Highway Safety Improvement Program (HSIP)

Fiscal Year 2012-13

Highway Safety Improvement Program (HISP) – § 23 USC Section 148

Bicycle and Pedestrian Safety Program (BPSP)

Highway-Rail Grade Crossing Safety Program (H-RGCP) – § 23 USC Section 130

Traffic Engineering Division
Virginia Department of Transportation
Revised September 2011

Highway Safety Improvement Program

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Chapter 1 Highway Safety Improvement Program (HSIP)

1.1 Program Overview

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) authorizes the Federal surface transportation programs for highways, highway safety, and transit. Highway Safety Improvement Program (HSIP) is structured and funded to make significant progress in reducing highway fatalities and injuries on all public roadways and streets. A considerable increase in funding is provided that is almost double the amount under TEA-21. States are required to develop and implement an effective, integrated and coordinated Strategic Highway Safety Plan (SHSP) that involves a comprehensive, data driven approach to highway safety. Virginia's 2010 SHSP is a statewide, coordinated, integrated safety plan that provides a comprehensive framework (4E's: Engineering, Enforcement, Education, and Emergency Medical Services) for reducing highway fatalities and serious injuries and establishes statewide goals, objectives, and key emphasis areas. Section 1401 of SAFETEA–LU includes the program and policy language for implementing the new HSIP which is coded in the new Section 148 of Title 23 of the United States Code (23USC148). The code continues Highway-Rail Grade Crossing Safety Program in Section 130, with dedicated funding, as part of the HSIP.

The Virginia Department of Transportation (VDOT) has developed a HSIP that involves the identification of high crash locations, an analysis of problems and countermeasures, and the prioritization and scheduling of improvement projects. VDOT's HSIP program consists of the following programs: **Highway Safety Program** (HSP), **High Risk Rural Roads Program** (HRRRP), **Highway-Rail Grade Crossing Safety Program** (H-RGCP), and **Bicycle and Pedestrian Safety Program** (BPSP). The HRRRP is a set-aside of the HSIP funds for rural major collectors and lower functional class roadways maintained by VDOT. Separate HRRRP guidelines are provided in the web document on TED website since this program is more centralized collaboration between HSIP staff and regional traffic engineers. The BPSP was initiated in 2003 to dedicate resources to the most vulnerable highway users and will be funded out of Section 148 allocations (See Chapter 4).

1.2 Program Administration

The VDOT Traffic Engineering Division (TED) HSIP staff serves as the focal point for administration of the Federal and State highway engineering safety programs within the Commonwealth of Virginia.

VDOT continues to implement an annual review of proposed safety improvements for prioritizing and funding safety projects within the Commonwealth. Local governments, railroad companies, and VDOT Districts and Regional staff submit engineering studies of project proposals for locations recommended for improvement. The propose safety improvements are evaluated on a statewide basis rather than on a local or district basis, to ensure that locations in need of improvement have a better opportunity to be selected and funded. Appropriate use of HSIP funds is only for locations or corridors where a known, '*substantive safety*' problem exists as indicated by location-specific data on severe crashes, and where it is determined that the specific project action can with confidence produce a measurable and significant reduction in the number and/or consequences of severe crashes. To achieve the maximum benefit, the focus of the program is on cost effective use of the funds allocated for safety improvements.

Priority will be given to projects having higher total number of deaths and serious injuries affected.

1.3 Program Funding

The Highway Safety Improvement Program is now a core program with a specific set–aside for rail grade crossing safety (23USC130). New HSIP apportionment formula includes a factor on the ratio of the number of fatalities on each State's Federal-Aid System to total fatalities, the ratios of lane miles and vehicle miles traveled to national totals on each State's Federal-Aid Highways. For FY2012-13 Virginia is expecting to receive about $33 million for HSIP and $4.5 million for H-RGCP, including the state match. A minimum of ten percent of the HSIP allocation will be set-aside funds for BPS program improvements. HRRR program receives about $2.2 million each year.

Federal-aid projects are reimbursable for costs incurred. Requests for reimbursement must be submitted to VDOT for processing after FHWA authorization to proceed for each phase of project development.

1.4 Program Contacts

For additional information regarding the Highway Safety Improvement Program, please visit VDOT Traffic Engineering Division website, email or phone the contacts below:

VDOT Traffic Engineering Division website: www.virginiadot.org/business/trafficeng-default.asp

HSIProgram@VirginiaDOT.org or,

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HSP and BPS Programs: Mr. Tracy Turpin P. E., Phone (804) 786-6610

H-RGC Program: Mr. Michael Wray, Phone (804) 786-2822

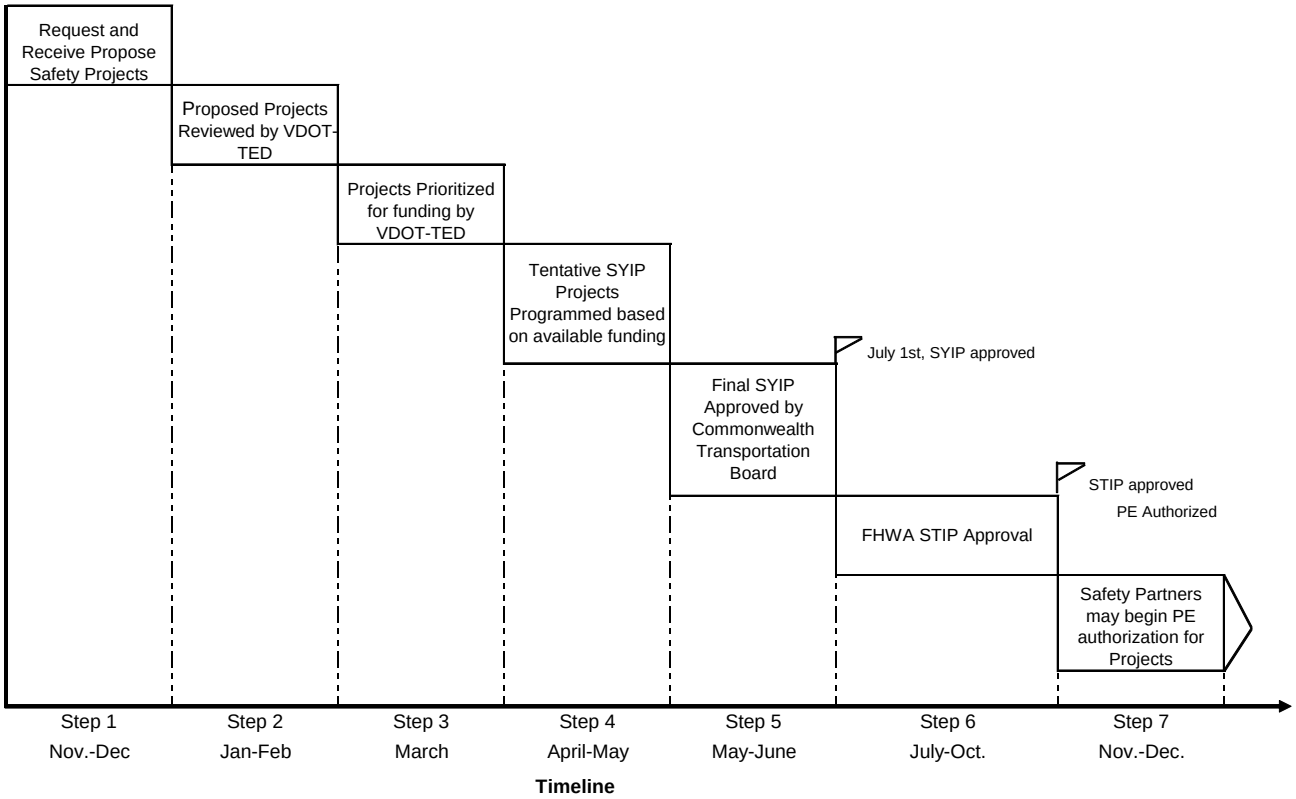
Chapter 2 HSIP Project Life Cycle

2.1 Proposed Safety Improvement Projects

2.1.1 Schedule

The HSIP annual project selection process follows both the federal and Virginia's fiscal years as shown in Figure 2-1. **Proposed safety improvements for FY 2012-13 Six-Year Improvement Program (SYIP) will be accepted through Sept, 2011.** Proposal engineering studies, review, and programming must allow time for Commonwealth Transportation Board approval of new projects. HSIP allocations for each fiscal year are now approved by FHWA as a line item of the fiscally constrained Statewide Transportation Improvement Program (STIP). FHWA funds are available in the next federal fiscal year that begins October 1st. After approval of the STIP, usually in October each year, project managers should request authorization preliminary engineering phase, and work on HSIP projects can begin. ***Reimbursement cannot be requested for any work done prior to authorization by FHWA and the Programming Division.***

Figure 2-1 FY2011-13 HSIP Project Selection Process



Note: The FHWA STIP is approved for obligation and expenditures in the federal October to September fiscal year.

The HSIP staff and Programming Division will coordinate with District Program Investment Managers (PIMs) and PE managers so that each project manager or local assistance coordinator liaison is aware of new projects.

2.1.2 Eligibility and Requirements

The eligibility criteria and procedures vary for the three safety programs. Generally speaking, the highway safety program targets vehicle only crashes and requires a Benefit/Cost analysis at high crash locations while Railway and Bicycle & Pedestrian Safety Program requires a risk analysis. Please refer to the corresponding chapters for information on eligibility, funding limit, requirements and project proposal procedures for each program.

HSIP Safety Partners are required to submit electronic version of the appropriate proposal form, in addition to a signed hardcopy. Electronic propose safety study forms can be downloaded from VDOT traffic engineering website. www.virginiadot.org/business/trafficeng-default.asp. Please refer to the corresponding chapters for electronic submission requirements for each program under HSIP. Supporting documentation, such as photos, large maps, study reports or letters, should be mailed to the State Traffic Engineer postal address on the form.

HSIP Safety Partners are required to rank multiple propose safety studies for each safety program (HSP, BPSP and H-RGCP). The priority number will be reflected in the proposal form as well as the electronic documentation name.

Please refer to Appendix E for project proposal checklist of each program.

2.2 Project Development

The implementation of projects involves phases of preliminary engineering, right-of-way acquisition, and construction. Throughout the project development process safety partners must work with the project managers and/or coordinators to ensure that the scope and cost of the project do not increase beyond that which was initially submitted. If additional improvements are appropriate for different target crashes at the same location, then another safety project proposal should be submitted or other funding resources to cover the related project should be explored. The related project may be coordinated and/or advertised with the safety project.

Furthermore, project schedules must be minimized since a safety issue has been identified. The intent of the HSIP is to expend federal funds on safety improvements that can be designed and constructed within three years. Federal funds must be authorized for PE within two months of the STIP approval. Safety Partners failing to get funds authorized within two months must request a time extension from TED. Projects are subject to removal if the extension is not granted by TED. **Projects should not require acquisition of significant rights of way, nor should they require extensive environmental review and mitigation.** The PE phase should be completed within 12 months of authorization.

2.3 Project Phases

2.3.1 Preliminary Engineering Phase

Upon receipt of federal authorization for preliminary engineering, work can begin on the design of the HSIP project. The preliminary engineering phase includes project scoping and

environmental documentation. Localities using a consultant for preliminary engineering must follow the required federal and state procedures for procuring professional services.

Within two months of authorizing preliminary engineering, an initial scoping meeting must be held to identify the project design elements, as well as to set project schedules. The HSIP proposal forms and associated engineering study reports should be used for the scoping report. Improvements that do not have targeted crashes and reductions identified from the engineering study (that is, there is not substantive safety concern) should not be added to the scope. Alternative low cost traffic engineering treatments may be considered for additional funding.

