REPORT OF THE
VIRGINIA DEPARTMENT OF TRANSPORTATION AND
THE RICHMOND METROPOLITAN AUTHORITY ON THE

STUDY TO EVALUATE THE USE OF AUTOMATIC VEHICLE IDENTIFICATION SYSTEMS AND THE SNOW REMOVAL PROCEDURES ON POWHITE PKWY, POWHITE PKWY EXT AND DOWNTOWN EXPRESSWAY

TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA

HOUSE DOCUMENT NO. 65

COMMONWEALTH OF VIRGINIA
RICHMOND
1997

TITLE PAGE

PREFACE

The 1996 General Assembly, under House Joint Resolution 51, HJR-51 (see Appendix A), directed the Virginia Department of Transportation (VDOT) and the Richmond Metropolitan Authority (RMA) to evaluate the use of automatic vehicle identification systems and the snow removal procedures on the Powhite Parkway, Powhite Parkway Extension (Route 76), and Downtown Expressway (Route 195).

This report could not have been completed without the contributions of the following people:

Mike Berry, RMA General Manger
Jim Kennedy, RMA Operations Director
Connie Sorrell, VDOT Richmond District Administrator
Bill Lindsey, VDOT Administrative Services Division Administrator
Tom Hawthorne, VDOT Richmond District Maintenance Manager
Don Perkins, VDOT Powhite Parkway Extension, Toll Facilities Director
VDOT Chesterfield Residency staff
VDOT Sandston Residency staff

EXECUTIVE SUMMARY

The 1996 General Assembly, under House Joint Resolution 51, HJR-51 (see Appendix A), directed the Virginia Department of Transportation (VDOT) and the Richmond Metropolitan Authority (RMA) to evaluate the use of automatic vehicle identification systems and the snow removal procedures on the Powhite Parkway, Powhite Parkway Extension (Route 76), and Downtown Expressway (Route 195). Though the Downtown Expressway and Powhite Parkway are not part of the State's highway system and are owned and operated as a toll facility by the Richmond Metropolitan Authority (RMA), VDOT provides routine maintenance services for all three roadways.

ELECTRONIC TOLL COLLECTION

ETC stands for electronic toll collection system (also sometimes referred to as automatic vehicle identification, AVI). It is designed so that participants submit a one-time, refundable deposit to establish a toll account. In turn, the participant receives a "transponder," a device the size of a credit card, to place in his/her vehicle. The transponder stores account information. The computer equipment in the toll plaza "reads" the information from each vehicle's transponder as the vehicle passes through the toll plaza without coming to a full stop. Since tolls are automatically debited from the prepaid account balances, the motorist no longer needs to use cash or tokens to pay for tolls. Since vehicles are allowed to pass through toll plazas without stopping, ETC will help reduce traffic back-ups and reduce air pollution. VDOT has already installed an ETC system, known as the Virginia Fastoll, at Dulles Toll Road and the Coleman Bridge (64,000 transponders). The Dulles Greenway also uses the Fastoll system.

VDOT and RMA employed consultants to identify the market demand, examine the current operational systems, and define the needs for an electronic toll collection system for use on the Powhite Parkway, Downtown Expressway, and the Powhite Parkway Extension. The consultants surveyed toll users and developed a task document (see Appendix B), which identifies a proposed schedule for the implementation of such a system and defines critical goals and assessment activities needed for a successful deployment of the system on each facility. As part of the tasks necessary for successful deployment, VDOT and RMA have outlined an inter-agency agreement defining potential approaches and concepts in the project. Various issues related to a dual-agency system have been identified and require resolution. Once the interagency agreement has been accepted and approved by all parties, VDOT and RMA plan to have the solicitation for bids distributed by January 1997, with installation of an operating system in December 1997.

SNOW REMOVAL

In January, 1996, the Richmond area received approximately 20 inches of snow followed by subfreezing temperatures. This event has been labeled by the media as the "Blizzard of '96." Snow storms such as this one are very rare and accumulations of this magnitude have occurred

only six times in the past 30 years. Subfreezing temperatures minimize the effectiveness of the chemicals which made snow removal even more difficult. In addition to this unusual weather, VDOT had experienced an 11% reduction in employees as a result of the 1995 Workforce Transition Act (WTA). Many of the employees who were experienced with snow removal on these facilities retired.

At the end of each major snow event, VDOT's management at both the Sandston and Chesterfield Residencies evaluate VDOT's snow removal operations. As a result, VDOT's management saw opportunities for improvements and adjusted several equipment and crew assignments to compensate for the differences in training and experience. Crew members also received additional instruction in route assignments and techniques for efficient snow removal. Furthermore, in the future, VDOT will not wait for the snow to stop falling and will start clearing the toll facilities as soon as equipment is available.

CHAPTER 1: INTRODUCTION

The 1996 General Assembly, under House Joint Resolution 51, HJR-51 (see Appendix A), directed the Virginia Department of Transportation (VDOT) and the Richmond Metropolitan Authority (RMA) to evaluate the use of automatic vehicle identification systems and the snow removal procedures on the Powhite Parkway, Powhite Parkway Extension (Route 76), and Downtown Expressway (Route 195).

The Richmond metropolitan area is served by a roadway facility known as the Downtown Expressway which begins at Interstate 95 just north of the James River and extends in a westerly direction through the downtown area. Where it crosses the James River, it becomes known as the Powhite Parkway. The Powhite Parkway continues south until it intersects with Chippenham Parkway. Major toll booths are located in the downtown area, south of the James River, and on ramps along its path. Though the Downtown Expressway and Powhite Parkway are not part of the State's highway system and are owned and operated as a toll facility by the Richmond Metropolitan Authority (RMA), VDOT provides routine maintenance services for RMA at no charge. This arrangement was outlined in a Departmental Policy Memorandum 7-2 (see Appendix C) when the bonds for these facilities were issued.

The Powhite Parkway Extension extends from the terminus of the existing RMA Powhite Parkway at Chippenham Parkway (Route 150) for approximately 10.4 miles to Old Hundred Road in Chesterfield County. It then extends approximately 2.8 mile as Route 288 connecting to Hull Street (Route 360). This roadway is owned and operated by the Virginia Department of Transportation as a toll facility. The Extension's main toll plaza is located just east of Route 288, and additional toll collection points are located on Courthouse Road (Route 653) and Midlothian Turnpike (Route 60) ramps.

