MARYLAND ROUTE 32: A POLICY ANALYSIS

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EXECUTIVE SUMMARY

The two-lane, nine-mile segment of Maryland Route 32 between Interstate 70 (I-70) and Route 108 in Howard County currently experiences moderate to severe rush hour congestion. This congestion will worsen as the population increases. This policy analysis, prepared by graduate students of the MPP Capstone class in the Department of Public Policy at UMBC, examines possible alternatives for addressing the congestion on this segment of Route 32.

On July 21, 2004, the Maryland Board of Public Works approved an exemption of the state's Smart Growth law to allow state funding for the widening of this portion of Route 32. This exemption was required because this segment of road is not located in, or connected two, Priority Funding Areas (PFAs). PFAs are places that the state and county governments have designated as being desirable for future growth and development, because they have existing public services and higher residential densities. Funding for capital projects outside these areas, including road construction, must seek an exemption from "Smart Growth" to receive state funding.

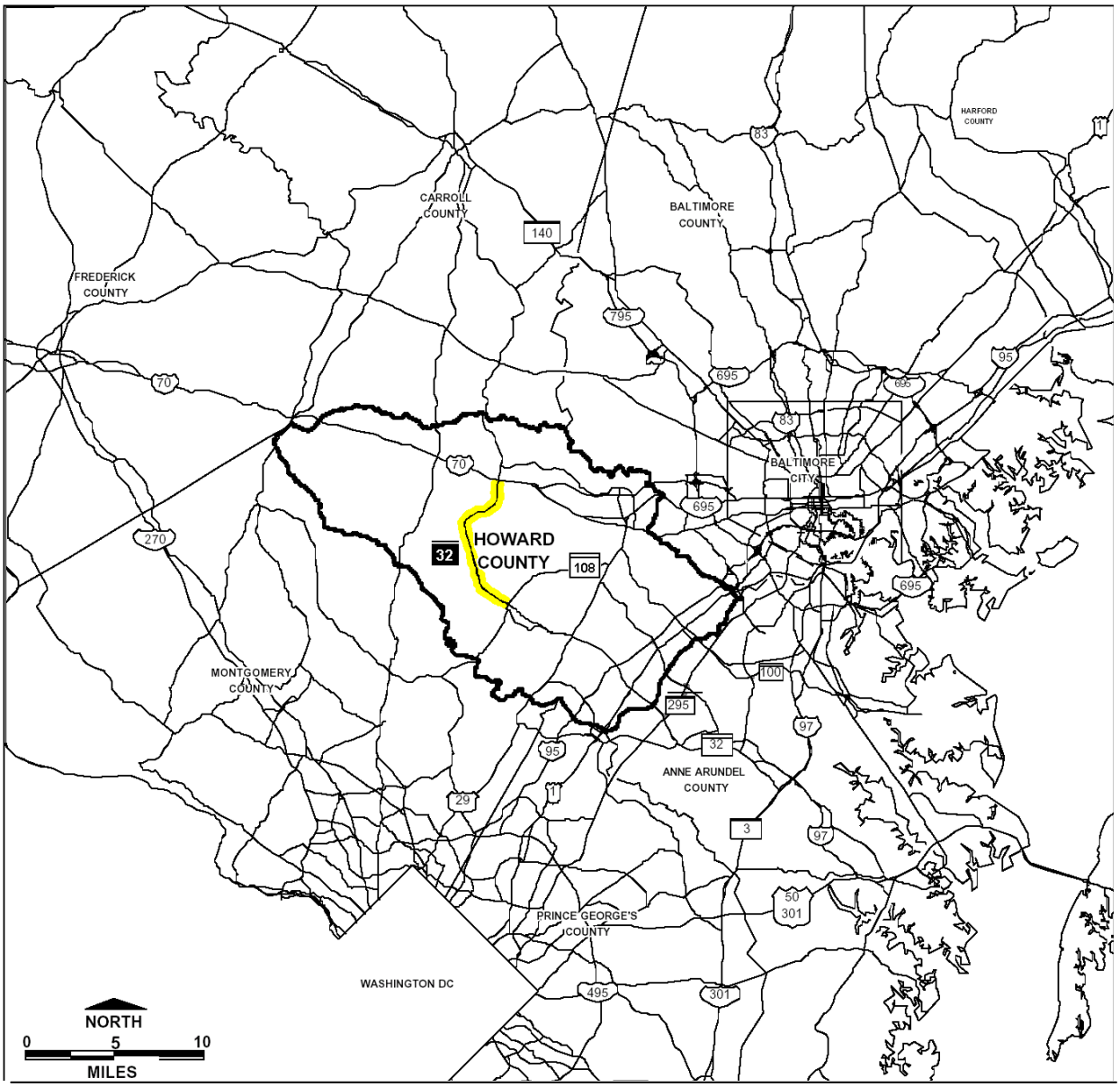
This analysis examines three policy alternatives to alleviate congestion on this road segment: 1) no-build; 2) structural upgrades; and 3) four-lane expansion. The no-build or do nothing alternative involves keeping the road as is. The road would not be widened, and large-scale improvements would not take place. The structural improvement alternative involves converting Route 32 to a limited-access highway with interchanges, similar to Route 90 in Worcester County. This alternative will improve traffic flow, but it will not increase capacity. Finally, the four-lane expansion is the alternative proposed by the State Highway Administration (SHA) to widen Route 32.

To determine the most appropriate alternative, we evaluated each of these options using a set of eight criteria. The criteria are the impacts on congestion, safety, political feasibility, cost, rate of sprawl, environmental impacts, equity, and noise.

Both structural upgrades and the four-lane expansion performed well in our evaluation, while the no-build alternative performed too poorly in the areas of congestion, safety, political feasibility and equity to be seriously considered. If decision makers determine that reducing congestion is the most important aspect of the project, while also valuing political feasibility, then we recommend implementation of the SHA's proposal to widen Maryland Route 32 to a four-lane road. This plan will increase the capacity of the road and is more likely to reduce congestion levels than the structural upgrades option, while also improving safety.

On the other hand, if decision makers determine that cost, rate of sprawl in land development, environmental, and noise concerns are more important, then we recommend adoption of the structural upgrade alternative. This alternative will moderately decrease the levels of congestion and will increase the levels of safety for users of the road. Additionally, this alternative would have a somewhat lower cost, would have less of an impact on the environment and noise, and would likely foster a slower rate of suburban sprawl than the four-lane expansion.

FIGURE 1: MAP OF PROJECT AREA – MARYLAND ROUTE 32 (SHADED)



Source: Howard County General Plan, 2000, p. 20.

INTRODUCTION

The Maryland State Highway Administration (SHA), under the direction of the Maryland Department of Transportation (MDOT), has determined that the two-lane, nine-mile stretch of Maryland Route 32 from Maryland Route 108 to Interstate 70 in Howard County has serious congestion and safety issues that need to be addressed (SHA, 2004, p.2). The SHA has proposed that the road be widened from two to four lanes, and has moved forward in planning for such a project.

As graduate students in the Department of Public Policy at the University of Maryland, Baltimore County (UMBC), we have conducted a policy analysis of this issue. We define the problem affecting this section of Route 32, propose alternatives for addressing the problem, specify criteria for evaluating the alternatives, and evaluate the alternatives.

We used a number of different sources and methods to shape our analysis. First, we traveled the two-lane section of Route 32 during the evening peak period to familiarize ourselves with the road. Then, we heard presentations from the following individuals and organizations:

SPEAKER	ORGANIZATION
Don Croce and Richard Gezelle	A Better Plan for MD 32 (Citizens Opposition Group)
Steve Horn	Director, Carroll County Dept. of Planning and Zoning
Virginia McConnell, PhD.	Professor of Economics, UMBC
Marsha McLaughlin	Director, Howard County Dept. of Planning and Zoning
Eric Tombs	Project Manager, State Highway Administration
Timothy Wheeler	Staff Writer, Baltimore Sun
David Whitaker	Manager, Transportation Planning, Maryland Department of Planning

All were instrumental in providing necessary information that allowed us to critically examine the complexities of this issue. Two of these parties reviewed the first draft of our paper and provided useful comments. To guide our analysis, we also conducted extensive reviews of the scholarly literature and best practices in the field of traffic management.

We have attempted to objectively examine this issue of congestion from multiple perspectives under the limitations inherent to a semester-long class. It is our hope that this analysis provides useful insight into the dynamics involved in the proposed expansion of Route 32, and informs the ongoing debate.

HISTORY OF ROUTE 32

We examined the nine-mile section of Route 32 that extends from Route 108 in Clarksville to I-70. This road section is located in western Howard County and is currently a two-lane, non-divided highway with ten-foot shoulders and no access controls. There are 11 intersections, seven of which are signalized, as well as numerous private driveway entrances throughout the study area. SHA proposes to widen Route 32 to create a four-lane divided highway with access provided through interchanges and service roads (SHA, 2004, pp. 3-5). Already, Route 32 has been widened to a four-lane road between I-95 and Route 108, so expansion of the area under study represents a continuation of an existing four-lane roadway.

The two-lane section of Route 32 runs through a rural section of western Howard County. The area zoned for low-density residential development, and also includes many acres of open space and active farmland. According to the 2000 Howard County General Plan, land use along Route 32 is a combination of commercial employment centers, rural residential, and rural conservation.

The area surrounding this road is served by major employment centers in eastern Howard County, as well as in Baltimore City, Montgomery County, and Washington, DC. This section of Route 32 is traveled by motorists originating from, and going to, points across a large portion of the Baltimore-Washington region. According to Marsha McLaughlin, Howard County's Director of Planning and Zoning, many users of this road originate from such areas as Carroll and Frederick Counties in Maryland, and a significant number come from Pennsylvania.

The project to widen Route 32 between Route 108 and I-70 started as a planning study in May, 1995. The Howard County Executive sent a priority letter to the Maryland Secretary of Transportation, which led to the formation of an Alternatives Workshop made up of representatives of the SHA and a focus group of area residents. SHA is responsible for conducting a project planning study. As a part of this process, SHA conducted accident, engineering, and environmental analyses, held public hearings, and created a Land Use Expert Panel (LUEP) (SHA, 2004, pp. 1-2).

