

# Highway Safety Improvement Program: Proactive Safety Project Funding Guidelines

## Summary

To be proactive with improving safety, funding has been allocated to Virginia Department of Transportation (VDOT) construction districts based on the proportion of severe crash within their boundaries. Using the funds will require the completing the following five steps:

- I. **Transportation Safety Planning (TSP)** - Conduct **safety planning** to identify the high severe crash locations within a known high severe crash jurisdiction or corridor
- II. **Roadway Safety Assessment** - Perform a **detailed crash analysis** and safety assessment review for candidate countermeasure development
- III. **HSIP Funding** - Submit **roadway safety assessment** report and benefit-cost analysis for proposed improvements to VDOT's Highway Safety Improvement Program
- IV. **Implement Project - Execute** approved improvement projects in a timely manner
- V. **Evaluate Effectiveness** - Track project completion and **report crash experience** after three years from completion.

These guidelines provide the framework for this new approach to finding and mitigating deaths and injuries from crashes on all public highways in Virginia.

## Introduction

Highway safety improvements should be targeted at the locations with the most severe crashes and should be implemented as quickly as possible. To improve the process of identifying, funding and implementing crash countermeasures, VDOT's Highway Safety Improvement Program (HSIP) has allocated federal funds to the highest severe crash corridors and jurisdictions. This guideline first documents the background and requirements of the federal safety program and funding. Then the HSIP requirements and safety project development process is defined. The intent of this new approach is to be more systematic and proactive to quickly deliver safety improvements that will drive down the number of deaths and injuries on Virginia's highways and streets.

## Background

### **SAFETEA-LU**

The 2005 SAFETEA-LU federal legislation and appropriations modifications for highway funding was a paradigm shift to make highway safety a core formula-driven program. The US code changes removed the previous Hazard Elimination Safety (23 USC Section 152) program to institute a new Highway Safety Improvement Program (Section 148 HSIP) with more than double the funding. The Highway-Rail Grade Crossing (Section 130) program remains, but was also made formula driven. New programs were also added for High Risk Rural Roads and Safe

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Routes to School. With the additional funding came additional requirements that initiated a more data-driven approach to problem identification and solutions.

## ***FHWA Requirements***

SAFETEA-LU provided three principle new requirements to be administered through the FHWA for the state DOTs to perform to be able to utilize the additional HSIP funding:

- **Strategic Highway Safety Plan** - The first requirement was for highway safety stakeholders to investigate the crash data and define countermeasure strategies that encompass the 4-Es of Education, Enforcement, Engineering and Emergency Services to address the problems identified. The resulting safety planning document was also to be goal driven. To continue the increasing allocation of FHWA funding to HSIP, VDOT was to lead in the development of this comprehensive Strategic Highway Safety Plan (SHSP) by 2007. In October 2006 Virginia's Secretary of Transportation adopted a 2006-2010 SHSP that identifies key partners at the state level to address highway safety as a health issue to focus on several emphasis areas to save lives and prevent injuries from vehicle crashes. The plan sets a 2010 goal to reduce severe crashes in Virginia to save 100 lives and prevent 4,000 injuries. The statewide analysis for the plan found that about 60 percent of crash related injuries and deaths are in 20 of Virginia's local jurisdictions. Following the SHSP development, each stakeholder agency is to develop a Safety Action Plan (SAP) to implement the strategies under their jurisdiction. VDOT's SAP addresses 50 strategies by identifying and outlining the activities and steps to implement about 150 actions VDOT should consider to undertake or support through 2010.
- **Transportation Safety Planning** - Second, SAFETEA-LU requires State and MPO level Transportation Improvement Programs (TIP) to incorporate elements of Transportation Safety Planning (TSP) to integrate safety assessments into project selection and prioritization. In addition, Virginia's SHSP has TSP as a focus area with strategies to implement crash data-driven planning down to the local jurisdiction, highway corridor and high severe crash location level.
- **Reporting Top 5 Percent Locations** - Third, an annual reporting requirement was added to the HSIP's documentation of the prioritization and implementation of countermeasures and the effectiveness of completed projects. Every state must now report the top five percent of the high crash locations on the entire public roadway network. Unfortunately, VDOT's roadway inventory does not include the independent cities and jurisdictions who maintain their own roadways. So crashes cannot be located to find high crash locations in those localities. Therefore, at present VDOT can only report each year on the Interstate, Primary and Secondary systems that are inventoried and maintained by the Commonwealth. Currently, annual five percent reports have identified high crash rate roadway segments and intersections by category within each construction district. From

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these high rate location listings, the frequency or density of injury and fatal crashes are ranked statewide to find the top five percent locations.