CHAPTER 2: ELECTRONIC TOLL COLLECTION (ETC)

BACKGROUND

ETC stands for electronic toll collection system (also sometimes referred to as automatic vehicle identification, AVI). It is designed so that participants submit a one-time, refundable deposit to establish a toll account. In turn, the participant receives a "transponder," a device the size of a credit card, to place in his/her vehicle. The transponder stores account information. The computer equipment in the toll plaza "reads" the information from each vehicle's transponder as the vehicle passes through the toll plaza without coming to a full stop. Since tolls are automatically debited from the prepaid account balances, the motorist no longer needs to use cash or tokens to pay for tolls. Since vehicles are allowed to pass through toll plazas without coming to a complete stop, ETC will help reduce traffic back-ups and reduce air pollution.

STATUS

VDOT has already installed an ETC system, known as the Virginia Fastoll, at Dulles Toll Road and the Coleman Bridge (64,000 transponders). The Dulles Greenway also uses the Fastoll system.

In cooperation with VDOT, RMA employed consultants to survey market demand, examine the current operational systems, and define the needs for an electronic toll collection system for use on the Powhite Parkway, Downtown Expressway, and the Powhite Parkway Extension. The consultants have completed a market demand survey and plaza operations analyses. The survey received 6,000 responses, representing over 25% of the toll users. The surveys indicated that 75-80% of the motorists "definitely" or "probably would" use ETC. If ETC were implemented in a mixed configuration (a combination of dedicated, ETC lanes and token/exact change lanes), 26-45% of the road users would be expected to use the program. This number would increase to 54%, if separate dedicated, express ETC lanes were provided.

Consultants under a separate contract to VDOT have developed a task document (see Appendix B), which has been reviewed by the respective authorities. This task document not only identifies a proposed schedule for the implementation of such a system, but also defines critical goals and assessment activities needed for a successful deployment of the system on each facility.

As part of the tasks necessary for successful deployment, VDOT and RMA have outlined an inter-agency agreement defining potential approaches and concepts in the project. Various issues related to a dual-agency system have been identified and require resolution before proceeding further, for example: concerns of cost and cost sharing, how patron accounts would be serviced and maintained, system compatibility between the two road administrations, and how to match the best parts of the existing systems.

Once the interagency agreement has been accepted and approved by all parties, VDOT and RMA plan to have the solicitation for bids distributed by January 1997, with installation of an operating system in December 1997.

CHAPTER 3: SNOW REMOVAL

POLICIES AND PROCEDURES

As provided in Departmental Policy Memorandum 7-2, VDOT provides routine maintenance of the Downtown Expressway and Powhite Parkway, at no charge to RMA (see Appendix C). These responsibilities include all activities associated with snow removal. Snow removal responsibilities on both the RMA and VDOT facilities are divided between VDOT's Sandston and Chesterfield Residencies. Sandston Residency is responsible for the Downtown Expressway mainline and each interchange ramp between Interstate 95 and the James River Bridge. Chesterfield Residency is responsible for the James River Bridge, the Powhite Parkway, and the Powhite Parkway Extension. Chesterfield and Sandston Residencies coordinate their snow removal plans so that the desirable level of service can be achieved. VDOT's goal is to maintain the entire length of toll facilities between Route 288 and Interstate 95 in such a manner that the customer notices no difference in the level of service.

VDOT has four levels of snow removal priorities for planning and executing snow removal operations. The Downtown Expressway, Powhite Parkway, and Powhite Parkway Extension are each classified as Priority 1 routes, otherwise known internally to VDOT as "Bare Pavement" routes. This priority is the highest level of service that VDOT provides in its snow removal program. VDOT includes the facilities belonging to the RMA in its snow removal planning, budgeting, and execution as if the roadway were any other Interstate or high priority Primary system route.

The following description is given in the current Maintenance Division Best Practices Manual of snow removal services for a Priority 1 route:

> Routes assigned this priority should receive first consideration. These routes should be kept free of ice and snow so traffic can proceed in safety without the use of chains, except during periods of heavy falling snow or drifting.
>
> Should extremely low temperatures prevent, or greatly retard the action of the chemicals, these routes should be covered with abrasives, so that traffic can proceed safety without the use of chains. This approach should never be considered a substitute, because VDOT's goal for Priority 1 routes is that they be free of ice and snow.

SPECIAL CONDITIONS

Snow removal on the Downtown Expressway, Powhite Parkway, and Powhite Parkway Extension presents a number of unique characteristics that set it apart from other urban, high volume, limited access facilities. These characteristics include the presence of toll barriers, closely spaced urban interchanges, and highly directional commuter traffic. These factors affect snow removal operations and require additional resources in order to achieve the desired level of service.

Toll barriers cause the pavement to widen from a normal width of four to six lanes to as many as 14 lanes. The extra pavement width presents significant snow disposal problems in heavy snow storms because the space between lanes is limited for storing the piles of snow. Furthermore, plowing across several lanes to the outside is nearly impossible because of traffic and the size of the snow piles that have to be carried. One solution to this problem during heavy snowfall is to open and maintain only a minimum number of toll lanes and then return after the storm weakens to load and haul snow away. Another method is to push snow into piles on the side of pavement using front end loaders during the night hours or non peak traffic hours. This solution requires intensive use of traffic control measures.

Closely spaced urban interchanges are a particular problem on the Downtown Expressway. The ramps associated with the interchanges receive virtually the same attention as the mainline. During a heavy snowfall, as many as four trucks are assigned the responsibility for maintaining the interchanges. Further complicating the snow removal is that most interchanges do not have on and off ramps directly adjacent to each other. This situation requires travel over City of Richmond streets to fully access the ramps. In most cases, the city streets have not been plowed and usually have abandoned vehicles parked on them. These conditions can delay or prevent the snow removal vehicles from getting through.

Compounding this problem is the complex nature of commuter traffic. It is unpredictable during storms which makes meeting the conflicting goals of cleaning around toll booths and minimizing delay to motorists difficult.

WINTER 1996

In January, 1996, the Richmond area received approximately 20 inches of snow followed by subfreezing temperatures. This event has been labeled by the media as the "Blizzard of '96." Snow storms such as this one are very rare and accumulations of this magnitude have occurred only six times in the last 30 years. Subfreezing temperatures following the storm minimized the effectiveness of the chemicals, which made snow removal even more difficult.

Normally, snow is piled on the side of roadway until the snow stops, because all trucks and loaders are used for plowing the snow and chemical application. Once the snow stops, the toll lanes are given top priority in the cleanup operations. Snow removal at the toll plaza is scheduled so that it precedes the next rush hour. In this particular case, there was so much snow that there was not enough room to store it on the side of the road, so it was piled on the roadway in front of two or three toll lanes.