The LUEP was composed of nine members and included developers, real estate consultants, academics, and interest group leaders. Their purpose was to assess the effects that each of three alternatives for Route 32 would have on land use in the surrounding areas. The alternatives that they considered were "no-build," two-lane with interchanges, and four-lane with interchanges. While there was internal disagreement over a number of their conclusions, they seemed to agree that increasing road capacity would increase demand for development (Land Use Expert Panel, 2004, p. 27).

During the planning process, SHA originally identified safety as its main concern for Route 32. There had been several fatal head on collisions on this section of Route 32 between 1996 and 1999. Accident analysis during this period revealed that the number of rear-end,

sideswipe and truck related accidents were significantly higher than the statewide average (SHA, 2000).

In the last ten years, SHA made minor roadway improvements to this section of Route 32 to improve safety. These improvements include the installation of rumble strips between opposing traffic, wider paint markings for the centerline, and several new left-turn lanes. The most recent accident analysis of this section shows that the overall accident rate is lower than the statewide average and reported no fatal accidents in calendar year 2002. Rear-end collisions remain the most common collision type along this roadway. Additionally, there was one accident-related fatality in 2000, one in 2003, and two in 2001 (SHA, 2004).

Rapid population and residential growth is occurring in areas north and west of Route 32. This growth combined with regional through traffic has morning and evening peak period traffic volumes nearing capacity. SHA reports that without further improvements the traffic on this section of Route 32 will exceed capacity during peak hours by 2025, impeding traffic flow and increasing the potential for accidents (SHA, 2000).

On July 21, 2004, state transportation officials sought and received an "extraordinary circumstances" exemption of Maryland's Smart Growth law based on growing congestion and safety concerns on Route 32 (SHA, 2004). The 1997 Smart Growth law restricts road-building funds to projects that connect "Priority Funding Areas" (PFAs). PFAs are places that the state and county governments have designated as being desirable for future growth and development, because they have existing public services and higher residential densities (See Appendix 1). The area of Route 32 being studied does not connect two PFAs. Therefore, an exemption was requested and granted by the Maryland Board of Public Works by a two to one vote (the Board

of Public Works consists of Maryland Governor Robert L. Ehrlich Jr., State Comptroller William Donald Schaffer and State Treasurer Nancy K. Kopp).

Opponents of the widening of Route 32 consist of many community activists and environmental groups. They include the 1000 Friends of Maryland, the Chesapeake Bay Foundation, A Better Plan for 32, the Citizens Planning and Housing Association, Environmental Defense, Greater Baltimore Urban League, Maryland League of Conservation Voters and the Maryland Public Interest Research Group. These groups argued against the granting of the "extraordinary circumstances" exemption by the Board of Public Works (1000 Friends of Maryland, et al., 2004).

Opponents contend that the proposed expansion will only serve to subsidize more growth and development in rural western Howard County (Wheeler, 7/13/2004). They also argue that the SHA's most recent accident analysis does not support its stated safety concerns. The opposition also states that there are alternatives short of widening Route 32 that have not been properly explored (1000 Friends of Maryland, et al., 2004).

The debate over widening Route 32 continues as the 1000 Friends of Maryland, a Baltimore-based group opposed to the widening of Route 32, has begun a legal challenge seeking to overturn the Board of Public Works July decision. They argue that if this decision is allowed to stand, it will undermine Maryland's Smart Growth law.

We hope that our policy analysis of this issue to widen Maryland Route 32 will contribute to the current deliberations.

PROBLEM DEFINITION

Based on our research, we have concluded that Route 32 between Route 108 in Clarksville and I-70 will have too much congestion during peak travel periods at least by the year 2025. Therefore, alternatives to alleviate congestion must be sought.

There are numerous factors to consider when evaluating issues of traffic congestion, especially in an area like the Baltimore/Washington metropolitan region. The major factors to consider are 1) projected population growth, 2) volume of vehicles using the roadway, 3) safety data on the roadway, and 4) land use availability in the area. These factors are important because they describe the current situation and have a direct impact on the number of vehicles using the road.

There are three counties that will be most affected by the decisions regarding Route 32: Howard County because that is where the section of highway is located; Frederick County, because residents use this roadway to commute; and Carroll County, because residents use this stretch of road and county officials argue that an expanded Route 32 is a crucial component of their plans for county economic development. For all of these factors, we provide current data and projections in these three counties and overall, if they exist.

Projected Population Growth

The state of Maryland, and especially the counties of Howard, Frederick, and Carroll, are projected to continue to experience population growth during the next 20 years. In Table 1 we have the actual and projected populations for the counties most affected by the expansion of Route 32.

The projected increase in population for the state of Maryland between 2000 and 2025 is a little over 1 million people, a 19.8 percent increase. By comparison, the counties most relevant to this study will experience far greater growth rates during the same period, with Frederick County experiencing the greatest population growth. The number of residents there will increase by 104,323 between 2000 and 2025, or 53 percent. Carroll County's population is projected to increase by 29 percent and Howard County's by 29 percent. The total number of new residents of these counties will increase by 219,234 people, or 37 percent.

TABLE 1: ACTUAL AND PROJECTED POPULATIONS IN THE STATE OF MARYLAND AND CARROLL, FREDERICK, AND HOWARD COUNTIES

STATE AND COUNTY	CENSUS 2000	PROJECTED POPULATION IN 2025	± IN POPULATION	% INCREASE
MARYLAND	5,296,486	6,345,250	1,048,764	19.8%
CARROLL COUNTY	150,897	194,150	43,253	28.7%
FREDERICK COUNTY	195,277	299,600	104,323	53.4%
HOWARD COUNTY	247,842	319,500	71,658	28.9%

Source: Maryland Department of Planning, Planning Data Services, May 2004.

These numbers clearly indicate that growth in these counties will continue over the next quarter century. Since all of these people need to get to jobs, attend schools, and shop, this population growth will have an impact on all roadways in these counties.

Data gleaned from the SHA's Land Use Expert Panel (LUEP) report demonstrates similarly high growth patterns. The LUEP projected that population will increase 33 percent for the Route 32 study area through 2020, the number of households will increase 43 percent, and the number of jobs will increase 41 percent (Land Use Expert Panel, 2004, pp. 9-10).

Traffic Volume of Cars Using Route 32

According to SHA's analysis of this nine-mile stretch on Route 32 between Route 108 and I-70, the volume of traffic using this roadway will increase regardless of whether the road is expanded. Once a road achieves a level of congestion intolerable to its travelers, travelers will choose alternative routes that they perceive to be faster or, more importantly, less crowded. Table 2 provides the traffic volumes that SHA projected in its planning study of the roadway.

The two segments in the table represent the volumes between: 1) Route 108 and the first planned interchange heading north; and 2) MD 144 (near I-70) and the first interchange heading south at Rosemary Lane. This SHA analysis predicts volumes for the no-build alternative, which includes no major structural changes, and the build alternative, which includes adding another two lanes and constructing five above-grade interchanges and altering the interchange at Route 32 and I-70.

Based on these numbers, SHA demonstrates that: 1) without widening the road the number of vehicles using this road will continue to increase; and 2) with widening the road the volume also increases, but it will be spread over four lanes instead of just two. On the first segment of road included in Table 2, there is a 42 percent projected increase in the number of drivers who will access the road in 2025 if Route 32 remains at the same capacity. However, the number of drivers is projected increase 104 percent if the four-lane expansion is built.

TABLE 2: TRAFFIC VOLUME COMPARISON

SEGMENT	2003	2025 NO-BUILD	% INCREASE	2025 BUILD	% INCREASE
1) MD 108 TO LINDEN CHURCH ROAD	26,400	37,500	42%	53,000	104%
2) ROSEMARY LANE TO MD 144	23,900	33,200	39%	48,700	101%

Source: State Highway Administration, 2004, p. 2.

Based on the data in this table, this roadway will be less congested if it is expanded than if it is unchanged. Looking at the data for the first segment, the SHA expects that roughly an additional 10,000 vehicles will access the road in 2025 without the expansion, meaning that more than 17,500 cars will use each lane every day. If the roadway is widened, its usage will increase by 26,600 vehicles a day, but the rate of usage for each lane will decrease to 13,250 vehicles per day, thereby making it less congested.

Safety Data

In 2004, SHA's initial justification for the exemption from the Smart Growth law was that this segment of Route 32 was one of the least safe roads in Maryland. This claim has since been moderated because recent data demonstrates that this is no longer the case. However, state and local officials and local residents alike express safety concerns about the roadway. Between 1996 and 1999, there were 125.9 accidents per 100 million Vehicle Miles Traveled (VMT) in comparison with the state average of 100.1 accidents per 100 million VMT on a similar road. The safety improvements made to the road since that time have decreased the accidents to 91.6 per 100 million VMT between 2000–2003, while the state average has gone up slightly to 103.3 accidents per 100 million VMT. If the four-lane expansion is completed, it is expected that it would become significantly safer since the statewide average for a four-lane roadway with controlled access is 38.5 accidents for every 100 million VMT (MDOT/MDP, 2004, p. 3).

Our analysis demonstrates an increase in accidents along this corridor over the past three years (See Appendix II). Based on our analysis of accidents on that segment of road, there were 70 accidents in 2000, 68 accidents in 2001, and 87 accidents in 2002. After six months of 2003,

the number of accidents was 46, which at that rate would reach 92 accidents by the end of 2003 (assuming a constant rate during the last half of the year).

Other data regarding accidents on this segment of road during the two periods of 1996 to 1999 and 2000 to 2003 indicate that there are some areas where the road is safer than the statewide average. According to the 1000 Friends of Maryland (2004), the following accident rates decreased and were lower relative to the statewide average in 2000 to 2003: injury, fatal, head-on, left-turn, angle, parked vehicle, and fixed object. Accident categories that continued to be above the state average even after the safety changes had been made were property damage, rear-end, and sideswipe.

Land Use Patterns

One of the major concerns for the opposition regarding this proposed expansion is that it would promote more growth and development in rural western Howard County. According to the Howard County General Plan (2000), 75 percent of the land in the rural west is already committed to residential development (48 percent of committed land), preservation easements (31 percent), parks and open space (13 percent), or institutional, infrastructure and other use, and commercial and industrial use (8 percent). The remaining one quarter is uncommitted and zoned for either rural conservation or rural residential not served by public sewers.