### ***Highway Safety Improvement Program (HSIP)***

VDOT uses an effective procedure to review safety project application proposals from VDOT and locality staff. The annual process allows equitable consideration and prioritization of projects based on the crash reduction benefit expected for the cost of the proposed countermeasure (Benefit/Cost ratio) on a statewide basis. Highway projects costing less than \$1 million with a B/C greater than 1.0 are eligible for HSIP funding. To address the safety of vulnerable bicyclists and pedestrians, a risk reduction based program for associated improvements was added in 2003. Guidelines and requirements of the HSIP is located on the web at [www.virginiadot.org](http://www.virginiadot.org) (search for HSIP)

Until SAFETEA-LU, the annual applications for HSIP projects typically outpaced FHWA safety funding:

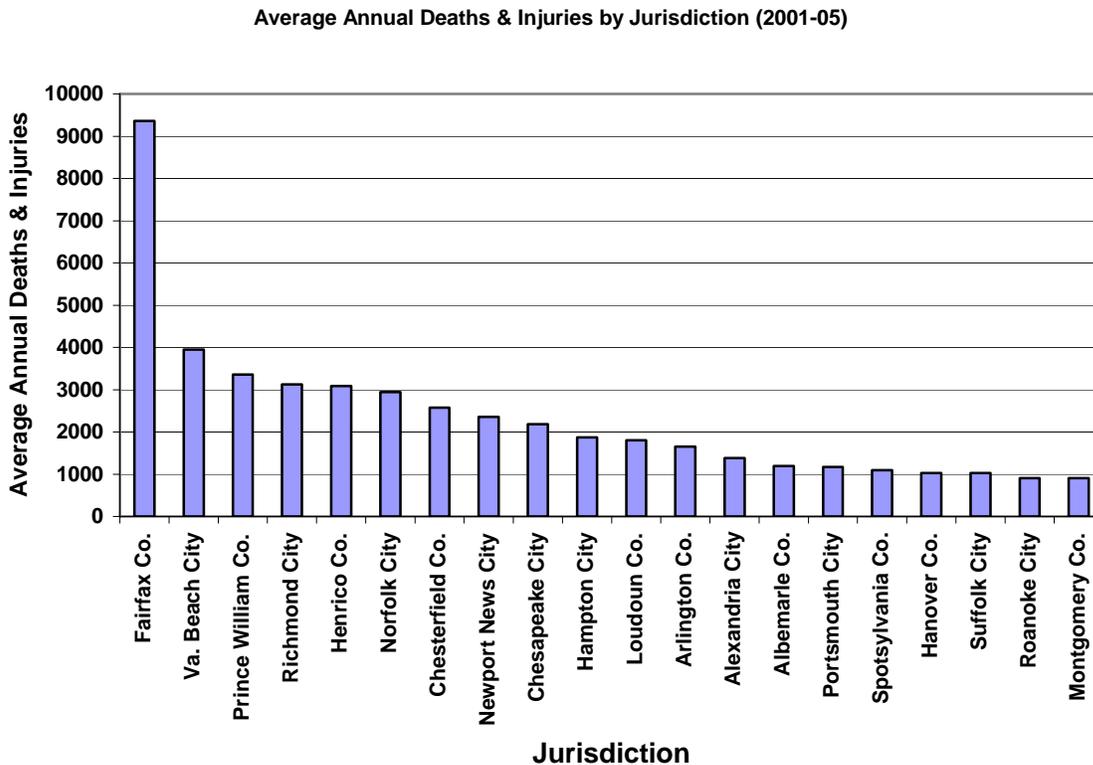
- For Virginia's FY 2006-07, with two years of federal SAFETEA-LU allocations, VDOT had an additional \$38 million after funding eligible HSIP projects. This additional funding was allocated to address high crash corridors VDOT identified on the Interstate and Primary systems. The funding was apportioned to the VDOT districts based on the number of fatal plus injury crashes within their boundaries.
- For the FY2007-08 HSIP, with a completed SHSP setting safety priorities, the \$20 million remaining after funding application projects was allocated to the top twenty jurisdictions with the most deaths and injuries from vehicle crashes. Figure 1 shows the five year annual jurisdictional average deaths and injuries reported in the SHSP that was the basis of the apportionments. Historically, over 73,000 traffic related deaths and injuries in Virginia each year<sup>1</sup>; 60 percent are in the top 20 jurisdictions.
- For FY2008-09 and 2010 HSIP, an additional \$15 and \$12 million dollars were allocated to each of the nine VDOT construction districts based on the number of fatal plus injury crashes within their boundaries.

