Alaska Department of Transportation and Public Facilities

Alaska Highway Safety Improvement Program

Handbook

Methodology for Identifying, Prioritizing and Evaluating Highway Safety Improvement Program Projects

20th Edition
April 2, 2021

To Be Used in Preparing:

FFY 2022 New Project Proposals	Due 7/1/21
FFY 2021 HSIP Annual Report	Due 8/15/21

20th Edition

April 2, 2021

19th Edition	***March 27, 2020***
18th Edition Addendum	***September 13, 2019***
18th Edition	***February 21, 2018***
17th Edition	***January 1, 2017***
16th Edition	***January 1, 2016***
15th Edition	***November 14, 2014***
14th Edition	***April 4, 2014***
13th Edition	***March 21, 2013***
12th Edition	***May 10, 2012***
11th Edition	***February 11, 2011***
10th Edition	***February 1, 2010***
9th Edition	***February 2, 2009***
8th Edition	***February 4, 2008***
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2nd Edition	***July 8, 1999***
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Note:

The words "accident" and "crash" are used interchangeably in the Alaska Highway Safety Improvement Program Handbook without distinction or implying fault, and do not imply whether or not an event was predictable or preventable. In the context of this Handbook and the Alaska HSIP, the usage of either term is inherently blame-neutral. The HSIP is focused on evaluating and advancing solutions to events with similar characteristics regardless of fault.

Federal legislation driving the HSIP, including ISTEA-21 (1991), SAFETEA-LU (2005), MAP-21 (2012), and FAST Act (2015), all use both terms widely. The original edition of the HSIP Handbook (1998) incorporated "accident" in development of other terminology, such as "Accident Reduction Factor." In recent years common usage tends toward the term "crash." As a result, more recent revisions or additions to the Handbook often use "crash."

HSIP Purpose:

To construct highway improvements that maximize lives saved and serious injuries eliminated per dollar spent.

HSIP Tunnel Vision

Other DOT&PF program funds
address a wide variety of transportation needs.
In contrast, HSIP funds are targeted single-mindedly
at saving lives and reducing serious injuries

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1. Introduction

1.1. What is the Alaska Highway Safety Improvement Program?

Alaska's Highway Safety Improvement Program (HSIP) is a federally-mandated program managed by the Alaska Department of Transportation and Public Facilities (DOT&PF). Its purpose is to reduce fatalities and serious injuries due to crashes on Alaskan roads.

Prior to 2005 the HSIP was focused on engineering countermeasures. Congress broadened the scope of the HSIP in 2005 to include a Strategic Highway Safety Plan (SHSP), which covers all types of highway safety countermeasures, including enforcement, education, emergency services, and engineering (the "4 Es"). Headquarters Program Development staff in cooperation with federal, state, local, and private sector safety stakeholders developed the original Strategic Highway Safety Plan in 2007 using a data-driven, multidisciplinary approach involving the 4 Es of safety to identify statewide goals, objectives, and key emphasis areas of Driver Behavior, Special Users, and Highways. Since then, the Alaska SHSP has been updated and revised in consultation with stakeholders. Program Development manages the SHSP. Headquarters and regional traffic and safety staff manage the HSIP to address applicable strategies of the SHSP, predominately as infrastructure projects.

This Handbook defines the department's program to develop, implement, and evaluate engineering countermeasures. To maintain continuity with historical usage, this program will be referred to in this manual by its traditional name, the Highway Safety Improvement Program.

Although the HSIP and SHSP are managed by different groups, they are coordinated to maximize crash reduction. The HSIP is used to address many of the goals and objectives of the SHSP (when doing so is cost-beneficial) and program managers consider all of the 4 E's when addressing safety problems. All HSIP projects align with one or more SHSP strategies.

The HSIP is the only Alaska highway program that evaluates its own cost-effectiveness. Completed projects are evaluated by benefit cost analysis using before and after crash data. Alaska HSIP projects have an average benefit to cost ratio weighted by project cost of 7.5:1. Benefit cost ratio is computed using the most recent five years' ranked projects with three years of post-project crash data and actual construction costs. Project benefits are evaluated with current year crash costs and Project Costs are escalated to the current year. Alaska DOT&PF reports benefit cost ratio in the annual HSIP Report.

The following excerpts are from Title 23, Part 924 of the Code of Federal Regulations, which provides the legal basis for the HSIP:

924.5 Policy

a) Each State shall develop, implement, and evaluate on an annual basis a HSIP that has the objective to significantly reduce fatalities and serious injuries resulting from crashes on all public roads.
b) HSIP funds shall be used for highway safety improvement projects that are consistent with the State's SHSP. HSIP funds should be used to maximize

opportunities to advance highway safety improvement projects that have the greatest potential to reduce the State's roadway fatalities and serious injuries.

924.7 Program Structure

(a) The HSIP shall include:

(1) A SHSP;

(2) A Railway-Highway Crossing Program; and

(3) A program of highway safety improvement projects.

(b) The HSIP shall address all public roads in the State and include separate processes for the planning, implementation, and evaluation of the HSIP components described in paragraph (a) of this section. These processes shall be developed by the States in cooperation with the FHWA Division Administrator in accordance with this section and the requirements of 23 U.S.C. 148. Where appropriate, the processes shall be developed in consultation with other safety stakeholders and officials of the various units of local and Tribal governments.

1.2. How is the Alaska HSIP funded?

HSIP funding is apportioned by Congress subject to annual obligation limits established by congressional finance committees. Since 2001, HSIP funding has been supplemented with "penalty" funding (23 U.S.C. Sections 154 and 164) which is a result of Alaska's non-conformance with federally recommended open container and repeat offender drunk driving laws. In FFY 2022, Alaska HSIP received funding provided under the following United States Code Title 23 Sections:

- 130: Railroad Safety
- 148: Highway Safety Improvement Program
- 154, 164: Penalty Funding

All HSIP highway projects are funded under a single "umbrella" project (Need ID 19217) in the State Transportation Improvement Program. See Section 1.6 for additional information on HSIP funding.

1.3. How are HSIP projects selected and managed?

Regional Traffic and Safety Engineers in Alaska's three regions (Northern, Central and Southcoast) screen crash data and consider other information to identify projects. Projects can be either ranked or non-ranked.

Ranked projects are implemented at locations with high crash history and are ranked by analyzing the benefit cost of specific safety-related improvements using estimated crash reduction factors and improvement costs. Non-ranked projects are implemented at locations with potential for severe crashes identified in SHSP strategies and may be spot or system-wide improvements. System wide, or systemic, improvement projects are implemented to reduce potential for fatal and serious injuries by mitigating road conditions or characteristics associated with specific crash types. Non-infrastructure projects are limited to those types specifically included in Appendix A (p. A-9) of this handbook, a reprinting of 23 U.S.C. Section 148 (a)(4)(B).

Alaska's three regional traffic & safety sections submit proposed projects to the State Traffic and Safety Engineer for review. HQ Traffic & Safety reviews the proposed new projects, works with regions to clarify project descriptions and scope, and submits recommended projects to the Chief Engineer for advancement as safety projects. Following Chief Engineer approval of new HSIP projects, the State Traffic and Safety Engineer proposes a list of new and on-going projects for funding and coordinates with HQ Program Development to prepare a funding plan for the coming federal fiscal year.

State Traffic and Safety personnel manage the federal funds for approved projects. Regional Traffic and Safety personnel work with preconstruction and construction personnel to ensure projects remain consistent with their HSIP scope throughout design and construction. The regions conduct follow-up studies to determine the effectiveness of completed projects. HQ Traffic & Safety summarizes the overall effectiveness of the statewide program in the annual HSIP Report.

1.4. How can we get the most out of the HSIP?

Highway infrastructure safety improvements are made under non-HSIP projects as well as HSIP projects. The greatest safety is achieved when both avenues have a strong safety focus. Proactively incorporating safety features in non-HSIP projects will eliminate the need for corrective HSIP projects in the future and enable the HSIP to go further in addressing safety problems that are not reachable with non-HSIP projects. In general, HSIP effectiveness should not be diluted by diverting its funds to safety improvements that should routinely be made under non-HSIP projects. However, HSIP participation may be considered on broader non-HSIP projects to provide safety countermeasures that are not routinely provided on similar projects.

The following excerpt from Part 924 of Title 23 of the Code of Federal Regulations supports this approach to safety project funding:

924.5 Policy

c) Safety improvements should also be incorporated into projects funded by other Federal-aid programs, such as the National Highway Performance Program (NHPP) and the Surface Transportation Program (STP). Safety improvements that are provided as part of a broader Federal-aid project should be funded from the same source as the broader project.

Independently nominated and approved HSIP work that is outside the geographical limits of non-HSIP projects can be HSIP-funded and combined with those projects, when feasible, to achieve construction administration economies of scale.

HSIP funds may be used to fund construction of cost-effective safety improvements within the project limits of broader non-HSIP projects only if approved in advance. To be considered for approval, the HSIP nominated work should be limited to improvements that would otherwise not be constructed under the broader project because they are not required by design standards and are not routinely constructed on similar projects. The HSIP nomination should describe how combining HSIP work into the broader project will provide greater cost-effectiveness than if the HSIP work were completed as a standalone project.

1.5. Special rules

The current transportation bill, Fixing America's Surface Transportation Act (FAST Act), continued two special rules from the previous Moving Ahead for Progress in the 21st Century Act (MAP-21). The special rules address potential safety concerns for High Risk Rural Roads (HRRR), and Older Drivers and Pedestrians. Both involve comparison of five-year rolling average fatality crash rates to evaluate whether rates are increasing or decreasing. Increasing rates trigger specified actions under the HSIP.

High Risk Rural Roads – MAP-21 eliminated HRRR annual set-aside funding, but requires a State to obligate a specified amount of funds on HRRRs if the fatality rate increases on rural roads in that State. FHWA computes the fatality rates on routes functionally classified as Rural Major Collector, Rural Minor Collector, or Rural Local road. The Alaska HSIP evaluates roads of these functional classifications for significant safety risks by frequency and / or rates of fatal and serious injury crashes and proposes projects to address problem areas on those roads.

Older Driver and Pedestrians – If Older Driver/Pedestrian crash rates increase (ages 65 years or older - fatal plus serious injury per 1,000 of state population), states are required to address the increase through strategies in the SHSP, taking into account the recommendations included in the publication of the Federal Highway Administration entitled 'Highway Design Handbook for Older Drivers and Pedestrians' (FHWA-RD-01-103), and dated May 2001, or as subsequently revised and updated. Alaska considers older driver and pedestrian road users when developing HSIP and other projects. In areas with identifiable and significant older driver and pedestrian crash problems, Alaska will implement mitigation strategies to address crash types involving older drivers and pedestrians.

1.6. Project funding

Approved HSIP projects are all projects consistent with the SHSP and approved by the Chief Engineer within the past two years. Unfunded projects approved for two years or more need to be reevaluated and resubmitted to remain eligible for funding.

