REPORT OF THE
DEPARTMENT OF TRANSPORTATION ON

Railroad Grade Crossings

TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA

SENATE DOCUMENT NO. 48

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Virginia
Department
Of
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A STUDY OF

RAILROAD GRADE CROSSINGS

(SJR 321)

JANUARY 1994

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PREFACE

The Virginia Department of Transportation (VDOT) under the direction of Ray D. Pethtel, Commonwealth Transportation Commissioner, was asked by the 1993 General Assembly through Senate Joint Resolution 321 (SJR 321) to study the railroad grade crossings in the Commonwealth.

The report was prepared by Kevin Landergan with technical assistance from Anne Oman, both of the VDOT Policy Office. Mary Lynn Tischer, Policy Office Director, provided management assistance throughout the study.

An Advisory Committee was formed to provide technical assistance. The Committee included: George R. Conner and W. Ralph Barret of the Virginia Department of Rail and Public Transportation (VDRPT), Robert O. Cassada of the Programming and Scheduling Division, Joseph E. Orcutt, Jr. and David A. Lee of the Transportation Planning Division, M. Scott Hollis of the Urban Division, James M. Fariss, Jr. of the Structure and Bridge Division, J. Cooper Wamsley of the Environmental Division, Earl N. Stitzer of the Traffic Engineering Division, MacFarland Neblett of the Suffolk Residency and P.D. Gribok of the Norfolk Residency.

Computer assistance was provided by Peggy Tardy, Ray Haynes, Thomas Hutton and Sandra Boze of the Information Systems Division.

Cartographic assistance was provided by Dwayne Altice of the Office of Public Affairs.

EXECUTIVE SUMMARY

This study was made in response to Senate Joint Resolution 321 (SJR 321) which requested that the Virginia Department of Transportation (VDOT) examine traffic congestion and safety-related problems at railroad grade crossings. The legislation requests that particular emphasis be given to cities and towns in Virginia's coastal plain and notes the desirability of grade separations as a means to eliminate the conflict between the rail and highway modes.

In performing the study, the entire inventory of 2,255 public grade crossings in the Commonwealth was analyzed using a benefit-cost approach to identify potential locations for grade separation projects. Sixteen potential projects in the state were identified as feasible at a total project cost of $73,700,000. Eleven of the projects were in the coastal plain. The total project cost for the 11 projects was $47,700,000. A number of additional locations were eliminated from consideration due to impacts on local businesses and residences as well as other factors. In urban areas, it is very difficult to construct grade separations without significantly altering adjacent neighborhoods and at a cost that is not prohibitive.

The funding set-aside to specifically eliminate grade crossings is small compared to the overall cost. A minimum of $1.4 million annually is specifically designated for grade separation improvements. A competitive selection process determines which projects are funded as part of this safety program. A recent change in the allocation process makes these funds available for grade separation projects as an addition to the regular primary, secondary or urban allocation rather than as part of these allocations. Allocating funds in this manner will tend to encourage the advancement of grade separation projects while having a minimal impact on the overall TTF.

Grade separation projects can also be funded with primary and secondary allocations through VDOT's Six-Year Improvement Programs in competition with other highway construction and transit projects.

In some instances, the problem associated with a grade crossing can be relieved through actions that involve a less-than-grade separation project. In particular, accidents can be greatly reduced or eliminated through a targeted program of safety improvements involving warning devices. VDOT's safety improvement program has been successful in reducing the number of grade crossing accidents in the coastal plain as well the rest of the state. During the past five years, accidents have been reduced by 29 percent in the coastal plain while the reduction in the rest of the state was 45 percent..

No ready solution to traffic delay problems exists short of grade separation. With the limited availability of funds to eliminate grade crossings and the inability to construct grade separations in downtown areas, local solutions to traffic delay problems must be found. Potential actions include minimizing the impact of grade crossings through traffic circulation changes and by working with local businesses and railroads to minimize train traffic during rush hours.

To determine the relative severity of the grade crossing related problems in the coastal plain, the coastal plain was compared with the rest of the state. The grade crossing factors analyzed included the number of grade crossings, the number of accidents, the volume of trains and vehicle counts at grade crossings, and the expected accident rate (EAR) index. Because of the relatively high vehicle (car, truck, other) traffic volumes in the coastal plain, a greater potential for accidents exists at grade crossings in this area compared with the rest of the state. The higher traffic volumes in the coastal plain tend to result in more traffic delays at these crossings as well. There is also a slightly greater concentration of rail grade crossings in the area south of the James River and west of Virginia Beach compared with the rest of the state.

BACKGROUND

This study was made in response to Senate Joint Resolution 321 (SJR 321) which requested that the Virginia Department of Transportation (VDOT) examine the difficulties and dangers of railroad grade crossings due to traffic congestion and safety-related problems. The bill, sponsored by Senators Lucas, Quayle, and Saslaw mandated that the study give particular emphasis to cities and towns in Virginia's coastal plain because of the numerous grade crossings in this area of the state. The legislation noted the inconveniences and hazards associated with increased rail traffic and the desirability of grade separations as a means of reducing grade crossings. The current study builds upon a previous study conducted in 1991 by VDOT but provides for more emphasis on the coastal area.

There are currently 2,255 public grade crossings in Virginia. A grade crossing is an intersection where a potential conflict exists between railroad traffic and road vehicle traffic. This conflict manifests itself in accidents and vehicle traffic delays. There are two ways to completely eliminate this conflict. One method is to separate the railroad and highway traffic through an improvement project that involves the construction of a bridge or underpass. The other means is for either the railroad line or highway to be eliminated through abandonment, closure, or relocation.

In some instances, the problem associated with a grade crossing can be relieved through actions that involve a less-than-grade separation project. In particular, accidents can be greatly reduced or eliminated through a targeted program of safety improvements involving warning devices. Unfortunately, no intermediate measures exist for reducing or eliminating vehicle traffic delays. Railroads operate on their own rights-of-ways that pre-date most roads and development. Grade crossings usually result from an encroachment of a road upon the railroad's rights-of-way rather than vice versa. An additional obstacle to the resolution of traffic delay problems is the tendency for the most severe traffic delay problems to occur in urbanized areas. In these areas, existing development makes grade separation projects nearly impossible without major damage to adjacent property and an extremely high improvement cost.

The potential for safety and traffic problems can be especially high in an area where there is a concentration of rail and highway traffic. Businesses and people locate close to rail lines to take advantage of the service that it offers and the jobs it helps generate. Railroads are in the business to serve business. To an extent, an active rail line is an indication of a healthy economy with all of its associated benefits. The negatives of rail lines and train traffic must be weighed against the positive economic benefits associated with an active rail line.

To determine the relative severity of the problem in the coastal plain, it was compared with the rest of the state. The grade crossing factors analyzed included the number of grade crossings, the number of accidents, the volume of trains and vehicle counts at grade crossings, and the expected accident rate (EAR) index.

With limited funds available and over 2,200 potential grade crossing projects, it is necessary to establish priorities. A benefit-cost analysis was made of all grade crossings to identify the most likely candidates for grade crossing separation improvements.

Current funding for grade separation projects within the state as well as financing mechanisms for grade crossing improvements in other states were also reviewed.

STUDY METHODOLOGY

The study examined several questions. First, which grade crossings have the worst accident and travel-delay problems? Second, are the accident rates and traffic delays worse for grade crossings in the emphasis area compared with the rest of the state? And third, what funding mechanisms are available for addressing the problems associated with railroad grade crossings?

The study involved three major steps: (1) identifying potential grade crossing separation improvement locations; (2) comparing the emphasis area with the rest of the state; and (3) reviewing the funding alternatives for potential improvements.

