

**REPORT OF THE  
VIRGINIA DEPARTMENT OF TRANSPORTATION  
AND THE  
CHESAPEAKE BAY BRIDGE AND TUNNEL DISTRICT  
IN RESPONSE TO SENATE JOINT RESOLUTION 132  
ON THE**

# **Future Capacity Of The Existing Chesapeake Bay Bridge And Tunnel**

**TO THE GOVERNOR AND  
THE GENERAL ASSEMBLY OF VIRGINIA**



## **SENATE DOCUMENT NO. 7**

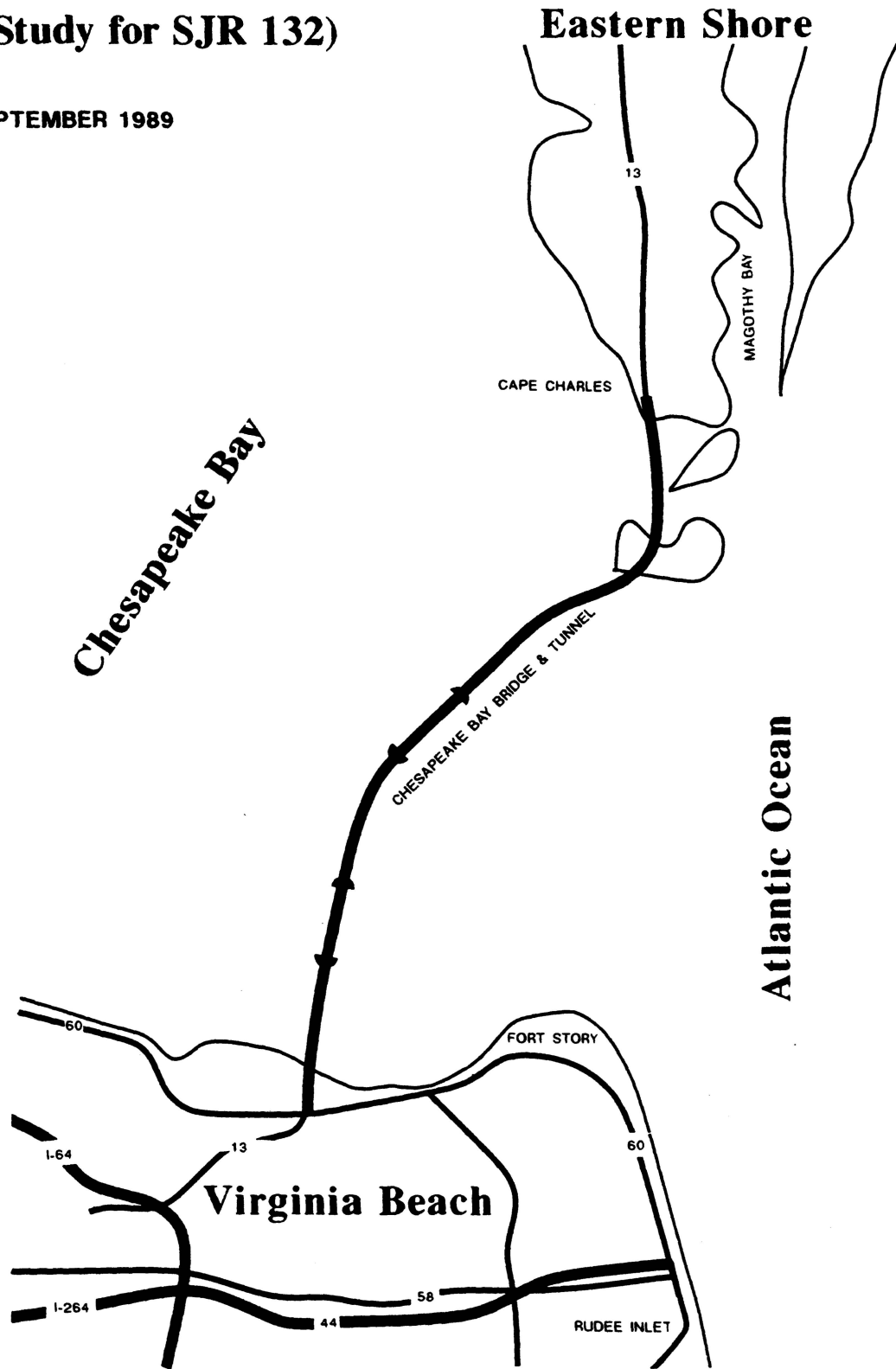
**COMMONWEALTH OF VIRGINIA  
RICHMOND  
1990**



# CHESAPEAKE BAY BRIDGE & TUNNEL

(Report on Study for SJR 132)

SEPTEMBER 1989



A Joint Study by the Virginia Department of Transportation and  
the Chesapeake Bay Bridge & Tunnel District



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## EXECUTIVE SUMMARY

As requested by Senate Joint Resolution No. 132, passed by the 1989 General Assembly, the Virginia Department of Transportation and the Chesapeake Bay Bridge and Tunnel Commission have conducted a joint study of the Chesapeake Bay Bridge and Tunnel (CBB&T). This study addresses traffic congestion and safety problems, maintenance, capacity of present facility, projected traffic volumes, recommended improvements, and financial alternatives.

The annual average daily traffic on the CBB&T exceeds 7,000 vehicles, which includes over 1,200 trucks using this facility every weekday. In the summer months the volume exceeds 10,000 vehicles per day, of which over 50 percent is vacation and recreational traffic.

The CBB&T is a "confined facility." For over 19 miles there are no shoulders, passing is limited, and with the high volume of trucks and recreational vehicles, congestion problems often occur. The number of hours that the traffic does not flow at the acceptable standard for this type of facility has doubled since 1985 (275 to 620 hours).

As traffic volumes and congestion have increased, so have accidents. Since 1985, there has been a 61 percent increase in accidents, injuries have doubled, and fatalities tripled. Coinciding with the increased accident rate on the CBB&T, the statewide rate on other Virginia two-lane primary routes has decreased.

Maintenance needs on the CBB&T are increasing as the facility ages. There were over 2,700 hours of lane closures last year for inspections and maintenance. Due to weather conditions on the Chesapeake Bay, major maintenance activities can only be scheduled during certain months. These months are also when traffic volumes are the highest. This adds to the congestion, as well as presenting safety problems. Traffic must be stopped and alternating northbound and southbound flows implemented because there are no routes that can be used as detours.

Traffic on the CBB&T has increased at an annual rate of 3.5 percent since it opened 25 years ago. After reviewing the traffic growth on the CBB&T, the 1980-1989 trend was selected to represent future growth. It is estimated that the annual average daily traffic on the CBB&T will be 10,100 vehicles by the year 2000. With seasonal variations, the daily traffic is expected to average 13,700 during the late spring, summer, and fall months. Along with this increase in traffic, more hours of congestion and an increase in accidents can be expected. Major maintenance activities will also become more difficult to perform as congestion is extended over a longer period of the day.

Based on the findings of this study, the conclusion is that an additional two lanes will be needed on the CBB&T by the year 2000.

The cost to provide the two additional lanes for the entire facility, estimated at \$1.2 billion, is beyond the financial capabilities of the CBB&T. An analysis of the revenues from tolls and other sources indicates that, with a one dollar average increase in tolls, the two additional lanes can be financed for the trestle and bridge sections. The cost estimated for this improvement is approximately \$275 million.

It is recommended that two additional lanes on the trestle and bridge sections be provided initially, and that the CBB&T continue to maintain two-way traffic in the tunnels. The two tunnels needed to complete the four-laning of the CBB&T will have to be provided in subsequent years.

Due to the time needed to perform studies and apply for the needed permits, it is also recommended that work begin immediately on the indepth traffic, environmental and financial studies, and development of specifications and plans.

1989 SESSION

LD9066115

SENATE JOINT RESOLUTION NO. 132

Offered January 16, 1989

Requesting the Virginia Department of Transportation and the Chesapeake Bay Bridge and Tunnel Commission to study the future capacity of the existing Chesapeake Bay Bridge and Tunnel.

Patrons—Fears, Andrews, Holland, C. A., Stallings, Walker and Joannou

Referred to the Committee on Rules

WHEREAS, under the authorizations in Section 4 of Chapter 714 of the 1956 Acts of Assembly, the enabling legislation of the Chesapeake Bay Bridge and Tunnel, the Bridge and Tunnel Commission is empowered to acquire full information to enable it to establish, construct, maintain, repair, and operate the project; and

WHEREAS, the Commission deems it necessary to determine the feasibility and practicability of the future capacity, maintenance, repair, safety, and operation of the project; and

WHEREAS, the project is an integral part of the overall transportation system of the Commonwealth; and

WHEREAS, the Virginia Department of Transportation and the Chesapeake Bay Bridge and Tunnel Commission are agreeable to participation in a joint study; now, therefore, be it

RESOLVED by the Senate, the House of Delegates concurring, That the Department and the Commission are hereby requested to make a joint study on all matters relating to the future capacity, maintenance, repair, safety, and operation of the project, including but not limited to whether the present capacity can safely handle future projected traffic volumes, and, if not, to consider reasonable alternatives.

The Department and the Commission shall complete the joint study in time to report to the 1990 Session of the General Assembly.

The cost of the joint study shall be shared equally by the Department and the Commission.

Upon completion of their study, the Department and the Commission shall report their findings and recommendations to the Governor and the General Assembly as provided in procedures of the Division of Legislative Automated Systems for processing legislative documents.

Official Use By Clerks	
<b>Agreed to By The Senate</b> without amendment <input type="checkbox"/> with amendment <input type="checkbox"/> substitute <input type="checkbox"/> substitute w/amdt <input type="checkbox"/>	<b>Agreed to By The House of Delegates</b> without amendment <input type="checkbox"/> with amendment <input type="checkbox"/> substitute <input type="checkbox"/> substitute w/amdt <input type="checkbox"/>
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# CHESAPEAKE BAY BRIDGE & TUNNEL

## Background and Introduction

On April 15, 1964, the Chesapeake Bay Bridge and Tunnel (CBB&T) was opened to traffic. This opening was the culmination of many years of effort by the Chesapeake Bay Bridge and Tunnel Commission (formerly the Chesapeake Bay Ferry Commission) to plan and construct a transportation facility connecting Virginia's Eastern Shore to the City of Virginia Beach.

Since its opening there has been a steady growth in the traffic using the facility. The heavier traveled periods are during the summer months when the vacation and recreational trips increase causing the CBB&T to operate at or near capacity.

Since the summer is the time of year that most of the maintenance must be performed on the CBB&T, the heavier traffic volumes make this task much more difficult. Along with the increase in traffic has come an increase in the number of accidents.

Considering the existing conditions, the 1989 session of the Virginia General Assembly passed Senate Joint Resolution Number 132, which requests the Department of Transportation (VDOT) and the Chesapeake Bay Bridge and Tunnel Commission to jointly study the Chesapeake Bay Bridge and Tunnel and report on the needs. This report is on the joint study of the existing and future conditions relating to capacity, maintenance, repair, safety, and operation of the Chesapeake Bay Bridge and Tunnel facility. Recommended improvements and possible financing of these improvements are also provided.

## Existing Traffic

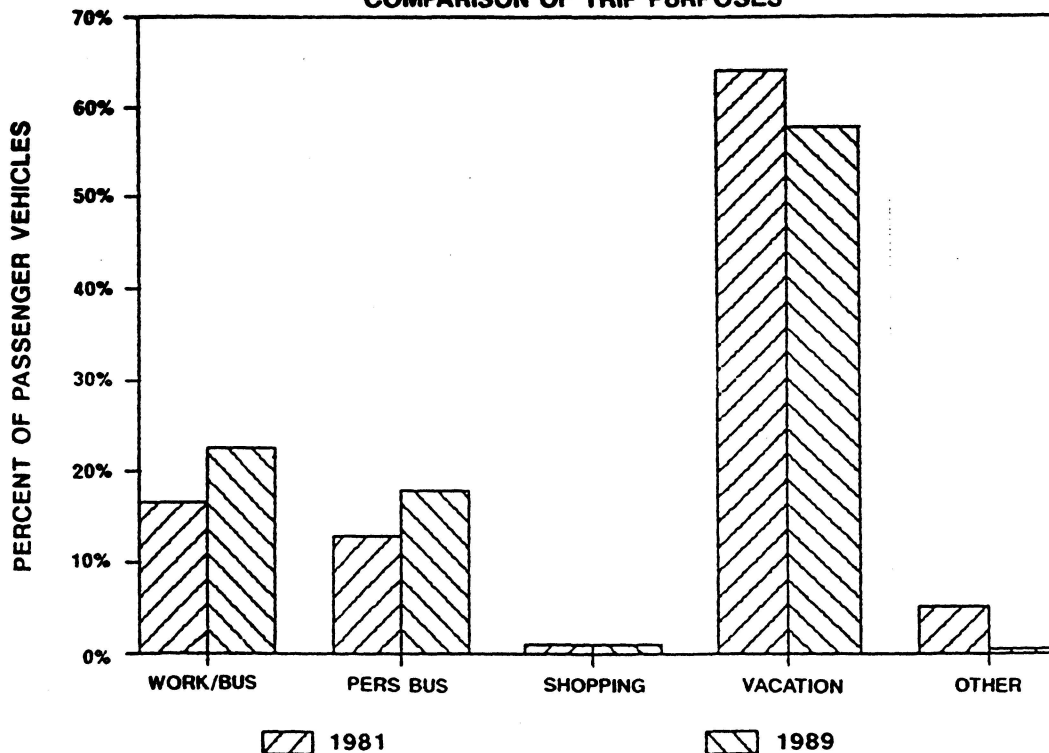
In the first year of operation (1964-65), there was an average of 3,050 vehicles per day using the CBB&T. Over the past 25 years, the traffic has grown at a rate of 3.5 percent annually. In the year 1988, the annual average daily traffic had increased to 7,060 vehicles per day (see Appendix A for additional traffic information). Table 1, which includes the average daily traffic by month from January 1985 through July 1989, shows that the heaviest traffic volumes occur in the summer months. During the summer, from mid-June to mid-September 1988, the average daily traffic was 10,080 vehicles per day. These figures include both toll paying vehicles and non-paying vehicles (State police, VDOT, CBB&T, and emergency vehicles).

Travel surveys, excluding heavy trucks and buses, show that much of the summer traffic is due to vacation and recreational trips, which normally increase during this time of the year. A comparison of a travel survey conducted in June 1989 to one taken in August and November 1981, is shown in Figure 1. The survey data shows that over half of the daily traffic during the survey periods is vacation or pleasure trips.