TABLE 3: RURAL WEST ACREAGE LAND USE SUMMARY, 1999

LAND USE	TOTAL COMMITTED	PERCENT COMMITTED	UNCOMMITTED	TOTAL
RESIDENTIAL DEVELOPMENT	34,400	48.0%	0	34,400
UNCOMMITTED (ZONED RC AND RR)	0	0.0%	23,100	23,100
COMMERCIAL AND INDUSTRIAL	300	0.4%	100	400
INSTITUTIONAL, INFRASTRUCTURE AND OTHER	5,200	7.3%	100	5,300
PRESERVATION EASEMENTS	22,400	31.3%	0	22,400
PARKS AND GREEN SPACE	9,300	13.0%	0	9,300
TOTAL	**71,600**	**100.0%**	**23,300**	**94,900**

Source: Howard County General Plan, 2000, p. 38.

These data are important to our analysis because one of the major issues is the impact of road expansion and induced demand–leading to sprawl. According to the Howard County Plan, in 1999, a total of 6,400 acres of land, or 19 percent, was already committed to residential development that had not yet been developed. Beyond that, the residential growth opportunities are currently limited because the remaining uncommitted land is not zoned to receive public water or sewer. While rezoning seems politically unlikely at this time, it is a possible that rezoning could occur if pressures for growth continue to increase. This is certainly a fear of the groups that oppose the widening of this road segment

LITERATURE REVIEW

To conduct this literature review, several different topical areas were identified for further research, given the policy problem and specific roadway under consideration. We identified appropriate literature using several academic databases available in the University of Maryland library system and reviewed literature from organizations that provided reports online. The literature reviewed includes academic studies, government reports, journal articles, and

technical reports. In addition, as part of our coursework we were required to read the book *Still Stuck in Traffic* by Anthony Downs (2004).

This literature section is divided into five topic areas: 1) safety, 2) road construction, 3) environmental effects, 4) sprawl, and 5) principles of traffic congestion.

Safety

Safety is one of the primary considerations when discussing the use of a roadway and is a concern at some level for many of the parties involved in this study. Two General Accounting Office (GAO) studies (2003, 2004) examined factors that contribute to traffic accidents. In 2000, the estimated economic cost of deaths, injuries, and economic loss was more than $230 billion nationwide. In 2001, there were approximately 6.3 million motor vehicle crashes in the United States and a total of 42,116 fatalities. The rate of fatalities per 100-million VMT decreased from 3.35 in 1975 to 1.51 in 2001, indicating that U.S. roadways are, in general, safer than they were nearly a quarter century ago.

These GAO studies concluded that the three main factors contributing to motor vehicle crashes, in order of importance are: 1) human factors, 2) roadway environment factors, and 3) vehicle factors. Most relevant to this study is the second of these three, the roadway environment factors, which include roadway design, roadside hazards, and roadway conditions. There was a disparity between rural and urban roads, with 60 percent of fatal accidents nationwide occurring on rural roads. Part of this disparity was due to the difficulty of getting crash victims timely medical attention, but this factor is still less important than the actual roadway environment factor. Design elements that lead to an increased number of crashes and fatalities include narrow lanes, sharp curves, lack of medians, small or non-existent shoulders, trees, utility poles, and animals. Many of these factors exist on the section of Route 32 currently under study.

In a study looking specifically at the safety effects of cross-section design on rural multilane highways, the U.S. Department of Transportation determined that there were several factors that lead to road safety deterioration on rural roads. The factors attributed to an increase in accidents were: "worsening roadside conditions, increasing exposure measures (i.e., daily vehicle-miles of travel), increasing numbers of driveways per mile, and increasing intersections (with and without turn lanes) per mile" (U.S. Department of Transportation, 1997, p. c-1). Increasing outside shoulder widths and increasing median widths, however, were both factors that decreased accident rates.

Road Construction

Construction is a common approach to dealing with congestion, and it is the primary approach being considered for this roadway. Cost is an obvious factor when considering road expansion. In one study, we found a comparison of the cost of different highway elements. Based on a nationwide analysis of costs for creating diamond interchanges (with twenty-five states participating), the average cost was $9 million for a one-mile interchange. The ranges were represented by Mississippi at the low end with an estimated $4 million, and Hawaii at the high end, with an estimated $26.7 million. The average cost of constructing a single lane mile was $2.3 million, with a range of $1 million in Mississippi to $8.5 million in New York (Washington State Department of Transportation, 2002). Based on this analysis, an interchange costs around three to four times more than a lane mile. This is an important factor to consider when looking at the cost of solely building the interchanges or building both interchanges and increasing the road capacity, which would be required for the structural upgrades in this analysis.

In an article on the subject of highway reconstruction, the authors concluded that the most successful highway and bridge projects had a task force of officials from multiple agencies, and consulted professionals to develop, implement, and evaluate plans to project all the possible impacts of reconstruction (Janson, Anderson, and Sterne, 1989). Because major highway construction has the tendency to cause major disruptions to the existing travel patterns and alternate routes, they created a process called a Transportation Management Plan (TMP) that includes five critical phases. They are: 1) anticipating the needs of the plan, 2) developing and approving the plan, 3) preparing to implement the plan, 4) implementing and monitoring the plan and 5) post construction activities. Additionally, each phase has five focuses: 1) programming and budgeting, 2) management taskforce, 3) construction area traffic control, 4) corridor transportation systems management and 5) public information and communications. SHA has developed a model anticipating future traffic patterns and future need and is now in the process of holding public workshops and approving its four-lane expansion plan.

Environmental Effects

The area surrounding Route 32 between I-70 and Route 108 is located in the rural western area of Howard County. While it is only a nine-mile stretch of road and the likelihood of broad environmental damage is minimal, environmental impacts should still be addressed. In a review of the literature regarding strictly environmental impacts, we were only able to find a few articles in traditional journals.

The first important piece to note is that the federal government has passed laws and regulations regarding the construction of highways. The Federal Aid Highway Act of 1962 and 1970 are key pieces of legislation outlining the overall process of project development. They

also mandate that states develop and implement guidelines for the analysis of air, noise, and water pollution in any highway development project (Cohn, 1982).

In an article addressing air quality and the effectiveness of Transportation Control Measures (TCMs), the author discusses the National Ambient Air Quality Standards (NAAQS), which regulate levels of carbon monoxide and ozone pollution. As a result of the Clean Air Act Amendments of 1977, NAAQS was responsible for reducing transportation related pollutants by using three strategies: emission controls, enforcement programs, and system transportation planning (Albersheim, 1982). Given that this law was passed nearly 30 years ago, and an updated law was passed in 1990, this Act is a significant part of the fabric of U.S. environmental policy and requires that the private and public sectors enact efforts to reduce air pollution.

Beyond the effects on the environment of actual construction of roads, automobiles also pollute the highways on which they travel. According to an article on this subject, effects of traffic on the environment depend on the intensity of traffic on the specific road and the way in which rainwater spreads pollutants. Road surfaces that are made from less porous materials will keep certain emissions and other pollutants from spilling off the road and contaminating the surrounding environment (Bohemen and Van De Laak, 2003).

Sprawl

One article addressed the definition of sprawl and identified it as "an elusive concept." Despite this quality, the authors developed a definition of sprawl for use in cases where it is measured as a "*condition of land use*." The definition is:

> *Sprawl (n.) is a pattern of land use in a UA [urbanized area] that exhibits low levels of some combination of eight distinct dimensions: density, continuity, concentration, clustering, centrality, nuclearity, mixed-uses, and proximity (Galster, Wolman, Coleman, and Freihage, 2001, p. 685).*

This article is relevant to this study as it tackles the difficulties of defining sprawl, such as when development becomes sprawl. In their analysis the authors reviewed 13 different urban areas including Washington, DC, which was ranked eighth in the "urban sprawl indicators ranking." The cities preceding our metropolitan area in ranking were New York, Philadelphia, Chicago, Boston, Los Angeles, San Francisco, and Houston.

A report from the Blue Ribbon Commission of Washington State (1999) noted that transportation investments have a significant influence on surrounding land use, and land use patterns also affect the utilization of transportation systems. An important point emphasized by this commission is that land use and transportation systems are intrinsically regional in nature.

Speaking to the expected growth in the affected areas, in a study defending sprawl, Gordon and Richardson (2000) make the argument that Americans like living in the suburbs and that no legislative action can change the impact of this preference.

In a study of jobs and commuting, Cervero (1989) notes that despite the fact that more jobs are moving to the suburbs, suburbanites are commuting farther than ever. Causes for this behavior include zoning laws that result in an under-supply of housing, costs of rent and housing that price many people out of the market, and demographic trends. Because more people are moving to the suburbs, the length of the average commute has steadily increased over recent years, with the percentage of suburb-to-suburb trips rising to 54 percent of total work trips (Baltimore Regional Transportation Plan, 2001, pp. 31-33).

In an opinion survey of municipal elected officials around the country, one question inquired about development in the cities in which they worked. Nationwide, opinions of elected officials on the issues of traffic congestion and sprawl and their relationship to development vary. When asked to select the conditions that create the most difficult decisions about

development, traffic congestion was ranked first (41 percent) and sprawl was ranked fifth (20 percent (Brennan and Hoene, 2004).

Principles of Traffic Congestion

In *Still Stuck in Traffic* (2004), Anthony Downs discusses a few concepts that are particularly relevant to our analysis. These concepts are triple convergence, induced demand, and triple divergence. Downs also addresses some of the realities regarding growth policies, which are covered in the end of this section.

Triple convergence can be likened to the concept of water seeking its own level. Downs explains what happens when a road is expanded in the following way:

> *...many drivers who formerly used alternative routes during peak hours switch to the improved expressway (spatial convergence); many drivers who formerly traveled just before or after the peak hours start traveling during those hours (time convergence); and some commuters who used to take public transportation during peak hours now switch to driving, since it has become faster (modal convergence). (Downs, 2004, p. 83)*

The expectation for Route 32 is that once it is expanded, triple convergence will occur and the roadway will fill up again fairly quickly.