(1) Potential Projects

The first part of this study involved identifying the grade crossing locations in the state most likely to benefit from a grade separation improvement. With over 2,200 grade crossings in the state, sufficient funds are not available to construct grade separation structures at all grade crossings. A systematic means of identifying priorities is necessary. Benefit-cost analysis is a proven tool that is often used to help prioritize major capital projects. Benefit-cost analysis identifies those grade crossings for which the expected benefits of a grade separation would exceed the estimated cost of making the improvement. By examining the benefit-cost ratio, a group of projects with potential for improvement can be established. The higher the ratio, the greater the benefits derived for each dollar of expenditure. In addition to a benefit-cost analysis, the five-year accident history of all grade crossings was reviewed to identify the locations where improvements could reduce accidents.

The current study used essentially the same benefit-cost analysis methodology developed by VDOT for a study made in response to House Joint Resolution 39 (HJR 39) in 1991. The methodology uses two factors, accidents and travel delays, to assess the need for making a grade separation improvement. A combination of the two factors can provide the basis for the improvement or a high value of either can indicate the need for making the improvement.

The methodology defines the benefit-cost of a project as being:

$$\frac{\text{benefit}}{\text{cost}} = \frac{\text{delay cost savings + accident cost savings}}{\text{project improvement costs}}$$

Benefits are equal to the cost savings that can be expected from eliminating delays and accidents by making the grade crossing improvement.

Delay costs result when vehicles wait at a grade crossing while it is occupied by a train. There is a cost associated with the time lost due to the traffic delay as well as with the fuel that is burned while the vehicles idle at a grade crossing.

The accident costs involve property damage as well as the monetary value assigned to injury and loss of life. The accident rate for a grade crossing is estimated by a model presented in the National Cooperative Highway Research Program Report #50. (4) The expected accident rate (EAR) generated by the model provides a relative measure of accident exposure at a grade crossing based upon train volume, road vehicle volume, the type of warning device (gates, flashing lights, etc.) and the urban/rural locational characteristic of the crossing. Some state departments of transportation use this model to measure the accident potential of railroad grade crossings. VDOT uses the EAR to identify potential high accident locations as part of its procedure for its grade crossing safety improvement program.

The project improvement costs relate to the costs associated with the grade separation for a bridge or underpass. These costs include the structure, the roadway approaches, and the right-of-way.

In a benefit-cost analysis, benefits are derived from the reduction of the delay and accident costs as a result of an improvement. If the benefits exceed the cost of the improvement then there is some merit for making the improvement. In other words, the benefit-cost ratio must exceed 1.0 for the project to be considered feasible.

Potential projects were identified through a process of elimination using the following procedure. The process was used to reduce 2,255 grade crossings in the state to the 16 most likely candidates for grade separation improvements.

1. A benefit-cost ratio was calculated for all grade crossings where:

$$\text{benefit-cost} = \frac{\text{delay costs savings + accidents costs savings}}{\text{project improvement cost}}$$

   A standard project improvement cost was used for all urban and rural grade crossings except where a site-specific planning cost estimate had been developed in the HJR 39 study.

2. All projects with a benefit-cost ratio of 1.5 or greater were identified for further analyses. If constructed, these projects can expect to realize benefits that exceed the cost of the project by one and one-half times.

   In most project selection processes, a project usually will not be considered unless the benefits exceed the cost of a project by several times. The competition for scarce financial resources is usually so intense that only those projects which yield the greatest benefit for each dollar of expenditure have any chance of being initiated and completed. A benefit-cost ratio of 5.0, for example, would mean that for every dollar expended one could expect to realize a cost savings (benefit) of five dollars. A benefit-cost ratio of 1.5 is somewhat liberal in this respect and includes more projects than would a higher benefit-cost ratio. Some of the projects involved would not normally be considered an immediate priority. Projects as low as this level are included, however, because the benefit-cost ratio for any particular project could increase as more detailed site and cost analyses are developed.

3. Each grade crossing identified in Step 2 was reviewed to determine its current status. Those locations where grade separation improvements were previously found to be infeasible were eliminated. These projects are usually in an urbanized area where the construction of a bridge or underpass results in considerable damage to adjacent property. Construction of the project may resolve the grade crossing problem but will also result in the elimination of a substantial number of businesses, alter the character of the area significantly, and/or result in the displacement of residences. The economic and social consequences of eliminating the grade crossing far outweigh the benefits derived from the grade crossing separation.

4. Grade crossing locations on spur lines or sidings were eliminated because of the limited hazard and the potential for changes in the future demand for train service. A grade separation improvement represents a major capital investment - one that is expected to last at least 50 years. Because of the possibility that the few businesses being served by the siding may relocate or close during that time frame, it is difficult to justify the cost of a grade crossing separation. Even if the continued viability of the businesses are assumed, the demand for rail freight service generally cannot be. Furthermore, trains operating on sidings tend to operate at low speeds where the potential for accidents is reduced as well. The cost of making a grade separation improvement is not justified in these circumstances.

5. Field reviews of the remaining locations were made by VDOT's Transportation Planning staff to develop the improvement requirements and make new planning cost estimates based upon those concepts. A revised benefit-cost ratio was calculated for these crossings using the new cost information. Those projects with a new benefit-cost ratio of less than 1.5 were eliminated.

   A planning cost is based upon a general concept of the type of improvement. It lacks the degree of accuracy of a detailed engineering cost estimate but is sufficient for budgetary estimates. The project location was laid out for each project on individual United States Geological Survey (USGS) topographic maps. The maps also include the route number, railroad location number, cost estimate, description of the project concept, typical section and other comments. The individual map information sheets are available for review in the VDOT Policy Office.

6. A preliminary review of the remaining projects was conducted by VDOT's Environmental Division to determine if there were any obvious environmental constraints upon making an improvement. The preliminary environmental reviews did not identify any obvious constraints to the construction of grade separation projects at these locations.

   A detailed description of the benefit-cost formula calculations are included in Appendix 2.

   Grade crossings with five or more accidents during the past five years were also identified and reviewed for possible improvements. Three such locations were identified. Two of the locations have received upgrades of their warning devices within the past two years and have been accident-free since. The other location is currently scheduled to receive an upgrade of its warning system.

(2) Emphasis Area Compared to State

SJR 321 mandates that emphasis be given to the cities and towns in the coastal plain. The emphasis area is presented in Exhibit 1 and it includes the following cities and towns:

Cities	Towns
Chesapeake	Boykins
Franklin	Branchville
Hampton	Capron
Newport News	Courtland
Norfolk	Ivor
Portsmouth	Newsoms
Suffolk	Wakefield
Virginia Beach	Waverly
Williamsburg	Windsor

The city of Poquoson is in the study area but does not have any railroad grade crossings.