**TABLE 1**  
Average Daily Traffic By Month  
and  
Average Annual Daily Traffic  
1985 - 1989

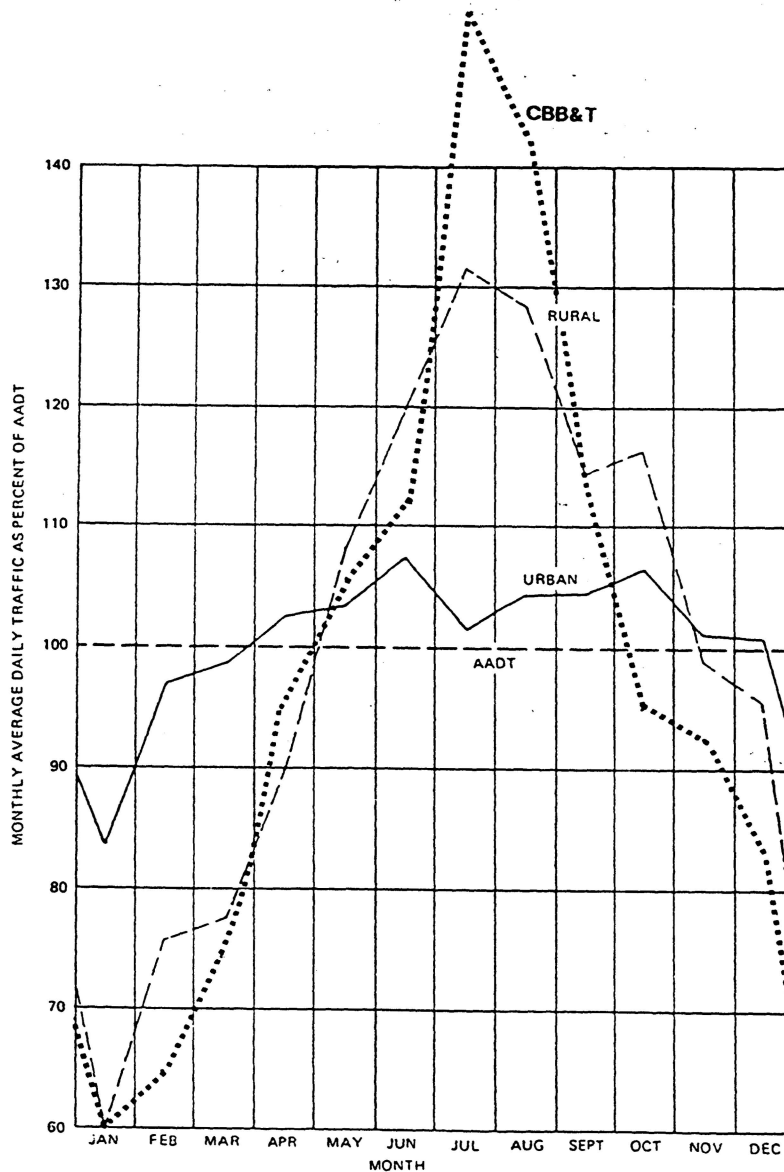
	1985	1986	1987	1988	1989
January	3,144	3,683	3,844	4,208	4,602
February	3,542	3,758	4,035	4,586	4,421
March	4,304	5,113	4,906	5,253	5,996
April	5,617	5,462	6,156	6,723	6,633
May	6,266	6,717	7,061	7,504	7,828
June	7,035	7,315	7,566	7,823	8,314
July	8,513	9,088	9,976	10,971	
August	9,055	9,429	9,949	10,119	
September	6,031	6,391	7,667	8,128	
October	5,350	5,770	6,327	6,724	
November	4,961	5,714	6,136	6,474	
December	5,020	5,227	5,523	5,852	
<b>AADT</b>	<b>5,750</b>	<b>6,160</b>	<b>6,610</b>	<b>7,060</b>	

**FIGURE 1**  
**CHESAPEAKE BAY BRIDGE TUNNEL**  
COMPARISON OF TRIP PURPOSES



The 1985 Highway Capacity Manual states that monthly variations in the daily traffic volumes are more severe on rural roads than urban roads. Additionally, on rural roads with recreational traffic, the variation is even more pronounced. Figure 2 shows the more uniform daily traffic for an urban street versus the drastic seasonal peak for a rural road. The CBB&T is part of an arterial route that carries through traffic with a high percentage of recreational trips; otherwise, its monthly traffic pattern is similar to other rural arterials.

**FIGURE 2**  
**MONTHLY TRAFFIC VARIATIONS**



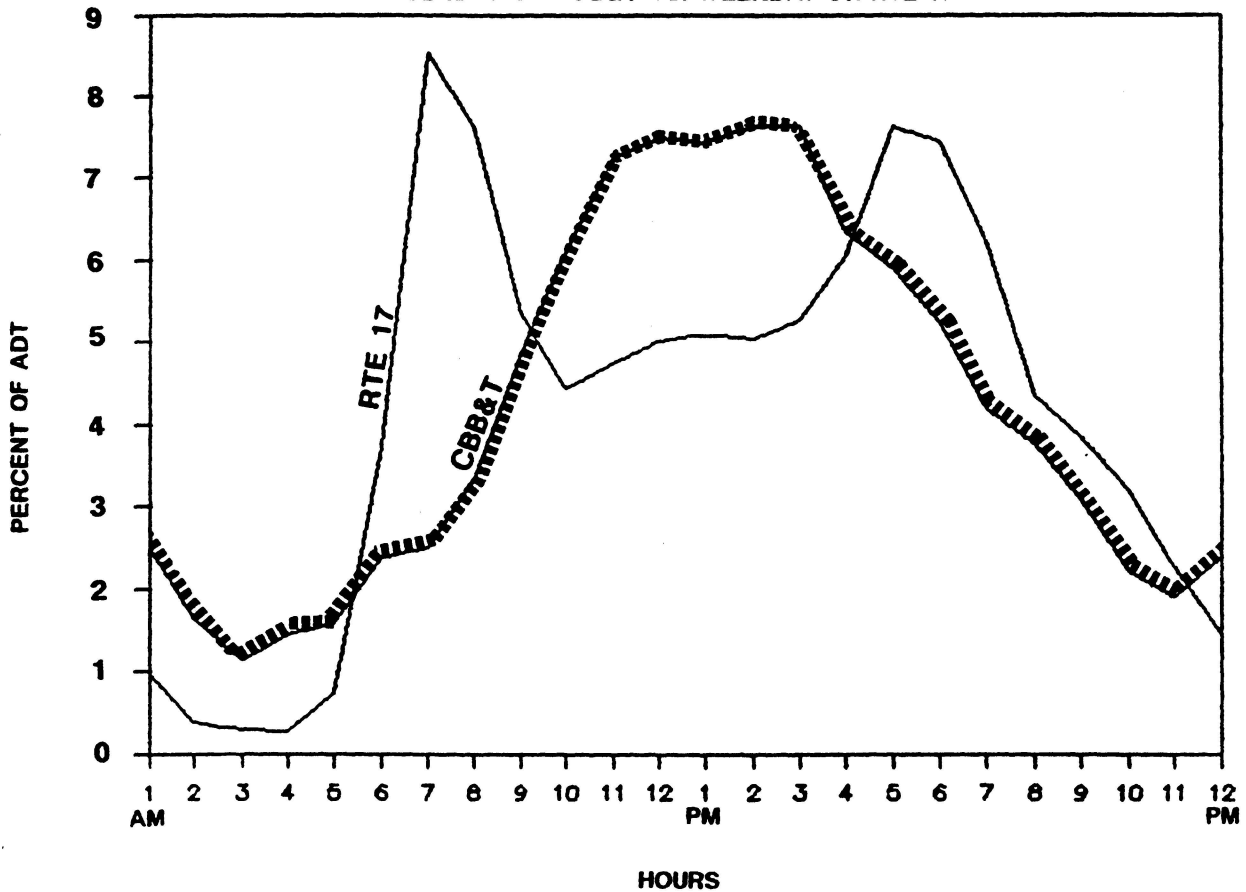
SOURCE; 1985 HIGHWAY CAPACITY MANUAL

Because much of the travel is related to vacation or recreational trips, the peak traffic period for the CBB&T is during the middle of the day. Highways that carry commuter traffic normally show higher peaks in the morning and the afternoon during periods of travel to and from work. A comparison of the CBB&T hourly distribution to that of a typical commuter route is shown in Figure 3.

**FIGURE 3**

**CHESAPEAKE BAY BRIDGE TUNNEL**

WEEKDAY ON CBB&T VS. WEEKDAY ON RTE 17





Over the past five years, truck traffic has shown an annual growth rate of approximately 5 percent. The CBB&T has become an important transportation link for truck traffic from the Port of Hampton Roads to the mid-Atlantic and northeast U.S. markets. Not only is the CBB&T a vital economic link for Virginia's ports, but much of the Eastern Shore farm produce is also shipped by truck across the facility. During the summer months of 1988, the weekday truck volume was more than 1,200 vehicles per day. Included in this weekday truck volume are nearly 1,000 tractor trailers. This heavy truck traffic has an effect on the traffic flow on the CBB&T and adds to the congestion on the facility.

### Capacity and Levels of Service

Capacity is the maximum number of vehicles that a transportation facility (highway, bridge, or tunnel) can carry during a given time period. When the traffic volumes equal the capacity of a roadway, the speeds are low, traffic is often in a stop and go condition, and there are long delays. When the traffic volumes are low, drivers can maintain posted speeds, pass slower vehicles safely, and there is little or no delay during their trip. Most transportation facilities carry a range of traffic volumes during the day, from a few vehicles in off-peak hours to heavy volumes that approach or exceed capacity during peak hours. By comparing these varying traffic volumes to its capacity, the "level of service" of a facility can be determined. The term "level of service" describes how effectively a transportation facility is operating under various traffic loads. There are six levels of service designations, from A to F, with level of service A representing the best operating conditions, and level of service F the worst. A description of each level of service and the analysis for the CBB&T are provided in Appendix A.

In the level of service analysis for the CBB&T, the facility was divided into seven analysis sections as shown in Figure 4. The analysis shows that section 6 (all of the two-lane roadway north of trestle C) has the worst level of service due to its limited passing sight distance. Table 2 shows the total hourly two-way traffic volumes that can be accommodated at various levels of service on section 6 of the CBB&T.

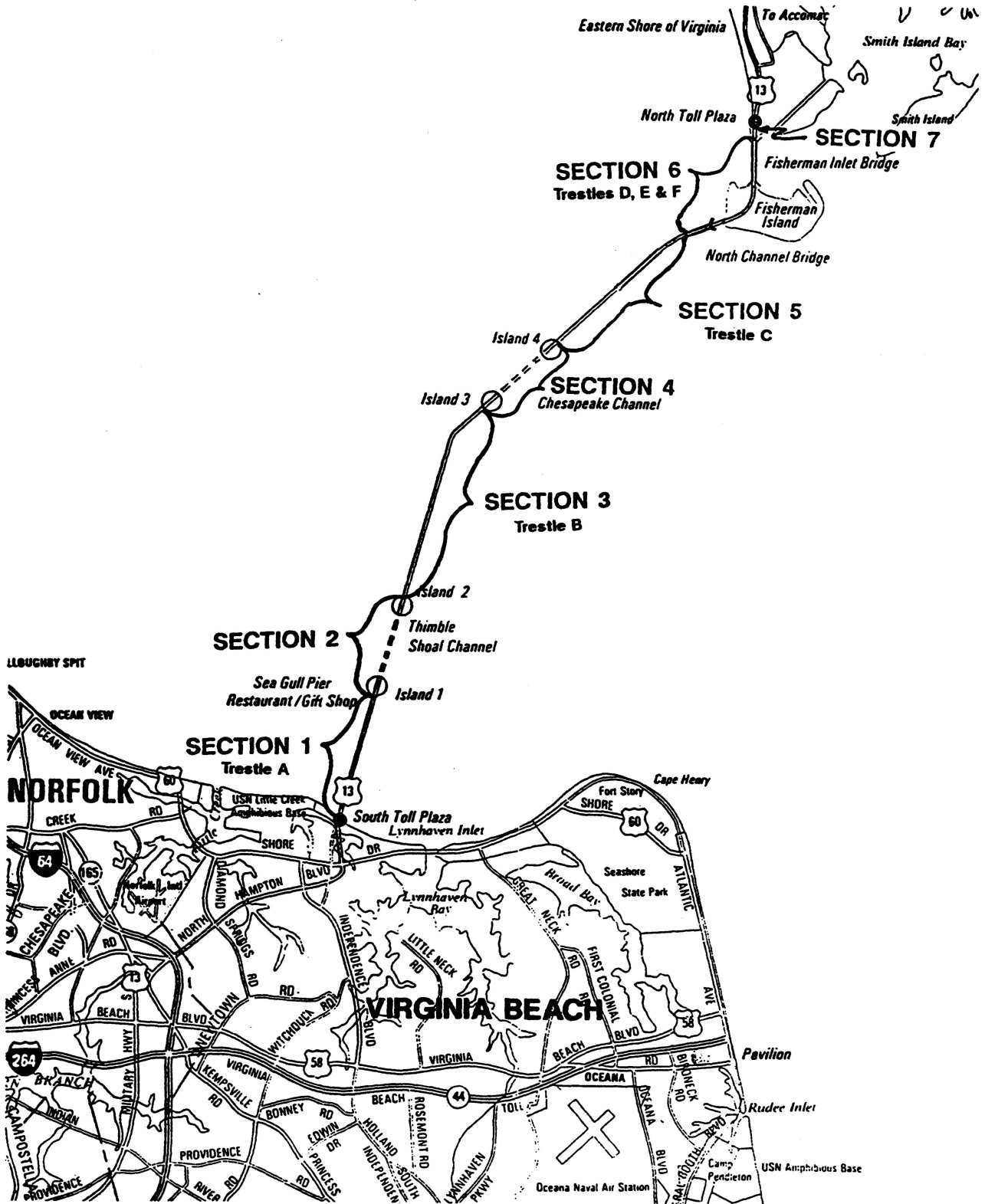
TABLE 2

Level of Service	Maximum Hourly Volume	Volume/ Capacity
A	135	.07
B	360	.19
C	650	.34
D	1,150	.59
E	2,240	1.00

The level of service volumes in Table 2 do not fully reflect the traffic operation problems on the CBB&T. Since more than half of the users are on pleasure or vacation trips, many of the drivers tend to "sightsee" as they cross the facility. These "sightseers" slow down the traffic flow and reduce the efficiency of the facility as well as frustrate the drivers that follow them. Analysis of the facility is further complicated because there is no way to quantify the effect that driving such long distances on a confined facility with limited lateral clearances has on the driver. It appears that the narrow

FIGURE 4

CHESAPEAKE BAY BRIDGE & TUNNEL SECTIONS



confines of the facility cause some drivers to slow down, creating traffic queues, then other drivers within the traffic queues become impatient and take risks by passing. This phenomenon affects the CBB&T to such a degree that it does not operate nearly as well as a two-lane highway.

In rural areas, VDOT's standard is to design two-lane highways to provide a level of service C during the design hour for a twenty year design period. Table 2 shows that the facility operates at a level of service C or better until the two-way traffic volume exceeds approximately 650 vehicles per hour (with a daily traffic volume of 8,500 vehicles). An examination of the traffic volumes on the CBB&T reveals that the number of hours that the traffic exceeded level of service C (650 vph) rose from 275 hours in 1985 to more than 600 hours in 1988. Table 3 shows that most of the hours that the traffic exceeded 650 vehicles per hour is during the summer months. In July of 1988, there were 190 hours in which the CBB&T operated at a level of service D or E. This indicates that there is a congestion problem developing on the CBB&T.

**TABLE 3**  
Hours of Operation at  
LOS D or E

	1985	1986	1987	1988
January	0	0	0	0
February	0	0	0	0
March	0	5	0	0
April	5	0	15	20
May	20	30	35	55
June	30	40	45	60
July	85	105	140	190
August	95	120	140	145
September	15	15	55	70
October	5	5	10	20
November	10	20	25	35
December	<u>10</u>	<u>15</u>	<u>15</u>	<u>25</u>
<b>TOTAL</b>	<b>275</b>	<b>355</b>	<b>480</b>	<b>620</b>

### Maintenance Activities

As the Chesapeake Bay Bridge and Tunnel ages, it is important to schedule maintenance work to prevent deterioration of the facility. Due to the weather conditions across the mouth of the Chesapeake Bay, major maintenance work can only be performed during certain months of the year, primarily during late spring, summer, and early fall. These months, however, are the same months in which the facility must accommodate the highest traffic volumes of the year. Major maintenance cannot be effectively accomplished at night when traffic volumes are lower due to the problem of providing sufficient lighting.

In the fiscal year 1988-89, lanes on the CBB&T were closed approximately 734 hours for maintenance in the tunnels and approximately 1,500 hours for maintenance on the trestles (see Appendix A). Additionally, bridge inspections by CBB&T required lane closures for 472 hours. When a lane is closed for maintenance, traffic must be stopped in both directions, and one-way (north-south) traffic movements are alternately allowed

through the lane closure area. With lane closures exceeding 2,700 hours per year and often occurring during periods of heavy traffic, these activities add to the traffic congestion and present a safety risk.

### Accidents

Another important consideration when analyzing the operation of a facility is its accident record. Table 4 gives a summary of the accidents that occurred on the CBB&T between January 1985 through December 1988. Since 1985 there has been a 61 percent increase in the number of accidents on the CBB&T. During this time the number of injuries has doubled and the fatalities have tripled.