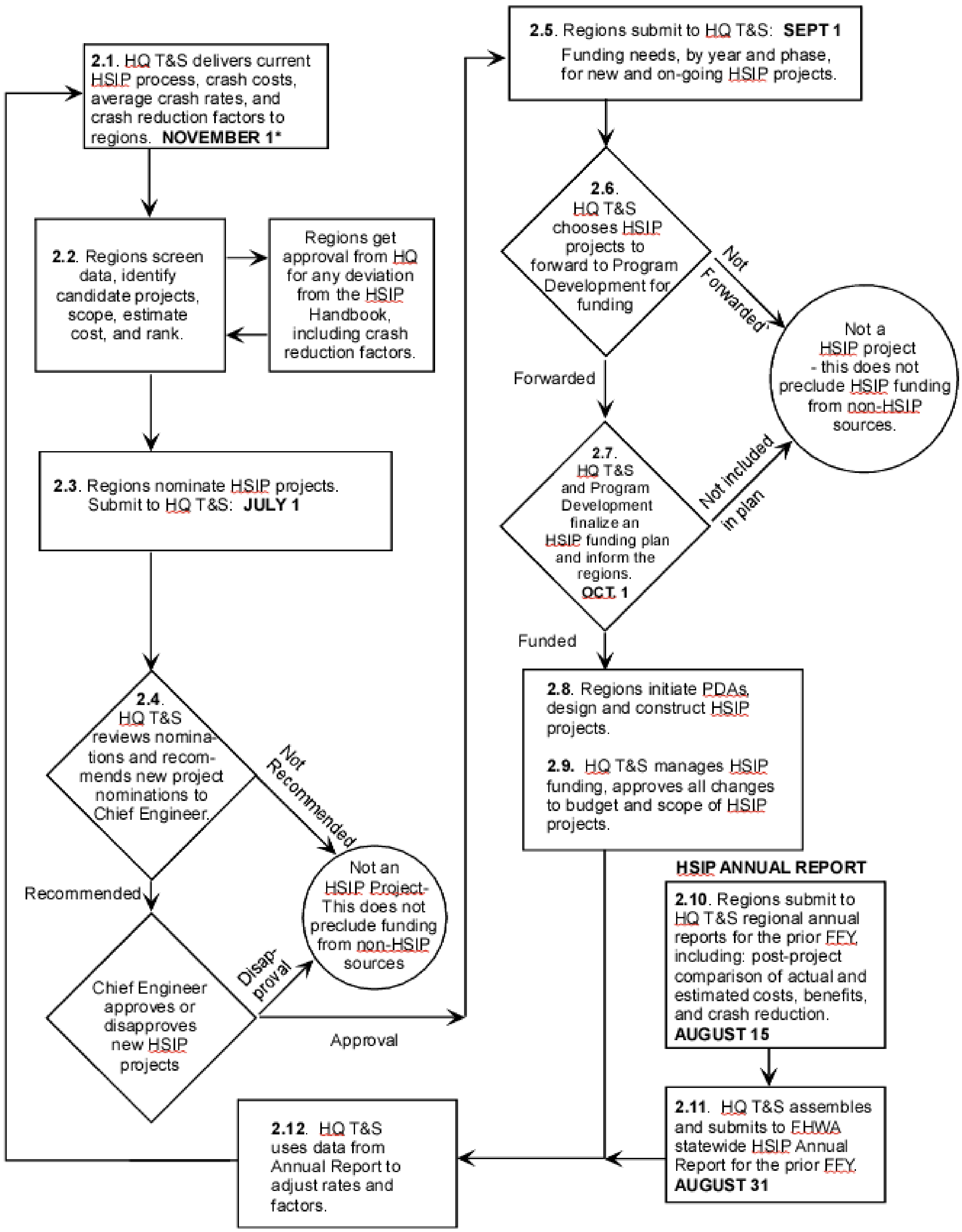
Candidate new projects should be submitted to the Regional Traffic Engineer for consideration, analysis and possible inclusion in the annual statewide submittal to the Chief Engineer. Projects are ranked and prioritized for funding using the DOT&PF HSIP process.

HSIP projects are consistent with Alaska's Strategic Highway Safety Plan (SHSP) and correct or improve a hazardous road location or feature, or address a highway safety problem included in Appendix A (p. A-9) of this handbook, a reprinting of 23 U.S.C. Section 148 (a)(4)(B). HSIP funds are eligible to fund qualified projects on all public roads, including non-State-owned public roads and roads on tribal land.

Individual activities are funded from HSIP apportionment and do not appear on the STIP. Projects must have prior approval in order to obligate safety funds. An annual HSIP funding plan is used to guide planned and unplanned funding decisions. A funding plan is prepared for the current federal fiscal year based on project schedule and funding needs provided by the regions.

2. Process Steps (Keyed to the Flow Chart)

Annual HSIP Process Flow Chart



* **NOVEMBER 1** is a target date which depends on availability of crash data. HSIP will strive to meet the target and will communicate any expectation of delay to the regions and FHWA Division Office.

2.1. HQ provides guidance documents and crash data to Regions (November 1 *)

Guidance Documents – Headquarters Traffic and Safety section (HQ Traffic & Safety) publishes a revised HSIP Handbook containing current HSIP procedures, factors, average crash rates, crash costs, worksheets, etc.

Crash Data – HQ Program Development updates the DOT&PF crash database, and makes crash data available to the regional and statewide traffic engineers.

HQ T&S performs certain preprocessing and/or preliminary analysis of the most recent five years' crash data to regions for HSIP purposes. HQ may also deliver reports or analyses highlighting areas of statewide interest, such as High Risk Rural Roads, Older Driver/Ped, Pedestrian or Bicycle, systemic screening, moose-vehicle or other analyses as required.

* **November 1** is a target date which depends on availability of crash data. HSIP will strive to meet the target date and will communicate any expectation of delay to the regions and FHWA Division Office.

2.2. Regions identify, scope, estimate, and rank proposed new projects

Review all fatal or serious injury (F&SI) crashes within the years that will be used for HSIP analysis. Determine the location of all F&SI crashes for which a location has not been provided and check, and correct if necessary, the location of those for which a location has been provided. Provide the necessary revisions to HQ Program Development so they can revise the crash database.

Identify high crash locations for potential new projects.

i. Identify High Crash Locations.

   (1) Open the Hotspot Analysis tool from the Alaska CARE Portal located at http://akhotspot.caps.ua.edu. Make selections and enter criteria into the Hotspot Analysis window on the left using the information below:

      (a) Box 1: Select "New Hotspot Analysis".

      (b) Box 2: Select the "Alaska eCrash Version 3" dataset. Enter 01/01/2013 as the start date and 12/31/2017 as the end date.

      (c) Box 3: Select "Region" from the "Region/City/Borough" drop down menu. Select your region from the "Region" drop down menu.

      (d) Box 4: Skip this box. A route selection is not necessary for this analysis.

      (e) Box 5: Skip this box. A filter is not necessary for this analysis.

      (f) Box 6: Select "Sliding Spot" from the "Method" drop down menu. Enter 2 for the spot size and 1 for the step size. Both the Spot Size and Step Size are measured in miles. Enter the crash costs in thousands from the "Crash Cost Derivation" spreadsheet in Appendix A for the injury severity weights. Leave the "Use crash rates instead of crash counts" check box unchecked.

(g) Box 7: Include spots with at least 1 crash, at least 1 fatal crash, at least 2 severe injury crashes, or at least 0 minor injury crashes. Select “Include intersection and non-intersection crashes” from the “Intersections” drop down menu. Return the top 100% of the sites.

(h) Box 8: Select “Run Hotspot Analysis”. The results spreadsheet will be emailed once the analysis is complete. The data in the results spreadsheet “Hotspot Summary” tab will be used to determine the HSIP project candidates.

(2) Combine overlapping locations and sort.

(a) Sort to remove locations without one fatal or two serious injury crashes.

(b) Identify and combine locations with overlapping spots on the same route. Determine how many crashes by severity are in the overlapping spots by referring to each route’s tab in the results spreadsheet. The combined spot length will be defined by the “FromMp” of the first spot to the “ToMp” of the last spot being combined. Multiply the number of crashes in each severity category by the crash costs in thousands from the “Crash Cost Derivation” spreadsheet in Appendix A to get a new “CrashRating” for the combined spot. For this analysis, the “CrashRating” column is the sum of HSIP crash costs in thousands for that location.

(c) Change the “CrashRating” column name to “Crash Costs (1000s)”. Add a new column called “Crash Costs / Mile (1000s)” to compute crash costs divided by the length of the spot. Sort using the “Crash Costs / Mile (1000s)” column to rank locations. The top 50 sites listed are HSIP candidates.

(3) For all HSIP project candidates identified under (2) above, explain what will be done to address the safety concern or, if nothing is planned, explain why not (this may need to be revisited when more information becomes available later in the HSIP process). Put this information in a new “Comments” column. Add and populate a column for “Route Name”. Finally, include the data from the Hotspot results spreadsheet’s “Hotspot Parameter” tab at the top of the candidate list.

(4) The final HSIP candidate list should resemble the example shown in A-2 of the appendix.

ii. Consider High Crash Risk Locations without crash data. Identify sites with a high potential for severe crashes that do not show up on the crash list. This is a judgment call, but some locations have evident safety problems without enough data to statistically prove it.

Scope potential new projects.

i. Identify crash patterns.

(1) Identify patterns and causes for intersections and segments, using appropriate methods:

(a) Create crash diagrams for intersections that remain on the list, or

(b) Use tabular analysis methods such as Excel Pivot Tables

(2) Discard locations that do not have clear patterns.

ii. Conduct field reviews.

iii. Determine which high-crash and potential high-crash locations have safety problems that are feasibly correctable.

iv. For traffic signal projects estimate which Alaska Traffic Manual signal warrants are met.

Estimate project cost.

i. Project costs will include all costs, regardless of project phase or funding source, incurred by DOT&PF for the development and delivery of the project. Matching funds, whether state/local/tribal, will also be included in project costs. Do not include costs incurred by other agencies participating in the project to maximize their benefit from their enhancement costs.

Rank potential new projects.

i. Decide whether projects should be ranked or non-ranked.

   Projects should be ranked unless:

   (a) There is no representative crash history, but the project improves a hazardous road location or addresses a highway safety problem, or

   (b) There is no approved crash reduction factor for the proposed countermeasure, or

   (c) Traffic volumes are too low for crash data to accurately represent hazard exposure.

   Ranked projects generally have a better chance of being funded. The non-ranked category should not be used to promote projects that have little potential for cost-effective safety improvement.

ii. Compute a benefit/cost (B/C) ratio for each project using the "Pre-Project Ranking and Post-Project Evaluation" worksheet in Appendix A. Complete all of the worksheet for ranked projects and all or as much as possible for non-ranked projects. Use crash reduction factors from the Crash Cost Reduction Factors table in Appendix A or, if not available, get approval for other factors from the State Traffic and Safety Engineer. Apply the reduction factors only to the crashes that table lists as susceptible to correction by the planned countermeasure(s). Justify crash reduction factors not available in the HSIP Handbook Appendix A using information from the CMF Clearinghouse or from state-specific experience.

If a project is non-ranked because there is no approved crash reduction factor for planned countermeasures, perform a sensitivity analysis by computing two projected benefit-cost ratios assuming crash reduction factors of 5% and 100% for crashes susceptible to correction by the proposed countermeasure(s). Submit the results using both ratios and a narrative explaining the project benefits. If a project is non-ranked because crash data is not available, a sensitivity analysis is not needed, but a narrative explaining the benefits of the project is required.

Systemic projects may be advanced for consideration if they address comparable safety characteristics at multiple locations. Systemic projects should combine locations with similar characteristics, risk factors, and potential for crash types that will be addressed by application of one or more effective low-cost countermeasures. Systemic projects do not have to meet the minimum benefit/cost threshold of ranked projects because they combine locations with the risk factors, even if some of those locations do not have a crash history. Submit a net B/C computation and a project narrative describing the safety problem in terms of common characteristics or risk factors and the implications on safety of applying the selected countermeasures.

Solicit input on high crash locations from municipalities, other agencies, regional planning, and M&O sections, as appropriate. Work with them to identify, scope, estimate, and rank projects within municipal city limits.

2.3. Regions nominate HSIP projects to HQ Traffic & Safety (July 1)

In addition to new projects, regions may update and resubmit previously approved projects that have not received funding (that is, have not had PDAs approved). Project nomination approvals are good for only two years – the year of initial approval and the following year – after that crash, cost, and other pertinent data need to be updated and the project re-nominated. Approved projects that are one year old may be submitted for funding approval under section 2.5 without re-nomination.

