys have tended to work better when they had questions that required short answers rather than longer open-ended questions. It was surprising, therefore, that for this study an open-ended questionnaire was not only answered but in one particular case was also cited by a respondent as being a motivating factor for supplying additional detailed information. The six questions shown here were sent to local and state officials, local planning departments, and metropolitan planning organizations. At least five responses provided valuable information regarding the potential case study areas.*

1. Over the past 30 years, has a transportation investment been constructed in your area that has greatly influenced growth in your county or city?

If yes, then what planning considerations were taken into account to control growth (for residential, commercial, and industrial)? Were new zoning ordinances taken into consideration to help control the growth around the transportation investment or were they left as they were?

If no, then has the area experienced growth without the presence of a major transportation investment? What is the impact the area experiences due to the lack of an adequate transportation investment (travel times, congestion, safety)?

If no, can you also recommend a potential case study area where transportation plans were modified in an attempt to influence growth?

2. How does your area assess the need for a new transportation investment? Do you invest in transportation to reduce congestion or do you invest because you want certain parts of your area to be more accessible?
3. In the past, transportation and land use planning have been somewhat separated when making decisions about new transportation investments; however, in recent years the two have been interconnected with each other to try and cure problems that have been presented by past transportation investments. How closely related are your transportation and land use planning departments now (2003) compared to when you incorporated a major transportation investment? If you have a transportation investment where transportation and land use were taken into consideration before construction, what effect did it have on development of the area? Does the development that ensued mirror what had been envisioned?
4. What unplanned factors arose as a result of the transportation investment in your area? Were these factors helpful or hurtful to the community and were they a direct or indirect result of the transportation investment or would they have been present if the investment had not been constructed?

5. If you have had a transportation investment that has influenced the growth of your area, what have you learned from that investment that you would or would not want to continue into other future transportation investments? What has worked and what has been a complete failure looking at all factors (water, sewer, schools, police and fire coverage, quality of neighborhoods, land prices, and labor markets)?
  
6. How many people and businesses do you project benefit from the transportation investment in your area? How much development has occurred as a result of the transportation investment, and what have been the social, economic, and environmental impacts of the investment?



## APPENDIX C

### EVALUATION OF EIGHT POTENTIAL CASE STUDIES

#### Overview

As described in the “Methods” section, interviews revealed eight possible case studies. Table C1 lists them and summarizes their relevance. The first column shows the transportation investment under consideration. The second provides additional information about the investment. The third indicates the impact that the transportation investment was hypothesized to have on growth. The fourth column gives the appropriate measure of effectiveness for testing the hypothesis. The section that follows details the strengths and weaknesses of each candidate case study.

**Table C1. Eight Possible Case Studies Identified by Members of Transportation Planning Research Advisory Committee and VDOT Staff**

Transportation Investment	Background	Hypothesis Statement	Measures of Effectiveness
Route 288 (Goochland County)	Route 288 will complete planned western loop around Richmond and provide transportation alternative for Chesterfield, Powhatan, and Goochland counties. Areas may grow after construction is complete.	Linkage of transportation and land use planning can produce area with less urban sprawl and reduced congestion for through traffic.	Compare relative amount of green space, density, and delays from Route 288 area to comparable areas. Such areas would be bypasses around cities of equal size to Richmond.
Route 58 (Southern Virginia)	In 1989, Virginia General Assembly established U.S. Route 58 Corridor Development Program to improve travel on Route 58 and economic development potential across this largely rural portion of state. This road has potential to bring development to southwest Virginia.	Roadway investments can generate and not just redistribute growth.	Examine redistribution of different businesses for Route 58 and comparable areas where no Route 58 exists. Were businesses newly generated or distributed? If yes, what practices were employed for such growth; zoning, tax incentives, state funding help?
Virginia Railway Express (Fredericksburg)	Although national transit ridership has declined, VRE’s passenger load is growing around 15%/ year. VRE is becoming valid mode of transportation into Washington metro area.	Transit investments can target growth into specific locations, such as areas adjacent to VRE stations.	Measure population growth and land development around stations and compare with other locations. Challenge is to remove confounding factors.
Route 3 (Spotsylvania County)	Spotsylvania is bedroom corridor for D.C. area and Route 3 corridor is now very congested.	Land use plans were not adequate to handle sudden and unforeseen increase in development.	Measure population and business growth, and compare changes recommended by plans to changes measured along Route 3.