**TABLE 4**  
Accident Summary 1985 - 1988

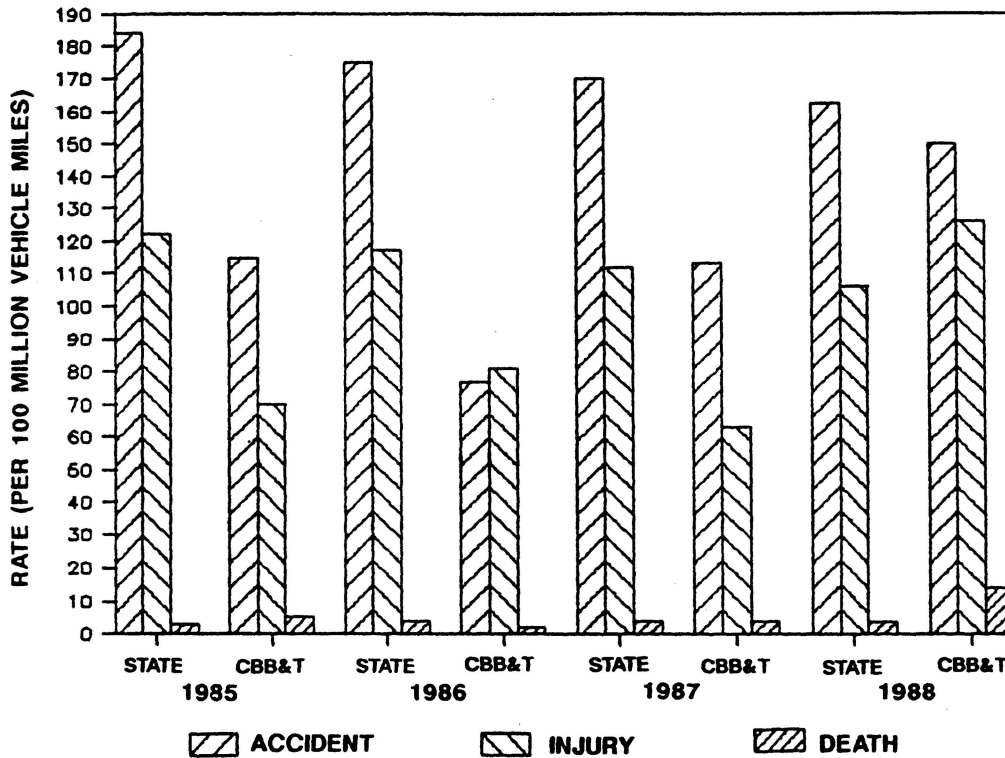
<u>Section</u>	<u>Property Damage</u>	<u>Accidents</u>			<u>Total</u>
		<u>Injury</u>	<u>Fatal</u>		
1. (Trestle A)	22	20	2		44
2. (Thimble Shoal)	25	4	0		29
3. (Trestle B)	19	15	5		39
4. (Chesapeake)	7	4	0		11
5. (Trestle C)	36	22	4		62
6. (Trestle D,E, & F)	10	4	0		14
7. (4 Lane Section)	<u>5</u>	<u>1</u>	<u>0</u>		<u>6</u>
<b>TOTALS</b>	124	70	11		205

The increase in accidents may be attributable to the increase in traffic using the CBB&T and the fact that the periods of traffic congestion are more frequent. This condition can cause some motorists to become impatient when speeds drop and take greater risks by trying to pass. Accidents have continued to increase in spite of actions taken by the CBB&T personnel, such as directing motorists to turn on their headlights for higher visibility by drivers and advising them of any lane closures.

In order to evaluate the CBB&T accident record, a comparison was made with the average of all two lane primary highways in the State. The standard for making such comparisons is to develop frequency rates which express accidents per 100 million miles of travel. Figure 5 displays these rates for the CBB&T and the statewide rates for two-lane arterial routes. While the average total accident rate for the State's two lane primaries has been decreasing, the rate for the CBB&T has been increasing, and in 1988 it has almost equaled the State rate. Additional accident data is contained in Appendix A.

FIGURE 5

**CHESAPEAKE BAY BRIDGE TUNNEL  
STATEWIDE ACCIDENT RATES VS. CBB&T**



Traffic Forecasts

The travel survey taken on the CBB&T shows that a major portion of the traffic in the corridor is pleasure or vacation related. The growth in this segment of the traffic could be due to the promotional advertisements and public relations activities of the CBB&T in various locations along the East Coast. The traffic growth throughout the history of the CBB&T has been approximately 3.5 percent annually. However, since the marketing program has begun to focus on attracting north-south travelers to the Route 13 corridor, the traffic growth on the CBB&T has been approximately 7 percent annually.

Over the past few years, the Virginia Port Authority has expanded the capacity of the Port of Hampton Roads and significantly increased the cargo handled by the terminals. Since some of this cargo has been attracted away from northeastern U.S. ports, it must be transported over land by trucks. Route 13 and the CBB&T offer an attractive route for truckers, and the tractor trailers using the facilities over the past few years have increased. This segment of the traffic volumes on the CBB&T is expected to increase in the future.

Since the traffic volumes in the corridor have the potential for continued growth in the future, the current historic trend is used as a basis for determining the projected traffic on the CBB&T. Figure 6 graphically displays the traffic volumes throughout the

history of the CBB&T, as well as three traffic growth trendlines. The low trendline uses data from July 1970 through June 1989 to project the traffic volume of approximately 11,000 vehicles per day by the year 2020. The high trendline uses data from July 1983 through June 1989 to project year 2020 volume of 18,100 vehicles per day.

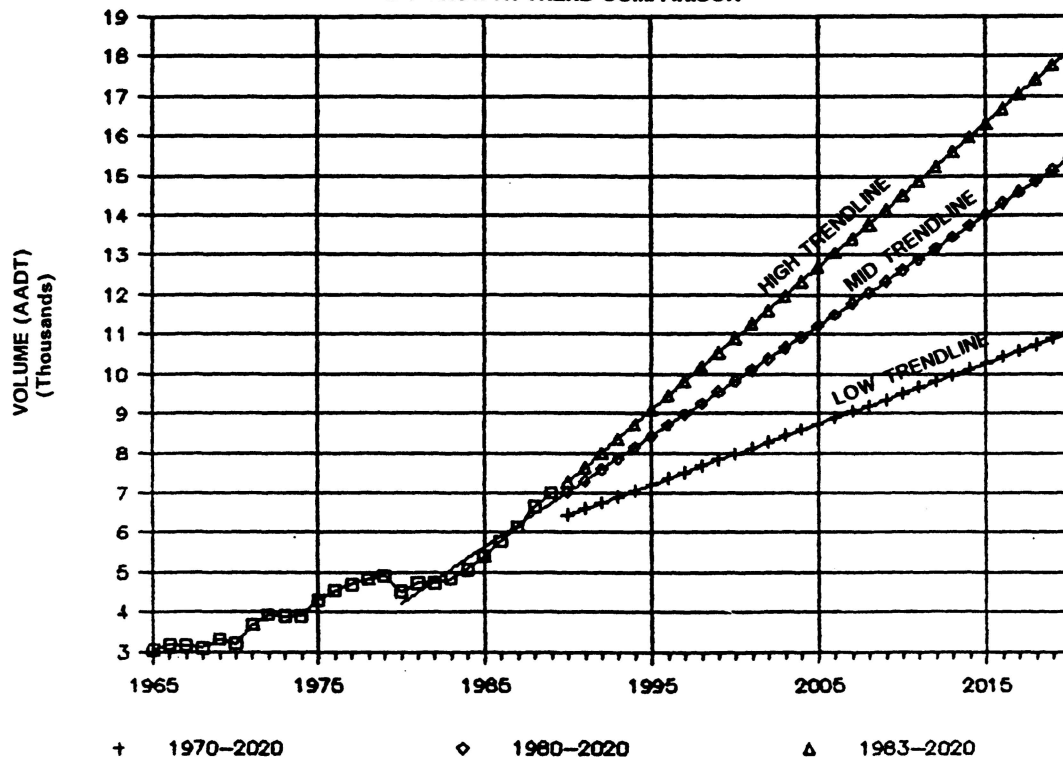
The low trendline in Figure 6 includes data from two periods (1973 and 1979), in which energy shortages reduced travel throughout the U.S., and it also includes years in which the marketing for the CBB&T did not focus on attracting north-south travelers to the corridor. For these reasons, the low trendline does not appear to express the full traffic growth potential for the CBB&T.

The high growth trendline uses data from the last six fiscal years (July 1983 through June 1989), and it allows no slippage in growth should another energy shortage or economic downturn occur. A major portion of the trips using the CBB&T are pleasure/vacation oriented. Since these are the first trips to be reduced when energy shortages occur or when the economy slows down, the high trendline may overstate the future CBB&T traffic growth.

The mid trendline in Figure 6 uses traffic data from July 1980 through June 1989 to project an annual average daily traffic volume of 15,400 vehicles per day by the year 2020. This mid line traffic projection is based on nine years of traffic data and includes years of both slow growth and the rapid growth of the past five years. The mid line also allows for deviation in the growth of traffic should another energy shortage occur. For these reasons, the mid line projection appears to best represent the potential future traffic growth on the Chesapeake Bay Bridge and Tunnel.

**FIGURE 6**

**CHESAPEAKE BAY BRIDGE TUNNEL  
AADT GROWTH TREND COMPARISON**



Based on the traffic projections, the CBB&T will be carrying 10,100 vehicles per day by the year 2000. With the seasonal variation in traffic, the facility will no doubt be experiencing severe congestion during the spring, summer, and fall months. Through the summer, the traffic volumes are expected to average 13,700 vehicles per day. Based on the projected traffic growth, Table 5 shows the average daily traffic (by month) that the facility will be carrying by the year 2000.

**TABLE 5**  
1988 and Year 2000 Average  
Daily Traffic - By Month

	<u>1988</u>	<u>2000</u>
January	4,208	5,980
February	4,586	6,510
March	5,253	7,460
April	6,723	9,550
May	7,504	10,660
June	7,823	11,100
July	10,971	15,600
August	10,119	14,370
September	8,128	11,550
October	6,724	9,550
November	6,474	9,200
December	<u>5,852</u>	<u>8,300</u>
AADT	7,060	10,100

Along with this increased traffic will come greater periods of congestion. This traffic congestion will increase the number of hours that the facility is expected to operate at level of service D or E as shown in Table 6. As drivers are confined to the facility for longer periods of time in stop and go traffic with little or no opportunity to pass, accidents can be expected to increase. At the same time, however, maintenance operations will be difficult to carry out during the daytime because lane closures could only occur during emergency situations. Based on the existing traffic conditions and the expected growth that will occur over the next few years, future improvements will be needed on the CBB&T.

**TABLE 6**  
Projected Hours of Operation  
at LOS D or E  
(Traffic Exceeding 650 vpd)

	<u>1988</u>	<u>2000</u>
January	0	10
February	0	10
March	0	10
April	20	80
May	55	160
June	60	180
July	190	350
August	145	340
September	70	180
October	20	80
November	35	100
December	<u>25</u>	<u>70</u>
TOTAL	620	1,570

## Improvement Alternatives

As part of this study on the CBB&T, improvement alternatives ranging from constructing turn-outs on the existing structure for disabled vehicles to providing four lanes on the entire facility, have been examined. Constructing turn-outs at intervals along the trestles could help remove vehicles from the traffic stream before they are totally disabled and obstruct the traffic flow. However, to be effective, the turn-outs would have to be constructed at intervals of approximately one quarter mile and the cost would be similar to that for providing an additional lane throughout the facility. The turn-outs would also have to be policed to ensure that sightseers do not block vehicles with emergencies that need to use them. Although turn-outs could be useful for disabled vehicles, they would not be an alternative to providing four lanes on the trestles.

Providing four lanes across the entire facility would cost approximately \$1.2 billion. This amount exceeds the revenues available from the Chesapeake Bay Bridge and Tunnel District. Therefore, it appears that the most financially viable alternative to serve the future traffic demand is to expeditiously provide four lanes on the trestle sections of the CBB&T, and continue to maintain two-way traffic in the two tunnels, and provide two additional tunnels in subsequent years. With four lanes on the trestles, the slower traffic would use the right lane, allowing the faster vehicles to pass. Experience on other facilities in the state, such as the Midtown Tunnel and the George P. Coleman Bridge, indicates that short two-lane facilities can accommodate relatively high volumes of traffic and such bottlenecks are tolerated by drivers. With the four-lane trestles, drivers would not have to take risks and both the sideswipe and head-on accidents should be eliminated; thus, making the facility much safer.

Based on a study by the Sverdrup Corporation, the section of the facility north of the Chesapeake Channel can be constructed at a cost of \$155.1 million. This is the first segment, Stage 1 (see Figure 7), which should be considered for construction according to the Sverdrup Corporation report.

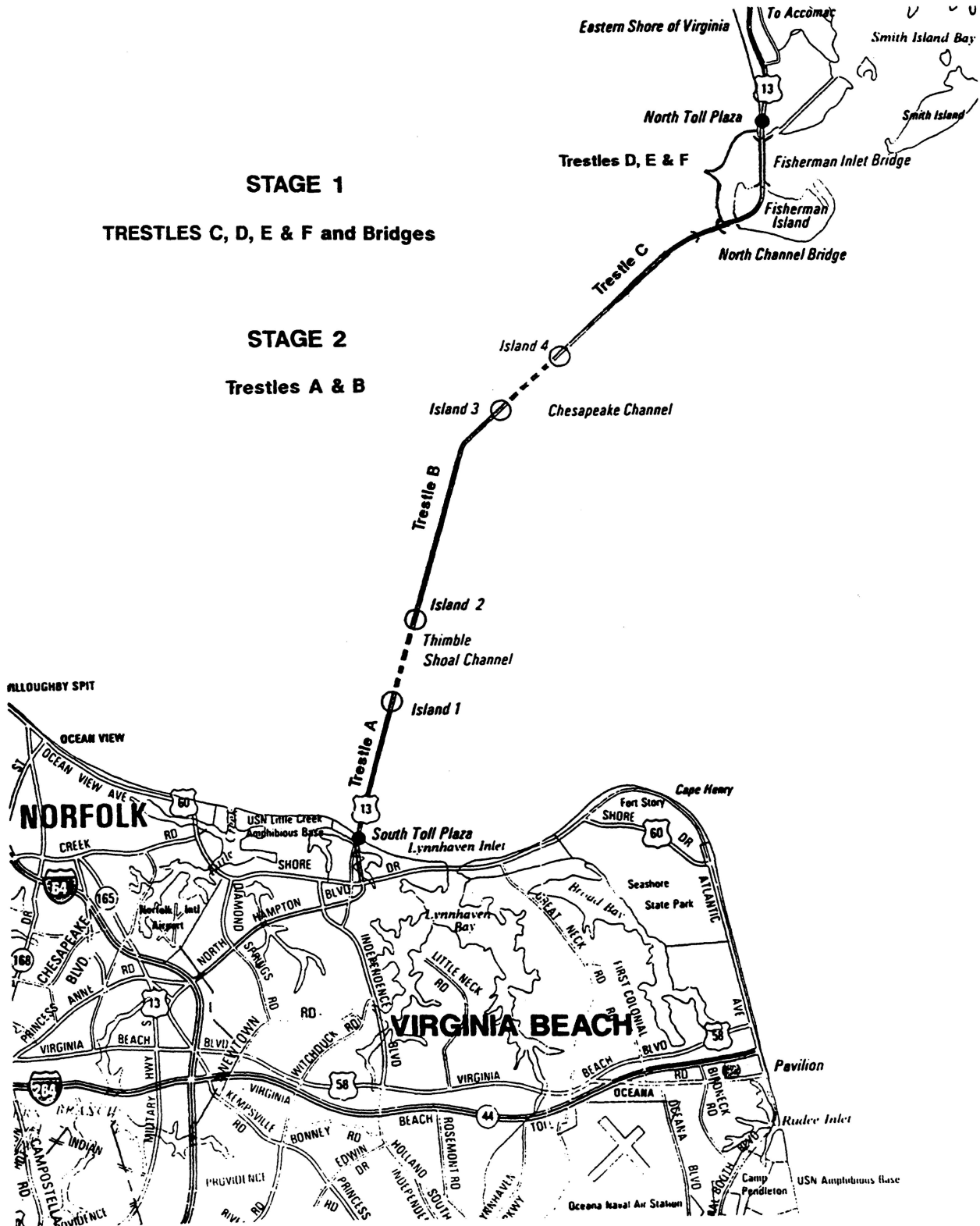
The cost for the construction of trestles A and B from Stage 2 (see Figure 7) of the Sverdrup Corporation report was extracted for this study. The cost for trestles A and B, as well as the connecting crossovers, is approximately \$120 million. The total cost for providing four-lane trestles across the facility with escalation to the year 1995 is \$275,137,500. The detailed cost breakdowns for Stages 1 and 2 are shown in Appendix B.