Submit the following summary information (in both hard copy and electronic form) under cover of a memo signed by the regional preconstruction engineer:

i. Regional top 50 locations list developed according to Section 2.2(i), formatted similarly to the example in A-2. For future reference (see section 2.2), add a narrative to all locations on lists (i), High Crash Locations, and (ii) High Crash Risk Locations, above, explaining how the safety concern will be addressed or, if not, why not.

ii. Use the "Regional Proposed Project Summary" spreadsheet to list ranked projects ordered by benefit/cost ratio followed by non-ranked projects.

    (1) Projects should be numbered with a 6-digit number composed as follows:

        (a) Last 2 digits of the first Federal Fiscal Year in which project design could start. For example, numbers of projects submitted in July 2021 would start with "22." (HSIP design funding for these projects would not be available until FFY 22 at the earliest.)

        (b) Region (N, C, or S).

        (c) Ranked or Non-ranked (R or N).

        (d) A two-digit sequential number in order of computed benefit/cost for ranked projects and in order of estimated benefit/cost for non-ranked projects. Start the sequential numbers with one (01) for both the ranked and non-ranked categories.

        Thus, the highest B/C Central Region project submitted in July of 2021 would be numbered 22CR01. The highest non-ranked CR project would be numbered 22CN01.

    (2) Modify the project numbers of previously submitted projects for which data and computations have been updated by appending the next fiscal year to the original number. For example, an updated project previously submitted as 18CR01, may be resubmitted in the FFY 22 proposal as 18CR01(22). Note this only applies to projects that are otherwise unchanged. If a project has been substantially changed, assign a new project number.

Submit the following information for each proposed project:

i. For ranked projects, benefit/cost ratios based on safety and maintenance benefits. Do not submit ranked projects with a B/C ratio less than 0.2:1.

ii. For non-ranked projects, a narrative explaining why they are non-ranked and how they will cost-effectively save lives and eliminate injuries. This narrative will be considered when prioritizing projects for funding.

   (1) If projects are non-ranked due to lack of reported crashes, include crash reduction factors for the selected countermeasures, if available, and address the safety implications in the narrative.

   (2) If projects are non-ranked due to lack of crash reduction factors for planned countermeasures, submit the sensitivity analyses described under section 2.2 and address the safety implications in the narrative.

iii. The number of fatal crashes and the number of serious injury crashes.

iv. Project Number

v. Project Cost Estimate

vi. A project summary including sections labeled as follows:

   (1) Location

   (2) Safety Problem Description

   (3) Safety Problem Solution

   (4) Project Description

   (5) FHWA reporting requirements:

      (a) SHSP Strategy

      (b) Functional Classification

      (c) Average Annual Daily Traffic

      (d) Posted Speed

      (e) Roadway Ownership

   (6) Other Pertinent Information (including the potential for combining projects, scheduling concerns, and project benefits not described elsewhere that may affect a project's prospects for receiving funding).

vii. Project ranking worksheet (submit in Excel format as well as in print and Adobe format)

viii. Cost estimate worksheet

ix. Sketch of improvement

x. Crash diagram (intersection improvements only): Highlight the crashes susceptible to reduction by each of the proposed improvements. Use a different color to highlight crashes susceptible to correction by each improvement. Pivot Tables or other concise tabular means may be used in lieu of crash diagrams to illustrate crash experience and identify crashes susceptible to correction by selected countermeasures.

xi. Present legible abbreviated tabular data that supports the project ranking worksheet in 8.5” x 11” landscape format. Use some means, such as color, to highlight crashes susceptible to correction by each improvement. In a separate Excel file, submit complete crash data extracts, hiding fields not relevant to the nomination. Analyze with pivot tables where appropriate.

xii. Signal warrant computations for intersections to be signalized or supporting reasoning leading to likelihood for signalization.

xiii. If the proposed safety work is to be included under a non-HSIP project, explain why it is not funded under that project. In general, safety work should be funded under projects that encompass them, rather than through the HSIP (see section 1.4).

2.4. HQ Traffic & Safety evaluates nominated projects and recommends projects to the Chief Engineer for approval (July 15)

HQ reviews regional projects, works with the regions to clarify any discrepancies, and asks for revisions as appropriate. If necessary, HQ will reject projects with little potential for cost-effective safety improvement.

HQ compiles a statewide list of ranked projects, ordered by benefit/cost ratio, and a list of non-ranked projects. HQ submits the lists to the Chief Engineer for approval by July 15, or within two to four weeks of receiving the last regional submittal. HQ notifies regions on receipt of Chief Engineer approval, which makes projects eligible to receive HSIP funding.

2.5. Regions submit HSIP funding request to HQ Traffic & Safety (September 1)

Submit candidate projects for HSIP funding (in both hard copy and electronic form) under cover of a memo signed by the regional preconstruction engineer. Provide this information by completing the “Regional Proposed Project Summary” posted on the HSIP web site. List previously initiated but not completed HSIP projects at the top, followed by ranked projects in order of B/C ratio, and non-ranked projects below. Provide estimated funding (by year and phase) needed for each project. Regional Traffic and Safety personnel should consult project managers about funding and scheduling of previously initiated projects.

This submittal differs from the July 1 submittal because, among other things, it includes up to date funding needs for on-going projects, while the July 1 submittal only addresses new projects.

2.6. HQ Traffic & Safety proposes funding plan to Program Development (September 15)

HQ Traffic & Safety submits the following to Program Development by September 15:

i. An HSIP project funding plan for the next federal fiscal year.

ii. Estimated project scheduling and funding for the two following federal fiscal years.

HQ Traffic & Safety will prioritize projects using criteria that include:

i. Lives saved and serious injuries eliminated per dollar spent. On ranked projects, this is indicated by safety benefit-cost ratios. On non-ranked projects, this is a subjective judgment made after reviewing the narratives provided by the regions.

   (1) Ranked projects are given higher priority for funding than non-ranked projects. Two tiers of ranked projects will be considered with the first category taking precedence over the second:

      (a) projects with at least one fatal crash or 2 serious injuries in 5 years, then by B/C

      (b) projects without at least one fatal crash or 2 serious injuries in 5 years, then by B/C

   (2) Non-ranked projects are prioritized for funding after ranked projects. The State Traffic and Safety Engineer will prioritize the non-ranked projects based on their relative expected reduction in risk to road users. The subset of systemic non-ranked projects will have a higher priority than the subset of spot non-ranked projects.

ii. Project deliverability based on a jurisdictions' history in delivering projects.

iii. Project duration. Quicker projects start saving lives and eliminating injuries sooner.

iv. State Traffic and Safety Engineer's discretion for project cost fitting within remaining funds and program balance between design and construction. Examples:

   (1) There is $500,000 left after including higher priority projects and the next best project costs $2,000,000, it will be passed over for the next best project that costs $500,000 or less.

   (2) The next best project at the funding cut-off line isn't requesting initial Phase 2 (design start) funding and a review of recent and current year design starts indicates an imbalance between new project design and construction phase projects, the next construction project(s) may be passed over for the next best project(s) requesting initial Phase 2 to keep the program fully obligated in future years.

Project prioritization is competitive based on each year's available funding and quality of projects. There are no hard and fast benefit-cost or duration thresholds that determine which projects receive funding. Projects receiving HSIP funds to begin Phase 2 (design) are not guaranteed HSIP funding for the remaining project phases in current or future funding plans. Any project phase requesting more than the program's annual allocation will not receive HSIP funds, but other phases in the project may receive HSIP funds on a case by case basis subject to requirements under section 1.4.

2.7. HQ Traffic & Safety and Program Development finalize a funding plan (October 1)

HQ Traffic & Safety will work with HQ Program Development to determine the amount of funding available and to craft the HSIP funding plan for the next federal fiscal year.

HQ Traffic & Safety will notify regional Traffic and Safety, Design, and Planning sections when Program Development approves the final funding plan.

2.8. Regions initiate Project Development Authorizations (PDAs), design, and construct HSIP projects

Regional traffic personnel work with project managers to keep HSIP projects targeted at safety improvement, cost efficient, and on schedule.

2.9. HQ Traffic and Safety manages statewide HSIP funding

HQ Traffic & Safety must approve all PDAs for HSIP projects. When there are deviations from the final funding plan, HQ Traffic & Safety will allocate HSIP funds to the regions on a project-by-project basis as follows:

i. Changes in available statewide funding:

   (1) Decreases will be allocated to regions in proportion to their share of the final funding plan.

   (2) Increases will be allocated based on project merit, rather than regional proportion. B/C ratio and the other factors listed in Section 2.6 will be considered when choosing projects to use the additional funds.

ii. Changes in regional requested or used funding:

   (1) Requests for additional funding:

      (a) Funding requests for over-runs of projects included in the final funding plan will be funded as long as funding is available within the region's allocation. Over-runs reduce funding available for the region's other projects. If Advance Construct funding is utilized, regional funding allocation for the following year will be adjusted accordingly.

      (b) Funding requests for projects not in the final funding plan but included in final funding plans in one of the previous 4 years and that have had PDAs approved will be granted as long as funding is available within the region's allocation. Projects in past funding plans *more* than 4 years old and that have had PDAs approved will be handled on a case by case basis.

      (c) Funding requests for projects approved by the Chief Engineer but never funded (including projects from past funding plans that have not had PDAs approved) and for which funding is available in the region's allocation will be handled on a case by case basis. (See Section 2.2 regarding ranking.)

   (2) Funding not fully used – Because HSIP funding is allocated for projects rather than as a regional allocation, unused funding for projects included in the final funding plan is not reserved for that region. However, if the region has other HSIP projects in the current funding plan that will over-run, the funding may be used to cover those over-runs. If not, funds may be reallocated to another region or reserved for future year programs.

Funding not fully used includes:

(a) funding allocated for project phases planned for the current year but unobligated because the funding was not needed to complete planned phases or a project or phase(s) was delayed into the future; and

(b) de-obligated project funding whether or not the project is included for funding in the current year funding plan. De-obligated funding usually must be re-obligated in the same federal fiscal year as de-obligation occurs.

The HSIP Funding Plan is a multi-year plan that allocates funding for the current federal fiscal year and forecasts future funding requirements and project schedules. When current year projects or phases become delayed and funding cannot be obligated from current year projects, all regions may propose advancement of project phases identified in the funding plan scheduled for future years. In the event that multiple projects or phases compete for unobligated funding, the ranking process of section 2.6 will be used to allocate the funds. Projects without prior headquarters and Chief Engineer approval will not be considered for obligation. All projects must first be submitted for approval and accepted for funding as outlined in sections 2.3 through 2.5.

2.10. Regions submit Annual Reports for the prior Year (August 15)

Regional Traffic and Safety Engineers submit annual reports for the prior federal fiscal year to the State Traffic and Safety Engineer by August 15. The regional reports include:

i. HSIP Project Effectiveness Evaluation worksheet – Compute actual benefit cost and crash reduction factors for ranked HSIP projects for which there are three years of post-construction crash data available (use workbook 2: Pre-Project Ranking, Post-Project Evaluation). Use the most recent crash costs (see “Crash Cost Derivation” in Appendix A) for “before” as well as “after” crash data when computing total crash costs. If “after” crashes deviated significantly from expectations, provide an explanation. B/C analysis is required for projects started before the current HSIP process (initiated in 1998) as well as those started after. When practical, actual benefit-costs and crash reduction factors should be computed for non-ranked as well as ranked projects. If this is not practical, include a statement explaining why not. Submit the Pre-Project Ranking, Post-Project Evaluation workbook electronically in Excel format with other report materials.

ii. Updated historical listing of all HSIP projects in the region.

iii. HSIP Project Effectiveness Summaries for HSIP projects that are addressed under:

(1) Section 148(g), including High Risk Rural Roads (HRRR) if HRRR project phases are implemented; and

(2) Section 130(g) Railway-Highway Crossings.

Use the worksheets illustrated in Appendix A, which are available for downloading (workbook 4: Regional HSIP Annual Report Templates).