The HSIP project will be scoped to identify features that need to be constructed or upgraded based on the RSA report or engineering study of substantive crashes. The designer is responsible for identifying substandard design features that are encountered. However, a design exception should only be required if one of the identified substandard design features has a direct correlation to the type of crashes encountered in the project limits. For example, if the engineering and crash analysis identifies the need for improving shoulder width and the vertical alignment, but only the shoulder width is being improved, then a design exception is needed for the substandard vertical curve.

At the scoping, the VDOT project manager or coordinator should determine if the target advertisement date and estimated costs are reasonable. If the target advertisement date or estimated costs are not reasonable and need to be changed, the TED HSIP staff must be notified.

Cities, Towns and local jurisdictions have the option of administering the design, advertisement and construction of their proposed safety project(s) or allowing VDOT to administer the project(s). If the jurisdiction elects to administer a project, then the locality must ensure that all VDOT and FHWA design, advertisement, contracting and construction requirements are satisfied. The jurisdiction must ensure that VDOT is kept appraised of the project's status, including updated estimates, planned advertisement dates, and other information. VDOT uses this information to coordinate funding and provide the required state and federal authorizations.

As with any federally funded project, HSIP projects are subject to required environmental analysis. Safety improvement projects typically involve very little environmental documentation since most projects qualify for “Programmatic Categorical Exclusion” or project specific “Categorical Exclusion”. Projects with greater environmental impact, such as needed drainage improvements or projects in historic districts require additional analysis and documentation.

2.3.2 Right-of-Way Acquisition Phase

Safety projects should not require acquisition of significant rights of way, nor should they require extensive environmental review and mitigation. Right-of-way acquisition may be authorized during the preliminary engineering phase. For no-plan and minimum plan projects, acquisition should adhere to VDOT R/W policy and procedures. Larger projects require approved right-of-way plans before right-of-way acquisition can begin.

2.3.3 Construction Phase

When preliminary engineering and right-of-way acquisition phases are completed on VDOT administered projects, the Scheduling and Contract Division prepares the construction bid and contract documents. Programming Division secures authorization to advertise the project. The recommendation for the award of a project is made and is submitted to VDOT’s commissioner

for approval. Should additional HSIP funds be needed upon review of the bid submissions, please contact HSIP staff for review and concurrence.

Federal regulations require all HSIP projects to be competitively bid. The only exception is when a "Cost Effectiveness Finding" is submitted to and approved by FHWA. The basis of this finding must be that VDOT state forces can construct the improvements at a considerably lower cost than advertising the project and receiving competitive bids. The finding must show both cost and time savings. Also, HSIP projects are not eligible for the Special Advertising and Award Process (SAAP).

Projects are also eligible for construction under an existing district-wide or locality-wide contract, provided the contract follows prescribed federal guidelines and have approval from the Commonwealth Transportation Board (CTB). Projects completed using regional contracts have generally included the installation of traffic control devices, such as traffic signals.

2.4 Project Monitoring

Once projects have been programmed and funds have been allocated, the VDOT-TED monitors the HSIP projects from inception to final voucher. The project monitoring process consists of tracking changes that occur to the following project functions: project advertisement dates, funding authorization dates, engineer's estimates and expenditures. TED will work with the safety partners to recalculate the benefit to cost ratio (B/C) if project costs increase to determine the amount of additional HSIP funding that is eligible. Attending field reviews, scoping meetings, reviewing and approving scoping reports may also be part of the monitoring process. The last phase of the project monitoring process is to evaluate and report the effectiveness to FHWA.

2.5 Program Evaluation

VDOT is required to prepare an annual HSIP report for submittal to FHWA documenting the safety improvements programmed, those obligated and completed with an assessment of the effectiveness of the program. To evaluate the effectiveness of each completed project, TED completes before-and-after crash studies. Crash statistics and traffic volume data (where available) are collected for three years before and after the construction period. Safety Partners from towns and cities must agree to provide information necessary for a post-construction evaluation. The data collected will also be used to assess and document crash reduction factors for selected HSIP improvements.

Chapter 3 Highway Safety Program (HSP)

3.1 Program Overview

Virginia's Highway Safety Improvement Safety Program's (HSIP) was formerly divided into the Hazard Elimination Safety (HES) and Bicycle and Pedestrian Safety Programs. With SAFETEA-LU, the HES Hazard Elimination Safety Program in Virginia has been renamed the Highway Safety Program (HSP). The primary objective of the HSP is to identify and improve locations where there is a high incidence of vehicle crashes, particularly those resulting in deaths or injuries, which support strategies to meet Virginia's Strategic Highway Safety Plan goals.

To provide state-wide equity in identifying and funding safety improvements, VDOT annually requests candidate projects from VDOT and local agency staff (**see Figure 2-1).** Each year HSIP staff fulfills the transportation safety planning requirements by producing District-wide listings of the high crash intersections and sections on VDOT maintained roadways and distributes them to VDOT regional traffic engineering staff. In the past these listings compare the annual crash rate of locations to a "critical rate" that is statically above the Construction District average rate for similar roadway types and configurations. These critical rate listings help VDOT staff identify high-crash locations that require further study and/or action to improve the measure of safety. Independent towns and cities must identify the high crash locations within their jurisdictions, since VDOT does not "locate" their crashes on non-VDOT system roadways at this time.

For intersections, the critical rate is slightly higher than the average crash rate and is expressed as the number of crashes within 0.03 miles (160 ft) radius of an intersection node per 1,000,000 entering vehicles (MEV) at the intersection. Average and critical rates are determined and summarized by district showing all counties within that particular district.

For highway sections, the critical rate is expressed as the number of crashes per 100,000,000 vehicle miles traveled (HMVMT) with average and critical rates calculated by district and by roadway system (interstate, primary, and secondary). Section rates are further summarized by characteristics of the route, number of lanes, divided/non-divided, control of access, urban/rural, and functional classification.

Recently HSIP staff has prepared listings for the engineering emphasis areas in Virginia's Strategic Highway Safety Plan. Two priority listings and maps are generated to rank intersection related crash locations and routes with the most severe roadway departure crashes in each jurisdiction. The information is available to VDOT staff on the Traffic Engineering Intranet site.

Further study is required for the locations identified with the most severe crashes. Study of crashes for a three year period could reveal a crash type or severity pattern occurring at an intersection or highway section. If a crash pattern is determined, a countermeasure may be identified to reduce or eliminate specific types of crashes or their severity. However, safety project proposals are not limited to the locations that are identified by HSIP transportation safety planning; however, candidate location should be derived by a systematic crash data or safety assessment driven method.

3.2 Project Eligibility

Safety projects implement countermeasure(s) to reduce the number and severity of crashes on any public road, including interstates, or public surface transportation facility. For safety improvement projects to be eligible for HSP funding there must be a documented crash history and *will be focused on areas identified as having the greatest need in the most current Strategic Highway Safety Plan (SHSP).* There may be some treatments that address a serious crash type and patterns, but that are not eligible for HSIP funding. *Some of the types* of work ineligible for HSIP funding are:

- bridge replacement
- general maintenance (maintenance of roadways, signs, signals, pavement markings, markers, etc.).

The keys to success in HSIP project selection will be 1) employing a data driven project selection process that focuses on reducing deaths and serious injuries; 2) studying the site and crash records for problem identification and contributing factors; 3) applying a full range of countermeasures proven effective in reducing crashes or severity and tailored to specific highway types or conditions, and 4) focusing on lower cost solutions that will enable more sites and/or mileage to be treated with the available funds. Eligible safety improvements have been categorized by VDOT as follows:

1. Traffic Sign and Marking Improvement
2. Traffic Signal and Operational Improvement
3. Channelization Improvement
4. Pavement Improvement
5. Roadway Widening
6. Shoulder and Roadside Improvement
7. Realignment Improvement
8. Illumination
9. Traffic Calming Improvement
10. Drainage Improvement

Some of the improvement categories are broadly defined. A detailed list of improvement types along with crash modification factors (CMF) and target crash type is provided in the "Improvement Type" sheet in the B/C worksheet (See Section 3.5.3 and Appendix B). Consult with the TED HSIP staff for clarification or questions regarding project categories and/or eligibility.

Projects completed under regional contracts are eligible provided the contract contains the appropriate federal language. Railroads and private roads are not eligible for HSP funding. Special Advertised and Awarded Projects (SAAP) are not eligible as well.

3.3 Project Funding

For FY2011-12, the HSP apportionment is expected to be about $33 million. Highway safety projects are federally financed at 90 percent with the state or locality providing 10 percent local match. All safety partners are normally required to sponsor the project and to be responsible for the 10 percent match. Local matching funds can come from state highway construction funds (primary, secondary, urban) or local jurisdiction sources. Since FY2008-09 Six Year Plan, however, VDOT allocated state funds to provide the required local match so projects have been completely funded. **VDOT anticipates providing the 10 percent local match for the FY 2012-13 safety projects; however, the safety partners should be willing and able to supply the local match should the state funding be unavailable.**

Since projects are prioritized based on the economic benefit/ cost ratio assessment, one of the major factors in the selection of projects is cost. In the past, projects costing more than $1,000,000 were not considered; often larger projects were assessed in segments or intersection approaches and then grouped together. Submitted projects estimated to cost more than $1,000,000 will be considered for FY2013; however, remember that significant increase in project cost will also affect the economic assessment used to prioritize selection for funding. *Any project exceeding the original scope cost estimate by more than 10 percent requires HSIP staff concurrence on the revised benefit-cost assessment and is subject to the removal of safety funds.* For cities and towns, any increase over the authorized project scope will be funded by the locality per the resolution agreement.

3.4 Project Requirements

Eligible safety improvement projects must encompass the following four factors:

(1) Projects must be relevant to the program purpose of reducing crashes, particularly injury and fatal crashes, or risks to motorists within the transportation network.
(2) Proposed improvements must match hazardous situations that are identified by crash data driven assessment of the network that is good transportation safety planning should identify the location.
(3) Safety Partners must demonstrate that projects will meet all the necessary VDOT guidelines and standards for design and construction to ensure that approved projects will be completed in a reasonable time period. For example, a project to install a traffic signal should provide a traffic signal warrant analysis[1] and the latest signal standards must be used.
(4) All projects must upgrade non-standard safety features to existing standards, when those features are related to the targeted crashes identified within the scope and work area of the engineering study (Roadway Safety Assessment). Requests for exceptions to this requirement will follow the appropriate design procedures. Further, all projects must meet the requirements of the Americans with Disabilities Act (ADA).

3.5 Safety Improvement Proposal Procedures

3.5.1 Eligible Safety Partners

Statewide, local jurisdictions and VDOT offices are eligible for HSP funding on all public roadways. All safety partners must be able to guarantee the required 10 percent match from the applicable highway system or local source.

3.5.2 Project Proposal Requirements

Starting with FY12 submissions of proposed highway safety projects, the ***request must include a Virginia registered professional engineer signed and sealed engineering study documenting the purpose and need of any improvements that impact the roadway, traffic operations, and traffic control devices (TCD)***. The elements and steps of a roadway safety assessment (RSA) that support the engineering study are documented on the TED-HSIP web page. Components that are re-engineering the existing TCDs will typically not need to be sealed studies. Please contact HSIP staff if you question the level of study required. The submitted RSA engineering study and proposal form will become the initial scoping document for the project.