## Financial Analysis

Over the next five years, from FY-89/90 through FY-93/94, the CBB&T has budgeted \$18.1 million for maintenance and equipment replacement. The maintenance costs include repaving all of the trestles and the tunnels as well as inspecting and making deck repairs on the two high-level bridges. These improvements are part of an ongoing maintenance program that includes inspections and repairs of minor problems as they occur. The costs of this program are well within the reserve maintenance funds set aside for that purpose. Overall, the CBB&T appears to be in good physical condition and barring any problems that may be detected in the future, no major cost outlays will be needed to repair or overhaul the facility. Therefore, it was assumed that the reserve maintenance fund could remain at a constant of \$3 million per year as shown in Appendix B, page B-4 of this report.



**FIGURE 7**  
**CHESAPEAKE BAY BRIDGE & TUNNEL**  
**CONSTRUCTION STAGES**



Based on the current and projected financial position of the CBB&T over the next seven years, the outstanding bond issue should be retired by June 1996 (See Appendix B). With this debt repaid, the revenue from tolls and other sources will be available to finance improvements to the CBB&T. Since it is not possible to finance all improvements necessary to provide four lanes across the CBB&T, only Stage 1 improvements at \$155.1 million and a combination of Stage 1 and Stage 2 improvements costing approximately \$275 million were evaluated for financing.

In order to determine the level of indebtedness that could be supported with revenue from the CBB&T, four financial scenarios based on 20-year revenue bond issues were analyzed. The differences between the scenarios were the amount of construction activity, the toll structure, and the "beginning construction" date, which was assumed to be 1995 unless otherwise noted. A brief outline of each of these scenarios, which are given in detail in Appendix B, page B-6, is as follows:

#### Scenario I

In this scenario, the \$155.1 million cost for Stage 1 improvements was assumed to be financed through a bond issue with the current level of tolls continuing after 1996. The analysis of this scenario shows that sufficient funds can be generated under the current toll structure to support the bond issue needed to fund Stage 1 improvements. The analysis also shows that sufficient revenues can be generated to pay off any indebtedness for this scenario by the end of fiscal year 2007. However, \$8.6 million is needed up-front to initiate the project, which can be provided from the existing CBB&T bond issue, as shown in Appendix B, page B-1, of this report.

#### Scenario II

In this scenario, all improvements in Stage 1 and the trestles from Stage 2, estimated to cost approximately \$275 million, were analyzed under the existing toll structure. The results of this analysis indicates that the current toll structure could not support a bond issue of this magnitude unless a supplement of approximately \$56 million could be provided from other sources.

#### Scenario III

In this scenario, the \$275 million for Stage 1 and Stage 2 improvements was analyzed using a revised toll structure. The revision in the toll structure would amount to an increase of approximately \$1 per vehicle over the existing toll rates. The revised toll structure would be implemented in fiscal year 1991 with the extra revenue that is collected between 1991 and 1996 being used for the proposed widening. The revised toll structure would then continue after 1996 to retire new bonds that would be issued for financing the improvements.

The analysis of this scenario shows that with an increased toll structure and supplemental revenues of approximately \$14 million from other sources, the \$275 million construction program can be supported. The supplemental revenues may be obtained from the existing CBB&T bond issue, as shown in Appendix B, page B-1.

#### Scenario IV

This scenario is the same as Scenario III, except that construction would be delayed for approximately one year and begin in 1996. The results of the analysis of this scenario indicate that a construction program of \$275 million can be supported with the increased toll structure, and a supplement of \$6.6 million from other sources such as the existing CBB&T bond issue, as indicated in Appendix B, page B-1.

## Other Alternatives

This study recognizes that a concept has been proposed for developing an entirely new crossing of the Chesapeake Bay. The concept shows the complete replacement of the CBB&T with a new facility on a different alignment which would include four-lane tunnels for auto and truck traffic, and a separate tube for a rail line. A new channel would be dredged replacing the Thimble Shoal and Chesapeake Channels.

Based on the fact that estimates have been prepared indicating that to provide two additional parallel lanes to the existing CBB&T would cost approximately \$1.2 billion, it is conceivable that the railroad/highway concept could exceed \$5 billion. The cost of a project of this magnitude would appear to be beyond the scope of financing by the Commonwealth or the private sector.

## Conclusions

The conclusions that can be drawn from this study are as follows:

- o CBB&T has shown continuous growth throughout its history even though the toll structure has been increased on four separate occasions. Reasonable toll increases in the future will not adversely affect continuation of this growth.
- o Although the annual average daily traffic is 7,000 vehicles per day, the CBB&T carries more than 10,000 vehicles per day (vpd) from mid-June through mid-September. The heavy seasonal traffic with 10 percent trucks and RVs creates hourly demands that cause the facility to operate at levels of service D and E. As the traffic growth continues, the number of hours that the facility must operate at congested levels will greatly increase.
- o By the year 2000 the annual average daily traffic is expected to reach 10,100 vpd, and during the summer months, the average daily traffic is expected to be 13,700. With high seasonal demand created by recreational trips, the CBB&T will experience heavy congestion during the summer months and there will also be periods of congestion in the spring and fall months.
- o Between 1985 and 1988, there was a 61 percent increase in the number of accidents on the CBB&T. As the traffic and the number of hours of congestion on the facility increase, the accident potential and safety problems can also be expected to increase.
- o As the CBB&T ages, there is a need for more inspections and preventative maintenance work which cannot be reasonably accomplished due to the two-way traffic conditions. As the hours of congestion increase, it will be even more difficult to schedule these activities.
- o The CBB&T is vital to the economy of the Eastern Shore and it is an important transportation link between the port of Hampton Roads and the northeast U.S. market area. Further, surveys by the City of Virginia Beach in 1988 have shown that a large percentage of the visitors to the Virginia Beach resort area travel there via the CBB&T.

- Route 13 and the CBB&T are designated as part of the State Arterial Highway System. The goal in designating this system is to provide four-lane highways to supplement and complement the Interstate System.
- Based on the existing traffic conditions and the expected traffic growth that will occur over the next few years, improvements to the CBB&T will obviously be needed. The greatest obstacle to these improvements is cost.
- If the trestles are widened to four lanes, there will be two short "bottlenecks" of approximately one mile at each of the tunnels. Experience on other facilities in the state, such as the Midtown Tunnel and the George P. Coleman Bridge, indicates that short two-lane facilities can accommodate relatively high volumes of traffic and such bottlenecks are tolerated by drivers.
- The trestles in Stage 1 (\$155.1 million) can be financed through the continuation of the current toll structure after 1996.
- Providing four lanes on all the trestles in Stage 1 and Stage 2 (a cost of approximately \$275 million) would require a combination of increasing the current toll structure and supplemental funds from other sources.
- According to projections made by the Chesapeake Bay Bridge and Tunnel District staff, \$26.74 million will be available at the time of payout of the existing bond issue for use on subsequent bond issues for the new construction.

### Recommendation

Based on the findings and conclusions regarding traffic growth, increasing accidents, difficulty scheduling preventative maintenance, and a viable financing alternative, it is recommended that the CBB&T be improved to provide two additional lanes on the trestle sections in the near future. Due to financial constraints, providing additional lanes in the tunnel sections will have to be accomplished in subsequent years.

Because of the lead time required prior to construction to obtain permits, conduct indepth traffic studies, develop construction plans and specifications, develop financial models, and arrange for financing of construction, planning should begin immediately for the construction of a parallel crossing.

SJR 132 Study  
Chesapeake Bay Bridge & Tunnel

References

1. Highway Capacity Manual - Special Report 209  
Transportation Research Board - 1985
2. A Study of Traffic and Revenue Trends, prepared by Wilbur Smith Associates  
and Wilbur S. Smith Management - November 1988
3. A Study of the Design and Construction Concepts for the Second Crossing of  
Chesapeake Bay, prepared by Sverdrup Corporation - April 1988

Note - Since this study was financed in part with Federal funds, the following disclaimer is required:

The contents of this report reflect the views of the authors (the Virginia Department of Transportation and the Chesapeake Bay Bridge and Tunnel District) who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration, the Commonwealth Transportation Board, or the Chesapeake Bay Bridge and Tunnel Commission. This report does not constitute a standard, specification, or regulation. FHWA acceptance of this report as evidence of fulfillment of the objectives of this planning study does not constitute approval of their location and design or a commitment to fund any such improvements. Additional project level environmental impact assessments and/or studies of alternatives may be necessary.



**APPENDIX A**  
**TRAFFIC RELATED DATA**

<b>EXISTING TRAFFIC AND PROJECTIONS</b>	<b>.....</b>	<b>A-1</b>
<b>HEAVY VEHICLE VOLUMES 1985 - 1989</b>	<b>.....</b>	<b>A-3</b>
<b>TRAVEL SURVEY DATA</b>	<b>.....</b>	<b>A-4</b>
<b>LEVEL OF SERVICE</b>	<b>.....</b>	<b>A-5</b>
<b>HOURS OF LANE CLOSURES</b>	<b>.....</b>	<b>A-12</b>
<b>ACCIDENT DATA</b>	<b>.....</b>	<b>A-15</b>





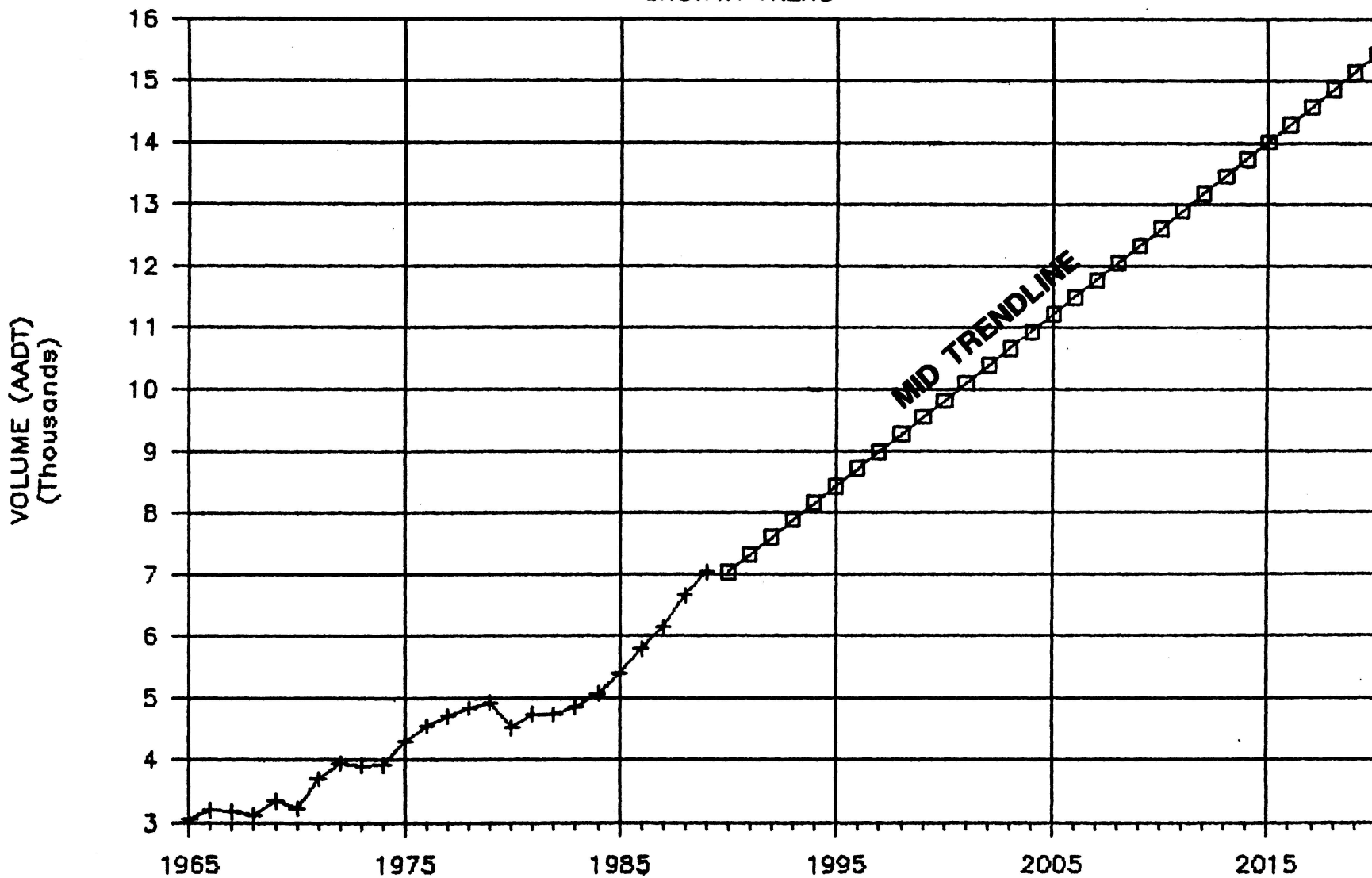
**CBB&T TRAFFIC PROJECTIONS**  
(Toll Paying Vehicles)

FISCAL YEAR	YEARLY COUNT	AADT	HIGH - TRENDLINE		MID - TRENDLINE		LOW - TRENDLINE	
			1983-1989	AADT	1980-1989	AADT	1970-1989	AADT
1965	1113463	3051						
1966	1165584	3193						
1967	1156717	3169						
1968	1136025	3112						
1969	1216652	3333						
1970	1175885	3222						
1971	1348622	3695						
1972	1441732	3950						
1973	1427971	3912						
1974	1430806	3920						
1975	1572630	4309						
1976	1660737	4550						
1977	1719265	4710						
1978	1767067	4841						
1979	1798644	4928						
1980	1649381	4519						
1981	1733091	4748						
1982	1730697	4742						
1983	1771442	4853						
1984	1852549	5075						
1985	1970226	5398						
1986	2116929	5800						
1987	2240450	6138						
1988	2431514	6662						
1989	2565474	7029						
1990			2660500	7290	2566000	7030	2355900	6450
1991			2792300	7650	2668000	7310	2411800	6610
1992			2924100	8010	2770100	7590	2467600	6760
1993			3055900	8370	2872200	7870	2523500	6910
1994			3187700	8730	2974200	8150	2579300	7070
1995			3319500	9090	3076300	8430	2635200	7220
1996			3451300	9460	3178400	8710	2691000	7370
1997			3583100	9820	3280400	8990	2746900	7530
1998			3714800	10180	3382500	9270	2802700	7680
1999			3846600	10540	3484500	9550	2858600	7830
2000			3978400	10900	3586600	9830	2914400	7980
2001			4110200	11260	3688700	10110	2970300	8140
2002			4242000	11620	3790700	10390	3026200	8290
2003			4373800	11980	3892800	10670	3082000	8440
2004			4505600	12340	3994800	10940	3137900	8600
2005			4637400	12710	4096900	11220	3193700	8750
2006			4769200	13070	4199000	11500	3249600	8900
2007			4901000	13430	4301000	11780	3305400	9060
2008			5032800	13790	4403100	12060	3361300	9210
2009			5164600	14150	4505200	12340	3417100	9360
2010			5296400	14510	4607200	12620	3473000	9510
2011			5428200	14870	4709300	12900	3528800	9670
2012			5559900	15230	4811300	13180	3584700	9820
2013			5691700	15590	4913400	13460	3640500	9970
2014			5823500	15950	5015500	13740	3696400	10130
2015			5955300	16320	5117500	14020	3752200	10280
2016			6087100	16680	5219600	14300	3808100	10430
2017			6218900	17040	5321600	14580	3863900	10590
2018			6350700	17400	5423700	14860	3919800	10740
2019			6482500	17760	5525800	15140	3975600	10890
2020			6614300	18120	5627800	15420	4031500	11050

# CHESAPEAKE BAY BRIDGE TUNNEL

GROWTH TREND

A-2



**CBB&T**

**HEAVY VEHICLES 1985 - 1989**

	1985	1986	1987	1988	1989
JANUARY	19125	21479	20462	21718	23238
FEBRUARY	18288	20199	20932	23098	21917
MARCH	22034	23621	25231	26950	26794
APRIL	23620	26039	25439	25200	26423
MAY	25758	26417	26881	27242	29115
JUNE	29121	29999	30976	31294	30988
JULY	30559	30859	33104	32685	
AUGUST	28249	26693	28929	30609	
SEPTEMBER	23119	26407	28387	28915	
OCTOBER	25767	27120	27971	29460	
NOVEMBER	21540	21875	24138	25937	
DECEMBER	20249	21893	23165	23672	