2.11. HQ Traffic & Safety publishes statewide HSIP Annual Report for the prior FFY (August 31)

HQ Traffic & Safety submits a statewide HSIP report for the prior federal fiscal year to the FHWA by August 31 using the FHWA Online Reporting Tool. The report includes:

i. HSIP Report - Addresses intersections and road segments as required under 23 U.S.C. Section 148(g). The report includes sections on progress in implementing HSIP projects; program effectiveness; project evaluation; a narrative addressing methodology, and effectiveness; and an explanation of how HSIP projects tie in with Alaska's Strategic Highway Safety Plan (SHSP).

ii. Railroad-Highway Crossing Report – Addresses railroad-highway crossings as required under 23 U.S.C. 130(g). The report includes sections on: general program information; and project metrics.

2.12. HQ Traffic & Safety uses evaluation data to adjust next year's factors

HQ Traffic & Safety analyzes crash reduction data from completed projects and uses the results to adjust the factors for the following year's HSIP.

Note on Electronic Document Transmittal

Submit all HSIP documents as electronic Adobe Acrobat PDF files, as well as on paper. Submit the Pre-Project Ranking, Post-Project Evaluation, Regional Proposed Project Summary, and Annual Report worksheets in Excel format, also.

Appendix A. HSIP Worksheets

HSIP Process Automation Tools and Submittal Templates (available online)

1. High Crash Location Screening
   - Top 50 Location List Example

2. Pre-Project Ranking, Post-Project Evaluation
   - Pre-Project Ranking: Predicted Benefit Cost Ratio
   - Post-Project Evaluation: Computation of Actual B/C and Crash Reduction Factors-Input
   - Post-Project Evaluation: Actual Crash Reduction Factors – Results
   - Post-Project Effectiveness Evaluation: Actual Benefit Cost Ratios

3. Regional Proposed Project Summary

4. Regional HSIP Annual Report
   - HSIP Project Effectiveness Summary (Section 148)–Highways and High Risk Rural Roads
   - HSIP Project Categories
   - HSIP Project Effectiveness Summary (Section 130)–Railroad-Highway Crossings

HSIP Data (for use with the Pre-Project Ranking and Post-Project Evaluation spreadsheet)

- Crash Cost Reduction Factors
- Crash Cost Derivation
- Project Life and M&O Costs for Various Improvements

Listing of HSIP/SMS Eligible Activities

User:	jtraffic
Analysis Type:	Overlapping Bucket Analysis
Data Source:	Alaska eCrash V3
Start Date:	01/01/2013
End Date:	12/31/2017
Region	Example Region
Return Top:	100.00%
Bucket Size:	2.00
Bucket Size:	2.00
Step Size:	1.00
Fatal Weight:	2224
Serious Injury Weight:	1112
Minor Injury Weight:	222
No Injury Weight:	22.2
Percent To Return:	100.00%
Minimum Crashes In Each Spot:	1
Minimum Fatal Crashes In Each Spot:	1
Minimum Serious Injury Crashes In Each Spot:	2
Minimum Minor Injury Crashes In Each Spot:	0
Use Crash Counts/Rates:	Counts

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High Crash Location Screening Process

Screening Date
3/31/2021

NOTES:
1. Explanations are required in the "Comments" column for all segments including at least one fatal crash or two major injury crashes occurred, where improvements are not recommended.
2. The location screening process flags locations with one or more fatals and/or two or more serious injury crashes for further study.
3. Only locations meeting criteria are shown on this template.
4. The Crash Costs per Mile column is used to sort locations in descending order.

Route Name	Route	FromMp	ToMp	Crash Costs (1000s)	Crash Costs / Mile (1000s)	Crashes / Mile	PDO Crash Count	Minor Injury Crash Count	Serious Injury Crash Count	Fatal Crash Count	Comments
Location 1	CDS #1	3.00	5.00	9017	4509	69	116	19	2	0	
Location 2	CDS #2	3.00	5.00	7294	3647	8	8	2	4	1	
Location 3	CDS #3	4.00	5.07	6975	6514	84	74	14	2	0	
Location 4	CDS #4	2.00	4.00	6688	3344	27	41	11	1	1	
Location 5	CDS #5	6.00	8.00	6311	3155	28	44	9	1	1	
Location 6	CDS #6	2.00	4.00	5267	2634	13	17	7	1	1	
Location 7	CDS #7	2.00	4.00	5203	2601	10	14	2	4	0	
Location 8	CDS #8	1.00	3.00	4912	2456	14	21	5	1	1	
Location 9	CDS #9	4.00	6.00	4934	2467	15	22	5	1	1	
Location 10	CDS #10	7.00	8.04	4488	4318	47	42	6	0	1	
Location 11	CDS #11	3.00	5.00	4466	2233	15	21	8	0	1	
Location 12	CDS #12	10.00	12.00	4422	2211	10	9	9	0	1	
Location 13	CDS #13	360.00	362.00	4024	2012	8	11	2	1	1	
Location 14	CDS #14	5.00	7.00	3935	1968	6	7	2	1	1	
Location 15	CDS #15	5.00	7.00	3933	1967	17	27	5	0	1	
Location 16	CDS #16	6.00	8.00	3911	1956	12	16	6	0	1	
Location 17	CDS #17	6.00	8.00	3847	1923	4	3	2	1	1	
Location 18	CDS #18	7.00	9.00	3645	1822	10	14	5	0	1	
Location 19	CDS #19	2.00	4.00	3556	1778	8	10	5	0	1	
Location 20	CDS #20	3.00	5.00	3469	1735	4	6	0	1	1	
Location 21	CDS #21	4.00	5.69	3447	2037	4	5	0	1	1	
Location 22	CDS #22	214.00	216.00	3425	1712	4	4	0	3	0	
Location 23	CDS #23	215.00	217.00	3425	1712	4	4	0	3	0	
Location 24	CDS #24	128.00	130.00	3336	1668	1	0	0	1	1	
Location 25	CDS #25	3.00	5.00	3336	1668	1	0	0	1	1	
Location 26	CDS #26	4.00	6.00	3336	1668	1	0	0	1	1	
Location 27	CDS #27	4.00	6.00	3156	1578	8	12	3	0	1	
Location 28	CDS #28	3.00	5.00	3112	1556	7	10	3	0	1	
Location 29	CDS #29	361.00	363.00	3001	1501	9	15	2	0	1	
Location 30	CDS #30	9.00	11.00	2801	1401	5	6	2	0	1	
Location 31	CDS #31	303.00	305.00	2779	1390	4	5	2	0	1	
Location 32	CDS #32	8.00	10.00	2735	1367	4	3	2	2	0	
Location 33	CDS #33	6.00	8.00	2668	1334	6	10	1	0	1	
Location 34	CDS #34	359.00	361.00	2690	1345	7	11	1	2	0	
Location 35	CDS #35	106.00	108.00	2690	1345	2	1	2	0	1	
Location 36	CDS #36	312.00	314.00	2668	1334	6	10	1	0	1	
Location 37	CDS #37	4.00	5.72	2668	1555	2	0	2	0	1	

Alaska DOT&PF

Highway Safety Improvement Program

Project Ranking Worksheet

Red fields are input fields.
Black fields are fixed, computed, or derived.

HSIP Project Name:	Test Intersection - Regional Project for the Betterment of All Mankind						
Analysis Period:	1/1/13	to	12/31/17	Form Completed by:	Joe Traffic	Date:	3/31/21

Miscellaneous Data

Rate of Return:	3%
No of years of crash analysis	5

Crash Cost Data

Crash Severity	Crash Cost
Property Damage Only:	$22,200
Minor Injury:	$222,000
Serious Injury:	$1,112,000
Fatality:	$2,224,000

Predicted Change in Crashes due to Improvement(s)

Imprv Type Num	Improvement	Type of Crash Susceptible to Reduction or Increase due to Improvement	Reduction Factor (+ or -)	# of Crashes Susceptible to Reduction or Increase PDO	Min	Ser	Fat
108	Intersection Illumination	Night Crashes at unlighted intersections	-50%	6	2	1	
101.3	Install Lt Turn Pocket at Rural, Unsignalized Intersection (Major Road Approach Only)	Rear-ends and side-swipes involving turning cars making the target movement	-60%	5	2	2	
109	New Traffic Signal	Angle crashes Rear-end crashes (expected to increase)	-60% 25%	10 6	5 5	1	
		Total Crashes Susceptible to Reduction or Increase:		27	14	4	
		Predicted Change in Crashes:		-11	-4.0	-2.3	
		Predicted Change in Crash Cost ($1,000):		-233	-877	-2,558	

Benefit/Cost of Improvements (Safety and M&O Benefits Only)

Improvement	Total Proj Cost (K)	Ann M/O Cost (K)	Life of Impvt (yrs)	Predicted Change in Crashes PDO	Min	Ser	Fat	Predicted Change in Crash Cost	Annualized Safety and M&O Benefits	Annualized Constr. and M&O Costs	Benefit Cost (Safety and M&O Benefits only)
Intersection Illumination	250	1.0	15	-3.0	-1.0	-0.5		-$844,600	$168,920	$21,942	7.7 : 1
Install Lt Turn Pocket at Rural, Unsignalized Intersection (Major Road Approach Only)	600	0.5	10	-3.0	-1.2	-1.2		-$1,667,400	$333,480	$70,838	4.7 : 1
New Traffic Signal	1250	10.0	10	-4.5	-1.8	-0.6		-$1,155,600	$231,120	$156,538	1.5 : 1
Subtotals:				-10.5	-4.0	-2.3					
Totals/Averages:	2100	11.5	10.6	-16.8				-$3,667,600	$733,520	$249,318	2.94 : 1

Benefit Cost Formula (Safety and M&O Benefits Only)

B/C Ratio = (Estimated Annual Reduction in Crash Cost)+(Decrease in Ann Maintenance Cost, 0 if increase) / (Annualized Construction Project cost)+(Increase in Ann Maintenance cost, 0 if decrease)

Combined Effects of Multiple Countermeasures

$$CRF_{combined} = \left[1 - \left(1 - \frac{CRF_1}{100}\right)\left(1 - \frac{CRF_2}{100}\right)\ldots\left(1 - \frac{CRF_n}{100}\right)\right] * 100$$

Compute a combined Crash Reduction Factor (CRF) only for crash types jointly influenced by dissimilar improvements at the location of interest. Consider limitations of this formula as discussed in TRB Special Report 214 Designing Safer Roads, 1987, pg. 253-255.

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Highway Safety Improvement Program

HSIP Project Evaluation Worksheet

Computation of Actual B/C and Crash Reduction Factors - INPUT

Red fields are input fields.
Black fields are fixed, computed, or derived.