Combined snow removal expenditures for this winter were approximately $200,000 for the RMA facilities. VDOT spent approximately 2500 labor hours in snow removal. Another $122,000 and 2450 labor hours were spent on the Powhite Parkway Extension.

EVALUATION OF EVENTS

At the end of each major snow event, VDOT's management at both the Sandston and Chesterfield Residencies evaluate VDOT's snow removal operations. This evaluation process includes discussing VDOT's service with RMA. Comments from Mike Berry, General Manager, and Jim Kennedy, Director of Operations, of RMA indicated that they were satisfied with the snow removal effort during the winter of 1996, given the unusual number and intensity of the snow storms. Despite the positive comments from RMA, VDOT's management saw opportunities for improvement.

One area for improvement was the inexperience of operators and their supervisors. VDOT experienced an 11% reduction in employees as a result of the 1995 Workforce Transition Act (WTA). Many of the senior employees who had experience in snow removal operations on the Downtown Expressway had retired in May 1995. VDOT supplemented the snow removal crew responsible for clearing the Downtown Expressway with mostly Construction Inspectors. None of the Construction Inspectors had experience with an event like the Blizzard of '96. The same factor holds true for the supervisors of the crews.

As a result of the evaluation, several equipment and crew assignments were adjusted to compensate for the differences in training and experience. Crew members also received additional instruction in route assignments and techniques for efficient snow removal. Furthermore, in the future, VDOT will not wait for the snow to stop falling and will start clearing the toll facilities as soon as equipment is available.

APPENDICES

APPENDIX A

Appendix A is a copy of the House Joint Resolution 51 (HJR 51), which requested the Virginia Department of Transportation (VDOT) to expedite the implementation of the automated vehicle identification (AVI) system and to examine the procedures for snow removal on the Powhite Parkway and Powhite Parkway Extension.

HOUSE JOINT RESOLUTION NO. 51

Requesting the Department of Transportation and the Richmond Metropolitan Authority to expedite the implementation of the automated vehicle identification (AVI) system and to examine the procedures for snow removal on the Powhite Parkway and the Powhite Parkway Extension.

Agreed to by the House of Delegates, February 1, 1996
Agreed to by the Senate, February 29, 1996

WHEREAS, the Powhite Parkway Extension is one of the major transportation arteries serving the residents of central Chesterfield County; and

WHEREAS, the federal Intermodal Surface Transportation Efficiency Act (ISTEA) recognizes the direct relationship between transportation facilities and land use; and

WHEREAS, ISTEA has application to the highways of the Commonwealth of Virginia; and

WHEREAS, the Department of Transportation is proceeding with the implementation of ISTEA in Virginia; and

WHEREAS, currently the revenue to cover the financial obligations associated with the construction of the Powhite Parkway Extension is raised through the collection of tolls at a toll plaza located in the vicinity of the Courthouse Road overpass; and

WHEREAS, this toll plaza represents a structural obstacle to the free flow of traffic; and

WHEREAS, the population of Chesterfield County is growing at the fastest pace in the Metropolitan Richmond area; and

WHEREAS, the continuous increase of population and increase of use of the Powhite Parkway Extension present the potential for considerable traffic congestion and delays equal to those experienced at the Richmond Metropolitan Authority toll plazas during rush hour; and

WHEREAS, the potential for traffic congestion, delays, and accidents is exacerbated on the Powhite Parkway and the Powhite Parkway Extension when snow removal is delayed and roads are not promptly cleared to accommodate traffic; and

WHEREAS, it is recognized that revenues to support the Powhite Parkway Extension must be collected; and

WHEREAS, the potential for future traffic congestion is increased without use of more efficient toll collection mechanisms; and

WHEREAS, considerable economic development opportunities are being created both in Chesterfield County and throughout the Richmond Metropolitan area; and

WHEREAS, those economic development opportunities hold the potential of favorably affecting the value of real estate and the quality of life of residents of central Chesterfield County; and

WHEREAS, the potential for increased traffic congestion is viewed as a detriment to the quality of life of residents of the central Chesterfield areas; and

WHEREAS, this issue affects individual citizens whose most prized possessions are their homes; and

WHEREAS, there are alternative methods of collecting the necessary revenue to cover the construction debt of the Powhite Parkway Extension; and

WHEREAS, a joint evaluation by the Richmond Metropolitan Authority and the Department of Transportation was performed for the use of automatic vehicle identification systems on the Powhite Parkway Extension, the Powhite Parkway, and the Downtown Expressway; and

WHEREAS, the evaluation indicated that the automatic vehicle identification systems are efficient and cost-effective methods of toll collection; and

WHEREAS, a survey indicated that a majority of motorists on these roads were likely to use such procedures; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the Department of Transportation and the Richmond Metropolitan Authority be requested to expedite the implementation of the automated vehicle identification (AVI) system and to examine the procedures for snow removal on the Powhite Parkway and the Powhite Parkway Extension. The Department and the Authority shall include in their deliberations on implementing the automated vehicle identification system on the Powhite Parkway Extension, the Powhite Parkway, and the Downtown Expressway, the needs of the affected central Chesterfield County area, including, but not limited to, the residents of a "Development" as defined in § 55-509 of the Code of Virginia, having more than 2,200 dwellings. The Department and the Authority shall also examine and evaluate the procedures for snow removal on the Powhite Parkway and the Powhite Parkway Extension and recommend appropriate alternatives to ensure that such roads are promptly cleared to facilitate road safety during inclement weather.

The Department and the Authority shall complete their work in time to submit their findings and recommendations to the Governor and the 1997 Session of the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for the processing of legislative documents.

APPENDIX B

Appendix B is a copy of the task document which includes the schedule for implementing the Electronic Toll Collection (ETC) system on the Downtown Expressway, Powhite Parkway, and the Powhite Parkway Extension.

Scope of Services for Electronic Tolling on the RMA and Powhite Facilities

The Virginia Department of Transportation is seeking to deploy electronic tolling on the Powhite and RMA toll roads located near and in Richmond Virginia. CRC will assist VDOT during the development of the IFB, procurement, installation, commissioning and evaluation phases of the project. The following scope of services identify the broad tasks associated with the work to be completed by Castle Rock Consultants.

Task 1 Development of IFB

Throughout Task 1, CRC will be working closely with the facility manager and other personnel responsible for the management and operations of each of the facilities. CRC will be charged with arranging meetings and teleconferences with these personnel to accomplish this task.