## TRAVEL SURVEY 1989

HOUR	TRIP PURPOSE						TOTAL
	WORK/ BUSINESS	PERSONAL BUSINESS	SHOPPING	PLEASURE/ VACATION	OTHER	NO ANSWER	
1	12	18	1	24	1	0	56
2	11	10	0	21	1	0	43
3	10	8	0	12	3	0	33
4	12	14	0	23	1	0	50
5	18	10	1	24	1	0	54
6	30	18	1	38	1	0	88
7	56	22	1	47	1	1	128
8	50	30	3	74	1	1	159
9	73	52	4	158	1	1	289
10	103	63	4	235	1	0	406
11	74	58	3	300	1	3	439
12	78	61	3	290	0	2	434
13	65	66	1	262	0	2	396
14	82	87	2	276	6	4	457
15	88	85	3	250	0	1	427
16	69	50	3	168	0	0	290
17	111	78	5	225	2	0	421
18	54	47	4	148	1	2	256
19	58	44	11	166	0	0	279
20	44	50	2	136	3	1	236
21	43	33	2	99	2	0	179
22	39	27	3	78	1	0	148
23	27	20	1	53	0	0	101
24	22	24	0	43	0	0	89
<b>TOTAL</b>	<b>1229</b>	<b>975</b>	<b>58</b>	<b>3150</b>	<b>28</b>	<b>18</b>	<b>5458</b>
<b>% TOTAL</b>	<b>22.5%</b>	<b>17.9%</b>	<b>1.1%</b>	<b>57.7%</b>	<b>0.5%</b>	<b>0.3%</b>	<b>100.0%</b>
<b>PEAK</b>	<b>17.9%</b>	<b>19.0%</b>	<b>0.4%</b>	<b>60.4%</b>	<b>1.3%</b>	<b>0.9%</b>	<b>100.0%</b>

## LEVEL OF SERVICE

In order to describe the traffic flow conditions on the CBB&T, an explanation of levels of service is necessary. The quality of service provided by a given highway facility is measured in terms of its level of service. In the evaluation of a roadway, there are six levels of service designations, from A to F, with level of service A representing the best operating conditions and level of service F the worst. A brief description of each level of service (LOS) is as follows:

- LOS A - represents free-flow. Vehicles can maneuver within the traffic stream and easily maintain the posted speed limit.
- LOS B - represents a stable flow. The spatial separation of vehicles allows easy maneuverability, and drivers can maintain the posted speed.
- LOS C - is still stable traffic flow, but the maneuverability and speeds are more restricted with higher traffic volumes. The drivers are more restricted in their freedom to select their speeds, to change lanes, or to pass.
- LOS D - approaches unstable flow. Temporary restrictions to the traffic flow may cause substantial drops in the operating speed, the drivers have little freedom to pass, and the comfort and convenience of the driver are lowered. Drivers usually tolerate this condition for short periods of time.
- LOS E - represents the capacity of the facility. The traffic flow is unstable, vehicles are unable to pass, there may be momentary stoppages in the traffic flow, and the vehicle operating speeds are very low.
- LOS F - describes a forced flow condition usually with low operating speeds and traffic volumes that are below capacity. This is often described as stop-and-go conditions.

# SECTION 1 TRESTLE A

1985 HCM:TWO-LANE HIGHWAYS

\*\*\*\*\*

FACILITY LOCATION.... CHESAPEAKE BAY BRIDGE TUNNEL  
 ANALYST..... RLT  
 TIME OF ANALYSIS.....  
 DATE OF ANALYSIS..... 7-11-89  
 OTHER INFORMATION.... TRESTLE A

A) ADJUSTMENT FACTORS

-----

PERCENTAGE OF TRUCKS.....	8
PERCENTAGE OF BUSES.....	0
PERCENTAGE OF RECREATIONAL VEHICLES.....	2
DESIGN SPEED (MPH).....	60
PEAK HOUR FACTOR.....	.94
DIRECTIONAL DISTRIBUTION (UP/DOWN).....	60 / 40
LANE WIDTH (FT).....	12
USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)...	2
PERCENT NO PASSING ZONES.....	25

B) CORRECTION FACTORS

-----  
 LEVEL TERRAIN

LOS	E T	E B	E R	f w	f d	f HV
---	---	---	---	---	---	---
A	2	1.8	2.2	.81	.94	.91
B	2.2	2	2.5	.81	.94	.89
C	2.2	2	2.5	.81	.94	.89
D	2	1.6	1.6	.81	.94	.92
E	2	1.6	1.6	.93	.94	.92

C) SERVICE FLOW RATE RESULTS

-----

LOS	SERVICE FLOW RATE	V/C
---	---	---
A	232	.12
B	454	.24
C	738	.39
D	1210	.62
E	2242	1

## SECTION 2 THIMBLE SHOAL TUNNEL

1985 HCM:TWO-LANE HIGHWAYS

\*\*\*\*\*

FACILITY LOCATION.... CHESAPEAKE BAY BRIDGE TUNNEL  
 ANALYST..... RLT  
 TIME OF ANALYSIS.....  
 DATE OF ANALYSIS..... 7-11-89  
 OTHER INFORMATION.... THIMBLE SHOAL TUNNEL

A) ADJUSTMENT FACTORS

-----

PERCENTAGE OF TRUCKS.....	8
PERCENTAGE OF BUSES.....	0
PERCENTAGE OF RECREATIONAL VEHICLES.....	2
DESIGN SPEED (MPH).....	60
PEAK HOUR FACTOR.....	.94
DIRECTIONAL DISTRIBUTION (UP/DOWN).....	60 / 40
LANE WIDTH (FT).....	12
USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)...	0
PERCENT NO PASSING ZONES.....	100

B) CORRECTION FACTORS

-----  
 LEVEL TERRAIN

LOS	E T	E B	E R	f w	f d	f HV
---	---	---	---	---	---	---
A	2	1.8	2.2	.7	.94	.91
B	2.2	2	2.5	.7	.94	.89
C	2.2	2	2.5	.7	.94	.89
D	2	1.6	1.6	.7	.94	.92
E	2	1.6	1.6	.88	.94	.92

C) SERVICE FLOW RATE RESULTS

-----

LOS	SERVICE FLOW RATE	V/C
---	---	---
A	67	.04
B	262	.16
C	524	.32
D	962	.57
E	2121	1

## SECTION 3 TRESTLE B

1985 HCM:TWO-LANE HIGHWAYS

\*\*\*\*\*

FACILITY LOCATION.... CHESAPEAKE BAY BRIDGE TUNNEL  
 ANALYST..... RLT  
 TIME OF ANALYSIS.....  
 DATE OF ANALYSIS..... 7-11-89  
 OTHER INFORMATION.... TRESTLE B

### A) ADJUSTMENT FACTORS

-----  
 PERCENTAGE OF TRUCKS..... 8  
 PERCENTAGE OF BUSES..... 0  
 PERCENTAGE OF RECREATIONAL VEHICLES..... 2  
 DESIGN SPEED (MPH)..... 60  
 PEAK HOUR FACTOR..... .94  
 DIRECTIONAL DISTRIBUTION (UP/DOWN)..... 60 / 40  
 LANE WIDTH (FT)..... 12  
 USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)... 2  
 PERCENT NO PASSING ZONES..... 40

### B) CORRECTION FACTORS

-----  
 LEVEL TERRAIN

LOS	E T	E B	E R	f w	f d	f HV
A	2	1.8	2.2	.81	.94	.91
B	2.2	2	2.5	.81	.94	.89
C	2.2	2	2.5	.81	.94	.89
D	2	1.6	1.6	.81	.94	.92
E	2	1.6	1.6	.93	.94	.92

### C) SERVICE FLOW RATE RESULTS

-----

LOS	SERVICE FLOW RATE	V/C
A	174	.09
B	398	.21
C	682	.36
D	1171	.6
E	2242	1



## SECTION 4 CHESAPEAKE CHANNEL TUNNEL

1985 HCM:TWO-LANE HIGHWAYS

\*\*\*\*\*

FACILITY LOCATION.... CHESAPEAKE BAY BRIDGE TUNNEL  
 ANALYST..... RLT  
 TIME OF ANALYSIS.....  
 DATE OF ANALYSIS..... 7-11-89  
 OTHER INFORMATION.... CHESAPEAKE CHANNEL TUNNEL

A) ADJUSTMENT FACTORS

-----  
 PERCENTAGE OF TRUCKS..... 8  
 PERCENTAGE OF BUSES..... 0  
 PERCENTAGE OF RECREATIONAL VEHICLES..... 2  
 DESIGN SPEED (MPH)..... 60  
 PEAK HOUR FACTOR..... .94  
 DIRECTIONAL DISTRIBUTION (UP/DOWN)..... 60 / 40  
 LANE WIDTH (FT)..... 12  
 USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)... 0  
 PERCENT NO PASSING ZONES..... 100

B) CORRECTION FACTORS

-----  
 LEVEL TERRAIN

LOS	E T	E B	E R	f w	f d	f HV
A	2	1.8	2.2	.7	.94	.91
B	2.2	2	2.5	.7	.94	.89
C	2.2	2	2.5	.7	.94	.89
D	2	1.6	1.6	.7	.94	.92
E	2	1.6	1.6	.88	.94	.92

C) SERVICE FLOW RATE RESULTS

-----  
 SERVICE

LOS	FLOW RATE	V/C
A	67	.04
B	262	.16
C	524	.32
D	962	.57
E	2121	1

## SECTION 5 TRESTLE C

1985 HCM:TWO-LANE HIGHWAYS

\*\*\*\*\*

FACILITY LOCATION.... CHESAPEAKE BAY BRIDGE TUNNEL  
 ANALYST..... RLT  
 TIME OF ANALYSIS.....  
 DATE OF ANALYSIS..... 7-11-89  
 OTHER INFORMATION.... TRESTLE C

A) ADJUSTMENT FACTORS

-----	
PERCENTAGE OF TRUCKS.....	8
PERCENTAGE OF BUSES.....	0
PERCENTAGE OF RECREATIONAL VEHICLES.....	2
DESIGN SPEED (MPH).....	60
PEAK HOUR FACTOR.....	.94
DIRECTIONAL DISTRIBUTION (UP/DOWN).....	60 / 40
LANE WIDTH (FT).....	12
USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)...	2
PERCENT NO PASSING ZONES.....	25

B) CORRECTION FACTORS

-----						
LEVEL TERRAIN						
LOS	E	E	E	f	f	f
	T	B	R	w	d	HV
---	---	---	---	---	---	---
A	2	1.8	2.2	.81	.94	.91
B	2.2	2	2.5	.81	.94	.89
C	2.2	2	2.5	.81	.94	.89
D	2	1.6	1.6	.81	.94	.92
E	2	1.6	1.6	.93	.94	.92

C) SERVICE FLOW RATE RESULTS

-----		
LOS	SERVICE FLOW RATE	V/C
---	---	---
A	232	.12
B	454	.24
C	738	.39
D	1210	.62
E	2242	1

## SECTION 6

### TRESTLE D, E & F

1985 HCM:TWO-LANE HIGHWAYS

\*\*\*\*\*

FACILITY LOCATION.... CHESAPEAKE BAY BRIDGE TUNNEL  
 ANALYST..... RLT  
 TIME OF ANALYSIS.....  
 DATE OF ANALYSIS..... 7-11-89  
 OTHER INFORMATION.... TRESTLE D, E, & F

A) ADJUSTMENT FACTORS

-----

PERCENTAGE OF TRUCKS.....	8
PERCENTAGE OF BUSES.....	0
PERCENTAGE OF RECREATIONAL VEHICLES.....	2
DESIGN SPEED (MPH).....	60
PEAK HOUR FACTOR.....	.94
DIRECTIONAL DISTRIBUTION (UP/DOWN).....	60 / 40
LANE WIDTH (FT).....	12
USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)...	2
PERCENT NO PASSING ZONES.....	60

B) CORRECTION FACTORS

-----  
 LEVEL TERRAIN

LOS	E T	E B	E R	f w	f d	f HV
---	---	---	---	---	---	---
A	2	1.8	2.2	.81	.94	.91
B	2.2	2	2.5	.81	.94	.89
C	2.2	2	2.5	.81	.94	.89
D	2	1.6	1.6	.81	.94	.92
E	2	1.6	1.6	.93	.94	.92

C) SERVICE FLOW RATE RESULTS

-----

LOS	SERVICE FLOW RATE	V/C
---	---	---
A	135	.07
B	360	.19
C	644*	.34
D	1152*	.59
E	2242*	1

\* ROUNDED OFF TO 650, 1150, AND 2240

MEMORANDUM

July 21, 1989

TO: JAMES K. BROOKSHIRE, JR., EXECUTIVE DIRECTOR

SUBJECT: LANE CLOSURES

As a result of your recent request, I have calculated the approximate hours, over the past year, our Maintenance Division spent doing preventive maintenance and routine maintenance in areas which require lane closures. We were able to calculate hours spent for the job activities as they were shown on our Maintenance Division reports. The following is a list which will show a departmental breakdown of lane closures showing the work activity, as well as hours of lane closure.

ELECTRICAL-MECHANICAL DEPARTMENT

The Electrical-Mechanical Department can expect to spend 452 work hours working from curb to curb on the trestles and bridges, and in the tunnels during a normal year. The breakdown would be as follows:

Relamping of Tunnels	- 208 hrs.
Tunnel Ballast Repair	- 40 hrs.
Relamping Trestles	- 48 hrs.
Relamping Aircraft Obstruction Lights	- 36 hrs.
Servicing Nav-Aid Lights	- 16 hrs.
Cable Faults	- 24 hrs.
Tunnel Approach and Open Cut Lighting	- 36 hrs.
Preventive Maintenance of Rail-to-Rail Ground Straps	- 4 hrs.
Inspection of High Voltage Feeders (in cable tray)	- <u>40 hrs.</u>
Total	452 hrs.

ELECTRONICS/COMMUNICATIONS DEPARTMENT

The Electronics/Communications Department, under normal circumstances, can spend a total of 460 hours working in the roadway area of the tunnels, trestles, and bridges. A breakdown of work activities is as follows:

Cable Repairs on Trestles	- 200 hrs.
Phone Repair on Trestles	- 50 hrs.
Speed Sign Maintenance	- 100 hrs.
Tunnel Antenna Maintenance	- 50 hrs.
Tunnel Approach Sign Maintenance	- 50 hrs.
North Channel Bridge Fog Horn Maintenance	- <u>10 hrs.</u>
Total	460 hrs.

As our telephone cable (which, as you know, serves as a power control cable on our signs, telephones and communications systems throughout the facility) is old, it will require more time in the roadway to perform splices and/or maintenance of this cable.

SHOPS AND SERVICES DEPARTMENT

The Shops and Services Department spends more time in lane closures than any other department on the facility. This past year they spent approximately 1,272 hours working inside lane closures. Examples of the work performed were:

Servicing and Inspection of Nav-Aid Generators	- 208 hrs.
Cleaning Scuppers on Trestles	- 64 hrs.
Repair of Angles (expansion dams), approx.	- 100 hrs.
Patching Potholes	- 160 hrs.
Tunnel Washing and Cleaning	- 400 hrs.
Drainage Cleaning	- 80 hrs.
Repairs of Railing due to Accidents	- 140 hrs.
Annual Maintenance/Bridge Rail Inspection	- <u>120 hrs.</u>
Total	1,272 hrs.

SPECIAL PROJECTS

Special project lane closures for the past year were as follows:

Approximately 232 hours were spent for inspections required by the National Bridge Inspection Standards and our normal annual inspection performed by Sverdrup Corporation. Sverdrup Corporation spent approximately 40 hrs. during their annual inspection.

This year was our first year of fracture critical inspection on North Channel Bridge and Fisherman Inlet Bridge. Although the inspection took 120 hours, the District spent 80 hours in preparation for the inspection.

What I have just given you is the breakdown of work that was done during the past year; however, our needs for the future dictate that more time be spent working in the roadway. Examples for the coming year are as follows:

Install Water Chase	- 40 hrs.
Rehabilitate Crib Wall	- 320 hrs.
Bridge Painting	- 100 hrs.
Repave Causeway and Approach Roads	- <u>160 hrs.</u>
Total	620 hrs.

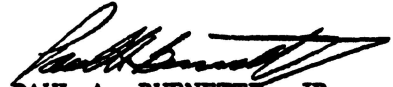
Although I have listed a lot of projects that need to be done in the roadway, the most important project I have not mentioned, and that will be repaving of the entire facility, other than the approach roads and causeway. It is anticipated that this project, although it would not be let as one project, would require approximately 18 months to complete, and this would mean 18 months of one-way traffic in that area of the facility.