Downs asserts, "widening an expressway may encourage more intensive property development in the primary destination it serves" (Downs, 2004, p. 84). This impact, while longer-term, can lead to what is called "induced demand." If a road is widened, it may encourage more demand for the use of the road because more people (commuters and residents) want to enjoy the upgraded access.

There is a corollary to triple convergence, which is "triple divergence." When a road becomes intolerably congested, commuters will seek an alternative that they perceive is faster. In this scenario, commuters will often spill into adjacent local streets, which are not built to handle high levels of traffic, making the area unsafe for residents. Triple divergence also applies

to public transportation: as congestion increases, commuters may find available public transportation more appealing. Commuters may also travel at different (or off-peak) times.

Finally, Downs discusses, "the imperviousness of growth to local policies." He states that, "no suburban community can hope to stop the growth of its metropolitan area as a whole if conditions favor the expansion of jobs there" (p. 89). Essentially, population pressures and the desire Americans have for even-larger, single-family homes, will continue to defy any policy local geared toward stopping it.

BEST PRACTICES REVIEW

To guide our identification of alternatives that address the problem of congestion on Route 32, we conducted a review of best practices in managing traffic congestion. Based on our research, we believe that these are more commonly found in think-tank and trade publications, rather than in the academic literature. Since many think tanks and trade groups archive publications on their websites, we used Internet search engines such as Yahoo and Google to find published reports on best practices. We also searched publication lists on the websites of some of the leading transportation and general policy organizations, such as the Brookings Institution, the Texas Transportation Institute, and the Institute of Transportation Engineers.

We identified fourteen publications that described some of the more successful steps that governments have taken to control traffic congestion. The best practices can be categorized in four groups: 1) supply-side solutions, 2) demand-side solutions, 3) traffic management technology solutions, and 4) intergovernmental solutions.

Supply-side solutions seek to improve traffic flow by increasing road capacities. This can be accomplished through improving and widening roads, or constructing new roads. To do so,

governments must allocate considerable funds, as infrastructure improvements can be quite costly. The proposed four-lane expansion of Route 32 falls under this category. Several of the publications that we reviewed stated that road construction and expansion are effective ways of lessening congestion (Lomax, et al., 2001; TRIP, 2003; TRIP, 2004). Additionally, Cox (2000) found that metropolitan areas that greatly increased the supply of roadways from 1982 to 1996 had only slightly more travel miles per capita than metropolitan areas that did not increase roadway capacity over this time. However, specific cases where expanding roadways have been effective in managing congestion were few. Instead of providing examples, advocates of supply-side solutions tended to base their argument around the fact that demand-side strategies are unsuccessful, making road expansion the only alternative.

Demand-side solutions aim to reduce congestion by giving motorists options to using stressed highways during peak periods. Some of these solutions reduce the demand for roads by increasing the supply of alternatives to driving, such as mass transit. Luten, et al., (2004) found that demand-side strategies are more cost-effective than supply-side strategies, with financial and time incentives being the most successful. Debacker and Harshman (2001) note that community planning-based solutions such as transit-oriented development, traditional neighborhood design, and employer-assisted housing were successful in lessening traffic problems in suburban Chicago. At the state-level, Lomax, et al., (2001) found that the State of Washington's Commute Trip Reduction Law, which requires employers to provide a variety of programs that reduce travel demand, has removed 18,500 vehicles from the state's roadways every morning. Another demand-side solution is to charge tolls for highway usage. A report by a Minnesota task force advocates charging tolls during peak periods, while Cox (2000) noted that high occupancy toll (HOT) and high occupancy vehicle (HOV) lanes have been successful on Route 91 in Southern

California. Cox also advocates creating limited-access interchanges and highways as a means of reducing the ability of motorists to get onto congested roads.

In comparison, supply-side advocates see the problem of congestion in terms of a lack of capacity, whereas, demand-side advocates see the problem in terms of too many vehicles that demand access to a particular road. Advocates of supply-side solutions criticize demand-side solutions as being unrealistic because of the difficulty inherent in trying to alter human behavior. Supply-side advocates also argue that demand-side solutions merely divert the problem of congestion to other roads or delay inevitable road expansion. Advocates of demand-side solutions counter that supply-side solutions do nothing to change the underlying dynamics that cause congestion. Therefore, expanded roadways are destined to become congested again in the future.

Traffic management technology solutions integrate elements of both supply-side and demand-side solutions. They are designed to facilitate the effective flow of traffic (demand) and alleviate disruptions in traffic networks (supply). A study published by KHA of Ohio (2001) noted successes in the use of Intelligent Transportation Systems (ITS), which use computer technologies to monitor traffic flows, manage traffic lights at intersections, and operate large message signs that alert motorists of impending delays. A different study published by the Ohio Department of Transportation (2003) found that half of all congestion delays are caused by "incidents," which includes crashes, debris on roads, or disabled vehicles. Therefore, an effective way of preventing congestion is to clear the roadways of incidents by developing quick-response protocols and deploying service patrol vehicles and tow trucks.

Intergovernmental solutions, or regionalism, involve different state and local governments cooperating in the formulation of policies to improve the flow of traffic. The traffic

network does not adhere to jurisdictional boundaries. On a given day, a motorist can easily drive through multiple counties, on both state- and locally-maintained roads. Howard County Planning Director Marsha McLauglin noted that many of the motorists on Route 32 come from Carroll or Frederick County, and a significant number come from Pennsylvania. Downs (2004) argues that the nature of the problem of traffic congestion requires that policies be formed at a regional level. Rothblatt and Colman (2001) and Debacker and Harshman (2001) note successes in the creation of region-wide transportation planning associations in both California and in the Chicago, Illinois metropolitan area.

The Baltimore Regional Transportation Board acts as a transportation planning association for the Baltimore area, although it merely suggests policies rather than enact them. The board is comprised of the elected executives of Anne Arundel, Baltimore, Carroll, Harford, and Howard Counties, and the cities of Annapolis and Baltimore. Also on the board are the Secretaries of the Maryland Departments of Planning, Transportation, and the Environment.

In 2001, the Board published the Baltimore Regional Transportation Plan (BRTP). It is a long-range plan that identifies transportation goals and proposes infrastructure improvements that the region should undertake between 2001 and 2025. Proposed road projects were included in the BRTP after having been thoroughly evaluated and requested by the jurisdiction in which the project falls. The proposal to widen Route 32 was included in this process.

Each proposed project was prioritized through a weighted scoring system that is based on evaluations of both, policy and technical levels. The policy-level evaluation was performed by the requesting jurisdiction, which assigned each project a numerical score based on whether it is high-, medium-, or low-priority. Then, MDP reviewed each proposal and deducted points if it was incompatible with the state's Smart Growth laws. Out of the 150 proposals reviewed, a total

of 13 proposals had points deducted. The Route 32 proposal accounted for four of the deducted projects – one for the widening, and three for its interchanges (Baltimore Regional Transportation Plan, 2001, p. 92).

The technical-level evaluation was conducted by the staff of the Baltimore Metropolitan Council, which assigned numerical scores to each project based on multiple criteria. The criteria measuring cost-effectiveness, congestion index, and peak demand carried the greatest weight.

After the evaluations, the numerical scores in both categories were combined, with the policy-level evaluation accounting for 60 percent of the total score, and the technical-level evaluation accounting for the remaining 40 percent. Based on this method of prioritization, the proposal to widen Route 32 ranked as the sixth most preferred highway project out of the 150 projects evaluated by the board. Finishing ahead of Route 32 were two separate expansions of the Baltimore Beltway in Baltimore County, and expansions of I-97, Route 2, and Route 3 in Anne Arundel County (Baltimore Regional Transportation Plan, 2001, p. 95).

ALTERNATIVES

For the purpose of exploring the various alternatives to the widening of Route 32 from MD 108 to I-70, we have divided the policy options into three categories: 1) no expansion, 2) limited expansion and 3) the SHA's recommendation of full expansion of Route 32. We also considered other alternatives that did not fall into these three categories, including: mass transit, ride sharing, flex-time (an adjustment in school/business hours), tolls, expansion of other roadways, and a truck ban. After careful review of the available data, we decided that these aforementioned alternatives were not feasible for the nine-mile stretch of road. This is not to say that that these alternatives would be ill suited if a long-term, regional transportation plan was considered. In fact, we agree with the Howard County General Plan of 2000 that there is a growing need for "regional public transportation" to alleviate congestion (p. 22).

In order to address the problem of congestion, it is important to review the current and projected traffic volumes on Route 32 during peak travel hours. According to the SHA and the Federal Highway Administration (FHA), the traffic volume on Route 32 between MD 108 and I-70 will grow by 39 percent if the proposed expansion does not take place and by 101 percent if indeed the state decides to add the additional two lanes (SHA, 2004).

ALTERNATIVE 1: NO-BUILD

The no-build or do nothing alternative involves keeping the road largely as is and will not cost the state any additional money other than standard maintenance. The piecemeal improvements that have been done over time, such as installing rumble strips and adding traffic signals, would continue as warranted. The road would not be widened, however, and large-scale improvements would not take place. If adopted, the no-build option may result in the diversion

of traffic to other roadways. Some of these other facilities may be less able to withstand the demands of heavy traffic.

ALTERNATIVE 2: STRUCTURAL UPGRADES

The structural upgrade alternative would essentially transform Maryland Route 32 into a limited-access two-lane highway, similar to Route 90 in Worcester County, Maryland. The purpose of this alternative is to keep traffic flowing and to improve safety. Left turns and traffic signals would be eliminated from this nine-mile stretch of road. In addition, this alternative will feature five diamond-shaped on and off ramps. Other features will include a widened shoulder for maneuvering around disabled vehicles, east and west-bound traffic divided with a grassy median, and adding guardrails.

ALTERNATIVE 3: FOUR-LANE ROAD EXPANSION

This alternative is the SHA plan for the widening of Route 32. Two lanes would be built on the west-side of the existing road, resulting in a four-lane highway with a grassy median separating opposing traffic flows. As with the structural upgrade alternative, all access to and egress from the road would require using one of five diamond-shaped interchanges. In this alternative, there would be nine residential and one business relocation. This alternative is estimated to cost approximately $220 million dollars over the next ten years.