1.1 Assessment of Existing Systems:

CRC will review the configuration of existing equipment at both of the toll facilities. In assessing each of the facilities, CRC will specifically identify the potential interfaces which may be used for the installation of new electronic tolling equipment. In addition to assessing the equipment in this task, CRC will review operational procedures and identify site specific institutional issues which may impact system design and deployment.

1.2 Define Deployment Goal

CRC will work with the facility manager and operations staff to define the specific goals of electronic tolling deployment for each of the facilities. CRC understands that VDOT wishes to maximize the benefits of electronic tolling at these facilities at the most expeditious cost. We will bring our knowledge of toll facilities and equipment to insure the end product will accomplish the goals defined.

1.3 Identify Deployment Strategy and Equipment

Based on the assessment of existing equipment completed in Task 1.1 and the goals identified in Task 1.2 CRC will work with the facility managers and other operations staff from the RMA and Powhite facilities to determine the optimum implementation strategy for each of the facilities. CRC will provide an estimate of the expected cost associated with the deployment plan defined.

1.3 Refine Procurement, Deployment and Testing Schedules

A first draft schedule for this project is attached to this scope of services. This schedule was

developed based on initial information on system goals and deployment strategy. The following general assumptions were used to develop this schedule:

- the electronic tolling system will be an add-on to existing toll equipment. The additional equipment to be interfaced with existing equipment will consist of AVI only.

- the system integrator contracted to purchase an interface the new equipment to the existing equipment will be able to procure and obtain necessary equipment in a shorter period than standard procurement cycles and will be able to utilize a design build approach.

- the system integrator and associated sub-contractors will have access to toll lanes for up to 12 hours per day.

- the time frame associated with system installation (winter months) will not affect the system integrators ability to accomplish required civil and in-lane installation work.

1.4 Write the IFB

CRC will develop the IFB and other associated procurement documents necessary to obtain a system integrator to complete the required work. CRC will identify the associated technical requirements and specifications including interface with the Fastoll customer service center, AVI compatibility, interface with existing toll collection equipment, AVI accuracy, maintenance requirements, central computer equipment specifications and reporting and audit system requirements.

Task 2 IFB Procurement

CRC will provide technical assistance and consulting during review of proposals. CRC will attend any pre-proposal meetings which may take place and will be available to answer technical questions from contractors proposing on the work. CRC will also be available for any presentations by proposing contractors which may take place during the review of proposals.

Task 3 System Installation

During the installation of the electronic tolling subsystem, CRC will work with the project manager and inspectors to review all plans, drawings and technical documentation, inspect site work, pre-test subsystems and insure that the installation is consistent with the proposed scope of work and IFB. CRC will also provide support during all progress meetings through attendance, acting as the official scribe and assisting VDOT in monitoring progress against project schedule.

Task 4 System Testing

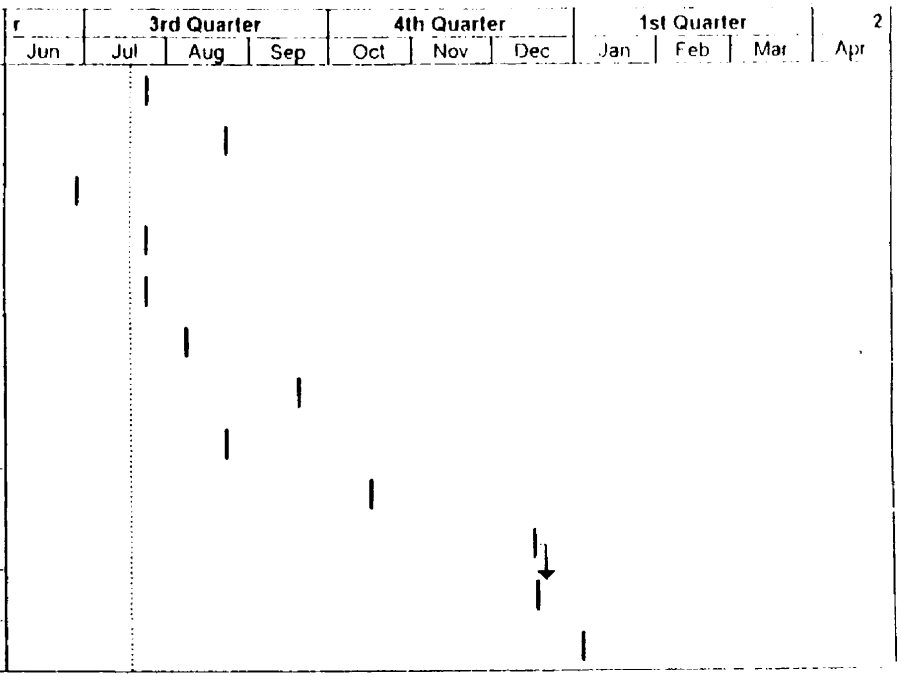
During this phase of the project, CRC will act as the independent engineer to insure that all system components meet the technical requirements identified in the IFB. CRC will review the test plans developed by the system integrator to insure completeness and validity. CRC presumes that the testing of components will take place during two phases. The first phase of the project will consist of component testing, insuring that each subsystem meets system requirements prior to converting lanes and commissioning the AVI system. Included in the subsystem testing will be specific tests for communications between the central computing equipment and the customer service center, tests of system reports, testing of communications between the lanes and the central computing equipment and testing of the AVI system. The second phase of testing will consist of a 2 month acceptance test where the overall system will be required to meet predefined accuracy requirements. CRC will produce a scientific report of the results of both of the test phases.

Task 5 Final Report

CRC will produce a final report for VDOT which will identify all work carried out under the contract. The final report will include an executive summary which outlines and summarizes the key areas of the project. The final report, which will be presented to VDOT approximately 6 months after system commissioning will identify the marketing strategy used to encourage patrons to utilize the AVI system as well as a status report on the number of patrons using the system, changes in traffic throughput and queue lengths and other statistics on systems performance during the first 6 months of electronic tolling operations. The final report will be developed in accordance with standard requirements for scientific and technical reports.