[1] Safety Partners submitting projects to install traffic signals at new locations **must** submit a copy of the warrant analysis showing that the signal meets the criteria outlined in the most recently adopted MUTCD.

All highway safety projects submitted for consideration must be on the latest version of the HSP Safety Improvement Proposal form (**see on TED website**), in addition to the required engineering study. The requested information must be provided for each location, as incomplete proposals will not be processed. The following information is required for each proposed project:

- **Safety Partners Name and Mailing Address**

  The name and mailing address of the governmental agency, municipality, organization, citizen's group or private individual who are proposing a safety improvement project.

- **Project Manager Name, Title and Phone Numbers**

  The name, title, and daytime telephone and fax numbers of the individual who will be responsible for the management of the project.

- **Specific Location of Proposed Highway Improvement Project**

  This section must define the location and limits of the proposed work. Preferably, this information should provide a route number or street name, a pair of termini and the county, city or town. The termini should be expressed as a distance and direction from nearby intersections (e.g., US-522 from 0.02 mi S. of Rte. 739 to 0.32 mi N. of Route 739 in Frederick County). Please also include an appropriately scaled map and/or sketch showing the location of the proposed improvement(s).

- **Fully Describe Project**

  Describe the project in detail (e.g., *install left turn lane on US 522 southbound at Route 739* and not just *install turn lane*). The description must include a description of the present conditions, all the proposed countermeasure(s) **(see Appendix B for identifying countermeasures)**, and the type and scope of all work to be done. You must also include any associated work that will be completed in conjunction with the proposed project (like storm water system adjustments, utility relocation -- these improvements may be completed with alternate funding sources). Short statements regarding any needed right of way acquisition, utility relocation and/or environmental assessment[2] should also be included. **A sketch plan of proposed improvement must now be included with the submitted proposal package.** The sketch plan might be based on VDOT GIS integrator, aerial photo map, or CAD files. Additional photos and maps of the area are encouraged and recommended to help document existing conditions. **All of this information should be summarized from the engineering study that must also be submitted.**

  If the project includes the installation of traffic signals at a new location a copy of the warrant analysis must be attached to the propose safety study. Also, included in the propose safety study are collision diagrams or maps showing all crashes associated with the related safety proposal.

  The existing Average Daily Traffic (ADT) on all impacted segments (e.g. approaches to intersection) should be included in the description of the project. **Peak period vehicle turning movement counts are now required for proposed intersection improvements.** Additionally, the type of construction plans (complete, minimal or no plans) that will be required for the project must be indicated.

- **Proposed Project Construction / Implementation Schedule**

  The form includes an estimated timetable for the design and construction of the proposed improvements. The approximate dates should be indicated in month/year format.

[2] Most HSIP projects qualify for a "Programmatic Categorical Exclusion" simply because they are *safety* projects.

The Begin PE date should be set as November 2012 to allow for FHWA STIP approval and project authorization to begin. With this start, the advertisement date should be with 12 months but shall not be any later than January 2015 for projects added to the FY 2012-13 Program. The completion date of a project should not be any later than January 2016. **In other words, a project will be advertised in two years and completed in three years from STIP approval at the latest.** The safety partners are responsible for coordinating the design of the project.

- **Estimated Project Costs**

  The project proposal must show the estimated project costs broken down by PE, R/W and Utilities, and Construction. All HSIP projects need at least $5,000 in PE for VDOT Central Office processing and review. Do not add oversight costs to each treatment; rather add to the first treatment that will be annualized with any others in the economic assessment. The estimates should be as detailed and accurate as possible, utilizing VDOT's Project Cost Estimation System (PCES) worksheets. Safety Partners who do not have access to the PCES worksheets shall submit detailed costs with a descriptive reason for not using PCES. VDOT will work with Cities and Towns to coordinate with the Regional Traffic Engineers and Local Assistance Program Managers to ensure project cost estimates are consistent with PCES.

- **Signature**

  Signature of a representative of the safety partners with the authority to expend the required matching funds is required. Forms that are not signed will not be processed.

Electronic Submission

For FY 2012-13 proposed projects, all submissions must be received in VDOT's Traffic Engineering office by **September 30, 2011** to be considered for qualification of HSIP funds. **Proposals received after September 30th will not be considered unless notification in writing is provided requesting an extension.**

HSP Safety Partners are required to submit an electronic version of the Safety Improvement Proposal Form in addition to a signed hardcopy. Electronic forms may be downloaded from VDOT Traffic Engineering Division website. **Please do not email other large documentation files, such as the engineering study report, with the proposal form, rather send supplemental documents with the signed forms via regular mail to VDOT-TED**. The Proposal Form needs to be renamed as directed and e-mailed to HSIProgram@virginiadot.org. Multiple Propose Safety Studies submitted by one safety partner should be included in one email, as space allows.

- HSP Safety Improvement Proposal Form (spreadsheet) named in the format of **HSP_2013_"Physical Jurisdiction"_Project##.xls**.

Here "Physical Jurisdiction" refers to the jurisdiction of the proposed project location. "Project##" represents the priority ranking number of projects for **each** safety partner. For example, VDOT Richmond District submits 4 candidate projects for HSP and the project which ranks second is located in Chesterfield County. The "physical jurisdiction" for this project is "Chesterfield County". The above two documents for this project should be named as:

- HSP_2013_Chesterfield County_Project02.xls

The subject of the email should follow the following format: HSP_2013_"Safety Partner"_ Project Proposal(s)

For the projects developed by VDOT Richmond District, an email with the subject "HSP_2013_Richmond District_Project Proposals" should be sent.

3.5.3 Benefit/Cost Analysis

Proposed improvements are evaluated for eligibility based on the benefits from the expected crash reductions versus the cost of the improvement over a project life span. To determine the benefits, the latest three years of available crash reports related to the improvement are compiled by the severity of the crash. For projects on VDOT maintained roadways the crash data though the end of calendar year 2009 will be available for the FY2012-13 Highway Safety Project proposals. Local cities and towns may have additional months of crashes to report. **Proposals on non-VDOT maintained roads are required to submit three years of ALL Police crash reports (FR300's) within the project limits and to identify those crashes that are targeted for reduction, that is, crashes associated with the proposed improvement. A summary sheet to report all crashes in the study limits that documents type and severity is provided in the HSP Proposal Form Spreadsheet.** Proposals on VDOT maintained roads must include the FR300 document number (copies are not needed). The total and project related crash count history will be used in the evaluation of completed projects. Collision diagrams or map of the related crashes indicating the type and severity (and other targeted factors) within the project limits are required as they provide helpful summaries for review and evaluation.

For FY2012-13 Highway Safety Program (HSP), the Project Proposal form and the economic benefit-cost analysis (B/C ratio) spreadsheet are combined into one spreadsheet to facilitate the electronic transmission of proposal data and information needed to program a project. The spreadsheet has the same form for intersection improvement projects and highway section improvement projects. A separate sheet is provided to document the identified problem and proposed improvements that should be obtained from the engineering safety assessment report. For those proposed improvements without known crash modification factors (CMF[3]), the safety partners should document the expected risk reduction for those elements. Some examples of improvements that reduce risk are signing and marking or those for pedestrians.

A crash modification factor (CMF) is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site. The main difference between crash reduction factor (CRF) and CMF is that CRF provides an estimate of the percentage reduction in crashes, while CMF is a multiplicative factor used to compute the expected number of crashes after implementing a given improvement. **VDOT's benefit/cost calculations will continue to use CRF values.**

Mathematically stated, CMF = 1 - (CRF/100). For example, if a particular countermeasure is expected to reduce the number of crashes by 23% (i.e., the CRF is 23), the CMF will be 1 - (23/100) = 0.77. On the other hand, if the treatment is expected to increase the number of crashes by 23% (i.e., the CRF is -23), the CMF will be = 1 - (-23/100) = 1.23.

[3] Crash Modification Factors is the term used in the Highway Safety Manual to indicate either the reduction or additional proportion of crashes an improvement is expected to produce in the "after" period.

Please note that the B/C ratio calculation is only used to assess the eligibility of a proposed improvement for Highway Safety Program (HSP) funding. Improvements that provide expected crash reductions resulting in a benefit to cost ratio (B/C) greater than one (1.0) are eligible for HSIP funding. However, a high B/C ratio does not guarantee funding. Other factors such as the total targeted severe crashes, validity of improvement countermeasure; project cost and the time frame to complete the project are also considered to prioritize the eligible improvements. In general, quick improvement projects with no right-of-way acquisition that target high severe crash locations will receive more favorable consideration.

Instructions for the HSP Safety Improvement Proposal Form worksheet are provided in the Appendix A of this document. Safety Partners should strictly follow the instructions to ensure accurate and consistent results. All submitted data and calculations will be checked for accuracy by Traffic Engineering's HSIP staff.

3.6 Project Selection

States are required to develop and maintain a method to determine the eligibility and prioritize safety improvements on a statewide competitive basis. VDOT has developed a benefit-to-cost (B/C) ratio analysis and ranking process to prioritize improvement projects for Federal funding. To be eligible for HSIP funding, projects must have a B/C ratio greater than one or identify and document a known risk.

Once all proposed projects have been received, the TED will review and check all submittals to ensure the proposal follows VDOT and FHWA guidelines. FR300 crash reports will be reviewed to determine if the recorded crashes relate to the proposed type of improvement specified on the proposal form. Field reviews may also be conducted to help define the problem and the reasonableness of the proposed improvement.

Project selection follows a two step process. The first step is to determine the eligibility of the projects for HSIP funding. The second step is to prioritize eligible projects based on B/C ratio, total targeted severe crashes, project cost range, improvement types, engineering review and available HSIP funding. **Priority will be given to quick, low environmental impact solutions to high severe crash locations.**

After reviewing and ranking all of the propose safety studies on a statewide basis, HSIP staff submits the project information to Programming Division to be added to the Six-Year Improvement Program for the Commonwealth's Transportation Board approval. The approved HSP projects may be found on-line at www.virginiadot.org/projects/syp-default.asp

Listings of new projects are also available from HSIP staff contacts.

Chapter 4 Bicycle and Pedestrian Safety Program (BPS)

4.1 Program Overview

Bicyclist and pedestrian safety concerns often differ from motor vehicle-related concerns as non-motorized users are the most vulnerable to injury or death from a crash. Although bicycle and pedestrian involved crashes can cluster on a corridor or at a high risk intersection, they are typically more dispersed and random than vehicle crashes. Further, there is little information available on the potential crash reductions from engineering countermeasures. As such, safety benefit-to-cost (B/C) ratio analysis and ranking procedures used for highway safety improvements do not fully integrate factors addressing bicycle and pedestrian safety and risk. Given the limitation of prioritizing non-motorized improvements, VDOT has developed the Bicycle and Pedestrian Safety (BPS) program to specifically address these safety issues.

The purpose of the BPS program is to implement safety projects addressing both bicycle and pedestrian crashes and the potential for crashes in Virginia. The safety projects target the reduction in the number and severity, or the risk of and exposure to crashes. The intent of the program is to promote improvement projects that address a known safety problem, that are small in scale, and can be completed quickly. Hence, BPS projects should not involve moving many utilities, the acquisition of significant right-of-way, nor extensive environmental documentation and mitigation.

Furthermore, the program is intended to address bicycle and pedestrian safety concerns in locations with the potential for risk that typically do not have sufficient crash numbers needed to rank well for project selection under the traditional crash reduction methods. Proposed BPS projects are evaluated based on risk factors from documented purpose and need to compete against other like projects.