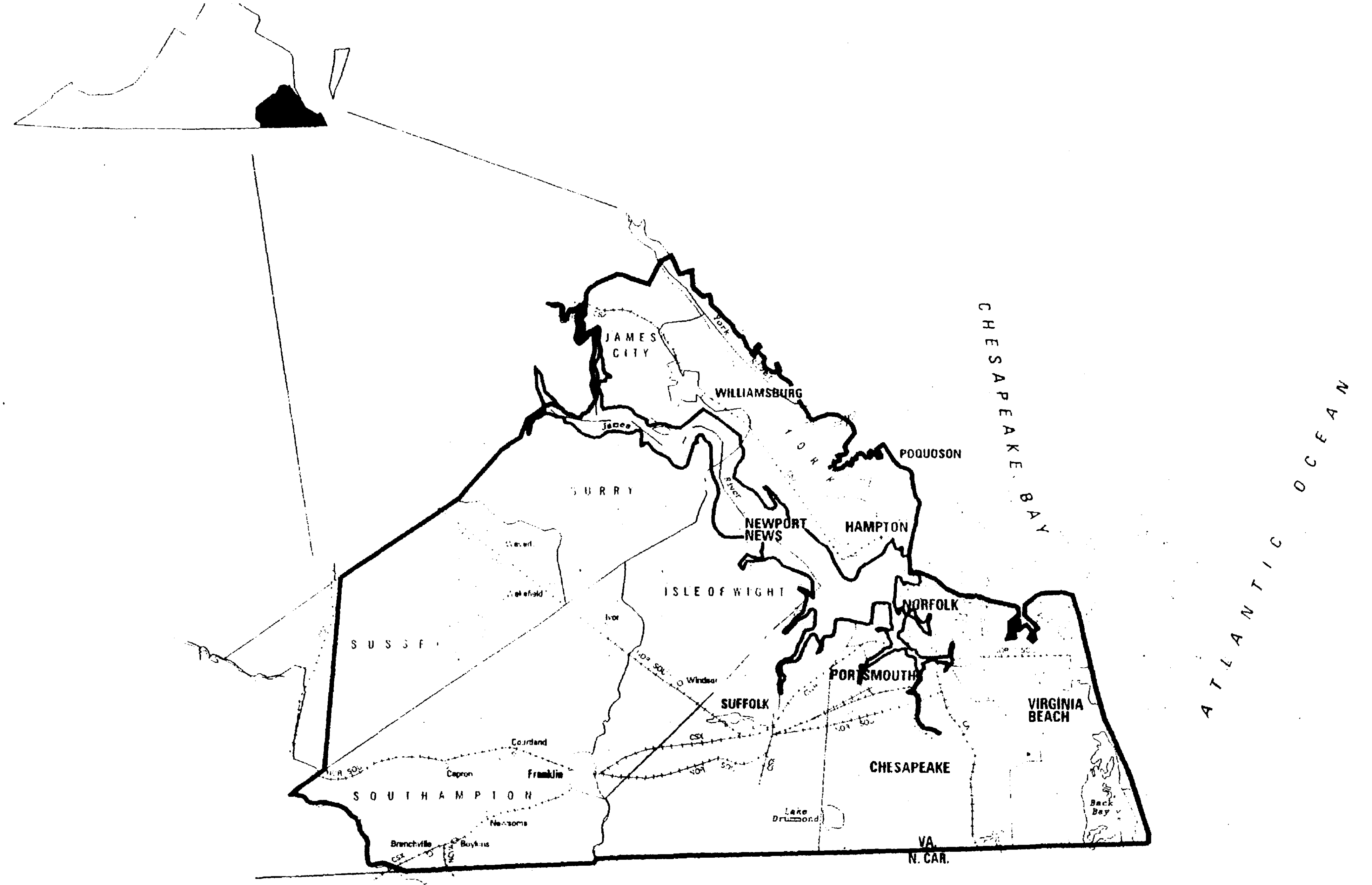
VDOT maintains an inventory of over 50 site-specific characteristics for each grade crossing in the state. The second step of the methodology involved an analysis of the railroad grade crossing database to determine if there is a concentration of grade crossings and related problems in the area of emphasis.

The database includes the number of accidents and fatalities for each grade crossing over a five-year period. Because the approximately 70 accidents per year is spread over 2,200 grade crossings, more than a single year is necessary to identify whether or not a grade crossing truly has an accident problem. Using a five-year accident history for grade crossing accident analysis ensures that policy is not established on a one year anomaly. The five-year accident history used for the study ended in December 1992. A comparison between the emphasis area and the rest of the state was made based on a number of grade crossing characteristics. These included:

- Number of grade crossings by jurisdiction,
- Number of accidents,
- Average daily train traffic for each grade crossing,
- Average daily vehicle (auto/truck) count for the intersecting road at each grade crossing, and
- Expected accident rate (EAR) for each grade crossing.

(3) Funding

The final step entailed a review of the available funding, alternative methods of funding grade separation projects, and the current project selection process for grade crossing improvements.


JAMES CITY
WILLIAMSBURG
POQUOSON
CHESAPEAKE BAY
ATLANTIC OCEAN
SURRY
NEWPORT NEWS
HAMPTON
ISLE OF WIGHT
NORFOLK
SUSSEX
PORTSMOUTH
SUFFOLK
VIRGINIA BEACH
CHESAPEAKE
SOUTHAMPTON
Franklin
Courtland
Capron
Newsoms
Branchville
Boykins
Ivor
Windsor
Waverly
Wakefield
Lake Drummond
Back Bay
VA.
N. CAR.

STUDY AREA

FINDINGS

Benefit-Cost Analysis of Grade Crossings

The first part of the study involved a benefit-cost analysis of all grade crossings in the state to determine which grade crossings are most likely to result in the largest decrease in accidents and travel delays relative to the cost of the improvement. A benefit-cost ratio was calculated for all 2,255 public grade crossings in the state to help identify priority locations.

Seventy-two projects with a benefit-cost ratio in excess of 1.0 were identified in the first step of the benefit-cost methodology described earlier in the report.[1] Sixteen potential projects with benefit-cost ratios greater than 1.5 remain after the process of elimination described in the methodology. These locations are presented in Table 1.

Eleven of the 16 projects identified through this process are in the emphasis area. The total planning cost estimate to make the improvements at the 16 identified grade crossings is $73,700,000 with $47,700,000 required for the emphasis area.

It should be stressed that the benefit-cost methodology is a general indicator of a project's relative value. As more specific site information is collected and a detailed cost analysis is developed, a project's inclusion in the group of locations identified in Table 1 can change. The methodology used to identify a potential project represents the best information available short of performing extensive field analyses of all grade crossings in the state. The results reflect current information concerning traffic counts, train traffic, grade crossing protection devices, and cost of improvements.

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[1]A listing of these grade crossing locations is presented in Appendix 3.

Table 1

POTENTIAL GRADE CROSSING PROJECT LOCATIONS WITH BENEFIT-COST (B/C) RATIO GREATER THAN 1.5					
District	Jurisdiction	Street	LOCATION	B/C RATIO	EST. COST
Northern Virginia	Manassas	Fairview	.04 Mi S Center	2.86	$2,500,000
District Subtotal					$2,500,000
Richmond	Henrico	Hungary Road	.006 Mi W Purcell	3.32	$3,000,000
Richmond	Richmond	Walmsley Blvd.	.47 Mi W Rt 1	1.75	$6,500,000
Richmond	Richmond	Jahnke Road	.26 Mi W Forest Hwy	1.95	$7,000,000
Richmond	Richmond	Broad Rock Road	.08 Mi W Rt 161	1.98	$7,000,000
District Subtotal					$23,500,000
Suffolk	Chesapeake	Liberty Street	.02 Mi E. Seaboard	1.62	$6,500,000
Suffolk	Chesapeake	Park Avenue	.04 Mi E Seaboard	1.91	$3,800,000
Suffolk	Chesapeake	Liberty Street	.01 Mi N Seaboard	2.10	$3,300,000
Suffolk	Norfolk	Hamplton Blvd.	.80 Mi S Rt 170	7.43	$4,200,000
Suffolk	Norfolk	Laved Avenue	.02 Mi E Halt Street	4.07	$3,300,000
Suffolk	Norfolk	Bainbridge Boulevard	Int "D" Street	3.04	$3,700,000
Suffolk	Portsmouth	George Washington Hwy.	.17 Mi E Frederick	6.30	$3,900,000
Suffolk	Portsmouth	High Street	Int Virginia Avenue	4.53	$5,000,000
Suffolk	Portsmouth	Turnpike Road	.65 Mi E Frederick	5.83	$4,000,000
Suffolk	Suffolk	Washington	.10 Mi E County	2.10	$5,000,000
Suffolk	Suffolk	Washington	.07 Mi E County	3.25	$5,000,000
District Subtotal					$47,700,000
Statewide Total					**$73,700,000**