Project Meetings Schedule as of Thu 7/18/96

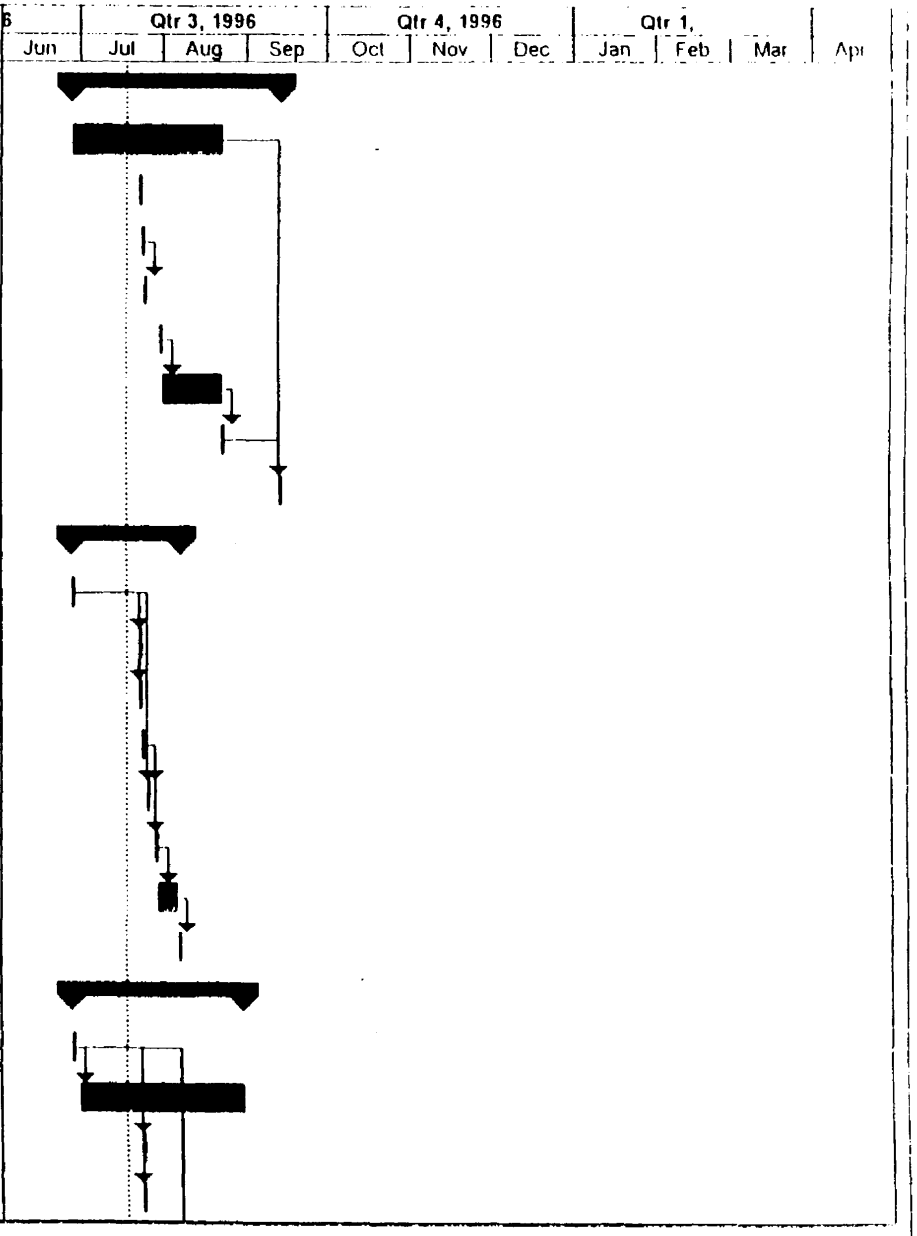
ID	Task Name	Duration	Start	Finish
3	Joint agency meeting	1d	Wed 7/24/96	Wed 7/24/96
8	Review Meeting (draft agency agreements)	1d	Fri 8/23/96	Fri 8/23/96
11	Initial agency meetings	1d	Fri 6/28/96	Fri 6/28/96
14	Joint agency kickoff meeting	1d	Wed 7/24/96	Wed 7/24/96
22	Joint planning meeting	1d	Wed 7/24/96	Wed 7/24/96
24	Meet with agency technical representatives	1d	Thu 8/8/96	Thu 8/8/96
38	Procurement document review meeting	1d	Thu 9/19/96	Thu 9/19/96
29	Conceptual design review meeting	1d	Fri 8/23/96	Fri 8/23/96
48	Pre-proposal meeting	1d	Wed 10/16/96	Wed 10/16/96
51	Proposal review meeting	1d	Mon 12/16/96	Mon 12/16/96
52	Proposal presentations	1d	Tue 12/17/96	Tue 12/17/96
55	Kick off meeting	1d	Fri 1/3/97	Fri 1/3/97



Project: RMA Powhite Project Schedul
Date: Thu 7/18/96

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

ID	Task Name	Duration	Start	Finish
1	**Develop Agency Agreements**	**56d**	**Fri 6/28/96**	**Fri 9/13/96**
5	Research key issues	40d	Fri 6/28/96	Thu 8/22/96
2	White paper on potential approaches	1d	Tue 7/23/96	Tue 7/23/96
3	Joint agency meeting	1d	Wed 7/24/96	Wed 7/24/96
4	Develop organizational chart and contact list	1d	Thu 7/25/96	Thu 7/25/96
6	Draft agreement(s) outline (procurement strategy	1d	Wed 7/31/96	Wed 7/31/96
7	Agency review of draft documentation	16d	Thu 8/1/96	Thu 8/22/96
8	Review Meeting (draft agency agreements)	1d	Fri 8/23/96	Fri 8/23/96
9	Final Agreement(s) Documentation	1d	Fri 9/13/96	Fri 9/13/96
10	**Deployment Goal Definition**	**29d**	**Fri 6/28/96**	**Wed 8/7/96**
11	Initial agency meetings	1d	Fri 6/28/96	Fri 6/28/96
12	RMA goals white paper	1d	Tue 7/23/96	Tue 7/23/96
13	Powhite goals white paper	1d	Tue 7/23/96	Tue 7/23/96
14	Joint agency kickoff meeting	1d	Wed 7/24/96	Wed 7/24/96
15	Key personnel list	1d	Fri 7/26/96	Fri 7/26/96
16	Draft project goals document	1d	Mon 7/29/96	Mon 7/29/96
17	Agencies review of goals document	5d	Tue 7/30/96	Mon 8/5/96
18	Final project goals document	1d	Wed 8/7/96	Wed 8/7/96
19	**Assessment of Existing Facilities**	**46d**	**Fri 6/28/96**	**Fri 8/30/96**
20	Initial site tours	1d	Fri 6/28/96	Fri 6/28/96
23	Collection of technical documentation	45d	Mon 7/1/96	Fri 8/30/96
21	Follow-up site tours	1d	Wed 7/24/96	Wed 7/24/96
22	Joint planning meeting	1d	Wed 7/24/96	Wed 7/24/96