With the advent of the Safe Routes to School (SRTS) program from the SAFETEA-LU legislation, the BPS program will provide complimentary or phased safety improvements in eligible neighborhoods. SRTS is intended to improve and encourage biking and walking within two miles of K-8th grade schools. Projects programmed under SRTS will be funded 100 percent by FHWA. For more information on the SRTS program is available on the VDOT website at: http://www.virginiadot.org/business/trafficeng-default.asp

4.2 Project Eligibility

Eligible projects must address specific bicycle or pedestrian safety problems on any public road, public surface transportation facility, or publicly owned bicycle or pedestrian pathway or trail.

The eligible improvements for BPS program includes, but is not limited to, on-street facilities; shared-use paths; treatments for intersections, mid-block crossings, crosswalks; signs and pavement markings; accessibility features; and traffic calming measures. A list of crash types with recommended countermeasures, including cost estimates is provided in **Appendix C**. Projects that are not eligible for the program are bicycle parking, directional signing, landscaping, maintenance, traffic calming only for motor vehicles (i.e., no non-motorized traffic), and traffic management measures.

4.3 Project Funding

The BPS program will typically be funded using a 10 percent set-aside of the annual HSIP allocation from FHWA. For FY2012-13, the BPS apportionment is expected to be about $3.3 million with the local match provided by VDOT.

BPS program safety projects are federally financed at 90 percent with the state or locality providing 10 percent match. Since FY2008-09 Six Year Plan, however, VDOT allocated state funds to provide the required local match so projects have been completely funded. **VDOT anticipates providing the 10 percent local match for the FY 2012-13 safety projects; however, the safety partners should be willing and able to supply the local match should the state funding be unavailable.**

4.4 Project Requirements

Eligible project proposals must encompass the following five factors:

(1) Projects need to be relevant to the program purpose of reducing crashes or risks for bicyclists and pedestrians within a transportation network. Submittal of non-motorized crash analysis can support that the location or corridor is a priority for the jurisdiction.
(2) Proposed improvements must match existing hazardous situations. Documented master or area plans and roadway safety assessments that address non-motorized travel provide supporting information.
(3) The proposed project cost should be less than $500,000 but higher costs and phased projects over multiple years will be considered.
(4) Safety Partners must demonstrate that projects will meet all the necessary guidelines and standards for design and construction to ensure that approved projects will be completed in a reasonable time period. For example, proposed installation of a traffic signal should provide a traffic signal warrant analysis.
(5) All projects must upgrade non-standard safety features to existing standards, when those features are within the scope and work area of the project. Requests for exceptions to this requirement will follow the appropriate procedures. Further, all projects must meet the requirements of the Americans with Disabilities Act (ADA).

4.5 Safety Improvement Proposal Procedure

4.5.1 Eligible Safety Partners

Both state and local agencies are eligible for Bicycle and Pedestrian Safety Program (BPS) funding. All Safety Partners must sponsor the project and be able to guarantee identify funding for expenses above the initial project estimate from the applicable highway system or local source.

4.5.2 Project Proposal Requirements

The BPS project proposals will follow either an engineering or planning level submittal track. ***Starting with FY12 submissions of proposed projects, the request must include a Virginia registered professional engineer signed and sealed engineering study documenting the purpose and need of any improvements that impact the roadway, traffic operations, and traffic control devices (TCD) by providing new devices, features or elements.*** The components and steps for conducting a roadway safety assessment (RSA) to complete an engineering study are documented on the TED-HSIP web page. Components that are re-engineering the existing TCDs or providing new facilities outside of the travelway typically will

not need to be sealed studies and may be submitted with planning level documentation. Please contact HSIP staff if you question the level of study required. The submitted RSA engineering or planning study and proposal form will become the initial scoping document for the project.

BPS project proposals require a description of the problem, a description of the solution proposed to address the problem, the proposed project schedule and cost, and a description of how the project will benefit the community and is supported by the submitting agency and community. Each project proposal submission *must* also include the following information:

- Completed, and current BPS Safety Improvement Proposal Forms
- Supporting safety analysis, such as crash data analysis and/or crash reports for the location or corridor, if applicable
- Project drawing or sketch showing existing conditions and the proposed improvement (hand drawings are acceptable) and relevant photographs. The sketch shall identify any potential impacts such as drainage, utilities and right-of-way
- Cost estimates using VDOT's PCES or recent line item costs
- Supporting documents and sealed engineering studies, if applicable

Each of the five areas listed on the Safety Improvement Proposal Form must be completed. Well-documented proposals are more likely to receive higher scores and ranking for funding priorities. If extra space is needed to supply pertinent information, please use additional sheets and attach planning or engineering studies. A separate proposal form must be completed for each candidate location, and there is no limit to the number of proposals submitted.

Project proposals on VDOT maintained systems should be vetted through Regional Traffic Engineering staff. Time should be allowed for review from other disciplines, particularly design engineers, to concur with constructability and impact issues.

Electronic Submission

Safety Partners are required to submit electronic version of Safety Improvement Proposal Forms documents in addition to a signed hardcopy. Electronic proposal forms are available from VDOT Traffic Engineering Division website. Please do not email other large documentation files with the proposal forms, rather send supplemental documents with signed forms via mail to VDOT-TED. The following documents need to be renamed as directed and e-mailed to HSIProgram@virginiadot.org for each project proposal. Multiple proposed projects submitted by one safety partner should be included in one email, as space allows.

- BPSP Safety Improvement Proposal Form (MS-EXCEL) named in the format of **BPSP_2013_"Physical Jurisdiction"_Project##.xls**

Here "Physical Jurisdiction" refers to the jurisdiction of the proposed project location. "Project##" represents the **priority ranking number** of projects for each safety partner. For example, VDOT Richmond District submits 4 candidate projects for BPSP and the project which ranks second is located in Chesterfield County. The "physical jurisdiction" for this project is "Chesterfield County". The above justification form document for this project should be named as:

- BPSP_2013_Chesterfield County_Project02.doc

The subject of the email should follow the following format: **BPSP_2013_"Safety Partner Name"_Project Proposals** For the second project of VDOT Richmond District, an email with

the subject "**BPSP_2013_ Richmond District Project Proposals**" should be sent with the above documents attached. All proposal forms and supporting safety studies for FY 2011-12 projects must be received in the Traffic Engineering Division office no later than **September 30, 2011**. All pertinent addresses are located on the bottom of the proposal form.

4.6 Project Selection

States are required to develop and maintain a method to prioritize safety improvements on a statewide basis. VDOT has developed a risk based purpose and need scoring to review and prioritize proposed BPS improvements submitted.

To effectively and equitably identify potential bicycle and/or pedestrian safety projects, a subjective 100 point-based scoring system is used to account for the following characteristics associated with these types of projects: minimal crash history that does not support a benefit/cost analysis; the potential for severe fatal and injury crashes; and well-documented safety hazards associated with each location.

The proposed project selection involves three phases: an initial review, a risk narrative review and scoring, and an engineering review.

The initial review addresses how each proposed safety project meets the minimum eligible criteria, including:

- Project eligibility
- Project requirements
- Required authorization signature for the mandatory 10 percent match (refer to BPS program funding)

The risk narrative review phase provides scores the following four factors:
(1) identification and demonstration of the problem (30 points),
(2) relevance of the solution to the problem and its potential to correct or improve the problem. Note sketch drawings and pictures of the location are needed for documentation (45 points)
(3) potential for timely implementation based on cost and schedule (15 points) and
(4) community support (10 points).

The engineering field review phase confirms that the existing problem matches the description of the proposed improvement project. This phase also looks for answers to questions raised regarding the proposed solution during the initial review phase, and also assesses the practicality and constructability of the project.

Projects are funded based on the final ranked scores, until fiscal year funds are exhausted. For inclusion in the Six Year Improvement Program, the final listing is submitted each spring to VDOT Programming Division each year for the Commonwealth's Transportation Board approval. The approved BPS projects may be found on-line at www.virginiadot.org/projects/syp-default.asp

Listings of new BPS projects are also available from HSIP staff contacts.

Chapter 5 Highway-Rail Grade Crossing Safety Program (H-RGCP)

5.1 Program Overview

The purpose of the Highway-Rail Grade Crossing Safety Program (H-RGCP) is to reduce the risk and number of crashes involving trains at highway-rail grade crossings. Section 130 of Title 23, US Code continues to provide funds to improve safety at any public highway-rail-grade crossing. A public road is defined as “any road under the jurisdiction of and maintained by a public roadway authority and open to public travel.” Private crossings are located “on a private roadway … not maintained by a public roadway authority.” and are not eligible to be funded within this program.

Over $130 million has been spent on upgrading more than 1320 rail grade crossing locations throughout the Commonwealth of Virginia, since inception of the Federal Highway Safety Act of 1973. This program has continued with subsequent acts and has provided funds to enhance safety at grade crossing locations. Virginia’s grade crossing inventory presently consists of about 1,899 public at-grade crossings.

5.2 Project Eligibility

Improvement projects are developed through safety partners submitting proposals that are reviewed and ranked on a “Statewide Competitive Basis.”

The federal legislation requires at least fifty percent of appropriated funds to be available for installation of warning devices, which include the following:

- Active warning devices (flashing lights and/or gates)
- Circuitry improvements (motion detectors and constant warning time predictors)
- Traffic and railroad signal upgrades to provide interconnection

Up to fifty percent is also available for elimination of hazards, including the following:

- Grade Separation
- Crossing closure
- Surface improvements (upgrade to hi-type crossing surface consisting of rubber or concrete, etc.)
- Standard signs and pavement markings
- General site improvements (improve sight distance restrictions, alignment, grade, etc)

Funding for the elimination of hazards shall not exceed two years of appropriated funds set aside for improvement types unless approved by the Traffic Engineering Division. These funds can also be used to cooperatively fund a project. However, H-RGCP safety improvements are intended to be quickly completed to minimize the identified risks. As such, projects that require right-of-way and/or have utility impacts will be scrutinized whether completion will occur within 36 months of approval.

5.3 Project Funding

Highway-Rail safety projects are federally financed at 90 percent with the state or locality providing the 10 percent match. For FY2010-11 VDOT allocated state funds to provide the required local match. **VDOT anticipates providing the 10 percent match for FY2012-13. Please be sure to provide current cost estimates. If there is an increase in the estimate once PE has been completed, the safety partners will be responsible for any additional funding over and above what was originally provided.** Note that work performed prior to the Commonwealth Transportation Board (CTB) approval or Federal project authorization will not be eligible for Federal reimbursement from Section 130 funds. Selected projects must be included in the Metropolitan Planning Organization (MPO), Transportation Improvement Program (TIP) and the Statewide Transportation Improvement Program (STIP) and approved by the Federal Highway Administration (FHWA).

5.4 Project Requirements

States are required to develop and maintain information and develop safety planning methods to prioritize crossings for improvements on a statewide basis. VDOT utilizes the Federal Railroad Administration's (FRA) "Accident Prediction Model"[4] (APM) as its methodology for establishing a statewide crossing improvement priority listing. The procedure is a mathematical formula, using a constant associated with the existing warning device status. The formula incorporates a factor for vehicle traffic, and number of trains that produce an "exposure index value." Additional factors utilized to compute the "accident prediction value" include:

- Through trains per day
- Maximum timetable speed
- Number of main tracks
- Highway surface
- Number of highway travel lanes
- Highway-Rail crashes

These "accident prediction values" are used as a tool to develop an annual preliminary ranking of crossings in need of further review for safety improvements. Since exposure is the primary component of this procedure, the greater the "accident prediction value", the more likely it is to qualify for funding.