HSIP Project Name:	***Test Intersection - Regional Project for the Betterment of All Mankind***	Form Completed by:	*Joe Traffic*	Date:	*7/15/2021*

Project Identification Data

Construction Project Name:	**Test Construction Project**
Federal Project Number:	**TEST-PROJ-1**
State (AKSAS) Proj. Number:	**12345**

Miscellaneous Data

Rate of Return:	3%
Intersection (I) or Segment (S)	I
If Segment, Length in Miles:	
Date Construction Began:	4/30/15
Date Project Accepted for Traffic:	11/1/15

Crash Cost Data

Crash Severity	*Crash Cost*
Property Damage Only:	$22,200
Minor Injury:	$222,000
Serious Injury:	$1,112,000
Fatality:	$2,224,000

CRASH HISTORY (All Crashes)

Period	Begin Date	End Date	No of Years	PDO	Min	Maj	Fat	Tot-al	Avg ADT
1) Before (HSIP Analysis Period)	1/1/13	12/31/17	5.0	29	12	6		47	10000
2) Before-Interim	1/1/11	12/31/14	2.0	12	3	3		18	10500
1 and 2 Combined	1/1/13	12/31/14	7.0	41	15	9		65	10143
3) After	1/1/16	12/31/18	3.0	13	6	2		21	11000

Crash Trend

Trend Control Area:	Mjr City / Borough
Crash Rate change from Before Period (1+2) to After Period (3)	**0.0%**

CRASH HISTORY (Crashes Susceptible to Reduction or Increase)

Improvement	**Type of Crash Susceptible to Reduction or Increase Due to Improvement**	**BEFORE (1+2)** HSIP Analysis Period 1/1/2013 to 12/31/2017				Interim 1/1/2011 to 12/31/2014						**AFTER (3)** 1/1/2016 to 12/31/2018					
		PDO	Min	Ser	Fat	PDO	Min	Ser	Fat	Total No of Crashes	Total Crash Cost ($K)	PDO	Min	Ser	Fat	Total No of Crashes	Total Crash Cost ($K)
Intersection Illumination	Night Crashes at unlighted intersections	6	2	1		2		1		12	2846	2				2	44
Install Lt Turn Pocket at Rural, Unsignalized Intersection (Major Road Approach Only)	Rear-ends and side-swipes involving turning cars making the target movement	5	2	2		1	1	1		12	4135	1		1		2	1134
New Traffic Signal	Angle crashes	10	5	1		6	2			24	3021	3	1			4	289
	Rear-end crashes (expected to increase)	6	5			2		1		14	2400	5	2	1		8	1667
	Totals / Averages:	27	14	4		11	3	3		62	####	11	3	2		16	3134
	Total Crash Costs:	**$12,401,600**										**$3,134,200**					

**** The "Before – Interim" time period extends from the end of the HSIP analysis period to the start of construction. Only full data years should be used. Use of partial years will skew results.***
Set Trend to 0% in the absence of a significant change in area-wide crash rate between the Before/Interim period and the After period.

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Highway Safety Improvement Program

HSIP Project Evaluation Worksheet

Computation of Actual Crash Reduction Factors - RESULTS

Red fields are input fields.
Black fields are fixed, computed, or derived.

Project:	***Test Intersection - Regional Project for the Betterment of All Mankind***	Form Completed by:	*Joe Traffic*	Date:	*7/15/2021*

Change in Total Crashes

Period	Begin Date	End Date	No of Crashes	Crash Cost	Crash Rate	Accident Cost per Ent Veh or Veh-Mile	***Percent Change*** From - To	Crash Rate	Statistically Significant?	Crash Cost/Veh
1) Before (HSIP Analysis Period)	1/1/13	12/31/17	47	$9,979,800	2.58	$0.55	1 to 2	-8.8%	No	1.8%
2) Before-Interim	1/1/11	12/31/14	18	$4,268,400	2.35	$0.56	2 to 3	-25.8%	No	-42.7%
1 and 2 Combined	1/1/13	12/31/14	65	$14,248,200	2.51	$0.55	(1+2) to 3	**-30.5%**	Yes	**-41.9%**
3) After	1/1/16	12/31/18	21	$3,844,600	1.74	$0.32				

Change in Crashes Susceptible to Reduction or Increase

Improvement	**Type of Crash Susceptible to Reduction or Increase due to Improvement**	**BEFORE (1+2)** No of Crashes per Year	Crash Cost /yr ($K)	**AFTER (3)** No of Crashes per Year	Crash Cost /yr ($K)	**Crash RATE Reduction Factor** Change in crashes/yr	Adj for Vol	Stat. Signif-icant?	Adj. for Trend	**Crash COST Reduction Factor** Change in crash cost/yr	Adj for Vol & Trend	Pre-dic-ted
Intersection Illumination	Night Crashes at unlighted intersections	***1.71***	407	***0.67***	15	-61%	-64.1%	YES	***-64.1%***	***-96%***	***-97%***	-50%
Install Lt Turn Pocket at Rural, Unsignalized Intersection (Major Road Approach Only)	Rear-ends and side-swipes involving turning cars making the target movement	***1.71***	591	***0.67***	378	-61%	-64.1%	YES	***-64%***	***-36%***	***-41%***	-60%
New Traffic Signal	Angle crashes	***3.43***	432	***1.33***	96	-61%	-64.1%	YES	***-64%***	***-78%***	***-79%***	-60%
	Rear-end crashes (expected to increase)	***2.00***	343	***2.67***	556	33%	22.9%	NO	***23%***	***62%***	***49%***	25%

Other Factors which may have impacted crash frequency - **(Provide explanation here if "After" crashesdeviated significantly from those predicted):**

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Highway Safety Improvement Program

HSIP Project Effectiveness Evaluation

Computation of Actual Benefit/Cost Ratio

Red fields are input fields. Black fields are fixed, computed, or derived.

Use the same crash costs for both before and after crashes when comparing actual vs predicted B/C and crash reduction.

HSIP Project Name:	***Test Intersection - Regional Project for the Betterment of All Mankind***
Construction Project Name:	***Test Construction Project***
Const. Project Number (Federal):	***TEST-PROJ-1***
Const. Project Number (AKSAS):	***12345***
Form Completed by:	*Joe Traffic*
Date:	*7/15/2021*

Financial/Time Factors	
Rate of Return (from Project Ranking worksheet):	3%
Average Life of Improvement (from Project Ranking worksheet):	10.6
Length of "After" evaluation period (years) (from Post Eval Input worksheet):	3.0

Actual B/C (Acc and M&O Benefits Only)	
Total Project Development and Construction Cost:	$2,500,000
Annual M&O Cost or Saving (from HSIP Project Ranking worksheet):	$11,500
Annualized Construction and M&O Costs:	$290,431
Projected Crash Cost in "After" period at "Before" rate (susceptible crashes only):	$5,314,971
Actual Crash Cost during "After" period (susceptible crashes only):	$3,134,200
Unadjusted Crash Cost Reduction:	$2,180,771
Crash Cost Reduction adjusted for crash trend:	$2,180,771
Annualized Safety and M&O Benefits	$726,924
Actual Benefit Cost Ratio (Crash and M&O Costs Only):	***2.5 : 1***

Comparison of Actual vs Predicted				
Total Project Development and Construction Cost:	Predicted:	$2,100,000	Difference:	***+19%***
	Actual:	$2,500,000		
Annualized Safety and M&O Benefits:	Predicted:	$733,520	Difference:	***-1%***
	Actual:	$726,924		
Project Benefit-Cost Ratio (Not Including Delay):	Predicted:	2.94 : 1	Difference:	***-14%***
	Actual:	2.5 : 1		

FFY 2022 Approved HSIP Projects - XX Region

Project Name:	Project Type			IRIS No.	HSIP Project Number	B/C	Safety Index	Crashes Susc. to Corr.				Region	Phase	Federal Fiscal Year			Longterm View			Constr by M&O?	Bundle?	Project Description
	New	FO	UFO					PDO	MIN	SER	FAT			22	23	24	25	26	27			
													2	$ -	$ -	$ -	$ -	$ -	$ -			
													3	$ -	$ -	$ -	$ -	$ -	$ -			
								0	0	0	0		4	$ -	$ -	$ -	$ -	$ -	$ -			
													7	$ -	$ -	$ -	$ -	$ -	$ -			
													Total	$ -	$ -	$ -	$ -	$ -	$ -			
													2	$ -	$ -	$ -	$ -	$ -	$ -			
													3	$ -	$ -	$ -	$ -	$ -	$ -			
								0	0	0	0		4	$ -	$ -	$ -	$ -	$ -	$ -			
													7	$ -	$ -	$ -	$ -	$ -	$ -			
													Total	$ -	$ -	$ -	$ -	$ -	$ -			
													2	$ -	$ -	$ -	$ -	$ -	$ -			
													3	$ -	$ -	$ -	$ -	$ -	$ -			
								0	0	0	0		4	$ -	$ -	$ -	$ -	$ -	$ -			
													7	$ -	$ -	$ -	$ -	$ -	$ -			
													Total	$ -	$ -	$ -	$ -	$ -	$ -			
													2	$ -	$ -	$ -	$ -	$ -	$ -			
													3	$ -	$ -	$ -	$ -	$ -	$ -			
								0	0	0	0		4	$ -	$ -	$ -	$ -	$ -	$ -			
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								0	0	0	0		4	$ -	$ -	$ -	$ -	$ -	$ -			
													7	$ -	$ -	$ -	$ -	$ -	$ -			
													Total	$ -	$ -	$ -	$ -	$ -	$ -			
													2	$ -	$ -	$ -	$ -	$ -	$ -			
													3	$ -	$ -	$ -	$ -	$ -	$ -			
								0	0	0	0		4	$ -	$ -	$ -	$ -	$ -	$ -			
													7	$ -	$ -	$ -	$ -	$ -	$ -			
													Total	$ -	$ -	$ -	$ -	$ -	$ -			
													2	$ -	$ -	$ -	$ -	$ -	$ -			
													3	$ -	$ -	$ -	$ -	$ -	$ -			
								0	0	0	0		4	$ -	$ -	$ -	$ -	$ -	$ -			
													7	$ -	$ -	$ -	$ -	$ -	$ -			
													Total	$ -	$ -	$ -	$ -	$ -	$ -			
													2	$ -	$ -	$ -	$ -	$ -	$ -			
													3	$ -	$ -	$ -	$ -	$ -	$ -			
								0	0	0	0		4	$ -	$ -	$ -	$ -	$ -	$ -			
													7	$ -	$ -	$ -	$ -	$ -	$ -			
													Total	$ -	$ -	$ -	$ -	$ -	$ -			

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HSIP Project Effectiveness Summary (Section 148)

Covering projects with 3 or more years of available post-project crash data & not previously reported

Section 148 HSIP Projects (not including HRRR)

Region	Location [1]	FHWA Rd Functional Classification [2]	Improvement Type [3]	Total Project Cost [4]	BEFORE & INTERIM Data (Years vary) [5]					AFTER Crash Data (3 years)				Evaluation Results (B/C Ratio) [6]
					Fatal	Serious Injury	Minor Injury	PDO	Years	Fatal	Serious Injury	Minor Injury	PDO	

Section 148 HSIP Projects - High Risk Rural Roads (HRRR) only

Region	Location [1]	FHWA Rd Functional Classification [2]	Improvement Type [3]	Total Project Cost [4]	BEFORE & INTERIM Data (Years vary) [5]					AFTER Crash Data (3 years)				Evaluation Results (B/C Ratio) [6]
					Fatal	Serious Injury	Minor Injury	PDO	Years	Fatal	Serious Injury	Minor Injury	PDO	

1. Location/identifier for project: basic information on where the project occurred
2. Use a) DOT&PF RIP Tool (http://rip.dot.state.ak.us/) using Route Log and Attribute by CDS Route Number reports, b) STAR (https://web.dot.state.ak.us/stwdplng/GIS/star.shtml), or c) the Statewide Functional Classification GIS Map (http://www.dot.alaska.gov/stwdplng/fclass/fclassmaps.shtml) to obtain route functional classification: including urban and rural; principal arterials, minor arterial roads, collector roads and local streets. *(For reference, see FHWA Highway Functional Classification Concepts, Criteria and Procedures at http://www.fhwa.dot.gov/planning/processes/statewide/related/highway_functional_classifications/)*
3. Type of improvement: base entry on information meeting descriptions from MAP-21 (Section 148 (a)(4)), reprinted on page A-11 of this HSIP Handbook. If multiple improvement types were combined in one project, list the predominant category. Project categories related to railway-highway grade crossing safety improvements should be reported separatly using the form under Tab 130 Eff.
4. Cost of improvement: cost to implement the improvement
5. Includes crashes from before and "interim" time periods.
6. Enter actual benefit cost ratios from the Alaska HSIP post-project evaluation process.

Highway Safety Improvement Project Categories

The following is a complete extract from 23 USC Section 148 Highway Safety Improvement Program (a) Definitions, as amended by FAST legislation under Section 1113 Highway Safety Improvement Program.