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<sup>1</sup> In 2007 the number of injuries from crashes dropped below 70,000 for the first time

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Figure 1 Top 20 Jurisdictions Annual Deaths and Injuries from Vehicle Crashes



The process of developing and funding projects using the Proactive HSIP allocations essentially follows the HSIP requirements of:

- finding high severe crash locations,
- conducting detailed crash analysis,
- performing a field review roadway safety assessment and
- prioritizing proposed countermeasure improvements.

Guidelines and tools for implementing these RSA steps are available on the web at [www.virginiadot.org](http://www.virginiadot.org)

The remainder of this document provides the HSIP requirements, procedures and tools for implementing safety improvements in a systematic and proactive manner to reduce the severe crashes on a known high severe crash corridor or at a spot.

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## Requirements for Using Proactive Safety Funds

The intent of allocating Proactive HSIP funds is to be more proactive and timely in delivering safety improvements where the highest concentrations of severe crashes are occurring. In addition to local applications for improvements at high crash spots, this approach will endeavor to seek a systematic improvements in corridors and at spot locations with older infrastructure.

To reduce the time to delivery, the proactive HSIP funds are intended to be used for more systematic upgrades and improvements that have lower environmental impacts. Larger scale improvements, requiring environmental and right-of-way mitigation, that are identified through this HSIP process may be proposed during the annual application process or seek other related funds (for example, CMAQ and SYIP construction projects). However, the use to the proactive HSIP funds will continue to follow the regular requirements and procedures of the HSIP project development seeking improvements with the largest return (highest B/C ratio). Although many systematic improvements may not have known crash reductions, standard traffic engineering and safety upgrades will be eligible.

The following sections identify and explain the steps and procedures that will be used to implement safety projects with the proactive HSIP funds as follows:

1. **Transportation Safety Planning (TSP)** - Compile and report high crash locations in each jurisdiction
2. **Roadway Safety Assessment (RSA)** - Conduct a detailed crash review and roadway safety assessment of highway severe crash corridors or locations for candidate countermeasure development
3. **HSIP Funding** - Submit roadway safety assessment report and HSIP application documents for project approval
4. **Implement Project** - Program and implement project improvements
5. **Evaluate Effectiveness** - Track project completion and report on crash experience after three years from completion.

### I Transportation Safety Planning (TSP)

**Minimum Submittal** – *Top 50 intersection locations with most deaths and injuries from crashes*

The first minimum requirement is that a safety planning process be used and reported to identify high crash locations for potential treatments. The process of identifying high severe crash locations to review for potential HSIP projects has been ongoing for the VDOT system for decades. This is one component of transportation safety planning (TSP) that is federally mandated for the development of Virginia's State-wide Transportation Improvement Program (STIP). Other more aggregate or corridor level safety analysis and measures are also used for statewide TSP.

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At present, Traffic Engineering Division (TED) performs the TSP functions at the statewide level for the VDOT maintained systems. However, little is known and disseminated regarding how localities that maintain their own roadway network identify high severe crash locations and prioritize improvements. With the exception of the Hampton Roads area, regional (Metropolitan Planning Organization) efforts in TSP around Virginia are limited and tend to be more aggregate in comparison and scope. The following location-specific TSP process is intended to help with the more macro/regional planning that meets the minimum requirement.