MEMORANDUM TO: James K. Brookshire, Jr., Executive Director  
July 21, 1989

Page 3

While all of the above projects are planned, there are other activities that, due to logistics, we just have not be able to get to (namely snooper work). I feel that each year we should keep our snooper doing girder and cable inspection, making repairs as they move along, and we could keep a snooper crew busy several months out of the year if the bridge could be made available to us.

We would also be able to spend more time doing preventive maintenance such as spot painting of steel bridges, repairs of cable trays, inspection of telephone cables, high voltage electrical feeders, etc., if the trestle could be made available to us through a parallel facility in the future.

  
PAUL A. BURNETTE, JR.  
Director of Maintenance

PABjr:epc

# CBB&T

## ACCIDENT SUMMARIES 1985 - 1988

ACCIDENT SUMMARY 1985

SECTION	ACCIDENTS			
	PROPERTY DAMAGE	INJURY	FATAL	TOTAL
1 (TRESTLE A)	4	2	0	6
2 (THIMBLE SHOAL)	5	2	0	7
3 (TRESTLE B)	5	2	1	8
4 (CHESAPEAKE)	2	1	0	3
5 (TRESTLE C)	8	5	1	14
6 (TRESTLE D,E,&F)	3	2	0	5
7 (4 LANE SECTION)	2	1	0	3
<b>TOTALS</b>	<b>29</b>	<b>15</b>	<b>2</b>	<b>46</b>

ACCIDENT SUMMARY 1986

SECTION	ACCIDENTS			
	PROPERTY DAMAGE	INJURY	FATAL	TOTAL
1 (TRESTLE A)	3	8	0	11
2 (THIMBLE SHOAL)	2	0	0	2
3 (TRESTLE B)	1	0	0	1
4 (CHESAPEAKE)	1	1	0	2
5 (TRESTLE C)	8	2	1	11
6 (TRESTLE D,E,&F)	4	2	0	6
7 (4 LANE SECTION)	0	0	0	0
<b>TOTALS</b>	<b>19</b>	<b>13</b>	<b>1</b>	<b>33</b>

ACCIDENT SUMMARY 1987

SECTION	ACCIDENTS			
	PROPERTY DAMAGE	INJURY	FATAL	TOTAL
1 (TRESTLE A)	11	2	0	13
2 (THIMBLE SHOAL)	8	1	0	9
3 (TRESTLE B)	6	4	1	11
4 (CHESAPEAKE)	3	1	0	4
5 (TRESTLE C)	10	2	1	13
6 (TRESTLE D,E,&F)	2	0	0	2
7 (4 LANE SECTION)	0	0	0	0
<b>TOTALS</b>	<b>40</b>	<b>10</b>	<b>2</b>	<b>52</b>

ACCIDENT SUMMARY 1988

SECTION	ACCIDENTS			
	PROPERTY DAMAGE	INJURY	FATAL	TOTAL
1 (TRESTLE A)	4	8	2	14
2 (THIMBLE SHOAL)	10	1	0	11
3 (TRESTLE B)	7	9	3	19
4 (CHESAPEAKE)	1	1	0	2
5 (TRESTLE C)	10	13	1	24
6 (TRESTLE D,E,&F)	1	0	0	1
7 (4 LANE SECTION)	3	0	0	3
<b>TOTALS</b>	<b>36</b>	<b>32</b>	<b>6</b>	<b>74</b>

# CBB&T

## 1985 ACCIDENT RATES AND PERCENT DAYLIGHT

SECTION NO.	SECTION LENGTH (MILES)	TRAFFIC (ADT)	TOTAL ACCIDENTS	PERCENT DAYLIGHT	TOTAL INJURYS	TOTAL FATALITIES	(PER 100 MIL. VEH. MILES TRAVELED)			
							ACCIDENT RATE	INJURY RATE	FATALITY RATE	
1	3.33	5750	6	16.7%	3	0	86	43	0	
2	1.56	5750	7	85.7%	2	0	214	61	0	
3	3.75	5750	8	37.5%	2	1	102	25	13	
4	1.48	5750	3	66.7%	7	0	97	225	0	
5	4.56	5750	14	42.9%	9	1	146	94	10	
6	3.86	5750	5	40.0%	3	0	62	37	0	
7	0.6	5750	3	100.0%	2	0	238	159	0	
TOTALS	19.14		46		28	2				
VIRGINIA 2 LANE PRIMARY RATES								184	122	3

## 1986 ACCIDENT RATES AND PERCENT DAYLIGHT

SECTION NO.	SECTION LENGTH (MILES)	TRAFFIC (ADT)	TOTAL ACCIDENTS	PERCENT DAYLIGHT	TOTAL INJURYS	TOTAL FATALITIES	(PER 100 MIL. VEH. MILES TRAVELED)			
							ACCIDENT RATE	INJURY RATE	FATALITY RATE	
1	3.33	6160	11	54.5%	29	0	147	387	0	
2	1.56	6160	2	50.0%	0	0	57	0	0	
3	3.75	6160	1	0.0%	0	0	12	0	0	
4	1.48	6160	2	50.0%	1	0	60	30	0	
5	4.56	6160	11	90.9%	2	1	107	20	10	
6	3.86	6160	6	66.7%	3	0	69	35	0	
7	0.6	6160	0	0.0%	0	0	0	0	0	
TOTALS	19.14		33		35	1				
VIRGINIA 2 LANE PRIMARY RATES								175	117	4



# CBB&T

## 1987 ACCIDENT RATES AND PERCENT DAYLIGHT

SECTION NO.	SECTION LENGTH (MILES)	TRAFFIC (ADT)	TOTAL ACCIDENTS	PERCENT DAYLIGHT	TOTAL INJURYS	TOTAL FATALITIES	(PER 100 MIL. VEH. MILES TRAVELED)		
							ACCIDENT RATE	INJURY RATE	FATALITY RATE
1	3.33	6610	13	84.6%	7	0	162	87	0
2	1.56	6610	9	77.8%	2	0	239	53	0
3	3.75	6610	11	63.6%	11	1	122	122	11
4	1.48	6610	4	25.0%	1	0	112	28	0
5	4.56	6610	13	69.2%	8	1	118	73	9
6	3.86	6610	2	0.0%	0	0	21	0	0
7	0.6	6610	0	0.0%	0	0	0	0	0
TOTALS	19.14		52		29	2			
VIRGINIA 2 LANE PRIMARY RATES							170	112	4

## 1988 ACCIDENT RATES AND PERCENT DAYLIGHT

SECTION NO.	SECTION LENGTH (MILES)	TRAFFIC (ADT)	TOTAL ACCIDENTS	PERCENT DAYLIGHT	TOTAL INJURYS	TOTAL FATALITIES	(PER 100 MIL. VEH. MILES TRAVELED)		
							ACCIDENT RATE	INJURY RATE	FATALITY RATE
1	3.33	7060	14	35.7%	19	2	163	221	23
2	1.56	7060	11	45.5%	1	0	274	25	0
3	3.75	7060	19	47.4%	14	4	197	145	41
4	1.48	7060	2	100.0%	1	0	52	26	0
5	4.56	7060	24	66.7%	27	1	204	230	9
6	3.86	7060	1	0.0%	0	0	10	0	0
7	0.6	7060	3	66.7%	0	0	194	0	0
TOTALS	19.14		74		62	7			
VIRGINIA 2 LANE PRIMARY RATES							162	106	4



## **APPENDIX B**

### **FINANCIAL ANALYSIS**

**ANALYSIS OF PROJECTED PAYOUT FOR  
CURRENT INDEBTEDNESS ..... B-1**

**ANALYSIS OF FINANCIAL ALTERNATIVES  
FOR FUTURE IMPROVEMENTS ..... B-6**



**CHESAPEAKE BAY BRIDGE and TUNNEL  
ANALYSIS OF PROJECTED PAYOUT FOR CURRENT INDEBTEDNESS**

The purpose of this analysis, prepared by the CBB&T Director of Finance, was twofold:

- 1) to estimate the payout date on the current bond issue, and
- 2) to estimate funds available at payout.

The analysis indicates that all bonds would be paid on June 1, 1996. Therefore, the assumption of July 1, 1996, in the financial analysis for future improvements appears valid.

Secondly, the estimate of funds available at payout are as follows:

	Million
1) 1996 Operating Revenues	\$ 1.703
2) Reserve Maintenance Fund Balances	20.436
3) General Reserve Balances	.801
4) Construction Fund Balances	2.000
5) Revenue Fund - Reserve	<u>1.800</u>
Total	<u>\$ 26.740</u>

Please Note: Items 4) and 5) are not reflected in the analysis but are balances that are either required by the Trust Indenture or will be available June 30, 1996.

CHESAPEAKE BAY BRIDGE & TUNNEL DISTRICT - PAYOUT SCHEDULE

OPERATING REVENUES & EXPENSES

SERIES A INTEREST & REDEMPTION

Fiscal Year	Toll Revenue	Other Revenue (1)	Total Revenue	Operating Expenses	Net Revenue
89/90	28,592,648	1,200,000	29,792,648	5,935,000	23,857,000
90/91	29,500,258	1,200,000	30,700,258	6,350,000	24,350,000
91/92	30,375,956	1,200,000	31,575,956	6,795,000	24,781,000
92/93	31,275,522	1,200,000	32,475,522	7,271,000	25,204,000
93/94	32,141,391	1,200,000	33,341,391	7,780,000	25,562,000
94/95	33,032,913	1,200,000	34,232,913	8,324,000	25,909,000
95/96	33,888,951	1,200,000	35,088,951	8,906,000	26,183,000

Fiscal Year	Beg. Balance	Bond Interest	Redemption Requirement	Discount Ratio	Par Amount Bonds Redeemed
89/90	32,360,000	1,545,000	2,659,000	0.980	2,713,000
90/91	29,647,000	1,411,000	2,789,000	0.980	2,846,000
91/92	26,801,000	1,271,000	2,925,000	0.990	2,955,000
92/93	23,846,000	1,125,000	3,067,000	0.990	3,098,000
93/94	20,748,000	973,000	3,217,000	1.000	3,217,000
94/95	17,631,000	814,000	3,374,000	1.000	3,374,000
95/96	14,167,000	601,000	3,538,000	1.000	3,538,000

Sub total 21,741,000  
From excess 10,619,000

TOTAL 32,360,000

=====

(1) OTHER REVENUE INCLUDES RESTAURANT/GIFT SHOP, STATE ASSISTANCE, ETC.

CHESAPEAKE BAY BRIDGE & TUNNEL DISTRICT - PAYOUT SCHEDULE

SERIES B INTEREST & REDEMPTION

SERIES C INTEREST

Fiscal Year	Beg. Balance	Bond Interest	Redemption Requirement	Discount Ratio	Par Amount Bonds Redeemed
89/90	14,936,000	806,000	1,145,000	1.000	1,145,000
90/91	13,791,000	742,000	1,208,000	1.000	1,208,000
91/92	12,583,000	675,000	1,275,000	1.000	1,275,000
92/93	11,308,000	604,000	1,345,000	1.000	1,345,000
93/94	9,963,000	529,000	1,419,000	1.000	1,419,000
94/95	8,544,000	450,000	1,497,000	1.000	1,497,000
95/96	7,047,000	194,000	779,000	1.000	779,000
					-----
					Sub total 8,668,000
					From excess 6,268,000
					-----
					TOTAL 14,936,000
					=====

Fiscal Year	Amt Avail C Int, RM, GR, REDEMPT	Beg. Balance	Bond Interest
89/90	17,702,000	90,526,000	5,046,000
90/91	18,200,000	78,544,000	4,381,000
91/92	18,635,000	67,001,000	3,645,000
92/93	19,063,000	52,417,000	2,787,000
93/94	19,424,000	36,530,000	1,859,000
94/95	19,774,000	19,704,000	872,000
95/96	21,071,000	1,581,000	45,000

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08/11/89

CHESAPEAKE BAY BRIDGE & TUNNEL DISTRICT - PAYOUT SCHEDULE

RESERVE MAINTENANCE FUND (RMF)

BAL FOR: 12,946,000  
INT RATE: 0.085

Fiscal Year	Amt Avail RNF, GR, Redemption	Provided	RNF Expenses	Interest Earnings	End. Balance
89/90	12,656,000	5,000,000	7,444,000	1,178,000	11,680,000
90/91	13,819,000	5,000,000	5,180,000	1,116,000	12,616,000
91/92	14,990,000	3,000,000	2,772,000	1,164,000	14,008,000
92/93	16,276,000	3,000,000	3,580,000	1,267,000	14,695,000
93/94	17,565,000	3,000,000	1,870,000	1,364,000	17,189,000
94/95	18,902,000	3,000,000	3,000,000	1,556,000	18,748,000
95/96	21,026,000	3,000,000	3,000,000	1,691,000	20,436,000

GENERAL RESERVE

BAL FOR: 11,674,000  
INT RATE: 0.085

Fiscal Year	Amt. Avail Gen Res & Redemption	Requirement	Excess Transfer	Interest Earnings	End. Balance
89/90	7,656,000	11,409,000	-1,377,000	943,000	11,240,000
90/91	8,819,000	10,080,000	-2,146,000	833,000	9,927,000
91/92	11,990,000	8,775,000	-2,302,000	713,000	8,338,000
92/93	13,276,000	7,197,000	-2,293,000	576,000	6,621,000
93/94	14,565,000	5,490,000	-2,261,000	428,000	4,788,000
94/95	18,902,000	3,684,000	-2,221,000	273,000	2,840,000
95/96	18,026,000	1,752,000	-2,146,000	107,000	801,000

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CHESAPEAKE BAY BRIDGE & TUNNEL DISTRICT - PAYOUT SCHEDULE

SERIES C REDEMPTION

BAL FOR: 2,349,842

Fiscal Year	Amt. Avail C, B, & A Redemption	Beg. Balance	Discount Ratio	Par Amount Bonds Redeemed
89/90	9,033,000	90,526,000	0.950	11,982,000
90/91	10,965,000	78,544,000	0.950	11,543,000
91/92	14,292,000	67,001,000	0.980	14,584,000
92/93	15,569,000	52,417,000	0.980	15,887,000
93/94	16,826,000	36,530,000	1.000	16,826,000
94/95	18,123,000	19,704,000	1.000	18,123,000
95/96	20,172,000	1,581,000	1.000	1,581,000
TOTAL				90,526,000

SERIES B & SERIES A REDEMPTION (EXCESS)

Fiscal Year	Amt. Avail. B & A Redemption	B Par Amount Redeemed	A Par Amount Redeemed
89/90	0	0	0
90/91	0	0	0
91/92	0	0	0
92/93	0	0	0
93/94	0	0	0
94/95	0	0	0
95/96	10,590,000	6,268,000	10,619,000
Totals		6,268,000	10,619,000

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## CHESAPEAKE BAY BRIDGE and TUNNEL

### ANALYSIS OF FINANCIAL ALTERNATIVES FOR FUTURE IMPROVEMENTS

Four scenarios were analyzed in this financial review. Differences between scenarios were the amount of construction activity, the toll structure, and the "begin construction" date.

#### Scenario I

Continue current tolls after present bonds are retired to repay new bonds issued to finance Stage I engineering and construction costs. Assumed construction would begin in 1995 (costs in 1995 dollars). An average toll rate per vehicle of \$10.60 based on total revenue and total vehicles from the November 1988 Wilbur Smith report was used in the analysis (see Attachment I).

#### Scenario II

Same as Scenario I except that the engineering and construction costs for the trestle portion of Stage II have been included.

#### Scenario III

Increase the current toll structure so that the average rate per vehicle would be \$11.60. The revised toll structure would begin in 1991 with the extra revenue collected from the average \$1.00 increase between 1991 and 1996 being used for the proposed widening. The revised toll structure would continue after the present bonds are retired to pay for new bonds issued to finance Stage I and Stage II (trestles only) engineering and construction costs.

#### Scenario IV

This Scenario is the same as Scenario III except that construction would begin in 1996 and cost estimates are expressed in 1996 dollars.

The following is an outline of the general assumptions that were made in regard to all four scenarios:

- . Future traffic would be based on 1980 - 1989 trend.
- . Other revenue from the Projected Payout Schedule developed by the CBB&T staff would continue through the new bond term (see Page B-2).
- . Annual operating and maintenance costs from the November 1988 Wilbur Smith report are valid. Operating costs would continue to increase at 7 percent per year as footnoted in the report, and maintenance costs would remain constant as indicated in the report (see Attachment II).
- . New bonds would be issued in 1994 at an 8.5 percent interest rate for a 20 year term.
- . Existing bonds would be retired by July 1, 1996, and payments on new bonds would begin in fiscal year 1996-97.
- . Interest would be earned at 7.5 percent on funds available for investment.
- . Project cost estimates from the April 1988 SVERDRUP CORP. report would be used (see Attachment III).
- . PE costs incurred prior to 1994 would be borne by CBB&T.