(4) Highway safety improvement project. –

(A) In general. - The term "highway safety improvement project" means strategies, activities, and projects on a public road that are consistent with a State strategic highway safety plan and –

(i) correct or improve a hazardous road location or feature; or

(ii) address a highway safety problem.

(B) Inclusions. - The term "highway safety improvement project" only includes a project for 1 or more of the following:

(i) An intersection safety improvement.

(ii) Pavement and shoulder widening (including addition of a passing lane to remedy an unsafe condition).

(iii) Installation of rumble strips or another warning device, if the rumble strips or other warning devices do not adversely affect the safety or mobility of bicyclists and pedestrians, including persons with disabilities.

(iv) Installation of a skid-resistant surface at an intersection or other location with a high frequency of crashes.

(v) An improvement for pedestrian or bicyclist safety or safety of persons with disabilities.

(vi) Construction and improvement of a railway-highway grade crossing safety feature, including installation of protective devices.

(vii) The conduct of a model traffic enforcement activity at a railway-highway crossing.

(viii) Construction of a traffic calming feature.

(ix) Elimination of a roadside hazard.

(x) Installation, replacement, and other improvement of highway signage and pavement markings, or a project to maintain minimum levels of retroreflectivity, that addresses a highway safety problem consistent with a State strategic highway safety plan.

(xi) Installation of a priority control system for emergency vehicles at signalized intersections.

(xii) Installation of a traffic control or other warning device at a location with high crash potential.

(xiii) Transportation safety planning.

(xiv) Collection, analysis, and improvement of safety data.

(xv) Planning integrated interoperable emergency communications equipment, operational activities, or traffic enforcement activities (including police assistance) relating to work zone safety.

(xvi) Installation of guardrails, barriers (including barriers between construction work zones and traffic lanes for the safety of road users and workers), and crash attenuators.

(xvii) The addition or retrofitting of structures or other measures to eliminate or reduce crashes involving vehicles and wildlife.

(xviii) Installation of yellow-green signs and signals at pedestrian and bicycle crossings and in school zones.

(xix) Construction and operational improvements on high risk rural roads.

(xx) Geometric improvements to a road for safety purposes that improve safety.

(xxi) A road safety audit.

(xxii) Roadway safety infrastructure improvements consistent with the recommendations included in the publication of the Federal Highway Administration entitled 'Highway Design Handbook for Older Drivers and Pedestrians' (FHWA-RD-01-103), dated May 2001 or as subsequently revised and updated.

(xxiii) Truck parking facilities eligible for funding under section 1401 of the MAP-21.

(xxiv) Systemic safety improvements.

(xxv) Installation of vehicle-to-infrastructure communication equipment.

(xxvi) Pedestrian hybrid beacons.

(xxvii) Roadway improvements that provide separation between pedestrians and motor vehicles, including medians and pedestrian crossing islands.

(xxviii) A physical infrastructure safety project not described in clauses (i) through (xxvii).

Guidance from FHWA has not been issued at the data of this publication. When issued, FHWA guidance will supercede this direct quote from the federal statute.

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HSIP Project Effectiveness Summary (Section 130 -Railroad Crossings)

Covering projects with 3 or more years of available post-project crash data & not previously reported

Region	Project Number	Location [1] (County/ Municipality, Highway)	USDOT Crossing Number	FHWA Roadway Functional Class [2]	Project Type and Description (using the suggested groupings below)	Crossing Protection (active, passive)	Crossing type (vehicle, pedestrian, etc)	Total Project Cost	Funding Type	Before & Interim Crash Data [3] (5 years)					After Crash Data (3 years)				Effectiveness [4]
										Fatal	Serious Injury	Minor Injury	PDO	Years	Fatal	Serious Injury	Minor Injury	PDO	

1. Location/identifier for project: basic information on where the project occurred
2. Use a) DOT&PF RIP Tool (http://rip.dot.state.ak.us/) using Route Log and Attribute by CDS Route Number reports, b) STAR (https://web.dot.state.ak.us/stwdplng/GIS/star.shtml), or c) the Statewide Functional Classification GIS Map (http://www.dot.alaska.gov/stwdplng/fclass/fclassmaps.shtml) to obtain route functional classification: including urban and rural; principal arterials, minor arterial roads, collector roads and local streets. (For reference, see FHWA Highway Functional Classification Concepts, Criteria and Procedures at http://www.fhwa.dot.gov/planning/processes/statewide/related/highway_functional_classifications/)
3. Includes crashes from before and "interim" time periods.
4. Enter actual benefit cost ratios from the Alaska HSIP post-project evaluation process.

Suggested grouping by project type is listed below.

- Crossing Approach Improvements - Projects such as channelization, new or upgraded signals on the approach (not including the active grade crossing signals), guardrail, pedestrian/bicycle path improvements near the crossing, and illumination.
- Crossing Warning Sign and Pavement Marking Improvements - Projects such as signs, pavement markings, and/or delineation where these project activities are the predominant safety improvements.
- Active Grade Crossing Equipment Installation/Upgrade - Projects such as new or upgraded flashing lights and gates, track circuitry, wayside horns, and signal improvements such as railway-highway signal interconnection and pre-emption.
- Visibility Improvements - Projects such as sight distance improvements and vegetation clearance.
- Roadway Geometry Improvements - Projects such as roadway horizontal and/or vertical alignment, sight distance, and elimination of high-profile ("humped") crossings.
- Grade Crossing Elimination - Projects such as crossing elimination through closure, relocation, or construction/reconstruction of a grade separation structure.
- Crossing Inventory Update - Projects such as efforts to update and manage the railway- highway grade crossing inventory and development of a web-based inventory.

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Crash Cost Reduction Factors

Applicable at Locations With Statistically High Rates of Target Crashes

Revised November 2014

Imprvmt Type Number	Type of Improvement / Crash Types Susceptible to Reduction	Crash Cost Rdctn. Factor	Comments
100	**INTERSECTION AND TRAFFIC CONTROL**		
101	New Turn Lane		
101.1	Install Left-turn Lane at Rural, Unsignalized, 3-Leg Intersection (Major Road Approach, Only)	-55%	
101.2	Install Left-turn Lane at Urban, Unsignalized Intersection (Major Road Approach, Only)	-50%	
101.3	Install Left-turn Lane at Rural, Unsignalized Intersection (Major Road Approach, Only)	-60%	
101.4	Install Right-turn Lane at Urban, Signalized Intersection	-10%	
101.5	Install Right-turn Lane at Rural, Signalized Intersection	-20%	
101.6	Install Right-turn Lane at Urban, Unsignalized Intersection (Major Road Approach, Only)	-10%	
101.7	Install Right-turn Lane at Rural, Unsignalized Intersection (Major Road Approach, Only)	-25%	
101.8	Install Left-turn Lane at Rural or Urban Signalized Intersection	-15%	
	Rear-ends and side-swipes involving turning cars making the target movement (this does not include adding lanes to existing turn pockets or to adding lanes on approaches controlled by STOP signs)		
102	Increase Turn Lane Length Rear-end crashes involving vehicles waiting to enter turn lane	-15%	Intended for locations where the existing turn pocket is lengthened to accommodate the turning lane demand, eliminating turning traffic which backs up into the thru lanes.
103	Install Two-Way Left Turn Lane All crashes involving the target left turns: angle, sideswipe, and rear end. Only applies to crashes for which no turning lane currently exists.	CLICK HERE for TWLTL Spreadsheet Solution	Best Practice is to treat CRF as a function as described in Research Results Digest 299.
104	Acceleration lane for right turning traffic from side street Multi-car crashes involving through traffic and vehicles making the target movement	-10%	
105	Improve Sight Distance at Intersection Multi-car angle crashes involving vehicles on the limited sight distance approach	-10%	
106	Improvement 106 (Install Stop Ahead or Yield Ahead signs) removed from Crash Cost Reduction Factor table due to inconclusive study results.		
107	Change Two Way Stop to All-Way Stop Control Angle crashes	-70%	
108	Intersection Illumination Night crashes at unlighted intersections	-50%	
109	New Traffic Signal Angle Crashes Rear-end Crashes (expected to increase)	-60% +25%	
110	Enlarge 8 inch Traffic Signal Head to 12 inches All rear end and right angle crashes	-10%	

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Applicable at Locations With Statistically High Rates of Target Crashes

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Imprvmt Type Number	Type of Improvement / Crash Types Susceptible to Reduction	Crash Cost Rdctn. Factor	Comments
111	Improve Signal Display		
111.1	Conversion of Side-Mounted Signals to Overhead Signals	-40%	Reductions are independent of number of signal heads converted or added.
111.2	Increase number of signal heads	-10%	
111.3	Add 3-inch yellow retroreflective sheeting to signal backplates	-15%	
111.4	Increase Number Of Overhead Signal Heads	-28%	
	All rear end and angle crashes involving the target approach		
112	Left-Turn Phase Traffic Signal Modifications		
112.1	Permissive (green ball) to Permissive (flashing yellow arrow)	-20%	
112.2	Permissive (green ball) to Protected-Permissive (flashing yellow arrow)	-40%	
112.3	Protected-Permissive (5-section with green ball and arrows) to Protected-Permissive (flashing yellow arrow)	-30%	
112.4	Protected-Permissive (5-section with green ball and arrows) to Protected-Only (all arrows)	-60%	
	Angle crashes involving the target left turn movement		
113	Install Curb Bulb Across Intersection From Multi-Lane Approach with Mandatory Turning Lane		Intended to address crashes involving vehicle failing to make turn in mandatory turn lane.
	Crashes involving vehicle failing to make turn in mandatory turn lane to be blocked by curb bulb	-70%	
114	Install Overhead Lane Use Control Signs		Intended to address crashes involving vehicle failing to make turn in mandatory turn lane.
	Crashes involving vehicles that attempt to make a movement that is prohibited from their lane	-70%	
115	Rumble strips on approaches to intersections		
	Non ice/snow crashes on the target approach caused by cars failing to stop	-80%	
116	Active Advance Warning Flashers		
	Rear end and angle crashes involving vehicles on the target approach	-25%	
117	Install Intersection Flashing Beacon		
	All right angle crashes involving vehicles on target intersection approaches	-30%	
118	Install a Single-Lane Roundabout		
118.1	Replace Signal or Two-Way STOP-Controlled 4-Leg Intersections with a Single-Lane Roundabout	-75%	
118.2	Replace Signal or STOP-Controlled (on one approach) 3-Leg Intersections with a Single-Lane Roundabout	-30%	
118.3	Replace an All-Way Stop Control Intersection with a Single-Lane Roundabout	0%	No change in safety
	All Intersection crashes		
119	Improvement 119 has been intentionally left blank		

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Applicable at Locations With Statistically High Rates of Target Crashes