5.5 Safety Improvement Proposal Procedure

Each year, the Traffic Engineering Division will submit highway-rail grade crossing inventory listings to the localities, railroads, and VDOT Regional Traffic Engineers for review of potential safety improvements at grade crossing locations within their jurisdictions. The Local Assistance Division and Regional Traffic Engineers are requested to work with, or forward these listings to, the appropriate persons in cities, towns and counties who may submit locations for candidate improvements. Utilizing the grade crossing list, the safety partners are requested to conduct engineering safety assessments including field reviews of the locations prior to submitting

[4] FRA uses the term accident rather than crash; references to the FRA methodology will use accident in Quotations

proposed safety improvements. Field reviews pictures and sketches are helpful to prioritize the safety needs of the candidate projects submitted.

Starting with FY12 submissions of proposed projects, the request must include a Virginia registered professional engineer signed and sealed engineering study documenting the purpose and need of any improvements that impact the roadway, traffic operations, and traffic control devices (TCD). The elements and steps of a roadway safety assessment (RSA) are documented on the TED-HSIP web page. Components that are re-engineering the existing TCDs or upgrading the crossing surface in-place typically will not need to be sealed studies. Please contact HSIP staff if you question the level of study required. The submitted RSA engineering study and proposal form will become the initial scoping document for the project.

In addition to the required RSA engineering study, all of the information requested on the Safety Project Proposal form (available on TED-HSIP website) must be submitted. A separate Safety Project Proposal form must be completed for each candidate location. **** NOTE: If signal upgrades and surface improvements are needed at an individual location, a separate project must be submitted for each improvement type. In the past, combining these improvement types in one project has slowed the installation process due to scheduling conflicts between the railroad's surface replacement and signal installation crews.** There are no restrictions on the number of project proposals that may be submitted; however, signing the proposal form indicates agreement to participate with 10 percent matching funds (should the need arise in the future). In addition, the project proposal form should not be altered. The following information must be included in the space provided:

- Name of the locality, group, or agency requesting the grade crossing improvement.
- Name, title, and telephone of the contact person who is submitting and managing the proposed improvement.
- Location sketch or drawing of the proposed grade crossing improvement.
- Type of improvement.

With the exception of grade crossing improvements within railroad right of way, all improvements on VDOT or locality right of way shall include a cost estimate as detailed and accurate as possible using VDOT's Project Cost Estimating System (PCES). Safety Partners who do not have access to the PCES worksheets shall submit detailed costs with a descriptive reason for not using PCES. VDOT will work with Cities and Towns to coordinate with the Regional Traffic Engineers and Local Assistance Managers to ensure proposed project cost estimates are consistent. Please contact the HSIP staff for direction on submitting projects that include highway improvements outside of railroad right of way. Typical project costs for rail improvements are provided in **Appendix D**. Provide any additional or updated information not provided on the inventory sheet that could improve the ranking status when evaluated. For example: increased ADT counts, school bus traffic, hazardous material vehicle crossing, and land use development. Signature of the authorized person responsible for expending the additional funds is required to be considered for H-RGC funding.

Electronic Submission

H-RGCP safety project proposal forms are required to be submitted electronically in addition to a signed hardcopy. Electronic forms may be downloaded from VDOT Traffic Engineering Division website. Please do not email large electronic files documenting the related engineering study, sketch and pictures with the Project Proposal form. Rather, send supplemental documents with the signed forms via mail to VDOT-TED. Multiple proposed projects submitted by one safety partner should be included in one email unless the size is prohibitive. The

following documents must be renamed as directed and e-mailed to HSIProgram@virginiadot.org for each project:

• H-RGCP Safety Project Proposal Form (XLS) named in the format of **H-RGCP_2013_"Physical Jurisdiction"_Project##.XLS**. Here "Physical Jurisdiction" refers to the jurisdiction of the proposed project location. "Project##" represents the **priority ranking number** of projects for each safety partner. For example, VDOT Richmond District submits four candidate projects for H-RGCP and the project which ranks second is located in Chesterfield County. The "physical jurisdiction" for this project is "Chesterfield County". The above three documents for this project should be named as:
H-RGCP_2013_Chesterfield County_Project02.doc

The subject of the email should follow the following format:
H-RGCP_2013_"Safety Partner's Agency" Project Proposal(s).

All project proposals for FY12-13 must be received in the Traffic Engineering Division office no later than **September 30, 2011**. Where applicable, project proposals are to be submitted through the same channels by which they received the grade crossing inventory listings.

5.6 Project Selection

Proposals received for grade crossing improvement projects will be evaluated on a statewide basis. The grade crossing APM inputs are adjusted to incorporate additional data identified in the engineering study and proposal form, such as, vehicle type volumes, and physical characteristics. Based on proposal information received, candidate locations are again ranked in a statewide order using the FRA APM formula. Field review is conducted by HSIP staff to evaluate the crossing to confirm or adjust the proposed improvement as needed. This review considers the following components:

- **Sight distance** – sufficient sight distance for approaching motorists to make a safe stop. Sight distance also applies to vehicles stopped at rail crossings.
- **Roadway geometry** – hazards and limitations to approaching motorists resulting from roadway geometry such as a steep grade, narrow pavement, horizontal curves, angle of crossing, adjacent roadway improvements.
- **Adjacent land use development** – adverse safety effects, caused by congestion, conflicts, or other problems created by adjacent land use.

A final priority ranking, referred to as a Priority Index value, is determined through an analysis of the previously collected data and field reviews. Once this Index is determined, candidate locations are ranked statewide in descending order for funding. Projects are funded utilizing the federal safety appropriations until funds are exhausted. As part of the Six Year Improvement Program the final listing is submitted to VDOT Programming Division each year for the Commonwealth's Transportation Board approval before the July 1st beginning of the fiscal year. The final approved list will be posted on the TED website. In recent years approximately twenty to thirty crossing improvement projects were funded by the H-RGCP. There may be instances where crossing warning devices are scheduled as part of a roadway construction project and the proposed type of warning is an upgrade of the existing warning devices. When this occurs and diagnostic reviews determine a short term need for the installation of warning devices, the crossing improvement may be advanced in the implementation schedule.

5.7 Project Development

Projects are developed in accordance with project implementation procedures outlined in this section. Several VDOT divisions are involved in the project development by phase. The Rail Project Management Section (RPMS) of Scheduling and Contract Development Division (SCD) typically authorizes the project with concurrence from HSIP staff. VDOT's Programming Division processes federal project authorization requests for funding obligation with the FHWA.

5.7.1 Design

Facilities and equipment that are the responsibility of the railroad for maintenance and operation shall conform to the standards established in the VDOT's Roadway Design Manual, AASHTO's Policy on Geometric Design of Highways and Streets "Green Book" and FHWA's Manual on Uniform Traffic Control Devices (MUTCD). When design guidelines cannot be met, the current design exception or design waiver process established in the Roadway Design Manual shall be followed.

Restrictions apply when a highway/railroad grade crossing is located within the limits of a Federal-aid project for construction of a highway or improvement of an existing highway. For such a location, the crossing shall not be opened for unrestricted use by traffic, or the project accepted by VDOT until the appropriate protective devices, advance warning signs, and pavement markings are installed and functioning properly. Recommended candidate grade crossing safety improvements are subject to approval by the HSIP staff based on prioritization and field evaluations. Traffic control devices and pavement markings shall comply with the latest edition of the MUTCD and VDOT supplements to the extent applicable to federal and state guidelines. Example: the MUTCD guidelines state advance warning signs (W10-1) SHALL BE installed for each public roadway approach at all public crossings.

5.7.2 Environmental Review

VDOT's Environmental Division is also responsible for conducting and documenting the necessary environmental reviews to ascertain any adverse environmental impacts. Typically these types of projects are exempt from the State Environmental Review Process (SERP). However, the Environmental Division makes this determination on a project by project basis. Environmental documents are required for all actions before federal funds can be spent on the construction phase. Based on past experience, Grade Crossing Improvements Program projects, typically do not involve significant environmental impacts, and qualify as "Programmatical Categorical Exclusions (PCEs)" when such projects:

- Do not induce impacts to planned growth or land use for the area
- Do not require any relocation
- Do not require substantial land acquisition except when acquired for preservation purpose as permitted by categories in PCE Agreement
- Do not require a U.S. Coast Guard permit
- Do not require an individual U.S. Army Corps of Engineers Section 404 permit
- Do not have an adverse effect on historic properties
- Do not use land (i.e. convert it) protected by Section 4(f)
- Do not involve significant air, noise, or water quality impacts
- Do not have significant impacts on travel patterns
- Do not require any changes in Interstate access control
- Do not otherwise; either individually or cumulatively, have any significant environmental impacts

5.7.3 Agency and Railroad Agreements

Where construction of a Federal-aid project requires the use of railroad properties or the adjustment to railroad facilities there shall be an agreement in writing. This agreement shall be compiled by VDOT's Rail Project Management Section (RPMS) and submitted to the appropriate railroad company for a detail engineering estimate, design and signature. The agreement is returned in a timely manner to VDOT for signature and processing with FHWA. Note: a third party agreement signature is required where VDOT does not maintain the roadway over the crossing such as within incorporated cities. The written agreement shall include the following information where applicable:

- A detailed statement of the work to be performed by each party
- A method of payment
- The extent to which the railroad is obligated to move or adjust the facilities at its own expense
- The railroad's share of the cost
- An itemized cost estimate of the work to be performed by the railroad
- The method to be used for performing the work, either by railroad forces or by contract
- Identification of the party or parties responsible for maintenance
- The form, duration, and amounts of any needed insurance
- References to plans and specifications

The railroad company shall provide a plan sheet consisting of:

- Crossing Layout
- Existing warning system
- Width of pavement/proposed width
- Track layout
- Significant topography
- Limits of right of way
- A profile of highway approaches
- Other details sufficient to allow proper location of protective devices

5.8 Project Implementation

Improvement projects will follow the following procedures in the project implementation phase.

1. Upon federal authorization the Rail Project Management Section shall notify the railroad company in writing to proceed with phase of work as described in the agreement.
2. The railroad company shall take the appropriate action to order equipment and begin work as scheduling permits and complete the project within a timely manner. Project implementation will take approximately twelve months.
3. The railroad performs the Force Account work, or, if non-railroad (highway) work is involved, the work is performed by VDOT forces or VDOT contract forces. VDOT audits all bills for compliance with applicable Federal regulations to determine the eligibility of the items.
4. When project is completed, the appropriate party will be responsible for installing and maintaining the warning signs and pavement markings outside of railroad right-of-way.
5. The railroad companies shall issue an "in-service" notice to the appropriate sections within VDOT when work is complete. VDOT Districts where work is performed shall prepare a C-5 and copy the HSIP staff after final inspection has been performed.
6. VDOT Rail Project Management Section shall process final bills with the Fiscal Division as received from the railroad companies.
7. VDOT performs a project audit, responds to any audit exceptions and prepares a Final Voucher for submittal to FHWA for approval.
8. The railroad, VDOT's HSIP Section and the Rail Project Management Section shall record and maintain project documentation upon completion and final audit.
9. Evaluation is conducted on a statewide basis.

5.9 Program Administration

The Highway-Rail Grade Crossing Safety Program (H-RGCP) is administered by the Highway Safety Improvement Program section in the Traffic Engineering Division of VDOT. The objective of the program is to reduce the number of injuries and fatalities at grade crossings include the following:

1. Establish a multi-year program that is updated annually, on a schedule that meets the needs of the VDOT District Offices, Cities and MPOs and other localities in building their Regional and Federal Statewide Transportation Improvement Programs.
2. Ensure that the most cost effective projects are being selected and that the objectives of the (H-RGCP), as defined in Federal law are being met.
3. Implement a structured process to approve or disapprove cost changes and changes in the scheduling of projects to encourage timely use of funds.