<b>Transportation Investment</b>	<b>Background</b>	<b>Hypothesis Statement</b>	<b>Measures of Effectiveness</b>
Metro Station (Arlington County)	Metro system has encouraged high-density development around transit centers and successfully deterred future growth out in county.	Transit investments can target growth into specific locations, such as areas adjacent to metro stations.	Compare densities near Metro stations to low densities elsewhere; show that such densities occurred because of Metro station. Study decision to place Metro underneath declining section of town instead of on median of I-66 as was done with other area stations.
Monticello Freeway (Fairfax County)	Eliminated roadways from its transportation plan in 1970s, subsequently had to issue more than \$100 million in bonds to fund transportation improvements to help relieve congestion.	Growth may be controlled by removing transportation investments from plans.	Compare current population to population during the decision period in 1970. Ideally, investigate growth patterns without road construction vs. road construction.
I-664 (Newport News)	Initially planned to help economic vitality of Newport News area. However, roadway produced more reliable highway infrastructure to south of city, thus encouraging areas of Chesapeake and Suffolk to grow considerably.	Transportation investments can shift population and economic growth to areas where land is cheaper if improvement makes land area more accessible.	Compare property values, commuting trends, and population of Newport News with that of Chesapeake and Suffolk before and after construction of I-664.
Powhite Parkway Extension (Richmond and Chesterfield)	Completed in 1988, this 10-mile 4-lane road extends Powhite Parkway westward into Chesterfield County.	Major growth has occurred as result of lower land values and more accessibility to City of Richmond.	Compare before and after land values, population density, and commuting trends. Are tolls on road influencing growth pattern of county?

### **Strengths and Weaknesses of Each Candidate Site**

#### **Route 288 (Goochland County)**

Route 288, a planned western loop around Richmond, will provide a much needed transportation alternative for Chesterfield, Powhatan, and Goochland counties. Since this roadway has not been opened, it was not selected as a case study. In the future, this area would be a prime example of an area that could use research guidelines to help plan for development.

#### **Route 58 Corridor (Southern Virginia)**

Improvements for this corridor began in 1989 when Virginia's General Assembly enacted legislations to start the U.S. Route 58 Corridor Development Program. The goal of the program is to increase the economic development potential to the mostly rural counties along the corridor.

The corridor is the longest roadway in Virginia, stretching from Virginia Beach to Cumberland Gap. It is 508 miles long and passes through counties where local economies are stagnant, having higher unemployment rates and lower growth rates in income and wealth than the state averages. The program was enacted because the major factor for the economic conditions in these areas was the lack of a modern four-lane highway.

This area was not selected for a case study because the entire 508-mile corridor has not been completed.

### **Virginia Railway Express (Fredericksburg)**

In 1992, the Virginia Railway Express (VRE) started to operate a commuter service that provides rail service from the Northern Virginia suburbs to Washington's Union Station, Alexandria, and Crystal City. The VRE has two routes: a Fredericksburg line, which consists of 12 stations between Fredericksburg and Union Station, and a Manassas line, which consists of 10 stations between Manassas and Union Station. VRE is a commuting option, along with buses and vanpools, in lieu of the automobile for people who travel into the Washington, D.C., area from outer suburban areas. As traffic congestion continues to increase, commuters are looking for other modes of travel into the area. In 1995, VRE conducted a survey showing that the highest proportion of riders lived within 2 miles of a VRE station and that 65% of the commuters work within walking distance of their destination stations. Currently, around 14,000 commuters per day use VRE facilities, and the number is increasing yearly. As transit ridership across the nation is slowing, VRE's passenger load is growing around 15% per year. VRE is becoming a convenient and valid mode of transportation into the Washington metro area.

However, the investigators determined that VRE would not be a good case study to pursue because: (1) it was developed only recently; (2) the impacts of the rail service have not currently influenced the direction of growth in the area; and (3) illustrating socioeconomic conditions and changes and overall transportation system characteristics would be difficult since VRE affects only a small percentage of the metropolitan population.

### **Route 3 Corridor (Spotsylvania County)**

The Route 3 corridor case study evaluates the land use impacts following improvements to Route 3 and the land use impacts associated with strong commercial and residential development adjacent to Route 3 during the 1970s and 1980s. Spotsylvania County has become one of the fastest growing counties in Virginia. Most of the major growth in the county occurred during the 70s and 80s, with most of the development and growth concentrated along the Route 3 corridor.