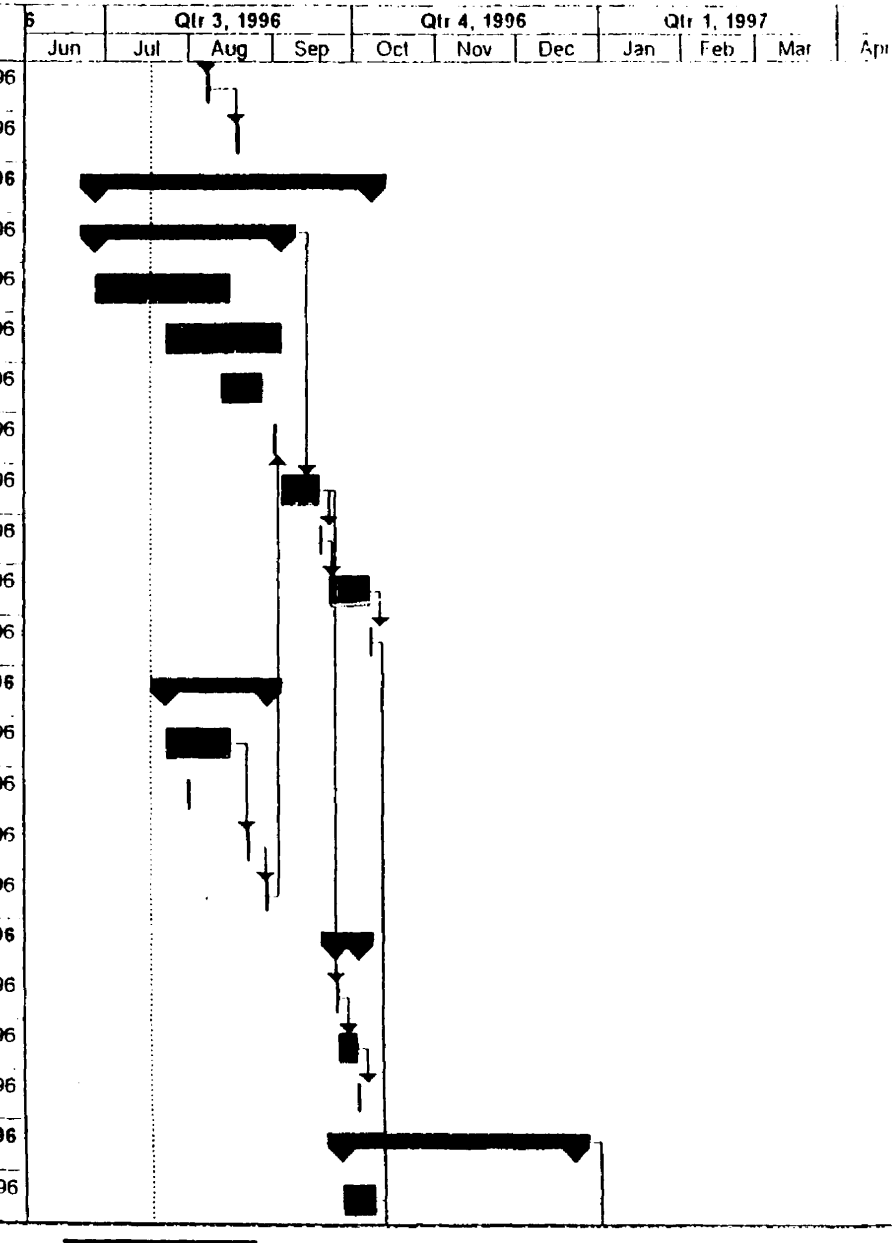


Project: RMA Powhite Project Schedul
Date: Thu 7/18/96

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

77

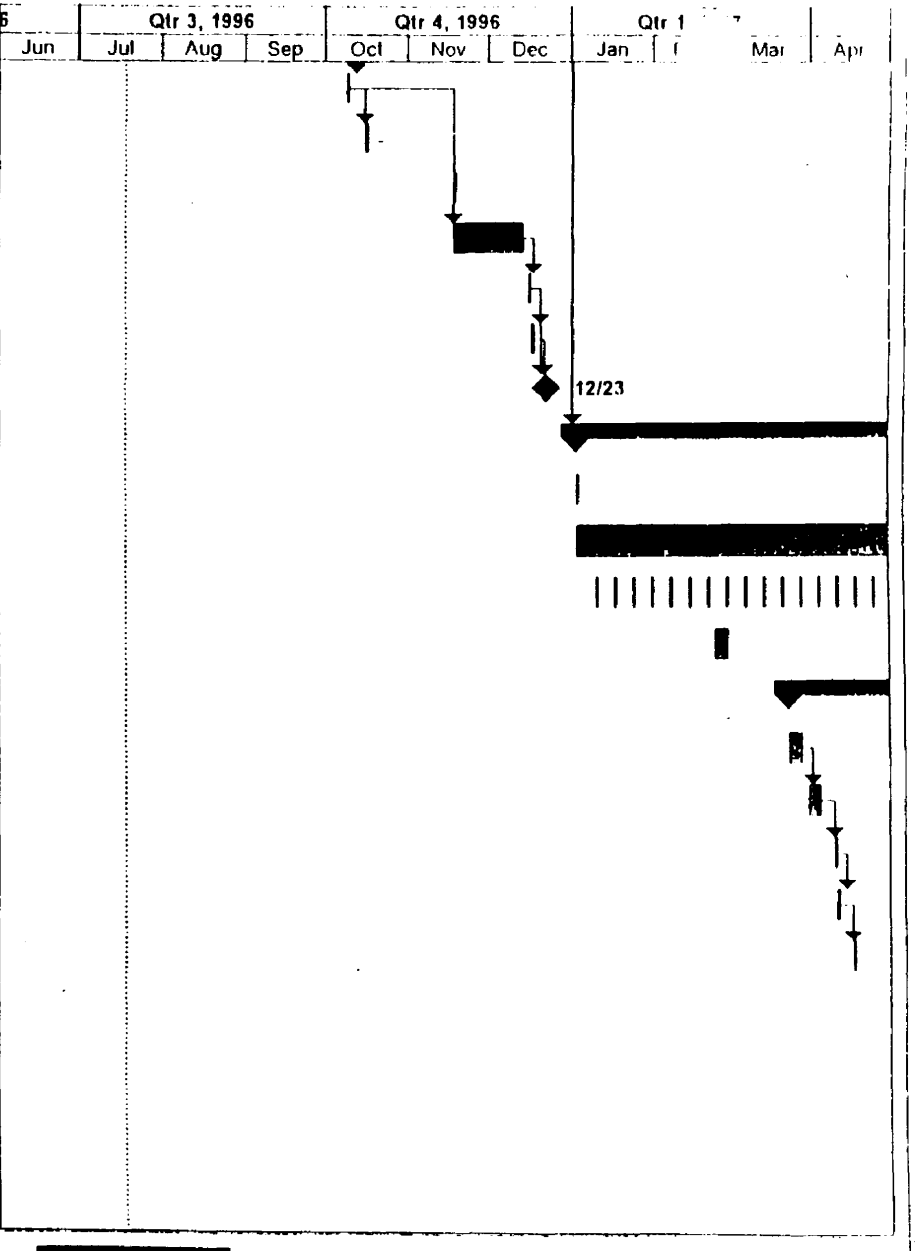
ID	Task Name	Duration	Start	Finish
24	Meet with agency technical representatives	1d	Thu 8/8/96	Thu 8/8/96
25	White paper on system assessment	1d	Mon 8/19/96	Mon 8/19/96
31	**Bid documentation development**	**73d**	**Fri 6/28/96**	**Tue 10/8/96**
33	Develop draft procurement document	49d	Fri 6/28/96	Wed 9/4/96
34	Develop bid document outline	36d	Fri 6/28/96	Fri 8/16/96
36	Write technical specifications	31d	Wed 7/24/96	Wed 9/4/96
35	Incorporate VDOT/RMA boiler plate	11d	Wed 8/14/96	Wed 8/28/96
32	Technical specifications meeting	1d	Mon 9/2/96	Mon 9/2/96
37	Agency review of draft procurement document	10d	Thu 9/5/96	Wed 9/18/96
38	Procurement document review meeting	1d	Thu 9/19/96	Thu 9/19/96
39	Procurement document revisions	11d	Mon 9/23/96	Mon 10/7/96
40	Final procurement document	1d	Tue 10/8/96	Tue 10/8/96
26	**Integration Approach Development**	**28d**	**Wed 7/24/96**	**Fri 8/30/96**
28	Develop Conceptual Designs	18d	Wed 7/24/96	Fri 8/16/96
27	Define review committee structure	1d	Thu 8/1/96	Thu 8/1/96
29	Conceptual design review meeting	1d	Fri 8/23/96	Fri 8/23/96
30	Final conceptual design	1d	Fri 8/30/96	Fri 8/30/96
41	**Procurement, Deployment & Testing Schedule**	**7d**	**Wed 9/25/96**	**Thu 10/3/96**
42	Draft revised schedule	1d	Wed 9/25/96	Wed 9/25/96
43	Agencies review of draft schedule	5d	Thu 9/26/96	Wed 10/2/96
44	Final schedule	1d	Thu 10/3/96	Thu 10/3/96