Appendix A

HSP Propose Safety Study Form and Instructions

HSIP-Proposal (Rev 05/12/11)

Virginia Department of Transportation

Highway Safety Improvement Program

HSP Proposed Safety Improvements FY2012-13

UPC #:

Receive#

HSIP file

Initiate Date (for office use only)

Agency: | Project Manager: | Tel: | Email:

Street Address: | Fax: | VDOT District | VDOT Region

City, State, Zip | Priority # | If submitting 2+ proposals | Repeated Proposal from prev. yrs?

Program Type	Project Type	County	Route (Include Name)	System (1)	Traffic Control	From/Major Road (HTRIS Node/Offset If Applicable)	To/Cross Road(HTRIS Node/Offset If Applicable)	Study Period Begins	Study Period Ends
HSP_Regular	SEGMENT								

Functional Class Code		Area Location Code		Federal System Code	

Briefly Describe Problem and Proposed Work	

Crash Data (Collision Diagrams/ Maps are required with all proposals)

Severity		Crash Type: Rear End	Sideswipe Same Direction	Left Turn	Right angle	Run off Road	Head On/ Sideswipe - Opposite	Pedestrian	Other(1)	Other(2)	Total Related Crashes	Total Crashes at This Location
Fatal	K=1 or 5										0	
Personal Injury (PI)	A=2										0	
	B=3										0	
	C=4										0	
PDO	PDO										0	
	Total											

Notes For traffic data , please fill corresponding section for intersection and section projects. Do not fill both traffic data sections.

Traffic Data (Inter.)	Period	Enter. ADT	NB Ent. ADT	SB Ent. ADT	EB Ent. ADT	WB Ent. ADT	Other leg Ent. ADT	# of Approaches	Crash Rate (Intersection)	Critical Rate (Intersection)	Inventory NODE	Traffic Annual Growth Rate
												0.02

Traffic Data (Section)	Period	2009	Sec1	Sec 2	Sec 3	Sec 4	Sec 5	Total/ Average	Speed Limit (Average)	Crash Rate (Section)		Top 5%
	Section Length (Mile)							0				
	Average AADT								Lane Width (ft)	Critical Rate (Section)		
	Number of Lanes											

Improvement Action

Number of Improvements | Discount Rate: 5.0%

Number	Improvement Description	Service Life	PRF	PRI	PRPD	Project Cost: PE cost plus $5000(2)	R/W&Utility	Construction	Annual Initial Cost
1									
2									
3									
4									
Total						Total Initial Cost	$ -		$ -

NOTE: 1. A local resolution is required upon notification of program approval for secondary road and urban projects 2. VDOT District and Central Office personnel charge review and administration time to project managed by localities. Safety Projects not managed by VDOT shall include a minimum of $5,000 for VDOT PE costs

Project Schedule (After STIP Approval)

Begin PE	Target Advert.	Begin Construction	Estimated Complete Date	Type of Plan
Oct, 2012				

Project Administrated by

B/C Calculation

Benefit	Total Annualized Benefit	Traffic Growth Factor(TGF)	Total Annual Benefit
	$ -	$ 1.00	$ -

Cost	Total Annualized Initial Cost	Total Annual Maintenance Cost	Total Annual Cost
	$ -	$ -	$ -

B/C=

Project Benefit

Type of Crash	Related Crash #	Annual Change in	Cost per Crash	Annual Benefit
K	0		$ 5,038,456	
A	0		$ 275,161	
B	0		$ 98,140	
C	0		$ 55,474	
PDO	0		$ 9,029	
Total	0	-		$ -

Signature of Sponsor with Authority to Expend 10% Matching Funds

Name (Print) | Signature | Date

VDOT anticipates providing the 10 percent match for the FY2012-13 ; however, the sponsor should be able to supply the local match if state funding becomes unavailalble. Please submit an electronic copy of this spreadsheet to HSIProgram@virginiadot.org and mail a paper copy with signature to the address below.

Mailing address:

***Attn:* HSP Improvement Proposal**

Mr. Ray Khoury, P.E.
State Traffic Engineer
Virginia Department of Transportation
1401 East Broad Street
Richmond, Virginia 23219

Counties:

Residency and County Staff are requested to submit proposed improvement safety studies through the Regional Traffic Engineer

(3) The yellow are required inputs and white areas are optional. The gray areas are automatically generated by embedded formulas.

(4) For all fields, please refer to "Instruction for FY2011-12 Highway Safety Project (HSP)" in the Appendix A of "HSIP Guideline"

HSIP-Proposals (Rev 05/11/11)

Virginia Department of Transportation

Highway Safety Improvement Program

HSP Proposed Safety Studies FY2012-13

Project #:

Receive#

HSIP file

Date Rec'd (for office use only)

Instructions for FY2011-12 Highway Safety Project (HSP) Proposal

For FY2011-12 Highway Safety Program (HSP), the project proposal documentation form and the economic B/C analysis are combined into one spreadsheet to facilitate the electronic transmission of proposal supporting data and engineering study findings (summary documentation).

Safety Partners are required to fill the yellow fields of the spreadsheet and submit an electronic version of the form to HSIProgram@virginiadot.org and a paper copy with signature. The white areas are optional input area and the grey areas are automatically generated by embedded formulas. All areas other than input areas are protected to ensure the accuracy and consistency of the worksheet.

Note that the B/C ratio calculation for each proposal is only used to assess the eligibility of a proposed improvement for Highway Safety Improvement Program (HSIP) funding. Improvements that provide expected crash reductions resulting in a benefit to cost ratio (B/C) greater than one (1.0) are eligible for HSIP funding. However, a high B/C ratio does not guarantee funding. Other factors such as the validity of improvement countermeasure, number of severe crashes targeted, project cost and the time to complete the project are also considered to prioritize the eligible improvements. In general, low cost, quick improvement and project targeting high crash locations will receive more favorable consideration.

The following gives detailed explanation of each field in the proposal form:

Safety Partners information

Fields in this section are self-explanatory.

General Information Section

ProgramType: Select the appropriate Propose Safety Study type. "Regular" refers to regular annual propose safety study open during the period of June to September each year. "HRRR" refers to propose safety study using high risk rural road funds allocated to each district.
VDOT District: Input the VDOT district that oversight the area
VDOT Region: Input the VDOT operational region that has oversight of the area
County: Input County/City name, such as Fairfax County, City of Richmond.
Route: Input route name of major direction, such as US1, SR6, Broad Street. If known, the 14 character VDOT name (Prefix, Route #, Suffix) should be provided.
System: If VDOT maintained road, select from "Interstate", "Primary" and "Secondary" ; If local maintained, select "Urban"
Traffic Control: Select appropriate traffic control option. For section improvement project, select the one with the right speed limit.
From/Major Road: Input the start limit for section project and input the name of the major road for intersection project, include HTRIS node and offset where applicable
To/Cross Road: Input the end limit for section project and the name of the cross (minor) road for intersection project, include HTRIS node and offset where applicable
Study Period Begins: Input the begin date of **three** year traffic crash data collection period in the format of mm/dd/yy

Study Period Ends: Input the finish date of **three** year traffic crash data collection period in the format of mm/dd/yy.
Functional Class Code: Select the functional class of study area from drop-down list
Area Location Code: Select area location code from drop-down list
Federal System Code: Select federal system code from the drop-down list
Briefly Describe Problem and Proposed work: A brief explanation of why this location is chosen for safety improvement by identifying current or potential safety problems or concerns and proposed cost-effective safety countermeasures. The detailed description can be input on second page.

Crash Data Section

Crash report information is needed to complete this section. "**Crash Summary" sheet must first be completed before completing this section.** "Crash Summary" Sheet can be found in the same MS-Excel file. Collision Diagrams, sketches and maps are required with all safety proposal submittals.

Crash Severity: The most severe vehicle occupant injury for each crash must be determined to categorize the crash using the KABCO scale. Since January 2004, the Virginia Police Crash Report (FR-300) indicates the severity of occupant injury in Field number 19; prior to 2004, Field # 15 of the FR-300 was used. The FR-300 Field 19 corresponding codes with the KABCO scale are as follows:

K= code of 1, dead before report (on scene), and code of 5, died later
A= code of 2, major visible injury
B= code of 3, minor visible injury
C= code of 4, complaint of but not visible injury
O= no codes, property damage only crash

Each crash must be classified by the most severe outcome for all the occupants for each crash targeted for reduction (related crash) by the improvement.

Crash Type: Several major types of crashes are listed; user can input additional collision types such as "Night", "Wet Pavement" in "Others (1)" and "Others (2)".
Total Related Crashes: Input the total target crashes related to the proposed countermeasures in this location. Please refer "improvement type" for target crash type for the countermeasure.
Total Crashes: Input the total crashes that occurred at this location, which should be more than or at least equal to Total Related Crashes. For example, include crashes on all approaches or other types not related to the improvement. This information will be used to evaluate the overall program effectiveness.

Traffic Data Section

Note: For traffic data, please fill corresponding section for intersection and section projects. Do not fill both traffic data sections.

Traffic Data (Intersection Project)

Period: Input the year of traffic data, such as 2003-05

Enter. ADT: Input Average Daily Traffic (ADT) entering the intersection on all approaches. That is, half of the total AADT on the approaching roadway links.

Crash Rate: Automatically calculated as $\frac{TotalCrashes * 1{,}000{,}000}{AADT * 365 * 3}$

Critical Rate: If known, input the critical rate for similar intersections in that VDOT District
NB Ent. ADT: Enter the North Bound Entering ADT
SB Ent. ADT: Enter the Sorth Bound Entering ADT
EB Ent. ADT: Enter the East Bound Entering ADT
WB Ent. ADT: Enter the West Bound Entering ADT
Other Leg En. ADT: Enter the Ent. ADT from other legs if applicable
The total number of the above entering ADT should equal to **Enter. ADT**
# of Approaches:

Traffic Data (Section Project)

Period: Input the year of traffic data, such as 2003-05
Section Length: Input the section length (mile)
Average ADT: Input the Average Daily Traffic (ADT) information
Number of Lanes: Input the number of through lanes in this section
Speed Limit: Input the speed limit on this section.

Crash Rate: Automatically calculated as $\frac{TotalCrashes * 100{,}000{,}000}{AADT * 365 * 3 * SectionLength}$

Critical Rate: If known, input the critical rate for a similar location in that VDOT District

Top 5%?: Input "Yes" or "No" depending on if it is one of the top 5 percent high crash locations identified each year

Traffic Growth Rate: Input the projected annual traffic growth rate for the area over the expected life of the improvement (normally based on last 10 to 20 years). This number will vary by jurisdictions and should be available from VDOT Transportation Planning offices.

Improvement Action Section

Number of Improvements: Enter total number of improvement actions (Contact HSIP staff if over 4 improvement actions are proposed)
Discount Rate: Equals to 5.0% (given by Central Office based on the latest Federal Reserve Fund rate as of 5/10/06.)
Improvement Description: Select improvement action from "Improvement Table"
Service Life*: Input the corresponding service life from "Improvement Table"
PRF: Percentage Reduction of Fatal Crashes; Input the corresponding number from "Improvement Table"
PRI: Percentage Reduction of Injury Crashes; Input the corresponding number from "Improvement Table" Sheet.
PRPD*: Percentage Reduction of Property Damage Only Crashes, Input from "Improvement Table" Sheet
Total- Service life: equals to maximum number of service life of all improvement actions.