# ATTACHMENT I

(SOURCE - NOVEMBER 1988 WILBUR SMITH REPORT)

## CBB&T

Table 5

### ESTIMATED REVENUE POTENTIAL

Fiscal 1988-2008

<u>FISCAL YEAR(1)</u>	<u>PASSENGER CARS &amp; LIGHT TRUCKS</u> (000's)	<u>HEAVY TRUCKS</u> (000's)	<u>BUSES</u> (000's)	<u>TOTAL REVENUE</u> (000's)
1988	\$20,100	\$ 7,274	\$316	\$27,690
1989	21,507	7,638	313	29,458
1990	23,012	8,020	310	31,342
1991	24,393	8,340	310	33,043
1992	25,857	8,674	310	34,841
1993	27,408	9,021	310	36,739
1994	29,053	9,382	310	38,745
1995	30,796	9,757	310	40,863
1996	32,336	10,147	310	42,793
1997	33,952	10,553	310	44,815
1998	35,650	10,975	310	46,935
1999	37,433	11,414	310	49,157
2000	39,304	11,871	310	51,485
2001	40,876	12,227	310	53,413
2002	42,511	12,594	310	55,415
2003	44,212	12,972	310	57,494
2004	45,980	13,361	310	59,651
2005	47,820	13,762	310	61,892
2006	49,732	14,175	310	64,217
2007	51,722	14,600	310	66,632
2008	53,791	15,038	310	69,139

NOTE: USING TOTAL REVENUE FROM THIS TABLE AND THE TOTAL TRAFFIC FIGURES FROM TABLE 6, AN AVERAGE TOLL RATE OF \$10.60 PER VEHICLE WAS DETERMINED FOR USE IN THE FINANCIAL ANALYSIS.

(1) Fiscal year beginning July 1.

**CBB&T**

Table 6  
ESTIMATED ANNUAL TRAFFIC POTENTIAL  
Fiscal 1988-2008

<u>FISCAL YEAR(1)</u>	<u>PASSENGER CARS &amp; LIGHT TRUCKS</u> (000's)	<u>HEAVY TRUCKS</u> (000's)	<u>BUSES</u> (000's)	<u>TOTAL TRAFFIC</u> (000's)	<u>AVERAGE DAILY TRAFFIC</u>
1988	2,211	332	12	2,555	7,000
1989	2,366	349	12	2,727	7,471
1990	2,532	367	12	2,911	7,975
1991	2,684	381	12	3,077	8,407
1992	2,845	396	12	3,253	8,912
1993	3,015	412	12	3,439	9,422
1994	3,196	429	12	3,637	9,964
1995	3,388	446	12	3,846	10,508
1996	3,557	464	12	4,033	11,049
1997	3,735	482	12	4,229	11,586
1998	3,922	502	12	4,436	12,153
1999	4,118	522	12	4,652	12,710
2000	4,324	543	12	4,879	13,367
2001	4,497	559	12	5,068	13,885
2002	4,677	576	12	5,265	14,425
2003	4,864	593	12	5,469	14,943
2004	5,058	611	12	5,681	15,564
2005	5,261	629	12	5,902	16,170
2006	5,471	648	12	6,131	16,797
2007	5,690	667	12	6,369	17,402
2008	5,918	687	12	6,617	18,129

(1) Fiscal year beginning July 1.

ATTACHMENT 1  
(SOURCE - NOVEMBER 1988 WILBUR SMITH REPORT)

**ATTACHMENT II**  
(SOURCE - NOVEMBER 1988 WILBUR SMITH REPORT)

**CBB&T**

Table 9  
NET REVENUE SUMMARY

<u>FISCAL YEAR(1)</u>	<u>TOLL REVENUE</u> (000's)	<u>OTHER INCOME(2)</u> (000's)	<u>TOTAL INCOME</u> (000's)	<u>OPERATING EXPENSES(3)</u> (000's)	<u>RESERVE MAINTENANCE(4)</u> (000's)	<u>NET REVENUE</u> (000's)
1988	\$27,690	\$990	\$28,680	\$ 5,547	\$8,000	\$15,133
1989	29,458	990	30,448	5,935	5,000	19,513
1990	31,342	990	32,332	6,350	5,000	20,982
1991	33,043	990	34,033	6,795	5,000	22,238
1992	34,841	990	35,831	7,271	3,000	25,560
1993	36,739	990	37,729	7,780	3,000	26,949
1994	38,745	990	39,735	8,325	3,000	28,410
1995	40,863	990	41,853	8,908	3,000	29,945
1996	42,793	990	43,783	9,532	3,000	31,251
1997	44,815	990	45,805	10,199	3,000	32,606
1998	46,935	990	47,925	10,913	3,000	34,012
1999	49,157	990	50,147	11,677	3,000	35,470
2000	51,485	990	52,475	12,494	3,000	36,981
2001	53,413	990	54,403	13,369	3,000	38,034
2002	55,415	990	56,405	14,305	3,000	39,100
2003	57,494	990	58,484	15,306	3,000	40,178
2004	59,651	990	60,641	16,378	3,000	41,263
2005	61,892	990	62,882	17,524	3,000	42,358
2006	64,217	990	65,207	18,751	3,000	43,456
2007	66,632	990	67,622	20,063	3,000	44,559
2008	69,139	990	70,129	21,468	3,000	45,661

(1) Fiscal Year beginning July 1.

(2) Includes investment income, State Assistance, concession income and other income as estimated by CBBT staff.

(3) Fiscal 1988-99 CBBT staff estimates. Fiscal 2000-08 estimated based on 7 percent per year increase.

(4) As estimated by CBBT staff.

**ATTACHMENT III**  
(SOURCE - APRIL 1988 SVERDRUP CORP. REPORT)

**CBB&T**

TABLE I  
CONSTRUCTION COST ESTIMATE

STAGE I - CONSTRUCTION

North Approach At-Grade Roadway	\$ 530,000
Fisherman Island At-Grade Roadway	2,300,000
Trestles C, D, E and F	41,950,000
Fisherman Inlet Bridge	1,770,000
North Channel Bridge	30,070,000
Stage I Tie-in at Island No. 4 and Trestle Crossovers (2)	4,100,000
Miscellaneous (Elect., etc.)	3,000,000
Mobilization	<u>4,000,000</u>
	\$ 87,720,000
Contingency ±25%	<u>21,930,000</u>
	\$ 109,650,000
Escalation to First Quarter 1995	<u>33,950,000</u>
Total Cost of Stage I - Construction	\$ 143,600,000
Engineering Services, Consultant Services, Design Studies, and Model Studies	<u>11,500,000</u>
STAGE I TOTAL COST	\$ 155,100,000

STAGE II - CONSTRUCTION

South Approach At-Grade Roadway	\$ 200,000
Trestles A and B	61,040,000
Islands 1, 2, 3 and 4	77,800,000
Thimble Shoal Tunnel	107,350,000
Chesapeake Tunnel	100,300,000
Ventilation Buildings and Open Approaches	92,880,000
Misc. (Ventilation Fans, HVAC, Elect., Mech., etc.)	17,000,000
Trestle Crossovers (3)	2,550,000
Mobilization	<u>23,000,000</u>
	\$ 482,120,000
Contingency ±25%	<u>120,530,000</u>
	\$ 602,650,000
Escalation to First Quarter 1998	<u>289,350,000</u>
Total Cost of Stage II - Construction	\$ 892,000,000
Engineering Services, Consultant Ser- vices, Design Studies and Model Studies	<u>71,400,000</u>
STAGE II TOTAL COST	\$ 963,400,000
TOTAL SECOND CROSSING PROJECT COST	\$1,118,500,000

If the project is constructed without staged construction the Total Project Cost, escalated to First Quarter 1997, is \$1,092,400,000.

### ATTACHMENT III

CHESAPEAKE BAY BRIDGE & TUNNEL  
COST ESTIMATES FOR ADDITIONAL TRESTLES (1995 dollars)

1. STAGE I (trestles) Engr.	\$11,500,000
Const.	\$143,600,000
<hr/>	
Total (Stage I)	\$155,100,000
2. STAGE II (trestle portion)	\$63,790,000
3. Additional crossovers (Stage I)	\$4,100,000
4. Contingency (25% of 2 + 3)	\$16,972,500
5. Total (2 + 3 + 4)	\$84,862,500
6. Escalate 5 to 1995 \$ (30.962%)	\$26,275,100
7. Total Stage II Const. (5 + 6)	\$111,137,600
8. Engr. Services (8.008% of 7)	\$8,899,900
9. Total Stage II Trestles (7 + 8)	\$120,037,500
10. Total Stage I & II Trestles (1 + 9)	\$275,137,500

Compiled by VDOT staff from April 1988 SVERDRUP CORP.  
Report - Table I

CHESAPEAKE BAY BRIDGE & TUNNEL TOLL FACILITY CASH FLOW ANALYSIS

BOND ISSUE \$155,750,000      BOND RATE 8.50%      INVESTMENT RATE 7.50%

TIME PERIOD	OPEN CASH BALANCE	UP FRONT PAYMENTS *	BOND PROCEEDS, TOLL REVENUE & ADDITIONAL INCOME	INTEREST EARNED	OPERATIONS AND MAINTENANCE COSTS	PE, R/W & UTILITY COSTS	CONSTRUCTION COSTS	TOTAL CASH AVAILABLE FOR DEBT SERVICE	INTEREST PAYMENT	PRINCIPAL PAYMENT	TOTAL PAYMENT	PRINCIPAL BALANCE	DEBT SERVICE COVERAGE	ANNUAL CASH BALANCE	CASH BALANCE
7/92-6/93	0	8,625,000	0	0	0	8,625,000	0	0	0	0	0	-	-	0	0
7/93-6/94	0	(8,601,530)	153,647,375	10,356,110	0	690,000	0	154,711,956	13,238,750	0	13,238,750	155,750,000	-	141,473,206	141,473,206
7/94-6/95	141,473,206	0	0	8,795,762	0	690,000	34,464,000	115,114,968	13,238,750	0	13,238,750	155,750,000	-	101,876,218	101,876,218
7/95-6/96	101,876,218	0	0	5,395,188	0	690,000	45,952,000	60,629,406	13,238,750	0	13,238,750	155,750,000	-	47,390,656	47,390,656
7/96-6/97	47,390,656	0	\$35,982,310	1,955,414	\$12,532,000	805,000	48,824,000	23,167,380	13,238,750	3,219,504	16,458,254	152,530,496	1.41	6,709,126	6,709,126
7/97-6/98	6,709,126	0	\$37,065,630	242,499	\$13,199,000	0	14,360,000	16,458,254	12,965,092	3,493,162	16,458,254	149,037,334	1.00	0	0
7/98-6/99	0	0	\$38,148,950	291,664	\$13,913,000	0	0	24,527,614	12,668,173	3,790,081	16,458,254	145,247,253	1.49	8,069,359	8,069,359
7/99-6/00	8,069,359	0	\$39,232,270	908,840	\$14,677,000	0	0	33,533,469	12,346,016	4,112,238	16,458,254	141,135,015	2.04	17,075,215	17,075,215
7/00-6/01	17,075,215	0	\$40,315,590	1,594,266	\$15,494,000	0	0	43,491,071	11,996,476	4,461,778	16,458,254	136,673,237	2.64	27,032,817	27,032,817
7/01-6/02	27,032,817	0	\$41,398,910	2,348,898	\$16,369,000	0	0	54,411,625	11,617,225	4,841,029	16,458,254	131,832,208	3.31	37,953,371	37,953,371
7/02-6/03	37,953,371	0	\$42,482,230	3,173,464	\$17,305,000	0	0	66,304,066	11,205,738	5,252,517	16,458,254	126,579,691	4.03	49,845,811	49,845,811
7/03-6/04	49,845,811	0	\$43,526,860	4,067,034	\$18,306,000	0	0	79,133,705	10,759,274	5,698,980	16,458,254	120,880,711	4.81	62,675,451	62,675,451
7/04-6/05	62,675,451	0	\$44,610,180	5,029,681	\$19,378,000	0	0	92,937,312	10,274,860	6,183,394	16,458,254	114,697,317	5.65	76,479,057	76,479,057
7/05-6/06	76,479,057	0	\$45,693,500	6,062,601	\$20,524,000	0	0	107,711,158	9,749,272	6,708,982	16,458,254	107,988,335	6.54	91,252,904	91,252,904
7/06-6/07	91,252,904	0	\$46,776,820	7,165,252	\$21,751,000	0	0	123,443,976	9,179,008	7,279,246	16,458,254	100,709,089	7.50	106,985,721	106,985,721
7/07-6/08	106,985,721	0	\$47,860,140	8,336,637	\$23,063,000	0	0	140,119,499	8,560,273	7,897,982	16,458,254	92,811,107	8.51	123,661,245	123,661,245
7/08-6/09	123,661,245	0	\$48,943,460	9,575,239	\$24,468,000	0	0	157,711,943	7,888,944	8,569,310	16,458,254	84,241,797	9.58	141,253,689	141,253,689
7/09-6/10	141,253,689	0	\$50,026,780	10,878,934	\$25,971,000	0	0	176,188,403	7,160,553	9,297,702	16,458,254	74,944,095	10.71	159,730,148	159,730,148
7/10-6/11	159,730,148	0	\$51,110,100	12,244,993	\$27,579,000	0	0	195,506,241	6,370,248	10,088,006	16,458,254	64,856,089	11.88	179,047,987	179,047,987
7/11-6/12	179,047,987	0	\$52,193,420	13,669,955	\$29,299,000	0	0	215,612,362	5,512,768	10,945,487	16,458,254	53,910,603	13.10	199,154,108	199,154,108
7/12-6/13	199,154,108	0	\$53,276,740	15,149,501	\$31,140,000	0	0	236,440,349	4,582,401	11,875,853	16,458,254	42,034,750	14.37	219,982,095	219,982,095
7/13-6/14	219,982,095	0	\$54,360,060	16,678,350	\$33,110,000	0	0	257,910,505	3,572,954	12,885,301	16,458,254	29,149,449	15.67	241,452,251	241,452,251
7/14-6/15	241,452,251	0	\$55,443,380	18,250,186	\$35,218,000	0	0	279,927,817	2,477,703	13,980,551	16,458,254	15,168,898	17.01	263,469,563	263,469,563
7/15-6/16	263,469,563	0	\$56,526,700	19,857,546	\$37,473,000	0	0	302,380,809	1,289,356	15,168,898	16,458,254	(0)	18.37	285,922,555	285,922,555
TOTALS		\$23,470				\$11,500,000	\$143,600,000								

\* The CBB&T District Staff anticipates \$ 26.74 Million to be available from the existing bond issue for use on new bond issues, see page B-1.