45	**System Procurement**	**61d**	**Fri 9/27/96**	**Mon 12/23/96**
46	Announcement documentation written	8d	Fri 9/27/96	Tue 10/8/96



Project RMA Powhite Project Schedul
Date Thu 7/18/96

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

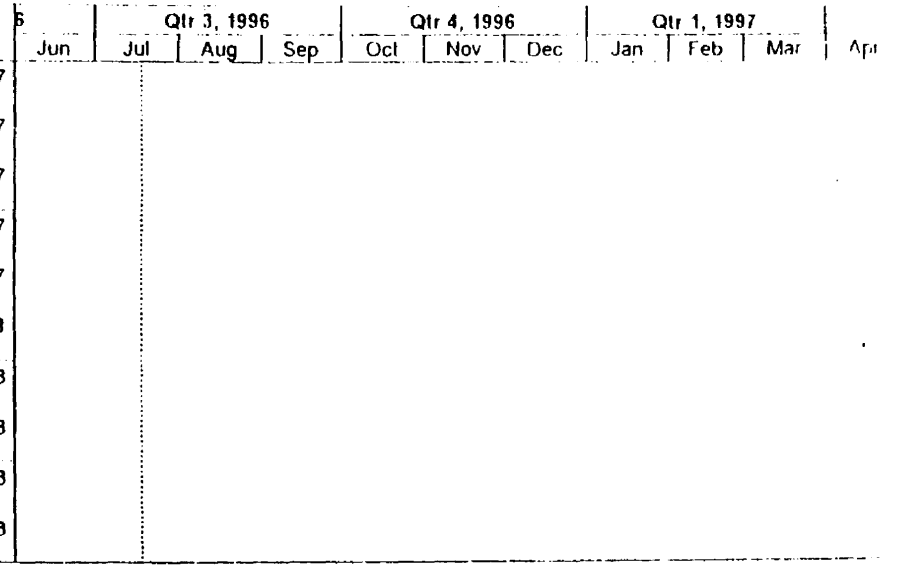
ID	Task Name	Duration	Start	Finish
47	Procurement document distributed	1d	Wed 10/9/96	Wed 10/9/96
48	Pre-proposal meeting	1d	Wed 10/16/96	Wed 10/16/96
49	Receive proposals from vendors	1d	Mon 11/18/96	Mon 11/18/96
50	Review of proposals	20d	Mon 11/18/96	Fri 12/13/96
51	Proposal review meeting	1d	Mon 12/16/96	Mon 12/16/96
52	Proposal presentations	1d	Tue 12/17/96	Tue 12/17/96
53	Award of contract	0d	Mon 12/23/96	Mon 12/23/96
54	**System Installation**	**176d**	**Fri 1/3/97**	**Fri 9/5/97**
55	Kick off meeting	1d	Fri 1/3/97	Fri 1/3/97
92	Installation support	176d	Fri 1/3/97	Fri 9/5/97
56	Progress meetings	171d	Fri 1/10/97	Fri 9/5/97
93	Design reviews	5d	Mon 2/24/97	Fri 2/28/97
94	**System Testing**	**176d**	**Mon 3/24/97**	**Fri 11/21/97**
95	Review of factory demo test plan	5d	Mon 3/24/97	Fri 3/28/97
96	Factory demo test support	5d	Mon 3/31/97	Fri 4/4/97
97	Factory demo test draft report	1d	Thu 4/10/97	Thu 4/10/97
98	Agency review of fact demo draft test report	1d	Fri 4/11/97	Fri 4/11/97
99	Factory demo test final report	1d	Thu 4/17/97	Thu 4/17/97
100	Review of field test test plan	5d	Mon 6/16/97	Fri 6/20/97
101	Field test support	5d	Mon 6/23/97	Fri 6/27/97
102	Field test draft report	1d	Thu 7/3/97	Thu 7/3/97
103	Agency review of field test draft report	1d	Wed 7/9/97	Wed 7/9/97
104	Field test final report	1d	Wed 7/16/97	Wed 7/16/97