Total-PRF: Equals $1-\prod_{1}^{m}(1-PRF_k)$, where m=number of improvement actions.

Total-PRI: Equals $1-\prod_{1}^{m}(1-PRI_k)$, where m=number of improvement actions.

Total-PRPD: Equals $1-\prod_{1}^{m}(1-PRPD_k)$, where m=number of improvement actions.

Project Cost

Costs are required to be generated by PCES or most recent line item costs used by locality.

PE Cost: Current value of Preliminary Engineering Cost for each improvement action
R/W&Utility: Current value of Right way and Utilities Cost for each improvement action
Construction: Current value of Construction Cost for each improvement action
Annualized Initial Cost: Annualized cost for each improve action over its service life

Project Schedule Section

Begin PE: Enter the expected Preliminary Engineering date
Target Advert.: Enter the Target Advertisement date
Begin Construction: Enter the expected Begin Construction Date
Estimated Completed Date: Enter the estimated completed date of the project
Type of Plan: Select from "Complete", "Minimal" and "No Plans"

Project Administrated by: Select from "VDOT" and "Locality"

B/C Calculation Section

Total Annualized Benefit: Equals the sum of Annul Benefit from the reduction of each related injury type crash

Traffic Growth Factor: Equals $(1+g)*\frac{(1+g)^n-1}{g\times n}$, where g =annual traffic growth rate and n =improvement action service life

Total Benefit: Equals Total Annualized Benefit * Traffic Growth Factor
Total Annualized Initial Cost: Sum of the annualized initial cost for all improvement actions.
Total Annual Maintenance Cost: Sum of the annual maintenance cost for all improvement actions
Total Cost: equals to Total Annualized Initial Cost +Total Annual Maintenance Cost
B/C: equals to Total Benefit/Total Cost for the defined life of the improvement.

Project Benefit

Related Crash #: Number of related crashes by severity type in the study period (3 years)
Annual Reduction: Annual reduction number of related crashes by severity type
Cost per Crash:
Fatal: $5,038,456[1]
Injury type A: $275,161[1]
Injury type B: $98,140
Injury type C: $55,474
Property Damage Only: $9,029[2]

Source:
1. CPI: Consumer Pricing Index HTTP://www.bls.gov/ecpi_dr.htm
2. ECI: Employment Cost Index HTTP://www.bels.gov/web/eci/echistrynaics.pdf

Benefit/Cost Analysis Methodology for VDOT HSIP Program

Assumption:

It is assumed that crash rate is linearly proportional to traffic exposure (using crash rate)

Basic Formula:

$$\frac{B}{C} = \frac{(NF \times C_f \times PRF) + (NI_A \times C_{IA} + NI_B \times C_{IB} + NI_c \times C_{IC}) \times PRI + (NPD \times AAPD \times PRPD) \times TGF}{\sum_i^m ((PECost_i + R/W\ \&\ UtilCost_i + ConstCost_i) \times K + AMC_i)}$$

Where:

NF = Number of related fatal crashes per year,

C_f = Cost of a fatal crash

PRF = Percent Reduction in fatal crashes

NI_A = Number of related injury A (incapacitating) crashes per year

C_{IA} = Cost of an injury type A (incapacitating) crash

NI_B = Number of related injury type B (Non-incapacitating) crashes per year

C_{IB} = Cost of an injury type B (Non-incapacitating) crash

NI_C = Number of injury type C crashes (possible injuries) per year

C_{IC} = Cost of an injury type C (possible injury) crash

PRI = Percent reduction in injury crashes

NPD = Number of related property-damage-only crashes per year

$AAPD$ = Annual average cost of property-damage-only crashes,

$PRPD$ = Percent reduction in property-damage-only crashes

TGF = Traffic growth factor = $\frac{(1+g) \times ((1+g)^n - 1}{g \times n}$, where g = annual traffic growth rate and n = improvement project service life

$PE\,cost_i$ = Estimated preliminary engineering cost of improvement measure i

$ConstCost_i$ = Estimated construction cost of improvement measure i

$R/W\ \&\ UtilCost_i$ = Estimated right-of-way and utility costs of improvement measure i,

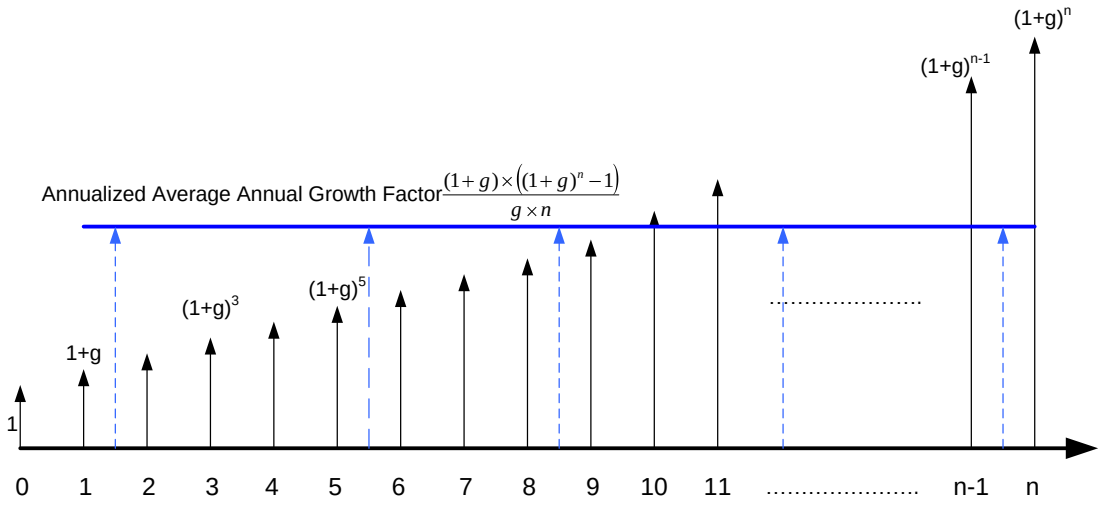
K = Capital recovery factor = $\frac{i(1+i)^n}{(1+i)^n - 1}$ where i=interest rate and n=improvement project service life

AMC = Annual maintenance cost for total improvement project

m = Number of improvement types

Note: This B/C is only used to establish the eligibility of candidate safety projects for HSIP funding. Another B/C using Equivalent Property Damage Only (EPDO) is used in the prioritization process.

Appendix: Derivation of Traffic Growth Factors



$$\text{Annualized Average Growth Factor} = \frac{(1+g)+(1+g)^2+(1+g)^3+\cdots\cdots+(1+g)^n}{n}$$

$$= \frac{(1+g)\times\left(+(1+g)+(1+g)^2+\cdots\cdots+(1+g)^{n-1}\right)}{n}$$

$$= \frac{1+g}{n}\times\frac{\left(-(1+g)^n\right)}{\left(-(1+g)\right)}$$

$$= \frac{1+g}{n}\times\frac{\left((1+g)^n-1\right)}{\left((1+g)-1\right)}$$

$$= \frac{(1+g)\times\left((1+g)^n-1\right)}{g\times n}$$

Appendix B

HSP Improvement Type Table and Crash Modification Factors

AASHTO Crash Modification Factors can be found at the following web site (url). Safety Partners are responsible for providing documentation and calculations for each CMF that is submitted.

http://www.cmfclearinghouse.org

Federal Codes for Safety Improvement Types

Code	Category	Abbreviation
1	(1) An intersection safety improvement.	Intersection Improvement (1)
2	(2) Pavement and shoulder widening (including addition of a passing lane to remedy an unsafe condition).	Pavement & Shoulder Widening (2)
3	(3) Installation of rumble strips or other warning devices, if the rumble strips or other warning devices do not adversely affect the safety or mobility of bicyclists, pedestrians and persons with disabilities.	Install Rumble Strips (3)
4	(4) Installation of a skid-resistant surface at an intersection or other location with a high frequency of crashes.	Insall Skid resistant surface (4)
5	(5) An improvement for pedestrian or bicyclist safety or for the safety of persons with disabilities.	Improve Ped & Bike (5)
6	(6) Construction of any project for the elimination of hazards at a railway-highway crossing that is eligible for funding under 23 U.S.C. 130, including the separation or protection of grades at railway-highway crossings.	Elimination of hazards at Railway-highway crossing (6)
7	(7) Construction of a railway-highway crossing safety feature, including installation of highway-rail grade crossing protective devices.	Construction of Railway-Highway Xing Safety features (7)
8	(8) The conduct of an effective traffic enforcement activity at a railway-highway crossing.	Effective traffic Enforcement at Railway-highway Xing (8)
9	(9) Construction of a traffic calming feature.	Construction of Traffic Calming feature (9)
10	(10) Elimination of a roadside obstacle or roadside hazard.	Elimination of roadside hazard (10)
11	(11) Improvement of highway signage and pavement markings.	Signage and Pavement markings (11)
12	(12) Installation of a priority control system for emergency vehicles at signalized intersections.	Priority control system for emergency Vehicles (12)
13	(13) Installation of a traffic control or other warning device at a location with high crash potential.	Traffic control or Warning device (13)
14	(14) Transportation safety planning.	Safety Planning (14)
15	(15) Improvement in the collection and analysis of safety data.	Collection & analysis of safety data (15)
16	(16) Planning integrated interoperable emergency communications equipment, operational activities, or traffic enforcement activities (including law enforcement assistance) relating to work zone safety.	Emergency equipment relating to workzone safety (16)
17	(17) Installation of guardrails, barriers (including barriers between construction work zones and traffic lanes for the safety of road users and workers), and crash attenuators.	Guardrail and other barriers (17)
18	(18) The addition or retrofitting of structures or other measures to eliminate or reduce crashes involving vehicles and wildlife.	Retrofitting structures (18)
19	(19) Installation and maintenance of signs (including fluorescent yellow-green signs) at pedestrian-bicycle crossings and in school zones.	Installation & maintenance of signs at bike-ped Xing (19)
20	(21) Construction and operational improvements on high risk rural roads.	Improvement on high risk rural roads (21)
21	(22) Conducting road safety audits.	RSA (22)

Appendix C

BPS Crash/Risk Groups with Recommended Countermeasures

The *Pedestrian Facilities Users Guide: Providing Safety and Mobility* (FHWA-RD-01-102, March 2002) identifies the following types of crash groups and recommended countermeasures.