Comparison of Emphasis Area with the Rest of the State

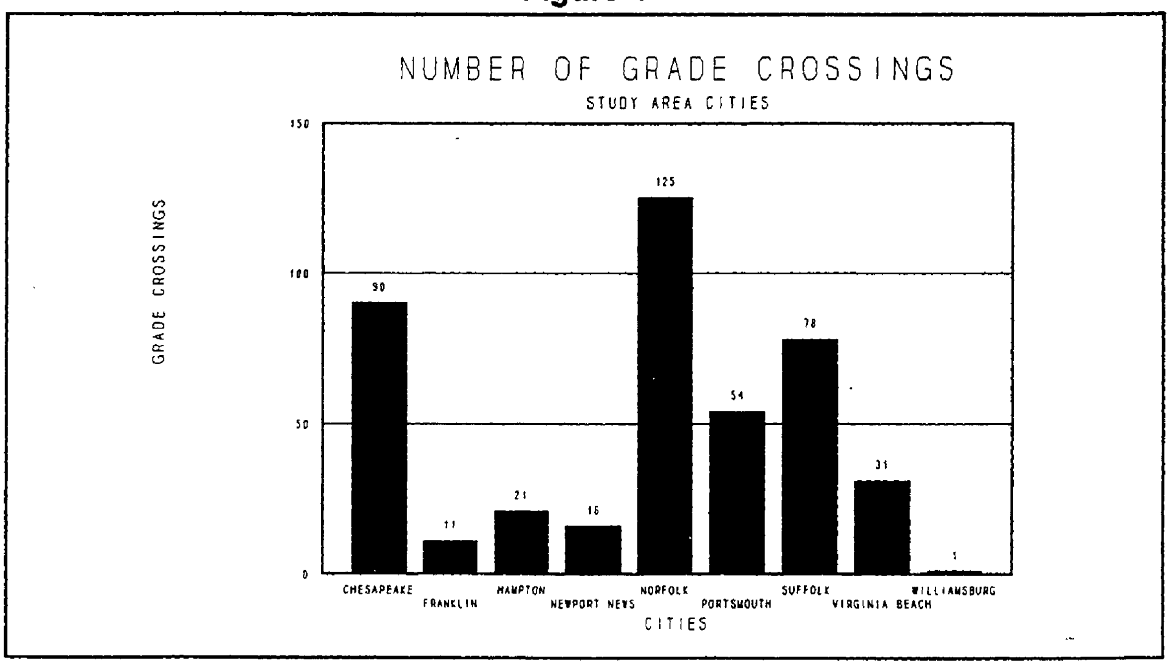
Number of Grade Crossings

Approximately 21 percent of Virginia's population lives in the emphasis area while only 17 percent of the railroad grade crossings are located in the area. Within the emphasis area, however, a concentration of grade crossings exists in the area south of the James River and west of Virginia Beach. The cities and towns in this area contain 15 percent of the grade crossings in the state compared with only 9 percent of the population. The relative concentration of grade crossings in this portion of the emphasis area results from the amount of rail traffic required to serve one of the world's busiest ocean ports and an extensive highway network required to serve a large population center. Because of the flat topography there are few opportunities to take advantage of the natural terrain to separate highway and railroad crossings.

The concentration of grade crossings in the emphasis area is also evident when the 136 counties and cities in Virginia are ranked by the number of grade crossings in the jurisdiction. Of the ten jurisdictions with the highest number of grade crossings in the state, four (Norfolk, Chesapeake, Suffolk and Portsmouth) are located in the emphasis area.

Figure 1 presents the number of grade crossings for the cities in the emphasis area.

Figure 1



Towns

Almost all of the grade crossings in the emphasis area are in cities; however, there are a few located in towns. Summary data for the grade crossings in the towns is presented in Table 2. There are a total of 16 grade crossings located in the nine towns in the emphasis area. All towns have at least one grade crossing while the maximum number of grade crossings in any town is three. In the past five years, three accidents have occurred at grade crossings in these towns. The number of accidents is approximately proportional to the number of grade crossings located in the towns compared with the rest of the state.

Table 2

Towns	Grade Crossings	Percent of State Grade Crossings	Accidents	Population	Percent of State Population
Boykins	1	0.04	0	685	0.01
Branchville	1	0.04	0	55	0.00
Capron	2	0.08	0	144	0.00
Courtland	3	0.12	0	819	0.01
Ivor	1	0.04	1	324	0.01
Newsoms	1	0.04	0	337	0.01
Wakefield	1	0.04	0	1,070	0.02
Waverly	3	0.12	2	2,223	0.04
Windsor	3	0.12	0	1,025	0.02
Total	16	0.63	3	6,682	0.115

Accidents

While many factors (warning devices, site geometry, etc.)affect the safety and congestion at grade crossings, two key ones are the number of trains and the number of vehicles using the intersecting road. As the traffic volumes of each mode increase, so does their exposure to each other and the likelihood of a conflict. As seen in Table 3, when the emphasis area is compared with the rest of the state, it has a lower volume of trains per grade crossing. An average of 7.0 trains per day move through the grade crossings in the emphasis area compared with 8.3 trains per day for the grade crossings in the rest of the state.

A major difference exists in the average daily vehicle volume for the emphasis area compared with the rest of the state. The emphasis area is a major urbanized area as indicated by the relatively high road vehicle (car/trucks) traffic counts. The average daily vehicle volume at the grade crossings in the emphasis area is 5,113 vehicles (cars, trucks, and other vehicles) per day compared with 2,080 vehicles per day for the rest of the state. The higher road traffic volume at each grade crossing results in a much greater exposure to accident potential and more severe congestion when delays do occur.

Table 3

	Average Daily Train Traffic	Average Daily Vehicle Count
State	8.1	2,613
Emphasis Area	7.0	5,113
Rest of State	8.3	2,080

The potential for accidents at grade crossings in the emphasis area was compared with the rest of the state by examining the expected accident rate. he EAR measures relative accident exposure based upon characteristics of the crossing. The EAR value is an estimate of the expected annual number of accidents at a crossing. As seen in Table 4, the EAR formula value for the average grade crossing in the emphasis area is 0.033; over twice the rate of 0.016 for the average grade crossing in the rest of the state.

Table 4

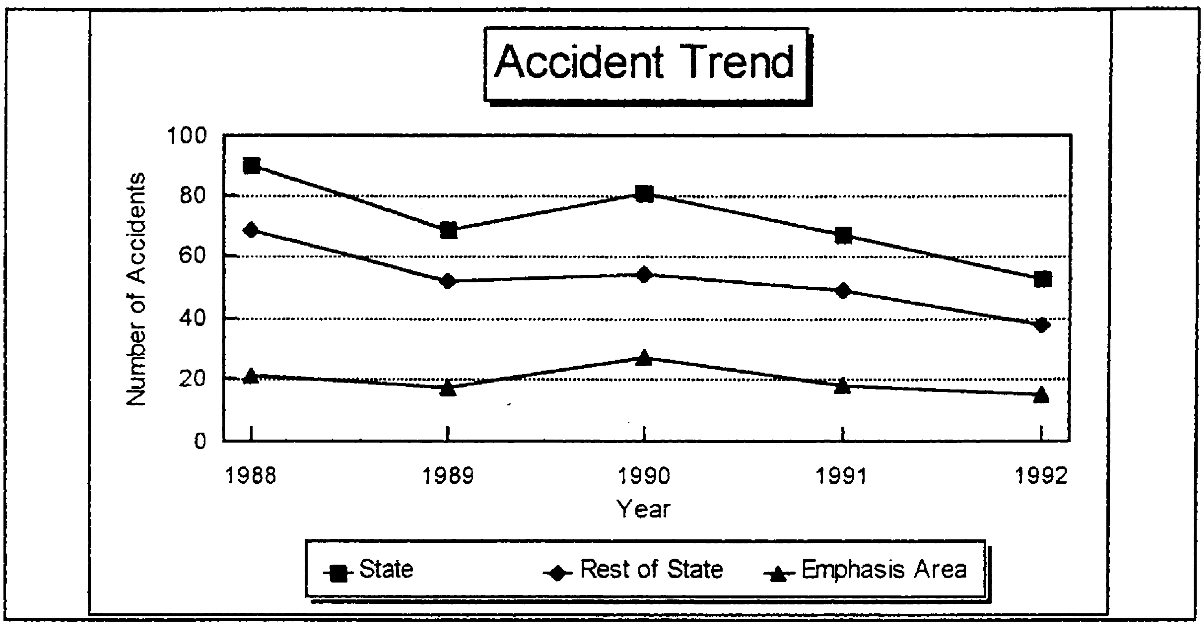
	EAR	Five-Year Accidents	Percent Accident	Five-Year Fatalities	Percent Fatalities
Statewide	.019	357	100	19	100
Emphasis Area	.033	98	27	3	16
Rest of State	.016	259	73	16	84

As presented in Table 4, the higher EAR formula value for the emphasis area corresponds with the number of accidents over the past five years. In the past five years, 98 accidents or 27 percent of the 357 accidents statewide have occurred in the emphasis area. This percentage is relatively high compared with the percentages of the population and grade crossings in the emphasis area.