Each year TED compiles a listing of intersections and roadway segments with crash rates statistically above average for the associated configuration within each VDOT construction district. The HSIP guidelines and the annual report to FHWA explain the procedures used within HTRIS to generate the listings, so they will not be repeated here. These annual listings, known as the Critical Rate reports<sup>2</sup>, may be as a starting point for mapping and investigating locations with the highest concentrations of crashes resulting in deaths or injuries. However, work has been initiated to use independent queries and mapping of the VDOT system crash data to find high severe crash intersections for each jurisdiction. An example map for Chesterfield County is also provided in Appendix A. So, VDOT staff has the TSP resources to identify high severe crash locations to develop HSIP projects in the VDOT maintained corridors that have been allocated proactive HSIP funds. Review should begin with the top five percent severe crash intersections or segments with the highest severe crash density on the VDOT system. Documentation of the systematic approach to address the top intersections and locations shall be submitted to HSIP staff.

Following the new SAFETEA-LU requirements [Section 148 (c) (1) (D)] for reducing traffic deaths and serious injuries on ALL public roads, VDOT has identified and prioritized the top five percent of high crash intersections and segments by also ranking the frequency of the fatal plus injury crashes at the critical rate locations on VDOT maintained roads. Similar analysis functions need to be conducted in the jurisdictions that maintain their own roadways. However, VDOT does not know if the highest crash locations are being submitted for HSIP projects nor if there are locations in the cities, plus Arlington and Henrico Counties, which may be in the top five percent locations of the Commonwealth.

Therefore, to meet the minimum federal requirements and to utilize HSIP funds assigned to the top severe crash jurisdictions, cities are required to compile and submit a listing of at least the top 50 (with more than one injury crash). If crash data summaries are readily available, then providing a ranked listing of more locations within the jurisdiction is desirable. For identifying the high severe crash locations, a minimum of the most recent three years of crash data analysis should be submitted (the same period that is used for a typical HSIP application). The principal data to be summarized are the crash frequency by severity and the people injured or killed in those severe crashes for different intersection configurations. The priority ranking for treatment action will be the *number of people* impacted for consistency with the measures and goals in the SHSP. Any past, ongoing or planned improvements at the intersection are also needed (to determine if assessment and countermeasure development is warranted). Should the locality not

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<sup>2</sup> Locations are critical if the spot crash rate is above the 95 percent confidence limit of the average rate for similar configurations in the VDOT construction district

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be able to generate a listing, HSIP funds may be used to code crashes and compile the listing (see developing engineering project under Roadway Safety Assessment)

Table 3 provides a sample template summarizing the crash and physical characteristic data elements and categories for ranking intersections. The aim is to use the data in a statewide listing, so determining the number of approaches and traffic control for those top intersections will match the VDOT categories.

A ranked jurisdictional listing of intersections is to be provided to VDOT HSIP program before any proposed HSIP projects using the jurisdictional allocations will be approved. The submittal should include a summary of the corridors and locations to be studied. HSIP staff will approve the listing and detailed safety study priorities. HSIP projects should first address the severe crash locations identified preferably along corridors that would benefit from systematic safety improvements. Reasons for not targeting the highest crash locations must be documented. These reasons could include systematic or capital improvement projects that were just completed, recently underway or planned in the near future. There may be planned land-use changes and roadway changes that are expected from development. However, longer term changes and improvements should **not** preclude review and proposal of safety upgrades and changes that could be effective for the next five, ten or more years during project funding and development.

**Optional Submittal** - *Supplemental information that could be included in the spreadsheet template includes:*

- 1. Intersection approach route numbers,*
- 2. daily traffic volumes*
- 3. and number of travel lanes*

*If crash data is available along roadway links, then jurisdictions have the option of providing severe high crash segments ranked based on the density of injuries plus deaths per mile. If traffic volume data is known then crash rates may be calculated by the jurisdiction to determine high crash rate intersections and/or segments as a third ranking measure.*

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**Table 3 Minimum Required Table Format of Ranked Severe Crash Intersections in Jurisdiction**

### Jurisdiction Severe Crash Intersections

Int_No	Major_Route Name	Minor_Route_Name	Traffic Control	Approach Legs	Year	PDO Crashes	Inj Crashes	Fatal Crashes	Total Crashes	People Injured	People Killed	PI+PK Rank	Tot Crash Rank	Recent Improve	Planned Improve	
123	Main Street	Washington Avenue	Sig	4	2004							1	7	ped signals in 2006		
					2005											
					2006											
					Total											
124	Main Street	Adams Avenue	Sig	4	2004							2	1		signal optimization	
					2005											
					2006											
					Total											
125	Main Street	Jefferson Avenue	Sig	4	2004							3	3		signal optimization	
					2005											
					2006											
					Total											
126	Main Street	Madison Avenue	Sig	4	2004							4	2		signal optimization	
					2005											
					2006											
					Total											
127	Main Street	Monroe Avenue	Sig	4	2004							5	5		signal optimization	
					2005											
					2006											
					Total											