OTHER ALTERNATIVES CONSIDERED

As previously stated, we considered a number of other alternatives, but they were then discarded largely because they were not realistic for this nine-mile stretch of road. The first two alternatives represent similar approaches: the rideshare (car/vanpool) and express bus service. Both of these alternatives require parking areas and an adequate number of people with the same or similar destinations. Although there are available parking spaces in some areas, the

origin/destination data tells us that there are not enough common commuters to make these viable alternatives for the nine-mile stretch of Route 32 (Baltimore Metropolitan Council, 2004).

According the Howard County General Plan (2000), ten "Park-and-Ride" parking lots are available in the county (two of which are located at the intersections of I-70 and Route 32 and at MD 108 and Route 32). But based on our observations, they are significantly underutilized.

Second, for these alternatives to be efficient, a meaningful number of people need to be going to the same place. If the majority of travelers on Route 32, during peak hours were found to have a common commute (such as Frederick to Annapolis) then carpooling and commuter buses could be part of a larger, regional plan to reduce traffic. Origin and destination data from the Baltimore Metropolitan Council indicate that peak hour commuters using Route 32 come from a broad area. A significant number of commuters originate come from areas in southeast and central Frederick County, and from southern Carroll County. There are commuters from throughout all of Howard County who use Route 32. Presumably heading west, there are large numbers of commuters from southwest Anne Arundel County and northwest Prince George's County. There are also a large number of people leaving from central Montgomery County who use Route 32 and few pockets of commuters from downtown Washington, DC, as well. In terms of destinations, most of them appear to be headed to southeast Carroll County, Howard County, southwest Anne Arundel County (where Fort Meade is located), northwestern Prince George's County, central Montgomery County, and parts of downtown Washington, DC.

Because of the voluntary nature of these programs, the fact that a nine-mile stretch of road is a short distance, and there are few common commuter origins/destinations, the demand for carpools and buses to circumvent traffic on this road will be relatively low. With the desire

of many commuters to drive alone, these two alternatives are not likely to have a huge impact on reducing congestion.

One option that we considered included the expansion of surrounding roads, including Interstate 70 and Route 29. While this option could certainly reduce some of the congestion on Route 32 by attracting travelers to those roads, the scope of our analysis does not permit full consideration due to time constraints and the regional nature of this alternative. Additionally, while it may reduce congestion on Route 32 in Howard County, it would have numerous repercussions for other surrounding counties.

Another alternative is flex-time. Flex-time is a program that employers voluntarily adopt to allow employees to alter their work hours and avoid peak hour traffic. We rejected this alternative because it would be impossible to implement for travelers on this segment of highway because 1) the road segment is only nine miles long, and 2) road users share few origins and destinations.

We also considered tolls as a means to 1) raise funds to pay for any changes to the roadway and to 2) reduce congestion by making drivers choose alternate routes to avoid the tolls. We determined that this alternative was not feasible because in general, the public does not like tolls and SHA does not have any other roadways with tolls, only tolls for bridges and tunnels. For these reasons and the fact that it is politically undesirable to make the public pay for something they expect to get for free (or that they feel they have already paid for through taxes), citizens and public officials would be unlikely to support assigning a toll to the nine-mile section of Route 32.

Last, we considered a truck ban in conjunction with two of the alternatives until one reviewer of our paper alerted us that it might not be a viable option. We discussed this issue with

Eric Tombs at SHA who indicated that a truck ban was not permissible because of the requirements of the roadway as a part of the National Highway System (NHS). Roads of this type are required to meet the needs of commerce and defense and allow trucks, and from what we gather, this roadway is a part of the NHS and subject to these requirements.

CRITERIA

To determine the best alternative, we evaluated each option with the criteria most relevant to the problem of congestion. The criteria selected include the impact on congestion, safety, political feasibility, cost, impact on sprawl, the impact on the environment, equity, and noise.

1.) IMPACT ON CONGESTION

Congestion involves the excess demand of vehicles in a given roadway, specifically during peak travel hours. When roads are congested, a small reduction in traffic volumes can provide a large reduction in delays. An alternative will be rated positively if it minimizes congestion.

2.) IMPACT ON SAFETY

Safety is the reduction in accidents and traffic related injuries and fatalities. Evaluations will take into account any safety features that are added to make turning on and off of the road easier, as well as safety features to reduce traffic-related accidents that involve injuries, fatalities, and economic loss. An alternative will be rated positively if it improves safety by decreasing the rate of accidents.

3.) POLITICAL FEASIBILITY

Political feasibility means the practicality and feasibility of an alternative given the current political environment. It is measured by how likely it is that an alternative will receive the backing of appropriate governmental institutions including the Board of Public Works (BPW), the state executive branch, the General Assembly, and the local governments. The extent to which the public does or does not support this option will

have a bearing on the Governor, the legislators, and the local governments, since all are elected positions. Legal issues may also be relevant. In December, 2004, opponents announced they intend to sue regarding the BPW exemption, which may alter the political feasibility. An alternative will be rated positively if it achieves high political feasibility.

4.) COST

Cost means the amount of public funds necessary for an alternative, including any construction, environmental remediation, land purchase, and maintenance. An alternative will be rated positively if the cost is lower.

5.) IMPACT ON RATE OF SPRAWL

Sprawl is the outward expansion of growth often occurring in low density residential areas dominated by private transportation and lack of centralized authority over land use. If an alternative is expected to lower the rate of sprawl, it will receive a positive rating.

6.) IMPACT ON ENVIRONMENT

Environmental impacts include the destruction of forests and wetlands and greater water and air pollution. An alternative that has minimal negative impact on the environment will be rated positively.

7.) EQUITY

Equity considerations include the extent to which different groups are affected differently. In this analysis, the specific groups considered are: the residents of the area proximate to this nine-mile road segment; the commuters using the roadway; Carroll County; and the local residents using the road. An alternative will receive a positive score when the fewest number of groups are negatively impacted.

8.) IMPACT ON NOISE

Noise from traffic as well as construction on and around Route 32 will be taken into account. Noise from traffic will be given more weight because construction-related noise is only short-term, whereas traffic-related noise will remain for a much longer period of time. Each alternative will be evaluated on the amount of noise likely as a result of that alternative. An alternative that reduces noise will be rated positively.

EVALUATION OF ALTERNATIVES

In previous sections we provided an overview of the various alternatives being considered for review in this analysis. We then provided a list of eight criteria that will be used to weigh the merits of each of the alternatives. In this section, we will provide a detailed analysis of each of the alternatives using the criteria previously identified. In addition, we have generated a matrix which provides an overview of the various alternatives and criteria, and summarizes the extent to which the alternatives meet each of the criteria.

MEASUREMENTS IN THE MATRIX

According to Eugene Bardach, who has written extensively on how to conduct policy analyses, "If you cannot fill in the cell with a quantitatively expressed description of the projected outcome, you might settle for a verbal description like "very good" or a symbolic descriptor like + or – " (Bardach, 2000, pp. 35-36). We have chosen to use an outcomes matrix where each of the alternatives is weighed against the various criteria using a five-point scale, the highest value is "+ +" and the lowest value is "- -." An "O" indicates that the criterion is minimally, if at all, affected by the given alternative (either in a positive or negative manner). The criteria have been worded so that a "+ +" is best in every scenario.

SUMMARY OF THE MATRIX

To summarize our evaluation of the alternatives based on the criteria we identified, we created a matrix with each alternative listed in the first column and each of the criteria listed across the top. The rating of each alternative received is noted in the intersection of the alternatives with the criteria (see Table 4).

Moving from left to right, the structural upgrade and the four-lane alternative best meet the first two of our criteria of decreasing congestion and increasing safety. The four-lane expansion has received the highest rating in terms of political acceptability because of the current political climate. Of the first three criteria, decreasing congestion, increasing safety, and political feasibility, we determined that the no-build alternative should receive a negative score because it would not decrease congestion levels, it would not increase safety, and is it not politically acceptable given the current administration.

To minimize cost and the rate of sprawl, the ratings flip to favor the no-build alternative. The no-build would cost the least, and would have a neutral impact on slowing the rate of sprawl. The structural upgrades would cost the taxpayers a considerable amount, but not as much as the four-lane expansion. We assessed the structural upgrades as neutral on minimizing the rate of sprawl and assessed the four-lane expansion as not minimizing sprawl.

We determined that the final three criteria, impact on the environment, equity, and noise, were the least compelling of all the criteria because of the short length of the road and the relative difficulty of assessing equity. We believe that these three criteria should be considered in that context. The no-build would impact the environment and noise least. The structural upgrades and the four-lane expansion received negative ratings in regards to the environment. We determined that the level of equity was negative for the no-build, and neutral for the structural upgrades and four-lane expansion. In considering noise we determined that the structural upgrades would have a minimal impact on noise; however, the four-lane expansion would increase noise.

TABLE 4: ALTERNATIVES AND CRITERIA MATRIX

	DECREASE CONGESTION	INCREASE LEVEL OF SAFETY	IS POLITICALLY FEASIBLE	MINIMIZE COST	MINIMIZE RATE OF SPRAWL	MINIMIZE ENVIRONMENTAL IMPACTS	INCREASE LEVEL OF EQUITY	MINIMIZE NOISE
NO-BUILD	- -	-	-	+	O	+	-	+
STRUCTURAL UPGRADES	+	+	O	-	O	-	O	O
FOUR-LANE ROAD EXPANSION	+ +	+	+ +	- -	-	- -	O	- -

"+ +" - BEST OUTCOME
"O" - NEUTRAL / MINIMAL IMPACT
"- -" - WORST OUTCOME

ALTERNATIVE 1: NO-BUILD

First, we will evaluate the no-build alternative using the criteria previously identified.

Impact on Congestion

The no-build alternative will do nothing to increase roadway capacity or reduce peak hour congestion. SHA data indicates that under the no-build alternative, traffic volume on this stretch of Route 32 will increase by roughly 40 percent from 2003 to 2025. Increasing traffic volume, while maintaining current road capacity will significantly increase congestion. Therefore, the no-build alternative receives a "- -" rating for its impact on congestion.