When all of the jurisdictions within the state are ranked according to the number of accidents experienced at railroad grade crossings over the past five years, the top three locations (Chesapeake, Norfolk, Suffolk) are in the emphasis area.

The five-year accident trend was also examined to evaluate the effectiveness of the grade crossing safety improvement program. As presented in Figure 2, there is a decreasing number of accidents occurring statewide and in the emphasis area over the period except for a small increase in 1990. During the past five years, accidents have been reduced by 29 percent in the coastal plain while the reduction in the rest of the state was 45 percent.

Figure 2



Travel Delays

While location-specific data are not available on the traffic delays at a particular grade crossing, the number of hours of vehicle delay for each grade crossing was estimated based upon assumptions of train length, train operating speed, average wait time at a grade crossing and probability of delay. There is a significant difference in the amount of traffic delays at grade crossings in the emphasis area and the rest of the state. Because the average traffic volume is over twice as great at a typical grade crossing in the emphasis area, the total number of vehicle hours of delay is much higher in the emphasis area. Forty-four percent of the statewide travel delay due to grade crossings is estimated to occur in the emphasis area.

The effects of grade crossings on traffic delays need to be examined in detail locally with respect to existing traffic patterns. A study by the Southeastern Virginia Planning District Commission of railroad grade crossings in Suffolk found that about 50 percent of the traffic delay was a result of local switching operations. Switching operations are constrained by operating hours of local businesses and the schedule of through-trains. The study noted that some effort had been made to schedule switching operations during non-peak hours.

Grade Crossing Versus Highway Accidents and Delays

To put the accidents and travel delays related to grade crossings in perspective, it is helpful to make some comparisons between grade crossings and highways. A grade crossing-related accident is a relatively rare event compared with the frequency of accidents experienced on major street segments or intersections. For example, the two worst grade crossing locations in the state had six accidents during the past five years. By contrast, in the city of Chesapeake alone, over 20 highway locations can be identified with six or more automotive accidents within the last six-month period. Chesapeake is not unique nor its accident problems particularly severe, rather, this is illustrative of the number of accidents that can occur on a highway system in an urbanized environment and provides a context in which grade crossings can be evaluated.

The number and severity of grade crossing accidents were also compared on a statewide basis to those on highways. During the past five years, there were 19 accidents with fatalities at railroad grade crossings compared with 4,427 highway accidents with fatalities. While important, the need for grade separation improvements must be considered relative to other transportation safety needs.

The travel delays related to grade crossings can also be put into context by making a comparison to the length of delay created for an individual motorist by a traffic light at an intersection. If arriving at the beginning of the red phase, a typical wait at a traffic light may involve a two-minute delay from the red light with an additional half minute for deceleration/acceleration. In this example, the total vehicle delay would be two and one-half minutes. The delay at a grade crossing can be much longer in duration. To illustrate, it takes about four minutes for a 9,000 foot train to clear a grade crossing intersection at 25 miles per hour. Add to this delay, a 60-90 second warning device activation/deactivation cycle and it is evident that the delay at a grade crossing can easily be as long as six or seven minutes.

FUNDING AND PROJECT SELECTION

Grade separation improvements can be funded from several sources. First, all grade crossing improvements are eligible for funding from regular highway construction allocations. Grade separation projects within a town or city could be funded from the urban system allocations; those on secondary routes would be eligible for funding from the specific county's secondary construction allocation; and those on the primary systems are funded from the VDOT primary district allocation. Grade separation projects funded from regular highway construction allocations are competing for funds with all other construction projects within those suballocations through VDOT's Six-Year Improvement Programs.

A second source is the categorical safety program funded by the federal Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991. The Surface Transportation Program (STP) of the federal law requires that ten percent of the funds, along with some money derived from equity allocations, be used for safety-related improvements. A portion of the safety-related improvements must involve hazard elimination at rail grade crossings including grade separations.

The categorical safety programs have been restructured as a result of ISTEA and the General Assembly's response to that legislation. In 1993, the General Assembly enacted interim language within the budget bill to bring the Commonwealth into closer alignment with the federal legislation. The General Assembly has directed that for the current biennium, projects funded from the STP safety set-aside be selected on a competitive basis. If a project is selected, then the 90 percent federal share will be provided from the STP set-aside funds. The required ten percent match can come from regular secondary, urban and/or primary system allocations.

In the past, selected projects were funded from the Transportation Trust Fund (TTF). Funds entering the TTF were derived from state and federal sources but were not distinguished as such in the allocation process. The amount provided from federal sources for hazard elimination including grade separations was part of the total available for the system allocations. When a proposed project involved a grade separation, federal funding could be provided for the improvement. This was an internal VDOT programming function and did not result in additional funding. Through the programming process, VDOT ensured that sufficient projects were included to fully use this categorical amount. Project funding was taken from the regular system allocations. Under the restructured program, the amount available for hazard elimination including grade separation projects will be in addition to the system allocation. Allocating funds in this manner will tend to encourage the advancement of grade separation projects while having a minimal impact on the overall TTF.

A special situation exists for the rail line between Washington, D.C. and Richmond. It has been designated as a high-speed rail corridor. Grade crossings on this ail line are eligible for special funding under Section 1010 of the federal ISTEA. Approximately $450,000 was spent in FY93 for grade crossing improvements in this corridor.

A more detailed description of the project selection process for STP safety-related projects can be found in Appendix 4.

Other States

Most states fund rail grade crossing improvements in a manner similar to Virginia; however, one state does levy a special tax to raise money for grade crossing separation projects. A recent survey by the Safety Task Force of the American Association of State Highway and Transportation Officials (AASHTO) Standing Committee on Railways identified Nebraska as having a unique funding source for grade crossing improvements. Nebraska taxes railroads $100 per year for each crossing and 7.5 cents for each train mile operated in the state.

CONCLUSIONS

SJR 321 mandated a review of the grade crossings in Virginia with a special focus on the coastal plain. In performing the study, a methodology was applied similar to that used by VDOT in 1991 in its review of grade crossings.

The methodology uses a benefit-cost approach to determine if the benefits of a separation improvement exceed the costs of funding the project. The benefits include those attributable to reducing or eliminating accidents (property damage, injury and fatalities) and travel delays. Accidents and travel delays are translated into monetary estimates. Either or both factors can provide the basis for making an improvement. Due to the low number of accidents in Virginia, travel delay is the dominant factor in the model.

The entire inventory of public grade crossings in the Commonwealth was analyzed using the benefit-cost approach to identify crossings for additional study. Because major capital improvements are rarely made without benefits significantly exceeding the cost of the project, a benefit-cost ratio greater than 1.5 was used to identify potential grade crossing improvement locations.