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Imprvmt Type Number	Type of Improvement / Crash Types Susceptible to Reduction	Crash Cost Rdctn. Factor	Comments
120	Improvement 120 (Intersection Skid Reduction Treatments) was removed from CRF Table because improvement of pavement traction is not easily quantifiable.		
200	**STRUCTURES**		
201	Replace or Widen Narrow Bridge Head-ons, Sideswipes, crashes with fixed objects on bridge or approaches	Use CRF computation: $CRF = 9.20 - 8.93 \times W_{before} + 10.68 \times W_{after}$ The variable W_{before} is the bridge shoulder width (feet) before widening. The variable W_{after} is the final bridge shoulder width (feet). The resulting dependent variable CRF is in percent.	
202	Construct Interchange All intersection crashes	CLICK HERE for Interchange Safety Analysis Tool (ISAT) Spreadsheet	Detailed Analysis, CLICK HERE Interchange Safety Analysis Tool Manual
300	**ROADWAY AND ROADSIDE**		
301	Widen Shoulder Run-off-road, head-on, opposite-direction sideswipe, and same direction sideswipe crashes within the widened segment	CLICK HERE for Shoulder Width Spreadsheet Solution	Best Practice is to treat CRF as a function as described in FHWA-RD-99-207
302	Widen Travel Lanes to PreConstruction Manual Standard Run-off-road, head-on, opposite-direction sideswipe, and same direction sideswipe crashes within the widened segment	CLICK HERE for Lane Width Spreadsheet Solution	Best Practice is to treat CRF as a function as described in FHWA-RD-99-207
303	Install Median Barrier Crashes within the median or resulting from vehicles crossing the median in which there are serious or fatal injuries	-90%	
304	Install Raised Median		
304.1	Install Raised Median on Undivided Street	-20%	
304.2	Install Raised Median to Replace Two Way Left Turn Lane Cross over and segment access-related vehicle crashes. Target crashes do not include vehicle-crossing pedestrian crashes (See Improvement 406 - Pedestrain Refuge Islands.)	-15%	
305	Close Median Opening REDUCES:Crashes involving vehicles making the movement(s) to be closed INCREASES: New crashes caused by diverted traffic *(Note: closing problem movements does not guarantee crash reduction. It is possible that more crashes will be caused by diversion than happened at the median opening.)*	-90% Increase Varies	Examine alternative routes, likely crash rates at intersections along those routes, estimate the number of crashes along those routes, and apply those crashes as an adjustment to the crashes expected to be reduced by -90% Submit documentation of assumptions and computations.
	Examine alternative routes for traffic diverted by the median closure. Estimate likely changes in volume at intersections along diversion routes. Using those volumes and existing crash rates, estimate the number of crashes at those intersections. Apply those crashes as an adjustment to the crashes at the project location which are expected to be reduced by CRF=-90%. Submit documentation of assumptions and computations with the project description and ranking worksheet.		
306	Install Rumble Strips on shoulders		
306.1	Two-lane rural highways (50 MPH and above)	-20%	
306.2	Four-lane rural highways (50 MPH and above) Non ice/snow run off the road crashes	-10%	

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Imprvmt Type Number	Type of Improvement / Crash Types Susceptible to Reduction	Crash Cost Rdctn. Factor	Comments
307	Flatten Horizontal Curves All non-intersection crashes within the realigned segment	CLICK HERE for Horz Curve Spreadsheet Solution	Best Practice is to treat CRF as a function as described in FHWA-RD-99-207
308	Flatten Crest Vertical Curves All non-intersection crashes within the realigned segment	Use Formula from Appendix E, pg 265, of TRB Special report 214	
309 through 313	When applying roadside treatment improvements 309 through 313 individually, apply the Crash Cost Reduction Factor or computational method described for that improvement. When applying two or more roadside treatments in combination, use Roadside Safety Analysis Program (RSAP) to determine the crash cost reduction effectiveness. When using RSAP compare various treatment options against the no treatment option to find the percent change in crash cost.		
309	Relocate Non-Crashworthy Utility Poles from within to beyond clear zone. Crashes with the poles to be relocated	Varies: Use Roadside Safety Analysis Program	Create “no-build alternative” (existing conditions) and “relocate utility poles” alternative. Run program to estimate CCRF. Use HSIPHB severity costs.
310	Flatten or Regrade Side Slopes All Run-off-the-road crashes	CLICK HERE for Slope Flattening Spreadsheet Solution	Best Practice is to use before/after table presented in NCHRP 617
311	Install Shoulder Guardrail Single car run-off-the-road crashes that would have been contained by the rail and resulted in fatal, serious, or minor injuries.	-45%	
312	Remove Obstacles Crashes with the obstacle to be removed	-100%	
313	Install Impact Attenuators on rigid objects Fatal and serious injury crashes with the object to be shielded	-70%	
314	New Curve Warning Signs and Delineators All non-intersection crashes within the target curve	-20%	
315	Signs, markings, delineators at narrow bridges All crashes on bridge and within 300 ft of bridge termini	-50%	
316	Install New Continuous Illumination Night crashes on currently unlighted segments to receive lighting (exclude crashes at intersections that currently have street lights)	-25%	
317	Install Centerline Rumble Strips (50 MPH and above) All non-ice/snow head-on and sideswipe crashes on rural 2-lane roads.	-25%	
318	Install Safety Edge on shoulder edge of pavement All crashes on rural 2-lane roads.	-5%	
400	**PEDESTRIAN AND BICYCLE SAFETY**		
401	Construct Sidewalk Crashes between vehicles and pedestrians walking on shoulder	-75%	

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Applicable at Locations With Statistically High Rates of Target Crashes

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Imprvmt Type Number	Type of Improvement / Crash Types Susceptible to Reduction	Crash Cost Rdctn. Factor	Comments
402	Construct Pedestrian and Bicycle Overpass/Underpass Crashes between vehicles and bikes or pedestrians at the Xing the OP or UP will replace	-100%	Only apply the CRF to likely users of the underpass or overpass
403	Install Countdown Timer Pedestrian Signals Crashes between vehicles and pedestrians crossing at the signal	-25%	
404	Install Mid-block Signal Controlled Pedestrian Crossings Target crashes between pedestrians and vehicles at the unsignalized location where the pedestrian crossing will be installed. Do not install too close to an existing traffic signal.	-12%	
405	Install Raised Pedestrian Crossings (Speed Tables) Target crashes between pedestrians and vehicles at the location where the raised pedestrian crossing it to be installed. Do not install too close to an existing traffic signal.	-12%	
406	Install Pedestrian Refuge Islands		
406.1	Install Raised Median as Refuge at Marked Crosswalk	-45%	
406.2	Install Raised Median as Refuge at Unmarked Crosswalk Target crashes between pedestrians and vehicles at an unsignalized pedestrian crossing.	-40%	
407	Install Dedicated Bicycle Lanes Target crashes between vehicles and cyclists on a roadway without a rideable shoulder or bike lane.	-10%	
408	Install Pedestrian Hybrid Beacon Target crashes between major street vehicles and pedestrains crossing uncontrolled major street locations within 150' location of proposed beacon.	-55%	
500	**RAILROAD-HIGHWAY CROSSINGS**		
501	Upgrade from RR signs to flashers Crashes involving trains and highway vehicles	-50%	
502	Upgrade from RR signs to gates & flashers Crashes involving trains and highway vehicles	-67%	
503	Upgrade from RR flashers to gates Crashes involving trains and highway vehicles	-45%	
504	Construct RR Grade Separation Crashes involving trains and highway vehicles	-100%	
505	Install RR Crossing Illumination Crashes involving trains and highway vehicles	-25%	
506	Improve RR Crossing Sight Distance Crashes involving trains and highway vehicles	-25%	25% CRF only used if full recommended sight distance is achieved with the improvement
900	**CUSTOM IMPROVEMENTS**		
999	Custom Improvement - Requires HQ Approval Crash Types by discussion with ST&SE	- %	Reduction factor(s) on approved basis

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Crash Cost Derivation
for Analysis of FFY '22 HSIP Projects

Updated 3/31/21

Crash Cost Source and Adjustment to 2021

Crash Category FHWA Memo 3/18/09	Crash Categories (AK)	Crash Costs FHWA 08/08/16	Crash Costs AK Categories Adj for fatals/crash	Crash Costs Inflated to Current Yr	Proportion of PDO Cost (Actual)
Property Damage Only:	PDO:	$ 7,385	$ 7,880	$ 8,112	1
Possible Injury (C)		$ 70,154			
	Min Inj:		$ 108,349	$ 111,545	13.75
Non-Incapacitating Injury (B)		$ 132,923			
Incapacitating Injury (A)		$ 664,615			
	Ser Inj:		$ 709,193	$ 730,114	90
Fatality:	Fatality:	$ 9,600,000	$ 10,243,902	$ 10,546,093	1300

GDP Implicit Price Deflator	
16 GDP IPD ('15 dollars):	110.0
18 GDP IPD ('18 dollars):	113.3
Cost Inflation:	2.95%

GDP IDP: Gross Domestic Product Implicit Price Deflator. 2009=100.00

The GDP IPDs shown are 4-quarter averages.

Crash Cost Proportioning (to reduce the impact of random severe crashes)

Crash Category	Crash 5 Yr Avg (2013 - 2017)	Total Cost (Using Costs Inflated to 2020 from Above)	Proportion of PDO Cost (Input)	Adjusted Costs	Adjusted Costs-Rounded (Use for Analysis)
Property Damage Only:	7,173	$ 58,190,094.48		$ 22,235	$ 22,200
Minor Injury:	3,007	$ 335,416,450	10	$ 222,350.10	$ 222,000
Serious Injury:	279	$ 203,701,836	50	$ 1,111,750.48	$ 1,112,000
Fatality:	65	$ 685,496,024	100	$ 2,223,501	$ 2,224,000
Total Crash Cost:	10524	$ 1,282,804,405		$ 1,282,804,405	$ 1,281,602,600

Adjust for Fatalities per Fatal Crash
1.07

Adjustment applied to FHWA Value for a Statistical Life, then distributed to other severity categories.

When past crash history is used to predict future crash costs at a location (as we do in the HSIP), adjustment to actual crash cost is necessary. If this is not done, rare and random severe crashes can attract a disproportionate share of safety funding even though they are not a good indicator of future crash experience. While the difference between a fatal crash and a property-damage-only crash might be measured in microseconds or depend on non-road-related factors such as driver health or vehicle condition, the ratio of actual cost between the two is 1300 to 1. Using the full cost of fatal and severe crashes would result in misallocation of highway safety funds. Crash cost adjustment should reduce, but not eliminate, the impact of severity on predicted future crash cost. Too much value assigned to severe crashes results in safety improvements where there is little likelihood of future crashes. Too little results in high speed roads with histories of severe crashes being given no more priority than low speed roads with no severe crashes.

We have adjusted the relative value of PDO, minor injury, serious injury, and fatal crashes to correspond with pre-set proportions while still adding up to the same statewide total crash cost. PDO crashes are both the most common and least-reliably reported. Reporting can vary widely between communities and over time due to changes in reporting thresholds. Because of this and the low severity level, PDO crashes have been assigned a value 1/10 that of minor injury crashes. The FAST Act highway bill requires HSIP programs to be targeted at serious injuries and fatals. This emphasis on severe crashes is provided by making serious (major) injury crashes 50 times and fatal crashes 100 times the value of a PDO, which strikes a balance between "Chasing fatals" (making the costs too high) and not weighing crash severity highly enough.

Adjusted crash costs need to be grounded in reality. Although we can re-allocate the cost between severity categories, we should not overstate or understate the total crash cost in the state. Aside from minor rounding, the adjusted costs shown here result in an exact match of total statewide crash costs using the average crash numbers from 2013 through 2017 (the latest five-year period available).

The FHWA's advisory memo dated August 8, 2016, "Guidance on Treatment of the Economic Value of a Statistical Life in U.S. Department of Transporation Analyses, 2016 Adjustment" (an update of a Feb 28, 2013 memo) estimates the economic value of preventing a human fatality at $9.6 million dollars. Alaska estimates crash costs for injuries of varying severity in accordance with percentages provided in FHWA's Technical Advisory T7570.2, October, 1994. On an annual basis, costs are temporally adjusted using the Gross Domestic Product Implicit Price Deflator. Because the FHWA advisory gave the cost of a fatality rather than the cost of a fatal crash, we increased the cost to account for the fact that some fatal crashes have multiple fatalities.

When crash costs are used to assess post-project crash reduction, the same crash costs should be used for both the before and after periods.