Impact on Safety

The no-build alternative does not provide for large-scale improvements that would increase the level of safety. However, incremental improvements such as installing rumble strips would continue to occur as conditions warrant. According to the SHA, the rate of rear-end collisions on this road (45.2 per 100-million vehicle miles) is double the state average (22.3), although the overall accident rate (91.6) is lower than the state average (103.3). While recent SHA accident data suggest that safety may have been improved by incremental improvements such as the installation of hazard beacons, Eric Tombs felt that the state would reach a point where no more incremental improvements could be realistically made on the road. The safety levels are likely to deteriorate as traffic levels increase. Therefore, the no-build alternative receives a "-" rating for its impact on safety.

Political Feasibility

The no-build alternative has a low probability of being adopted by the current political bodies. Governor Ehrlich and his administration support the four-lane expansion plan, as do nearly all of the state and local elected officials in the area that are affected by Route 32. The

Board of Public Works has already voted in favor of the exemption that allows for the project to go forward in regards to the Smart Growth Law.

It is conceivable that Smart Growth advocates in the General Assembly, feeling pressure from statewide conservation groups such as the 1000 Friends of Maryland, could fight the expansion and choose to support the no-build alternative. However, this would defy the practice of legislative courtesy since Howard and Carroll County delegates and senators generally support expansion. Even the local opposition group, known as A Better Plan for 32, does not support the no-build alternative. Therefore it would receive little political or citizen support from any group. While their exact recommendation is not fully articulated, opponents advocate something more congruent with our structural upgrade alternative.

Given the current political dynamics, the no-build alternative receives a rating of "-" for political feasibility. However, it is important to note that the political dynamics can change. The election of a governor in 2006 who opposes the project could significantly increase the political feasibility of the no-build alternative. Changes in the state comptroller or local elected officials could also increase feasibility. Finally, if the 1000 Friends of Maryland group is successful in its lawsuit to have the Board of Public Works exemption overturned, the no-build alternative becomes more politically feasible.

Cost

The no-build alternative has a very low financial cost, because it does not involve any major capital improvements. The only costs associated with it would be for any additional incremental improvements. Therefore, the no-build alternative receives a "+" for cost.

Impact on Rate of Sprawl

This alternative will have no impact on the rate of sprawl. Since the no-build alternative is the status quo, sprawl would continue to occur at current rates. The LUEP examined this issue and determined that not increasing the capacity of the road would slow development, but not stop it. While the no-build alternative could help to slow the rate of growth, sprawl will continue to occur. Therefore, the no-build alternative receives a rating of "O" for its impact on the rate of sprawl.

Impact on Environment

The no-build alternative for Route 32 will produce the same impact on the environment that it currently does. Forest and wetland degradation would not change significantly, nor would any construction-related impacts. Therefore, the no-build alternative receives a "+" rating for impact on the environment.

Equity

The no-build alternative has a neutral impact on equity, as it has both positive and negative effects on the various groups. Under the no-build alternative, residents will not be inconvenienced with construction noise, relocation, or an increased amount of sprawl. Commuters would have to deal with a higher level of congestion that will only increase over time, and the use and congestion of surrounding roads will negatively impact the surrounding areas. Last, Carroll County could be negatively impacted, because at least some of the county's economic development plans hinge on an expansion of Route 32. In this case, the positives and the negatives seem to offset one another. The no-build alternative receives a rating of "-" for equity.

Impact on Noise

The no-build alternative will not alter the current level of noise. Noise caused by traffic will continue and construction-related noise would not be a problem because no construction efforts would be undertaken. Therefore, the no-build alternative receives a "+" rating for impact on noise.

ALTERNATIVE 2: STRUCTURAL UPGRADES

Second, we will evaluate the structural upgrades alternative using the criteria previously identified.

Impact on Congestion

Congestion will be somewhat alleviated by this alternative, but not significantly. Structural upgrades will not impact the actual capacity of the road, but will allow for better flow along it. The major structural parts of the road that currently slow traffic and create congestion are 1) traffic lights, 2) a number of smaller exits and entrances to the roadway, and 3) traffic incidents.

If interchanges were built eliminating the need for lights, the traffic would flow better increasing the number of vehicles that could access the facility during peak hours. Interchanges would create controlled access and eliminate the smaller entrances and exits, which would help keep cars from having to slow down for users of these turn-offs. Left-hand turns off of the road onto these smaller entrances and driveways slow traffic significantly because there is not sufficient room for cars to pass. Turn lanes and interchanges would reduce congestion associated with left-hand turns. Incidents on Route 32 can cause enormous buildups in traffic because there is often little or no shoulder on the side of the road, providing few alternatives for

users of the roadway when an incident occurs. Having an adequate shoulder the entire length of this stretch of road would help alleviate the congestion that incidents cause. Since structural upgrades would help to improve the traffic flow and eliminate some congestion, this alternative receives a "+" ranking.

Impact on Safety

The structural upgrade alternative will increase the safety level for both users of the roadway and residents in the area. The addition of controlled-access interchanges, a median and additional shoulder space will make the road safer. With these structural improvements, the number of rear-end, property damage, side-swipe and head-on collisions will decrease because of the elimination of traffic lights and slowing for turns. In addition, if interchanges include some area for pedestrian traffic, there may be greater safety for residents trying to cross Route 32. Last, while we were unable to acquire data regarding the accident rate of similar two-lane, limited-access roads, we assume the rate would be lower than the current rate.

Safety might be reduced if the capacity of the road were inadequate for all the drivers that wanted to use it. The drivers would have to choose alternate routes on smaller side streets. If this happens, these side streets may become less safe because they were built to only handle a certain level of traffic. Due to the improved safety associated with reduced accidents and pedestrian lanes in the interchanges, we give this alternative a "+" ranking for safety.

Political Feasibility

The structural upgrade alternative has a slight chance of being politically acceptable. There are groups opposed to structural upgrades and groups who are in favor and both could gather support to either influence the General Assembly to lobby the Governor to not fund the project or later support the election of a new governor who would not include this in his or her

budget. Supporting the structural upgrades alternative are groups that are interested in preventing any exceptions to Maryland's Smart Growth law. Several of the residents who live near the roadway do not want it expanded because they believe it will encourage more development, therefore, they would support this alternative. There are several groups opposed to structural upgrades and in favor of expanding the road, including the Howard County Council, the Carroll County Council, the Office of the Governor of Maryland, and SHA.

Providing political support for structural upgrades without expansion are the various advocacy groups for Smart Growth and certain residents around the roadway. In its letter to the Board of Public Works, 1000 Friends of Maryland wrote against expansion saying that the request did not "meet the requirements for an exception under state law." Members of the group A Better Plan for 32 advocates a road similar to MD 90 located on the Eastern Shore. This roadway includes controlled access, a median barrier, no traffic lights, and wide striping.

Given this variety of perspectives, it would appear that this option has some political support, but the support is mainly from advocacy groups and not from major state and county institutions. However, it is possible for these groups to gain political support if there is a change in administration or if they can gather enough citizen support. Therefore, the alternative receives an "O" ranking.

Cost

Structural upgrades will still require building all interchanges as well as adding turn-lanes and shoulders, so it is likely to have a high cost. There are six interchanges proposed under the road expansion plan (five diamond plus two new ramps from I-70), in addition to the actual expansion. Assuming these interchanges remain in this alternative, the cost for them would still be substantial. While we were unable to get a cost estimate for only structural upgrades, we

know that the four-lane comparison is estimated to cost $210 to $220 million, and that interchanges could conceivably cover about half of this cost. In addition, this alternative might be considered wasteful because in view of the SHA, why exert all that time, labor, and effort, if the road will again be inadequate in another few decades. Therefore, this alternative receives a "–" ranking for minimizing cost.

Impact on Rate of Sprawl

Structural upgrades probably will not have a significant impact on the rate of sprawl. The assumption that the LUEP made was that growth was the status quo and unless there is a severe economic downturn, rates of development will continue at an already healthy pace. According to the LUEP, the impact that the structural upgrades alternative would have on the rate of sprawl would be to somewhat accelerate it, but not as much as the four-lane expansion. Since growth is expected to continue regardless of the selected alternative, and structural upgrades will not largely accelerate the rate of sprawl, this alternative receives an "O" ranking because of the moderate impact expected.

Impact on Environment

The environmental impact of the structural update would presumably be less than the four-lane expansion because it would not require as much construction or environmental damage, but greater than the no-build alternative. The road would remain two lanes so it would not accommodate as many vehicles as the four-lane alternative, which means that air pollution from vehicles would be lower than with the four-lane alternative. The environmental impact of the four-lane expansion is already relatively low, with 2.28 acres of wetlands and remediation and 70.7 acres of forest removal. Wetlands and forest removal under this alternative would be even less. However there is still a small negative environmental impact from the structural

upgrade because of the large footprint of the interchanges, therefore this alternative receives a "–" ranking.

Equity

The structural upgrades alternative is likely to have a neutral impact on equity. This is partially because of the disproportionate economic impact on Carroll County, whose officials see the four-lane alternative as a key to commercial development in the county. Since the structural upgrade will only moderately increase capacity, it could hinder the economic development in Carroll County. There will not be a major artery that drivers from Carroll County can easily access from some of the county's major population centers. Commuters will still have to deal with some congestion under this option, although safety will be improved. Structural upgrades will not have as much of a negative impact on local residents who do not favor four-lane expansion because there will be less construction. This alternative receives a "–" ranking for its negative impact on Carroll County residents and commuters.

Impact on Noise

Structural upgrades are not likely to have any significant impact on noise. Estimates for noise pollution under the four-lane expansion are already low; therefore the noise impacts under structural upgrades will be even lower. There will be some construction-related noise when the upgrades are done, but because the upgrades will not substantially increase capacity, traffic-related noise will increase only as much as capacity increases. The only noise that may result would be due to the amount of vehicles traveling on a smaller road than the four-lane alternative; however a larger road would logically draw more traffic and would create more noise than the structural upgrades alternative. Therefore, this alternative receives an "O" ranking.

ALTERNATIVE 3: FOUR-LANE ROAD EXPANSION

Last, we will evaluate the four-lane expansion alternative proposed by SHA using the criteria previously identified.