- State Route 3 is an east-west corridor cutting through the northern section of Spotsylvania County. Route 3 is the main east-west roadway from Fredericksburg and is the first major roadway exit in Spotsylvania County from I-95 from Washington, D.C. The rapid growth of the Washington, D.C., metropolitan area has had a tremendous influence on the Route 3 corridor in terms of residential and commercial development and increased traffic volumes. A 1985 comprehensive plan

review notes: “Many of the new residents of Spotsylvania County moved here to escape the congestion and high taxes of other areas” (Payne, 1985, p. 5). As a result, the county mushroomed into a bedroom community, creating a huge strain on the county’s transportation network and calling for an increased awareness of land use and transportation.

This corridor was initially selected for study because of widespread data availability and evidence of deliberate planning decisions that attempted to influence how the county grew.

### **Metro Station Areas (Arlington County)**

The Arlington County BOS implemented its current land use policy when Metro expanded out from Washington, D.C., into Virginia in the late 1970s. The two Metro corridors that were expanded into Arlington County were the Blue Line, which opened July 1, 1977, and the Orange Line, which opened December 1, 1979. The development of the county has been influenced greatly by the incorporation of the Metro system into the county’s land use policy.

It is easy to conclude that the county’s decision to incorporate Metro into the transportation network induced land use changes especially along the Jefferson Davis Corridor and the Rosslyn-Ballston corridor. The county was successful in incorporating a transportation system to influence the direction of growth.

The investigators found several promising development patterns for further investigation into how these patterns were planned and carried out. Before the Metro opened, county planners had already set four major goals to help influence the direction and promote growth within the corridors:

1. Aim for a 50/50 tax base mix of residential and commercial development.
2. Aim for dense mixed-use development with a significant level of residential development.
3. Try to preserve existing single family and garden apartments that were constructed before Metro was implemented.
4. Focus redevelopment within ¼ mile of entrances to Metro stations.

This case study could have been selected in accordance with established criteria and given additional time would be appropriate for inclusion in a follow up study. In retrospect, its inclusion in future research would allow one to consider how transportation infrastructure other than road improvements can be used to influence growth. Appendix A provided a starting point for such a case study.

## **Monticello and Other Freeways (Fairfax County)**

Fairfax County was selected because the removal of freeways from transportation plans in the 1960s was the original impetus for this research project. Additionally, Fairfax had ostensibly wrestled with growth management earlier than most other jurisdictions in the commonwealth, with the possible exceptions of Arlington and Alexandria.

## **I-664 (Newport News)**

The I-664 case study evaluated the land use impacts of incorporating a new four-lane interstate highway system into the Cities of Newport News, Chesapeake, and Suffolk. I-644 is a 20.7-mile-long freeway that connects I-64 in Hampton to I-64/I-264 in Chesapeake and was completed in April 1992. Initial planning predictions suggested the interstate would serve two purposes: alleviate traffic congestion to the Hampton Roads Bridge-Tunnel during peak periods and improve transportation connections to the western edge of the region. Planners also predicted that since I-664 would connect Newport News to Chesapeake and Suffolk with a short 10-minute drive by car that the new interstate would greatly help the economic vitality of the Newport News area.

The new I-664 has alleviated traffic congestion on the Hampton Road Bridge-Tunnel, and it has improved transportation connections to the western edge of the region. However, it has not helped revitalize and promote growth in the Newport News area as initially thought.

The I-664 case study was selected for future investigation because the highway had a considerable influence on the growth patterns of the region. The interstate suddenly made the areas of Chesapeake and Suffolk more accessible by allowing a trip to Newport News and other cities on the Peninsula in less than 10 minutes. The highway also made the areas of Chesapeake and Suffolk more attractive because of the availability of open space and cheaper land values. As a result of these factors, the City of Newport News experienced a decline in population and a continued decline in economic vitality. Since the construction of I-664, the City of Chesapeake underwent a population increase of 23.2%; the City of Suffolk a 26.6% increase; and the City of Newport News, which once was thought to benefit the most from the interstate, a population increase of only 1.2% since 1992. Further investigation into this area's traffic patterns, housing values, sewer and water services, and zoning practices will foster a better understanding of the influence of this roadway on the area. Investigation will also illustrate why the predictions for the Newport News area as a result of the interstate system never came to fruition. In conclusion, this case study was selected because of the interstate's substantial impact on the region and the growth caused as a result of incorporating the interstate into the areas.

## **Powhite Parkway Extension (City of Richmond and Chesterfield County)**

Also called Virginia State Route 76, the Powhite Parkway has not been in service long enough to determine its long-range land use impacts.