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Project Life and M&O Costs
for Various Improvements

Imprv. No.	*Type of Improvement*	*Project Life* (From 1996 HSIP Annual Report)	*M&O Cost* (From ADOT&PF Sources)	
			Amount	*per Unit*
INTERSECTION AND TRAFFIC CONTROL				
101	New Turning Lanes	10	$6,000.00	lane-mile/Year
102	Increase Turn Lane Length	10	$6,000.00	lane-mile/Year
103	Two-Way Left Turn Lane	10	$6,000.00	lane-mile/Year
104	Acceleration lane for right turning traffic from side street	10	$6,000.00	lane-mile/Year
105	Improve Sight Distance at Intersection	10	$0.00	
107	Change Two Way Stop to All-Way Stop Control	6	$80.00	sign/year
108	Intersection Illumination	15	$270.00	lum/year
109	New Traffic Signal	10	$10,000.00	each/year
110	Enlarge 8 inch Traffic Signal Head to 12 inches	10	$0.00	
111.1	Conversion of Side-Mounted Signals to Overhead Signals	10	$0.00	
111.2	Increase number of signal heads	10	$50.00	each/year
112	Left-Turn Phase Traffic Signal Modifications	10	$0.00	
113	Install Curb Bulb Across Intersection From Multi-Lane Approach with Mandatory Turning Lane	20	$1.00	linear ft/year
114	Install Overhead Lane Use Control Signs	6	$80.00	sign/year
115	Rumble strips on approaches to intersections	10	$0.00	
116	Active Advance Warning Flashers	10	$2,500.00	each/year
117	Install Intersection Flashing Beacon	10	$2,500.00	each/year
118	Replace a Signal or STOP controlled intersection with a Single-Lane Roundabout	20	$0.00	
	Channelization	10	$100.00	short median/yr
	Improve Sight Distance	10	$0.00	
	SmallTraffic Signs	6	$80.00	sign/year
	LargeTraffic Signs (over 50 sf)	6	$830.00	sign/year
	Replacement of existing large and small traffic signs.	6	$0.00	
	Pavement Markings	2	$0.00	
	Flexible Delineators	2	$10.00	delin./year
STRUCTURES				
201	Replace Narrow Bridge	20	$0.00	
201	Widen Narrow Bridge	20	$0.25	square ft/year
202	Construct Interchange	30	$1,000.00	each/year
	Construct New Bridge (where there was none)	30	$0.25	square ft/year
	Replace or Improve Minor Structure	20	$0.00	
	Upgrade Bridge Rail	10	$0.00	
ROADWAY AND ROADSIDE				
301	Widen Shoulder	20	$500.00	per foot-mile/year
302	Widen Travel Lanes to PreConstruction Manual Standard	20	$500.00	per foot-mile/year
303	Install Median Barrier	20	$1.00	linear ft/year
304	Install Raised Median	20	$1.00	linear ft/year
305	Close Median Opening	10	$0.00	
306	Install Rumble Strips on shoulders	10	$0.00	
307	Flatten Horizontal Curves	20	$0.00	
308	Flatten Crest Vertical Curves	20	$0.00	
309	Relocate Non-Crashworthy Utility Poles from within to beyond clear zone.	20	$0.00	
310	Flatten or Regrade Side Slopes	20	$0.00	

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Project Life and M&O Costs
for Various Improvements

Imprv. No.	Type of Improvement	Project Life (From 1996 HSIP Annual Report)	M&O Cost (From ADOT&PF Sources)	
			Amount	per Unit
311	Install Shoulder Guardrail	10	$1.00	linear ft/year
312	Remove Obstacles	20	$0.00	
313	Install Impact Attenuators on rigid objects	10	$200.00	each/year
314	New Curve Warning Signs and Delineators	6	$80.00	sign/year
315	Signs, markings, delineators at narrow bridges	6	$80.00	sign/year
316	Install New Continuous Illumination	15	$270.00	lum/year
317	Install Centerline Rumble Strips (45 MPH and above)	10	$0.00	
	Add Lanes	20	$6,000.00	lane-mile/year
	Install Breakaway Sign Supports	10	$0.00	
	Install Breakaway Utility Poles	10	$0.00	
	Install Guardrail End Treatment	10	$100.00	each/year
	Upgrade Guardrail	10	$0.00	
	Upgrade Median Barrier	15	$0.00	
	Install Bridge Approach Guardrail Transition	10	$0.00	
PEDESTRIAN AND BICYCLE SAFETY				
401	Construct Sidewalk	20	$0.20	linear ft/year
402	Construct Pedestrian and Bicycle Overpass/Underpass	30	$0.25	square ft/year
403	Install Countdown Timer Pedestrian Signals	10	$0.00	
404	Install Mid-block Signal Controlled Pedestrian Crossings	10	$2,500.00	each/year
405	Install Raised Pedestrian Crossings (Speed Tables)	20	$0.00	
406	Install Pedestrian Refuge Islands	20	$1.00	linear ft/year
407	Install Dedicated Bicycle Lanes	20	$500.00	per foot-mile/year
	Install Fencing and Pedestrian Barrier	10	$0.20	linear ft/year
	Other Non-construction Bikeway Improvements	20	$0.00	
408	Install Pedestrian Hybrid Beacon	10	$2,000.00	each/year
RAILROAD-HIGHWAY CROSSINGS				
501	Upgrade from RR signs to flashers	10	$3,000.00	each/year
502	Upgrade from RR signs to gates & flashers	10	$6,000.00	each/year
503	Upgrade from RR flashers to gates	10	$3,000.00	each/year
504	Construct RR Grade Separation	30	$1,000.00	each/year
505	Install RR Crossing Illumination	10	$270.00	lum/year
506	Improve RR Crossing Sight Distance	10	$0.00	
	Install RR Signs and Markings Assbly where there was none	10	$200.00	each/year
	Install RR Crossbucks	10	$50.00	each/year
	Install New RR Track Circuitry	10	$0.00	
	Improve RR Crossing Surface	10	$0.00	
	Improve RR Crossing Alignment	10	$0.00	
	Relocate or Consolidate RR Crossings	30	$0.00	
	Relocate Highway to Eliminate RR Crossing	30	$0.00	

Highway Safety Improvement Program/Safety Management System Description and Activities List

Alaska DOT&PF and Alaska Division Office, FHWA agreed on eligible activities, April 29, 2013.

Purpose: This document describes eligible safety activities carried out by Regional Traffic & Safety Engineers (RTSE), regional staff, and State Traffic & Safety Engineers (STSE).

Objective: To outline the eligible safety activities conducted by traffic and safety staff.

Eligible safety activities fall under either the Highway Safety Improvement Program (HSIP) or the Safety Management System (SMS). HSIP considers the safety needs of all public roads, including non-State-owned public roads and roads on tribal land. Guidance for the HSIP is contained in the DOT&PF *HSIP Handbook*. SMS are non-project-related activities performed on state-owned roads and not all lead to operational changes or improvements in the system.

HSIP is an annual program focused on developing projects to reduce the number and severity of crashes on public roads. HSIP activities consider facility performance and condition in order to nominate and construct safety improvement projects. MAP-21 amends 23 USC 148 Highway Safety Improvement Program, and provides a listing of eligible projects, strategies, and activities.

<u>Eligible Activities</u>: Identifying high crash locations and other highway safety needs and proposing safety improvements to address those needs. Typical activities include proposing and constructing projects, managing the HSIP program including reporting, funding, training, and supporting regional HSIP activities. A list of activities includes:

- Review crash data, analyze locations for safety needs
- Identify, scope and nominate safety projects
- Initiate approved regional safety projects
- Monitor and coordinate with departmental, agency, or consulting personnel during project development and construction to maintain project scope and schedule
- Evaluate project effectiveness
- Prepare regional annual HSIP report
- Conduct Road Safety Audits and operational reviews at locations considered for HSIP projects
- Coordinate with regional planning and local governments
- Assist STSEs in assessing and improving program methodology
- Support development and implementation of the Strategic Highway Safety Plan
- Conduct training on safety improvements, countermeasures, and methods used on HSIP projects strategies, and activities
- Develop crash reduction factors or computational methods for predictive crash analysis using "Before-After" studies or other means to evaluate and assess countermeasure effectiveness
- Manage the HSIP, perform other activities necessary to respond to federal and state guidance and provide direction to regions
- Maintain and update the *HSIP Handbook*

- Prepare and distribute crash data, crash rates, and other safety-related information
- Review, approve, and recommend qualifying projects for funding
- Manage the program to promote completing safety projects and obligating all HSIP funds
- Complete the HSIP Annual Report
- Secure federal funding for the HSIP program and prepare an annual funding plan

SMS is a highway safety system that includes managing traffic control devices and systems to maintain safety performance and decrease the potential for fatal and major injury crashes. SMS activities inventory, monitor, and assess condition and performance of devices and systems to identify appropriate responses to changes in safety performance. Inventory, monitoring, or evaluation of operational issues that do not address safety performance is not an eligible use of HSIP/SMS funding.

Important systems include, but are not limited to: safety corridors, school zones, traffic signals, railroad crossings, all way stops, pedestrian and non-motorized crossings, flashing beacons, avalanche gates, emergency service traffic devices (for support of fire, hospital, callbox systems), evacuation route signing, and speed zones.

<u>Eligible Activities:</u> Working with planners and designers to consider safety countermeasures and improvements on non-HSIP projects, evaluating safety issues impacted by capacity/volume constraints and business growth activities, responding to public queries and interpreting the *Alaska Traffic Manual* and other standards, policies, and practices. Such safety-related activities include:

- Records, Tracking - inventory and mapping of major devices, tracking performance using crash data
- School Zones - interpret policy, establish sites, inventory, map, coordinate w/ local governments
- Traffic Signal, All Way Stops, Roundabouts, Intersection Control Engineering
    - Inventory, assessment, application of engineering standards, inspections (QA/QC), lane evaluation, signal timing improvements, system monitoring to ensure safety and efficiency
- Speed Limits – establish, review per state policy
- Safety Corridor audit, Road Safety Audits, and operational review of regional safety concerns not associated with a project
- Access Management, planning, and other activities in the context of Long Range Transportation Plans considering safety and capacity, ROW permitting, data review
- Annual inventory and reporting of open public RR-Grade crossings
- Drafting sign layouts, concept sketches
- Gather and review crash data in support of other SMS functions or requests for information
- Provide guidance to planning/design/WZTC personnel regarding roadside design elements, signing, pavement marking, operational standards, policies and procedures, Chief Engineers directives
- Work Zone Traffic Control and Special Events (not associated with projects)
    - WZTC and temporary speed limits, field striping and signing
    - Non-project related review, approve, coordinate, write specifications
    - Permitting and traffic control plan review for special events
    - Annual work zone traffic control reviews

    - Annual work zone accident report preparation
- Support Emergency Response Services
    - Coordination and planning for incident response
    - Coordination with communities regarding Tsunami evacuation routes
    - Communication with police and M&O regarding operations of avalanche gates, road closures, Changeable Message Signs, and callbox systems
- Public information and involvement, interaction with municipal agencies, and response to legislative inquiries
- Special/Ad hoc analyses to identify specific accident problems, respond to safety concerns, support safety initiatives
- Address public requests for signing, marked crosswalks, or other traffic control devices
- Involvement with communities and agencies planning Safe Routes to Schools projects
- Departmental Traffic & Safety engineering coordination and meetings, crash data improvement, research of technical advisories, support uniform application of optional devices and treatments
- Safety and traffic engineering related training focused on national standards, best practices, tools and guidance materials used on traffic and safety improvements
- Contribute to national dialog regarding traffic control devices and safety processes such as the Strategic Highway Safety Plan, MUTCD, etc.
- Contribute to new or revised safety-related policy and procedures, guidance, and standards, such as the *Alaska Traffic Manual*, Alaska Sign Design Specifications, Standard Drawings, Specifications, etc.
- Acquire software, manuals, guidance materials and training for safety and traffic engineering activities
- Assist Department of Law staff with preparing legal defense for lawsuits lodged against the State and provide expert testimony in court, as required
- Crash data improvement and analysis
- Resolve safety-related policy questions
- Investigate highway safety problems, recommend and promote cost-effective solutions
- Provide technical assistance on traffic and safety issues
- Identify traffic and safety-related training needs
- Organize and lead an annual statewide Traffic and Safety Engineering meeting
- Promote high priority research projects and peer-to-peer interaction on safety issues involving other states; and other traffic and safety-related activities