Impact on Congestion

Of all the alternatives considered, the four-lane expansion plan best meets the goal of decreasing congestion. By this we mean that this alternative best meets the goal of preventing overcrowding of vehicles on Route 32. Statistics cited earlier illustrate the expected rise in traffic volume from now until the year 2025. Widening the road from two to four lanes would double the capacity on this stretch. It would also reduce the per-lane usage from a projection of 17,500 cars per lane per day on a two-lane road to 13,250 cars per lane per day on a four-lane road (based on our earlier analysis of SHA data). The four-lane alternative will increase capacity more than any other alternative examined. Because of the law of triple convergence, expansion will eventually lead to congestion during peak hours, but this congestion will be more manageable that it is currently and the road will accommodate more traffic. As time passes, this expansion may again prove inadequate, but this is true for all alternatives being covered. We ranked this alternative a "+ +" in regards to how well it meets the criterion of decreasing congestion.

Impact on Safety

Triple convergence also plays an important role in analyzing this alternative's effects on safety. SHA has stated that the high number of rear-end accidents is "likely due to the stop-and-go traffic during peak periods" (SHA, 2004). In the short term, doubling the size of the road and controlling access will improve the flow of traffic and reduce rear-end accidents caused by traffic lights and turns. Once expanded, the traffic on this highway will likely be similar to other four-

lane highways in Maryland and the accident rate of 38.5 per 100-million VMT similar. Improvements that prevent drivers from making turns onto and off of Route 32, and the likelihood of realizing some reduction in accident rates, lead us to rate this alternative favorably with respect to safety. However, because there are two lanes in each direction, the opportunity for accidents due to lane-switching might increase (a factor that does not exist on the structural upgrades). Therefore, it was ranked a "+" for increasing the level of safety on Route 32.

Political Feasibility

This plan has the overwhelming support of the state and county officials involved in the process, including the Governor's administration, the BPW, Howard and Carroll county councils, and the State Highway Administration. With such broad support, this alternative enjoys a very high level of political feasibility. Therefore, we awarded this alternative a "+ +" under the criterion of political acceptability.

This broad support, however, could be subject to change if certain factors change such as election of a new governor, and if the strong opposition by opponents of expanding Route 32 generates wider support. Additionally, as of December 1, 2004, the Baltimore Sun reported that the 1000 Friends of Maryland planned to file a notice with the intent to sue and to ask a Circuit Court judge to overturn a Board of Public Works decision to exempt the Route 32 widening project from the state's strict Smart Growth law. Therefore, it is possible that current levels of political support for the four-lane expansion might erode.

Cost

It is estimated that the expansion proposed by SHA will cost $210 to $220 million to complete. This figure represents only the cost to complete the project and does not take into account future maintenance costs – where overall cost figures will exceed initial estimates

because there will be more square footage of road to maintain. In these figures it is our assumption that the state is only including the cost of expanding the road and is not the future costs of maintaining a road double the original capacity of Route 32. Reasonably, we would expect the maintenance costs to increase.

The road widening project is the most expensive alternative proposed to address problems on Route 32. Based on its cost projections, this alternative is rated poorly on the basis of cost. Therefore, it was ranked "- -" under the criterion of cost.

Impact on Rate of Sprawl

The desire to limit the rate of sprawl may not be as well served under this proposal. The opposition we met with and whose materials we reviewed maintain that the expansion plan is "a big sprawl maker" (1000 Friends of Maryland, et al., 2003). The 1000 Friends of Maryland group believes that widening the road would lead to the construction of 45,000 additional homes (Wheeler, 12/1/2004). Daniel Pontious, Regional Policy Director for the Citizens Planning and Housing Association, argues that the plan to widen Route 32 in western Howard County would encourage more low-density development and divert funds needed for revitalizing neighborhoods (Wheeler, 7/20/2004). The Maryland Department of Planning, which signed off on the expansion, did not find that it met the requirements under Smart Growth, finding in their analysis that about two-thirds of the traffic on Route 32 was not between priority funding areas.

The LEUP indicated that development may increase under the expansion, but also that other local land use controls will effectively manage that development. Carroll County officials have long considered Route 32 the gateway to economic development, an attraction that could lure industry to south Carroll County. Carroll County and Sykesville have plans to develop a 96-acre property in the town and along Route 32 into a business and academic campus known as the

Warfield Complex (Hare, 2004). One county's sprawl is another county's economic lifeline. According to opposition groups, an expansion to four lanes could be used in the future as an excuse to change current zoning laws, which could further accelerate sprawl. For these reasons, we have ranked this alternative, under the rate of sprawl criterion, as a "-".

Impact on Environment

The SHA acknowledged in its public workshop on September 8, 2004 that road expansion alternative will affect these elements in the environment:

- Non-tidal wetlands and waters of the U.S. associated with Route 32
- Less than four acres of wetlands and approximately seventy-one acres of forest area
- 100-year floodplains totaling approximately fourteen acres
- A maximum of 8,940 linear feet of stream impact (Terrapin Branch, Benson Branch, Clyde's Branch, and the Middle Patuxent River)
- 92.5 acres of right of way and 21.5 acres of active farmland

Some of these elements are protected by federal law and require mitigation as part of the planning. However, the footprint of the project will be much larger than structural upgrades, and even if environmental losses are remediated, they are still losses to the residents in the study area. Given this information, we have ranked this four-lane expansion alternative as a "- -" under the criterion of minimizing environmental impacts.

Equity

SHA's road expansion plan does take equity issues into consideration. Residents along Route 32 will experience the inconveniences of construction, and some will be displaced. SHA, "has taken steps to identify and avoid disproportionately high and adverse effects on minority or low income communities located in the study area" (SHA, 2004). SHA has made attempts to

ensure that residents along Route 32, especially minority and low-income citizens, are treated fairly under their project. Commuters will benefit from the corridor's increased capacity and short-term reduction in congestion. Clearly, some groups will benefit (primarily commuters, Carroll County, and business along Route 32 and in Carroll County), while other groups not previously discussed will be disadvantaged. Thus, the expansion project addresses the equity criterion with neutral effectiveness; therefore, we ranked it an "O" under the criterion of increasing the equity level.

Impact on Noise

Noise from traffic as well as construction on and around Route 32 should be taken into account. However, the noise from traffic will be given more weight than construction-related noise in the short-term, because traffic-related noise will remain regardless.

SHA's plan of widening the road and adding interchanges is not well suited to reducing noise. The size and scope of the project necessitate a large amount of construction-related noise. SHA's informational publication on widening Route 32 states that "the project noise levels for the design year (2020) would approach or exceed the Federal Highway Administration's Noise Abatement Criteria, under both of the build and no-build conditions" (SHA, 2004). Once completed, the four-lane road will facilitate greater volumes, increasing traffic-related noise. The triple convergence dictates that road widening draws even more traffic to the improved road, once again pushing the road to full capacity. Therefore, the extensive construction-related noise and increase in traffic-related noise lead this alternative to receive a "- -" ranking with respect to the criterion of minimizing noise.

CONCLUSION

Our recommendations for the segment of Maryland Route 32 have been determined by our assessment of three principal alternatives. The main goal of this analysis was to determine the best way to decrease the level of congestion on Route 32.

We measured each of the alternatives against a set of relevant criteria. Based on our research and knowledge of traffic congestion, we provided each alternative with a score and the outcomes were provided in the alternative's matrix. As a group we reviewed the results of this matrix. Two of the alternatives, structural upgrades and the four-lane expansion had similar outcomes, and the no-build alternative was weak on the alternatives that appeared most salient to all parties. However, with the weight that we placed on alleviating congestion and political feasibility, it is clear that the four-lane road expansion fared best.

Therefore, if decision makers believe that reducing congestion is the most important criterion, then we recommend that the four-lane alternative be pursued. The plan will allow the existing road to operate in a more efficient manner, increasing the overall road capacity, and decreasing the congestion. We strongly encourage the SHA to more openly address the concerns of the opposition groups with better ongoing communication regarding the purpose, law, and benefits of the expansion.

Due to the rate at which the Baltimore-Washington metropolitan areas are growing, there will be an unavoidable increase in the amount of automobiles on roads in the region. This is particularly true for Route 32. If the road is expanded to a four-lane highway, triple convergence and induced demand will occur. We recognize that the road may become congested in the long run, and might encourage sprawl. While many residents and opposition groups feel that the

alternative selected will have negative impacts on their communities, these impacts will likely be offset. Widening and improving the road will bring better access on and off the road, and increase the safety level. In the short-run the level of congestion will be reduced, providing a better-flowing traffic system.

There are, however, several drawbacks to the four-lane alternative. This alternative receives negative rankings for cost, rate of sprawl, environmental impacts, and noise. Therefore, if decision makers place more importance on these criteria than on reducing congestion, then we recommend that the structural upgrade alternative be pursued. The structural upgrade alternative will improve congestion as well, though not as much as the four-lane alternative. It will also improve safety and has a slight chance of political acceptability. Additionally, this alternative receives fewer negative rankings than the four-lane on cost, rate of sprawl, the environment, and noise.

Ultimately, the decision to alleviate congestion on Route 32 is out of our hands. However, based on our evaluation of possible alternatives, our two-fold recommendation is that if congestion is the most important criterion to decision makers, then the four-lane alternative should prevail. However, if other criteria are weighted as more important (cost, sprawl, the environment, and noise), then the structural upgrades alternative should be selected.

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APPENDIX I

MARYLAND'S SMART GROWTH LAW

The Smart Growth Act, passed in Maryland in 1997, was designed to revitalize communities, preserve natural areas, and save taxpayers from the cost of building new infrastructure. To these ends, it directs state spending on roads, water treatment plants, and other infrastructure and services to existing communities and other designated "priority funding areas" (PFAs). PFAs are characterized as having high-density housing (>3.5 units per acre), having existing or planned water and sewer service, and being consistent with county growth projections.