Twenty-nine grade crossings were identified for potential improvements. A number of these locations were eliminated from consideration due to impacts on local businesses and residences as well as other factors. In urban areas, it is very difficult) construct grade separations without significantly altering adjacent neighborhoods and at a cost that is not prohibitive. Sixteen potential projects in the state were identified as feasible at a total project cost of $73,700,000. Eleven of the projects were in the coastal plain. The total project cost for the eleven projects was $47,700,000.

The funding available specifically for railroad grade crossing improvements including grade separations is small compared to the overall cost. Up to 50 percent of grade crossing improvement funds for hazard elimination is available for grade separations. A competitive selection process determines which projects are funded as part of this safety program. A recent change in the allocation process makes these funds available for grade separation projects as an addition to the regular primary, secondary or urban allocation rather than as part of these allocations. Grade separation projects can also be funded with primary and secondary allocations through VDOT's Six-Year Improvement Programs in competition with other highway construction and transit projects.

Because of the relatively high vehicle (car, truck, other) road traffic volumes in the coastal plain, a greater potential for accidents exists at grade crossings in this area compared with the rest of the state. The higher traffic volumes in the coastal plain tend to result in more traffic delays at these crossings as well. There is also a slightly greater concentration of rail grade crossings in the area south of the James River and west of Virginia Beach compared with the rest of the state.

VDOT's safety improvement program has been successful in reducing the number of grade crossing accidents in the coastal plain as well the rest of the state. During the past five years, accidents have been reduced by 29 percent in the coastal plain while the reduction in the rest of the state was 45 percent.

No ready solution to traffic delay problems exists short of grade separation. With the limited availability of funds to eliminate grade crossings and the inability to construct grade separations in downtown areas, local traffic plans need to determine alternative routings to minimize the impact on traffic circulation and the optimum location of grade separation improvements. Local traffic plans should take advantage of those grade separations that exist and minimize the use of streets with grade crossings as major thoroughfares where possible. Localities should work with local industries, ports and the railroads to schedule trains in such a way as to reduce the number of trains during the peak hours for road traffic.

In summary, the cities and towns in part of the coastal plain have a disproportionate share of grade crossings that would benefit from grade separation projects. The study provides an initial grouping of grade crossings that could be evaluated for further consideration of grade separation projects should the General Assembly make special monies available.

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APPENDIX 1

SENATE JOINT RESOLUTION NO. 321

Requesting the Department of Transportation to study railroad crossings.

Agreed to by the Senate, February 9, 1993
Agreed to by the House of Delegates, February 23, 1993

WHEREAS, increased rail traffic through cities and towns contributes to noise pollution, creates safety hazards, and congests highway traffic; and

WHEREAS, the inconveniences and hazards presented by increases in rail traffic through cities and towns are magnified in those localities lying in Virginia's coastal plain because of the existence of numerous grade crossings; and

WHEREAS, to reduce traffic congestion and improve safety; it is highly desirable to eliminate as many railroad grade crossings as possible by replacing them with either overpasses or underpasses; and

WHEREAS, construction of such overpasses and underpasses is expensive and often beyond the financial capacities of municipalities; now, therefore, be it

RESOLVED by the Senate, the House of Delegates concurring, That the Department of Transportation be requested to study railroad crossings, particularly those in cities and towns lying in Virginia's coastal plain. The Department shall examine the difficulties and dangers presented by railroad grade crossings, evaluate methods of financing elimination of these grade crossings through the construction of overpasses and underpasses, and recommend those legislative and other actions that seem appropriate.

The Department shall complete its work in time to submit its findings and recommendations to the Governor and the 1994 Session of the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for processing legislative documents.

APPENDIX 2

Benefit-Cost Analysis

The key features of the benefit-cost analysis used to conduct this study is described below. An example follows which presents each part of the benefit-cost equation and the calculations made to arrive at the benefit-cost ratio.

Accident Cost Savings

The accident cost savings are estimated by multiplying the estimated cost per accident by the expected accident rate (EAR).

The cost per accident of $102,942 for urban accidents and $141,126 for rural accidents is based upon estimates made by the Federal Highway Administration (FHWA). The EAR value for a particular grade crossing is determined by the vehicle traffic volume, the type of warning device and the urban or rural location. Specific values are provided in a VDOT working paper based upon the National Cooperative Highway Research Program Report #50.

Travel Time Savings

To determine the travel time savings, it is necessary to first determine the number of minutes the average grade crossing is closed in a day. It has been assumed that the average train length is 9,000 feet (1.7 miles). The length of the train is divided by the speed to determine the time in hours that the train is blocking the grade crossing. This figure is converted to minutes by multiplying by 60. An average of .65 minutes is added to each train passage for the activation/deactivation of warning devices and the driver reaction time to start up after the train has passed. The resulting time is multiplied by the number of trains per day to determine the total number of minutes each day the grade crossing is blocked.

Based upon the minutes per day the grade crossing is blocked by train traffic and the vehicle traffic volume, the total delays for all vehicles is calculated.

This figure is then applied to the average urban and rural wage rate. The estimate in the previous study was increased by an inflationary rate to arrive at an $11.87 per hour for urban workers and $8.53 for rural workers. The time delay multiplied by the wage rate equals the estimated daily cost of a time delay. This estimate is multiplied by 365 to represent the time savings for a year.

A similar procedure is used to estimate the fuel cost savings that are realized from a grade separation improvement. The cost of fuel is estimated at $1.10 per gallon. An FHWA report indicates that idling vehicles burn fuel at an average rate of 0.013 gallons per minute. This rate and the cost-per-gallon are multiplied by the delay at the grade crossing to determine the value of fuel savings for a grade separation improvement.

Cost of Improvement

The cost of improvements are based upon VDOT analysis of general construction costs for highway bridges, required approaches and the procurement of additional rights-of-way. It is assumed that the average grade separation cost in rural areas is $1.2 million and $6.0 million in urban areas. A useful life of 50 years is assumed. The annualized cost is determined by dividing the project cost by the useful life.