CHESAPEAKE BAY BRIDGE & TUNNEL TOLL FACILITY CASH FLOW ANALYSIS

BOND ISSUE \$228,800,000      BOND RATE 8.50%      INVESTMENT RATE 7.50%

TIME PERIOD FY	OPEN CASH BALANCE	UP FRONT PAYMENTS *	BOND PROCEEDS, TOLL REVENUE & ADDITIONAL INCOME	INTEREST EARNED	OPERATIONS AND MAINTENANCE COSTS	PE, R/W & UTILITY COSTS	CONSTRUCTION COSTS	TOTAL CASH AVAILABLE FOR SERVICE	INTEREST PAYMENT	PRINCIPAL PAYMENT	TOTAL PAYMENT	PRINCIPAL BALANCE	DEBT SERVICE COVERAGE	ANNUAL CASH BALANCE	CASH BALANCE
7/92-6/93	0	15,299,925	0	0	0	15,299,925	0	0	0	0	0	-	-	0	0
7/93-6/94	0	40,622,978	225,711,200	19,199,864	0	1,223,994	0	284,310,048	19,448,000	0	19,448,000	228,800,000	-	264,862,048	264,862,048
7/94-6/95	264,862,048	0	0	16,796,815	0	1,223,994	61,137,024	219,297,845	19,448,000	0	19,448,000	228,800,000	-	199,849,845	199,849,845
7/95-6/96	199,849,845	0	0	11,156,687	0	1,223,994	81,516,032	128,266,507	19,448,000	0	19,448,000	228,800,000	-	108,818,507	108,818,507
7/96-6/97	108,818,507	0	\$35,982,310	4,832,664	\$12,532,000	1,427,993	86,610,784	49,062,703	19,448,000	4,729,519	24,177,519	224,070,481	2.03	24,885,184	24,885,184
7/97-6/98	24,885,184	0	\$37,065,630	899,464	\$13,199,000	0	25,473,760	24,177,519	19,045,991	5,131,528	24,177,519	218,938,953	1.00	0	0
7/98-6/99	0	0	\$38,148,950	2,191	\$13,913,000	0	0	24,238,141	18,609,811	5,567,708	24,177,519	213,371,245	1.00	60,622	60,622
7/99-6/00	60,622	0	\$39,232,270	18,712	\$14,677,000	0	0	24,634,605	18,136,556	6,040,963	24,177,519	207,330,282	1.02	457,086	457,086
7/00-6/01	457,086	0	\$40,315,590	58,434	\$15,494,000	0	0	25,337,110	17,623,074	6,554,445	24,177,519	200,775,837	1.05	1,159,591	1,159,591
7/01-6/02	1,159,591	0	\$41,398,910	118,934	\$16,369,000	0	0	26,308,435	17,065,946	7,111,573	24,177,519	193,664,264	1.09	2,130,916	2,130,916
7/02-6/03	2,130,916	0	\$42,482,230	197,308	\$17,305,000	0	0	27,505,454	16,461,462	7,716,056	24,177,519	185,948,208	1.14	3,327,935	3,327,935
7/03-6/04	3,327,935	0	\$43,526,860	288,720	\$18,306,000	0	0	28,837,515	15,805,598	8,371,921	24,177,519	177,576,287	1.19	4,659,996	4,659,996
7/04-6/05	4,659,996	0	\$44,610,180	389,050	\$19,378,000	0	0	30,281,226	15,093,984	9,083,535	24,177,519	168,492,752	1.25	6,103,707	6,103,707
7/05-6/06	6,103,707	0	\$45,693,500	494,977	\$20,524,000	0	0	31,768,184	14,321,884	9,855,635	24,177,519	158,637,117	1.31	7,590,665	7,590,665
7/06-6/07	7,590,665	0	\$46,776,820	601,111	\$21,751,000	0	0	33,217,596	13,484,155	10,693,364	24,177,519	147,943,753	1.37	9,040,077	9,040,077
7/07-6/08	9,040,077	0	\$47,860,140	701,242	\$23,063,000	0	0	34,538,459	12,575,219	11,602,300	24,177,519	136,341,453	1.43	10,360,940	10,360,940
7/08-6/09	10,360,940	0	\$48,943,460	788,243	\$24,468,000	0	0	35,624,643	11,589,024	12,588,495	24,177,519	123,752,958	1.47	11,447,124	11,447,124
7/09-6/10	11,447,124	0	\$50,026,780	853,969	\$25,971,000	0	0	36,356,874	10,519,001	13,658,518	24,177,519	110,094,440	1.50	12,179,355	12,179,355
7/10-6/11	12,179,355	0	\$51,110,100	889,211	\$27,579,000	0	0	36,599,665	9,358,027	14,819,492	24,177,519	95,274,948	1.51	12,422,147	12,422,147
7/11-6/12	12,422,147	0	\$52,193,420	883,545	\$29,299,000	0	0	36,200,111	8,098,371	16,079,148	24,177,519	79,195,800	1.50	12,022,592	12,022,592
7/12-6/13	12,022,592	0	\$53,276,740	825,165	\$31,140,000	0	0	34,984,498	6,731,643	17,445,876	24,177,519	61,749,924	1.45	10,806,979	10,806,979
7/13-6/14	10,806,979	0	\$54,360,060	700,744	\$33,110,000	0	0	32,757,782	5,248,744	18,928,775	24,177,519	42,821,149	1.35	8,580,263	8,580,263
7/14-6/15	8,580,263	0	\$55,443,380	495,315	\$35,218,000	0	0	29,300,958	3,639,798	20,537,721	24,177,519	22,283,428	1.21	5,123,439	5,123,439
7/15-6/16	5,123,439	0	\$56,526,700	192,115	\$37,473,000	0	0	24,369,254	1,894,091	22,283,428	24,177,519	0	1.01	191,735	191,735
TOTALS		\$55,922,903				\$20,399,900	\$254,737,600								

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\* The CBBT District Staff anticipates \$ 26.74 Million to be available from the existing bond issue for use on new bond issues, see page B-1.

CHESAPEAKE BAY BRIDGE & TUNNEL TOLL FACILITY CASH FLOW ANALYSIS

BOND ISSUE \$262,000,000      BOND RATE 8.50%      INVESTMENT RATE 7.50%

TIME PERIOD	OPEN CASH BALANCE	UP FRONT PAYMENTS *	BOND PROCEEDS, TOLL REVENUE & ADDITIONAL INCOME	INTEREST EARNED	OPERATIONS AND MAINTENANCE COSTS	PE, R/W & UTILITY COSTS	CONSTRUCTION COSTS	TOTAL CASH AVAILABLE FOR DEBT SERVICE	INTEREST PAYMENT	PRINCIPAL PAYMENT	TOTAL PAYMENT	PRINCIPAL BALANCE	DEBT SERVICE COVERAGE	ANNUAL CASH BALANCE	CASH BALANCE
7/92-6/93	0	6,549,345	8,750,580	0	0	15,299,925	0	0	0	0	0	-	-	0	0
7/93-6/94	0	7,163,443	261,437,750	19,264,065	0	1,223,994	0	286,641,264	22,270,000	0	22,270,000	262,000,000	-	264,371,264	264,371,264
7/94-6/95	264,371,264	0	3,076,950	16,884,953	0	1,223,994	61,137,024	221,972,149	22,270,000	0	22,270,000	262,000,000	-	199,702,149	199,702,149
7/95-6/96	199,702,149	0	3,179,150	11,278,221	0	1,223,994	81,516,032	131,419,494	22,270,000	0	22,270,000	262,000,000	-	109,149,494	109,149,494
7/96-6/97	109,149,494	0	\$39,263,660	4,848,978	\$12,532,000	1,427,993	86,610,784	52,691,355	22,270,000	5,415,795	27,685,795	256,584,205	1.90	25,005,560	25,005,560
7/97-6/98	25,005,560	0	\$40,449,180	903,815	\$13,199,000	0	25,473,760	27,685,795	21,809,657	5,876,138	27,685,795	250,708,067	1.00	0	0
7/98-6/99	0	0	\$41,634,700	1,346	\$13,913,000	0	0	27,723,046	21,310,186	6,375,610	27,685,795	244,332,457	1.00	37,251	37,251
7/99-6/00	37,251	0	\$42,820,220	19,947	\$14,677,000	0	0	28,200,418	20,768,259	6,917,536	27,685,795	237,414,921	1.02	514,623	514,623
7/00-6/01	514,623	0	\$44,005,740	69,570	\$15,494,000	0	0	29,095,933	20,180,268	7,505,527	27,685,795	229,909,394	1.05	1,410,138	1,410,138
7/01-6/02	1,410,138	0	\$45,191,260	148,378	\$16,369,000	0	0	30,380,775	19,542,298	8,143,497	27,685,795	221,765,897	1.10	2,694,980	2,694,980
7/02-6/03	2,694,980	0	\$46,376,780	254,098	\$17,305,000	0	0	32,020,858	18,850,101	8,835,694	27,685,795	212,930,203	1.16	4,335,063	4,335,063
7/03-6/04	4,335,063	0	\$47,519,960	382,436	\$18,306,000	0	0	33,931,458	18,099,067	9,586,728	27,685,795	203,343,475	1.23	6,245,663	6,245,663
7/04-6/05	6,245,663	0	\$48,705,480	529,988	\$19,378,000	0	0	36,103,131	17,284,195	10,401,600	27,685,795	192,941,875	1.30	8,417,336	8,417,336
7/05-6/06	8,417,336	0	\$49,891,000	694,345	\$20,524,000	0	0	38,478,681	16,400,059	11,285,736	27,685,795	181,656,139	1.39	10,792,886	10,792,886
7/06-6/07	10,792,886	0	\$51,076,520	870,956	\$21,751,000	0	0	40,989,362	15,440,772	12,245,023	27,685,795	169,411,116	1.48	13,303,567	13,303,567
7/07-6/08	13,303,567	0	\$52,262,040	1,054,514	\$23,063,000	0	0	43,557,121	14,399,945	13,285,850	27,685,795	156,125,265	1.57	15,871,326	15,871,326
7/08-6/09	15,871,326	0	\$53,447,560	1,238,866	\$24,468,000	0	0	46,089,751	13,270,648	14,415,148	27,685,795	141,710,117	1.66	18,403,956	18,403,956
7/09-6/10	18,403,956	0	\$54,633,080	1,416,907	\$25,971,000	0	0	48,482,943	12,045,360	15,640,435	27,685,795	126,069,682	1.75	20,797,148	20,797,148
7/10-6/11	20,797,148	0	\$55,818,600	1,580,554	\$27,579,000	0	0	50,617,302	10,715,923	16,969,872	27,685,795	109,099,810	1.83	22,931,507	22,931,507
7/11-6/12	22,931,507	0	\$57,004,120	1,720,588	\$29,299,000	0	0	52,357,214	9,273,484	18,412,311	27,685,795	90,687,498	1.89	24,671,419	24,671,419
7/12-6/13	24,671,419	0	\$58,189,640	1,826,501	\$31,140,000	0	0	53,547,560	7,708,437	19,977,358	27,685,795	70,710,141	1.93	25,861,764	25,861,764
7/13-6/14	25,861,764	0	\$59,375,160	1,886,358	\$33,110,000	0	0	54,013,283	6,010,362	21,675,433	27,685,795	49,034,707	1.95	26,327,487	26,327,487
7/14-6/15	26,327,487	0	\$60,560,680	1,886,695	\$35,218,000	0	0	53,556,862	4,167,950	23,517,845	27,685,795	25,516,862	1.93	25,871,067	25,871,067
7/15-6/16	25,871,067	0	\$61,746,200	1,812,358	\$37,473,000	0	0	51,956,625	2,168,933	25,516,862	27,685,795	(0)	1.88	24,270,829	24,270,829
TOTALS		\$13,712,788				\$20,399,900	\$254,737,600								

\* The CBB&T District Staff anticipates \$ 26.74 Million to be available from the existing bond issue for use on new bond issues, see page B-1.

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CHESAPEAKE BAY BRIDGE & TUNNEL TOLL FACILITY CASH FLOW ANALYSIS

BOND ISSUE \$266,000,000 BOND RATE 8.50% INVESTMENT RATE 7.50%

B-15

TIME PERIOD	OPEN CASH BALANCE	UP FRONT PAYMENTS *	BOND PROCEEDS, TOLL REVENUE & ADDITIONAL INCOME	INTEREST EARNED	OPERATIONS AND MAINTENANCE COSTS	PE, R/W & UTILITY COSTS	CONSTRUCTION COSTS	TOTAL CASH AVAILABLE FOR DEBT SERVICE	INTEREST PAYMENT	PRINCIPAL PAYMENT	TOTAL PAYMENT	PRINCIPAL BALANCE	DEBT SERVICE COVERAGE	ANNUAL CASH BALANCE	CASH BALANCE
7/92-6/93	0	6,549,345	8,750,580	0	0	15,299,925	0	0	0	0	0	-	-	0	0
7/93-6/94	(0)	(1,793,453)	2,974,750	42,697	0	1,223,994	0	0	0	0	0	266,000,000	-	0	0
7/94-6/95	0	(2,911,997)	265,485,950	18,799,272	0	1,223,994	0	280,149,231	22,610,000	0	22,610,000	266,000,000	-	1257,539,231	257,539,231
7/95-6/96	257,539,231	0	3,179,150	16,266,590	0	1,223,994	63,827,040	211,933,937	22,610,000	0	22,610,000	266,000,000	-	189,323,937	189,323,937
7/96-6/97	189,323,937	0	\$39,263,660	10,902,763	\$12,532,000	1,427,993	85,102,720	140,427,647	22,610,000	5,498,479	28,108,479	260,501,521	5.00	112,319,168	112,319,168
7/97-6/98	112,319,168	0	\$40,449,180	5,000,940	\$13,199,000	0	90,421,640	54,148,647	22,142,629	5,965,850	28,108,479	254,535,671	1.93	26,040,168	26,040,168
7/98-6/99	26,040,168	0	\$41,634,700	941,211	\$13,913,000	0	26,594,600	28,108,479	21,635,532	6,472,947	28,108,479	248,062,724	1.00	0	0
7/99-6/00	0	0	\$42,820,220	1,303	\$14,677,000	0	0	28,144,523	21,085,332	7,023,148	28,108,479	241,039,576	1.00	36,044	36,044
7/00-6/01	36,044	0	\$44,005,740	17,826	\$15,494,000	0	0	28,565,609	20,488,364	7,620,115	28,108,479	233,419,461	1.02	457,130	457,130
7/01-6/02	457,130	0	\$45,191,260	61,052	\$16,369,000	0	0	29,340,442	19,840,654	8,267,825	28,108,479	225,151,636	1.04	1,231,962	1,231,962
7/02-6/03	1,231,962	0	\$46,376,780	128,521	\$17,305,000	0	0	30,432,263	19,137,889	8,970,590	28,108,479	216,181,046	1.08	2,323,784	2,323,784
7/03-6/04	2,323,784	0	\$47,519,960	215,739	\$18,306,000	0	0	31,753,483	18,375,389	9,733,090	28,108,479	206,447,955	1.13	3,645,004	3,645,004
7/04-6/05	3,645,004	0	\$48,705,480	319,088	\$19,378,000	0	0	33,291,572	17,548,076	10,560,403	28,108,479	195,887,553	1.18	5,183,093	5,183,093
7/05-6/06	5,183,093	0	\$49,891,000	435,927	\$20,524,000	0	0	34,986,019	16,650,442	11,458,037	28,108,479	184,429,515	1.24	6,877,540	6,877,540
7/06-6/07	6,877,540	0	\$51,076,520	561,455	\$21,751,000	0	0	36,764,515	15,676,509	12,431,970	28,108,479	171,997,545	1.31	8,656,036	8,656,036
7/07-6/08	8,656,036	0	\$52,262,040	690,099	\$23,063,000	0	0	38,545,174	14,619,791	13,488,688	28,108,479	158,508,857	1.37	10,436,695	10,436,695
7/08-6/09	10,436,695	0	\$53,447,560	815,418	\$24,468,000	0	0	40,231,673	13,473,253	14,635,226	28,108,479	143,873,631	1.43	12,123,194	12,123,194
7/09-6/10	12,123,194	0	\$54,633,080	930,000	\$25,971,000	0	0	41,715,273	12,229,259	15,879,221	28,108,479	127,994,410	1.48	13,606,794	13,606,794
7/10-6/11	13,606,794	0	\$55,818,600	1,025,427	\$27,579,000	0	0	42,871,821	10,879,525	17,228,954	28,108,479	110,765,456	1.53	14,763,341	14,763,341
7/11-6/12	14,763,341	0	\$57,004,120	1,092,125	\$29,299,000	0	0	43,560,586	9,415,064	18,693,415	28,108,479	92,072,040	1.55	15,452,107	15,452,107
7/12-6/13	15,452,107	0	\$58,189,640	1,119,202	\$31,140,000	0	0	43,620,948	7,826,123	20,282,356	28,108,479	71,789,685	1.55	15,512,469	15,512,469
7/13-6/14	15,512,469	0	\$59,375,160	1,094,311	\$33,110,000	0	0	42,871,940	6,102,123	22,006,356	28,108,479	49,783,329	1.53	14,763,461	14,763,461
7/14-6/15	14,763,461	0	\$60,560,680	1,003,542	\$35,218,000	0	0	41,109,683	4,231,583	23,876,896	28,108,479	25,906,432	1.46	13,001,204	13,001,204
7/15-6/16	13,001,204	0	\$61,746,200	831,267	\$37,473,000	0	0	38,105,671	2,202,047	25,906,432	28,108,479	0	1.36	9,997,192	9,997,192
TOTALS		\$1,843,895				\$20,399,900	\$265,946,000								

\* The CBB&T District Staff anticipates 26.74 Million to be available from the existing bond issue for use on new bond issues, see page B-1.