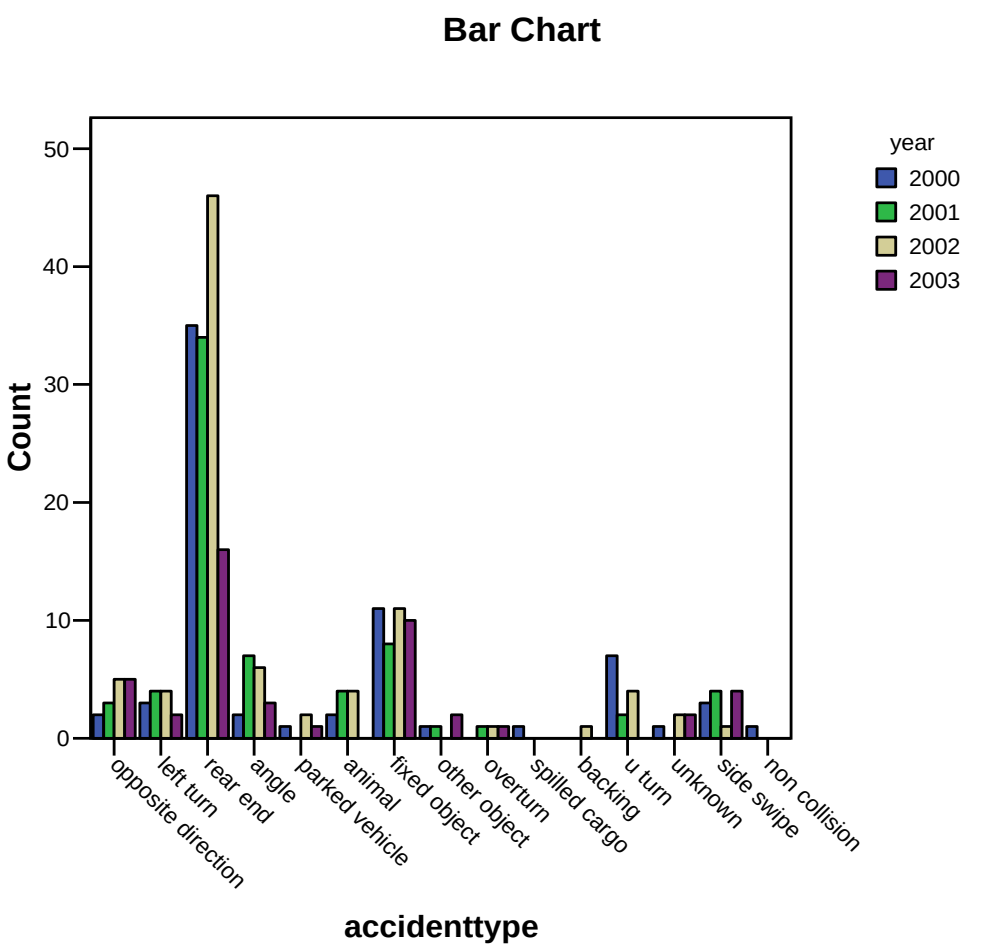
Smart Growth in Maryland is based on ten principles:
1. Mix land uses
2. Take advantage of compact building design
3. Create a range of housing opportunities and choices
4. Create "walkable" neighborhoods
5. Promote distinctive, attractive communities with a strong sense of place
6. Preserve open space, farmland, natural beauty, and critical environmental areas
7. Strengthen and encourage growth in existing communities
8. Provide a variety of transportation choices
9. Make development decisions predictable, fair, and cost-effective
10. Encourage citizen and stakeholder participation

An exemption of this law that would allow funding for a road project outside of a PFA can be obtained from the Board of Public Works if it would connect PFAs, if it does not increase road capacity, or if there exist extraordinary circumstances that would create "an extreme inequity, hardship, or disadvantage" that could not be otherwise alleviated. The Board of Public Works consists of the Governor, the Comptroller, and the Treasurer.

Source: "Smart Growth in Maryland," Governor's Office of Smart Growth, January 2003.
Annotated Code of Maryland. Section 5, Subtitle 7B: Priority Funding Areas.

APPENDIX II

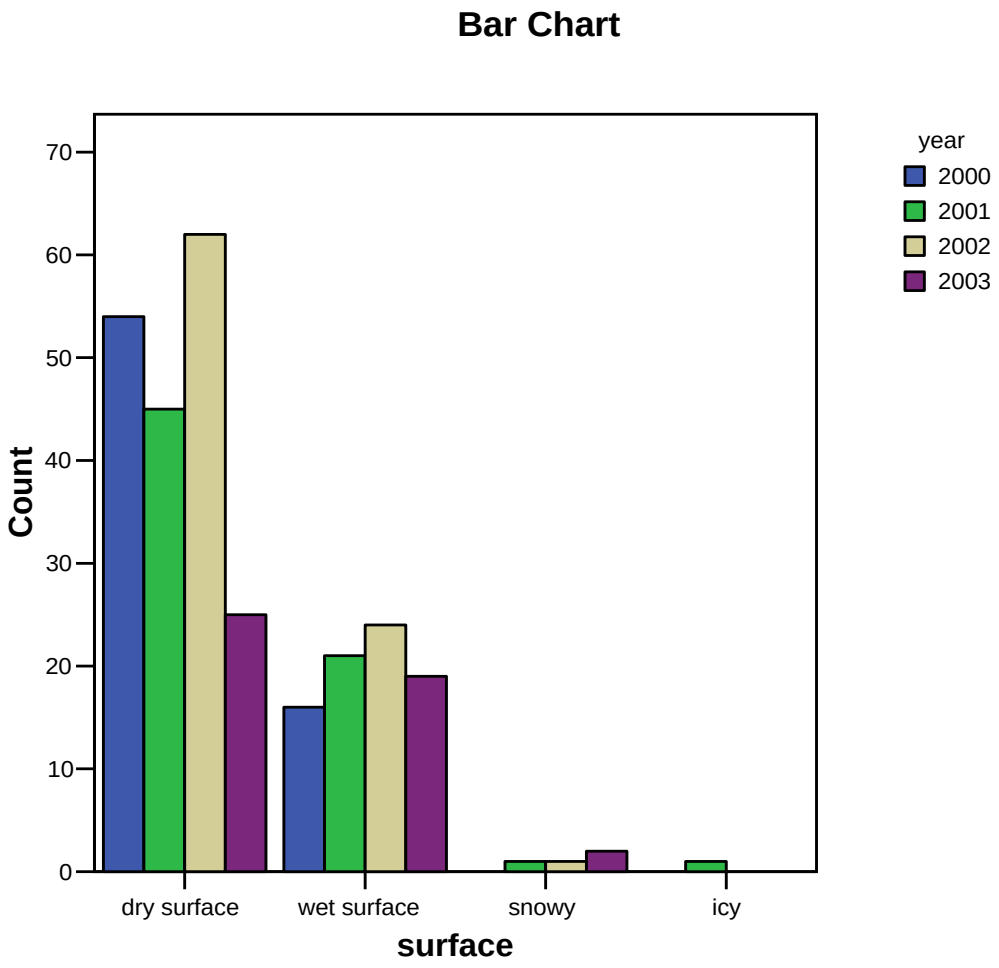
Accident Type on MD 32 between Route 108 to I-70 from January 1, 2000 - June 30, 2003



Source: "Traffic and Safety Analysis," State Highway Administration.

APPENDIX III

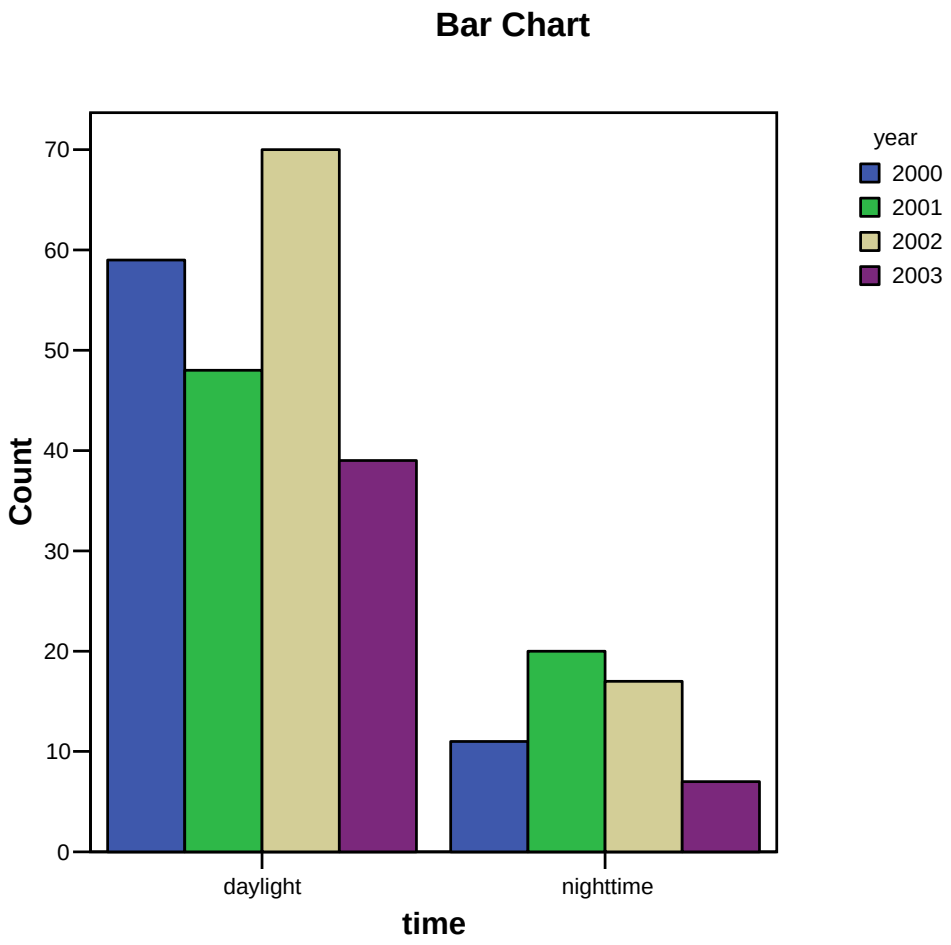
Type of Road Surface of Accidents on MD 32 between Route 108 and I-70 from January 1, 2000 - June 30, 2003



Source: "Traffic and Safety Analysis," State Highway Administration.

APPENDIX IV

Daylight vs. Nighttime Accidents on MD 32 between Route 108 and I-70 from January 1, 2000 - June 30, 2003



Source: "Traffic and Safety Analysis," State Highway Administration.