APPENDIX 3
POTENTIAL GRADE CROSSING PROJECT LOCATIONS WITH INITIAL B/C RATIO GREATER THAN 1.0
BY ELIMINATION PROCESS

DISTRICT	JURISDICTION	AAR NO	STREET	LOCATION	INITIAL BC RATIO	REVISED B/C	STATUS	ESTIMATED COST
POTENTIAL PROJECTS								
SUFFOLK	NORFOLK	856004T	HAMPTON BLVD	.80MI S RT170	5.20	7.43		$4,200,000
SUFFOLK	PORTSMOUTH	856053P	GEO.WASHINGTON HY	.17MI E FREDERICK	4.10	6.30		$3,900,000
SUFFOLK	PORTSMOUTH	856101C	TURNPIKE RD	.65MI E FREDERICK	3.89	5.83		$4,000,000
SUFFOLK	PORTSMOUTH	856100V	HIGH ST	INT VIRGINIA AVE	3.77	4.53		$5,000,000
SUFFOLK	NORFOLK	467368U	LOVITT AVE	.02MI E HOLT ST	2.24	4.07		$3,300,000
RICHMOND	HENRICO	860437F	HUNGARY ROAD	006MI W PURCELL	1.66	3.32		$3,000,000
SUFFOLK	SUFFOLK	464149V	WASHINGTON	.07MI E COUNTY	2.71	3.25		$5,000,000
SUFFOLK	NORFOLK	856067X	BAINBRIDGE BLVD	INT "D" ST	1.88	3.04		$3,700,000
NORTHERN VIRGINIA	MANASSAS	714345U	FAIRVIEW	.04MI S CENTER	1.19	2.86		$2,500,000
SUFFOLK	CHESAPEAKE	856069L	LIBERTY ST	.01MI N SEABORD	1.16	2.10		$3,300,000
SUFFOLK	SUFFOLK	626027R	WASHINGTON	.10MI E COUNTY	1.75	2.10		$5,000,000
RICHMOND	RICHMOND	623668M	BROAD ROCK RD	.08MI W RT161	2.31	1.98		$7,000,000
RICHMOND	RICHMOND	623663D	JAHNKE RD	.26MI W FOREST H	2.27	1.95		$7,000,000
SUFFOLK	CHESAPEAKE	467378A	PARK AVE	.04MI E SEABOARD	1.21	1.91		$3,800,000
RICHMOND	RICHMOND	623672C	WALMSLEY BLVD	.47MI W RT 1	1.89	1.75		$6,500,000
SUFFOLK	CHESAPEAKE	467376L	LIBERTY ST	.02MI E SEABOARD	1.76	1.62		$6,500,000
PROJECTS WITH HIGH REVISED B/C RATIO ELIMINATED DUE TO INFEASIBLITY								
SUFFOLK	SUFFOLK	464153K	MAIN	.03MI S TRUITT	3.13	6.70	Not feasible: dead end street at parking lot	$2,800,000
SUFFOLK	PORTSMOUTH	856051B	DEEP CREEK BLVD	.03MI E FREDERICK	2.06	1.78	Not feasible: geometric & r/w problems	$7,000,000
SUFFOLK	PORTSMOUTH	856058Y	ELM AVE	.20MI N VICTORY	1.95	1.52	Not feasible: geometric & r/w problems; Navy property	$7,660,000
RICHMOND	HOPEWELL	467502D	MAIN ST	.01MI S. CITY POINT	1.63	2.44	Not Feasible: Main St dead end. Close to LaPrade Ave structure	
PROJECTS ELIMINATED DUE TO REVISED B/C RATIO LESS THAN 1.5								
SUFFOLK	NEWPORT NEWS	224171W	YORKTOWN RD	.03MI NE RT 60	1.51	1.30		$7,000,000
SUFFOLK	SUFFOLK	467400K	WASHINGTON	INT HALL	1.67	1.28		$7,800,000
SUFFOLK	NORFOLK	735340T	MILITARY HWY	.10MI NE ELIZABETH	1.98	1.25		$9,500,000
RICHMOND	CHESTERFIELD	623687S	WOODS EDGE RD	.34MI E RT 1	1.93	1.16		$2,000,000
SALEM	ROANOKE	468572W	2ND ST	.01MI S SHENANDOAH	1.91	1.15		$10,000,000
SALEM	ROANOKE	468565L	HOLLINS RD	.01MI N NORFOLK	1.88	1.13		$10,000,000
NORTHERN VIRGINIA	PRINCE WILLIAM	860600A	FEATHERSTONE RD	.40MI E RT1311	2.23	0.89		$3,000,000
NORTHERN VIRGINIA	FAIRFAX	905893K	RT 611	003MI N RT617	2.24	0.75	Defense Department property	$3,600,000
RICHMOND	CHESTERFIELD	623681B	CENTRALIA RD	.05MI W RT144	2.73	0.66		$5,000,000
SUFFOLK	SUFFOLK	464154S	RT 13	.43MI N RT731	1.60	0.55		$3,500,000
SUFFOLK	JAMES CITY	224233S	RT 645	.01MI N RT 60	1.69	0.14		$15,000,000
SUFFOLK	PORTSMOUTH	626092W	EFFINGHAM ST	.08MI S RT 2640P	1.67	0.13		$65,000,000
PROJECTS ELIMINATED DUE TO INFEASIBLITY OR SPUR LINE								
NORTHERN VIRGINIA	FAIRFAX	714326P	INDUSTRIAL RD	.08MI E RT 5211	2.60		Spur only	
RICHMOND	RICHMOND	623635A	HOPKINS RD	.15MI W RT 1	1.68		Spur only	
RICHMOND	RICHMOND	623636G	COFER ST	.15MI W RT 1	1.30		Spur only	
FREDERICKSBURG	KING WILLIAM	714289P	RT 30	.09MI SW RT 296	2.12		Not Feasible: requires new bridge over Pamunkey River	
NORTHERN VIRGINIA	FAIRFAX	714341S	MAIN ST	001MI S RT2005	3.65		Not Feasible: geometrics; r/w problems	
RICHMOND	RICHMOND	714220U	14TH ST	INT BYRD STREET	3.13		Not Feasible: geometric & r/w problems; requires new bridge over James	
SALEM	ROANOKE	468009G	CAMPBELL AVE	INT 3RD STREET	1.89		Not Feasible: geometric & r/w problems	
RICHMOND	CHESTERFIELD	715248N	ROBIUS & HUGUENOT	INT RTS 675&711	1.96		Not Feasible: existing 4 lane rd recently completed	
SUFFOLK	CHESAPEAKE	467391N	GEO WASHINGTON HWY	.01MI S YADKIN RD	2.02		Done- under construction	

APPENDIX 3
POTENTIAL GRADE CROSSING PROJECT LOCATIONS WITH INITIAL B/C RATIO GREATER THAN 1.0
BY ELIMINATION PROCESS

DISTRICT	JURISDICTION	AAR NO	STREET	LOCATION	INITIAL BC RATIO	REVISED B/C	STATUS	ESTIMATED COST
PROJECTS ELIMINATED DUE TO INITIAL B/C RATIO BELOW 1.5								
SUFFOLK	WAVERLY	467451V	RT 40	.06MI SW RT 460	1.48			
SUFFOLK	NORFOLK	467352X	CHURCH ST	.02MI S RUGBY ST	1.45			
SUFFOLK	CHESAPEAKE	467695E	CAMPOSTELLA RD	.18MI N LIBERTY	1.43			
LYNCHBURG	HALIFAX	470517W	RT501	.45MI S RT 360	1.40			
RICHMOND	ASHLAND	860459F	ENGLAND_ST	INT CENTER STREET	1.39			
CULPEPER	CHARLOTTSVILLE	714715V	MAIN ST	.05MI E RT 15	1.38			
SUFFOLK	NORFOLK	467339J	LLEWELLYN AVE	.01MI S 23RD ST	1.30			
SUFFOLK	NEWPORT NEWS	224146N	HARPERSVILLE RD	.45MI W RT 143	1.24			
BRISTOL	BRISTOL	734414E	COMMONWEALTH AVE	INT HIGHLAND	1.24			
SUFFOLK	PORTSMOUTH	856052H	PORTSMOUTH BLVD	.03MI E FREDERIC	1.23			
RICHMOND	RICHMOND	623548W	BELLS RD	.05MI E MERIDIAN	1.22			
CULPEPER	CHARLOTTSVILLE	714770V	9TH ST	INT ESTES ST	1.20			
SUFFOLK	PORTSMOUTH	626098M	FREDERICK BLVD	.15MI S TURNPIKE	1.18			
RICHMOND	RICHMOND	626161C	COMMERCE RD	INT DINWIDDIE AVE	1.17			
NORTHERN VIRGINIA	PRINCE WILLIAM	860598B	DAWSON BEACH RD	.005MI E RT 1	1.17			
SUFFOLK	EMPORIA	623755R	ATLANTIC ST	INT HALIFAX STREET	1.16			
RICHMOND	RICHMOND	623640W	BELLS RD	.16MI W CASTLEWOO	1.16			
RICHMOND	PRINCE GEORGE	467480F	RIVES RD	.03 MI SW RT 630	1.14			
NORTHERN VIRGINIA	ALEXANDRIA	714294L	WASHINGTON ST	.03MI S SLATERS	1.12			
RICHMOND	HENRICO	860435S	HERMITAGE RD	.24MI E STAPLES	1.10			
SUFFOLK	SUFFOLK	464150P	MADISON	.06MI E COUNTY	1.10			
SUFFOLK	SUFFOLK	626026J	MADISON	.07MI E COUNTY	1.10			
LYNCHBURG	DANVILLE	713976S	WOODING AVE	.15MI SE W MAIN	1.09			
SALEM	BEDFORD	470379K	RT 626	025MI SW RT833	1.06			
SUFFOLK	WILLIAMSBURG	224195K	HENRY ST	.04MI N LAFAYETTE	1.05			
LYNCHBURG	APPOMATTOX	467990J	S. CHURCH STREET	001MI S RT131	1.05			
BRISTOL	BRISTOL	734411J	EUCLID ST	.04MI S COMM AVE	1.04			
SUFFOLK	NEWPORT NEWS	224167G	INDUSTRIAL PARK DR.	.35MI E RESERVOIR	1.02			
SUFFOLK	NORFOLK	467360P	PRINCESS ANNE RD	.14MI E TIDEWATER	1.02			
STAUNTON	FREDRICKSBURG	139441L	RT 11	.07MI N RT 764	1.02			
BRISTOL	BRISTOL	469842W	STATE ST	.03MI W 3RD ST	1.00			