Project: RMA Powhite Project Schedul
Date: Thu 7/18/96

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

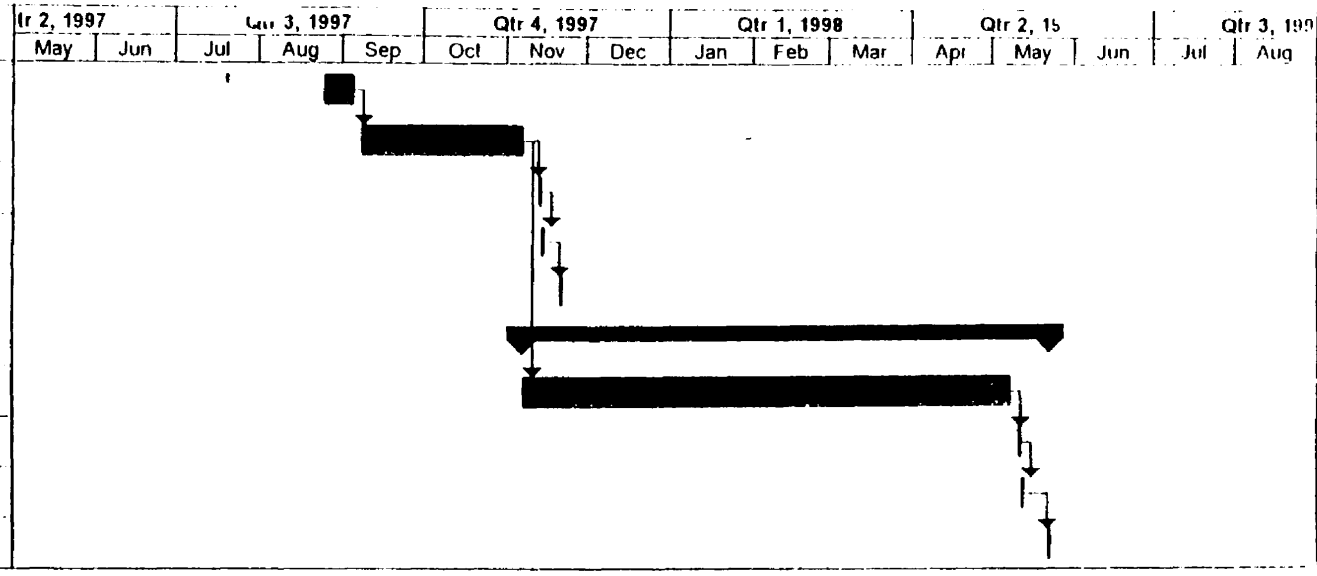
ID	Task Name	Duration	Start	Finish
105	Review of acceptance testing test plan	9d	Mon 8/25/97	Thu 9/4/97
106	Acceptance testing support	44d	Mon 9/8/97	Thu 11/6/97
107	Acceptance testing draft report	1d	Thu 11/13/97	Thu 11/13/97
108	Agency review of draft test report	1d	Fri 11/14/97	Fri 11/14/97
109	Acceptance testing final report	1d	Fri 11/21/97	Fri 11/21/97
110	**Final Report**	**141d**	**Fri 11/7/97**	**Fri 6/22/98**
111	System Assessment	130d	Fri 11/7/97	Thu 5/7/98
112	Draft Final Report	1d	Mon 5/11/98	Mon 5/11/98
113	Agency review of draft final report	1d	Tue 5/12/98	Tue 5/12/98
114	Final System report	1d	Fri 5/22/98	Fri 5/22/98



Project: RMA Powhite Project Schedul
Date: Thu 7/18/96

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

ID	Task Name
105	Review of acceptance testing test plan
106	Acceptance testing support
107	Acceptance testing draft report
108	Agency review of draft test report
109	Acceptance testing final report
110	**Final Report**
111	System Assessment
112	Draft Final Report
113	Agency review of draft final report
114	Final System report



Project: RMA Powhite Project Schedul
Date: Thu 7/18/96

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

APPENDIX C

Appendix C is the Departmental Policy Memorandum outlining the agreement between the Virginia Department of Transportation with the Richmond Metropolitan Authority that stipulates VDOT will provide for the maintenance and snow removal of the Downtown Expressway and Powhite Parkway.

Date: 5/6/91 DPM Number: 7-2

Approved: Ray D. Pethtel Supersedes: 9-3 (9/1/87)

AID TO TOLL REVENUE BOND FACILITIES

Policy The Board may use highway funds to aid in the payment of the cost to toll revenue bond projects.

Types of Aid Below is a listing of toll facilities and the types of aid offered:

FACILITY	TYPE OF AID
Approach roads to the Chesapeake Bay Bridge-Tunnel	effective July 1, 1966, the Commission approved the transfer of 2.9 miles of Route 13 (from 2.17 miles south Route 683 to Route 600, 0.4 miles north Chesapeake Bay Bridge Toll Plaza) to the Primary System, and authorized the cost of maintaining that section to be financed from highway funds, relieving the Chesapeake Bay Bridge-Tunnel Bond Funds of such cost.
Bridge-Tunnel Roadway	Effective July 1, 1974, the Commission will provide aid from highway funds to the Chesapeake Bay Bridge-Tunnel Authority, which is generally classified as an urban facility, at the same rate as paid to cities for extensions of the Primary System within their corporate boundaries.

continued on next page

Types of Aid (continued)

FACILITY	TYPE OF AID
Richmond Metropolitan Authority (RMA)	The CTB will provide aid from highway funds to the RMA in the form of actually performing maintenance of the expressway system, exclusive of the Boulevard Bridge, as segments of the system are opened to traffic. The aid is limited to ordinary maintenance activities as defined in VDOT's "Activity Code Manual", and to pavement markings. It shall not include other maintenance replacement activities nor any costs incurred from toll collection expenses.
Powhite Parkway Extension	On July 17, 1986, the CTB formally expressed its intent to annually allocate maintenance funds for the Powhite Parkway Extension Toll Road. These allocations for maintenance will continue until the toll road's revenue can assume the responsibility.

Reference

* Code of Virginia, Section 33.1-288.
* Highway Commission Minutes, 4/21/66; 8/17/72.
* Commonwealth Transportation Board Minutes, 7/17/86.