Types of Crashes	Countermeasures	Estimated Costs	Source
Midblock: Dart/Dash	Curb Extensions	Curb extensions cost from $2,000 to $20,000 per corner, depending on design and site conditions	FHWA website
	Crossing Island	Costs range from $6,000 - $9,000	FHWA website
	Raised pedestrian crossing (speed table)	Raised crosswalks are approximately $5,000 - $7,000, depending on drainage conditions and materials used.	FHWA website
	High-visibility crosswalk striping		
	Overhead illuminated crosswalks		
	Overhead Lighting		
	In-pavement lighting		
	Safety lighting	Varies depending on fixture type and service agreement with local utility.	FHWA website
	Street lighting	Varies depending on fixture type and service agreement with local utility.	FHWA website
	Median improvements (refuge areas)	$10,000 to $30,000 per 100 feet, depending on the design, site conditions, and whether the median can be added as part of a utility improvement or other street construction project.	FHWA website
	Midblock ped. traffic signals w/ tacticle/audible feature		
	Roadway narrowing	Adding striped shoulders or on-street bike lanes can cost as little as $1000 per mile if the old paint does not need to be changed. The cost for restriping a mile of street to bike lanes or reducing the number of lanes to add on-street parking is $5,000–$10,000 depending on the number of old lane lines to be removed. Constructing a raised median or widening a sidewalk can cost $100,000 or more per mile.	FHWA website
	Paved shoulders (4' on each side)	$87,000 per mile	VDOT (2003)

Types of Crashes	Countermeasures	Estimated Costs	Source
Midblock: Dart/Dash	Bike lanes (4' on each side w/ curb and gutter - CG-6)	$320,000 per mile	VDOT (2003)
	Bike lanes (5' on each side w/ mountable curb- CG-3)	$340,000 per mile	VDOT (2003)
	Bike symbol on pavement	$120.00 each	VDOT (2003)
	Bike Lane symbol	$120.00 each	VDOT (2003)
	Arrow symbol for bike lane	$85.00 each	VDOT (2003)
	Marked crosswalks (pavement line 4")	$1.00 L.F.	VDOT (2003)
	Pedestrian bridge (overpass and underpass)	$500,000–$4 million depending on site characteristics	FHWA website
	Pedestrian barriers (gate, fencing, etc.)		
	Raised Intersection	The cost of a raised intersection is highly dependent on the size of the roads They can cost from $25,000 to $70,000	FHWA website
	Pedestrian Crossing Signs		
	Raised pedestrian crossing (speed table)	Raised crosswalks are approximately $5,000 - $7,000, depending on drainage conditions and materials used.	FHWA website
	Relocated bus stops (includes shelters)	1,000–$10,000	FHWA website
Multiple Threat	Recessed Stop Lines	Low. There is no extra cost when the recessed stop line is installed on new paving or as part of repaving projects. A "STOP HERE" sign can be used to supplement the recessed stop line.	FHWA website
	Traffic signals/pedestrian signals	$30,000–$140,000	FHWA website
	Add Signs	$50–$150 per sign	FHWA website
	Raised Median	$15,000 to $30,000 per 100 feet	FHWA website
	Pedestrian Crossing Signs		
	Pedestrian Signal Timing	Adjusting signal timing is very low cost, and requires a few hours of staff time to accomplish. New signal equipment is approximately $20,000.	FHWA website
	Pedestrian push button/pole in median		
Other Midblock	Relocated bus stops (includes shelters)	1,000–$10,000	FHWA website
	Remove Parking	$30–$150 per sign	FHWA website

Types of Crashes	Countermeasures	Estimated Costs	Source
Failure to yield @ unsignalized location	Roadway narrowing	Adding striped shoulders or on-street bike lanes can cost as little as $1000 per mile if the old paint does not need to be changed. The cost for restriping a mile of street to bike lanes or reducing the number of lanes to add on-street parking is $5,000–$10,000 depending on the number of old lane lines to be removed. Constructing a raised median or widening a sidewalk can cost $100,000 or more per mile.	FHWA website
	Remove Parking	$30–$150 per sign	FHWA website
	Crossing Island	Costs range from $6,000 - $9,000	FHWA website
	Curb Extensions	Curb extensions cost from $2,000 to $20,000 per corner, depending on design and site conditions	FHWA website
	Raised pedestrian crossing (speed table)	Raised crosswalks are approximately $5,000 - $7,000, depending on drainage conditions and materials used.	FHWA website
	Raised Intersection	The cost of a raised intersection is highly dependent on the size of the roads They can cost from $25,000 to $70,000	FHWA website
	Pedestrian Crossing Signs		
Bus-Related	Relocated bus stops (includes shelters)	1,000–$10,000	FHWA website
	Raised pedestrian crossing (speed table)	Raised crosswalks are approximately $5,000 - $7,000, depending on drainage conditions and materials used.	FHWA website
	Raised Intersection	The cost of a raised intersection is highly dependent on the size of the roads They can cost from $25,000 to $70,000	FHWA website
	Pedestrian bridge (overpass and underpass)	$500,000–$4 million depending on site characteristics	FHWA website
	Pedestrian Crossing Signs		
	Curb Extensions	Curb extensions cost from $2,000 to $20,000 per corner, depending on design and site conditions	FHWA website
	Traffic signals/pedestrian signals	$30,000–$140,000	FHWA website
	Pedestrian Signal Timing	Adjusting signal timing is very low cost, and requires a few hours of staff time to accomplish. New signal equipment is approximately $20,000.	FHWA website
	Pedestrian push button/pole in median		
	Overhead illuminated crosswalks		

Types of Crashes	Countermeasures	Estimated Costs	Source
Bus-Related	Overhead Lighting		
	In-pavement lighting		
Turning Vehicles @ Intersection	Safety lighting	Varies depending on fixture type and service agreement with local utility.	FHWA website
	Street lighting	Varies depending on fixture type and service agreement with local utility.	FHWA website
	Bike lanes (4' on each side w/ curb and gutter - CG-6)	$320,000 per mile	VDOT (2003)
	Bike lanes (5' on each side w/ mountable curb- CG-3)	$340,000 per mile	VDOT (2003)
	Reduce curb radius		
	RTOR Restrictions	$30–$150 per NO TURN ON RED sign. Electronic signs have higher costs.	FHWA website
	Recessed Stop Lines	Low. There is no extra cost when the recessed stop line is installed on new paving or as part of repaving projects. A "STOP HERE" sign can be used to supplement the recessed stop line.	FHWA website
	Prohibit Left Turns		
	ITS Technologies		
	Infared detection technology		
	Pedestrian Signal Timing	Adjusting signal timing is very low cost, and requires a few hours of staff time to accomplish. New signal equipment is approximately $20,000.	FHWA website
	Pedestrian push button/pole in median		
	Loop Detectors for bicycles (6X15 quad)	$540.00 each	VDOT (2003)
	Detector Amplifier	$200.00 each	VDOT (2003)
Walking along roadway	Clear Obstacles		
	Audible signal		
	Curb Ramps	$800 to $1,500 per curb ramp (new or retrofitted)	FHWA website
	Bike crossing (W11-1 30"X30")	$238.00 each	VDOT (2003)
	Bike lane ahead (R7-9 12"X18")	$110.00 each	VDOT (2003)
	Bikes prohibited (R5-6 24"X24")	$178.00 each	VDOT (2003)
	Bike route (D11-1 18"X24")	$151.00 each	VDOT (2003)
	Interstate bike route (D11-1 18"X24")	$151.00 each	VDOT (2003)

Types of Crashes	Countermeasures	Estimated Costs	Source
Walking along roadway	Bike lane ahead R3-16 24"X30")	$205.00 each	VDOT (2003)
	Sidewalks (5' wide)	$116,000 per mile	VDOT (2003)
Working/Playing in Road	Sidewalks (5' wide)	$116,000 per mile	VDOT (2003)
	Curb Extensions	Curb extensions cost from $2,000 to $20,000 per corner, depending on design and site conditions	FHWA website
	Crossing Island	Costs range from $6,000 - $9,000	FHWA website
	Raised pedestrian crossing (speed table)	Raised crosswalks are approximately $5,000 - $7,000, depending on drainage conditions and materials used.	FHWA website
	Raised Intersection	The cost of a raised intersection is highly dependent on the size of the roads They can cost from $25,000 to $70,000	FHWA website
	Overhead Lighting		
	In-pavement lighting		
	Safety lighting	Varies depending on fixture type and service agreement with local utility.	FHWA website
	Street lighting	Varies depending on fixture type and service agreement with local utility.	FHWA website
Crossing Expressway	Install/upgrade lighting		

Appendix D

Highway-Rail Grade Crossing Improvement Costs (FY 2011-2012)

Highway-Rail Grade Crossing
Improvement Projects and Costs for FY 2011-2012
Crossing Surface Improvement

Hi-type Rubber Crossing Surface – Single track, two lane road - $75,000

Hi-grade Rubber - Single track, two lane road – ($260/ft) $135,000

Lay-In Concrete Panels - Single track, two lane road – ($180/ft) $70,000

Platform Concrete Crossing Surface (Tub Type) - Single track, two lane road – ($260/ft) $110,000

Signal Improvements

Upgrade to 12" Lens - $50,000

Flashing Lights only - $130,000

Flashing Lights and Gates - $220,000

Cantilever Flashing Lights - $275,000

*Cantilever Flashing Lights and Gates - $325,000

If sidewalk present at Highway/Rail Grade Crossing:
Pedestrian Gate – separate pedestal - $55,000
Pedestrian Gate – add to gate - $35,000

If a Unidirectional will be required, add $90,000

Interconnection of Railroad Signals and Highway Traffic Signals – $40,000-$60,000

Source – VDOT's Rail Project Agreement Section

*Cantilever Flashing Lights and Gates are typically used where there are 2 or more travel lanes in one direction or sight distance is limited on either approach to a rail crossing
** According to the railroad companies, unidirectionals may be required when railroad "track" signals are in close proximity to any proposed automatic warning device installation

NOTE: The additional costs associated with traffic control, detours or lane closures, if needed, is not included in the installation estimates for rail upgrades/ improvements

Appendix E

HSIP Safety Improvement Proposal Checklist

Highway Safety Program (HSP) / High Risk Rural Road Program (HRRRP)

Improvement Proposal Checklist

- ☐ HSP Safety Improvement Proposal Form (with signature)
- ☐ Engineering study of crash and traffic analysis and proposed improvements
- ☐ Sketch of the proposed improvement showing potential impacts
- ☐ Crash Summary Sheet (from HSP Proposal Form)
- ☐ Turning Movement Counts if it is an intersection project
- ☐ Copy of FR300s on the Crash Summary Sheet
- ☐ A detailed breakdown of project cost by PE, R/W and Utilities, and Construction estimate from VDOT's Project Cost Estimation System (PCES) worksheets
- ☐ Additional photos and maps of the area are required

In addition to above hard copy documents, please provide:

☐ **Electronic submission** to HSIProgram@virginiadot.org with email subject: "HSP_2013_Safety partners" Propose Safety Study

Attachments:

- HSP_2013_Physical Jurisdiction_Project##.xls

Bike and Pedestrian Safety Program (BPSP) Propose Safety Study Checklist

- ☐ BPSP Safety Improvement Proposal Form (with signature)
- ☐ Engineering study of crashes, traffic analysis and proposed improvements
- ☐ Sketch of the proposed improvement showing potential impacts
- ☐ Crash Summary Sheet (from B/C worksheet), if applicable
- ☐ Copy of FR300s on the Crash Summary Sheet, if applicable
- ☐ A detailed breakdown cost by PE, R/W and Utilities, and Construction estimate from VDOT's Project Cost Estimation System (PCES) worksheets
- ☐ Additional photos and maps of the area are strongly encouraged

In addition to above hard copy documents, please provide:

☐ **Electronic submission** to HSIProgram@virginiadot.org with email subject: "BPSP_2013_Safety Partners" Propose Safety Study

Attachments:

- BPSP_2013_Physical Jurisdiction_Project##.doc.

Highway-Rail Grade Crossing Safety Program (H-RGCP) Propose Safety Study Checklist

- ☐ H-RGCP Propose Safety Study Form (with signature)
- ☐ Engineering study of crash and traffic analysis and proposed improvements
- ☐ Sketch of the proposed improvement showing potential impacts
- ☐ Additional photos and maps of the area are strongly encouraged

In addition to above hard copy documents, please provide:

☐ **Electronic submission** to HSIProgram@VirginiaDOT.org with email subject:

“H-RGCP_2013_ Safety Partners” Propose Safety Study

Attachments:

- H-RGCP_2013_Physical Jurisdiction_Project##.doc