APPENDIX 4

Rail-Highway Grade Crossing Safety Improvement Program

The following is an excerpt from the VDOT 1993 Annual Report Highway Safety Improvement Program pages 42-48. It outlines the project selection process for rail grade separation projects and other improvements.

B. Identification Process

Statewide rail-highway grade crossing locations for safety improvements are determined utilizing the following criteria:

1. <u>Protective Devices</u>

a. First Review (Office)

1) A computerized rail-highway crossing inventory listing is a tool used in establishing a preliminary statewide establishing a priority listing. This listing contains all public at-grade crossings in Virginia. Crossings are ranked using the National Cooperative Highway Research Program Report #50 Formula (NCHRP). This methodology incorporates factors for vehicle traffic, warning devices, and the number of trains at a crossing in a 24-hour period. The result produces an "expected accident rate" to the nearest thousand per year.

(2) A preliminary statewide priority listing is then adjusted by considering additional factors as determined through our engineering review.

a) <u>Number of tracks</u> - Federal guidelines require multi-track crossings under certain circumstances to be gated where Section 130 funding is utilized for improvements. The type of tracks would be identified as main line, branch, siding or other.

(b) <u>Train speed</u> - This is based on timetable information provided by the railroad companies. Special consideration is given where train speeds exceed threshold values of 45 mph and where high-speed rail corridors exist or are in the pre-planning stage.

(c) Accidents - Accident history is viewed as a major factor in the engineering review process. A five-year accident history analysis is conducted for each grade crossing.

(d) Vehicle type - School buses, other mass transit (both rail and highway) and hazardous material transport vehicles receive special consideration in the decision-making process for ranking crossings.

b. Second Review (Field)

An on-site engineering safety study to evaluate the crossing and determine the type of improvement is conducted by the diagnostic team. The following factors are considered during these reviews:

(1) Sight distance - sufficiency of current sight distance for the approaching motorists to make a safe stop when required.

(2) Roadway geometrics - hazards and limitations to approaching motorists resulting from roadway geometrics, such as a steep grade, narrow pavement, horizontal curves, angle of crossing, and so forth.

(3) Adjacent land use development - adverse safety effects, congestion, or other problems created by adjacent land use.

2. Hazard Elimination

Ranking of candidate locations identified for "Hazard Elimination" basically follow the same procedures listed for "Protective Devices." However, there may be additional factors considered when the following types of hazard elimination projects are examined:

a. Relocation - No additional factors are considered.

b. Crossing closure - As defined by the Code of Virginia in §56-365: Local governing body files application with railroad company in writing for action within 60 days. Local authorities can petition the State Corporation Commission to intervene if delays occur.

c. Grade separation - Requires comparison of accident data with vehicle/train exposure and bridge priority methodology as developed for separation or crossings with flashing lights and gates as warning systems.

d. Reconstruction of existing grade separation - Based on structure condition and vehicle usage.

e. Crossing Surface Improvement - The type of existing surface, a diagnostic evaluation addressing crossing conditions, roadway and track geometry status and the types of vehicle and train traffic are all considered. A point value is placed on each category as determined through a comparison study. The crossing with greatest point value is deemed most needed.

f. Crossing illumination - Accidents and/or incident situations occurring under darkness shall be utilized for decision making.

g. Sight distance - No additional factors are considered.

(Note: Items e, f, and g can also be defined under "Protective Devices")

C. Priority Evaluation for Protective Devices and Hazard Elimination

A final priority ranking which includes types of improvements is determined through an analysis of the previously defined office and field reviews, as a joint effort of VDOT and VDRPT. This produces a modified EAR, and all locations statewide are placed in order of the highest need to the lowest.

Crossing improvements are identified in a priority ranking with a crossing identification number. Locations are then submitted to the localities by October 31 of each year, for their consideration and application for funding.

Grade crossings are re-evaluated each year as determined through the data update in office and/or field review information. Approximately, twenty to thirty crossings are submitted for Federal approval annually for Section 130 funding usage. Annual submissions are based on funding availability.

Grade crossing improvements that are part of highway improvement projects are evaluated using all appropriate factors discussed above, and priority ranking established as if they were part of the Federal grade crossing improvement program. However, the schedule for actual implementation will be determined, insofar as feasible, by the schedule for the highway improvement. There may be instances where grade crossing improvement priorities are sufficiently high to justify implementing them in advance of the highway improvements.

D. Application Process For Protective Devices and Hazard Elimination

Grade crossings deemed greatest in need of improvements as defined in priority evaluation are submitted to the appropriate district or division administrator seeking locality participation for implementation of improvements.

1. <u>Localities Notified of Potential Improvements</u>

Each locality is notified of potential grade crossing improvements through appropriate VDOT divisions and districts follows:

a. VDOT Maintained Highways (Primary System) - The lists of potential crossing improvements are sent to the VDOT district administrators for their consideration and recommendations.

b. VDOT Maintained Highways (Secondary System) - The lists of crossing improvements are sent to the VDOT district administrators for submission to their respective county board of supervisors through the resident engineers.

c. City/Town Crossings - The lists of potential crossing improvements are sent to the Urban Division for submission to the appropriate localities.

(1) Metropolitan Planning Organizations (MPO) Areas - Where applicable, these areas are notified of potential crossing improvements through the Transportation Planning Division.

2. <u>Locality Participation and Application</u>

Localities, after receiving their grade crossing lists, shall submit applications for those locations that they are willing to participate with 10 percent funding. This must be accomplished by February 1, and each application must be submitted to the Traffic Engineering Division through the same channels by which it received the list. The Traffic Engineering Division will develop the implementation list as funding will allow. Crossing improvement locations are prioritized using the crossing identification number with the lowest number having the highest priority.

3. <u>Project Funding</u>

Rail safety projects will be financed based on 90 percent Surface Transportation Program (STP 10 percent set aside) funds and 10 percent local matching funds. State highway allocation funds for secondary, urban and/or primary roads are considered matching funds. Revenue sharing funds also may be considered. Section 130 funds can only be used for public crossings. Private crossings are not eligible.

E. FHWA Submission

After the applications have been forwarded through the appropriate VDOT district or division to the Traffic Engineering Division, they are prioritized according to their identification number. Crossings within the allotted funding are then submitted to FHWA for inclusion in the Section 130 Rail-Highway Safety Improvement Program.

F. Project Implementation

After Federal approval, the Traffic Engineering Division will submit the listing to the Programming and Scheduling Division of VDOT for inclusion into the Metropolitan and State Transportation Improvement Program. At this time appropriate VDOT divisions will be notified, and residencies, under the guidance of the Secondary Roads Division, will submit the SR-1 form and resolution. The Urban Division will proceed accordingly, and submit the U-9 form and resolution. These projects must be part of the Metropolitan and State Transportation Improvement Program.

The Department of Rail and Public Transportation will take the necessary action to secure the agreements with the rail companies, VDOT and the localities.