Traffic Control = signalized or stop; Intersection configuration = number of approach legs; # Killed = persons killed in fatal crashes; # injured = persons injured in fatal and injury crashes; Rank by number of persons killed plus number injured and by total crashes, Improve = intersection has recent or planned improvements that would remove the location from potential HSIP project development

#### Optional Information

1. Major/Minor or Approach leg Route numbers
2. Intersection Entering ADT or approach ADT
3. Number of Lanes at Each Approach (Left, Through, Right)

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## II Roadway Safety Assessment (RSA)

**Minimum Submittal** – *Location specific RSA detailing the crash history, existing conditions and proposed countermeasures*

Subsequent to VDOT approval of the submitted transportation safety planning documentation, with the high severe crash locations identified, a comprehensive examination of the crash history and roadway environment is the next step in developing potential countermeasure treatments. VDOT has developed a Roadway Safety Assessment (RSA) process to conduct a formal safety examination of each location. With approval by VDOT HSIP staff, the jurisdiction may use their HSIP allocations to compile the severe crash location listings and/or conduct the RSAs. Additionally the same engineering project established for the planning and RSA/PE studies may be expanded to be used for the design of the approved countermeasures. Consultants may be contracted to perform these tasks. To use HSIP funds for these preliminary Engineering activities, the following must be submitted to HSIP staff at [HSIPProgram@VirginiaDOT.org](mailto:HSIPProgram@VirginiaDOT.org) for approval:

1. Scope including basic task descriptions, schedule and cost estimate
2. Who will be conducting the RSA: staff, consultants, mix

The RSA steps that will be used to develop HSIP projects are:

1. Conduct a detailed crash data analysis for the location
2. Select a multidisciplinary RSA team
3. Review crash data and related information with RSA team
4. Perform field review under various conditions as crash data details
5. Review information gathered to conduct safety evaluation and propose countermeasures
6. Report findings and recommendations
7. Present recommended countermeasures and HSIP application for approval

The detail and depth of an RSA should be based on the local knowledge of the identified high severe crash locations. The RSA may cover a corridor or individual isolated locations. If the intersection(s) are known to need updates and modernization of Traffic Control Devices that address multiple collision types, then the data analysis and field review should be thorough enough to support the documentation of crash and/or risk reductions for an HSIP application. For example, the intersections may be along a corridor that should have signal, signing and marking upgrades to present standards<sup>3</sup>. There may not be known crash reduction factors for every device needed, but the need and risk reduction from better visibility and conspicuity can be documented. However, if target crash type improvements are envisioned, such as left or right-turn improvements, then more data and analysis is needed to support the more involved and higher cost projects that would be proposed.

Further details on conducting the RSA steps are available on the web in the [RSA Guidelines](#) document. To standardize and to be complete when performing the field investigation, VDOT

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<sup>3</sup> Such as improvement provided in ITE's "The Traffic Safety Toolbox"

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has developed a Field Review Assessment Tool (FRAT) checklist and documentation spreadsheet which is also available on the RSA web page. A completed FRAT checklist spreadsheet file that documents existing conditions and lists recommended improvements will be an acceptable report for the RSA findings and proposed countermeasures. However, a RSA report and recommendations summary documented in a memo acceptable. The RSA guidelines provide a template for a typical report memo. Aerial photos and pictures of the existing conditions from multiple angles or approaches are required along with a sketch or drawing of the proposed improvements.

Example analysis for an intersection RSA conducted on Broad Street (US 250) in Henrico County are also provided in the above links for reference. For this example, the Broad Street corridor was assessed to find the high crash locations (TSP step to find intersections and segments). Then collision diagrams and trend information (Step 1) were prepared for several intersections and the RSA review was conducted at the intersection of Broad Street and Parham Road by HSIP staff (step 4).

The recommendations should address what can be implemented in the short, intermediate and long term relative to the cost and environmental or right-of-way impacts. The RSA report shall recommend and prioritize the proposed improvements into the following three categories related to potential funding:

Short-term	1. Roadway maintenance and operations related treatments that can be implemented within a few months
Intermediate	2. HSIP allocation eligible projects with minimal impacts that can be implemented in one or two years, such as: <ul style="list-style-type: none"> <li>a. Guardrail</li> <li>b. Traffic Signs</li> <li>c. Traffic Signals &amp; ITS</li> <li>d. Pavement Marking</li> <li>e. Roadway Lighting</li> <li>f. Roadside Safety including pedestrian facilities</li> <li>g. Shoulder Improvement including turn lane modifications</li> <li>h. Rumble Strips</li> </ul>
Long-term	3. Construction projects with more environmental and right-of-way impacts that require three or more years for project development. These may be submitted as annual HSIP application or funded with other capital improvement funds.

The HSIP funds allocated to the jurisdiction should be used to complete eligible improvements with short to intermediate time to implement and minimal environmental impacts.

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With a completed and documented RSA the next requirement is to submit an HSIP application based on the Benefits and Costs. Improvement project development is defined in the next section.

**Optional Submittal** – *Recent traffic impact or planning studies at the location*

### III HSIP Project Development

Conducting a RSA is essentially the process followed by applicants to develop and submit annual [HSIP applications](#) for safety improvements. The VDOT Six-year Improvement Plan jurisdictional (parent) projects are actually Program Items that will not be open to charges. Child HSIP projects, at specified locations, will be developed as soon as they are submitted and approved and will be linked to these parent projects. Having the Program Items approved in the STIP and TIP allows for quicker delivery not having to wait for the annual HSIP process. For example, the City of Richmond may choose to use their allocations in their parent VDOT Project Code 86733 to improve several signals on Broad Street. The signal modifications would be in a separate child Project set-up to be funded out of and linked to Project 86733. Depending on whether a jurisdictional preliminary engineering project has been established for the studies and design, the child project may only have construction and possibly right of way phases. However, projects with environmental and right-of-way impacts should be avoided as they will require federal process that will take additional resources and time.

With the crash and proposed countermeasure information compiled for the RSA, submitting the HSIP application information should be straight forward and quick. Applications should be submitted for each intersection or spot and for each segment based improvement. The applications do not need to address all the proposed improvements from the RSA. The process for HSIP staff to approve the development of a location specific project using the proactive funding is as follows:

1. Submit RSA report memo and HSIP application Benefit/Cost spreadsheets to [HSIPProgram@VirginiaDOT.org](mailto:HSIPProgram@VirginiaDOT.org)
2. HSIP staff review will approve, suggest revisions or deny proposed safety improvement scope and funding allocation within two weeks
3. The regional or jurisdiction traffic engineer who proposed the project and the VDOT district PE and Local Assistance will be notified that a new project will be developed
4. HSIP staff will forward District PE and/or Local Assistance staff information needed to generate new (child) project in Six-Year Plan Project Pool and submit form(s) to Programming division to transfer funds from the parent project
5. VDOT District PE or Local Assistance requests Programming Division for TIP/STIP action, preferably an adjustment not an amendment, depending on the expected impacts, and then authorization for each phase of the project.
6. Programming will notify HSIP staff, District PE and Local Assistance contacts when federal authorization and state authorization has occurred and the project is open to charges.

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7. HSIP staff will notify Regional and Jurisdictional Traffic Engineers and Local Assistance when notice to proceed has been given.

A summary of the process steps, from study to project delivery, and the responsibilities of the parties involved are provided in the project development summary document. For contracting purposes, multiple proposed improvements may be grouped together to be constructed together. For example, multiple intersection improvements along a corridor may be grouped.

### **IV Implementing Safety Improvements**

Safety projects may be administered by VDOT or the locality as determined when the project is initiated and a project manager assigned. The work may be performed using existing contracts or newly procured as long as the contract follows the federal requirements and process.

### **V HSIP Project Reporting**

When safety projects are completed VDOT is required to report on the effectiveness of the countermeasures. Annual reports to FHWA assess the crash experience for three years before and after the project completion. As indicated in the HSIP guidelines, since VDOT does not have the means to retrieve crash reports at specific locations in the cities, Henrico and Arlington Counties, those jurisdictions must provide the crash reports for the three year after period. Copies of the crash reports shall be submitted the HSIP staff as electronic or paper copies.

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## Appendix A Sample Jurisdiction High Severe Crash Intersection Map

